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PRELIMINARY GEOTECHNICAL ENGINEERING AND ENGINEERING GEOLOGY INVESTIGATION

FOR

4057 HAYVENHURST AVENUE
ENCINO

Prepared By

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January 22, 2021

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Mr. Alex Fur
7405 Del Zuro Drive
Los Angeles, CA 90046

Subject: Preliminary Geotechnical Engineering
and Engineering Geology Investigation
4057 Hayvenhurst Avenue, Encino
SAS File Number: 0FUR229

Dear Mr. Fur:

SASSAN Geosciences, Inc. (SAS) has completed a preliminary geotechnical engineering and engineering geology investigation for the subject property. Our investigation was performed to determine the nature of surface and subsurface soils and to evaluate their physical and engineering properties. The results were then analyzed, and recommendations for design and construction of the proposed improvements and related parameters were prepared. This report presents our findings and recommendations.

LOCATION AND SITE DESCRIPTION

The subject property is located on the west side of Hayvenhurst Avenue in Encino section of the City of Los Angeles, California. A vicinity map is presented on Figure A-1 in Appendix A of this report. This property is comprised of a one-story single-family residence with an attached garage and a swimming pool in the backyard to the west of the residence. The residence and swimming pool are located on the eastern half of the property, within a relatively level area. The western half of the property is an ascending, east-facing slope with a total relief of approximately eighty (80) feet. The westerly ascending slope is comprised of two parts, separated by an existing concrete swale: the lower gentle slope and the upper moderate slope. The lower part is a natural slope with gradients up to approximately 2:1 (H:V), and the upper part is a compacted fill slope with gradients up to approximately 1.5:1 (H:V). A plot plan indicating the locations of the existing improvements is presented on Figure A-2 in Appendix A of this report.

OBJECTIVE

The owners wish to assess the geotechnical and geological characteristics of the underlying ground in order to demolish the existing residence, to backfill the existing swimming pool, and to construct a two-story single-family residence with a basement, a two-story accessory dwelling unit (ADU) in the north-western corner of the rear yard and a swimming pool in the rear yard to the west of the residence at the subject property. Construction of the proposed improvements will required grading within the western half of the property and construction of retaining walls, up to approximately twelve (12) feet in height for the basement, and up to approximately thirty-six (36) feet in height in the western portion of the rear yard, along the toe of the westerly-ascending slope. In addition, the rear yard retaining wall along the toe of the westerly-ascending slope will incorporate a storage space throughout its entire length. A plot plan and cross-sections, indicating the locations of the existing and proposed improvements, are presented on Figures A-2 through A-4 in Appendix A of this report.

FIELD INVESTIGATION

Subsurface exploration was performed on November 27, 2020 and involved excavating four (4) test pits to a maximum depth of approximately five and one-half (5.5) feet. The excavating operation was performed by manual labor. Two and one-half-inch (2.5) diameter split spoon ring samples of soil and grab samples of bedrock were obtained from the test pits. Earth materials encountered were classified in accordance with the visual-manual procedures of the Unified Soil Classification System.

A plot plan indicating the approximate test pit locations is presented on Figure A-2 in Appendix A of this report.

SOIL AND GEOLOGIC CONDITIONS

Published geologic maps (Dibblee, T.W.Jr., 1991, Geologic Map of the Beverly Hills and Van Nuys [South ½] Quadrangles) indicate that the project site is underlain at depth by sedimentary bedrock of the Miocene age Topanga formation consisting of interbedded sandstone, conglomeratic sandstone, and claystone with bedding dipping to the north. The eastern portion of the property, where the proposed residence and swimming pool will be located, is mapped as underlain by alluvium within the north flowing canyon, where Hayvenhurst Avenue is located. The sloping, western portion of the property is mapped as underlain by bedrock of the Topanga formation. A copy of a regional geologic map (Dibblee) is presented on Figure D-1 in Appendix D of this report.

Our field investigation, which consisted of four (4) hand excavated test pits and hand auger borings, generally confirmed the published soil and geologic conditions with the following exceptions:

In the area of the proposed residence and swimming pool, the alluvium is mantled with fill, ranging in thickness from approximately two (2) to four (4) feet, consisting of silty clay. The underlying alluvium consists of sandy silt with rock (shale) fragments.

In the slope area to the west, the lower portion is underlain by bedrock of the Topanga formation, consisting of massive conglomeratic sandstone. The upper portion of the slope, at a steeper gradient is a graded fill slope, consisting of silty sand with fine to coarse gravel of siltstone and sandstone fragments. Research of city files did not find compaction reports, prepared for grading/construction of the fill slope.

Soil and geologic conditions, determined by our field investigation and review of published maps, are shown on the attached Geologic Plan, Figure A-2, and Geologic Section, Figure A-3 in Appendix A of this report.

EARTH MATERIALS

The earth materials encountered in the test pits vary by location. The test pit TP-1 is located on the upper moderate slope and was excavated in compacted fill material to the total depth of approximately five and one-half (5.5) feet. The test pit TP-2 is located on the lower gentle slope and encountered approximately eight (8) inches of topsoil, underlain by bedrock, which extends to the depths explored. The test pits TP-3 and TP-4 were excavated in the level pad area, and encountered up to approximately four and one-half (4.5) feet of fill, underlain by alluvium, which extends to the depths explored. The fill layer is thinner in the western parts of the pad, and thickens towards the east. Detailed logs of the test pits are presented on Figures B-1 through B-4 in Appendix B of this report.

GROUNDWATER

Groundwater seepage was not encountered in the test pits to the depths explored, and is not anticipated to impact the proposed construction.

LABORATORY TESTING

Moisture content (ASTM D 2216) and shear strength (ASTM D 3080) tests were performed for selected samples of soil considered to be representative of those encountered. The results of direct shear tests are presented on Figures B-5 and B-6 in Appendix B of this report. Evaluation of the test data is reflected throughout this report.

LIQUEFACTION

The subject property is shown on the "State of California Seismic Hazard Zones" map presented on Figure C-1 in Appendix C of this report. The site is located outside of the seismically induced liquefaction hazard zones.

SLOPE STABILITY ANALYSIS

The stability of the slope was analyzed using GSTABL7, a computer program developed to handle general slope stability problems by the Simplified Janbu and the Modified Bishop method of slices.

A set of strength parameters was obtained from the laboratory direct shear test results. The most critical slope was selected for the analysis. The plan line of the cross-section for this slope is presented on Figure A-2 in Appendix A of this report. Section A-A, used in static slope stability analyses for temporary excavations, is presented on Figure E-1 in Appendix E, section A-A, used in static and pseudo-static slope stability analyses, is presented on Figure F-1, and the surficial slope stability analysis is presented on Figure F-2 in Appendix F of this report. Following table summarizes the strength parameters used in slope stability analyses:

	Strength Parameters				
Material Type	Bedrock	Fill	Alluvium Type I	Alluvium Type II	Surficial Soil
Depth (ft)	1	4	2	4.5	2
Location Number	TP-2	TP-1	TP-3	TP-4	TP-1
Internal Friction Angle (deg)	36	27	24	29	32
Cohesion (psf)	890	410	220	110	260
Total Unit Weight (pcf)	141	136	139	139	136
Saturated Unit Weight (pcf)	141	136	139	139	136

Seismic coefficient k_{eq}=0.258 was used in the pseudo-static slope stability analyses. A copy of the analysis to determine the seismic coefficient is presented in Appendix J of this report.

Series of deep-seated static slope stability analyses for section A-A with temporary excavations resulted in a minimum factor of safety of 1.541, which is above the minimum Code requirements. The results of the stability analyses for temporary excavations are presented in Appendix E of this report.

Series of deep-seated static and pseudo-static slope stability analyses for section A-A resulted in minimum factors of safety of 1.419 and 0.934, which are below the minimum Code requirements. A surficial slope stability analysis for section A-A resulted in a minimum factor of safety of 1.88, which is above the minimum Code requirements. The results of the stability analyses are presented in Appendix F of this report.

Additional deep-seated slope stability analyses were performed without piles to determine the locations of the potential failure planes with factors of safety of 1.5 and 1.0 for static and pseudo-static conditions, respectively. Based on our analyses, the lowest potential failure planes with factors of safety above 1.5 and 1.0 for static and pseudo-static conditions, respectively, are crossing the soldier piles, supporting the backyard retaining wall at the toe of the ascending slope, at one (1) inch below the proposed pad level. The results of the stability analyses are presented in Appendix F of this report.

Also, deep-seated slope stability analyses were performed with piles to determine the values of the lateral loads, acting on the soldier piles, supporting the backyard retaining wall at the toe of the ascending slope, required to raise the minimum factors of safety to 1.5 and 1.0 for static and pseudo-static conditions, respectively. Based on our analyses, the lateral load required to raise the minimum factor of safety of the slope to 1.5 for static condition equals to 10,100 pounds per lineal foot in horizontal direction, and the lateral load required to raise the minimum factor of safety of the slope to 1.0 for pseudo-static condition equals to 11,100 pounds per lineal foot in horizontal direction. These values translate into EFPs of 15.6 pcf [(10,100*2)/(36^2)= 15.6] for static condition and 17.1 pcf [(11,100*2)/(36^2)= 17.1] for pseudo-static condition. The results of the stability analyses are presented in Appendix F of this report.

Additional deep-seated slope stability analyses were performed to determine the factors of safety of the portion of the slope above the backyard retaining wall at the toe of the ascending slope. Series of deep-seated static and pseudo-static slope stability analyses for overtopping on section A-A resulted in minimum factors of safety of 1.646 and 1.054, respectively, which are above the minimum Code requirements. The results of the stability analyses are presented in Appendix F of this report.

CONCLUSIONS AND RECOMMENDATIONS

General

The referenced property is considered to be suitable for construction of the proposed improvements from a geotechnical engineering and engineering geology standpoint, provided that our recommendations are incorporated into the approved construction plans.

The conclusions and recommendations presented here are based on our observations at the site during our investigation, engineering judgment, and analysis of the soil samples obtained from the test pits. Minor variations of subsurface conditions are common, and major variations are possible.

General Grading

Grading areas must be stripped of all vegetation, debris, and other deleterious material. All loose soil disturbed by the removal of trees and/or structures (if applicable) must be removed and recompacted.

The existing fill and surficial soil, in the area of the proposed residence, are up to approximately four and one-half (4.5) feet thick and are not suitable for foundation support. At locations where new fill is proposed, the existing fill and unsuitable soil must be entirely removed and replaced with a certified engineered fill. The proposed new fill must be placed in horizontal layers, and must be benched into undisturbed bedrock or competent alluvial deposits.

Removal of Old Pool Shell

The concrete shell of the existing old swimming pool must be completely removed. Below are provided recommendations for initial preparation, performed prior to backfilling of the existing old pool, and complete removal of the old pool shell:

1. Water must be completely drained from the old swimming pool.

2. All organic mater and debris (if any) must be completely removed from the bottom of the old pool.

3. All inlet and outlet pipes must be plugged.

4. The concrete shell of the old swimming pool must be cut/broken into small pieces and completely removed from the property.

5. The excavation must be backfilled with engineered fill per recommendations provided later in this report.

6. The new fill must be benched into the sides of the excavation.

Temporary Excavations

The review of the architectural plans indicates that excavations up to approximately twelve (12) feet in depth will be required during construction of the proposed basement retaining walls, and up to approximately thirty-six (36) feet in height will be required during construction of the proposed backyard retaining wall along the toe of the ascending slope.

The temporary excavations for the proposed basement on the east and west sides will be located at a significant distance from the street, property lines and existing structures on the neighboring properties, and will not be surcharged by the street and neighboring structures. Therefore, the temporary excavations on the east and west sides may be performed continuously in accordance with the table, provided below. However, the basement excavations on the north and south sides will be located from the adjacent property lines at a distance that is less than the depth of the excavation. As such, the temporary excavations on the north and south sides will be surcharged by the neighboring properties and must be shored. Recommendations for design and construction of shoring are provided in the following sections of this report.

Excavations up to approximately thirty-six (36) feet in height will be required during construction of the proposed backyard retaining walls. As such, due to topography of the subject property and heights of the proposed backyard retaining walls, the temporary excavations for construction of the rear yard retaining walls must be performed in accordance with the recommendations for the sequence of the construction of the proposed backyard retaining walls, provided in the next section of this report.

Based on the integrity of the site earth materials, it is our opinion that unsurcharged temporary excavations may be performed continuously in accordance with the following table:

Maximum Depth of Cut (ft)	***Maximum Slope Ratio (H:V)***
Bedrock	
0-10	Vertical
>10	1:1
Soil	
0-5	Vertical
>5	1:1

When the above system becomes impractical, shoring has to be designed for the temporary excavations. If such a condition arises, this office can provide the necessary strength parameters needed in the design of shoring elements.

The contractor may perform the excavation under continuous monitoring of a grading inspector who would ensure the quality of grading and presence of competent earth materials. The excavations may be left open for a temporary period of four (4) weeks. A grading inspector must be present when laborers are working within five (5) feet of the temporary cut area.

Sequence of Construction of Backyard Retaining Wall

Due to topography of the subject property and heights of the proposed rear yard retaining walls, we are providing following recommendations for the sequence of the construction of the proposed backyard retaining wall and associated storage space. The construction of the backyard retaining walls must be performed in two (2) stages. **First Stage:** The initial excavation in the western portion of the property must be performed up to the level of the bottom of the storage space structure, which will create a temporary level pad that may be used by drilling equipment. The temporary excavation along the toe of the westerly-ascending slope may be performed in accordance with the table, recommended in the "Temporary Excavations" section of this report. **Second Stage**: The temporary excavations for construction of the proposed backyard retaining wall below the storage space may commence only after completion of the first stage. The proposed soldier piles will extend up to the existing surface and will serve as shoring during temporary excavations. Following are our recommendations for the sequence of construction of the proposed backyard retaining wall:

1. The initial excavation in the western portion of the property must be performed up to the level of the bottom of the storage space structure.

2. Create a temporary level pad that may be used by drilling equipment.

3. Perform the temporary excavation along the toe of the westerly-ascending slope in accordance with the table, recommended in the "Temporary Excavations" section of this report. The results of the deep-seated static slope stability analyses for section A-A with temporary excavations are presented in Appendix E of this report.

4. Drill shafts for the piles for support of proposed backyard retaining walls. The shafts must be drilled from the existing surface down to the required depth (to be determined by the consulting civil engineer).

5. The allowable maximum spacing of the piles must be twelve (12) feet side-to-side. The results of the analysis for stability of the temporary excavations after installation of the soldier piles are presented in Appendix G of this report.

6. Install reinforcement for the proposed piles in the drilled shafts per approved structural plans and pour concrete.

7. Install the subdrain system for the proposed retaining wall at the bottom of the storage space.

8. Construct curtain of the retaining wall/storage space reinforcement per approved structural plans.

9. Construct the proposed retaining wall/storage space above the soldier piles.

10. After the concrete attains the required strength, commence the temporary excavations for construction of the proposed retaining wall below the proposed storage space. The temporary excavation may be performed up to the maximum depth of approximately ten (10) feet below the ground surface.

11. Install dowels on the soldier piles and construct curtain of the retaining wall reinforcement per approved structural plans.

12. Construct the proposed retaining wall between the soldier piles.

13. Continue the temporary excavation in ten (10) foot vertical intervals repeating the steps 10, 11 and 12, until proposed finish subgrade level is reached.

14. Install the subdrain system for the proposed retaining wall at the bottom of the wall.

15. Install dowels on the soldier piles and construct curtain of the retaining wall reinforcement per approved structural plans.

16. Construct the proposed retaining wall between the piles.

Shoring Installation

Based on existing architectural plans, temporary excavations up to approximately fourteen (14) feet in depth will be required during construction of the retaining walls of the proposed basement. The basement excavations on the north and south sides will be located from the adjacent property lines at a distance that is less than the depth of the excavation and must be shored. The temporary excavations on the north and south sides may commence only after installation of the soldier piles of the shoring system. The shoring may consist of wide flange I-beams imbedded in concrete soldier piles and wooden lagging that spans between the I-beams. The final design of the shoring must be performed by the consulting civil engineer. The recommendations for the soldier piles are provided in the following section of this report. The installation of the shoring must be performed in the following order:

1. The shoring piles must be drilled from the existing surface down to the required depth (to be determined by the consulting civil engineer).

2. Soldier pile reinforcement (steel I-beams) for shoring must be installed.

3. The soldier piles must be filled with concrete up to the bottom of the proposed grade beam.

4. The rest of the soldier pile must be filled with one-sack-slurry up to the existing surface.

5. The initial excavation may be performed up to five (5) feet below the existing grade.

6. The wooden lagging must be installed up to the bottom of the excavation.

7. The lagging must be backfilled with incompressible material such as compacted construction sand or a half-sack-slurry.

8. The excavation may be performed up to the design depth (bottom of the proposed grade beam) in five (5) foot vertical intervals, repeating the steps 5, 6 and 7.

9. The wooden lagging must be installed up to the level of the top of the proposed grade beam (two (2) feet above the bottom of the excavation).

10. The lagging must be backfilled with incompressible material such as compacted construction sand or a half-sack-slurry.

Shoring Design Recommendations

The shoring may consist of wide flange I-beams imbedded in concrete soldier piles and wooden lagging that spans between the I-beams. The pressure distribution diagram for the design of the shoring elements and the back-up calculations are presented in Appendix H of this report. The final design of the shoring must be performed by the consulting civil engineer. The consulting structural engineer may combine the proposed shoring piles and foundation piles for support of the basement retaining walls. The following minimums apply to the design of the shoring elements:

1. Soldier piles of the shoring system must be founded at a minimum depth of eight (8) feet into undisturbed alluvium. The actual depth of soldier piles, however, must be determined by the structural engineer in conjunction with this office.

2. The maximum allowable horizontal spacing of the shoring piles must be eight (8) feet center-to-center. The results of the analysis for stability of the temporary excavations after installation of the shoring piles are presented in Appendix G of this report.

3. Soldier piles must have a minimum diameter of twenty-four (24) inches.

4. The pile excavations must be covered if left overnight.

5. Soldier piles must be assumed fixed at two (2) feet into undisturbed alluvium.

6. A Registered Grading Deputy Inspector, approved by and responsible to this office, will be required to provide continuous inspection during the drilling of the proposed soldier piles and installation of shoring.

7. Active earth pressure increasing at a minimum rate of 49 psf per foot of depth must be used in the design of shoring elements. The backup calculations are presented in Appendix H of this report.

8. Active earth pressure increasing at a minimum rate of 30 psf per foot of depth up to the maximum of 400 psf must be used in the design of wooden lagging that spans between the I-beams.

9. The shoring elements must be design for a maximum allowable horizontal deflection of one-half (½) inch.

10. An allowable passive earth pressure increasing at a maximum rate of 300 psf per foot of depth, to a maximum of 4,500 psf, must be applied to portions of the shoring piles that are embedded a minimum two (2) feet into alluvium.

11. The suggested passive pressure may be doubled for an isolated pile condition (d>2.5D).

Foundations

The proposed residence and backyard retaining walls must be supported on a grade beam/soldier pile combination foundation. The following recommendations should be implemented. A side friction value of 750 psf in compression and 375 psf in tension may be utilized for the portion of the soldier piles that are penetrated a minimum two (2) feet into undisturbed bedrock. The allowable side friction values may be increased by thirty (30) percent for momentary wind and seismic loads. The following minimums apply to the soldier piles:

1. Soldier piles must be founded at a minimum depth of eight (8) feet into undisturbed bedrock. The actual depth of soldier piles, however, must be determined by the structural engineer in conjunction with this office.

2. The allowable maximum spacing of the soldier piles, supporting the backyard retaining walls, must be twelve (12) feet side-to-side. The horizontal spacing of the friction piles, supporting the basement retaining walls, may be determined by the consulting structural engineer.

3. Soldier piles must have a minimum diameter of twenty-four (24) inches.

4. The pile excavations must be covered if left overnight.

5. A Registered Grading Deputy Inspector approved by and responsible to this office will be required to provide continuous inspection for the proposed soldier pile drilling and installation.

6. Active earth pressure increasing at a minimum rate of 58 psf per foot of depth must be used in the design of cantilevered basement retaining walls, and at -rest earth pressure increasing at a minimum rate of 90 psf per foot of depth must be used in the design of basement retaining walls that are braced at the top and the bottom. Our analyses indicate, that the values of static and combined static and seismic earth pressures are below the above-recommended values, therefore additional earth pressure due to seismic forces does not need to be applied to the proposed retaining walls. The results of the earth pressure analyses are presented in Appendix I of this report.

7. Based on our analyses, the lateral load required to raise the minimum factor of safety of the slope to 1.5 for static condition equals to 10,100 pounds per lineal foot in horizontal direction, and the lateral load required to raise the minimum factor of safety of the slope to 1.0 for pseudo-static condition equals to 11,100 pounds per lineal foot in horizontal direction. These values translate into EFPs of 15.6 pcf [(10,100*2)/(36^2)= 15.6] for static condition and 17.1 pcf [(11,100*2)/(36^2)= 17.1] for pseudo-static condition. As such, active earth pressures, increasing at rates listed in the following table, must be used in the design of the proposed rear yard retaining walls:

Slope of the Retained Backfill (H:V)	*Active EFP (pcf)*
Level	30
5:1	33
4:1	35
3:1	38
2:1	43
1½:1	55

Our analyses indicate, that the values of static and combined static and seismic earth pressures are below above recommended values, therefore additional earth pressure due to seismic forces does not need to be applied to the proposed retaining walls. The results of the analyses are presented in Appendix F of this report.

8. Passive earth pressure increasing at the rate of 400 psf per foot of depth, to a maximum of 8,000 psf, must be applied to portions of the soldier piles that are embedded a minimum two (2) feet into undisturbed bedrock.

9. The suggested passive pressure may be doubled for an isolated pile condition (d>2.5D).

<u>Subdrain System</u>

The proposed retaining walls must be provided with weep holes or perforated pipe and gravel sub-drain to prevent entrapment of water in the backfill. The perforated pipe must consist of four-inch (4”) minimum diameter PVC Schedule 40, or ABS SDR-35, with a minimum of sixteen (16) perforations per foot on the bottom one-third of the pipe. Every foot of the pipe should be embedded in three (3) cubic feet of three-quarter-inch (3/4”) gravel wrapped in filter fabric (Mirafi 140N or equal). Placement of gravel and filter fabric is also required for weep holes. The subdrain system behind the basement retaining walls will be located below the street level and will not drain via gravity. The subdrain water must be collected in a concrete catch basin and pumped to the street via sump-pumps.

In addition, the retaining walls of the basement must be provided with extensive damp-proofing. The damp-proofing must be designed by a water proofing specialist.

Freeboard

All retaining walls, surcharged by a sloping condition, must be provided with a minimum twelve-inch (12”) high freeboard for slough protection. An open Vee Channel at the toe of the slope must be constructed behind the wall to carry off the slope water.

Swimming Pool Recommendations

The concrete shell of the proposed swimming pool must be designed as a freestanding structure. A bearing capacity of 3,000 psf must be used for the base of the swimming pool, founded minimum twenty four (24) inches into undisturbed bedrock. The following minimums apply to the lateral loading of the pool shell:

1. Water pressure increasing at a minimum rate of 65 psf per foot of depth and acting upon the inner wall of the swimming pool shell must be used in calculations.

2. Active earth pressure increasing at a minimum rate of 60 psf per foot of depth and acting upon the outer wall of the swimming pool shell must be used in calculations.

3. Passive earth pressure increasing at the rate of 400 psf per foot of depth, to a maximum of 6,000 psf, must be used in calculations for the portion of the pool shell that is in contact with the bedrock.

4. A coefficient of friction of 0.4 must be utilized for resisting lateral loads at the contact surface of concrete and foundation soils.

5. The swimming pool must be located at a minimum distance of seven (7) feet from the neighboring retaining walls, measured from inside face of the wall.

Settlements

Maximum total and differential settlements are expected to be less than one-half (½) and one-quarter (¼) inches, respectively, provided that our recommendations are followed.

Seismic Hazards

The subject property is shown on the "State of California Seismic Hazard Zones" map presented in Appendix C of this report. The site is located outside of potential seismically induced landslide and liquefaction hazard zones.

Seismic Parameters

The seismic parameters for the design of the proposed structure based on the 2020 Los Angeles Building Code are as follows:

Latitude	34^{o} 08' 41" N
Longitude	118^{o} 29' 54" W
Site Classification	D
Site Coefficient, F_a	1.2
Site Coefficient, F_v	1.7
Site Spectral Response Acceleration Parameters (g):	
Mapped Acceleration, S_S (0.2 sec.)	1.872
Mapped Acceleration, S_1 (1 sec.)	0.665
Adjusted Maximum Acceleration, S_{MS} (0.2 sec.)	2.246
Adjusted Maximum Acceleration, S_{M1} (1 sec.)	1.131
Design Acceleration, S_{DS} (0.2 sec.)	1.498
Design Acceleration, S_{D1} (1 sec.)	0.754

A long period coefficient (Fv) of 1.7 may be utilized for calculation of Ts, provided that the value of the Seismic Response Coefficient (Cs) is determined by Equation 12.8-2 (ASCE/SEI 7-16) for values of the fundamental period of the building (T) less than or equal to 1.5Ts, and taken as 1.5 times the value computed in accordance with either Equation 12.8-3 (ASCE/SEI 7-16) for T greater than 1.5Ts and less than or equal to T_L or Equation 12.8-4 (ASCE/SEI 7-16) for T greater than T_L.

Conformance with the above listed criteria for seismic design does not constitute any kind of warranty, guarantee, or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and limb, and to prevent catastrophic failures, and not to avoid all damage, since such design may be economically prohibitive.

Engineered Fill

All fill earth materials must consist of clean soil that is free of vegetation and other debris. The fill must be placed in six- (6-) to eight- (8-) inch thick lifts at near optimum moisture content and compacted. Particles larger than three (3) inches in diameter must not be allowed in the backfill material. Earth materials must not be imported to the site without prior approval by the soil engineer. All engineered fill must be compacted to a minimum of ninety (90) percent of its maximum dry density (ASTM D 1557). Where cohesionless soil having less than fifteen (15) percent finer than 0.005 millimeter is used for fill, it must be compacted to a minimum of ninety-five (95) percent of its maximum dry density. Neither jetting nor water tamping are permitted.

Heavy construction equipment must be maintained at a minimum distance of three (3) feet from the existing structures. Hand-operated compaction equipment must be used to compact the backfill soils within this 3-foot-wide zone.

Bulking and Shrinkage

Estimates of bulking and shrinkage factors are based on empirical judgments. **Bulking** is estimated by comparing the material in its natural state, as encountered in the exploratory excavations, to a loose excavated state. **Shrinkage** is estimated by comparing the material in its loose excavated state to a properly compacted state.

Based on our experience, the shrinkage and bulking factors for the types of earth materials, encountered at the subject property, are anticipated to be for the bedrock 40% and for the top soil 20%.

Internal Concrete Slabs

The subgrade for the proposed internal concrete slabs-on-grade must consist of undisturbed alluvium or a minimum two (2) foot thick layer of certified compacted fill. The competent subgrade must be covered with four (4) inches of crushed miscellaneous aggregate (CMA) and compacted to ninety-five percent (95%) of its maximum dry density (ASTM D 1557). The CMA must be covered with one (1) inch of sand. The sand must be covered by a ten (10)-mil vapor barrier. The vapor barrier must be installed so that the edges of the sheet overlap at least twelve (12) inches onto any adjacent sheet. The vapor barrier must be covered with one (1) inch of sand. The sand must be covered with four (4) inches of non-expansive hard rock concrete mix (3/4" max. rock size). The reinforcement must be a minimum of #4 bars at sixteen (16) inches on center in both directions. The reinforcement must be placed at the mid-depth of the concrete slab. The slab must be covered with a vapor barrier for at least two (2) days to slow the curing time, reduce the shrinkage crack potential and be self-watering.

The consulting structural-engineer-of-record may decide to increase the slab thickness according to the proposed traffic loads.

Driveway

The subgrade for the proposed driveway must consist of undisturbed alluvium or a minimum two (2) foot thick layer of certified compacted fill. The competent subgrade must be covered with four (4) inches of crushed miscellaneous aggregate (CMA) and compacted to ninety-five percent (95%) of its maximum dry density (ASTM D1557). The CMA must be covered by asphalt concrete, concrete slab, stone pavers or equal.

Pipe Bedding and Trench Backfill

The pipe bedding must consist of sand or similar granular material having a minimum sand equivalent value of thirty (30). The sand must be placed in a zone that extends a minimum of six (6) inches below and twelve (12) inches above the pipe for the full trench width. The bedding material must be compacted. The trench backfill above the pipe bedding may consist of approved, on-site or imported soils, and it must be compacted. Where utility trenches are parallel to the footings, the bottom of the trench must be located above a plane with a slope of 1:1, projected downward from the adjacent bottom edge of the footing.

Site Drainage

Drainage devices such as sloping sidewalks and area drains must be provided around the building to collect and direct all water away from the structure. Neither rain nor excess irrigation water should be allowed to collect or pond against foundations. The collected water must be directed to the proper drainage system via non-erosive devices. The actual site drainage, however, must be designed by the consulting civil engineer-of-record.

DESIGN REVIEW

We suggest that the geotechnical and geological aspects of the project be reviewed by this firm during the design process. The scope of our services may include assistance to the design team by providing specific recommendations for special cases, reviewing the foundation design, reviewing the geotechnical and geological portions of the project for possible cost savings through alternative approaches, and evaluating the overall applicability of our recommendations. Additional site-specific explorations may also be considered if significant foundation modifications are required using the above recommendations.

The owner should anticipate that both the geologist and soils engineer must review and approve the detailed plans prior to issuance of any permits. This approval shall be by signature on the plans which clearly indicates that the geologist and soils engineer have reviewed the plans prepared by the design engineer and that the plans include the recommendations contained in their reports.

INSPECTIONS

All excavations must be inspected and approved. All fill placed for engineering purposes must be tested for compaction and moisture content and certified. The subdrain system must be observed and approved. Inspection of excavations and subdrain system may also be required by the appropriate reviewing governmental agencies.

It is recommended that SAS be retained to verify compliance with the recommendations made in this report, to ensure compliance with the design concepts, specifications, and recommendations, and to allow design changes in the event that exposed subsurface conditions differ from those anticipated herein.

A joint meeting among the parties involved in this project is recommended prior to the start of groundbreaking to discuss specific procedures and scheduling.

Inspections performed by SAS are for verification purposes only and shall under no circumstance relieve other parties involved in the design and construction from their obligation to perform work in accordance with the approved plans.

In the event that the recommendations contained herein are interpreted by others, SAS will not accept responsibility for such interpretations.

INVESTIGATION LIMITATIONS

The conclusions and recommendations presented in this report are based on the findings and observations in the field and the results of laboratory tests performed on representative samples. The soils encountered in the test pits are believed to be representative of the total area; however, soil characteristics can vary throughout the site. SAS should be notified if subsurface conditions are encountered which differ from those described in this report.

This report has not been prepared for use by parties or projects other than those named and described above. It may not contain sufficient information for other parties or other purposes. The conclusions and recommendations presented in this report are professional opinions. These opinions have been derived in accordance with current standards of geotechnical engineering and engineering geology practice, field observations and laboratory test results. No other warranty is expressed or implied.

Samples secured for this investigation will be retained in our laboratory for a period of thirty (30) days from the date of this report and will be disposed after this period unless other arrangements are made.

This report should be reviewed and updated after a period of one year or if the project concept changes from that described herein.

We appreciate the opportunity to be of service to you. If you have any questions, please call our office.

Sincerely,

SASSAN GEOSCIENCES, INC.

Sassan A. Salehipour, G.E.
President

Thomas G. Hill, C.E.G.
Engineering Geologist

SAS/TH:ak/0fur229a3.doc
Appendices

REFERENCES:

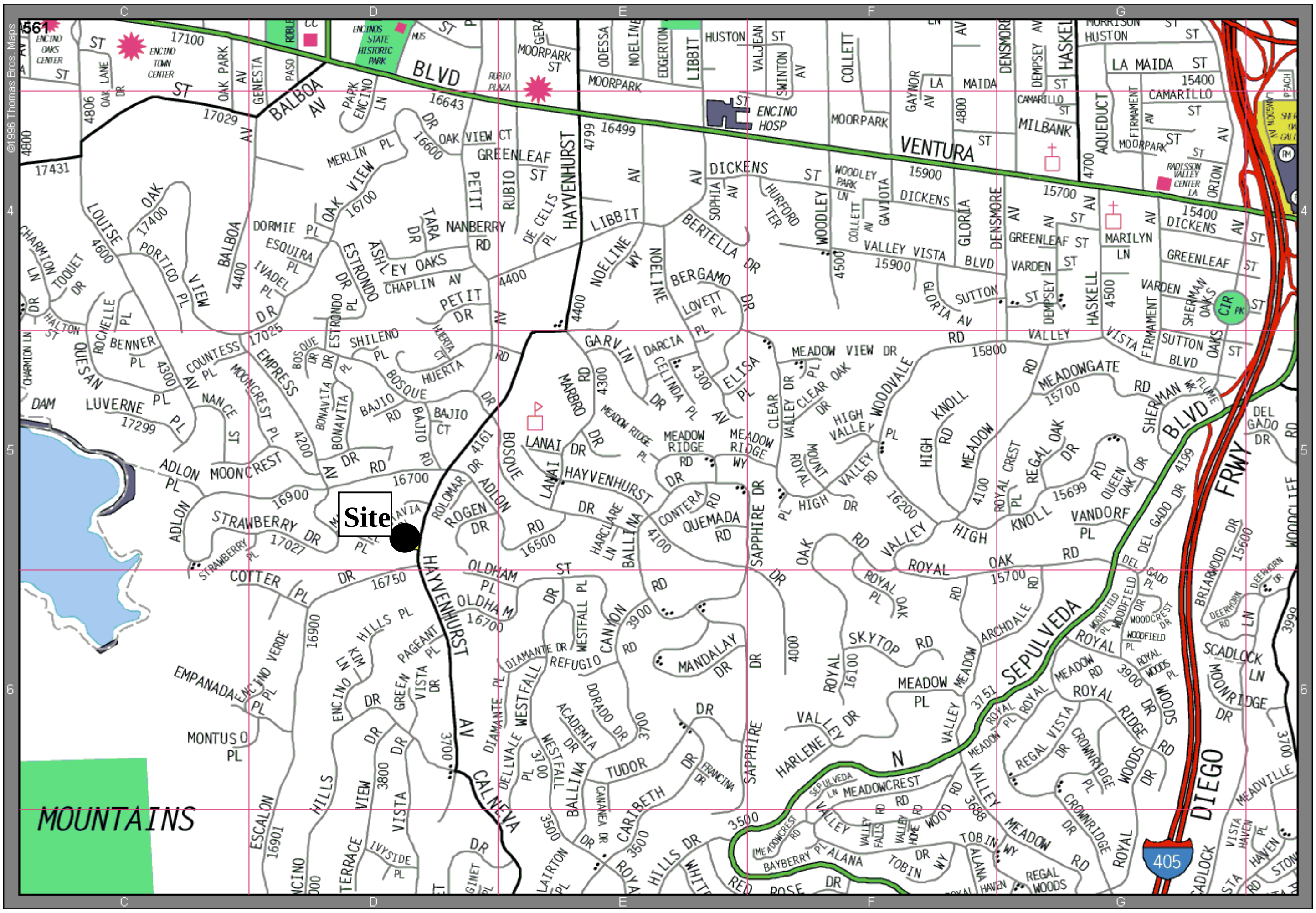
1. California Division of Mines and Geology, 1997, Seismic Hazard Zone Report for the Van Nuys 7.5 Minute Quadrangle, Los Angeles County, California; SHZR 08

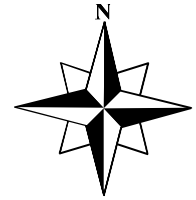
2. California Division of Mines and Geology, 1998, Seismic Hazard Zones Map for the Van Nuys Quadrangle, Los Angeles County, California; Scale 1:24,000

3. City of Los Angeles, Preliminary Geologic Maps, Map # 44

4. Dibblee, T.W., 1991, Geologic Map of the Beverly Hills and Van Nuys (South ½) Quadrangles, Los Angeles County, California. Dibblee Geological Foundation, Santa Barbara, California; Map DF-31; Scale 1:24,000

APPENDIX A





SAS	VICINITY MAP 4057 HAYVENHURST AVENUE, ENCINO	FIGURE A-1

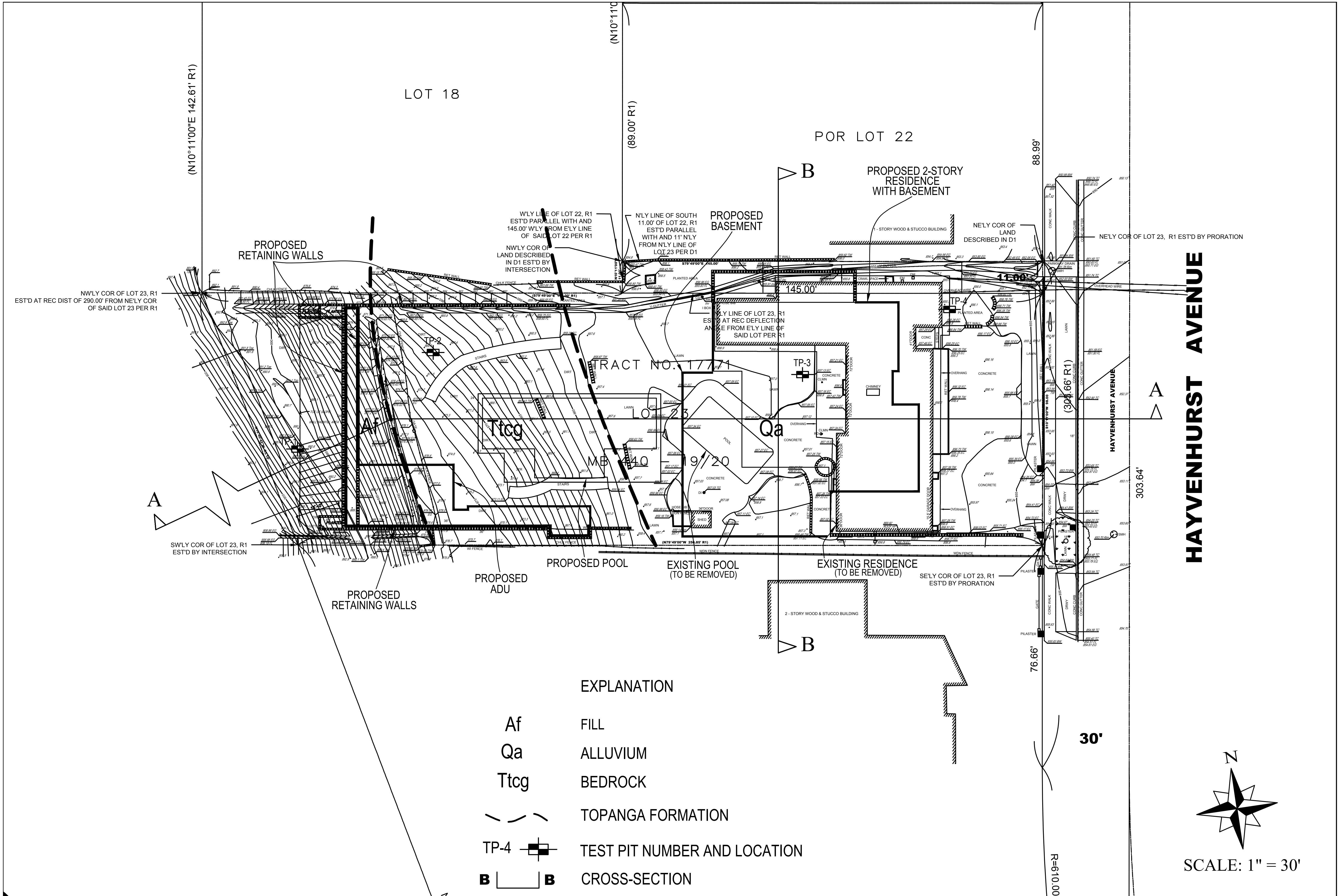
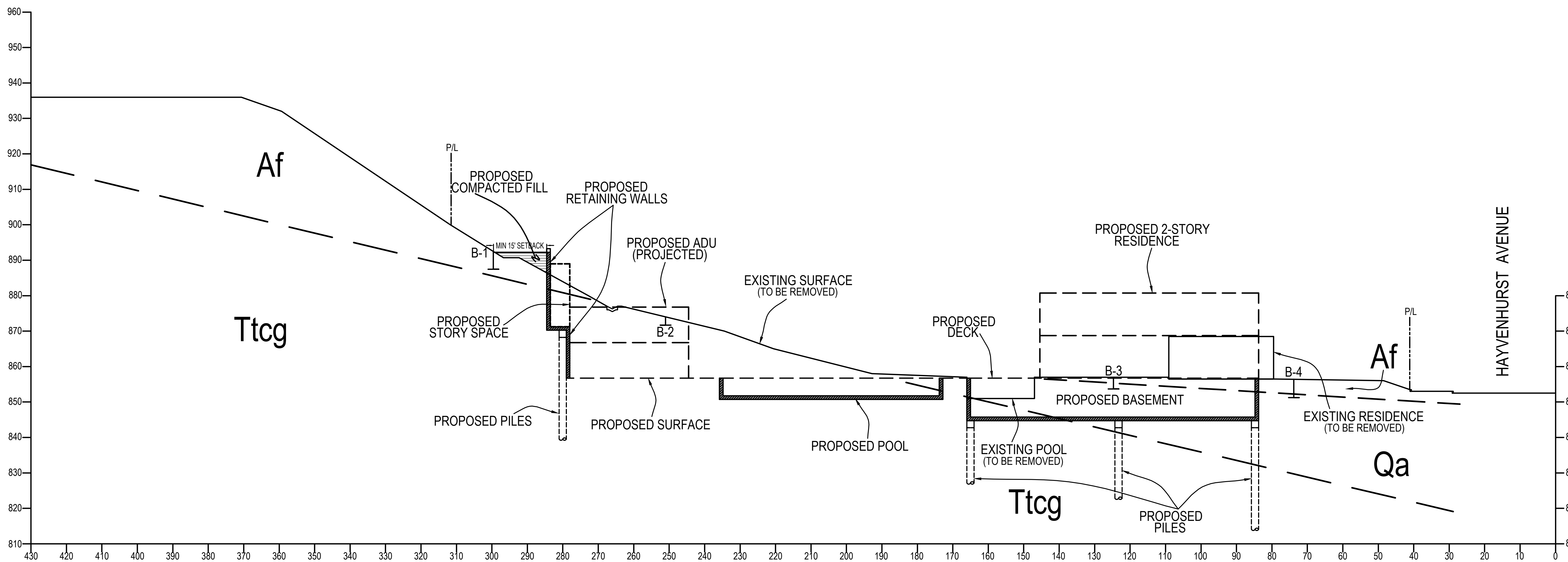


FIGURE A-2

PLOT PLAN
4057 HAYVENHURST AVENUE, ENCINO

SAS
0FUR229



SCALE: 1" = 30'

FIGURE A-3

CROSS-SECTION A-A
4057 HAYVENHURST AVENUE, ENCINO

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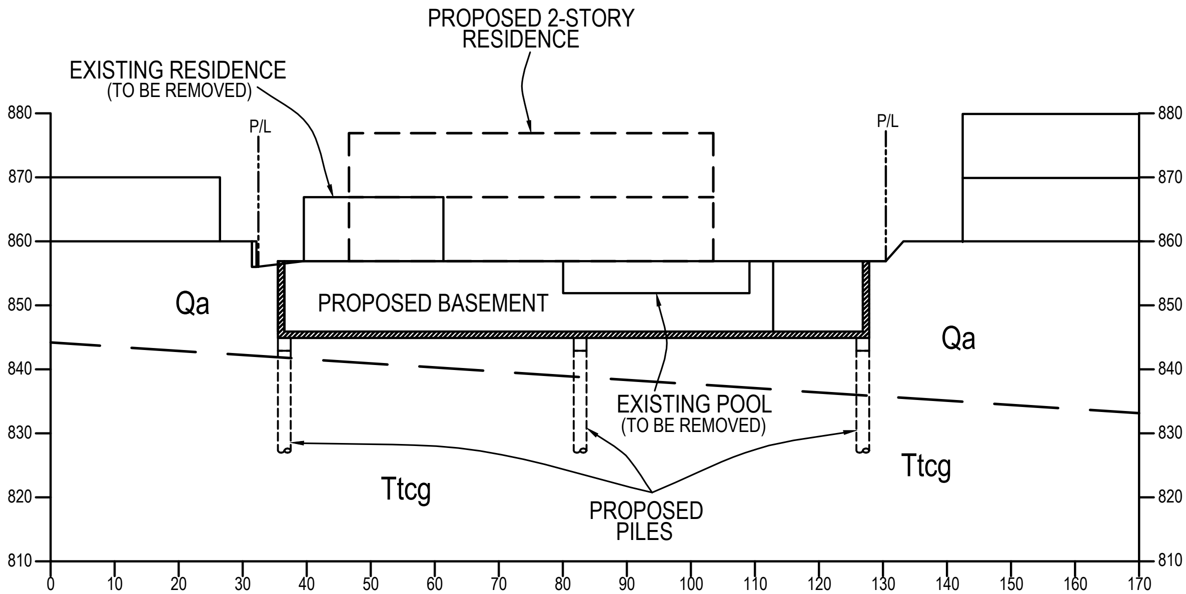
CROSS-SECTION B-B

4057 HAYVENHURST AVENUE, ENCINO

S4S
0FUR229



SCALE: 1" = 30'

LEGEND SEE FIGURE A-2

FIGURE
A-4

APPENDIX B

Sample Number	γ_d (pcf)	Moisture (%)	N	USCS	Depth (ft)	Description
				SM	0–3	**Fill:** Yellow brown silty sand with F-C gravel of Siltstone / Sandstone. Slightly moist. Loose to 10 inches then dense and gray silty sand with thin bedded siltstone fragments. Slightly moist. Dense
R-1	118	6				
				ML	3–5.5	Change to yellow brown sandy silt with hard volcanic rock fragments. Moist, dense
R-2	116	13				
						Refusal @5.5'
					6, 7, 8, 9, 10	Excavation Terminated at Depth of 5.5 Feet Water Seepage Was Not Encountered

R = Ring Sample

SAS	LOG OF TEST PIT NUMBER ONE (TP-1) 4057 HAYVENHURST AVENUE, ENCINO	FIGURE B-1

Sample Number	γ_d (pcf)	Moisture (%)	N	USCS	Depth (ft)	Description
				ML	0	**Native / Surficial Soil:** Brown sandy silt with F-M gravel of volcanic , angular rock fragments. Dry to slightly moist, loose, porous, many small rootlets
R-1	126	4		BX	1 2	**Bedrock: Topanga Fm**. Conglomeratic Sandstone, Orange brown, clasts are subrounded to angular. Primarily volcanic rock with lesser olive brown gray sandstone. Hard, massive, difficult to excavate
					3 4 5 6 7 8 9 10	Excavation Terminated at Depth of 28 Inches Water Seepage Was Not Encountered

R = Ring Sample

SAS	LOG OF TEST PIT NUMBER TWO (TP-2) 4057 HAYVENHURST AVENUE, ENCINO	FIGURE B-2

Sample Number	γ_d (pcf)	Moisture (%)	N	USCS	Depth (ft)	Description
				CL	0–1	**Fill:** Fill with grass cover: Dark brown, silty clay. Moist, firm
R-1	108	12		ML	2–3	**Alluvium or Fill;** Yellow brown sandy silt with subangular rock fragments. Moist, firm
						Refusal at 3.3' on rocky soil
					4–10	

Excavation Terminated at Depth of 40 Inches
Water Seepage Was Not Encountered

R = Ring Sample

SAS

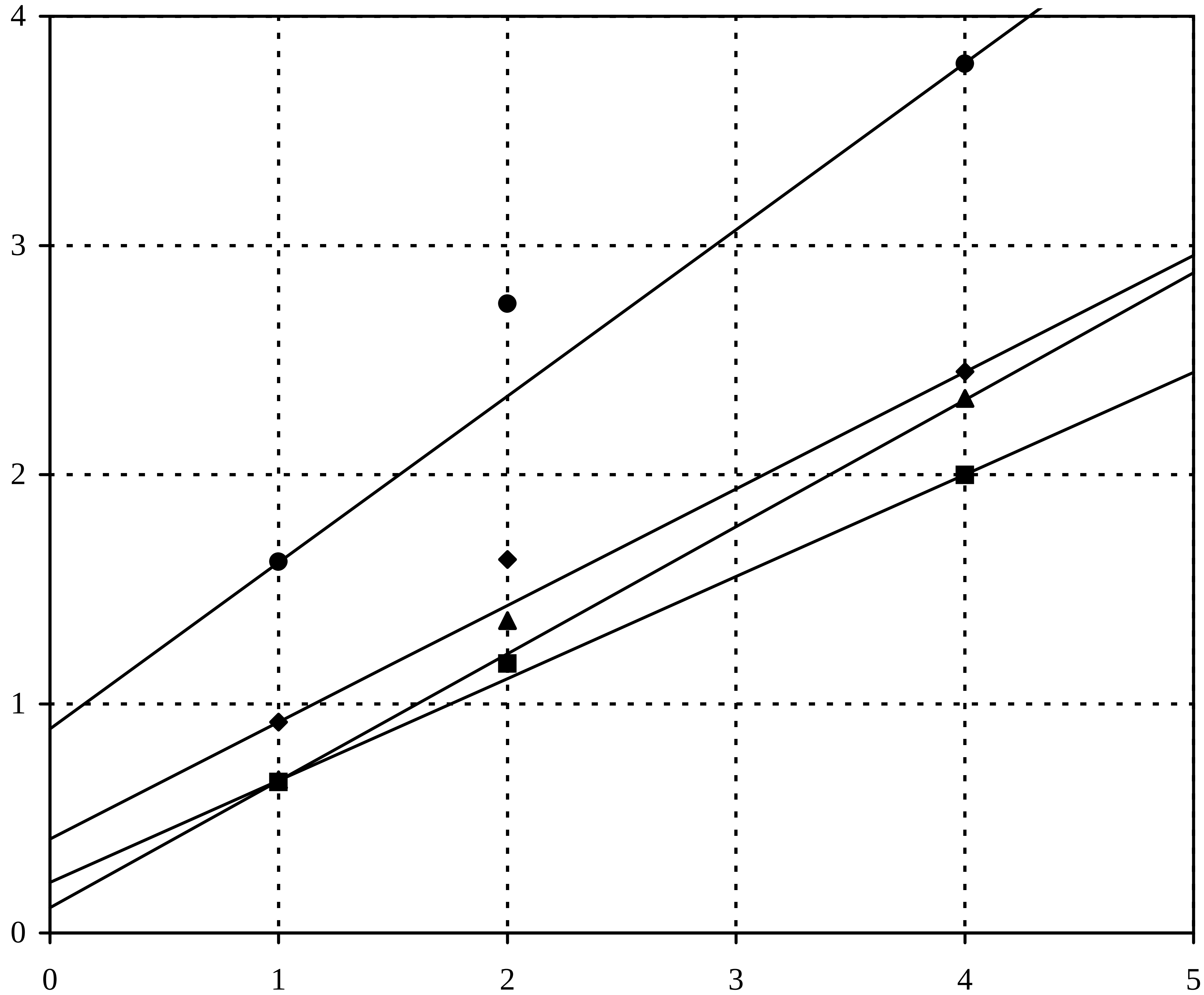
LOG OF TEST PIT NUMBER THREE (TP-3)
4057 HAYVENHURST AVENUE, ENCINO

FIGURE B-3

Sample Number	γ_d (pcf)	Moisture (%)	N	USCS	Depth (ft)	Description
				CL/ML	0	**Fill:** Brown silty clay and clayey silt with rock fragments to 3". Moist, firm
					1	
R-1	102	14			2	
					3	
					4	
R-1	123	8		SM	5	**Native (Alluvium):** Yellow brown, silty sand with fine to coarse gravel (Rock Fragments), moist, dense
					6	
					7	
					8	
					9	
					10	Excavation Terminated at Depth of 5' 2" Water Seepage Was Not Encountered

R = Ring Sample

SAS	LOG OF TEST PIT NUMBER FOUR (TP-4) 4057 HAYVENHURST AVENUE, ENCINO	FIGURE B-4



Symbol	Test Location	Sample Number	Depth (ft)	Soil Type	Cohesion (psf)	Friction Angle (deg)	Remarks
u	TP-1	R-2	4	ML	410	27	1
●	TP-2	R-1	1.0	Bedrock	890	36	2
■	TP-3	R-1	2.0	ML	220	24	3
▲	TP-4	R-1	4.5	SM	110	29	4

Remarks:

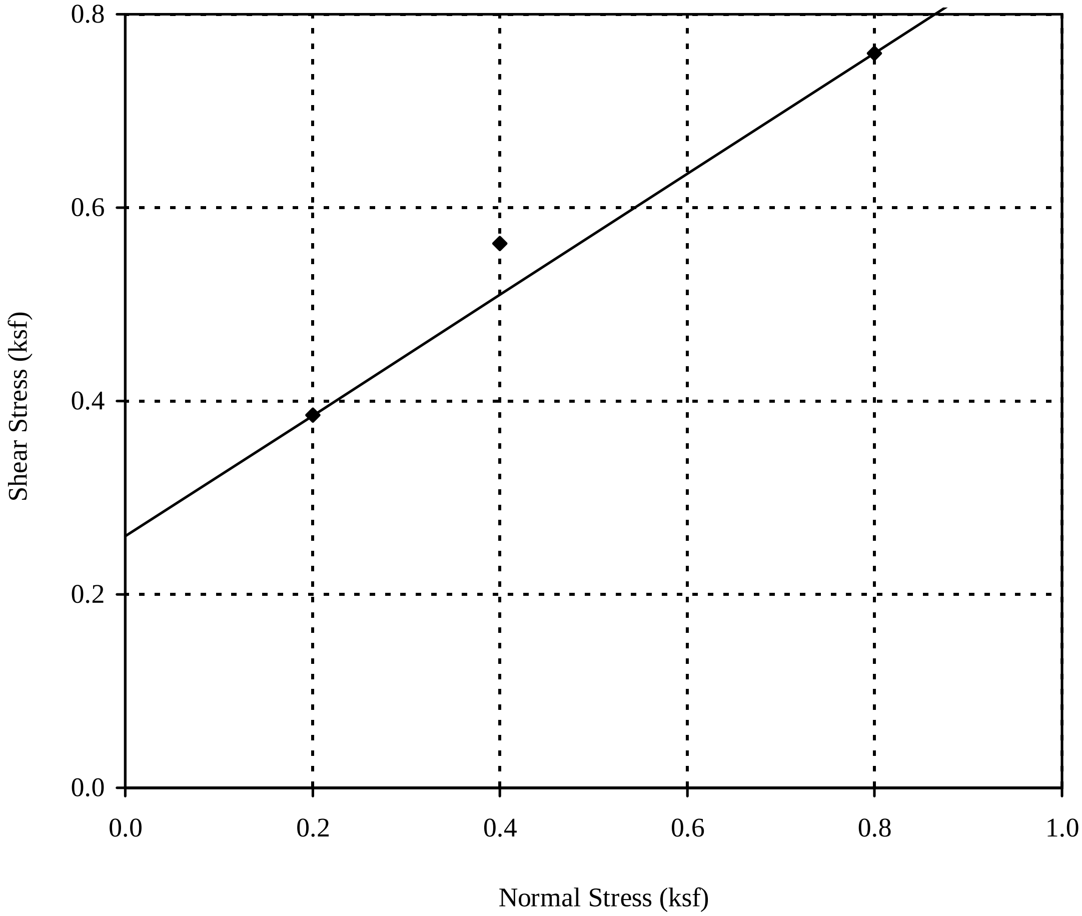
1 - FILL; Saturated Moisture Content: 16%, Dry Density: 116 pcf; Ultimate

2 - BEDROCK; Saturated Moisture Content: 12%, Dry Density: 126 pcf; Ultimate

3 - ALLUVIUM; Saturated Moisture Content: 20%, Dry Density: 108 pcf; Ultimate

4 - ALLUVIUM; Saturated Moisture Content: 13%, Dry Density: 123 pcf; Ultimate

SAS	DIRECT SHEAR TEST RESULTS 4057 HAYVENHURST AVENUE, ENCINO	FIGURE B-5



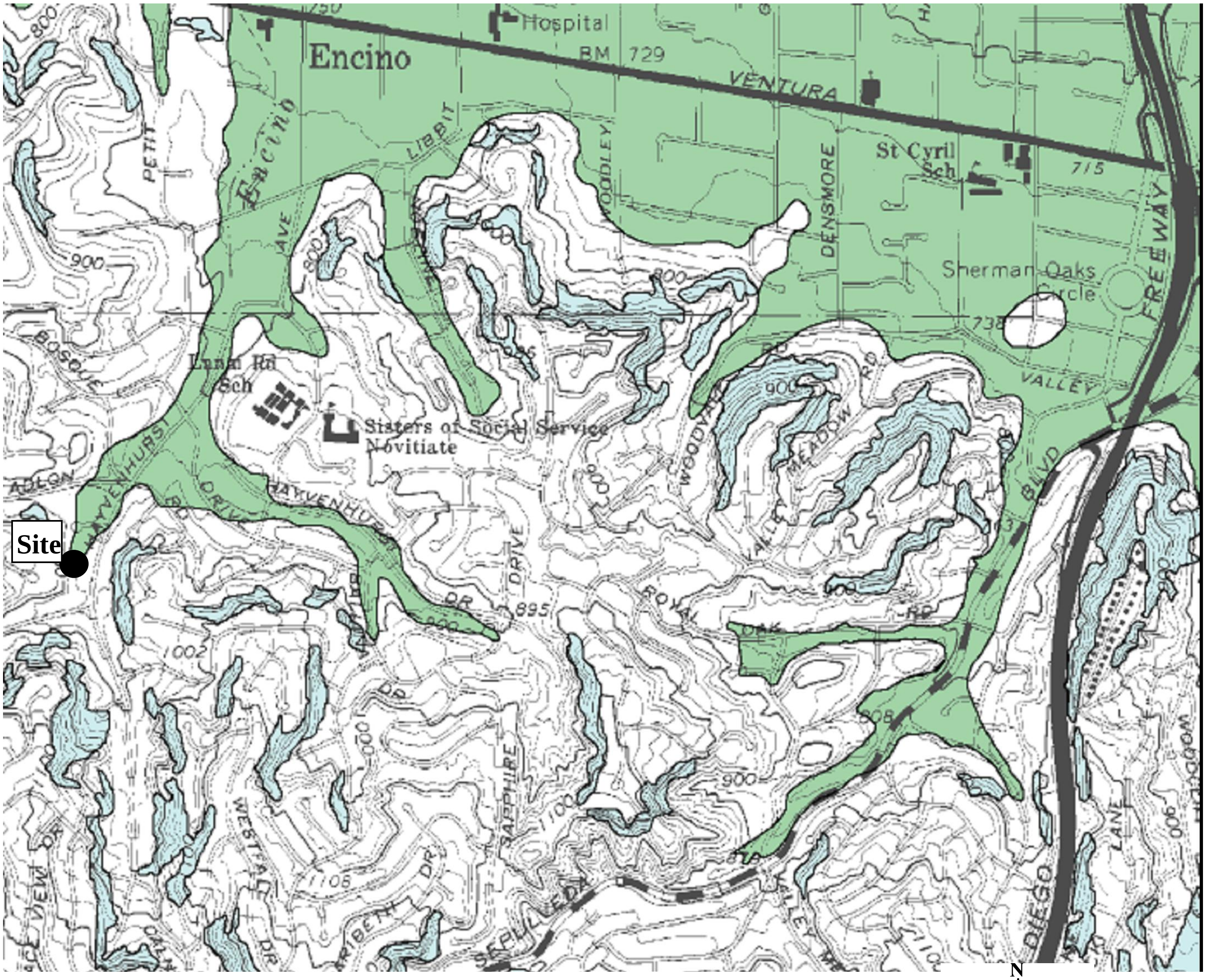
Symbol	Test Location	Sample Number	Depth (ft)	Soil Type	Cohesion (psf)	Friction Angle (deg)	Remarks
u	TP-1	R-1	2	SM	260	32	1

Remarks:

1 - FILL; Saturated Moisture Content: 15%, Dry Density: 118 pcf; Ultimate

SAS	DIRECT SHEAR TEST RESULTS 4057 HAYVENHURST AVENUE, ENCINO	FIGURE B-6

APPENDIX C



STATE OF CALIFORNIA

SEISMIC HAZARD ZONES

Delineated in compliance with Chapter 7.8, Division 2 of the California Public Resources Code (Seismic Hazards Mapping Act)

VAN NUYS QUADRANGLE

OFFICIAL MAP

Released: February 1, 1998

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

SAS	CALIFORNIA SEISMIC HAZARD ZONES MAP 4057 HAYVENHURST AVENUE, ENCINO	FIGURE C-1

APPENDIX D

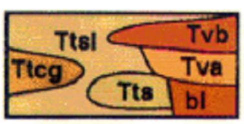
SURFICIAL SEDIMENTS

unconsolidated detrital sediments; generally undissected

af *artificial cut and fill* **Qls** *landslide debris*

Qs *beach sand*

Qa *alluvial gravel, sand, and silt-clay, derived mostly from Santa Monica Mountains; includes gravel and sand of stream channels*



MIDDLE TOPANGA FORMATION AND VOLCANIC ROCKS

(middle Topanga Formation of Durrell 1954; part of Topanga Formation of Hoots 1931)

*marine clastic; middle Miocene age (*Tcb *and* Ttsl *intercalated)*

Ttsl *mostly interbedded gray to tan semi-friable sandstone and gray micaceous claystone; locally includes lenses of pebbly sandstone and pebble-cobble conglomerate*

Ttcg *light gray conglomerate of cobbles and pebbles of granitic metaporphyritic and quartzitic rocks in soft sandy matrix*

Tts *tan semi-friable sandstone, poorly exposed*

Tvb *basaltic volcanic rocks: dark gray to black, fine grained, massive, rarely vesicular; composed of mafic minerals (augite and olivine) and plagioclase feldspar; incoherent where weathered; occur as lenticular flows and/or injected sills; probably equivalent to and related to Conejo Volcanics of Yerkes and Campbell 1979*

Tva *andesitic volcanic rocks, black where fresh, weathers dark gray to brown, fine grained, in part vesicular, brecciated; may range to basaltic*

bl *intrusive basalt-andesite*

N

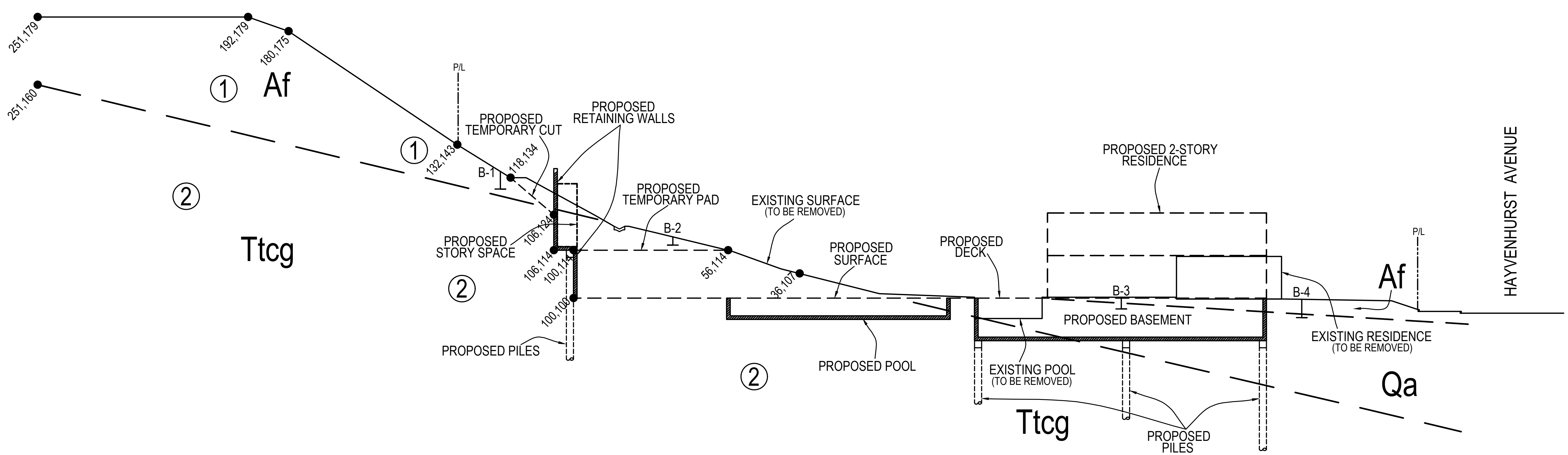
Dibblee, T.W., Jr., Dibblee Geological Foundation, Geologic Map of Beverly Hills and Van Nuys (South ½) Quadrangles, 1991, Map # DF-31

SAS	GEOLOGIC MAP 4057 HAYVENHURST AVENUE, ENCINO	FIGURE D-1

APPENDIX E

① FILL: C = 410 psf, φ = 27°

② BEDROCK: C = 390 psf, φ = 36°



SCALE: 1" = 30'

FIGURE E-1

CROSS-SECTION A-A
4057 HAYVENHURST AVENUE, ENCINO

SAS
0FUR229

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****

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 Earthquake, and Applied Force Options.

****

```
Analysis Run Date:        1/27/2021
Time of Run:              1:27PM
Run By:                   Username
Input Data Filename:      C:0fur9-1t.in
Output Filename:          C:0fur9-1t.OUT
Unit System:              English
Plotted Output Filename:  C:0fur9-1t.PLT
PROBLEM DESCRIPTION:  4057 Hayvenhurs Slope Stability Analysis
                      Section A-A (Temp; Circ; Static)
BOUNDARY COORDINATES
     Note: User origin value specified.
     Add 0.00 to X-values and 0.00 to Y-values listed.

    8 Top   Boundaries
    9 Total Boundaries
```

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	36.00	107.00	56.00	114.00	2
2	56.00	114.00	106.00	114.00	2
3	106.00	114.00	106.01	124.00	2
4	106.01	124.00	118.00	134.00	1
5	118.00	134.00	132.00	143.00	1
6	132.00	143.00	180.00	175.00	1
7	180.00	175.00	192.00	179.00	1
8	192.00	179.00	251.00	179.00	1
9	106.01	124.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

```
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1100 Trial Surfaces Have Been Generated.
 100 Surface(s) Initiate(s) From Each Of    11 Points Equally Spaced
Along The Ground Surface Between  X =  88.00(ft)
                             and  X = 118.00(ft)
Each Surface Terminates Between   X = 180.00(ft)
                            and   X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
 7.00(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 Evaluated =  1100
      Statistical Data On All Valid FS Values:
         FS Max =  15.146   FS Min =   1.541   FS Ave =   3.245
         Standard Deviation =    0.882   Coefficient of Variation =   27.18 %
```

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	112.00	129.00
2	119.00	129.21
3	125.97	129.87
4	132.88	130.96
5	139.71	132.48
6	146.44	134.42
7	153.03	136.78
8	159.46	139.55
9	165.71	142.71
10	171.74	146.25
11	177.54	150.17
12	183.09	154.44
13	188.36	159.05
14	193.33	163.98
15	197.98	169.21
16	202.30	174.72
17	205.24	179.00

Circle Center At X = 112.01 ; Y = 241.00 ; and Radius = 112.00

Factor of Safety

*** 1.541 ***

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	6.0	1965.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	1.0	694.5	0.0	0.0	0.	0.	0.0	0.0	0.0
3	7.0	6956.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	6.0	8793.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.9	1486.6	0.0	0.0	0.	0.	0.0	0.0	0.0
6	6.8	13147.4	0.0	0.0	0.	0.	0.0	0.0	0.0
7	6.7	15489.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	6.6	17230.4	0.0	0.0	0.	0.	0.0	0.0	0.0
9	6.4	18366.1	0.0	0.0	0.	0.	0.0	0.0	0.0
10	6.2	18907.5	0.0	0.0	0.	0.	0.0	0.0	0.0
11	6.0	18879.0	0.0	0.0	0.	0.	0.0	0.0	0.0
12	5.8	18318.3	0.0	0.0	0.	0.	0.0	0.0	0.0
13	2.5	7709.3	0.0	0.0	0.	0.	0.0	0.0	0.0
14	3.1	9349.8	0.0	0.0	0.	0.	0.0	0.0	0.0
15	5.3	14445.2	0.0	0.0	0.	0.	0.0	0.0	0.0
16	3.6	8689.2	0.0	0.0	0.	0.	0.0	0.0	0.0
17	1.3	2828.0	0.0	0.0	0.	0.	0.0	0.0	0.0
18	4.7	7848.7	0.0	0.0	0.	0.	0.0	0.0	0.0
19	4.3	4129.5	0.0	0.0	0.	0.	0.0	0.0	0.0
20	2.9	855.4	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	112.00	129.00
2	118.95	129.87
3	125.83	131.12
4	132.64	132.76
5	139.34	134.77
6	145.92	137.16
7	152.36	139.90
8	158.64	143.01
9	164.73	146.45
10	170.62	150.23
11	176.30	154.33
12	181.73	158.74
13	186.91	163.45
14	191.82	168.44
15	196.45	173.69

16	200.62	179.00

Circle Center At X = 99.86 ; Y = 254.04 ; and Radius = 125.63

Factor of Safety

*** 1.543 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	109.00	126.49
2	115.92	127.54
3	122.76	129.02
4	129.50	130.92
5	136.11	133.24
6	142.55	135.97
7	148.81	139.09
8	154.87	142.61
9	160.69	146.49
10	166.26	150.74
11	171.55	155.32
12	176.54	160.23
13	181.22	165.44
14	185.56	170.93
15	189.55	176.68
16	190.68	178.56

Circle Center At X = 95.87 ; Y = 237.19 ; and Radius = 111.47

Factor of Safety

*** 1.546 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.00	131.50
2	122.00	131.47
3	128.98	131.98
4	135.90	133.02
5	142.72	134.60
6	149.40	136.71
7	155.89	139.32
8	162.16	142.43
9	168.17	146.02
10	173.89	150.06
11	179.28	154.53
12	184.30	159.41
13	188.93	164.66
14	193.14	170.25
15	196.91	176.15
16	198.43	179.00

Circle Center At X = 118.97 ; Y = 221.53 ; and Radius = 90.12

Factor of Safety

*** 1.563 ***

Failure Surface Specified By 15 Coordinate Points

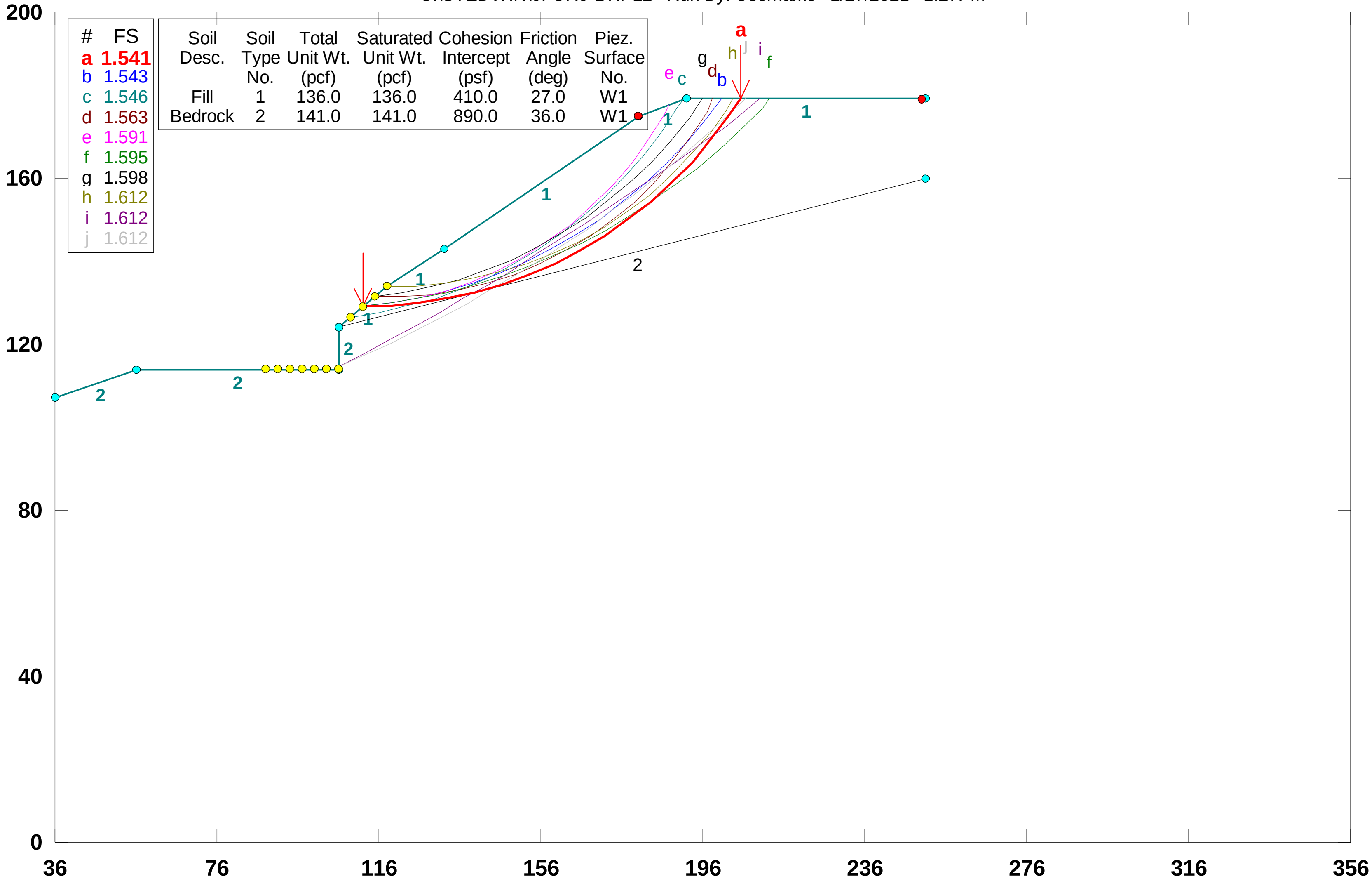
Point No.	X-Surf (ft)	Y-Surf (ft)
1	112.00	129.00
2	118.96	129.77
3	125.84	131.06
4	132.60	132.85
5	139.22	135.14
6	145.65	137.91
7	151.85	141.16
8	157.80	144.85
9	163.45	148.98
10	168.79	153.51
11	173.77	158.42
12	178.37	163.70
13	182.58	169.30
14	186.35	175.19
15	187.62	177.54

```
Circle Center At X =   105.07 ; Y =   223.09 ; and Radius =    94.35
       Factor of Safety
      ***    1.591   ***
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        112.00      129.00
    2        118.95      129.86
    3        125.85      131.03
    4        132.69      132.49
    5        139.47      134.26
    6        146.16      136.32
    7        152.75      138.67
    8        159.23      141.31
    9        165.60      144.23
   10        171.82      147.42
   11        177.91      150.89
   12        183.83      154.62
   13        189.59      158.60
   14        195.16      162.84
   15        200.55      167.31
   16        205.73      172.01
   17        210.70      176.94
   18        212.61      179.00
Circle Center At X =    95.87 ; Y =   287.67 ; and Radius =   159.49
       Factor of Safety
      ***    1.595   ***
Failure Surface Specified By 15 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        115.00      131.50
    2        121.94      132.44
    3        128.80      133.80
    4        135.57      135.58
    5        142.22      137.78
    6        148.72      140.38
    7        155.04      143.38
    8        161.17      146.76
    9        167.08      150.51
   10        172.75      154.62
   11        178.15      159.07
   12        183.27      163.85
   13        188.08      168.93
   14        192.57      174.30
   15        196.03      179.00
Circle Center At X =   103.28 ; Y =   244.43 ; and Radius =   113.54
       Factor of Safety
      ***    1.598   ***
Failure Surface Specified By 16 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        118.00      134.00
    2        125.00      134.08
    3        131.98      134.65
    4        138.90      135.71
    5        145.72      137.26
    6        152.42      139.28
    7        158.97      141.77
    8        165.32      144.72
    9        171.44      148.10
   10        177.32      151.91
   11        182.91      156.12
   12        188.19      160.71
   13        193.13      165.67
   14        197.72      170.96
   15        201.91      176.56
```

```
   16        203.49      179.00
Circle Center At X =   120.44 ; Y =   233.07 ; and Radius =    99.10
       Factor of Safety
      ***    1.612   ***
Failure Surface Specified By 19 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        106.00      114.50
    2        112.25      117.66
    3        118.46      120.89
    4        124.64      124.18
    5        130.78      127.53
    6        136.89      130.95
    7        142.97      134.43
    8        149.00      137.97
    9        155.00      141.58
   10        160.97      145.24
   11        166.89      148.97
   12        172.78      152.76
   13        178.62      156.61
   14        184.43      160.52
   15        190.19      164.49
   16        195.92      168.52
   17        201.60      172.61
   18        207.24      176.76
   19        210.21      179.00
Circle Center At X =  -195.83 ; Y =   718.74 ; and Radius =   675.43
       Factor of Safety
      ***    1.612   ***
Failure Surface Specified By 19 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        106.00      114.50
    2        112.43      117.27
    3        118.80      120.17
    4        125.11      123.20
    5        131.36      126.35
    6        137.55      129.63
    7        143.66      133.03
    8        149.71      136.56
    9        155.69      140.21
   10        161.59      143.97
   11        167.41      147.86
   12        173.15      151.86
   13        178.81      155.98
   14        184.39      160.21
   15        189.88      164.55
   16        195.28      169.00
   17        200.59      173.57
   18        205.81      178.23
   19        206.63      179.00
Circle Center At X =   -27.98 ; Y =   434.36 ; and Radius =   346.78
       Factor of Safety
      ***    1.612   ***
          **** END OF GSTABL7 OUTPUT ****
```

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Temp; Circ; Static)

C:\STEDWIN\0FUR9-1T.PL2 Run By: Username 1/27/2021 1:27PM



GSTABL7 v.2 FSmin=1.541

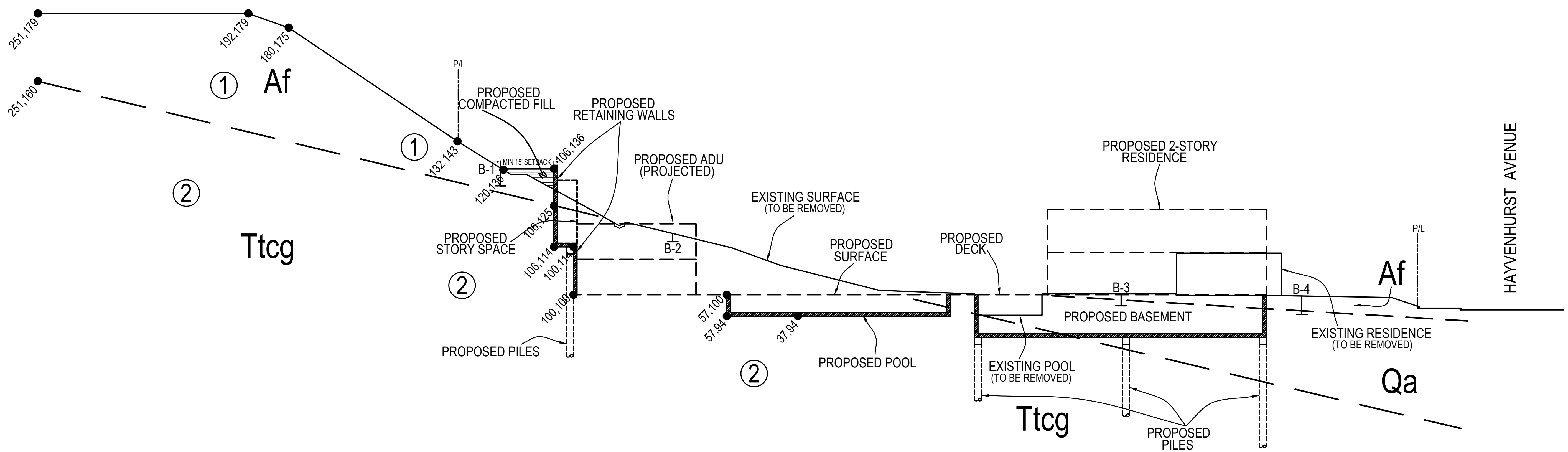
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

APPENDIX F

① FILL: C = 410 psf, φ = 27°

② BEDROCK: C = 890 psf, φ = 36°



SCALE: 1" = 30'

FIGURE F-1

CROSS-SECTION A-A
4057 HAYVENHURST AVENUE, ENCINO

SAS
0FUR229

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****

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 Earthquake, and Applied Force Options.
****

Analysis Run Date: 1/27/2021
Time of Run: 1:31PM
Run By: Username
Input Data Filename: C:0fur9-1s.in
Output Filename: C:0fur9-1s.OUT
Unit System: English
Plotted Output Filename: C:0fur9-1s.PLT
PROBLEM DESCRIPTION: 4057 Hayvenhurs Slope Stability Analysis
Section A-A (Circular; Static)

BOUNDARY COORDINATES
Note: User origin value specified.
Add 36.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1100 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 11 Points Equally Spaced
Along The Ground Surface Between X = 88.00(ft)
and X = 118.00(ft)
Each Surface Terminates Between X = 180.00(ft)
and X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
7.00(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 Evaluated = 1100

Statistical Data On All Valid FS Values:

FS Max = 5.004 FS Min = 1.419 FS Ave = 3.227

Standard Deviation = 0.786 Coefficient of Variation = 24.35 %

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	105.70	104.77
3	111.37	108.88
4	117.00	113.03
5	122.60	117.23
6	128.17	121.47
7	133.71	125.76
8	139.20	130.09
9	144.67	134.46
10	150.10	138.88
11	155.49	143.35
12	160.85	147.85
13	166.17	152.40
14	171.45	156.99
15	176.70	161.62
16	181.91	166.30
17	187.09	171.01
18	192.22	175.77
19	195.65	179.00

Circle Center At X = -405.07 ; Y = 815.40 ; and Radius = 875.15

Factor of Safety

*** 1.419 ***

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	0.0	8.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.7	9035.5	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.3	384.8	0.0	0.0	0.	0.	0.0	0.0	0.0
4	0.0	20.5	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.0	35.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	5.3	21640.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	5.6	19645.6	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.0	9112.1	0.0	0.0	0.	0.	0.0	0.0	0.0
9	2.6	7426.2	0.0	0.0	0.	0.	0.0	0.0	0.0
10	5.6	15275.3	0.0	0.0	0.	0.	0.0	0.0	0.0
11	3.8	10005.6	0.0	0.0	0.	0.	0.0	0.0	0.0
12	1.7	4338.4	0.0	0.0	0.	0.	0.0	0.0	0.0
13	5.5	13617.6	0.0	0.0	0.	0.	0.0	0.0	0.0
14	5.2	12380.4	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.2	548.7	0.0	0.0	0.	0.	0.0	0.0	0.0
16	5.4	12242.3	0.0	0.0	0.	0.	0.0	0.0	0.0
17	5.4	11551.1	0.0	0.0	0.	0.	0.0	0.0	0.0
18	5.4	10818.4	0.0	0.0	0.	0.	0.0	0.0	0.0
19	5.3	10045.6	0.0	0.0	0.	0.	0.0	0.0	0.0
20	5.3	9233.6	0.0	0.0	0.	0.	0.0	0.0	0.0
21	5.2	8383.7	0.0	0.0	0.	0.	0.0	0.0	0.0
22	3.3	4843.8	0.0	0.0	0.	0.	0.0	0.0	0.0
23	1.9	2570.4	0.0	0.0	0.	0.	0.0	0.0	0.0
24	5.2	5519.9	0.0	0.0	0.	0.	0.0	0.0	0.0
25	4.9	3270.1	0.0	0.0	0.	0.	0.0	0.0	0.0
26	0.2	100.3	0.0	0.0	0.	0.	0.0	0.0	0.0
27	3.4	754.2	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	100.00	100.70
2	105.71	104.75

3	111.41	108.81
4	117.10	112.90
5	122.77	116.99
6	128.44	121.11
7	134.08	125.25
8	139.72	129.40
9	145.34	133.57
10	150.95	137.76
11	156.55	141.96
12	162.13	146.18
13	167.70	150.43
14	173.25	154.68
15	178.80	158.96
16	184.33	163.25
17	189.84	167.56
18	195.34	171.89
19	200.83	176.23
20	204.30	179.00

Circle Center At X = -1182.68 ; Y = 1918.10 ; and Radius = 2224.45

Factor of Safety

*** 1.422 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.13	104.08
3	112.19	107.59
4	118.16	111.25
5	124.04	115.04
6	129.83	118.97
7	135.53	123.03
8	141.14	127.23
9	146.64	131.56
10	152.04	136.01
11	157.33	140.59
12	162.52	145.29
13	167.59	150.12
14	172.55	155.06
15	177.40	160.11
16	182.12	165.28
17	186.72	170.55
18	191.20	175.93
19	193.63	179.00

Circle Center At X = -41.05 ; Y = 364.59 ; and Radius = 299.22

Factor of Safety

*** 1.438 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	105.36	105.21
3	110.70	109.73
4	116.03	114.27
5	121.34	118.84
6	126.63	123.42
7	131.90	128.02
8	137.16	132.65
9	142.40	137.29
10	147.62	141.95
11	152.82	146.63
12	158.01	151.33
13	163.18	156.05
14	168.33	160.79
15	173.47	165.55
16	178.58	170.33
17	183.68	175.12

18	185.48	176.83

Circle Center At X = -1101.19 ; Y = 1535.61 ; and Radius = 1871.31

Factor of Safety

*** 1.467 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.14	104.07
3	112.24	107.50
4	118.31	110.98
5	124.35	114.53
6	130.35	118.13
7	136.31	121.80
8	142.24	125.52
9	148.13	129.30
10	153.98	133.14
11	159.80	137.04
12	165.58	140.99
13	171.31	145.00
14	177.01	149.07
15	182.67	153.20
16	188.28	157.37
17	193.86	161.61
18	199.39	165.90
19	204.88	170.24
20	210.32	174.64
21	215.62	179.00

Circle Center At X = -237.97 ; Y = 724.30 ; and Radius = 709.30

Factor of Safety

*** 1.491 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	105.24	105.35
3	110.47	110.00
4	115.69	114.66
5	120.90	119.33
6	126.11	124.02
7	131.30	128.71
8	136.49	133.41
9	141.67	138.12
10	146.84	142.83
11	152.00	147.56
12	157.16	152.30
13	162.30	157.05
14	167.44	161.80
15	172.57	166.57
16	177.68	171.34
17	182.47	175.82

Circle Center At X = -2457.99 ; Y = 2991.90 ; and Radius = 3860.35

Factor of Safety

*** 1.496 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.40	103.55
3	112.72	106.55
4	118.98	109.68
5	125.16	112.97
6	131.27	116.39
7	137.29	119.96
8	143.23	123.66
9	149.09	127.50

10	154.85	131.47
11	160.52	135.58
12	166.09	139.81
13	171.56	144.18
14	176.94	148.66
15	182.20	153.28
16	187.36	158.01
17	192.41	162.86
18	197.34	167.82
19	202.16	172.90
20	206.86	178.09
21	207.65	179.00

Circle Center At X = -20.01 ; Y = 378.90 ; and Radius = 302.98

Factor of Safety

*** 1.497 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	105.22	105.37
3	110.43	110.04
4	115.64	114.71
5	120.85	119.39
6	126.05	124.08
7	131.25	128.77
8	136.44	133.47
9	141.62	138.17
10	146.80	142.88
11	151.98	147.59
12	157.15	152.31
13	162.32	157.03
14	167.48	161.76
15	172.63	166.49
16	177.79	171.23
17	182.93	175.98

Circle Center At X = -4415.49 ; Y = 5158.97 ; and Radius = 6780.54

Factor of Safety

*** 1.497 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.09	104.15
3	112.16	107.65
4	118.20	111.18
5	124.21	114.76
6	130.20	118.39
7	136.17	122.05
8	142.10	125.76
9	148.01	129.51
10	153.90	133.31
11	159.75	137.14
12	165.58	141.02
13	171.38	144.94
14	177.15	148.90
15	182.89	152.90
16	188.61	156.95
17	194.29	161.03
18	199.95	165.16
19	205.57	169.32
20	211.17	173.53
21	216.73	177.78
22	218.31	179.00

Circle Center At X = -376.45 ; Y = 949.19 ; and Radius = 973.11

Factor of Safety

*** 1.500 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.47	103.37
3	112.82	106.32
4	119.04	109.53
5	125.11	113.02
6	131.03	116.76
7	136.77	120.76
8	142.34	125.00
9	147.72	129.48
10	152.90	134.19
11	157.87	139.12
12	162.62	144.26
13	167.14	149.60
14	171.43	155.14
15	175.47	160.85
16	179.26	166.74
17	182.79	172.78
18	184.81	176.60

Circle Center At X = 41.97 ; Y = 250.89 ; and Radius = 161.01

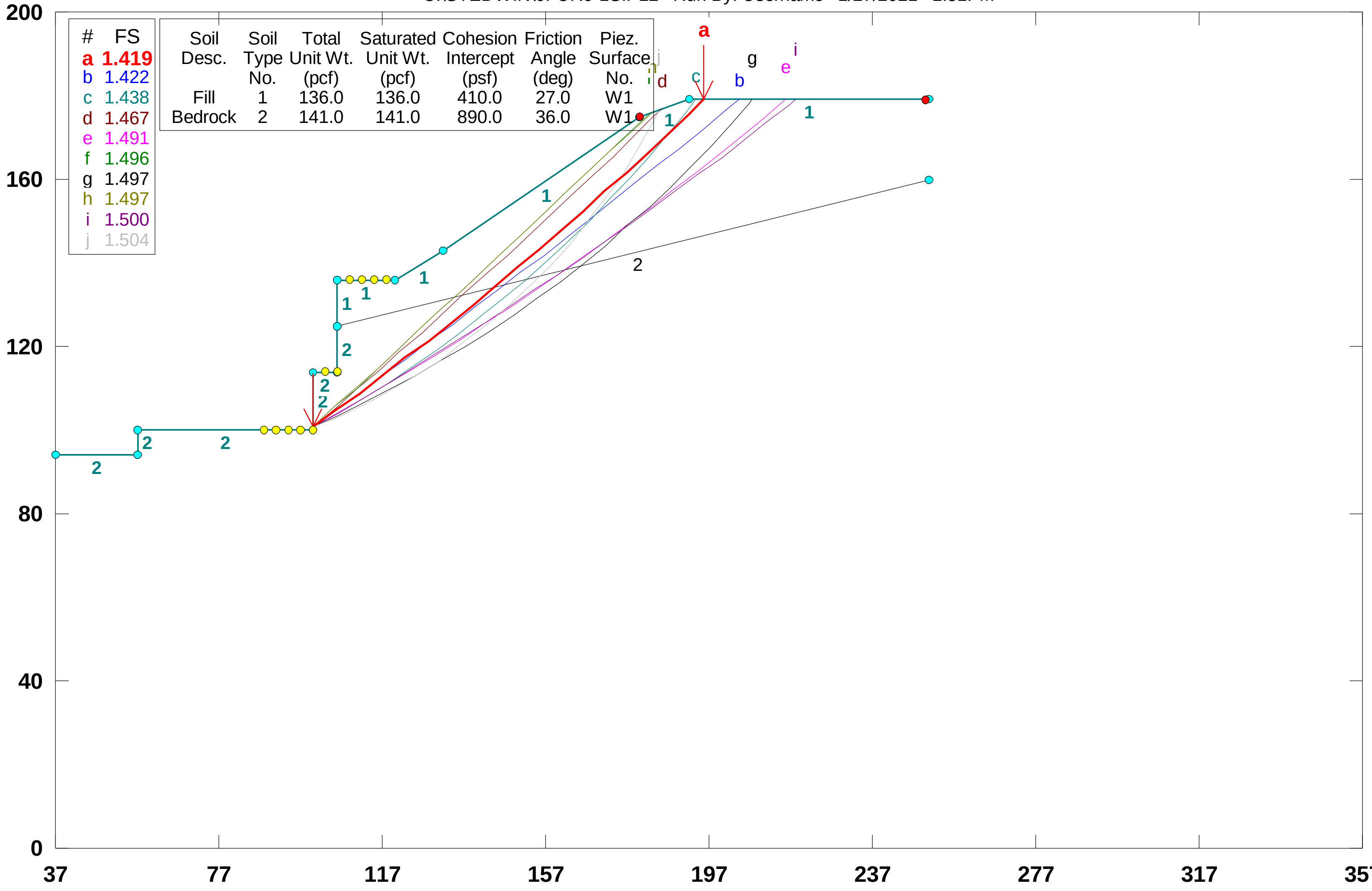
Factor of Safety

*** 1.504 ***

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

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Circular; Static)

C:\STEDWIN\0FUR9-1S.PL2   Run By: Username   1/27/2021   1:31PM



GSTABL7 v.2 FSmin=1.419

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****
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 Earthquake, and Applied Force Options.
****

Analysis Run Date: 1/27/2021
Time of Run: 1:33PM
Run By: Username
Input Data Filename: C:0fur9-1p.in
Output Filename: C:0fur9-1p.OUT
Unit System: English
Plotted Output Filename: C:0fur9-1p.PLT
PROBLEM DESCRIPTION: 4057 Hayvenhurs Slope Stability Analysis
Section A-A (Circular; Pseudo-Static)

BOUNDARY COORDINATES
Note: User origin value specified.
Add 37.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

A Horizontal Earthquake Loading Coefficient
Of0.260 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1100 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 11 Points Equally Spaced
Along The Ground Surface Between X = 88.00(ft)
and X = 118.00(ft)
Each Surface Terminates Between X = 180.00(ft)
and X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)

7.00(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 Evaluated = 1100
Statistical Data On All Valid FS Values:
FS Max = 2.808   FS Min = 0.934   FS Ave = 1.988
Standard Deviation = 0.420   Coefficient of Variation = 21.13 %
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	105.71	104.75
3	111.41	108.81
4	117.10	112.90
5	122.77	116.99
6	128.44	121.11
7	134.08	125.25
8	139.72	129.40
9	145.34	133.57
10	150.95	137.76
11	156.55	141.96
12	162.13	146.18
13	167.70	150.43
14	173.25	154.68
15	178.80	158.96
16	184.33	163.25
17	189.84	167.56
18	195.34	171.89
19	200.83	176.23
20	204.30	179.00

Circle Center At X = -1182.68 ; Y = 1918.10 ; and Radius = 2224.45
Factor of Safety
*** 0.934 ***
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	0.0	8.9	0.0	0.0	0.	0.	2.3	0.0	0.0
2	5.7	9061.9	0.0	0.0	0.	0.	2356.1	0.0	0.0
3	0.3	370.0	0.0	0.0	0.	0.	96.2	0.0	0.0
4	0.0	20.5	0.0	0.0	0.	0.	5.3	0.0	0.0
5	0.0	35.7	0.0	0.0	0.	0.	9.3	0.0	0.0
6	5.4	21855.6	0.0	0.0	0.	0.	5682.4	0.0	0.0
7	5.7	19907.6	0.0	0.0	0.	0.	5176.0	0.0	0.0
8	2.9	8903.5	0.0	0.0	0.	0.	2314.9	0.0	0.0
9	2.8	8030.8	0.0	0.0	0.	0.	2088.0	0.0	0.0
10	5.7	15868.0	0.0	0.0	0.	0.	4125.7	0.0	0.0
11	3.6	9624.6	0.0	0.0	0.	0.	2502.4	0.0	0.0
12	2.1	5518.3	0.0	0.0	0.	0.	1434.7	0.0	0.0
13	5.6	14664.7	0.0	0.0	0.	0.	3812.8	0.0	0.0
14	5.6	14239.3	0.0	0.0	0.	0.	3702.2	0.0	0.0
15	1.8	4553.5	0.0	0.0	0.	0.	1183.9	0.0	0.0
16	3.8	9259.3	0.0	0.0	0.	0.	2407.4	0.0	0.0
17	5.6	13424.8	0.0	0.0	0.	0.	3490.4	0.0	0.0
18	5.6	13022.5	0.0	0.0	0.	0.	3385.8	0.0	0.0
19	5.6	12601.9	0.0	0.0	0.	0.	3276.5	0.0	0.0
20	5.6	12163.0	0.0	0.0	0.	0.	3162.4	0.0	0.0
21	5.5	11706.1	0.0	0.0	0.	0.	3043.6	0.0	0.0
22	1.2	2481.9	0.0	0.0	0.	0.	645.3	0.0	0.0
23	4.3	8325.1	0.0	0.0	0.	0.	2164.5	0.0	0.0
24	5.5	8967.5	0.0	0.0	0.	0.	2331.6	0.0	0.0
25	2.2	3002.3	0.0	0.0	0.	0.	780.6	0.0	0.0
26	3.3	3832.0	0.0	0.0	0.	0.	996.3	0.0	0.0

```
 27       5.5    3686.1     0.0     0.0       0.      0.   958.4     0.0      0.0
 28       3.5     652.9     0.0     0.0       0.      0.   169.8     0.0      0.0
        Failure Surface Specified By 19 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1        100.00      100.70
            2        105.70      104.77
            3        111.37      108.88
            4        117.00      113.03
            5        122.60      117.23
            6        128.17      121.47
            7        133.71      125.76
            8        139.20      130.09
            9        144.67      134.46
           10        150.10      138.88
           11        155.49      143.35
           12        160.85      147.85
           13        166.17      152.40
           14        171.45      156.99
           15        176.70      161.62
           16        181.91      166.30
           17        187.09      171.01
           18        192.22      175.77
           19        195.65      179.00
        Circle Center At X =  -405.07 ; Y =   815.40 ; and Radius =   875.15
               Factor of Safety
              ***    0.949   ***
        Failure Surface Specified By 21 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1        100.00      100.70
            2        106.14      104.07
            3        112.24      107.50
            4        118.31      110.98
            5        124.35      114.53
            6        130.35      118.13
            7        136.31      121.80
            8        142.24      125.52
            9        148.13      129.30
           10        153.98      133.14
           11        159.80      137.04
           12        165.58      140.99
           13        171.31      145.00
           14        177.01      149.07
           15        182.67      153.20
           16        188.28      157.37
           17        193.86      161.61
           18        199.39      165.90
           19        204.88      170.24
           20        210.32      174.64
           21        215.62      179.00
        Circle Center At X =  -237.97 ; Y =   724.30 ; and Radius =   709.30
               Factor of Safety
              ***    0.956   ***
        Failure Surface Specified By 22 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1        100.00      100.70
            2        106.09      104.15
            3        112.16      107.65
            4        118.20      111.18
            5        124.21      114.76
            6        130.20      118.39
            7        136.17      122.05
            8        142.10      125.76
            9        148.01      129.51
```

10	153.90	133.31
11	159.75	137.14
12	165.58	141.02
13	171.38	144.94
14	177.15	148.90
15	182.89	152.90
16	188.61	156.95
17	194.29	161.03
18	199.95	165.16
19	205.57	169.32
20	211.17	173.53
21	216.73	177.78
22	218.31	179.00

Circle Center At X = -376.45 ; Y =   949.19 ; and Radius =   973.11

Factor of Safety

***   0.957   ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.13	104.08
3	112.19	107.59
4	118.16	111.25
5	124.04	115.04
6	129.83	118.97
7	135.53	123.03
8	141.14	127.23
9	146.64	131.56
10	152.04	136.01
11	157.33	140.59
12	162.52	145.29
13	167.59	150.12
14	172.55	155.06
15	177.40	160.11
16	182.12	165.28
17	186.72	170.55
18	191.20	175.93
19	193.63	179.00

Circle Center At X =   -41.05 ; Y =   364.59 ; and Radius =   299.22

Factor of Safety

***   0.963   ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.40	103.55
3	112.72	106.55
4	118.98	109.68
5	125.16	112.97
6	131.27	116.39
7	137.29	119.96
8	143.23	123.66
9	149.09	127.50
10	154.85	131.47
11	160.52	135.58
12	166.09	139.81
13	171.56	144.18
14	176.94	148.66
15	182.20	153.28
16	187.36	158.01
17	192.41	162.86
18	197.34	167.82
19	202.16	172.90
20	206.86	178.09
21	207.65	179.00

Circle Center At X =   -20.01 ; Y =   378.90 ; and Radius =   302.98

Factor of Safety
*** 0.977 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.12	104.10
3	112.24	107.50
4	118.35	110.92
5	124.45	114.35
6	130.54	117.80
7	136.63	121.26
8	142.71	124.73
9	148.78	128.22
10	154.84	131.72
11	160.89	135.23
12	166.94	138.76
13	172.97	142.31
14	179.00	145.86
15	185.02	149.43
16	191.04	153.02
17	197.04	156.61
18	203.04	160.23
19	209.03	163.85
20	215.01	167.49
21	220.98	171.14
22	226.94	174.81
23	232.89	178.49
24	233.72	179.00

Circle Center At X = -1383.21 ; Y = 2787.21 ; and Radius = 3068.76

Factor of Safety
*** 0.997 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	105.36	105.21
3	110.70	109.73
4	116.03	114.27
5	121.34	118.84
6	126.63	123.42
7	131.90	128.02
8	137.16	132.65
9	142.40	137.29
10	147.62	141.95
11	152.82	146.63
12	158.01	151.33
13	163.18	156.05
14	168.33	160.79
15	173.47	165.55
16	178.58	170.33
17	183.68	175.12
18	185.48	176.83

Circle Center At X = -1101.19 ; Y = 1535.61 ; and Radius = 1871.31

Factor of Safety
*** 1.005 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	106.58	103.10
3	113.09	105.66
4	119.54	108.39
5	125.92	111.28
6	132.22	114.33
7	138.44	117.54

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    8        144.58      120.90
    9        150.63      124.42
   10        156.59      128.09
   11        162.46      131.91
   12        168.22      135.87
   13        173.89      139.98
   14        179.45      144.24
   15        184.90      148.63
   16        190.24      153.16
   17        195.46      157.82
   18        200.56      162.61
   19        205.54      167.53
   20        210.39      172.58
   21        215.12      177.74
   22        216.21      179.00
Circle Center At X =     8.65 ; Y =   361.67 ; and Radius =   276.49
       Factor of Safety
      ***    1.022   ***
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        100.00      100.70
    2        106.47      103.37
    3        112.82      106.32
    4        119.04      109.53
    5        125.11      113.02
    6        131.03      116.76
    7        136.77      120.76
    8        142.34      125.00
    9        147.72      129.48
   10        152.90      134.19
   11        157.87      139.12
   12        162.62      144.26
   13        167.14      149.60
   14        171.43      155.14
   15        175.47      160.85
   16        179.26      166.74
   17        182.79      172.78
   18        184.81      176.60
Circle Center At X =    41.97 ; Y =   250.89 ; and Radius =   161.01
       Factor of Safety
      ***    1.023   ***
          **** END OF GSTABL7 OUTPUT ****
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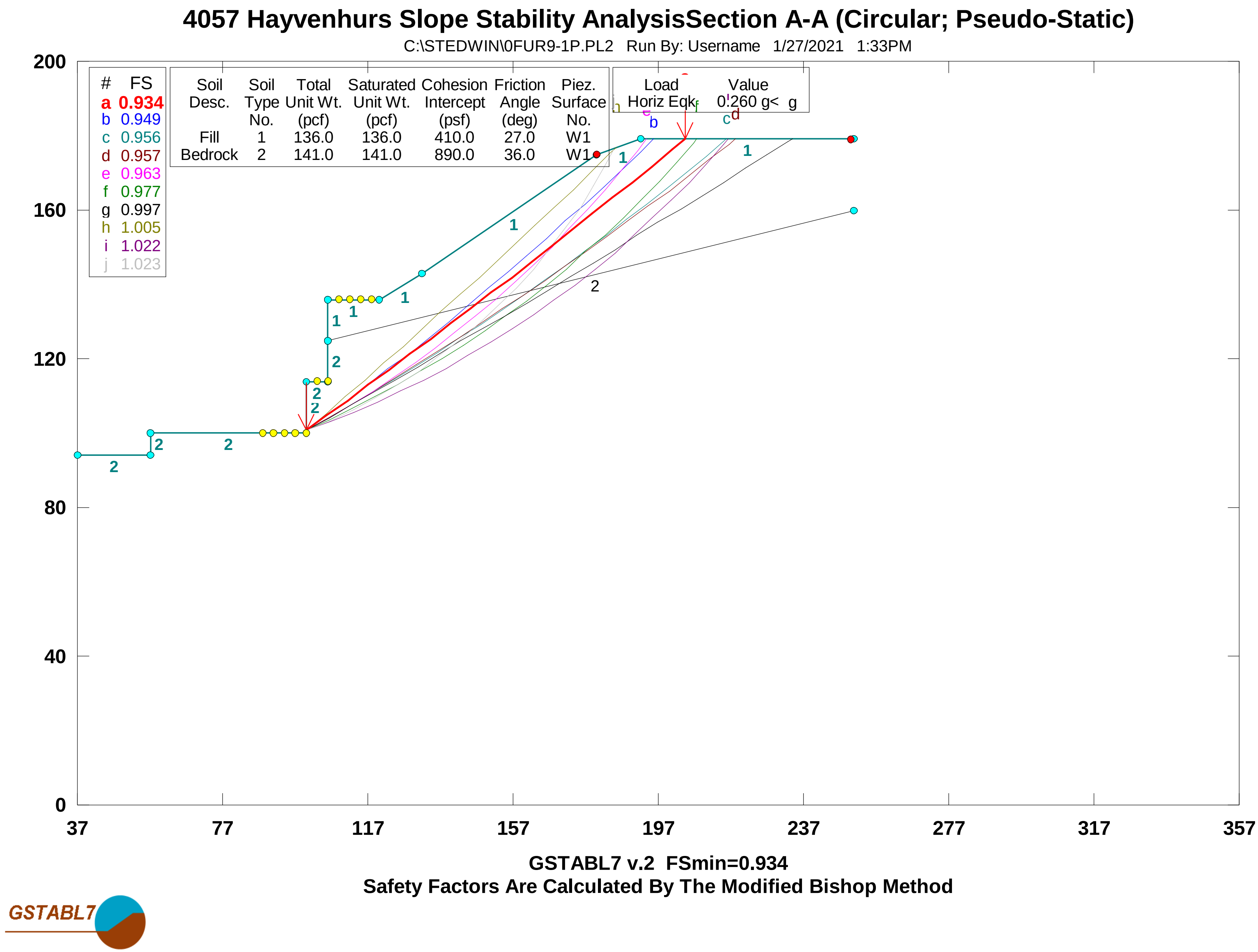


4057 Hayvenhurs Slope Stability AnalysisSection A-A (Circular; Pseudo-Static)
C:\STEDWIN\0FUR9-1P.PL2 Run By: Username 1/27/2021 1:33PM
FS
a 0.934
b 0.949
c 0.956
d 0.957
e 0.963
f 0.977
g 0.997
h 1.005
i 1.022
j 1.023
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No.
Fill 1 136.0 136.0 410.0 27.0 W1
Bedrock 2 141.0 141.0 890.0 36.0 W1
Load Value
Horiz Eqk 0.260 g< g
GSTABL7 v.2 FSmin=0.934
Safety Factors Are Calculated By The Modified Bishop Method
GSTABL7

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****

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 Earthquake, and Applied Force Options.

****

Analysis Run Date: 1/27/2021
Time of Run: 2:06PM
Run By: Username
Input Data Filename: C:0fur9-4s.in
Output Filename: C:0fur9-4s.OUT
Unit System: English
Plotted Output Filename: C:0fur9-4s.PLT
PROBLEM DESCRIPTION: 4057 Hayvenhurs Slope Stability Analysis
Section A-A (Srch FS=1.5; Static)

BOUNDARY COORDINATES
Note: User origin value specified.
Add 37.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

Searching Routine Will Be Limited To An Area Defined By 1 Boundaries
Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	100.00	100.00	100.00	99.90

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1100 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 11 Points Equally Spaced
Along The Ground Surface Between X = 60.00(ft)
and X = 90.00(ft)
Each Surface Terminates Between X = 180.00(ft)
and X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)

9.00(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 Evaluated = 1100
Statistical Data On All Valid FS Values:
FS Max = 3.449 FS Min = 1.909 FS Ave = 2.711
Standard Deviation = 0.391 Coefficient of Variation = 14.44 %
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.00	100.00
2	80.90	98.66
3	89.88	98.08
4	98.88	98.25
5	107.83	99.17
6	116.68	100.84
7	125.35	103.25
8	133.79	106.37
9	141.94	110.20
10	149.73	114.69
11	157.13	119.82
12	164.07	125.55
13	170.50	131.85
14	176.38	138.66
15	181.67	145.94
16	186.33	153.64
17	190.33	161.70
18	193.64	170.07
19	196.23	178.69
20	196.30	179.00

Circle Center At X = 92.37 ; Y = 205.24 ; and Radius = 107.19
Factor of Safety
*** 1.909 ***
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	8.9	838.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	9.0	2064.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.0	2332.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.1	267.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.0	12.2	0.0	0.0	0.	0.	0.0	0.0	0.0
6	6.0	12945.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	0.0	28.9	0.0	0.0	0.	0.	0.0	0.0	0.0
8	0.0	44.1	0.0	0.0	0.	0.	0.0	0.0	0.0
9	1.8	9338.3	0.0	0.0	0.	0.	0.0	0.0	0.0
10	8.8	44462.8	0.0	0.0	0.	0.	0.0	0.0	0.0
11	3.3	16129.1	0.0	0.0	0.	0.	0.0	0.0	0.0
12	5.3	26205.2	0.0	0.0	0.	0.	0.0	0.0	0.0
13	6.7	33956.7	0.0	0.0	0.	0.	0.0	0.0	0.0
14	1.8	9358.4	0.0	0.0	0.	0.	0.0	0.0	0.0
15	8.1	43792.1	0.0	0.0	0.	0.	0.0	0.0	0.0
16	7.8	43055.5	0.0	0.0	0.	0.	0.0	0.0	0.0
17	7.4	40967.5	0.0	0.0	0.	0.	0.0	0.0	0.0
18	6.9	37693.1	0.0	0.0	0.	0.	0.0	0.0	0.0
19	6.4	33444.5	0.0	0.0	0.	0.	0.0	0.0	0.0
20	5.9	28474.3	0.0	0.0	0.	0.	0.0	0.0	0.0
21	2.9	13139.0	0.0	0.0	0.	0.	0.0	0.0	0.0
22	0.7	2952.1	0.0	0.0	0.	0.	0.0	0.0	0.0
23	1.7	6928.6	0.0	0.0	0.	0.	0.0	0.0	0.0
24	4.7	16824.8	0.0	0.0	0.	0.	0.0	0.0	0.0
25	4.0	10933.5	0.0	0.0	0.	0.	0.0	0.0	0.0
26	1.7	3385.2	0.0	0.0	0.	0.	0.0	0.0	0.0

27	1.6	2451.0	0.0	0.0	0.	0.	0.0	0.0	0.0
28	2.6	1629.6	0.0	0.0	0.	0.	0.0	0.0	0.0
29	0.1	1.4	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	78.00	100.00
2	86.92	98.83
3	95.91	98.39
4	104.91	98.68
5	113.85	99.71
6	122.68	101.46
7	131.34	103.92
8	139.76	107.08
9	147.91	110.91
10	155.71	115.39
11	163.12	120.50
12	170.09	126.19
13	176.58	132.43
14	182.54	139.18
15	187.92	146.39
16	192.71	154.01
17	196.85	162.00
18	200.33	170.30
19	203.13	178.85
20	203.16	179.00

Circle Center At X = 96.82 ; Y = 208.84 ; and Radius = 110.45

Factor of Safety

*** 1.926 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.00	100.00
2	89.91	98.71
3	98.90	98.30
4	107.89	98.76
5	116.79	100.08
6	125.52	102.26
7	134.00	105.28
8	142.15	109.11
9	149.88	113.70
10	157.14	119.03
11	163.84	125.03
12	169.94	131.66
13	175.36	138.84
14	180.06	146.52
15	183.99	154.61
16	187.12	163.05
17	189.42	171.75
18	190.52	178.51

Circle Center At X = 98.71 ; Y = 190.94 ; and Radius = 92.65

Factor of Safety

*** 1.940 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.00	100.00
2	86.92	98.80
3	95.91	98.31
4	104.90	98.54
5	113.85	99.48
6	122.70	101.14
7	131.39	103.49
8	139.86	106.52
9	148.07	110.22
10	155.95	114.56

11	163.46	119.52
12	170.56	125.06
13	177.19	131.14
14	183.32	137.73
15	188.90	144.79
16	193.90	152.27
17	198.30	160.13
18	202.05	168.31
19	205.14	176.76
20	205.76	179.00

Circle Center At X = 97.56 ; Y = 211.17 ; and Radius = 112.88
Factor of Safety
*** 1.940 ***
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.00	100.00
2	77.87	98.46
3	86.83	97.62
4	95.83	97.47
5	104.81	98.01
6	113.72	99.25
7	122.52	101.18
8	131.13	103.78
9	139.52	107.04
10	147.63	110.94
11	155.42	115.46
12	162.83	120.56
13	169.82	126.23
14	176.36	132.42
15	182.39	139.09
16	187.90	146.21
17	192.83	153.74
18	197.17	161.63
19	200.88	169.82
20	203.95	178.29
21	204.15	179.00

Circle Center At X = 93.27 ; Y = 213.63 ; and Radius = 116.19
Factor of Safety
*** 1.942 ***
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.00	100.00
2	71.83	98.24
3	80.76	97.18
4	89.76	96.81
5	98.75	97.16
6	107.69	98.21
7	116.52	99.95
8	125.18	102.38
9	133.63	105.48
10	141.81	109.24
11	149.67	113.62
12	157.17	118.61
13	164.25	124.16
14	170.87	130.26
15	176.99	136.85
16	182.59	143.90
17	187.61	151.37
18	192.03	159.21
19	195.82	167.37
20	198.96	175.81
21	199.87	179.00

Circle Center At X = 89.86 ; Y = 211.66 ; and Radius = 114.84
Factor of Safety

*** 1.946 ***
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.00	100.00
2	71.84	98.32
3	80.80	97.41
4	89.79	97.28
5	98.77	97.94
6	107.65	99.38
7	116.38	101.58
8	124.88	104.54
9	133.09	108.23
10	140.95	112.61
11	148.40	117.67
12	155.38	123.35
13	161.83	129.62
14	167.72	136.42
15	172.99	143.72
16	177.61	151.44
17	181.54	159.54
18	184.74	167.95
19	187.21	176.61
20	187.37	177.46

Circle Center At X = 86.74 ; Y = 200.45 ; and Radius = 103.22
Factor of Safety
*** 1.948 ***
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.00	100.00
2	68.84	98.33
3	77.80	97.40
4	86.79	97.22
5	95.78	97.79
6	104.68	99.10
7	113.44	101.15
8	122.01	103.92
9	130.31	107.39
10	138.29	111.55
11	145.91	116.35
12	153.09	121.77
13	159.80	127.76
14	165.99	134.30
15	171.61	141.33
16	176.63	148.80
17	181.01	156.66
18	184.73	164.86
19	187.74	173.34
20	188.97	177.99

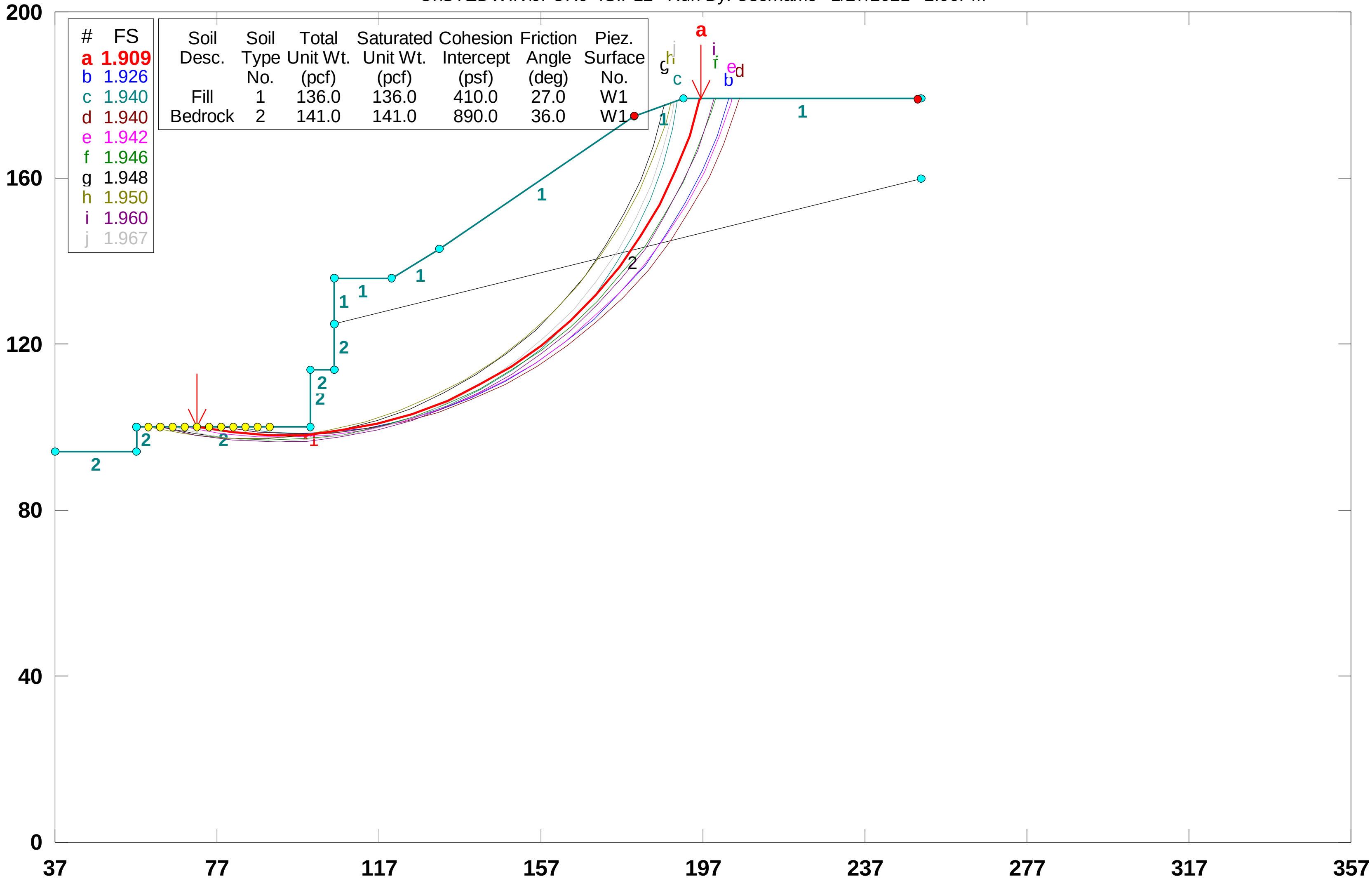
Circle Center At X = 84.49 ; Y = 205.13 ; and Radius = 107.95
Factor of Safety
*** 1.950 ***
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.00	100.00
2	71.80	98.09
3	80.71	96.89
4	89.70	96.40
5	98.70	96.64
6	107.65	97.59
7	116.49	99.26
8	125.17	101.63
9	133.64	104.68
10	141.83	108.40

```
   11        149.70      112.77
   12        157.20      117.75
   13        164.27      123.31
   14        170.88      129.43
   15        176.98      136.05
   16        182.52      143.14
   17        187.48      150.64
   18        191.83      158.53
   19        195.53      166.73
   20        198.57      175.20
   21        199.59      179.00
Circle Center At X =    91.26 ; Y =   208.84 ; and Radius =   112.45
       Factor of Safety
      ***    1.960   ***
Failure Surface Specified By 20 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         66.00      100.00
    2         74.79       98.06
    3         83.72       96.92
    4         92.71       96.60
    5        101.70       97.08
    6        110.60       98.38
    7        119.36      100.47
    8        127.89      103.34
    9        136.12      106.97
   10        144.00      111.33
   11        151.44      116.39
   12        158.41      122.09
   13        164.82      128.40
   14        170.65      135.26
   15        175.83      142.62
   16        180.33      150.42
   17        184.10      158.59
   18        187.12      167.06
   19        189.37      175.78
   20        189.77      178.26
Circle Center At X =    91.85 ; Y =   196.11 ; and Radius =    99.53
       Factor of Safety
      ***    1.967   ***
          **** END OF GSTABL7 OUTPUT ****
```

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Srch FS=1.5; Static)

C:\STEDWIN\0FUR9-4S.PL2 Run By: Username 1/27/2021 2:06PM



GSTABL7 v.2 FSmin=1.909

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

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

** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****

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 Earthquake, and Applied Force Options.

****

```
Analysis Run Date:        1/27/2021
Time of Run:              2:05PM
Run By:                   Username
Input Data Filename:      C:0fur9-4p.in
Output Filename:          C:0fur9-4p.OUT
Unit System:              English
Plotted Output Filename:  C:0fur9-4p.PLT
PROBLEM DESCRIPTION:  4057 Hayvenhurs Slope Stability Analysis
                      Section A-A (Srch FS=1.0; Pseudo-Static)
BOUNDARY COORDINATES
     Note: User origin value specified.
     Add 37.00 to X-values and 0.00 to Y-values listed.

   12 Top   Boundaries
   13 Total Boundaries
```

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

Searching Routine Will Be Limited To An Area Defined By 1 Boundaries
Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	100.00	100.00	100.00	99.90

```
A Horizontal Earthquake Loading Coefficient
Of0.260 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure =    0.0(psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1100 Trial Surfaces Have Been Generated.
 100 Surface(s) Initiate(s) From Each Of    11 Points Equally Spaced
Along The Ground Surface Between  X =  60.00(ft)
```

```
                             and  X =  90.00(ft)
Each Surface Terminates Between   X = 180.00(ft)
                            and   X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =      0.00(ft)
 9.00(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 Evaluated =  1100
      Statistical Data On All Valid FS Values:
         FS Max =   2.212   FS Min =   1.312   FS Ave =   1.762
         Standard Deviation =    0.239   Coefficient of Variation =   13.57 %
      Failure Surface Specified By 20 Coordinate Points
```

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.00	100.00
2	86.92	98.83
3	95.91	98.39
4	104.91	98.68
5	113.85	99.71
6	122.68	101.46
7	131.34	103.92
8	139.76	107.08
9	147.91	110.91
10	155.71	115.39
11	163.12	120.50
12	170.09	126.19
13	176.58	132.43
14	182.54	139.18
15	187.92	146.39
16	192.71	154.01
17	196.85	162.00
18	200.33	170.30
19	203.13	178.85
20	203.16	179.00

```
      Circle Center At X =    96.82 ; Y =   208.84 ; and Radius =   110.45
             Factor of Safety
            ***    1.312   ***
          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	8.9	736.4	0.0	0.0	0.	0.	191.5	0.0	0.0
2	9.0	1762.5	0.0	0.0	0.	0.	458.3	0.0	0.0
3	4.1	889.7	0.0	0.0	0.	0.	231.3	0.0	0.0
4	0.0	12.0	0.0	0.0	0.	0.	3.1	0.0	0.0
5	4.9	10634.8	0.0	0.0	0.	0.	2765.1	0.0	0.0
6	1.1	2347.7	0.0	0.0	0.	0.	610.4	0.0	0.0
7	0.0	29.2	0.0	0.0	0.	0.	7.6	0.0	0.0
8	0.0	44.4	0.0	0.0	0.	0.	11.5	0.0	0.0
9	7.8	40170.6	0.0	0.0	0.	0.	10444.3	0.0	0.0
10	6.1	30686.0	0.0	0.0	0.	0.	7978.4	0.0	0.0
11	2.7	13333.2	0.0	0.0	0.	0.	3466.6	0.0	0.0
12	8.7	45217.8	0.0	0.0	0.	0.	11756.6	0.0	0.0
13	0.7	3594.8	0.0	0.0	0.	0.	934.7	0.0	0.0
14	7.8	43226.6	0.0	0.0	0.	0.	11238.9	0.0	0.0
15	8.1	47419.2	0.0	0.0	0.	0.	12329.0	0.0	0.0
16	7.8	46584.2	0.0	0.0	0.	0.	12111.9	0.0	0.0
17	7.4	44420.8	0.0	0.0	0.	0.	11549.4	0.0	0.0
18	7.0	41084.0	0.0	0.0	0.	0.	10681.8	0.0	0.0
19	6.5	36772.2	0.0	0.0	0.	0.	9560.8	0.0	0.0
20	3.4	18510.1	0.0	0.0	0.	0.	4812.6	0.0	0.0
21	2.5	13065.5	0.0	0.0	0.	0.	3397.0	0.0	0.0

22	3.9	18533.1	0.0	0.0	0.	0.	4818.6	0.0	0.0
23	1.5	6393.2	0.0	0.0	0.	0.	1662.2	0.0	0.0
24	4.1	15904.1	0.0	0.0	0.	0.	4135.1	0.0	0.0
25	0.7	2453.7	0.0	0.0	0.	0.	638.0	0.0	0.0
26	4.1	11839.5	0.0	0.0	0.	0.	3078.3	0.0	0.0
27	3.5	6086.8	0.0	0.0	0.	0.	1582.6	0.0	0.0
28	2.8	1682.4	0.0	0.0	0.	0.	437.4	0.0	0.0
29	0.0	0.4	0.0	0.0	0.	0.	0.1	0.0	0.0

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.00	100.00
2	83.94	98.93
3	92.92	98.46
4	101.92	98.59
5	110.89	99.32
6	119.80	100.65
7	128.59	102.57
8	137.23	105.07
9	145.69	108.14
10	153.93	111.77
11	161.90	115.95
12	169.58	120.64
13	176.93	125.84
14	183.91	131.52
15	190.50	137.65
16	196.67	144.20
17	202.38	151.16
18	207.62	158.48
19	212.35	166.13
20	216.57	174.08
21	218.77	179.00

Circle Center At X = 95.48 ; Y = 233.18 ; and Radius = 134.75

Factor of Safety

*** 1.314 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.00	100.00
2	80.90	98.66
3	89.88	98.08
4	98.88	98.25
5	107.83	99.17
6	116.68	100.84
7	125.35	103.25
8	133.79	106.37
9	141.94	110.20
10	149.73	114.69
11	157.13	119.82
12	164.07	125.55
13	170.50	131.85
14	176.38	138.66
15	181.67	145.94
16	186.33	153.64
17	190.33	161.70
18	193.64	170.07
19	196.23	178.69
20	196.30	179.00

Circle Center At X = 92.37 ; Y = 205.24 ; and Radius = 107.19

Factor of Safety

*** 1.315 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.00	100.00
2	86.92	98.80

3	95.91	98.31
4	104.90	98.54
5	113.85	99.48
6	122.70	101.14
7	131.39	103.49
8	139.86	106.52
9	148.07	110.22
10	155.95	114.56
11	163.46	119.52
12	170.56	125.06
13	177.19	131.14
14	183.32	137.73
15	188.90	144.79
16	193.90	152.27
17	198.30	160.13
18	202.05	168.31
19	205.14	176.76
20	205.76	179.00

Circle Center At X = 97.56 ; Y = 211.17 ; and Radius = 112.88

Factor of Safety

*** 1.316 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.00	100.00
2	86.94	98.92
3	95.92	98.47
4	104.92	98.67
5	113.88	99.51
6	122.76	100.98
7	131.51	103.08
8	140.09	105.80
9	148.46	109.12
10	156.56	113.03
11	164.37	117.51
12	171.84	122.53
13	178.93	128.07
14	185.61	134.11
15	191.84	140.60
16	197.60	147.52
17	202.85	154.83
18	207.56	162.50
19	211.71	170.48
20	215.29	178.74
21	215.38	179.00

Circle Center At X = 97.66 ; Y = 224.78 ; and Radius = 126.32

Factor of Safety

*** 1.316 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.00	100.00
2	71.89	98.56
3	80.85	97.72
4	89.84	97.47
5	98.84	97.81
6	107.79	98.74
7	116.66	100.26
8	125.41	102.36
9	134.00	105.04
10	142.40	108.28
11	150.56	112.06
12	158.46	116.38
13	166.06	121.20
14	173.32	126.52
15	180.22	132.30

16	186.71	138.53
17	192.79	145.17
18	198.41	152.20
19	203.56	159.58
20	208.20	167.29
21	212.33	175.29
22	213.95	179.00

Circle Center At X = 89.20 ; Y = 233.65 ; and Radius = 136.19
Factor of Safety
*** 1.317 ***
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.00	100.00
2	77.87	98.46
3	86.83	97.62
4	95.83	97.47
5	104.81	98.01
6	113.72	99.25
7	122.52	101.18
8	131.13	103.78
9	139.52	107.04
10	147.63	110.94
11	155.42	115.46
12	162.83	120.56
13	169.82	126.23
14	176.36	132.42
15	182.39	139.09
16	187.90	146.21
17	192.83	153.74
18	197.17	161.63
19	200.88	169.82
20	203.95	178.29
21	204.15	179.00

Circle Center At X = 93.27 ; Y = 213.63 ; and Radius = 116.19
Factor of Safety
*** 1.322 ***
Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.00	100.00
2	68.92	98.76
3	77.89	98.04
4	86.88	97.83
5	95.88	98.14
6	104.84	98.97
7	113.74	100.30
8	122.55	102.15
9	131.24	104.50
10	139.78	107.34
11	148.14	110.67
12	156.30	114.47
13	164.22	118.73
14	171.89	123.45
15	179.28	128.59
16	186.35	134.15
17	193.10	140.10
18	199.49	146.44
19	205.52	153.13
20	211.14	160.15
21	216.36	167.49
22	221.14	175.11
23	223.28	179.00

Circle Center At X = 86.00 ; Y = 254.63 ; and Radius = 156.80
Factor of Safety
*** 1.322 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	72.00	100.00
2	80.94	98.94
3	89.92	98.43
4	98.92	98.47
5	107.90	99.04
6	116.83	100.17
7	125.68	101.83
8	134.41	104.03
9	142.99	106.75
10	151.38	109.99
11	159.57	113.73
12	167.51	117.96
13	175.19	122.66
14	182.56	127.82
15	189.60	133.42
16	196.30	139.44
17	202.61	145.85
18	208.53	152.63
19	214.02	159.76
20	219.08	167.21
21	223.66	174.95
22	225.74	179.00

Circle Center At X = 93.90 ; Y = 246.49 ; and Radius = 148.12

Factor of Safety

*** 1.325 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	78.00	100.00
2	86.90	98.68
3	95.88	98.05
4	104.88	98.13
5	113.85	98.90
6	122.73	100.37
7	131.46	102.53
8	140.01	105.36
9	148.30	108.85
10	156.31	112.97
11	163.96	117.70
12	171.23	123.01
13	178.05	128.87
14	184.41	135.25
15	190.24	142.10
16	195.53	149.39
17	200.23	157.06
18	204.32	165.08
19	207.78	173.39
20	209.61	179.00

Circle Center At X = 99.45 ; Y = 213.40 ; and Radius = 115.41

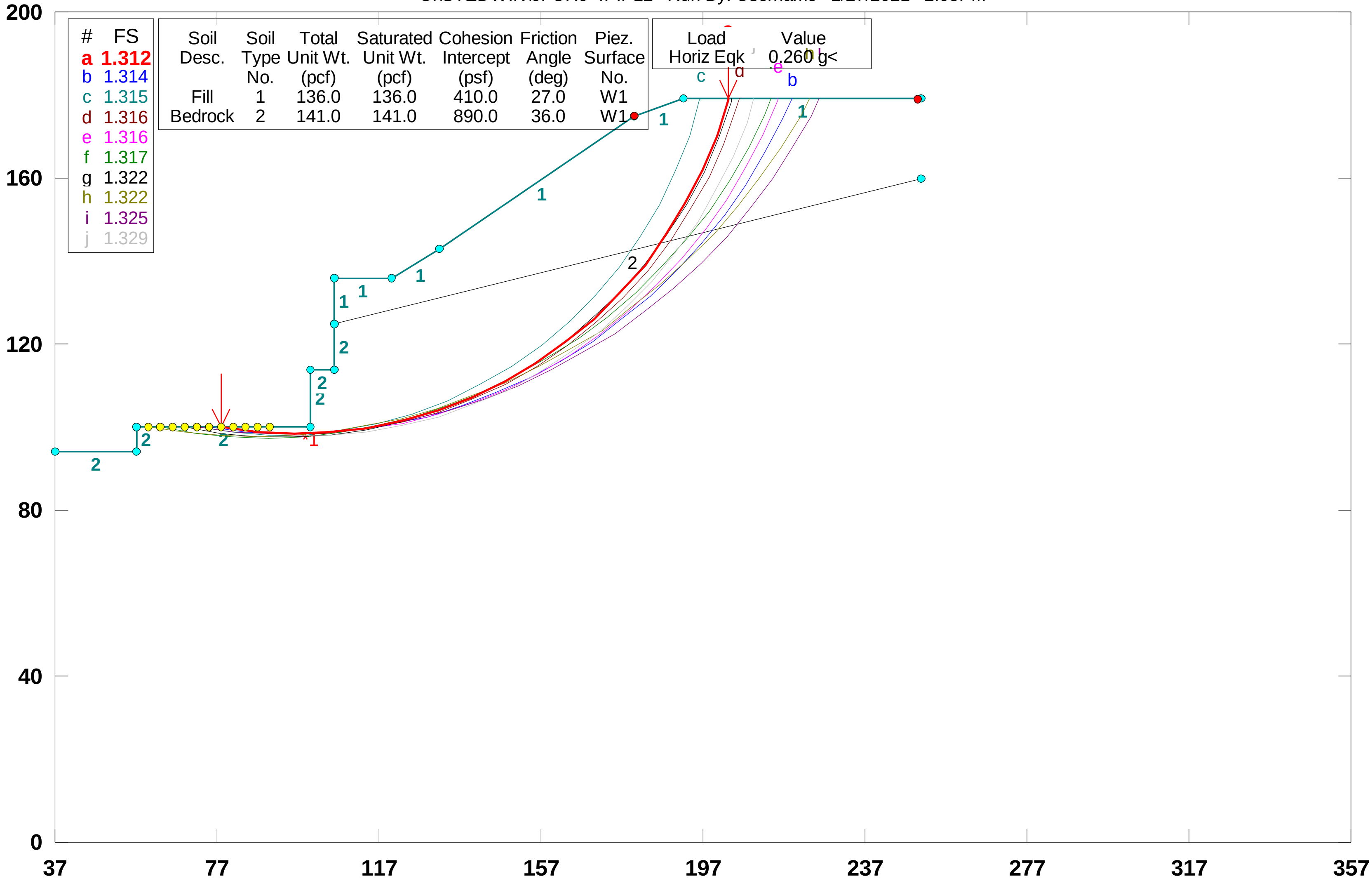
Factor of Safety

*** 1.329 ***

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

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Srch FS=1.0; Pseudo-Static)

C:\STEDWIN\0FUR9-4P.PL2 Run By: Username 1/27/2021 2:05PM



GSTABL7 v.2 FSmin=1.312

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****
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 Earthquake, and Applied Force Options.
****

Analysis Run Date: 1/27/2021
Time of Run: 1:37PM
Run By: Username
Input Data Filename: C:0fur9-2s.in
Output Filename: C:0fur9-2s.OUT
Unit System: English
Plotted Output Filename: C:0fur9-2s.PLT
PROBLEM DESCRIPTION: 4057 Hayvenhurs Slope Stability Analysis
Section A-A (Pile Load; Static)

BOUNDARY COORDINATES
Note: User origin value specified.
Add 0.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

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	106.02	136.00	10100.0	1.0	90.00	50.0

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.
1300 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 13 Points Equally Spaced
Along The Ground Surface Between X = 88.00(ft)
and X = 124.00(ft)
Each Surface Terminates Between X = 180.00(ft)

and X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
4.00(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 Evaluated = 1300
Statistical Data On All Valid FS Values:
FS Max = 5.195 FS Min = 1.500 FS Ave = 3.294
Standard Deviation = 0.810 Coefficient of Variation = 24.59 %
Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.30	102.96
3	106.60	105.23
4	109.89	107.50
5	113.18	109.78
6	116.46	112.07
7	119.73	114.36
8	123.01	116.67
9	126.27	118.98
10	129.53	121.29
11	132.79	123.62
12	136.03	125.95
13	139.28	128.29
14	142.52	130.64
15	145.75	132.99
16	148.98	135.36
17	152.20	137.73
18	155.42	140.10
19	158.63	142.49
20	161.84	144.88
21	165.04	147.28
22	168.23	149.69
23	171.42	152.10
24	174.61	154.52
25	177.78	156.95
26	180.96	159.38
27	184.12	161.83
28	187.29	164.28
29	190.44	166.73
30	193.59	169.20
31	196.74	171.67
32	199.88	174.15
33	203.01	176.64
34	205.98	179.00

Circle Center At X = -884.32 ; Y = 1543.89 ; and Radius = 1746.90
Factor of Safety
*** 1.500 ***
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	8.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.3	5646.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	2.7	3845.7	0.0	0.0	0.	0.	0.0	0.0	0.0
4	0.0	20.7	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.0	35.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.6	2498.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	3.3	13582.4	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.3	12519.0	0.0	0.0	0.	0.	0.0	0.0	0.0
9	3.3	11455.4	0.0	0.0	0.	0.	0.0	0.0	0.0

10	3.3	10391.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	0.3	796.7	0.0	0.0	0.	0.	0.0	0.0	0.0
12	3.0	8889.1	0.0	0.0	0.	0.	0.0	0.0	0.0
13	3.3	9464.9	0.0	0.0	0.	0.	0.0	0.0	0.0
14	3.3	9242.5	0.0	0.0	0.	0.	0.0	0.0	0.0
15	2.5	6860.4	0.0	0.0	0.	0.	0.0	0.0	0.0
16	0.8	2159.0	0.0	0.0	0.	0.	0.0	0.0	0.0
17	3.2	8874.0	0.0	0.0	0.	0.	0.0	0.0	0.0
18	3.2	8758.4	0.0	0.0	0.	0.	0.0	0.0	0.0
19	3.2	8638.1	0.0	0.0	0.	0.	0.0	0.0	0.0
20	3.2	8513.1	0.0	0.0	0.	0.	0.0	0.0	0.0
21	3.2	8383.4	0.0	0.0	0.	0.	0.0	0.0	0.0
22	0.0	79.9	0.0	0.0	0.	0.	0.0	0.0	0.0
23	3.2	8181.9	0.0	0.0	0.	0.	0.0	0.0	0.0
24	3.2	8148.6	0.0	0.0	0.	0.	0.0	0.0	0.0
25	3.2	8030.9	0.0	0.0	0.	0.	0.0	0.0	0.0
26	3.2	7908.8	0.0	0.0	0.	0.	0.0	0.0	0.0
27	3.2	7782.1	0.0	0.0	0.	0.	0.0	0.0	0.0
28	3.2	7651.1	0.0	0.0	0.	0.	0.0	0.0	0.0
29	3.2	7515.6	0.0	0.0	0.	0.	0.0	0.0	0.0
30	3.2	7375.7	0.0	0.0	0.	0.	0.0	0.0	0.0
31	3.2	7231.6	0.0	0.0	0.	0.	0.0	0.0	0.0
32	2.2	4960.9	0.0	0.0	0.	0.	0.0	0.0	0.0
33	1.0	2101.5	0.0	0.0	0.	0.	0.0	0.0	0.0
34	3.2	6565.5	0.0	0.0	0.	0.	0.0	0.0	0.0
35	3.2	5955.5	0.0	0.0	0.	0.	0.0	0.0	0.0
36	3.2	5343.6	0.0	0.0	0.	0.	0.0	0.0	0.0
37	1.6	2413.8	0.0	0.0	0.	0.	0.0	0.0	0.0
38	1.6	2258.6	0.0	0.0	0.	0.	0.0	0.0	0.0
39	3.1	3663.3	0.0	0.0	0.	0.	0.0	0.0	0.0
40	3.1	2599.9	0.0	0.0	0.	0.	0.0	0.0	0.0
41	3.1	1537.2	0.0	0.0	0.	0.	0.0	0.0	0.0
42	3.0	476.8	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.37	102.86
3	106.72	105.05
4	110.05	107.26
5	113.37	109.50
6	116.67	111.76
7	119.94	114.05
8	123.20	116.37
9	126.44	118.71
10	129.67	121.09
11	132.87	123.48
12	136.05	125.91
13	139.21	128.35
14	142.36	130.83
15	145.48	133.33
16	148.58	135.85
17	151.66	138.40
18	154.73	140.98
19	157.77	143.58
20	160.78	146.20
21	163.78	148.85
22	166.76	151.52
23	169.71	154.22
24	172.64	156.94
25	175.55	159.68
26	178.44	162.45
27	181.31	165.24
28	184.15	168.06
29	186.97	170.90
30	189.76	173.76

31	192.54	176.64
32	194.77	179.00

Circle Center At X = -163.95 ; Y = 516.70 ; and Radius = 492.66

Factor of Safety

*** 1.505 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.27	103.01
3	106.53	105.33
4	109.78	107.66
5	113.02	110.01
6	116.24	112.38
7	119.46	114.76
8	122.66	117.15
9	125.85	119.57
10	129.03	122.00
11	132.19	124.44
12	135.35	126.90
13	138.49	129.37
14	141.62	131.86
15	144.74	134.37
16	147.84	136.89
17	150.94	139.42
18	154.02	141.98
19	157.09	144.54
20	160.14	147.12
21	163.19	149.72
22	166.22	152.33
23	169.24	154.95
24	172.24	157.59
25	175.23	160.25
26	178.21	162.92
27	181.18	165.60
28	184.13	168.30
29	187.07	171.01
30	190.00	173.74
31	192.91	176.48
32	195.56	179.00

Circle Center At X = -369.53 ; Y = 771.25 ; and Radius = 818.59

Factor of Safety

*** 1.505 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.44	102.75
3	106.84	104.86
4	110.21	107.01
5	113.55	109.21
6	116.85	111.47
7	120.12	113.77
8	123.36	116.13
9	126.55	118.53
10	129.71	120.98
11	132.84	123.48
12	135.92	126.03
13	138.97	128.62
14	141.97	131.26
15	144.94	133.94
16	147.87	136.67
17	150.75	139.44
18	153.59	142.26
19	156.39	145.12
20	159.14	148.02

21	161.85	150.96
22	164.51	153.95
23	167.13	156.97
24	169.70	160.03
25	172.23	163.14
26	174.71	166.28
27	177.13	169.45
28	179.52	172.67
29	181.56	175.52

Circle Center At X =   -33.12 ; Y =   327.71 ; and Radius =   263.16

Factor of Safety

***   1.554   ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.69	102.24
3	107.36	103.83
4	111.00	105.49
5	114.62	107.20
6	118.21	108.97
7	121.76	110.80
8	125.29	112.68
9	128.79	114.62
10	132.26	116.62
11	135.69	118.68
12	139.09	120.78
13	142.45	122.95
14	145.78	125.16
15	149.08	127.43
16	152.33	129.76
17	155.55	132.13
18	158.73	134.56
19	161.87	137.04
20	164.97	139.56
21	168.03	142.14
22	171.05	144.77
23	174.02	147.44
24	176.95	150.17
25	179.84	152.93
26	182.68	155.75
27	185.47	158.61
28	188.22	161.52
29	190.93	164.47
30	193.58	167.46
31	196.18	170.49
32	198.74	173.57
33	201.25	176.69
34	203.05	179.00

Circle Center At X =   6.65 ; Y =   330.52 ; and Radius =   248.06

Factor of Safety

***   1.557   ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.58	102.49
3	107.13	104.34
4	110.63	106.27
5	114.10	108.26
6	117.52	110.33
7	120.91	112.46
8	124.25	114.66
9	127.54	116.93
10	130.79	119.26
11	133.99	121.66

12	137.14	124.12
13	140.25	126.65
14	143.30	129.24
15	146.29	131.89
16	149.24	134.59
17	152.13	137.36
18	154.96	140.19
19	157.73	143.07
20	160.45	146.00
21	163.11	148.99
22	165.70	152.04
23	168.24	155.13
24	170.71	158.28
25	173.12	161.47
26	175.46	164.71
27	177.74	168.00
28	179.95	171.33
29	182.09	174.71
30	182.84	175.95

Circle Center At X =   13.30 ; Y =   279.38 ; and Radius =   198.60

Factor of Safety

*** 1.563 ***

Failure Surface Specified By 37 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.45	102.74
3	106.89	104.77
4	110.32	106.82
5	113.76	108.88
6	117.18	110.94
7	120.60	113.02
8	124.02	115.10
9	127.43	117.19
10	130.83	119.29
11	134.23	121.40
12	137.63	123.51
13	141.01	125.64
14	144.40	127.77
15	147.78	129.91
16	151.15	132.06
17	154.52	134.22
18	157.88	136.39
19	161.23	138.57
20	164.58	140.75
21	167.93	142.95
22	171.27	145.15
23	174.60	147.36
24	177.93	149.57
25	181.26	151.80
26	184.57	154.04
27	187.88	156.28
28	191.19	158.53
29	194.49	160.79
30	197.78	163.06
31	201.07	165.34
32	204.36	167.62
33	207.63	169.92
34	210.91	172.22
35	214.17	174.53
36	217.43	176.85
37	220.45	179.00

Circle Center At X = -702.78 ; Y = 1467.44 ; and Radius = 1585.06

Factor of Safety

*** 1.566 ***

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.04	103.30
3	106.09	105.90
4	109.12	108.50
5	112.16	111.11
6	115.19	113.71
7	118.22	116.32
8	121.25	118.94
9	124.27	121.56
10	127.30	124.18
11	130.32	126.80
12	133.33	129.43
13	136.35	132.06
14	139.36	134.69
15	142.36	137.33
16	145.37	139.97
17	148.37	142.61
18	151.37	145.26
19	154.37	147.91
20	157.36	150.56
21	160.36	153.21
22	163.34	155.87
23	166.33	158.53
24	169.31	161.20
25	172.29	163.86
26	175.27	166.54
27	178.25	169.21
28	181.22	171.89
29	184.19	174.57
30	187.15	177.25
31	187.39	177.46

Circle Center At X = -2383.89 ; Y = 3016.76 ; and Radius = 3830.55

Factor of Safety

***   1.572   ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.07	103.26
3	106.14	105.83
4	109.20	108.41
5	112.26	110.99
6	115.30	113.58
7	118.35	116.18
8	121.38	118.78
9	124.41	121.40
10	127.43	124.02
11	130.45	126.64
12	133.46	129.28
13	136.46	131.92
14	139.46	134.57
15	142.45	137.23
16	145.43	139.89
17	148.41	142.56
18	151.38	145.24
19	154.34	147.93
20	157.30	150.62
21	160.25	153.32
22	163.19	156.03
23	166.13	158.75
24	169.06	161.47
25	171.98	164.20
26	174.90	166.94
27	177.81	169.68

28	180.71	172.43
29	183.61	175.19
30	185.23	176.74

Circle Center At X = -936.45 ; Y = 1348.23 ; and Radius = 1621.90

Factor of Safety

*** 1.573 ***

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.52	102.60
3	107.04	104.51
4	110.54	106.44
5	114.04	108.38
6	117.52	110.34
7	121.00	112.32
8	124.47	114.31
9	127.93	116.32
10	131.38	118.35
11	134.82	120.39
12	138.25	122.44
13	141.67	124.52
14	145.08	126.61
15	148.48	128.71
16	151.87	130.83
17	155.25	132.97
18	158.63	135.12
19	161.99	137.29
20	165.34	139.47
21	168.68	141.67
22	172.01	143.89
23	175.33	146.12
24	178.64	148.37
25	181.94	150.63
26	185.23	152.91
27	188.51	155.20
28	191.77	157.51
29	195.03	159.83
30	198.28	162.17
31	201.51	164.52
32	204.73	166.89
33	207.95	169.27
34	211.15	171.67
35	214.34	174.08
36	217.52	176.51
37	220.68	178.95
38	220.74	179.00

Circle Center At X = -303.85 ; Y = 855.74 ; and Radius = 856.25

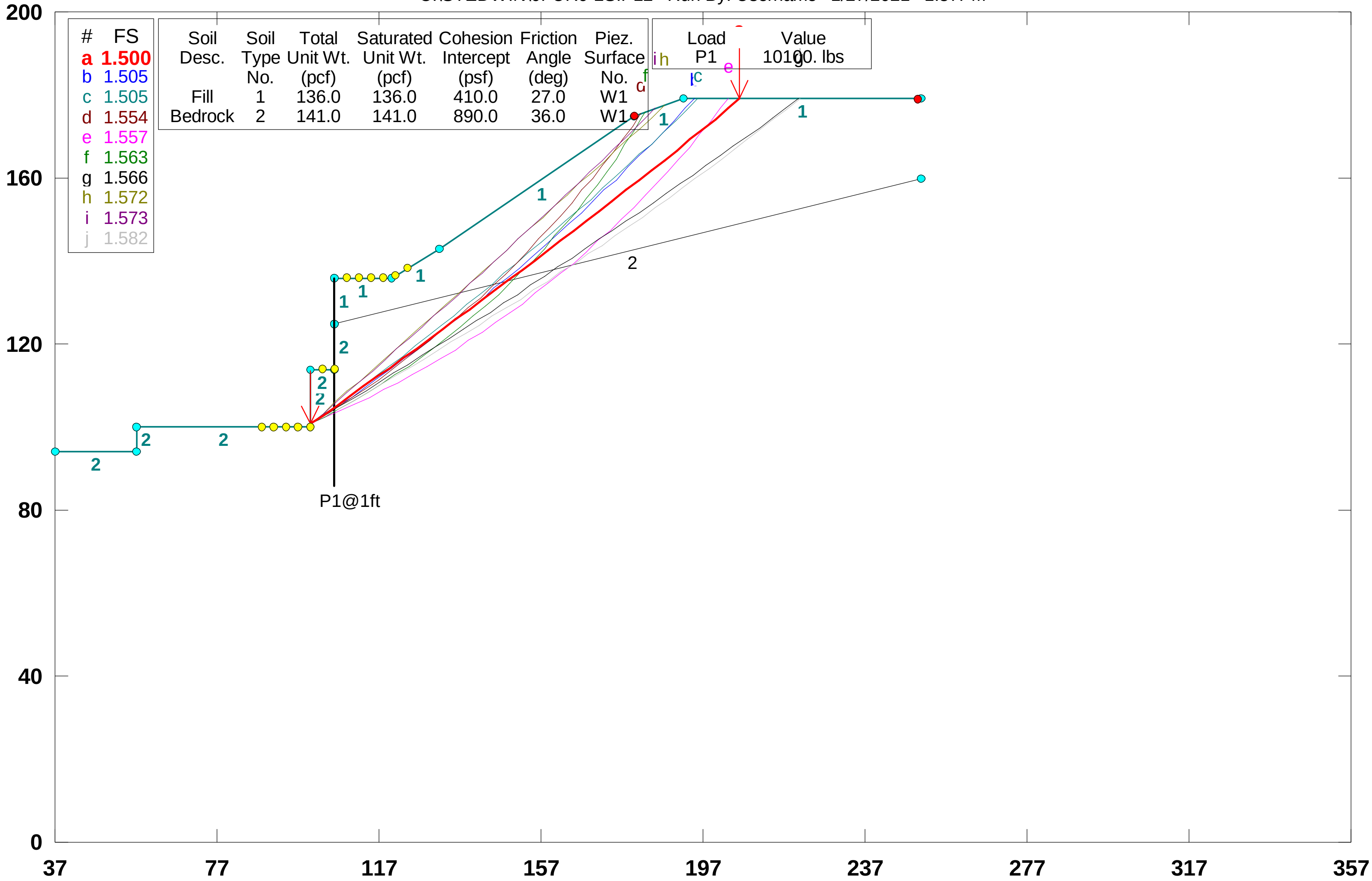
Factor of Safety

*** 1.582 ***

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

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Pile Load; Static)

C:\STEDWIN\0FUR9-2S.PL2 Run By: Username 1/27/2021 1:37PM



GSTABL7 v.2 FSmin=1.500

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****

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 Earthquake, and Applied Force Options.

****

Analysis Run Date: 1/27/2021
Time of Run: 1:50PM
Run By: Username
Input Data Filename: C:0fur9-2p.in
Output Filename: C:0fur9-2p.OUT
Unit System: English
Plotted Output Filename: C:0fur9-2p.PLT
PROBLEM DESCRIPTION: 4057 Hayvenhurs Slope Stability Analysis
Section A-A (Pile Load; Pseudo-Static)

BOUNDARY COORDINATES
Note: User origin value specified.
Add 37.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

A Horizontal Earthquake Loading Coefficient
Of0.260 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)

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	106.02	136.00	11100.0	1.0	90.00	50.0

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.

1300 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 13 Points Equally Spaced
Along The Ground Surface Between X = 88.00(ft)
and X = 124.00(ft)
Each Surface Terminates Between X = 180.00(ft)
and X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
4.00(ft) Line Segments Define Each Trial Failure Surface.
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Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 1300
Statistical Data On All Valid FS Values:
FS Max = 2.851 FS Min = 1.000 FS Ave = 2.017
Standard Deviation = 0.433 Coefficient of Variation = 21.48 %
Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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4	109.89	107.50
5	113.18	109.78
6	116.46	112.07
7	119.73	114.36
8	123.01	116.67
9	126.27	118.98
10	129.53	121.29
11	132.79	123.62
12	136.03	125.95
13	139.28	128.29
14	142.52	130.64
15	145.75	132.99
16	148.98	135.36
17	152.20	137.73
18	155.42	140.10
19	158.63	142.49
20	161.84	144.88
21	165.04	147.28
22	168.23	149.69
23	171.42	152.10
24	174.61	154.52
25	177.78	156.95
26	180.96	159.38
27	184.12	161.83
28	187.29	164.28
29	190.44	166.73
30	193.59	169.20
31	196.74	171.67
32	199.88	174.15
33	203.01	176.64
34	205.98	179.00

Circle Center At X = -884.32 ; Y = 1543.89 ; and Radius = 1746.90
Factor of Safety
*** 1.000 ***
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	8.9	0.0	0.0	0.	0.	2.3	0.0	0.0
2	3.3	5646.6	0.0	0.0	0.	0.	1468.1	0.0	0.0
3	2.7	3845.7	0.0	0.0	0.	0.	999.9	0.0	0.0
4	0.0	20.7	0.0	0.0	0.	0.	5.4	0.0	0.0

5	0.0	35.9	0.0	0.0	0.	0.	9.3	0.0	0.0
6	0.6	2498.1	0.0	0.0	0.	0.	649.5	0.0	0.0
7	3.3	13582.4	0.0	0.0	0.	0.	3531.4	0.0	0.0
8	3.3	12519.0	0.0	0.0	0.	0.	3254.9	0.0	0.0
9	3.3	11455.4	0.0	0.0	0.	0.	2978.4	0.0	0.0
10	3.3	10391.6	0.0	0.0	0.	0.	2701.8	0.0	0.0
11	0.3	796.7	0.0	0.0	0.	0.	207.1	0.0	0.0
12	3.0	8889.1	0.0	0.0	0.	0.	2311.2	0.0	0.0
13	3.3	9464.9	0.0	0.0	0.	0.	2460.9	0.0	0.0
14	3.3	9242.5	0.0	0.0	0.	0.	2403.0	0.0	0.0
15	2.5	6860.4	0.0	0.0	0.	0.	1783.7	0.0	0.0
16	0.8	2159.0	0.0	0.0	0.	0.	561.3	0.0	0.0
17	3.2	8874.0	0.0	0.0	0.	0.	2307.2	0.0	0.0
18	3.2	8758.4	0.0	0.0	0.	0.	2277.2	0.0	0.0
19	3.2	8638.1	0.0	0.0	0.	0.	2245.9	0.0	0.0
20	3.2	8513.1	0.0	0.0	0.	0.	2213.4	0.0	0.0
21	3.2	8383.4	0.0	0.0	0.	0.	2179.7	0.0	0.0
22	0.0	79.9	0.0	0.0	0.	0.	20.8	0.0	0.0
23	3.2	8181.9	0.0	0.0	0.	0.	2127.3	0.0	0.0
24	3.2	8148.6	0.0	0.0	0.	0.	2118.6	0.0	0.0
25	3.2	8030.9	0.0	0.0	0.	0.	2088.0	0.0	0.0
26	3.2	7908.8	0.0	0.0	0.	0.	2056.3	0.0	0.0
27	3.2	7782.1	0.0	0.0	0.	0.	2023.3	0.0	0.0
28	3.2	7651.1	0.0	0.0	0.	0.	1989.3	0.0	0.0
29	3.2	7515.6	0.0	0.0	0.	0.	1954.1	0.0	0.0
30	3.2	7375.7	0.0	0.0	0.	0.	1917.7	0.0	0.0
31	3.2	7231.6	0.0	0.0	0.	0.	1880.2	0.0	0.0
32	2.2	4960.9	0.0	0.0	0.	0.	1289.8	0.0	0.0
33	1.0	2101.5	0.0	0.0	0.	0.	546.4	0.0	0.0
34	3.2	6565.5	0.0	0.0	0.	0.	1707.0	0.0	0.0
35	3.2	5955.5	0.0	0.0	0.	0.	1548.4	0.0	0.0
36	3.2	5343.6	0.0	0.0	0.	0.	1389.3	0.0	0.0
37	1.6	2413.8	0.0	0.0	0.	0.	627.6	0.0	0.0
38	1.6	2258.6	0.0	0.0	0.	0.	587.2	0.0	0.0
39	3.1	3663.3	0.0	0.0	0.	0.	952.5	0.0	0.0
40	3.1	2599.9	0.0	0.0	0.	0.	676.0	0.0	0.0
41	3.1	1537.2	0.0	0.0	0.	0.	399.7	0.0	0.0
42	3.0	476.8	0.0	0.0	0.	0.	124.0	0.0	0.0

Failure Surface Specified By 37 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.45	102.74
3	106.89	104.77
4	110.32	106.82
5	113.76	108.88
6	117.18	110.94
7	120.60	113.02
8	124.02	115.10
9	127.43	117.19
10	130.83	119.29
11	134.23	121.40
12	137.63	123.51
13	141.01	125.64
14	144.40	127.77
15	147.78	129.91
16	151.15	132.06
17	154.52	134.22
18	157.88	136.39
19	161.23	138.57
20	164.58	140.75
21	167.93	142.95
22	171.27	145.15
23	174.60	147.36
24	177.93	149.57
25	181.26	151.80

26	184.57	154.04
27	187.88	156.28
28	191.19	158.53
29	194.49	160.79
30	197.78	163.06
31	201.07	165.34
32	204.36	167.62
33	207.63	169.92
34	210.91	172.22
35	214.17	174.53
36	217.43	176.85
37	220.45	179.00

Circle Center At X = -702.78 ; Y = 1467.44 ; and Radius = 1585.06

Factor of Safety

*** 1.009 ***

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.52	102.60
3	107.04	104.51
4	110.54	106.44
5	114.04	108.38
6	117.52	110.34
7	121.00	112.32
8	124.47	114.31
9	127.93	116.32
10	131.38	118.35
11	134.82	120.39
12	138.25	122.44
13	141.67	124.52
14	145.08	126.61
15	148.48	128.71
16	151.87	130.83
17	155.25	132.97
18	158.63	135.12
19	161.99	137.29
20	165.34	139.47
21	168.68	141.67
22	172.01	143.89
23	175.33	146.12
24	178.64	148.37
25	181.94	150.63
26	185.23	152.91
27	188.51	155.20
28	191.77	157.51
29	195.03	159.83
30	198.28	162.17
31	201.51	164.52
32	204.73	166.89
33	207.95	169.27
34	211.15	171.67
35	214.34	174.08
36	217.52	176.51
37	220.68	178.95
38	220.74	179.00

Circle Center At X = -303.85 ; Y =   855.74 ; and Radius =   856.25

Factor of Safety

*** 1.019 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.37	102.86
3	106.72	105.05
4	110.05	107.26

5	113.37	109.50
6	116.67	111.76
7	119.94	114.05
8	123.20	116.37
9	126.44	118.71
10	129.67	121.09
11	132.87	123.48
12	136.05	125.91
13	139.21	128.35
14	142.36	130.83
15	145.48	133.33
16	148.58	135.85
17	151.66	138.40
18	154.73	140.98
19	157.77	143.58
20	160.78	146.20
21	163.78	148.85
22	166.76	151.52
23	169.71	154.22
24	172.64	156.94
25	175.55	159.68
26	178.44	162.45
27	181.31	165.24
28	184.15	168.06
29	186.97	170.90
30	189.76	173.76
31	192.54	176.64
32	194.77	179.00

Circle Center At X = -163.95 ; Y = 516.70 ; and Radius = 492.66

Factor of Safety

*** 1.028 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.27	103.01
3	106.53	105.33
4	109.78	107.66
5	113.02	110.01
6	116.24	112.38
7	119.46	114.76
8	122.66	117.15
9	125.85	119.57
10	129.03	122.00
11	132.19	124.44
12	135.35	126.90
13	138.49	129.37
14	141.62	131.86
15	144.74	134.37
16	147.84	136.89
17	150.94	139.42
18	154.02	141.98
19	157.09	144.54
20	160.14	147.12
21	163.19	149.72
22	166.22	152.33
23	169.24	154.95
24	172.24	157.59
25	175.23	160.25
26	178.21	162.92
27	181.18	165.60
28	184.13	168.30
29	187.07	171.01
30	190.00	173.74
31	192.91	176.48
32	195.56	179.00

Circle Center At X = -369.53 ; Y =   771.25 ; and Radius =   818.59

Factor of Safety

***   1.029   ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.69	102.24
3	107.36	103.83
4	111.00	105.49
5	114.62	107.20
6	118.21	108.97
7	121.76	110.80
8	125.29	112.68
9	128.79	114.62
10	132.26	116.62
11	135.69	118.68
12	139.09	120.78
13	142.45	122.95
14	145.78	125.16
15	149.08	127.43
16	152.33	129.76
17	155.55	132.13
18	158.73	134.56
19	161.87	137.04
20	164.97	139.56
21	168.03	142.14
22	171.05	144.77
23	174.02	147.44
24	176.95	150.17
25	179.84	152.93
26	182.68	155.75
27	185.47	158.61
28	188.22	161.52
29	190.93	164.47
30	193.58	167.46
31	196.18	170.49
32	198.74	173.57
33	201.25	176.69
34	203.05	179.00

Circle Center At X =   6.65 ; Y =   330.52 ; and Radius =   248.06

Factor of Safety

***   1.043   ***

Failure Surface Specified By 41 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	100.70
2	103.53	102.59
3	107.06	104.47
4	110.58	106.36
5	114.10	108.26
6	117.62	110.17
7	121.13	112.08
8	124.64	114.00
9	128.15	115.92
10	131.66	117.85
11	135.16	119.78
12	138.65	121.72
13	142.15	123.67
14	145.64	125.63
15	149.13	127.59
16	152.61	129.55
17	156.09	131.52
18	159.57	133.50
19	163.04	135.49
20	166.51	137.47

21	169.98	139.47
22	173.44	141.47
23	176.90	143.48
24	180.35	145.50
25	183.81	147.52
26	187.26	149.54
27	190.70	151.57
28	194.14	153.61
29	197.58	155.66
30	201.02	157.71
31	204.45	159.76
32	207.87	161.82
33	211.30	163.89
34	214.72	165.97
35	218.14	168.05
36	221.55	170.13
37	224.96	172.22
38	228.36	174.32
39	231.77	176.42
40	235.16	178.53
41	235.91	179.00

Circle Center At X = -978.09 ; Y = 2129.25 ; and Radius = 2297.23

Factor of Safety

*** 1.055 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.00	136.58
2	125.00	136.60
3	129.00	136.76
4	132.99	137.07
5	136.96	137.53
6	140.91	138.13
7	144.84	138.89
8	148.74	139.79
9	152.60	140.83
10	156.42	142.02
11	160.19	143.35
12	163.91	144.81
13	167.58	146.42
14	171.18	148.16
15	174.71	150.03
16	178.17	152.04
17	181.56	154.17
18	184.86	156.43
19	188.08	158.80
20	191.20	161.30
21	194.23	163.91
22	197.17	166.63
23	199.99	169.46
24	202.71	172.39
25	205.32	175.43
26	207.82	178.55
27	208.15	179.00

Circle Center At X =   122.66 ; Y =   243.94 ; and Radius =   107.36

Factor of Safety

*** 1.058 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.00	136.58
2	125.00	136.62
3	129.00	136.80
4	132.98	137.11
5	136.96	137.56
6	140.92	138.14

7	144.85	138.86
8	148.76	139.71
9	152.63	140.70
10	156.47	141.82
11	160.27	143.07
12	164.03	144.45
13	167.73	145.96
14	171.38	147.60
15	174.98	149.36
16	178.51	151.24
17	181.97	153.24
18	185.36	155.36
19	188.68	157.59
20	191.92	159.94
21	195.08	162.39
22	198.15	164.95
23	201.13	167.62
24	204.02	170.39
25	206.81	173.25
26	209.50	176.21
27	211.87	179.00

Circle Center At X =   121.90 ; Y =   253.22 ; and Radius =   116.64
Factor of Safety
*** 1.062 ***

Failure Surface Specified By 25 Coordinate Points

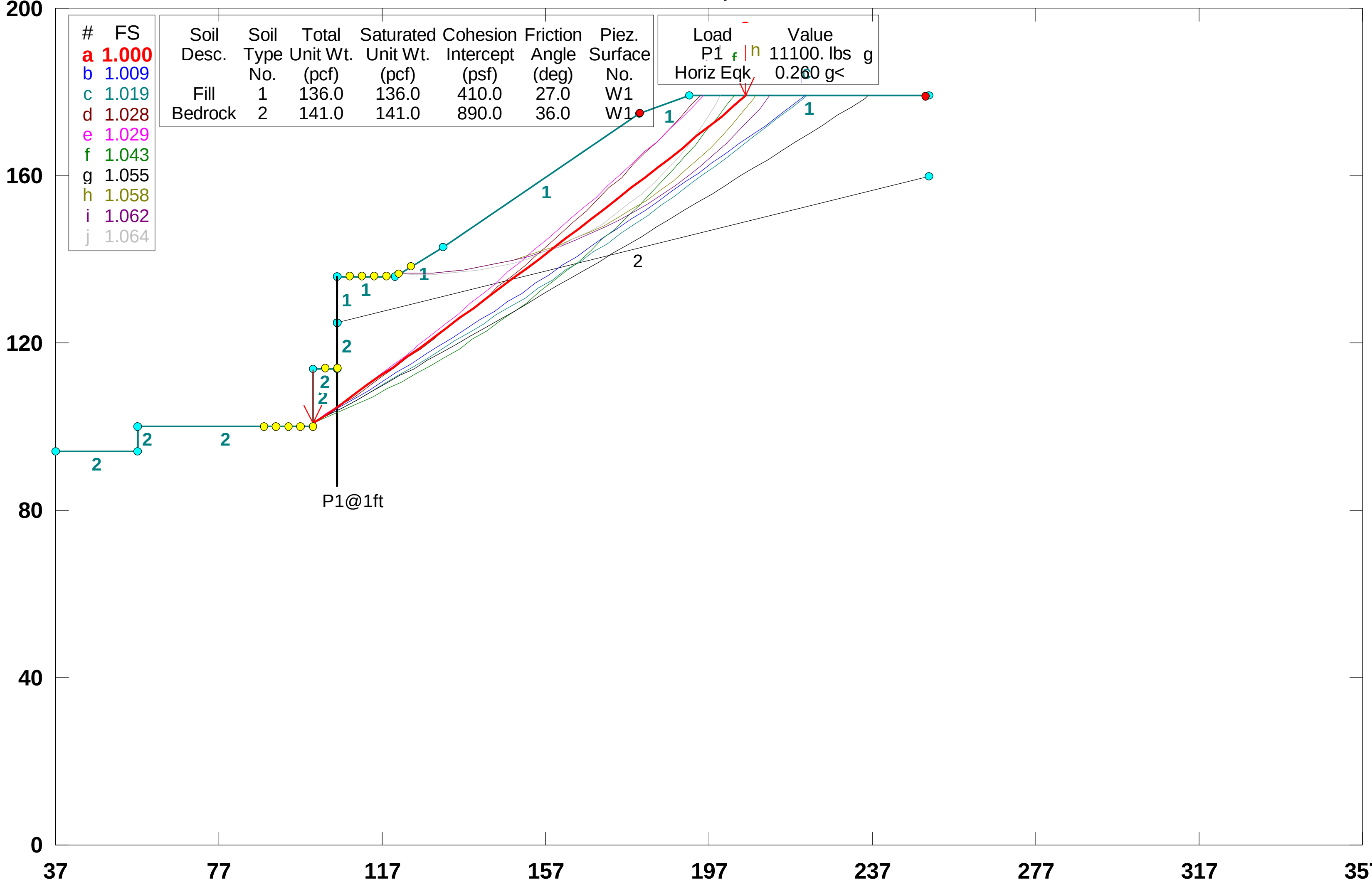
Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.00	136.58
2	124.99	136.37
3	128.99	136.35
4	132.99	136.52
5	136.97	136.89
6	140.93	137.45
7	144.86	138.20
8	148.75	139.14
9	152.59	140.27
10	156.37	141.58
11	160.08	143.08
12	163.71	144.75
13	167.26	146.60
14	170.71	148.62
15	174.06	150.81
16	177.30	153.15
17	180.42	155.65
18	183.42	158.30
19	186.29	161.09
20	189.02	164.01
21	191.60	167.07
22	194.03	170.25
23	196.30	173.54
24	198.41	176.93
25	199.56	179.00

Circle Center At X =   127.43 ; Y =   218.69 ; and Radius =   82.35
Factor of Safety
*** 1.064 ***

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

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Pile Load; Pseudo-Static)

C:\STEDWIN\0FUR9-2P.PL2 Run By: Username 1/27/2021 1:50PM



GSTABL7 v.2 FSmin=1.000

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

****

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 Earthquake, and Applied Force Options.
****

Analysis Run Date: 1/27/2021
Time of Run: 1:54PM
Run By: Username
Input Data Filename: C:0fur9-3s.in
Output Filename: C:0fur9-3s.OUT
Unit System: English
Plotted Output Filename: C:0fur9-3s.PLT
PROBLEM DESCRIPTION: 4057 Hayvenhurs Slope Stability Analysis
Section A-A (Overtoping; Static)

BOUNDARY COORDINATES
Note: User origin value specified.
Add 37.00 to X-values and 0.00 to Y-values listed.

12 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

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	106.02	136.00	10100.0	1.0	90.00	50.0

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.
900 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 9 Points Equally Spaced
Along The Ground Surface Between X = 108.00(ft)
and X = 124.00(ft)
Each Surface Terminates Between X = 180.00(ft)

and X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(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 Evaluated = 900
Statistical Data On All Valid FS Values:
FS Max = 5.235 FS Min = 1.646 FS Ave = 3.457
Standard Deviation = 0.939 Coefficient of Variation = 27.15 %
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.00	136.00
2	125.00	135.86
3	130.00	135.99
4	134.98	136.40
5	139.93	137.08
6	144.84	138.04
7	149.69	139.27
8	154.46	140.76
9	159.14	142.52
10	163.72	144.53
11	168.18	146.79
12	172.51	149.29
13	176.69	152.03
14	180.71	155.00
15	184.57	158.19
16	188.24	161.58
17	191.72	165.17
18	194.99	168.95
19	198.05	172.90
20	200.89	177.02
21	202.10	179.00

Circle Center At X = 125.09 ; Y = 226.24 ; and Radius = 90.38
Factor of Safety
*** 1.646 ***
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	5.0	1039.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	5.0	3024.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	2.0	1728.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.0	3126.9	0.0	0.0	0.	0.	0.0	0.0	0.0
5	5.0	6665.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	4.9	8250.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	4.8	9571.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	4.8	10621.0	0.0	0.0	0.	0.	0.0	0.0	0.0
9	4.7	11393.1	0.0	0.0	0.	0.	0.0	0.0	0.0
10	4.6	11888.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	4.5	12112.8	0.0	0.0	0.	0.	0.0	0.0	0.0
12	4.3	12076.0	0.0	0.0	0.	0.	0.0	0.0	0.0
13	4.2	11792.9	0.0	0.0	0.	0.	0.0	0.0	0.0
14	3.3	9297.4	0.0	0.0	0.	0.	0.0	0.0	0.0
15	0.7	1974.1	0.0	0.0	0.	0.	0.0	0.0	0.0
16	3.9	10108.7	0.0	0.0	0.	0.	0.0	0.0	0.0
17	3.7	8615.0	0.0	0.0	0.	0.	0.0	0.0	0.0
18	3.5	7073.2	0.0	0.0	0.	0.	0.0	0.0	0.0
19	0.3	523.2	0.0	0.0	0.	0.	0.0	0.0	0.0
20	3.0	4792.6	0.0	0.0	0.	0.	0.0	0.0	0.0
21	3.1	3360.8	0.0	0.0	0.	0.	0.0	0.0	0.0
22	2.8	1558.4	0.0	0.0	0.	0.	0.0	0.0	0.0

```
 23      1.2     162.7     0.0     0.0       0.      0.     0.0     0.0      0.0
        Failure Surface Specified By 21 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1         118.00      136.00
            2         122.98      135.53
            3         127.98      135.38
            4         132.97      135.54
            5         137.95      136.02
            6         142.89      136.82
            7         147.76      137.92
            8         152.56      139.34
            9         157.25      141.05
           10         161.83      143.06
           11         166.27      145.36
           12         170.56      147.93
           13         174.68      150.77
           14         178.60      153.87
           15         182.33      157.21
           16         185.83      160.77
           17         189.10      164.56
           18         192.12      168.54
           19         194.89      172.71
           20         197.38      177.04
           21         198.35      179.00
        Circle Center At X =   127.89 ; Y =   214.16 ; and Radius =    78.78
               Factor of Safety
              ***    1.651   ***
        Failure Surface Specified By 21 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1         116.00      136.00
            2         120.97      135.48
            3         125.97      135.28
            4         130.97      135.40
            5         135.95      135.83
            6         140.89      136.58
            7         145.78      137.64
            8         150.59      139.00
            9         155.31      140.66
           10         159.91      142.62
           11         164.37      144.87
           12         168.69      147.40
           13         172.84      150.19
           14         176.80      153.24
           15         180.56      156.53
           16         184.11      160.06
           17         187.42      163.80
           18         190.50      167.74
           19         193.31      171.87
           20         195.86      176.17
           21         197.31      179.00
        Circle Center At X =   126.63 ; Y =   214.33 ; and Radius =    79.05
               Factor of Safety
              ***    1.662   ***
        Failure Surface Specified By 20 Coordinate Points
          Point      X-Surf      Y-Surf
           No.        (ft)        (ft)
            1         122.00      137.17
            2         126.95      136.44
            3         131.93      136.08
            4         136.93      136.07
            5         141.92      136.42
            6         146.87      137.13
            7         151.76      138.19
            8         156.55      139.60
```

9	161.24	141.35
10	165.78	143.44
11	170.17	145.84
12	174.37	148.55
13	178.36	151.56
14	182.13	154.85
15	185.66	158.39
16	188.92	162.18
17	191.89	166.20
18	194.58	170.42
19	196.95	174.82
20	198.83	179.00

Circle Center At X =   134.54 ; Y =   205.61 ; and Radius =   69.58

Factor of Safety

*** 1.676 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.00	136.00
2	118.97	135.44
3	123.96	135.16
4	128.96	135.17
5	133.95	135.46
6	138.92	136.04
7	143.84	136.90
8	148.71	138.04
9	153.51	139.46
10	158.21	141.15
11	162.82	143.10
12	167.30	145.32
13	171.65	147.78
14	175.85	150.49
15	179.89	153.44
16	183.75	156.61
17	187.43	160.00
18	190.91	163.59
19	194.18	167.38
20	197.22	171.34
21	200.04	175.47
22	202.15	179.00

Circle Center At X =   126.33 ; Y =   222.58 ; and Radius =   87.46

Factor of Safety

*** 1.677 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.00	136.00
2	120.94	135.24
3	125.93	134.84
4	130.93	134.80
5	135.92	135.12
6	140.87	135.81
7	145.76	136.85
8	150.56	138.24
9	155.25	139.97
10	159.80	142.04
11	164.20	144.43
12	168.40	147.13
13	172.40	150.13
14	176.17	153.42
15	179.70	156.96
16	182.96	160.75
17	185.93	164.77
18	188.61	168.99
19	190.98	173.40
20	193.02	177.96

21	193.39	179.00

Circle Center At X = 128.96 ; Y = 203.86 ; and Radius = 69.09

Factor of Safety

*** 1.678 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.00	138.33
2	128.97	137.82
3	133.97	137.64
4	138.97	137.81
5	143.94	138.31
6	148.87	139.16
7	153.73	140.34
8	158.50	141.85
9	163.15	143.68
10	167.67	145.82
11	172.03	148.26
12	176.21	151.00
13	180.20	154.02
14	183.97	157.30
15	187.51	160.83
16	190.80	164.60
17	193.83	168.58
18	196.57	172.76
19	199.03	177.11
20	199.93	179.00

Circle Center At X = 134.06 ; Y = 210.77 ; and Radius = 73.13

Factor of Safety

*** 1.681 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.00	137.17
2	126.95	136.47
3	131.94	136.11
4	136.94	136.08
5	141.93	136.39
6	146.89	137.03
7	151.79	138.00
8	156.62	139.30
9	161.35	140.92
10	165.96	142.85
11	170.44	145.08
12	174.75	147.61
13	178.88	150.42
14	182.82	153.51
15	186.54	156.85
16	190.03	160.43
17	193.27	164.24
18	196.25	168.25
19	198.96	172.46
20	201.37	176.83
21	202.38	179.00

Circle Center At X = 134.85 ; Y = 210.70 ; and Radius = 74.64

Factor of Safety

*** 1.684 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.00	137.17
2	126.92	136.27
3	131.89	135.73
4	136.89	135.56
5	141.88	135.74
6	146.85	136.29

7	151.77	137.19
8	156.61	138.45
9	161.35	140.05
10	165.95	141.99
11	170.41	144.27
12	174.69	146.85
13	178.77	149.74
14	182.63	152.92
15	186.25	156.37
16	189.61	160.07
17	192.70	164.00
18	195.49	168.15
19	197.98	172.49
20	200.15	176.99
21	200.94	179.00

Circle Center At X = 136.83 ; Y = 204.65 ; and Radius = 69.09

Factor of Safety

*** 1.697 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.00	136.00
2	120.94	135.22
3	125.92	134.82
4	130.92	134.81
5	135.91	135.18
6	140.85	135.94
7	145.72	137.07
8	150.49	138.58
9	155.13	140.45
10	159.60	142.67
11	163.90	145.24
12	167.98	148.12
13	171.83	151.31
14	175.43	154.79
15	178.74	158.53
16	181.75	162.52
17	184.45	166.73
18	186.82	171.14
19	188.84	175.71
20	189.73	178.24

Circle Center At X = 128.60 ; Y = 199.48 ; and Radius = 64.72

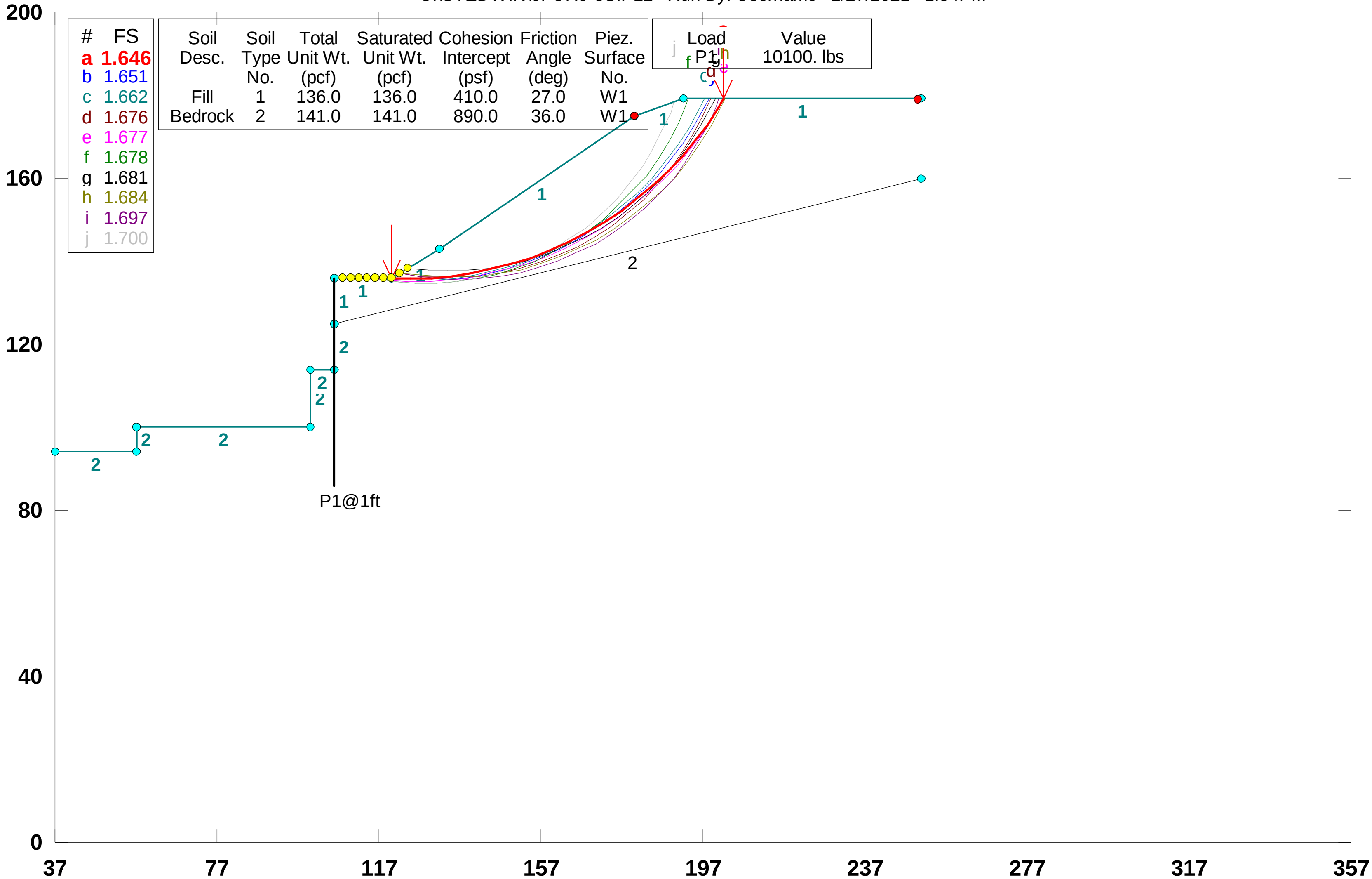
Factor of Safety

*** 1.700 ***

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

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Overtoping; Static)

C:\STEDWIN\0FUR9-3S.PL2 Run By: Username 1/27/2021 1:54PM



GSTABL7 v.2 FSmin=1.646

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.002, December 2001 **

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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 Earthquake, and Applied Force Options.
*********************************************************************************
 Analysis Run Date:        1/27/2021
 Time of Run:              1:55PM
 Run By:                   Username
 Input Data Filename:      C:0fur9-3p.in
 Output Filename:          C:0fur9-3p.OUT
 Unit System:              English
 Plotted Output Filename:  C:0fur9-3p.PLT
 PROBLEM DESCRIPTION:  4057 Hayvenhurs Slope Stability Analysis
                       Section A-A (Overtoping; Pseudo-Static)
 BOUNDARY COORDINATES
      Note: User origin value specified.
      Add 37.00 to X-values and 0.00 to Y-values listed.

    12 Top   Boundaries
    13 Total Boundaries
```

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	37.00	94.00	57.00	94.00	2
2	57.00	94.00	57.01	100.00	2
3	57.01	100.00	100.00	100.00	2
4	100.00	100.00	100.01	114.00	2
5	100.01	114.00	106.00	114.00	2
6	106.00	114.00	106.01	125.00	2
7	106.01	125.00	106.02	136.00	1
8	106.02	136.00	120.00	136.00	1
9	120.00	136.00	132.00	143.00	1
10	132.00	143.00	180.00	175.00	1
11	180.00	175.00	192.00	179.00	1
12	192.00	179.00	251.00	179.00	1
13	106.01	125.00	251.00	160.00	2

Default Y-Origin = 0.00(ft)
ISOTROPIC SOIL PARAMETERS
2 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	136.0	136.0	410.0	27.0	0.00	0.0	1
2	141.0	141.0	890.0	36.0	0.00	0.0	1

A Horizontal Earthquake Loading Coefficient
Of0.260 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure = 0.0(psf)
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	106.02	136.00	11100.0	1.0	90.00	50.0

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.

900 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 9 Points Equally Spaced
Along The Ground Surface Between X = 108.00(ft)
and X = 124.00(ft)
Each Surface Terminates Between X = 180.00(ft)
and X = 250.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(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 Evaluated = 900
Statistical Data On All Valid FS Values:
FS Max = 2.872 FS Min = 1.054 FS Ave = 2.056
Standard Deviation = 0.499 Coefficient of Variation = 24.24 %
Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.00	136.00
2	125.00	135.86
3	130.00	135.99
4	134.98	136.40
5	139.93	137.08
6	144.84	138.04
7	149.69	139.27
8	154.46	140.76
9	159.14	142.52
10	163.72	144.53
11	168.18	146.79
12	172.51	149.29
13	176.69	152.03
14	180.71	155.00
15	184.57	158.19
16	188.24	161.58
17	191.72	165.17
18	194.99	168.95
19	198.05	172.90
20	200.89	177.02
21	202.10	179.00

Circle Center At X = 125.09 ; Y = 226.24 ; and Radius = 90.38
Factor of Safety
*** 1.054 ***
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	5.0	1039.6	0.0	0.0	0.	0.	270.3	0.0	0.0
2	5.0	3024.8	0.0	0.0	0.	0.	786.5	0.0	0.0
3	2.0	1728.2	0.0	0.0	0.	0.	449.3	0.0	0.0
4	3.0	3126.9	0.0	0.0	0.	0.	813.0	0.0	0.0
5	5.0	6665.5	0.0	0.0	0.	0.	1733.0	0.0	0.0
6	4.9	8250.1	0.0	0.0	0.	0.	2145.0	0.0	0.0
7	4.8	9571.8	0.0	0.0	0.	0.	2488.7	0.0	0.0
8	4.8	10621.0	0.0	0.0	0.	0.	2761.5	0.0	0.0
9	4.7	11393.1	0.0	0.0	0.	0.	2962.2	0.0	0.0
10	4.6	11888.6	0.0	0.0	0.	0.	3091.0	0.0	0.0
11	4.5	12112.8	0.0	0.0	0.	0.	3149.3	0.0	0.0
12	4.3	12076.0	0.0	0.0	0.	0.	3139.8	0.0	0.0
13	4.2	11792.9	0.0	0.0	0.	0.	3066.1	0.0	0.0
14	3.3	9297.4	0.0	0.0	0.	0.	2417.3	0.0	0.0
15	0.7	1974.1	0.0	0.0	0.	0.	513.3	0.0	0.0
16	3.9	10108.7	0.0	0.0	0.	0.	2628.3	0.0	0.0
17	3.7	8615.0	0.0	0.0	0.	0.	2239.9	0.0	0.0

18	3.5	7073.2	0.0	0.0	0.	0.	1839.0	0.0	0.0
19	0.3	523.2	0.0	0.0	0.	0.	136.0	0.0	0.0
20	3.0	4792.6	0.0	0.0	0.	0.	1246.1	0.0	0.0
21	3.1	3360.8	0.0	0.0	0.	0.	873.8	0.0	0.0
22	2.8	1558.4	0.0	0.0	0.	0.	405.2	0.0	0.0
23	1.2	162.7	0.0	0.0	0.	0.	42.3	0.0	0.0

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.00	136.00
2	122.98	135.53
3	127.98	135.38
4	132.97	135.54
5	137.95	136.02
6	142.89	136.82
7	147.76	137.92
8	152.56	139.34
9	157.25	141.05
10	161.83	143.06
11	166.27	145.36
12	170.56	147.93
13	174.68	150.77
14	178.60	153.87
15	182.33	157.21
16	185.83	160.77
17	189.10	164.56
18	192.12	168.54
19	194.89	172.71
20	197.38	177.04
21	198.35	179.00

Circle Center At X = 127.89 ; Y = 214.16 ; and Radius = 78.78

Factor of Safety
*** 1.073 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.00	136.00
2	124.99	135.66
3	129.99	135.55
4	134.99	135.68
5	139.97	136.03
6	144.94	136.61
7	149.87	137.41
8	154.77	138.45
9	159.61	139.70
10	164.38	141.18
11	169.09	142.88
12	173.71	144.79
13	178.24	146.91
14	182.66	149.23
15	186.98	151.76
16	191.17	154.48
17	195.23	157.40
18	199.16	160.49
19	202.94	163.77
20	206.56	167.21
21	210.03	170.82
22	213.32	174.58
23	216.44	178.49
24	216.81	179.00

Circle Center At X = 129.86 ; Y = 244.29 ; and Radius = 108.74

Factor of Safety
*** 1.073 ***

Failure Surface Specified By 21 Coordinate Points

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

1	124.00	138.33
2	128.99	138.03
3	133.99	138.00
4	138.98	138.26
5	143.96	138.79
6	148.89	139.60
7	153.77	140.68
8	158.59	142.03
9	163.32	143.64
10	167.95	145.52
11	172.47	147.65
12	176.87	150.03
13	181.13	152.66
14	185.23	155.51
15	189.17	158.59
16	192.93	161.89
17	196.51	165.38
18	199.88	169.08
19	203.04	172.95
20	205.98	176.99
21	207.27	179.00

Circle Center At X = 131.94 ; Y = 227.74 ; and Radius = 89.76

Factor of Safety

*** 1.077 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.00	136.00
2	120.96	135.35
3	125.94	134.95
4	130.94	134.82
5	135.94	134.94
6	140.92	135.33
7	145.88	135.98
8	150.80	136.88
9	155.66	138.04
10	160.46	139.45
11	165.17	141.11
12	169.80	143.02
13	174.32	145.16
14	178.71	147.54
15	182.98	150.14
16	187.11	152.96
17	191.09	156.00
18	194.90	159.23
19	198.54	162.66
20	201.99	166.28
21	205.25	170.07
22	208.31	174.03
23	211.15	178.14
24	211.69	179.00

Circle Center At X = 131.02 ; Y = 230.53 ; and Radius = 95.72

Factor of Safety

*** 1.078 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	114.00	136.00
2	118.97	135.44
3	123.96	135.16
4	128.96	135.17
5	133.95	135.46
6	138.92	136.04
7	143.84	136.90
8	148.71	138.04
9	153.51	139.46

```
   10        158.21      141.15
   11        162.82      143.10
   12        167.30      145.32
   13        171.65      147.78
   14        175.85      150.49
   15        179.89      153.44
   16        183.75      156.61
   17        187.43      160.00
   18        190.91      163.59
   19        194.18      167.38
   20        197.22      171.34
   21        200.04      175.47
   22        202.15      179.00
Circle Center At X =   126.33 ; Y =   222.58 ; and Radius =    87.46
       Factor of Safety
      ***    1.079   ***
Failure Surface Specified By 23 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        118.00      136.00
    2        122.94      135.24
    3        127.92      134.75
    4        132.91      134.54
    5        137.91      134.61
    6        142.90      134.97
    7        147.86      135.60
    8        152.78      136.51
    9        157.64      137.69
   10        162.42      139.14
   11        167.12      140.86
   12        171.71      142.84
   13        176.18      145.07
   14        180.52      147.55
   15        184.72      150.27
   16        188.76      153.22
   17        192.62      156.39
   18        196.31      159.77
   19        199.79      163.35
   20        203.07      167.13
   21        206.14      171.08
   22        208.98      175.19
   23        211.30      179.00
Circle Center At X =   134.11 ; Y =   223.78 ; and Radius =    89.25
       Factor of Safety
      ***    1.082   ***
Failure Surface Specified By 24 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        112.00      136.00
    2        116.98      135.55
    3        121.98      135.34
    4        126.98      135.37
    5        131.97      135.64
    6        136.94      136.15
    7        141.89      136.89
    8        146.79      137.87
    9        151.64      139.09
   10        156.42      140.54
   11        161.14      142.21
   12        165.76      144.11
   13        170.29      146.23
   14        174.71      148.56
   15        179.02      151.11
   16        183.20      153.85
   17        187.24      156.80
   18        191.13      159.93
```

```
   19        194.87      163.25
   20        198.45      166.74
   21        201.86      170.40
   22        205.09      174.22
   23        208.13      178.19
   24        208.69      179.00
Circle Center At X =   123.88 ; Y =   239.50 ; and Radius =   104.18
       Factor of Safety
      ***    1.083   ***
Failure Surface Specified By 21 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        122.00      137.17
    2        126.95      136.47
    3        131.94      136.11
    4        136.94      136.08
    5        141.93      136.39
    6        146.89      137.03
    7        151.79      138.00
    8        156.62      139.30
    9        161.35      140.92
   10        165.96      142.85
   11        170.44      145.08
   12        174.75      147.61
   13        178.88      150.42
   14        182.82      153.51
   15        186.54      156.85
   16        190.03      160.43
   17        193.27      164.24
   18        196.25      168.25
   19        198.96      172.46
   20        201.37      176.83
   21        202.38      179.00
Circle Center At X =   134.85 ; Y =   210.70 ; and Radius =    74.64
       Factor of Safety
      ***    1.083   ***
Failure Surface Specified By 21 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        116.00      136.00
    2        120.97      135.48
    3        125.97      135.28
    4        130.97      135.40
    5        135.95      135.83
    6        140.89      136.58
    7        145.78      137.64
    8        150.59      139.00
    9        155.31      140.66
   10        159.91      142.62
   11        164.37      144.87
   12        168.69      147.40
   13        172.84      150.19
   14        176.80      153.24
   15        180.56      156.53
   16        184.11      160.06
   17        187.42      163.80
   18        190.50      167.74
   19        193.31      171.87
   20        195.86      176.17
   21        197.31      179.00
Circle Center At X =   126.63 ; Y =   214.33 ; and Radius =    79.05
       Factor of Safety
      ***    1.083   ***
          **** END OF GSTABL7 OUTPUT ****
```

4057 Hayvenhurs Slope Stability AnalysisSection A-A (Overtoping; Pseudo-Static)

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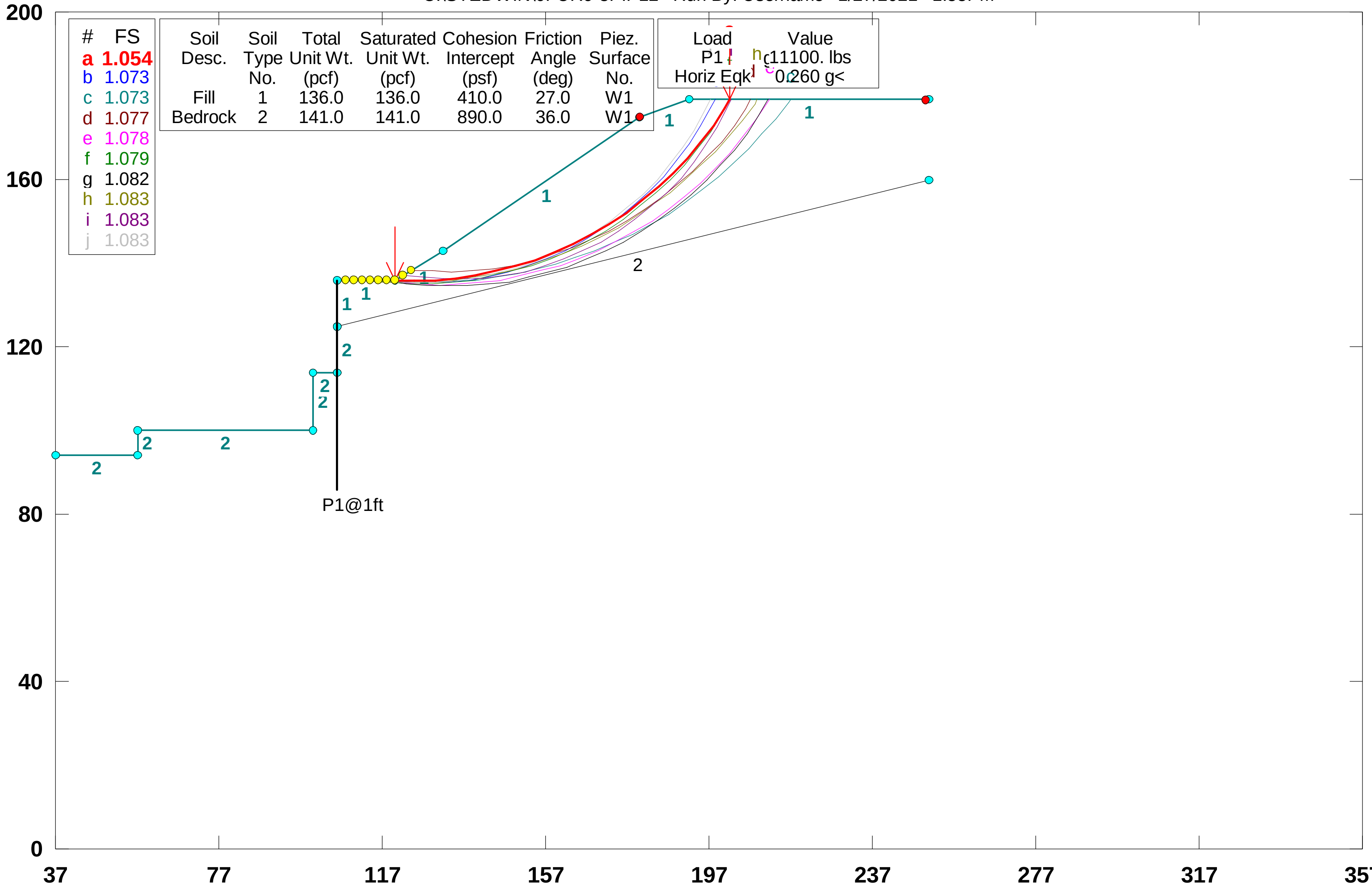


GSTABL7 v.2 FSmin=1.054

Safety Factors Are Calculated By The Modified Bishop Method

ASSUMPTIONS:

1. The slip surface is 3 feet from the slope surface and parallel to the slope
2. The saturation is to extend 3 feet below the slope surface
3. There is sufficient permeability to establish water flow and the flow lines are parallel to the slope surface.

$$F.S. = \frac{C + (\gamma_t - \gamma_w)\, h \cos^2(\alpha) \tan(\phi)}{\gamma_t\, h \cos(\alpha) \sin(\alpha)}$$

Where:

F.S.	-	Factor of Safety			
h	-	Vertical Depth of Saturation	h =	3	feet
γ_t	-	Total Unit Weight of Saturated Soil	γ_t =	136	pcf
γ_w	-	Unit Weight of Water	γ_w =	62	pcf
C	-	Cohesion	C =	260	psf
ϕ	-	Friction Angle	ϕ =	32	degrees
α	-	Slope Angle	α =	34	degrees

$$F.S. = \frac{260 + (136 - 62)(3) \cos^2(34) \tan(32)}{(136)(3) \cos(34) \sin(34)}$$

<u>F.S. = 1.88</u>

APPENDIX G

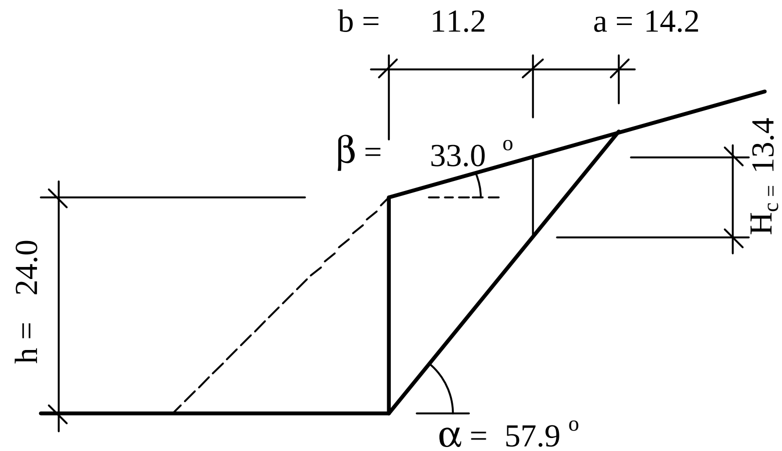
STABILITY OF TEMPORARY EXCAVATIONS

FOR 24 FEET HIGH EXCAVATION

(ALLOWABLE SPACING BETWEEN SOLDIER PILES OF BACKYARD RETAINING WALL)

Data:

Height of Cut,	$h =$	24.0	ft
Slope Angle,	$\beta =$	33.0	deg
Density of Soil,	$\gamma_s =$	141	pcf
Cohesion,	$C =$	890	psf
Friction Angle,	$\phi =$	36	deg
Factor of Safety,	F.S. =	1.50	



Maximum Width of Slot:

$$d = \frac{1/3 * \gamma_s * K_o * \tan\phi * (h^2 * (a + b) - H_c^2 * a) + 2A*C}{(F.S.) * W * \sin\alpha * \cos\alpha - W * \cos^2\alpha * \tan\phi - C * b}$$

Determination of the components of equation:

Slide plane angle,	$\alpha =$	57.9	deg	(Search for Critical Failure Plane)
Location of Tension Crack	$a =$	14.2	ft	
Length of Wedge,	$b =$	11.2	ft	
Height of Tension Crack,	$H_c =$	13.4	ft	
Area of Wedge,	$A = b * (h + H_c) / 2 =$	209.1	ft^2	
Weight of Wedge,	$W = A * \gamma_s =$	29486	lbs	
Coef. of latteral pressure,	$K_o = 1 - \sin\phi =$	0.41		

$$d = \frac{1/3 * 141 * 0.41 * \tan 36 * (24 * 24 * (14.2 + 11.2) - 13.4 * 13.4 * 14.2) + 2 * 890 * 209.1}{1.5 * 29486.3 * \sin 57.9 * \cos 57.9 - 29486.3 * \cos 57.9 * \cos 57.9 * \tan 36 - 890 * 11.2}$$

$$d = \frac{541894.8}{3915.3} = 138.4 \quad ft$$

Maximum Allowable Spacing Between Piles is 138 Feet

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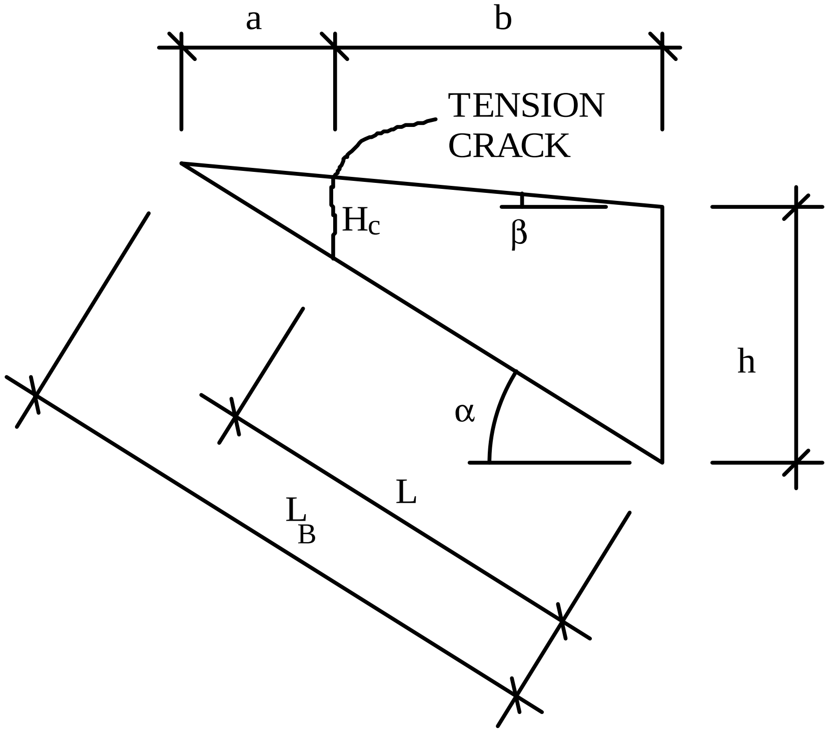
TENSION CRACK LOCATION
FOR 24 FEET HIGH EXCAVATION

DATA:

Soil Density,	γ_s =	141	pcf
Cohesion,	C =	890	psf
Friction Angle,	ϕ =	36	degrees
Surface Angle,	β =	33.0	degrees
Fail. Plane Angle,	α =	57.9	degrees
Height of Cut,	h =	24.0	ft
Factor of Safety,	F.S.=	1.5	



HEIGHT AND LOCATION OF TENSION CRACK:

Total Length of Block, $L_B = (h * \cos\beta) / (\sin(\alpha - \beta)) =$ 47.8 ft

Height of Crack, $H_c = C / (\gamma_s * \cos\alpha * (\sin\alpha * F.S. - \cos\alpha * \tan\phi)) =$ 13.4 ft

Location of Crack, $a = H_c / (\tan\alpha - \tan\beta) =$ 14.2 ft

Location of Crack, $b = L_B * \cos\alpha - H_c / (\tan\alpha - \tan\beta) =$ 11.2 ft

Length of Failure Plane, $L = b / \cos\alpha =$ 21.0 ft

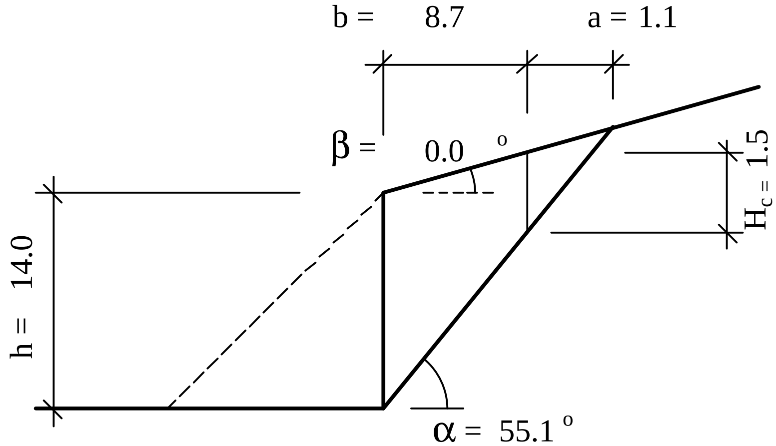
STABILITY OF TEMPORARY EXCAVATIONS

FOR 14 FEET HIGH EXCAVATION

(ALLOWABLE SPACING BETWEEN SHORING PILES OF BASEMENT RETAINING WALL)

Data:

Height of Cut,	$h =$	14.0	ft
Slope Angle,	$\beta =$	0.0	deg
Density of Soil,	$\gamma_s =$	139	pcf
Cohesion,	$C =$	110	psf
Friction Angle,	$\phi =$	29	deg
Factor of Safety,	F.S. $=$	1.50	



Maximum Width of Slot:

$$d = \frac{1/3 * \gamma_s * K_o * \tan\phi * (h^2 * (a + b) - H_c^2 * a) + 2A*C}{(F.S.) * W * \sin\alpha * \cos\alpha - W * \cos^2\alpha * \tan\phi - C * b}$$

Determination of the components of equation:

Slide plane angle,	$\alpha =$ 55.1 deg		(Search for Critical Failure Plane)
Location of Tension Crack	$a =$ 1.1 ft		
Length of Wedge,	$b =$ 8.7 ft		
Height of Tension Crack,	$H_c =$ 1.5 ft		
Area of Wedge,	$A = b * (h + H_c) / 2 =$	67.5	ft^2
Weight of Wedge,	$W = A * \gamma_s =$	9377	lbs
Coef. of latteral pressure,	$K_o = 1 - \sin\phi =$	0.52	

$$d = \frac{1/3 * 139 * 0.52 * \tan 29 * (14 * 14 * (1.1 + 8.7) - 1.5 * 1.5 * 1.1) + 2 * 110 * 67.5}{1.5 * 9377.4 * \sin 55.1 * \cos 55.1 - 9377.4 * \cos 55.1 * \cos 55.1 * \tan 29 - 110 * 8.7}$$

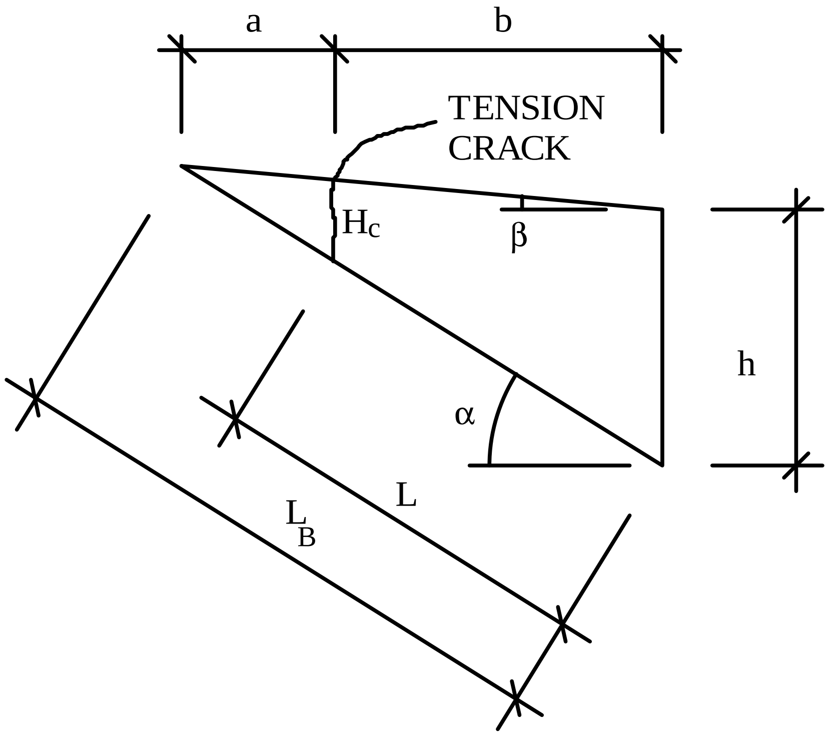
$$d = \frac{40100.2}{3942.3} = 10.17 \text{ ft}$$

Maximum Allowable Spacing Between Piles is 10 Feet

TENSION CRACK LOCATION
FOR 14 FEET HIGH EXCAVATION

DATA:

Soil Density, γ_s = 139 pcf
Cohesion, C = 110 psf
Friction Angle, ϕ = 29 degrees
Surface Angle, β = 0.0 degrees
Fail. Plane Angle, α = 55.1 degrees
Height of Cut, h = 14.0 ft
Factor of Safety, F.S.= 1.5



HEIGHT AND LOCATION OF TENSION CRACK:

Total Length of Block, $L_B = (h * \cos\beta) / (\sin(\alpha - \beta)) =$ 17.1 ft

Height of Crack, $H_c = C / (\gamma_s * \cos\alpha * (\sin\alpha * F.S. - \cos\alpha * \tan\phi)) =$ 1.5 ft

Location of Crack, $a = H_c / (\tan\alpha - \tan\beta) =$ 1.1 ft

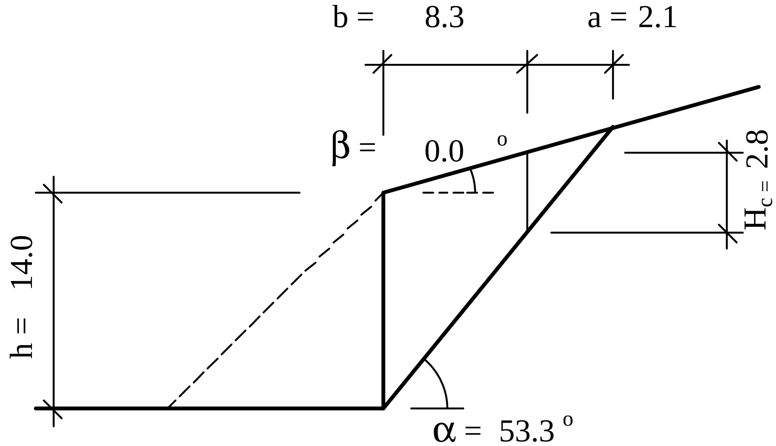
Location of Crack, $b = L_B * \cos\alpha - H_c / (\tan\alpha - \tan\beta) =$ 8.7 ft

Length of Failure Plane, $L = b / \cos\alpha =$ 15.2 ft

STABILITY OF TEMPORARY EXCAVATIONS
FOR 14 FEET HIGH EXCAVATION
(ALLOWABLE SPACING BETWEEN SHORING PILES OF BASEMENT RETAINING WALL)

Data:

Height of Cut,	$h =$ 14.0	ft
Slope Angle,	$\beta =$ 0.0	deg
Density of Soil,	$\gamma_s =$ 139	pcf
Cohesion,	C = 220	psf
Friction Angle,	$\phi =$ 24	deg
Factor of Safety,	F.S. = 1.50	



Maximum Width of Slot:

$$d = \frac{1/3 * \gamma_s * K_o * \tan\phi * (h^2 * (a + b) - H_c^2 * a) + 2A*C}{(F.S.) * W * \sin\alpha * \cos\alpha - W * \cos^2\alpha * \tan\phi - C * b}$$

Determination of the components of equation:

Slide plane angle,	$\alpha =$ 53.3 deg		(Search for Critical Failure Plane)
Location of Tension Crack	a = 2.1 ft		
Length of Wedge,	b = 8.3 ft		
Height of Tension Crack,	$H_c =$ 2.8 ft		
Area of Wedge,	$A = b * (h + H_c) / 2 =$	70.2	ft^2
Weight of Wedge,	$W = A * \gamma_s =$	9751	lbs
Coef. of latteral pressure,	$K_o = 1 - \sin\phi =$	0.59	

$$d = \frac{1/3 * 139 * 0.59 * \tan 24 * (14 * 14 * (2.1 + 8.3) - 2.8 * 2.8 * 2.1) + 2 * 220 * 70.2}{1.5 * 9751.4 * \sin 53.3 * \cos 53.3 - 9751.4 * \cos 53.3 * \cos 53.3 * \tan 24 - 220 * 8.3}$$

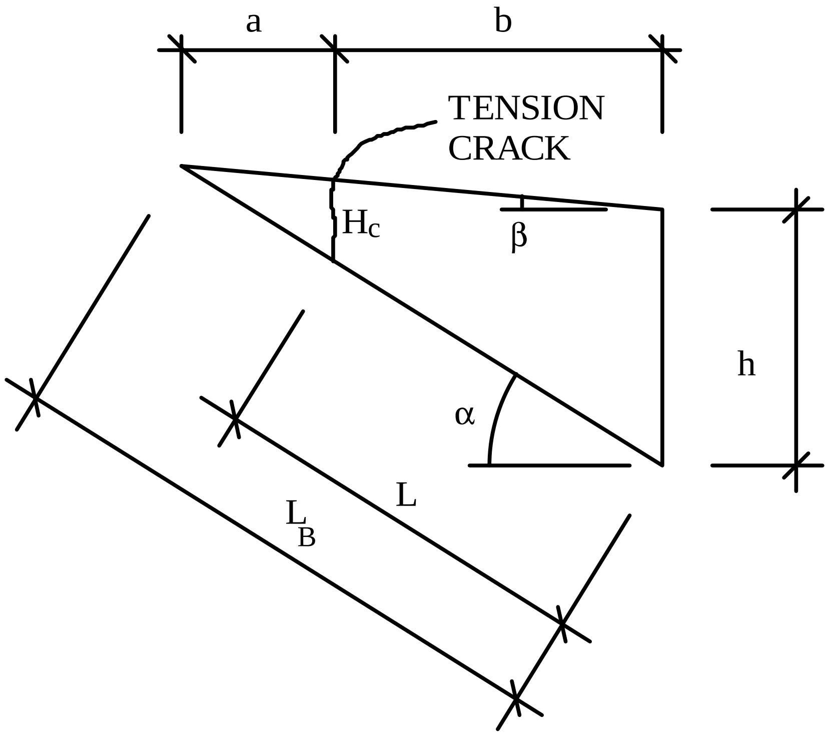
$$d = \frac{55723.6}{3623.8} = 15.38 \text{ ft}$$

Maximum Allowable Spacing Between Piles is 15 Feet

TENSION CRACK LOCATION
FOR 14 FEET HIGH EXCAVATION

DATA:

Soil Density,	γ_s = 139	pcf
Cohesion,	C = 220	psf
Friction Angle,	ϕ = 24	degrees
Surface Angle,	β = 0.0	degrees
Fail. Plane Angle,	α = 53.3	degrees
Height of Cut,	h = 14.0	ft
Factor of Safety,	F.S.= 1.5	



HEIGHT AND LOCATION OF TENSION CRACK:

Total Length of Block, $L_B = (h * \cos\beta) / (\sin(\alpha - \beta)) =$ 17.5 ft

Height of Crack, $H_c = C / (\gamma_s * \cos\alpha * (\sin\alpha * F.S. - \cos\alpha * \tan\phi)) =$ 2.8 ft

Location of Crack, $a = H_c / (\tan\alpha - \tan\beta) =$ 2.1 ft

Location of Crack, $b = L_B * \cos\alpha - H_c / (\tan\alpha - \tan\beta) =$ 8.3 ft

Length of Failure Plane, $L = b / \cos\alpha =$ 13.9 ft

APPENDIX H

LATERAL LOAD DISTRIBUTION FOR SHORING

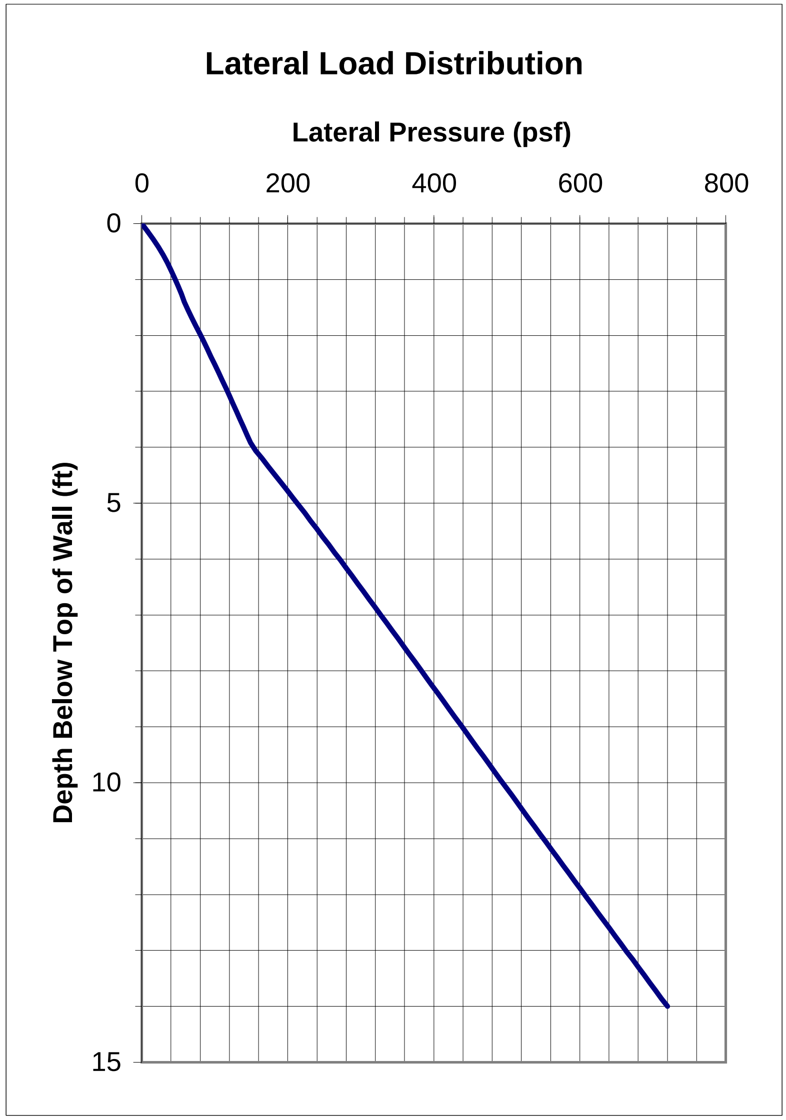
CONTILEVERED 14 FOOT HIGH SHORING

SURCHARGED BY NEIGHBORING ONE-STORY BUILDING AND SIDE YARD; NORTH SIDE

Initial Input:

Soil and Shoring Data:

Shoring Type - Cantilever		C	
Height of Shoring	H =	14	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	110	psf
Friction Angle	ϕ =	29	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.373	
Required Factor of Safety	FS =	1.25	



Distributed Surcharge Data:

Distributed Load	q =	50	psf
Distance from Shoring	L_1 =	1.0	ft
Width of Load	B_1 =	6.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Shoring	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	1000	plf
Distance from Shoring	L_3 =	7	ft
Width of Footing	B_3 =	1.5	ft
Depth of Footing	D =	1.5	ft

Eqiuvalent Fluid Pressure: 48.5 pcf
Total Force Acting on Shoring: 4756 lb/ft
Point of Application: 9.6 ft Below Top of Shoring
Pressure at Poin 'A': 156.05 psf @ 4.1 ft Below Top of Shori
Pressure at Poin 'B': 522.28 psf @ 10.5 ft Below Top of Sho
Relative Maximum: 720.08 psf @ 14 ft Below Top of Shorin

LATERAL LOAD DISTRIBUTION FOR SHORING

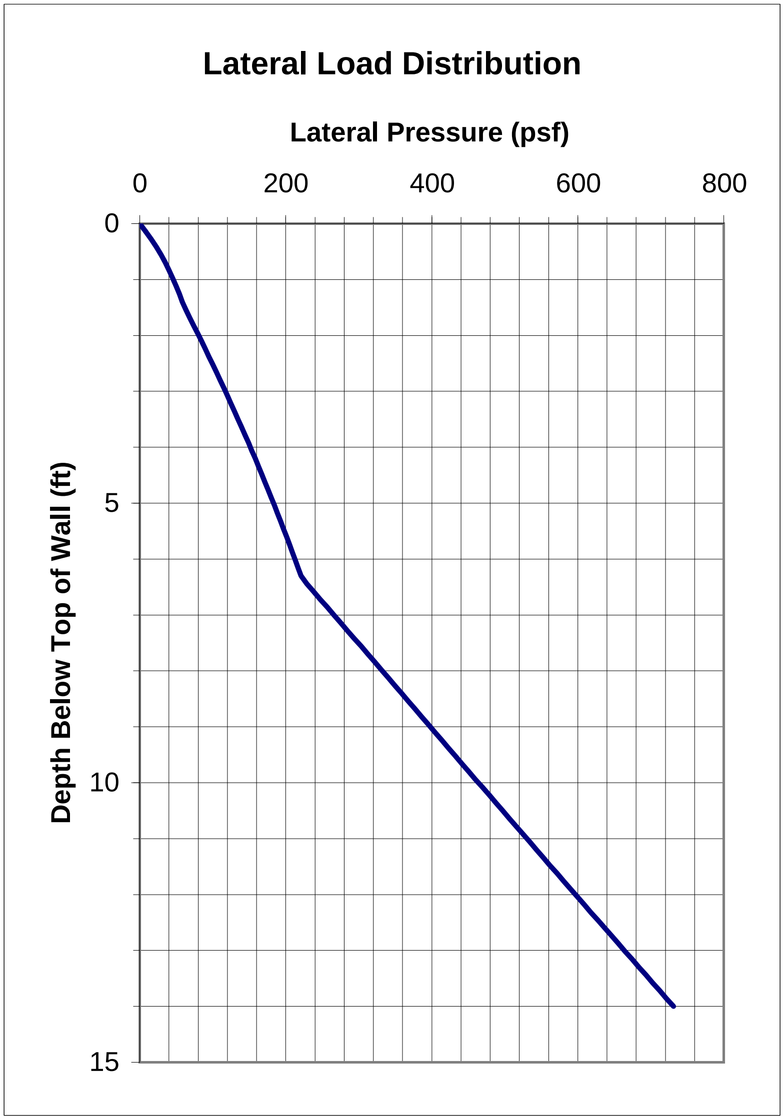
CONTILEVERED 14 FOOT HIGH SHORING

SURCHARGED BY NEIGHBORING ONE-STORY BUILDING AND SIDE YARD; NORTH SIDE

Initial Input:

Soil and Shoring Data:

Shoring Type - Cantilever		C	
Height of Shoring	H =	14	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	220	psf
Friction Angle	ϕ =	24	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.399	
Required Factor of Safety	FS =	1.25	



Distributed Surcharge Data:

Distributed Load	q =	50	psf
Distance from Shoring	L_1 =	1.0	ft
Width of Load	B_1 =	6.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Shoring	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	1000	plf
Distance from Shoring	L_3 =	7	ft
Width of Footing	B_3 =	1.5	ft
Depth of Footing	D =	1.5	ft

Eqiuvalent Fluid Pressure: 45.5 pcf
Total Force Acting on Shoring: 4457 lb/ft
Point of Application: 9.7 ft Below Top of Shoring
Pressure at Poin 'A': 228.75 psf @ 6.4 ft Below Top of Shori
Pressure at Poin 'B': 497.1 psf @ 10.5 ft Below Top of Shori
Relative Maximum: 731.1 psf @ 14 ft Below Top of Shoring

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LATERAL LOAD DISTRIBUTION FOR SHORING

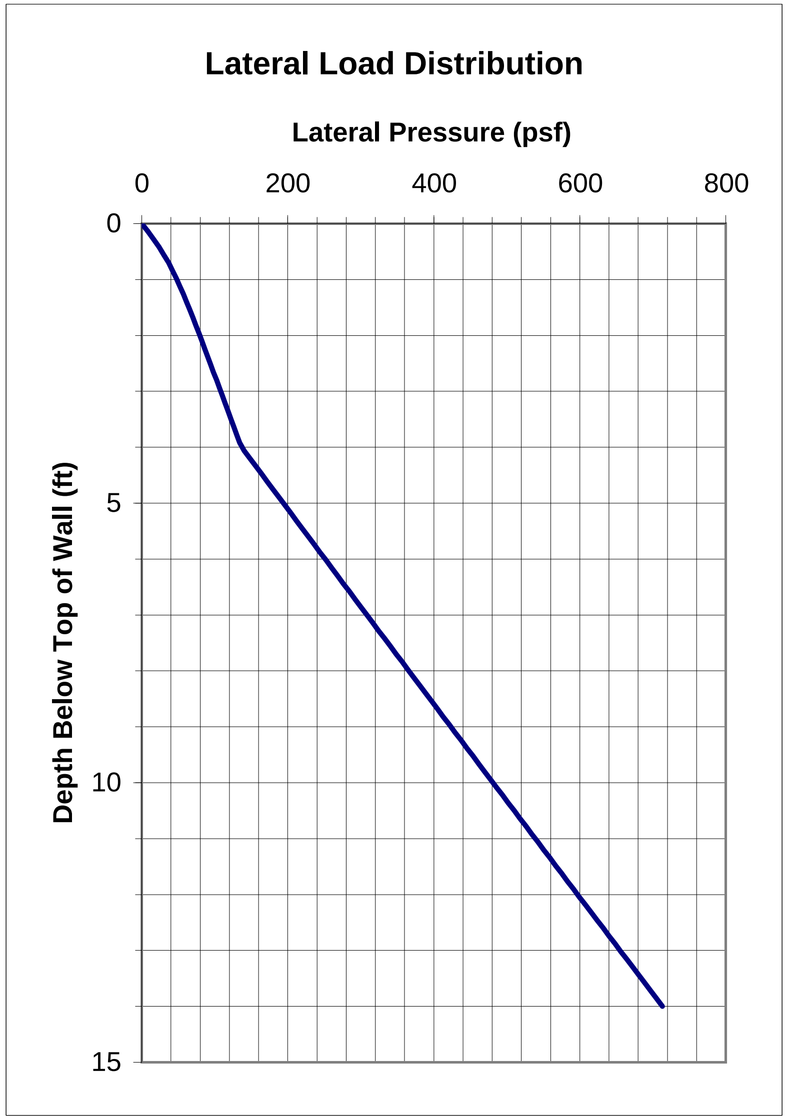
CONTILEVERED 14 FOOT HIGH SHORING

SURCHARGED BY NEIGHBORING SIDE YARD; SOUTH SIDE

Initial Input:

Soil and Shoring Data:

Shoring Type - Cantilever		C	
Height of Shoring	H =	14	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	110	psf
Friction Angle	ϕ =	29	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.373	
Required Factor of Safety FS =		1.25	



Distributed Surcharge Data:

Distributed Load	q =	50	psf
Distance from Shoring	L_1 =	1.0	ft
Width of Load	B_1 =	13.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Shoring	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	0	plf
Distance from Shoring	L_3 =	0	ft
Width of Footing	B_3 =	0.0	ft
Depth of Footing	D =	0.0	ft

Eqiuvalent Fluid Pressure: 46.9 pcf
Total Force Acting on Shoring: 4597 lb/ft
Point of Application: 9.7 ft Below Top of Shoring
Pressure at Poin 'A': 140.4 psf @ 4.1 ft Below Top of Shorir
Pressure at Poin 'B': 510.15 psf @ 10.5 ft Below Top of Shoı
Relative Maximum: 713.42 psf @ 14 ft Below Top of Shorin

LATERAL LOAD DISTRIBUTION FOR SHORING

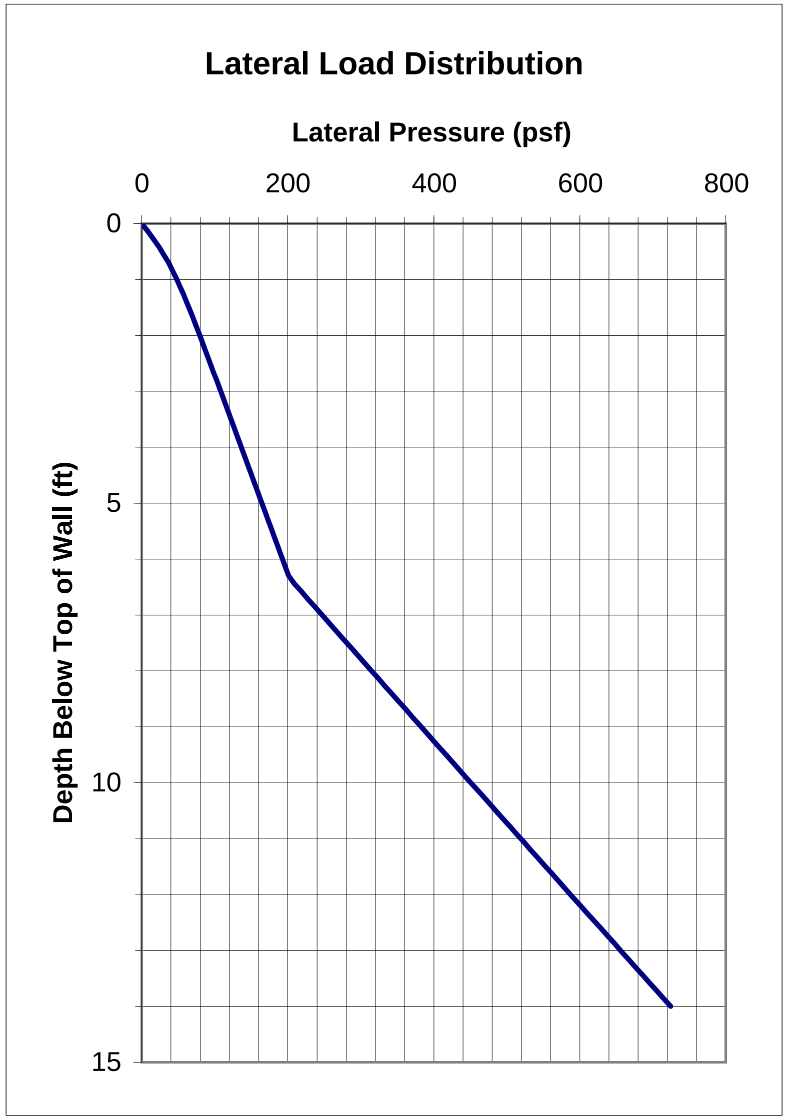
CONTILEVERED 14 FOOT HIGH SHORING

SURCHARGED BY NEIGHBORING SIDE YARD; SOUTH SIDE

Initial Input:

Soil and Shoring Data:

Shoring Type - Cantilever		C	
Height of Shoring	H =	14	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	220	psf
Friction Angle	ϕ =	24	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.399	
Required Factor of Safety	FS =	1.25	



Distributed Surcharge Data:

Distributed Load	q =	50	psf
Distance from Shoring	L_1 =	1.0	ft
Width of Load	B_1 =	13.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Shoring	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	0	plf
Distance from Shoring	L_3 =	0	ft
Width of Footing	B_3 =	0.0	ft
Depth of Footing	D =	0.0	ft

Eqiuvalent Fluid Pressure: 43.9 pcf
Total Force Acting on Shoring: 4298 lb/ft
Point of Application: 9.8 ft Below Top of Shoring
Pressure at Poin 'A': 209.14 psf @ 6.4 ft Below Top of Shori
Pressure at Poin 'B': 484.97 psf @ 10.5 ft Below Top of Sho
Relative Maximum: 724.44 psf @ 14 ft Below Top of Shorin

APPENDIX I

STATIC EQUIVALENT FLUID PRESSURE

RETAINING WALLS OF BASEMENT

FOR 12 FEET HIGH RETAINING WALL

Wedge No.	Lateral Load from Active Pressure (Single Wedge) (lbs/lf)	Lateral Load from Active Pressure (Accumulated) (lbs/lf)	Equivalent Fluid Pressure psf/ft or pcf
1	3,707	3,707	51.5

EFP calculated for H=	12	ft	
Total Density, γ_t =	139	pcf	
Saturated Density, γ_s =	139	pcf	
Water Density, γ_w =	62.4	pcf	
Friction Angle, ϕ =	29	degrees	
Cohesion, C =	110	psf	
Surface Angle, β =	0	degrees	
Fail. Plane Angle, α =	55.1	degrees	(Search for Critical Failure Plane)

LATERAL LOAD APPLIED ON BLOCK 1
RETAINING WALLS OF BASEMENT
FOR 12 FEET HIGH RETAINING WALL

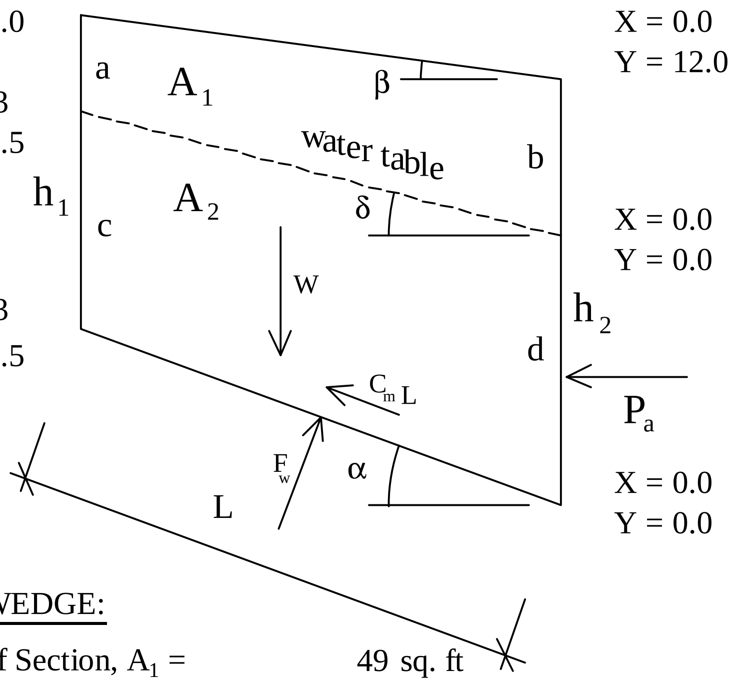
DATA:

Total Density, γ_t =	139	pcf			
Saturated Density, γ_s =	139	pcf			
Water Density, γ_w =	62.4	pcf			
Friction Angle, ϕ =	29.0	degrees	Mobilized, ϕ_m =	20.3	degrees
Cohesion, C =	110	psf	Mobilized, C_m =	73	psf
Fail. Plane Angle, α =	55.1	degrees			
Surface Angle, β =	0.0	degrees			
Water Table Angle, δ =	55.1	degrees			
Wedge Length, L =	12.8	ft			
Factor of Safety, FS =	1.5				

X = 7.3
Y = 12.0

X = 7.3
Y = 10.5

X = 7.3
Y = 10.5



X = 0.0
Y = 12.0

X = 0.0
Y = 0.0

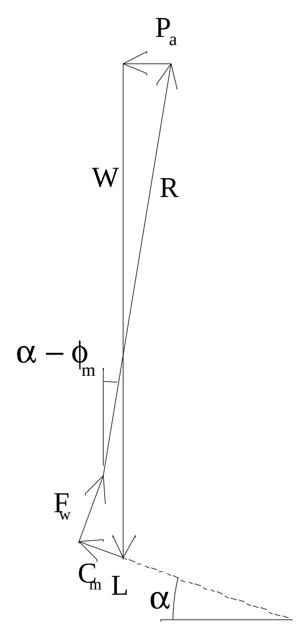
X = 0.0
Y = 0.0

a =	1.5	ft
b =	12.0	ft
c =	0.0	ft
d =	0.0	ft
h_1=	1.5	ft
h_2=	12.0	ft

THE WEDGE:

Area of Section, A_1 =	49	sq. ft
Area of Section, A_2 =	0	sq. ft
Total Area, A =	49	sq. ft
Weight of Soil, W =	6,860	lbs/lf
Cohesion, $C_m L$ =	937	lbs/lf
Uplift Force, F_w =	0	lbs/lf

Lateral Load, P_a = 3,707 lbs/lf

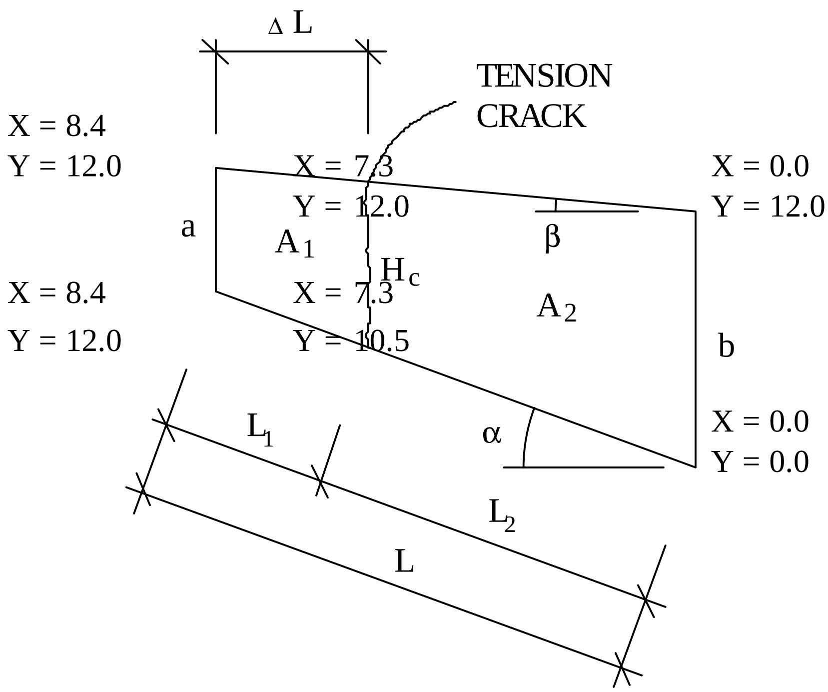


TENSION CRACK LOCATION

RETAINING WALLS OF BASEMENT

DATA:

Soil Density, γ_t =	139	pcf
Friction Angle, ϕ =	29	degrees
Cohesion, C =	110	psf
Surface Angle, β =	0.0	degrees
Fail. Plane Angle, α =	55.1	degrees
Wedge Length, L =	15	ft
Factor of Safety, F.S.=	1.5	



a =	0.0	ft
b =	12.0	ft
l=	8.4	

HEIGHT AND LOCATION OF TENSION CRACK:

Height of Crack, H_c =	1.5	ft
Location of Crack, ΔL =	1.1	ft

SECTION OF WEDGE ABOVE THE CRACK:

Length of Section, L_1 =	2	ft	Driving Force, W_{D1} =	91	lbs
Area of Section, A_1 =	1	sq. ft	Friction, F_{fr1} =	35	lbs
Weight of Section, W_1 =	111	lbs	Cohesion, CL_1 =	203	lbs

Horizontal Projection of Resulting Force, P_1 = -84 lbs

SECTION OF WEDGE BELOW THE CRACK:

Length of Section, L_2 =	13	ft	Driving Force, W_{D2} =	5,629	lbs
Area of Section, A_2 =	49	sq. ft	Friction, F_{fr2} =	2,173	lbs
Weight of Section, W_2 =	6,860	lbs	Cohesion, CL_2 =	1,406	lbs

Horizontal Projection of Resulting Force, P_2 = 1,172 lbs

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STATIC EQUIVALENT FLUID PRESSURE

RETAINING WALLS OF BASEMENT

FOR 12 FEET HIGH RETAINING WALL

Wedge No.	Lateral Load from Active Pressure (Single Wedge) (lbs/lf)	Lateral Load from Active Pressure (Accumulated) (lbs/lf)	Equivalent Fluid Pressure psf/ft or pcf
1	3,257	3,257	45.2

EFP calculated for H=	12	ft

Total Density, γ_t =	139	pcf	
Saturated Density, γ_s =	139	pcf	
Water Density, γ_w =	62.4	pcf	
Friction Angle, ϕ =	24	degrees	
Cohesion, C =	220	psf	
Surface Angle, β =	0	degrees	
Fail. Plane Angle, α =	53.3	degrees	(Search for Critical Failure Plane)

LATERAL LOAD APPLIED ON BLOCK 1
RETAINING WALLS OF BASEMENT
FOR 12 FEET HIGH RETAINING WALL

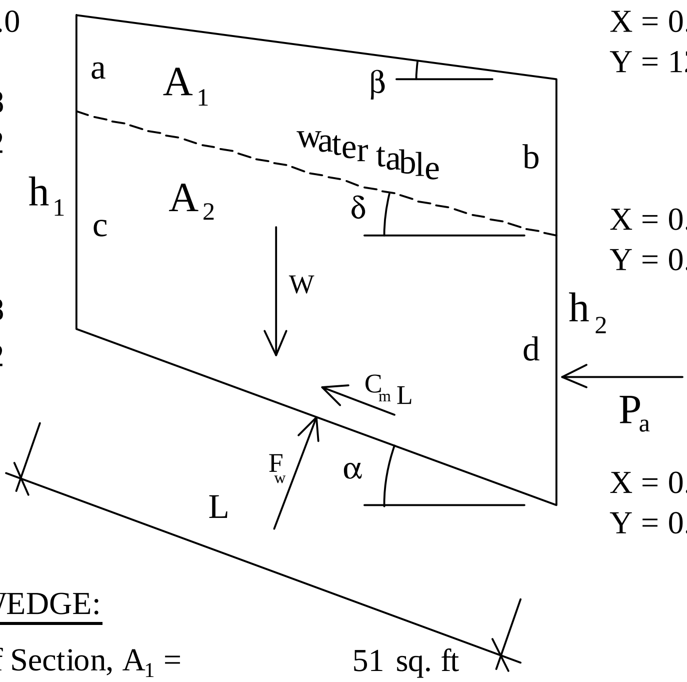
DATA:

Total Density, γ_t =	139	pcf			
Saturated Density, γ_s =	139	pcf			
Water Density, γ_w =	62.4	pcf			
Friction Angle, ϕ =	24.0	degrees	Mobilized, ϕ_m =	16.5	degrees
Cohesion, C =	220	psf	Mobilized, C_m =	147	psf
Fail. Plane Angle, α =	53.3	degrees			
Surface Angle, β =	0.0	degrees			
Water Table Angle, δ =	53.3	degrees			
Wedge Length, L =	11.4	ft			
Factor of Safety, FS =	1.5				

X = 6.8
Y = 12.0

X = 6.8
Y = 9.2

X = 6.8
Y = 9.2



X = 0.0
Y = 12.0

a =	2.8	ft
b =	12.0	ft
c =	0.0	ft
d =	0.0	ft
h_1=	2.8	ft
h_2=	12.0	ft

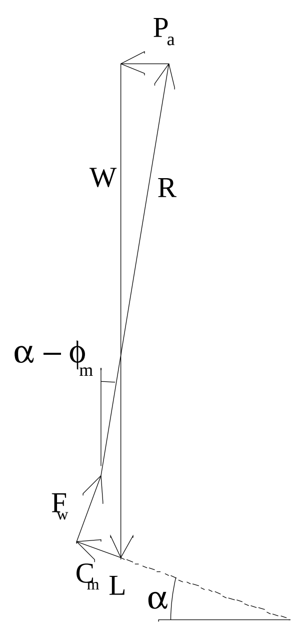
X = 0.0
Y = 0.0

X = 0.0
Y = 0.0

THE WEDGE:

Area of Section, A_1 =	51	sq. ft
Area of Section, A_2 =	0	sq. ft
Total Area, A =	51	sq. ft
Weight of Soil, W =	7,054	lbs/lf
Cohesion, C_mL =	1,679	lbs/lf
Uplift Force, F_w =	0	lbs/lf

Lateral Load, P_a = 3,257 lbs/lf



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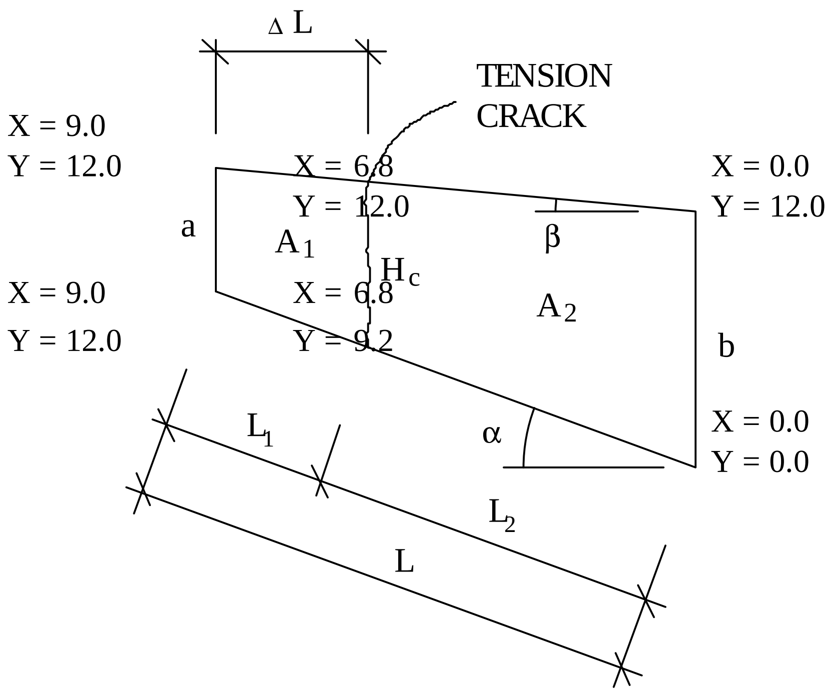
TENSION CRACK LOCATION
RETAINING WALLS OF BASEMENT

DATA:

Soil Density, γ_t =	139	pcf
Friction Angle, ϕ =	24	degrees
Cohesion, C =	220	psf
Surface Angle, β =	0.0	degrees
Fail. Plane Angle, α =	53.3	degrees
Wedge Length, L =	15	ft
Factor of Safety, F.S.=	1.5	



a =	0.0	ft
b =	12.0	ft
l=	9.0	

HEIGHT AND LOCATION OF TENSION CRACK:

Height of Crack, H_c =	2.8	ft
Location of Crack, ΔL =	2.1	ft

SECTION OF WEDGE ABOVE THE CRACK:

Length of Section, L_1 =	4	ft	Driving Force, W_{D1} =	332	lbs
Area of Section, A_1 =	3	sq. ft	Friction, F_{fr1} =	110	lbs
Weight of Section, W_1 =	415	lbs	Cohesion, CL_1 =	776	lbs

Horizontal Projection of Resulting Force, P_1 = -332 lbs

SECTION OF WEDGE BELOW THE CRACK:

Length of Section, L_2 =	11	ft	Driving Force, W_{D2} =	5,653	lbs
Area of Section, A_2 =	51	sq. ft	Friction, F_{fr2} =	1,878	lbs
Weight of Section, W_2 =	7,054	lbs	Cohesion, CL_2 =	2,518	lbs

Horizontal Projection of Resulting Force, P_2 = 752 lbs

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PSEUDO-STATIC EQUIVALENT FLUID PRESSURE
RETAINING WALLS OF BASEMENT
FOR 12 FEET HIGH RETAINING WALL

Wedge No.	Lateral Load from Active Pressure (Single Wedge) (lbs/lf)	Lateral Load from Active Pressure (Accumulated) (lbs/lf)	Equivalent Fluid Pressure psf/ft or pcf
1	4,160	4,160	57.8

EFP calculated for H= 12 ft

Total Density, γ_t =	139	pcf	
Saturated Density, γ_s =	139	pcf	
Water Density, γ_w =	62.4	pcf	
Friction Angle, ϕ =	29	degrees	
Cohesion, C =	110	psf	
Surface Angle, β =	0	degrees	
Fail. Plane Angle, α =	46.3	degrees	(Search for Critical Failure Plane)
Required F.S. =	1		
Seismic Forces	Yes		
Coef. of Horiz. Accel. =	0.286		(PGA_M = 0.857)
Coef. of Vert. Accel. =	0		

NOTE: - The Pseudo-Static Analysis Combines The Earth Pressures From Static And Seismic Forces

LATERAL LOAD APPLIED ON BLOCK 1
RETAINING WALLS OF BASEMENT
FOR 12 FEET HIGH RETAINING WALL

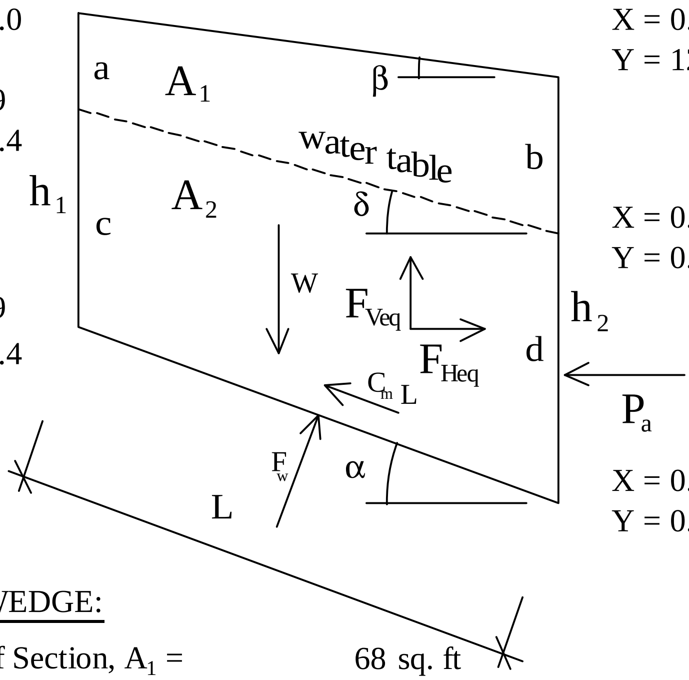
DATA:

Total Density, γ_t =	139	pcf	Coef. of Horiz. Accel. =	0.285667	
Saturated Density, γ_s =	139	pcf	Coef. of Vert. Accel. =	0	
Water Density, γ_w =	62.4	pcf			
Friction Angle, ϕ =	29.0	degrees	Mobilized, ϕ_m =	29.0	degrees
Cohesion, C =	110	psf	Mobilized, C_m =	110	psf
Fail. Plane Angle, α =	46.3	degrees			
Surface Angle, β =	0.0	degrees			
Water Table Angle, δ =	46.3	degrees			
Wedge Length, L =	14.3	ft			
Factor of Safety, FS =	1.0				

X = 9.9
Y = 12.0

X = 9.9
Y = 10.4

X = 9.9
Y = 10.4

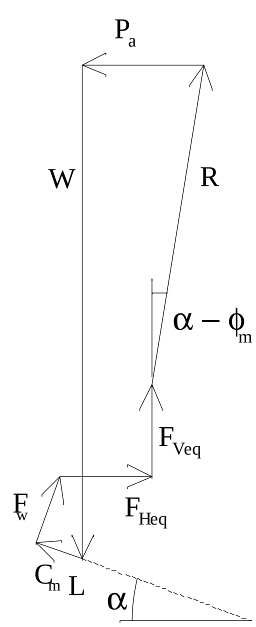


X = 0.0
Y = 12.0

X = 0.0
Y = 0.0

X = 0.0
Y = 0.0

a =	1.6	ft
b =	12.0	ft
c =	0.0	ft
d =	0.0	ft
h_1=	1.6	ft
h_2=	12.0	ft



THE WEDGE:

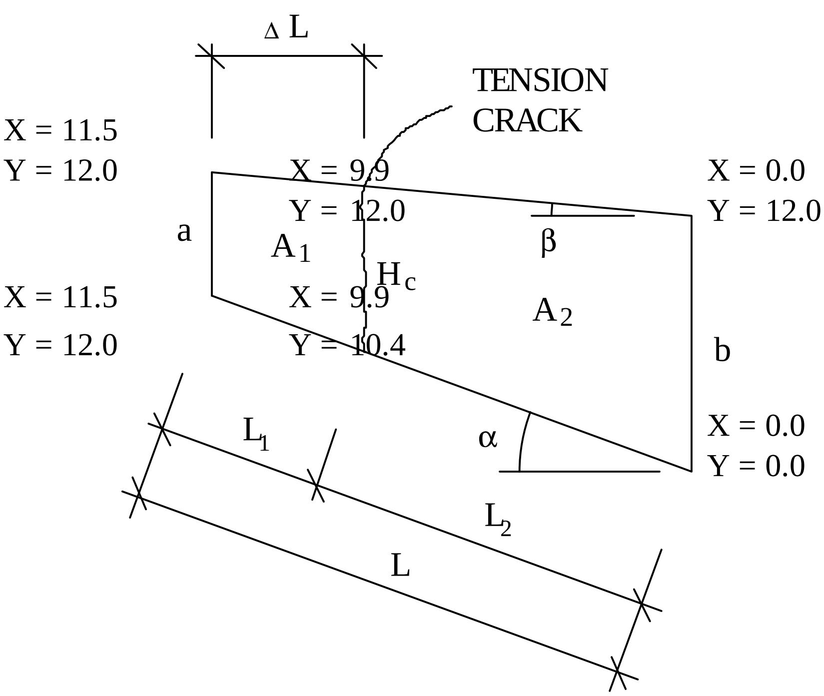
Area of Section, A_1 =	68	sq. ft
Area of Section, A_2 =	0	sq. ft
Total Area, A =	68	sq. ft
Weight of Soil, W =	9,397	lbs/lf
Cohesion, C_mL =	1,578	lbs/lf
Uplift Force, F_w =	0	lbs/lf
Horiz. Seism. Force, F_{Heq}=	2,684	lbs/lf
Vert. Seism. Force, F_{Veq}=	0	lbs/lf
Lateral Load, P_a =	**4,160**	**lbs/lf**

TENSION CRACK LOCATION

RETAINING WALLS OF BASEMENT

DATA:

Soil Density, γ_t =	139	pcf
Friction Angle, ϕ =	29	degrees
Cohesion, C =	110	psf
Surface Angle, β =	0.0	degrees
Fail. Plane Angle, α =	46.3	degrees
Wedge Length, L =	17	ft
Factor of Safety, F.S.=	1.5	



a =	0.0	ft
b =	12.0	ft
l=	11.5	

HEIGHT AND LOCATION OF TENSION CRACK:

Height of Crack, H_c =	1.6	ft
Location of Crack, ΔL =	1.6	ft

SECTION OF WEDGE ABOVE THE CRACK:

Length of Section, L_1 =	2	ft	Driving Force, W_{D1} =	128	lbs
Area of Section, A_1 =	1	sq. ft	Friction, F_{fr1} =	68	lbs
Weight of Section, W_1 =	177	lbs	Cohesion, CL_1 =	249	lbs

Horizontal Projection of Resulting Force, P_1 = -130 lbs

SECTION OF WEDGE BELOW THE CRACK:

Length of Section, L_2 =	14	ft	Driving Force, W_{D2} =	6,790	lbs
Area of Section, A_2 =	68	sq. ft	Friction, F_{fr2} =	3,601	lbs
Weight of Section, W_2 =	9,397	lbs	Cohesion, CL_2 =	1,578	lbs

Horizontal Projection of Resulting Force, P_2 = 1,114 lbs

PSEUDO-STATIC EQUIVALENT FLUID PRESSURE

RETAINING WALLS OF BASEMENT

FOR 12 FEET HIGH RETAINING WALL

Wedge No.	Lateral Load from Active Pressure (Single Wedge) (lbs/lf)	Lateral Load from Active Pressure (Accumulated) (lbs/lf)	Equivalent Fluid Pressure psf/ft or pcf
1	3,543	3,543	49.2

EFP calculated for H= 12 ft

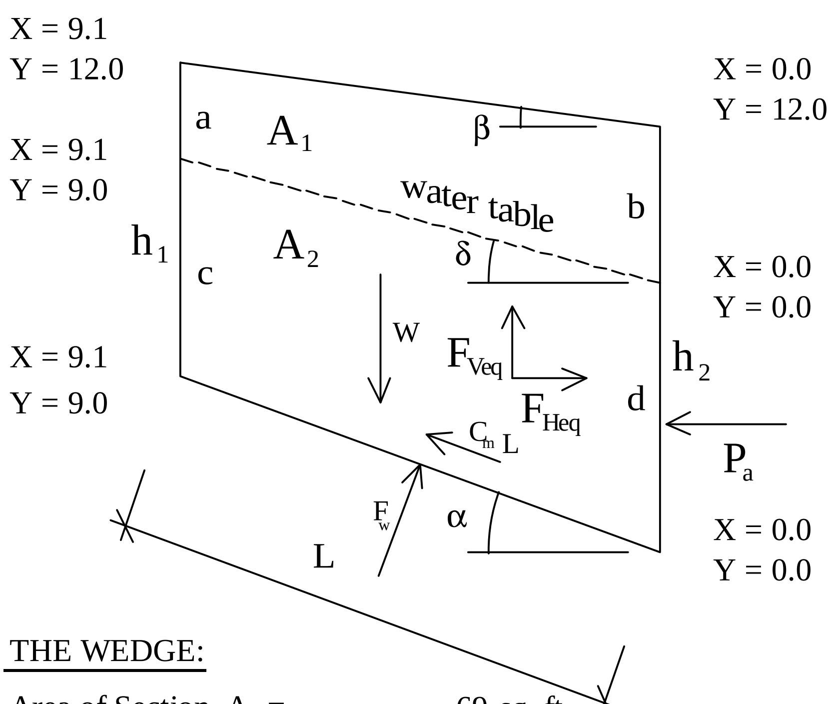
Total Density, γ_t =	139	pcf	
Saturated Density, γ_s =	139	pcf	
Water Density, γ_w =	62.4	pcf	
Friction Angle, ϕ =	24	degrees	
Cohesion, C =	220	psf	
Surface Angle, β =	0	degrees	
Fail. Plane Angle, α =	44.5	degrees	(Search for Critical Failure Plane)
Required F.S. =	1		
Seismic Forces	Yes		
Coef. of Horiz. Accel. =	0.286		(PGA_M = 0.857)
Coef. of Vert. Accel. =	0		

NOTE: - The Pseudo-Static Analysis Combines The Earth Pressures From Static And Seismic Forces

LATERAL LOAD APPLIED ON BLOCK 1
RETAINING WALLS OF BASEMENT
FOR 12 FEET HIGH RETAINING WALL

DATA:

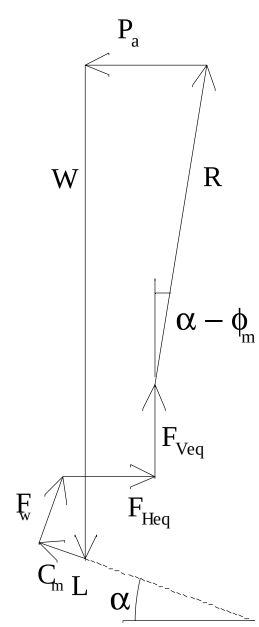
Total Density, γ_t =	139	pcf	Coef. of Horiz. Accel. =	0.285667	
Saturated Density, γ_s =	139	pcf	Coef. of Vert. Accel. =	0	
Water Density, γ_w =	62.4	pcf			
Friction Angle, ϕ =	24.0	degrees	Mobilized, ϕ_m =	24.0	degrees
Cohesion, C =	220	psf	Mobilized, C_m =	220	psf
Fail. Plane Angle, α =	44.5	degrees			
Surface Angle, β =	0.0	degrees			
Water Table Angle, δ =	44.5	degrees			
Wedge Length, L =	12.8	ft			
Factor of Safety, FS =	1.0				



a =	3.0	ft
b =	12.0	ft
c =	0.0	ft
d =	0.0	ft
h_1=	3.0	ft
h_2=	12.0	ft

THE WEDGE:

Area of Section, A_1 =	69	sq. ft
Area of Section, A_2 =	0	sq. ft
Total Area, A =	69	sq. ft
Weight of Soil, W =	9,546	lbs/lf
Cohesion, C_mL =	2,818	lbs/lf
Uplift Force, F_w =	0	lbs/lf
Horiz. Seism. Force, F_{Heq}=	2,727	lbs/lf
Vert. Seism. Force, F_{Veq}=	0	lbs/lf
Lateral Load, P_a =	**3,543**	**lbs/lf**



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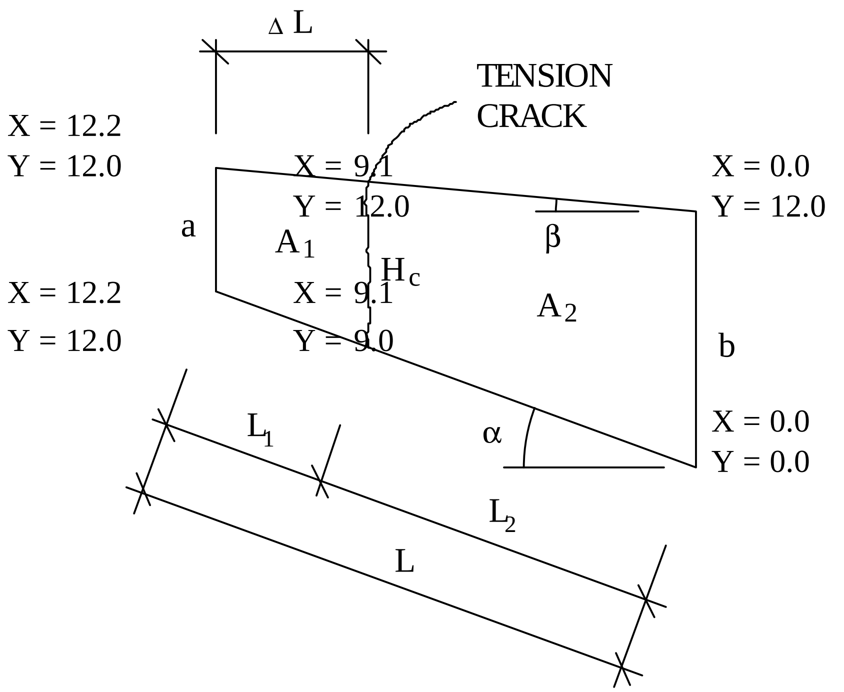
TENSION CRACK LOCATION
RETAINING WALLS OF BASEMENT

DATA:

Soil Density, γ_t =	139	pcf
Friction Angle, ϕ =	24	degrees
Cohesion, C =	220	psf
Surface Angle, β =	0.0	degrees
Fail. Plane Angle, α =	44.5	degrees
Wedge Length, L =	17	ft
Factor of Safety, F.S.=	1.5	



a =	0.0	ft
b =	12.0	ft
l=	12.2	

HEIGHT AND LOCATION OF TENSION CRACK:

Height of Crack, H_c =	3.0	ft
Location of Crack, ΔL =	3.1	ft

SECTION OF WEDGE ABOVE THE CRACK:

Length of Section, L_1 =	4	ft	Driving Force, W_{D1} =	454	lbs
Area of Section, A_1 =	5	sq. ft	Friction, F_{fr1} =	206	lbs
Weight of Section, W_1 =	648	lbs	Cohesion, CL_1 =	950	lbs

Horizontal Projection of Resulting Force, P_1 = -501 lbs

SECTION OF WEDGE BELOW THE CRACK:

Length of Section, L_2 =	13	ft	Driving Force, W_{D2} =	6,688	lbs
Area of Section, A_2 =	69	sq. ft	Friction, F_{fr2} =	3,033	lbs
Weight of Section, W_2 =	9,546	lbs	Cohesion, CL_2 =	2,818	lbs

Horizontal Projection of Resulting Force, P_2 = 597 lbs

LATERAL LOAD DISTRIBUTION FOR RETAINING WALL

CANTILEVERED 12 FOOT HIGH BASEMENT WALLS

SURCHARGED BY NEIGHBORING ONE-STORY BUILDING AND SIDE YARD; NORTH SIDE

Initial Input:

Soil and Retaining Wall Data:

Wall Type - Cantilever		C	
Height of Wall	H =	12	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	110	psf
Friction Angle	ϕ =	29	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.395	
Required Factor of Safety FS =		1.5	

Distributed Surcharge Data:

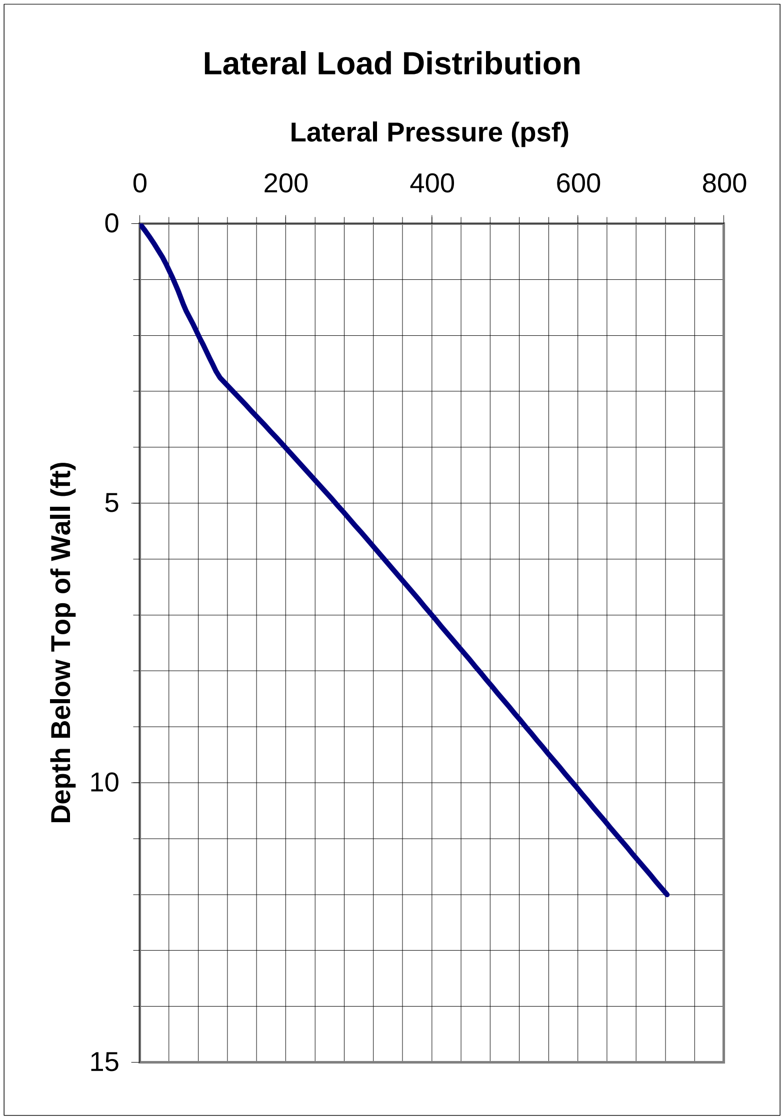
Distributed Load	q =	50	psf
Distance from Wall	L_1 =	1.0	ft
Width of Load	B_1 =	6.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Wall	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	1000	plf
Distance from Wall	L_3 =	7	ft
Width of Footing	B_3 =	1.5	ft
Depth of Footing	D =	1.5	ft



Eqiuvalent Fluid Pressure: 57 pcf
Total Force Acting on Wall: 4104 lb/ft
Point of Application: 8.3 ft Below Top of Wall
Pressure at Poin 'A': 109.92 psf @ 2.8 ft Below Top of Wall
Pressure at Poin 'B': 513.34 psf @ 8.8 ft Below Top of Wall
Relative Maximum: 722.4 psf @ 12 ft Below Top of Wall

LATERAL LOAD DISTRIBUTION FOR RETAINING WALL

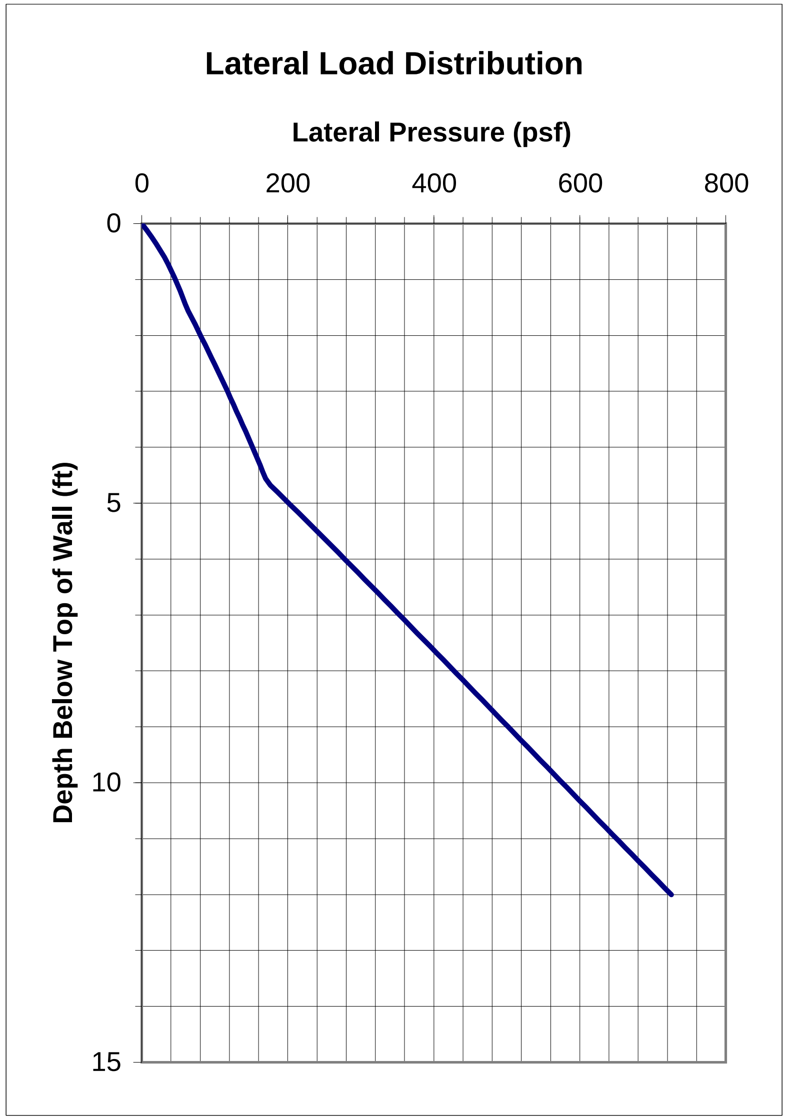
CANTILEVERED 12 FOOT HIGH BASEMENT WALLS

SURCHARGED BY NEIGHBORING ONE-STORY BUILDING AND SIDE YARD; NORTH SIDE

Initial Input:

Soil and Retaining Wall Data:

Wall Type - Cantilever		C	
Height of Wall	H =	12	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	220	psf
Friction Angle	ϕ =	24	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.417	
Required Factor of Safety FS =		1.5	



Distributed Surcharge Data:

Distributed Load	q =	50	psf
Distance from Wall	L_1 =	1.0	ft
Width of Load	B_1 =	6.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Wall	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	1000	plf
Distance from Wall	L_3 =	7	ft
Width of Footing	B_3 =	1.5	ft
Depth of Footing	D =	1.5	ft

Eqiuvalent Fluid Pressure: 52.6 pcf
Total Force Acting on Wall: 3787 lb/ft
Point of Application: 8.4 ft Below Top of Wall
Pressure at Poin 'A': 176.36 psf @ 4.7 ft Below Top of Wall
Pressure at Poin 'B': 483.99 psf @ 8.8 ft Below Top of Wall
Relative Maximum: 725.37 psf @ 12 ft Below Top of Wall

LATERAL LOAD DISTRIBUTION FOR RETAINING WALL

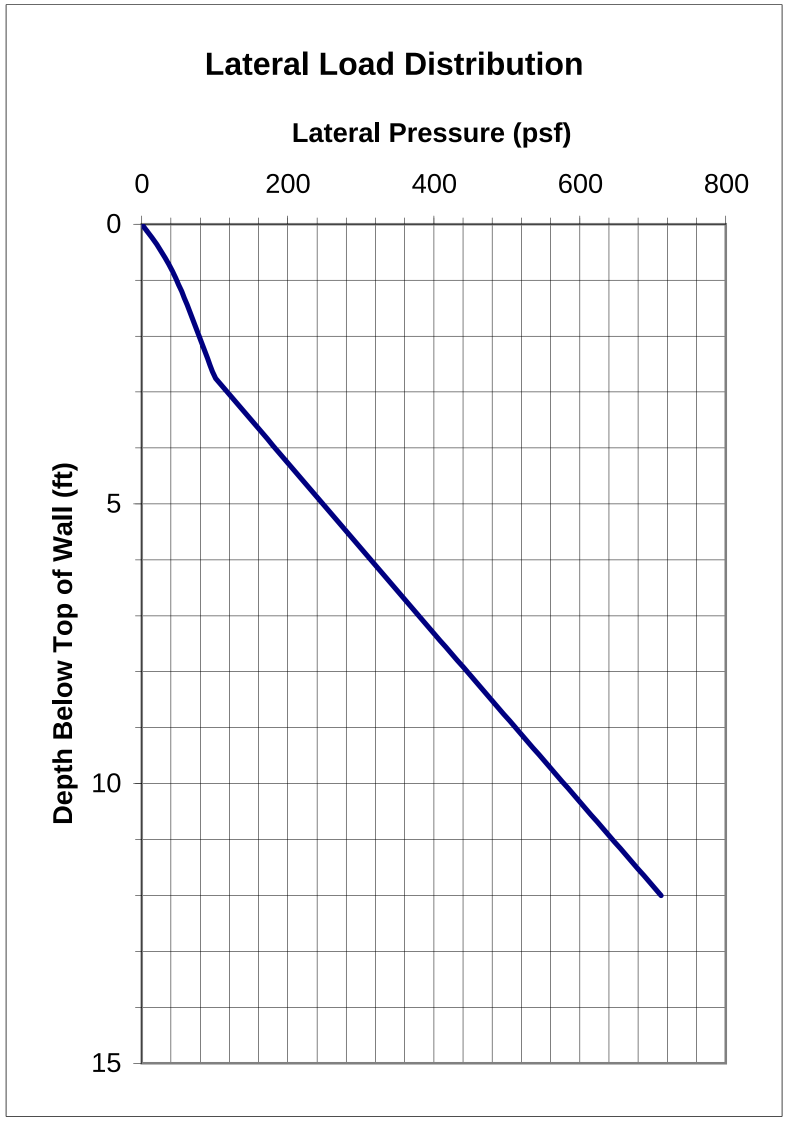
CANTILEVERED 12 FOOT HIGH BASEMENT WALLS

SURCHARGED BY NEIGHBORING SIDE YARD; SOUTH SIDE

Initial Input:

Soil and Retaining Wall Data:

Wall Type - Cantilever		C	
Height of Wall	H =	12	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	110	psf
Friction Angle	ϕ =	29	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.395	
Required Factor of Safety	FS =	1.5	



Distributed Surcharge Data:

Distributed Load	q =	50	psf
Distance from Wall	L_1 =	1.0	ft
Width of Load	B_1 =	11.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Wall	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	0	plf
Distance from Wall	L_3 =	0	ft
Width of Footing	B_3 =	0.0	ft
Depth of Footing	D =	0.0	ft

Eqiuvalent Fluid Pressure: 54.8 pcf

Total Force Acting on Wall: 3946 lb/ft

Point of Application: 8.3 ft Below Top of Wall

Pressure at Poin 'A': 101.47 psf @ 2.8 ft Below Top of Wall

Pressure at Poin 'B': 495.99 psf @ 8.8 ft Below Top of Wall

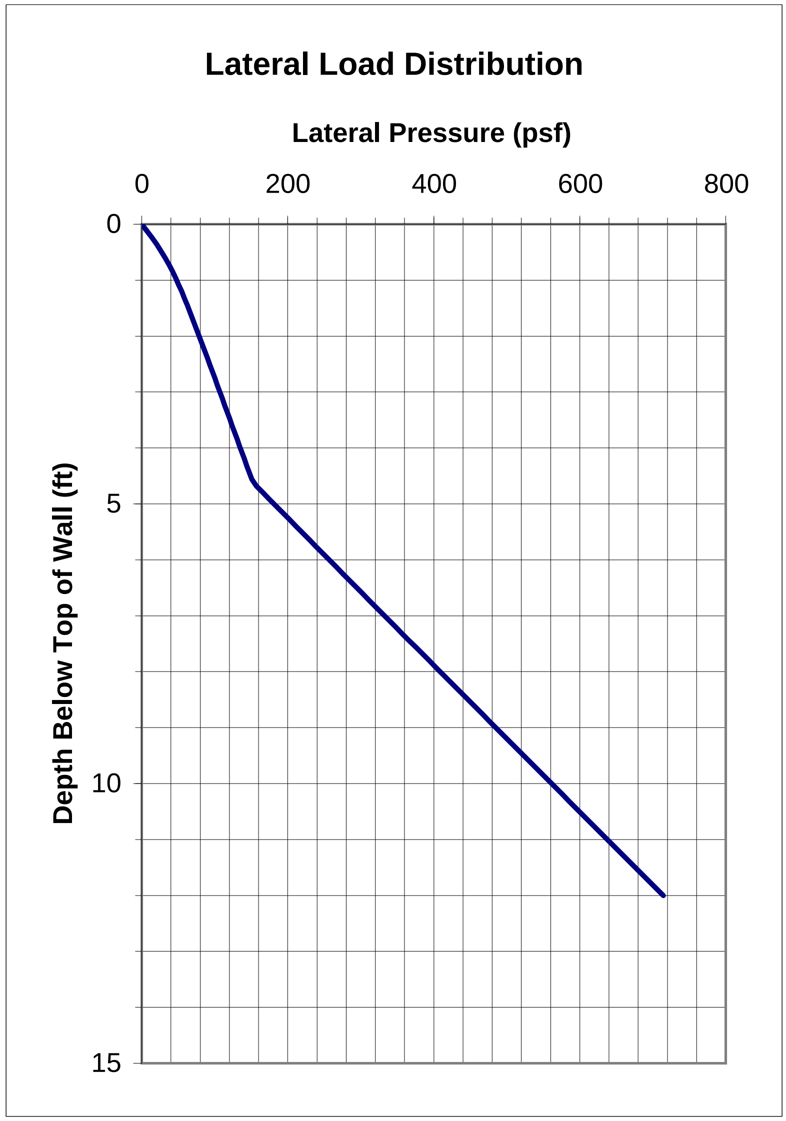
Relative Maximum: 711.67 psf @ 12 ft Below Top of Wall

LATERAL LOAD DISTRIBUTION FOR RETAINING WALL
CANTILEVERED 12 FOOT HIGH BASEMENT WALLS
SURCHARGED BY NEIGHBORING SIDE YARD; SOUTH SIDE

Initial Input:

Soil and Retaining Wall Data:

Wall Type - Cantilever		C	
Height of Wall	H =	12	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	220	psf
Friction Angle	ϕ =	24	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.417	
Required Factor of Safety FS =		1.5	



Distributed Surcharge Data:

Distributed Load	q =	50	psf
Distance from Wall	L_1 =	1.0	ft
Width of Load	B_1 =	11.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Wall	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	0	plf
Distance from Wall	L_3 =	0	ft
Width of Footing	B_3 =	0.0	ft
Depth of Footing	D =	0.0	ft

Eqiuvalent Fluid Pressure: 50.4 pcf
Total Force Acting on Wall: 3630 lb/ft
Point of Application: 8.5 ft Below Top of Wall
Pressure at Poin 'A': 157 psf @ 4.7 ft Below Top of Wall
Pressure at Poin 'B': 466.64 psf @ 8.8 ft Below Top of Wall
Relative Maximum: 714.64 psf @ 12 ft Below Top of Wall

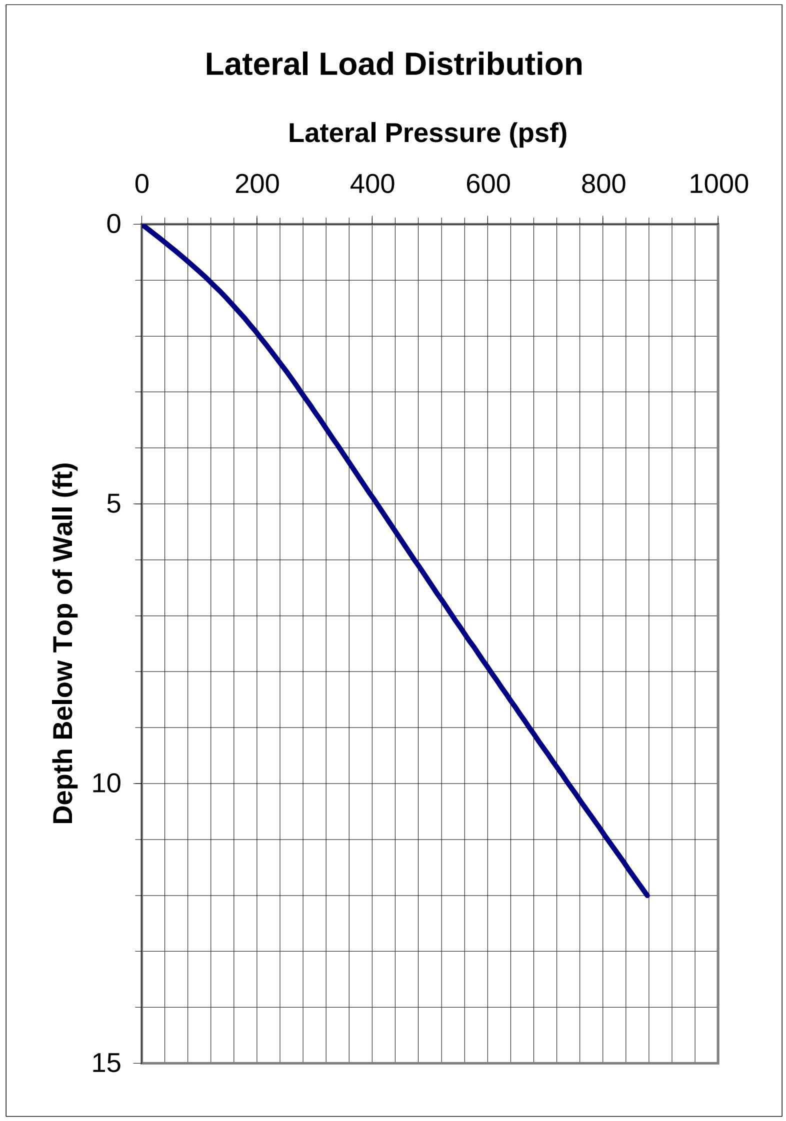
LATERAL LOAD DISTRIBUTION FOR RETAINING WALL

RESTRAINED 12 FOOT HIGH BASEMENT WALLS
SURCHARGED BY ADJACENT DRIVEWAY

Initial Input:

Soil and Retaining Wall Data:

Wall Type - Braced		B	
Height of Wall	$H =$	12	ft
Total Density	$\gamma_t =$	139	pcf
Saturated Density	$\gamma_s =$	139	pcf
Cohesion	$C =$	110	psf
Friction Angle	$\phi =$	29	deg
Depth of Water Table	$d_w =$	30	ft
Poisson Ratio	$\mu =$	0.340	



Distributed Surcharge Data:

Distributed Load	$q =$	200	psf
Distance from Wall	$L_1 =$	2.0	ft
Width of Load	$B_1 =$	10.0	ft

Concentrated Load Data:

Concentr. Load 1	$P_1 =$	0	lb
Concentr. Load 2	$P_2 =$	0	lb
Distance from Wall	$L_2 =$	0.0	ft
Dist. between Loads	$B_2 =$	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	$Q =$	0	plf
Distance from Wall	$L_3 =$	0	ft
Width of Footing	$B_3 =$	0.0	ft
Depth of Footing	$D =$	0.0	ft

Eqiuvalent Fluid Pressure: 78.9 pcf
Total Force Acting on Wall: 5682 lb/ft
Point of Application: 7.8 ft Below Top of Wall
Pressure at Poin 'A': 207.3 psf @ 2 ft Below Top of Wall
Pressure at Poin 'B': 473.3 psf @ 6 ft Below Top of Wall
Relative Maximum: 877.32 psf @ 12 ft Below Top of Wall

LATERAL LOAD DISTRIBUTION FOR RETAINING WALL
RESTRAINED 12 FOOT HIGH BASEMENT WALLS
SURCHARGED BY ADJACENT DRIVEWAY

Initial Input:

Soil and Retaining Wall Data:

Wall Type - Braced		B	
Height of Wall	H =	12	ft
Total Density	γ_t =	139	pcf
Saturated Density	γ_s =	139	pcf
Cohesion	C =	220	psf
Friction Angle	ϕ =	24	deg
Depth of Water Table	d_w =	30	ft
Poisson Ratio	μ =	0.372	

Distributed Surcharge Data:

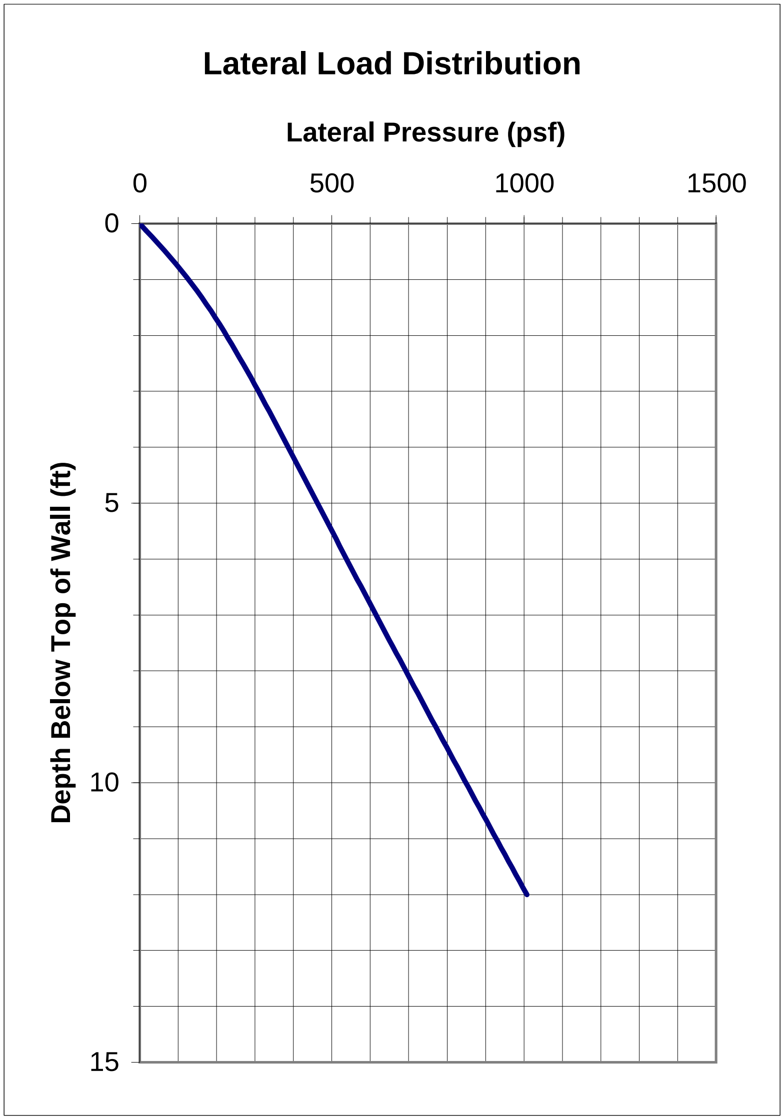
Distributed Load	q =	200	psf
Distance from Wall	L_1 =	2.0	ft
Width of Load	B_1 =	10.0	ft

Concentrated Load Data:

Concentr. Load 1	P_1 =	0	lb
Concentr. Load 2	P_2 =	0	lb
Distance from Wall	L_2 =	0.0	ft
Dist. between Loads	B_2 =	0.0	ft

Adjacent Footing Data:

Linear Load on Footing	Q =	0	plf
Distance from Wall	L_3 =	0	ft
Width of Footing	B_3 =	0.0	ft
Depth of Footing	D =	0.0	ft



Eqiuvalent Fluid Pressure: 89.9 pcf
Total Force Acting on Wall: 6472 lb/ft
Point of Application: 7.8 ft Below Top of Wall
Pressure at Poin 'A': 229.44 psf @ 2 ft Below Top of Wall
Pressure at Poin 'B': 538.42 psf @ 6 ft Below Top of Wall
Relative Maximum: 1007.54 psf @ 12 ft Below Top of Wall

APPENDIX J

DETERMINATION OF SEISMIC COEFFICIENT

Input Data:

Peak Ground Acceleration	PGA_M =	0.857	
Magnitude	M =	6.31	
Threshold	u =	5	cm
Distance	r =	13.19	km

Analysis:

Peak Ground Acceleration	PGA =	0.571
Duration of Shaking for r>10	D_{5-95} =	8.309
Non Linear Response Factor	NRF =	0.877
Site Seismicity Factor	f_{eq} =	0.452
Seismic Coefficient	k_{eq} =	0.258