

**GLOBAL GEO-ENGINEERING, INC.**

September 22, 2021  
Project 1726-04

Mr. Omar Dalati  
16711 Sim Lane  
Huntington Beach, California 91649

Subject: Geotechnical Report Update  
Proposed Residential Development  
16872 Sumach Lane  
Village of Sleepy Hollow  
County of San Bernardino, California

- References:
- a) Global Geo-Engineering, Inc. – *Assumption of Responsibility and Geotechnical Report Update*, Project 1726-04, dated June 2, 2004;
  - b) City of Chino Hills – *Geotechnical Review Sheet* dated February 1, 2005;
  - c) Global Geo-Engineering, Inc. – *Response to Geotechnical Review Sheet Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04, dated December 13, 2005;
  - d) City of Chino Hills – *Geotechnical Review Sheet* dated December 19, 2005;
  - e) Global Geo-Engineering, Inc. – *Response to Geotechnical Review Sheet Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04 dated April 26, 2006;
  - f) Global Geo-Engineering, Inc. – *Assumption of Responsibility and Percolation Testing Report Update, Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04, dated October 25, 2006;
  - g) Global Geo-Engineering, Inc. – *Geotechnical Report Update, Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04, dated October 5, 2016;
  - h) City of Chino Hills – *Geotechnical Review Sheet* dated November 17, 2016;

- i) Global Geo-Engineering, Inc. – *Response to Geotechnical Review Sheet Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04 dated January 23, 2017;
  - j) City of Chino Hills – *Geotechnical Review Sheet* dated February 21, 2017;
  - k) Global Geo-Engineering, Inc. – *Response to Geotechnical Review Sheet, Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04, dated March 14, 2017;
  - l) Global Geo-Engineering, Inc. – *Geotechnical Report Update, Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04, dated September 27, 2019;
  - h) City of Chino Hills – *Plan Review Correction Notice*;
  - i) Global Geo-Engineering, Inc. – *Response to City of Chino Hills Correction Notice, Proposed Residential Development, 16872 Sumach Lane, Village of Sleepy Hollow, County of San Bernardino, California*, Project 1726-04 dated October 25, 2019.
- 

Dear Mr. Dalati:

## 1. **INTRODUCTION**

- a) In accordance with your request, we are submitting this geotechnical update report for the above referenced site. We understand that the proposed development will consist of a single-family residence with a driveway.
- b) Soil and Testing Engineers, Inc. (STE) conducted a geotechnical investigation for the subject site in August 1990. The results of the investigation were presented in their *Geotechnical Investigation* report, Job Number 9041081, dated August 16, 1990. A *Report of Percolation Testing* was prepared on August 17, 1990.
- c) We have reviewed the reports prepared by Soil and Testing Engineers, Inc. We, in general, concur with the findings, conclusions and the recommendations. Our additional recommendations are provided in this letter.
- d) We provided an updated soils report in 2004. Our report was reviewed by the city of Chino Hills. Additional letters were submitted in response to the comments by the city.

- e) We have revisited the site in 2019 in order to observe the existing conditions. The lot currently remains unimproved. We understand from you that the current site conditions are generally similar to the conditions described in the STE report, dated August 16, 1990 and our update report dated October 5, 2016.
- f) We reviewed the site plan and cross sections provided to us. The proposed development is also similar to the one proposed in 2004/2006.

## **2. CONCLUSIONS AND RECOMMENDATIONS**

### **2.1 General**

- a) It is our opinion that the site will be suitable for the proposed development, from a geotechnical aspect, assuming that our recommendations are implemented.
- b) We are of the opinion that the proposed structures can be supported on shallow spread footings founded in compacted fill consisting of on-site soils.
- c) Grading consisting of cut and fill along with construction of several retaining walls will be required to achieve planned building pads and associated driveway.
- d) In our opinion, the proposed development will be safe against hazards from landslides settlement or slippage, provided the recommendations included in this report are implemented during the design and the construction. All grading and earthwork should be performed under the observation and testing firm to achieve proper subgrade preparation, selection of satisfactory materials, and placement and compaction of all structural fills.
- e) We consider that the anticipated grading will not adversely affect, nor be adversely affected by adjoining property, with due precautions being taken.
- f) The design recommendations in the report should be reviewed during the grading phase when soil conditions in the excavations become exposed.
- g) The foundation plans/design loads should be reviewed by the Geotechnical Engineer.

### **2.2 Grading Plan Review**

- a) We have reviewed the current grading plan, which we understand is same as the plan reviewed by us in 2016.

- b) The proposed improvements on the subject site include construction of a new single family residence along with a driveway on the eastern portion of property. New retaining walls will be constructed on the northern and western portion of the property. New concrete walkways and seepage pits are also proposed.
- c) We constructed two geotechnical cross sections using the most recent grading plan. The cross sections and the locations are shown on the *Geotechnical Plan and Cross Sections, Plate 1*.
- d) Our engineering geologist has revisited the site. Based on the prior geotechnical report and the existing conditions, the bedding attitudes have been shown on *Plate 1*. It is our opinion that the bedding will not exert any surcharge pressure on the retaining walls.

## 2.3 Grading

### 2.3.1 Processing of on-site soils

- a) All the existing topsoil and colluvium are not considered suitable to support the structures and should be overexcavated within the structural areas and extending at least five feet beyond the building perimeters.
- b) The review of the grading plan indicates a cut/fill transition will be encountered within the building pad. The soils should be overexcavated such that there is at least three feet of compacted fill below the footings and the slab-on-grade. The overexcavation should extend laterally for a distance of five feet beyond the building perimeters.
- c) Pavement areas including driveways and concrete flatwork (sidewalks, patios, walkways, etc.), will require overexcavation to a depth of twelve inches below the existing ground surface or finish subgrade, whichever is lower.
- d) Prior to placement of fill, the bottom of the excavation should be scarified for six to eight inches
- e) Any loosening of reworked or native material, consequent to the passage of construction traffic, weathering, etc., should be made good prior to further construction.

- f) The depths of overexcavation should be reviewed by the Geotechnical Engineer during the actual construction. Any surface or subsurface obstructions, or questionable material encountered during grading should be brought immediately to the attention of the Geotechnical Engineer for proper exposure, removal or processing as directed. No underground obstructions or facilities should remain in any structural areas. Depressions and/or cavities created as a result of the removal of obstructions should be backfilled properly with suitable material, and compacted.

#### 2.3.2 Material Selection

- a) After the site has been stripped of any debris, vegetation and organic soils, excavated on-site soils are considered satisfactory for reuse in the construction of on-site fills, provided the organic content does not exceed 3 percent by volume.
- b) Large size pieces of rocks greater than 4 inches in diameter should not be incorporated in compacted fill.

#### 2.3.3 Compaction Requirements

- a) Reworking/compaction shall include moisture conditioning as needed to bring the soils to slightly above the optimum moisture content. The structural fills consisting of on-site soils should be compacted to 90 percent of the maximum dry density. The optimum moisture content and maximum dry density should be determined in the laboratory in accordance with ASTM Test Designation D1557.
- b) Fill should be compacted in lifts not exceeding 8 inches (loose).

#### 2.3.4 Excavating Conditions

- a) Excavation of on-site materials may be accomplished with standard earthmoving or trenching equipment. No hard rock was encountered which would require blasting.
- b) Ground water was not encountered during the investigation. Dewatering is not anticipated.

#### 2.3.5 Shrinkage

For preliminary earthwork calculations, an average shrinkage factor of 12 percent is recommended for the fill soils and the colluvium. The bedrock is anticipated to bulk 3 to 5 percent. (This does not include handling losses).

#### 2.3.6 Expansion Potential

- a) Based upon laboratory testing of the existing site soils, the expansion potential is considered to be *high*.
- b) In any event, the subgrade soils should be tested for their expansion potential or during the final stages of grading.

#### 2.3.7 Corrosion Potential

- a) A representative soil sample was tested during the prior investigation. The sulphate content was determined to be 0.002 percent. As the sulphate content is less than 0.1 percent the sulphate exposure is considered to be *negligible*.
- b) At the conclusion of the grading operations, a representative sample will be tested to determine the corrosion potential. Mitigating recommendations, if required, will be provided at that time. For the preliminary design, assume the soils to be severely corrosive to the metal pipes.

#### 2.3.8 Utility Trenching

- a) The walls of temporary construction trenches should stand nearly vertical, with only minor sloughing, provided the total depth does not exceed about 4 feet. Shoring of excavation walls or flattening of slopes may be required, if greater depths are necessary.
- b) Trenches should be located so as not to impair the bearing capacity or to cause settlement under foundations. As a guide, trenches should be clear of a 45-degree plane extending outward and downward from the edge of foundations.
- c) Existing soils may be utilized for trenching backfill, provided they are free of organic materials.
- d) All work associated with trench shoring must conform to the state and federal safety codes.

#### 2.3.9 Surface Drainage Provisions

Positive surface gradients should be provided adjacent to the buildings to direct surface water run-off away from structural foundations and to suitable discharge facilities.

#### 2.3.10 Grading Control

All grading and earthwork should be performed under the observation of a Geotechnical Engineer in order to achieve proper subgrade preparation, selection of satisfactory materials, and placement and compaction of all structural fill. Sufficient notification prior to stripping and earthwork construction is essential to make certain that the work will be adequately observed and tested.

#### 2.4 Slabs-on-Grade

- a) Concrete floor slabs may be founded on the existing compacted fill.
- b) The subgrade soils are considered to be highly expansive. We recommend using a Plasticity Index of 60 for the design of the slab in accordance with 2013 CBC. At minimum, the following recommendations should be considered for the slab construction.
- c) The slab-on-grade should be underlain by 6 inches of SAND. If a floor covering that would be critically affected by moisture is to be used, it is recommended that at least 10-mil thick plastic vapor barrier be installed at the mid-height of the SAND layer.
- d) It is recommended that #4 bars on 12-inch centers or equivalent be provided as minimum reinforcement in slabs-on-grade. Joints should be provided. Slabs should be at least 6 inches thick.
- e) The finished floor elevation should be higher than the outside grade.
- f) Alternatively, the three feet of subgrade soils may be replaced with non-expansive soils. If this option is chosen, we will provide additional recommendations which will include reduced thickness of the slab and a reduction in reinforcement.
- g) The flatwork should be minimum 4-inches in thickness, underlain by a 2-inch blanket of clean coarse sand reinforced with #3 rebars on 18 inches on center. Joints should be provided as recommended by the structural engineer.

## 2.5 Spread Footing Foundations

The proposed structures, of the type anticipated, can be founded on shallow spread footings. The criteria presented as follows should be adopted:

### 2.5.1 Dimensions/Embedment Depths

|                                                           | <b>Minimum Width<br/>(ft.)</b> | <b>Minimum Thickness<br/>(in.)</b> | <b>Minimum Embedment<br/>Below Lowest<br/>Finished Surface<br/>(ft.)</b> |
|-----------------------------------------------------------|--------------------------------|------------------------------------|--------------------------------------------------------------------------|
| Equivalent 2-story wall footings<br>(supporting 2 floors) | 1.25                           | 7                                  | 2.5                                                                      |
| Square column footings<br>Up to 50 kips                   | -                              | -                                  | 2.5                                                                      |

### 2.5.2 Allowable Bearing Capacity

The following allowable bearing capacity may be used for the preliminary design. These values are typical for on-site soils:

2,000 lb/ft<sup>2</sup> at 2.5 ft. depth.

(Notes:

- These values may be increased by one-third in the case of short-duration loads, such as induced by wind or seismic forces;
- At least four, #5 bars should be provided as minimum reinforcement in wall footings, two at top and two at bottom;
- Bearing capacities should be re-evaluated when loads have been obtained and footings sized during the preliminary design;
- Footings adjacent to the slope should be sited such that horizontal distance from the lower outer edge of the footing to the competent slope should be  $\frac{1}{2}$  x the slope height; minimum 6 feet and need not exceed 40 feet;
- Planter areas should not be sited adjacent to walls. The footings may have to be deepened by 6 inches if the planter areas are sited next to the walls;
- Footing excavations should be kept moist prior to the concrete pour;

- Footing excavations should be observed by the Geotechnical Engineer;
- It should be ensured that the embedment depths do not become reduced or adversely affected by erosion, softening, planting, digging, etc.)

### 2.5.3 Settlement

The total and differential settlement due to the structural loads is anticipated to be less than 1-inch and  $\frac{3}{4}$ -inch, respectively.

### 2.6 Lateral Pressures:

- a) The following lateral pressures are recommended for the design of retaining structures.

| Lateral Force                                | Soil Profile                        | Pressure (lb/ft <sup>2</sup> /Ft depth) |                        |
|----------------------------------------------|-------------------------------------|-----------------------------------------|------------------------|
|                                              |                                     | Unrestrained Wall                       | Rigidly Supported Wall |
| Active Pressure                              | Level<br>2:1 (horizontal: vertical) | 45                                      | -                      |
|                                              |                                     | 60                                      | -                      |
| At-Rest Pressure                             | Level                               | -                                       | 75                     |
| Passive Resistance<br>(ignore upper 1.5 ft.) | Level                               | 240                                     | -                      |

- b) Friction coefficient: 0.38 (includes a Factor of Safety of 1.5). While combining frictional resistance with passive resistance, reduce passive resistance by one-third.
- c) These values apply to the on-site backfill.
- d) Backfill should be placed under engineering control.
- e) Subdrains comprised of 4-inch perforated SDR-35 or equivalent PVC pipe covered in a minimum of one cubic foot per linear foot of filter rock and wrapped in Mirafi 140N filter fabric should be provided behind retaining walls.

### 2.7 Fill Slopes (if any)

- a) Fill slopes should be overbuilt and cut back to design profiles, so as to achieve proper compaction on the slope faces. Overbuilding is usually on the order of 2 to 4 feet, depending on the soil, equipment, etc.

- b) Compaction efforts may be achieved by backrolling and gridrolling the slope as fill progresses, instead of overbuilding. Whatever means or widths of overbuilding are adopted, it should be ensured that the slopes are compacted to a minimum 90 percent relative compaction at the finished slope surface.
- c) Any proposed fill slopes should be properly benched into the competent soils. Keys, in general, should be constructed at a minimum of 12 feet wide and 3 to 5 feet deep with the bottom inclined away from the toe of the slope at 2 percent. The proposed fill should be interlocked (benched) into competent material. (Typical benching dimensions: 5 to 10 feet wide x 4 feet high).
- d) The key width of the stability fill, if required, should be approximately 12 feet. The fill should be properly benched. The stabilization measures are subject to review during the grading when exposed slopes can be observed and representative samples can be tested to determine the strength parameters.
- e) Keyway subdrains must be provided in all keyway excavations. Subdrain pipe shall consist of perforated, 4-inch diameter PVC, Schedule 40 or SDR-35, wrapped in Mirafi 140N (or equivalent) rock. All subdrain shall be inspected prior to covering with the fabric and rock.
- f) Normal erosion control/maintenance will be required

### 3. **SEISMICITY**

- a) The following table provides seismic design parameter values in accordance with ASCE 7-16:

| ITEM                                                                   | VALUE     |
|------------------------------------------------------------------------|-----------|
| Site Longitude (Decimal-degrees)                                       | -117.7814 |
| Site Latitude (Decimal-degrees)                                        | 33.9469   |
| Site Class                                                             | C         |
| Seismic Design Category                                                | D         |
| Mapped Spectral Response Acceleration-Short Period (0.2 Sec) - $S_s$   | 1.977     |
| Mapped Spectral Response Acceleration-1 Second Period - $S_1$          | 0.685     |
| Short Period Site Coefficient- $F_a$                                   | 1.2       |
| Long Period Site Coefficient $F_v$                                     | 1.4       |
| Adjusted Spectral Response Acceleration @ 0.2 Sec. Period ( $S_{ms}$ ) | 2.372     |
| Adjusted Spectral Response Acceleration @ 1Sec.Period ( $S_{m1}$ )     | 0.959     |
| Design Spectral Response Acceleration @ 0.2 Sec. Period ( $S_{Ds}$ )   | 1.581     |
| Design Spectral Response Acceleration @ 1-Sec. Period ( $S_{D1}$ )     | 0.640     |

- b) The subject site is primarily underlain by bedrock. Ground water was not encountered in any of the previous explorations. The potential for liquefaction is considered to be very low.

#### 4. **PERCOLATION TESTING**

The percolation testing on the subject site was conducted in accordance to the County of San Bernardino requirements/guidelines. As the lot is currently unimproved and the site conditions are generally similar to the conditions observed before for the prior update report; the percolation testing done in accordance with the County of San Bernardino requirements remain applicable.

#### 5. **SLOPE STABILITY**

- a) We analyzed the construction stability of the cuts proposed for the retaining walls along the west side (Cross Section A-A') and along the northwest side (Cross Section B-B').
- b) We also conducted gross analyses for Cross Section A-A'. We assumed along bedding shear angle of  $20^{\circ}$  and cohesion of  $100 \text{ lb/ft}^2$ . It also assumed a vertical surface at the location of the proposed retaining wall. We did not consider any resistance from the wall or its footing. We analyzed the slope along two along-bedding slip surfaces. The computed factors of safety were greater than 1.5 indicating that no surcharge pressures will be exerted on the wall due to the out-of-slope bedding conditions. The analyses is enclosed in *Appendix A*.
- c) We recommend the construction cut along the west side should be made at a gradient of 1/2:1 (horizontal:vertical) with the lower 5 feet being vertical, subject to review during the excavation.
- d) The construction cuts along the northwestern side of the lot should be vertical.
- e) The stability analyses indicate the factors of safety for the proposed cuts will be significantly greater than the minimum required of 1.2. The results of the stability analyses are included in *Appendix A*.
- f) Any adverse conditions exposed during the excavation will be evaluated by us and mitigating recommendations, if required, will be provided with due consideration given to the exposed geologic condition including bedding, height of the excavation etc.
- g) The construction cut may be left open for a reasonable duration required to construct the improvements. The cut should be evaluated on a weekly basis by an engineering geologist.

- h) In our geotechnical opinion, the cuts as recommended will not any adverse impact the adjacent properties.

## 6. LIMITATIONS

- a) Soils and bedrock over an area show variations in geological structure, type, strength and other properties from what can be observed, sampled and tested from specimens extracted from necessarily limited exploratory borings. Therefore, there are natural limitations inherent in making geologic and soil engineering studies and analyses. Our findings, interpretations, analyses and recommendations are based on observation, laboratory data and our professional experience; and the projections we make are professional judgments conforming to the usual standards of the profession. No other warranty is herein expressed or implied.
- b) In the event that during construction, conditions are exposed which are significantly different from those described in this report, they should be brought to the attention of the Geotechnical Engineer.
- c) Other factors that should be considered with respect to the stability of temporary excavation sidewalls include construction traffic and storage of materials on or near the tops of the slopes, construction scheduling, and weather conditions at the time of construction. All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act of 1970, and the Construction Safety Act should also be followed. No temporary excavations should be left open without proper protections to mitigate safety hazards. **The contractor is solely responsible for ensuring the safety of construction personnel and the general public, and for appointing a designated *Competent Person* to observe and classify temporary excavation sidewalls pursuant to OSHA Safety and Health Regulations for Construction.**

Mr. Omar Dalati  
September 22, 2021  
Project 1726-04  
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The opportunity to be of service is sincerely appreciated. If you have any questions or if we can be of further assistance, please call.

Very truly yours,

GLOBAL GEO-ENGINEERING, INC.



Mohan B. Upasani  
Principal Geotechnical Engineer  
RGE 2301  
(Exp. March 31, 2023)



Kevin B. Young  
Principal Engineering Geologist  
CEG 2253  
(Exp. October 31, 2021)

MBU/KBY: kby/fdg

Enclosures:

Terms and Conditions  
Slope Stability Analyses  
Geotechnical Plan and Cross Sections

- Appendix A  
- Plate 1

## TERMS AND CONDITIONS

Consultant shall serve Client by providing professional counsel and technical advice regarding subsurface conditions consistent with the scope of services agreed-to between the parties. Consultant will use his professional judgment and will perform his services using that degree of care and skill ordinarily exercised under similar circumstances, by reputable foundation engineers and/or engineering geologists practicing in this or similar localities.

- In assisting Client, the Consultant may include or rely on information and drawings prepared by others for the purpose of clarification, reference or bidding; however, by including the same, the Consultant assumes no responsibility for the information shown thereon and Client agrees that Consultant is not responsible for any defects in its services that result from reliance on the information and drawings prepared by others. Consultant shall not be liable for any incorrect advice; judgment or decision based on any inaccurate information furnished by the Client or any third party, and Client will indemnify Consultant against claims, demands, or liability arising out of, or contribute to, by such information.
- Unless otherwise negotiated in writing, Client agrees to limit any and all liability, claim for damages, cost of defense, or expenses to be levied against Consultant on account of design defect, error, omission, or professional negligence to a sum **not to exceed ten thousand dollars or charged fees whichever is less**. Further, Client agrees to notify any construction contractor or subcontractor who may perform work in connection with any design, report, or study prepared by Consultant of such limitation of liability for design defects, errors, omissions, or professional negligence, and require as a condition precedent to their performing the work a like limitation of liability on their part as against the Consultant. In the event the Client fails to obtain a like limitation of liability provision as to design defects, errors, omissions or professional negligence, any liability of the Client and Consultant to such contractor or subcontractor arising out of a negligence shall be allocated between Client and Consultant in such a manner that the aggregate liability of Consultant for such design defects to all parties, including the Client shall **not exceed ten thousand dollars or charged fees whichever is less**. No warranty, expressed or implied of merchantability or fitness, is made or intended in connection with the work to be performed by Consultant or by the proposal for consulting or other services or by the furnishing of oral or written reports or findings made by Consultant.
- The Client agrees, to the fullest extent permitted by law, to indemnify, defend and hold harmless the Consultant, its officers, directors, employees, agents and subconsultants from and against all claims, damages, liabilities or costs, including reasonable attorney's fees and defense costs, of any nature whatsoever arising from or in connection with the Project to the extent that said claims, damages, liabilities or costs arise out of the work, services, or conduct of Client or Client's contractors, subconsultants, or other third party not under Consultant's control. Client further agrees that the duty to defend set forth herein arises immediately and is not contingent on a finding of fault against Client or Client's contractors, subconsultants, or other third parties. Client shall not be obligated under this provision to indemnify Consultant for Consultant's sole negligence or willful misconduct.
- Client shall grant free access to the site for all necessary equipment and personnel and Client shall notify any and all possessors of the project site that Client has granted Consultant free access to the project site at no charge to Consultant unless expressly agreed to otherwise in writing.
- If Client is not the property owner for the subject Project, Client agrees that it will notify the property owner of the terms of this agreement and obtain said property owner's approval to the terms and conditions herein. Should Client fail to obtain the property owner's agreement as required herein, Client agrees to be solely responsible to Consultant for all damages, liabilities, costs, including litigation fees and costs, arising from such failure that exceed that limitation of Consultant's liability herein.
- Client shall locate for Consultant and shall assume responsibility for the accuracy of his representations as to the locations of all underground utilities and installations. Consultant will not be responsible for damage to any such utilities or installation not so located.
- Client and Consultant agree to waive claims against each other for consequential damages arising out of or relating to this agreement. Neither party to this agreement shall assign the contract without the express, written consent of the other party.
- Consultant agrees to cover all open test holes and place a cover to carry a 200-pound load on each hole prior to leaving project site unattended. Consultant agrees that all test holes will be backfilled upon completion of the job. However, Client may request test holes to remain open after completion of Consultants work. In the event Client agrees to pay for all costs associated with covering and backfilling said test holes at a later date, and Client shall indemnify, defend and hold harmless Consultant for all claims, demands and liabilities arising from his request, except for the sole negligence of the Consultant, to the extent permitted by law.
- Consultant shall not be responsible for the general safety on the job or for the work of Client, other contractors and third parties.
- Consultant shall be excused for any delay in completion of the contract caused by acts of God, acts of the Client or Client's agent and/or contractors, inclement weather, labor trouble, acts of public utilities, public bodies, or inspectors, extra work, failure of Client to make payments promptly, or other contingencies unforeseen by Consultant and beyond reasonable control of the Consultant.
- In the event that either party desires to terminate this contract prior to completion of the project, written notification of such intention to terminate must be tendered to the other party. In the event Client notifies Consultant of such intention to terminate Consultant's services prior to completion of the contract, Consultant reserves the right to complete such analysis and records as are necessary to place files in order, to dispose of samples, put equipment in order, and (where considered necessary to protect his professional reputation) to complete a report on the work performed to date. In the event that Consultant incurs cost in Client's termination of this Agreement, a termination charge to cover such cost shall be paid by Client.
- If the Client is a corporation, the individual or individuals who sign or initial this Contract, on behalf of the Client, guarantee that Client will perform its duties under this Contract. The individual or individuals so signing or initialing this Contract warrant that they are duly authorized agents of the Client.
- Any notice required or permitted under this Contract may be given by ordinary mail at the address contained in this Contract, but such address may be changed by written notice given by one party to the other from time to time. Notice shall be deemed received in the ordinary course of the mail. This agreement shall be deemed to have been entered into the County of Orange, State of California.

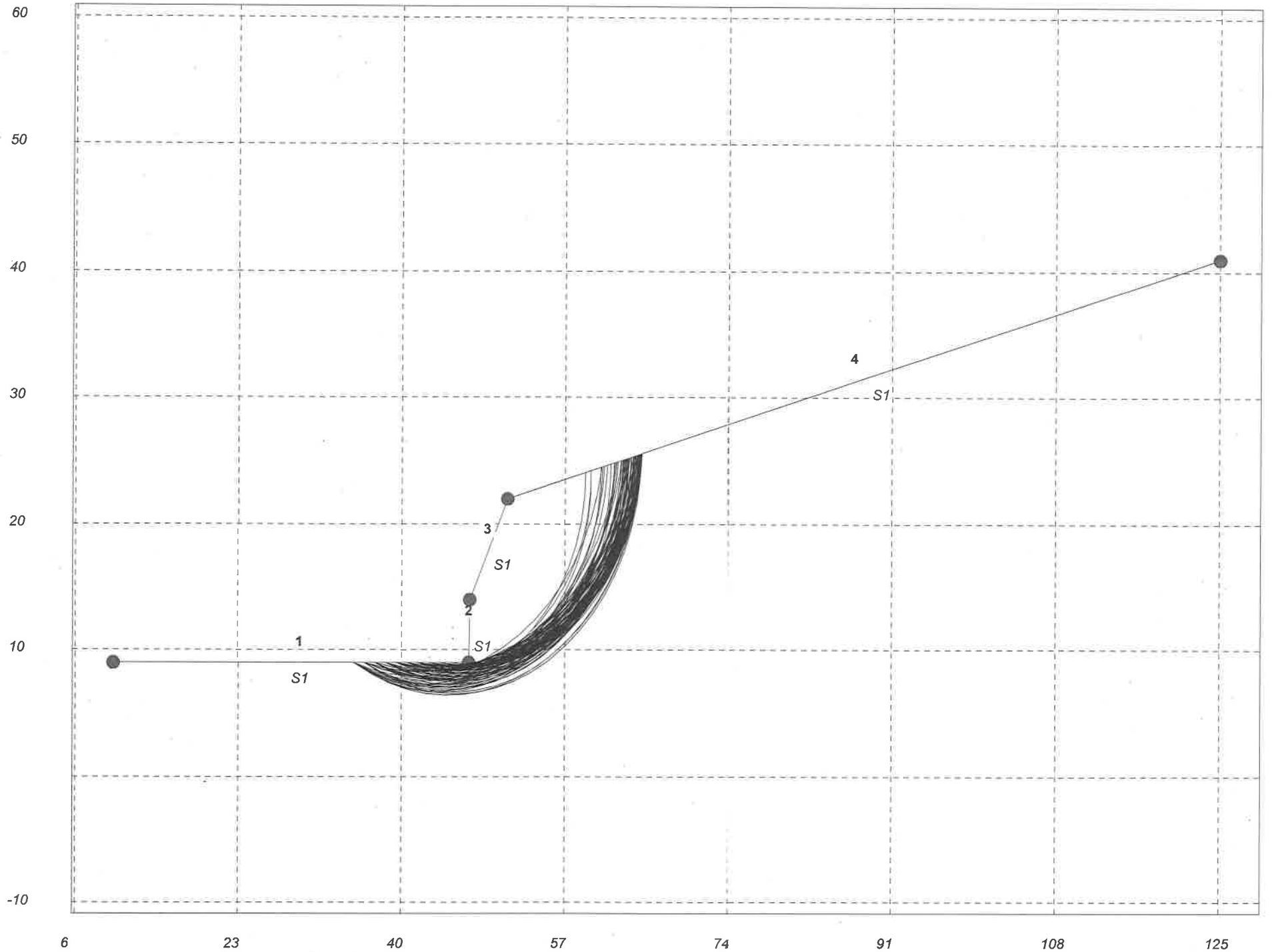
## LIMITATIONS

Our findings, interpretations, analyses, and recommendations are professional opinions, prepared and presented in accordance with generally accepted professional practices and are based on observation, laboratory data and our professional experience. Consultant does not assume responsibility for the proper execution of the work by others by undertaking the services being provided to Client under this agreement and shall in no way be responsible for the deficiencies or defects in the work performed by others not under Consultant's direct control. No other warranty herein is expressed or implied.

**Appendix A**

**Slope Stability Analyses**

1726-04 Section A-A' - FS Min = 1.793



result.out  
\*\* PCSTABL6 \*\*

by  
Purdue University

--Slope Stability Analysis--  
Simplified Janbu, Simplified Bishop  
or Spencer's Method of Slices

Run Date:  
Time of Run:  
Run By:  
Input Data Filename: run.in  
Output Filename: result.out  
Unit: ENGLISH  
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION 1726-04 Section A-A'

BOUNDARY COORDINATES

4 Top Boundaries  
4 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|--------------|-------------|-------------|--------------|--------------|---------------------|
| 1            | 10.00       | 9.00        | 47.00        | 9.00         | 1                   |
| 2            | 47.00       | 9.00        | 47.10        | 14.00        | 1                   |
| 3            | 47.10       | 14.00       | 51.00        | 22.00        | 1                   |
| 4            | 51.00       | 22.00       | 125.00       | 41.00        | 1                   |

ISOTROPIC SOIL PARAMETERS

1 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             | 114.0                | 114.0                    | 250.0                    | 30.0                 | 0.00                 | 0.0                     | 0                 |

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

100 Trial Surfaces Have Been Generated.

result.out

10 Surfaces Initiate From Each Of 10 Points Equally Spaced  
Along The Ground Surface Between X = 35.00 ft.  
and X = 45.00 ft.

Each Surface Terminates Between X = 55.00 ft.  
and X = 65.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation  
At Which A Surface Extends Is Y = 2.00 ft.

2.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

\* \* Safety Factors Are Calculated By The Modified Janbu Method \* \*

Failure Surface Specified By 16 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) |
|--------------|----------------|----------------|
| 1            | 41.67          | 9.00           |
| 2            | 43.66          | 8.78           |
| 3            | 45.66          | 8.79           |
| 4            | 47.64          | 9.02           |
| 5            | 49.59          | 9.46           |
| 6            | 51.48          | 10.13          |
| 7            | 53.28          | 10.99          |
| 8            | 54.98          | 12.05          |
| 9            | 56.54          | 13.30          |
| 10           | 57.96          | 14.70          |
| 11           | 59.22          | 16.26          |
| 12           | 60.29          | 17.95          |
| 13           | 61.17          | 19.75          |
| 14           | 61.85          | 21.63          |
| 15           | 62.31          | 23.57          |
| 16           | 62.48          | 24.95          |

\*\*\* 1.793 \*\*\*

Individual data on the 18 slices

|       |       |       |       |            |
|-------|-------|-------|-------|------------|
| Water | Water |       |       | Earthquake |
| Force | Force | Force | Force | Force      |
|       |       |       |       | Surcharge  |

Page 2

| Slice No. | width (ft) | weight (lbs) | Top (lbs) | result.out |            |           |           |           | Load (lbs) |
|-----------|------------|--------------|-----------|------------|------------|-----------|-----------|-----------|------------|
|           |            |              |           | Bot (lbs)  | Norm (lbs) | Tan (lbs) | Hor (lbs) | Ver (lbs) |            |
| 1         | 2.0        | 24.5         | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 2         | 2.0        | 48.6         | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 3         | 1.3        | 20.4         | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 4         | 0.1        | 29.1         | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 5         | 0.5        | 344.4        | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 6         | 1.9        | 1749.1       | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 7         | 1.4        | 1740.9       | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 8         | 0.5        | 657.0        | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 9         | 1.8        | 2424.1       | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 10        | 1.7        | 2180.4       | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 11        | 1.6        | 1884.5       | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 12        | 1.4        | 1554.5       | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 13        | 1.3        | 1210.6       | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 14        | 1.1        | 874.2        | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 15        | 0.9        | 566.7        | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 16        | 0.7        | 308.6        | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 17        | 0.5        | 118.1        | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |
| 18        | 0.2        | 12.7         | 0.0       | 0.0        | 0.0        | 0.0       | 0.0       | 0.0       | 0.0        |

Failure Surface Specified By 17 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) |
|--------------|----------------|----------------|
| 1            | 41.67          | 9.00           |
| 2            | 43.65          | 8.77           |
| 3            | 45.65          | 8.75           |
| 4            | 47.64          | 8.95           |
| 5            | 49.60          | 9.35           |
| 6            | 51.50          | 9.97           |
| 7            | 53.33          | 10.79          |
| 8            | 55.06          | 11.80          |
| 9            | 56.66          | 12.99          |
| 10           | 58.13          | 14.34          |
| 11           | 59.45          | 15.85          |
| 12           | 60.60          | 17.49          |
| 13           | 61.56          | 19.24          |
| 14           | 62.34          | 21.08          |
| 15           | 62.90          | 23.00          |
| 16           | 63.26          | 24.97          |
| 17           | 63.28          | 25.15          |

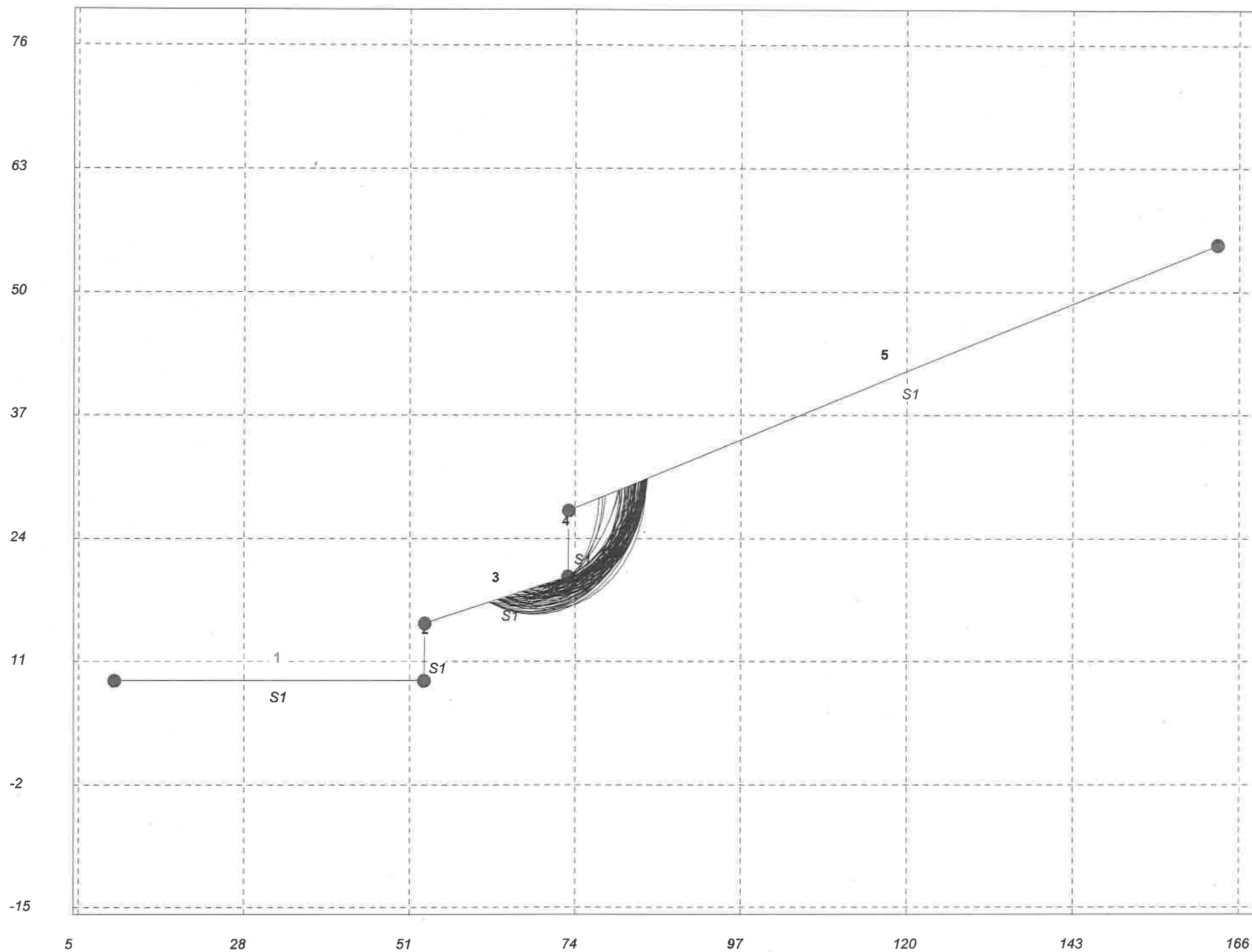
\*\*\* 1.798 \*\*\*

1

Failure Surface Specified By 17 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) |
|--------------|----------------|----------------|
| 1            | 41.67          | 9.00           |
| 2            | 43.65          | 8.77           |
| 3            | 45.65          | 8.75           |
| 4            | 47.64          | 8.95           |
| 5            | 49.60          | 9.35           |

1726-04 Section B-B' - FS Min = 2.17



result.out  
\*\* PCSTABL6 \*\*

by  
Purdue University

--Slope Stability Analysis--  
Simplified Janbu, Simplified Bishop  
or Spencer's Method of Slices

Run Date:  
Time of Run:  
Run By:  
Input Data Filename: run.in  
Output Filename: result.out  
Unit: ENGLISH  
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION 1726-04 Section B-B'

BOUNDARY COORDINATES

5 Top Boundaries  
5 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|--------------|-------------|-------------|--------------|--------------|---------------------|
| 1            | 10.00       | 9.00        | 53.00        | 9.00         | 1                   |
| 2            | 53.00       | 9.00        | 53.10        | 15.00        | 1                   |
| 3            | 53.10       | 15.00       | 73.00        | 20.00        | 1                   |
| 4            | 73.00       | 20.00       | 73.10        | 27.00        | 1                   |
| 5            | 73.10       | 27.00       | 163.00       | 55.00        | 1                   |

ISOTROPIC SOIL PARAMETERS

1 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             | 114.0                | 114.0                    | 250.0                    | 30.0                 | 0.00                 | 0.0                     | 0                 |

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

result.out  
100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced  
Along The Ground Surface Between X = 62.00 ft.  
and X = 72.00 ft.

Each Surface Terminates Between X = 74.00 ft.  
and X = 84.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation  
At Which A Surface Extends Is Y = 2.00 ft.

2.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

\* \* Safety Factors Are Calculated By The Modified Janbu Method \* \*

Failure Surface Specified By 10 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) |
|--------------|----------------|----------------|
| 1            | 70.89          | 19.47          |
| 2            | 72.87          | 19.72          |
| 3            | 74.80          | 20.25          |
| 4            | 76.63          | 21.06          |
| 5            | 78.33          | 22.12          |
| 6            | 79.85          | 23.41          |
| 7            | 81.18          | 24.91          |
| 8            | 82.27          | 26.59          |
| 9            | 83.11          | 28.40          |
| 10           | 83.68          | 30.29          |

\*\*\* 2.170 \*\*\*

Individual data on the 11 slices

| Slice<br>No. | Width<br>(ft) | Weight<br>(lbs) | Water                 | Water                 | Force<br>Norm<br>(lbs) | Force<br>Tan<br>(lbs) | Earthquake            |                       | Surcharge<br>Load<br>(lbs) |
|--------------|---------------|-----------------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|----------------------------|
|              |               |                 | Force<br>Top<br>(lbs) | Force<br>Bot<br>(lbs) |                        |                       | Force<br>Hor<br>(lbs) | Force<br>Ver<br>(lbs) |                            |
| 1            | 2.0           | 28.0            | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 2            | 0.1           | 3.5             | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 3            | 0.1           | 42.5            | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |

|    |     |        |     | result.out |     |     |     |     |     |
|----|-----|--------|-----|------------|-----|-----|-----|-----|-----|
| 4  | 1.7 | 1405.1 | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5  | 1.8 | 1493.7 | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6  | 1.7 | 1309.5 | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7  | 1.5 | 1060.7 | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8  | 1.3 | 776.5  | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9  | 1.1 | 491.0  | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 0.8 | 239.4  | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 0.6 | 55.4   | 0.0 | 0.0        | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Failure Surface Specified By 11 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|-----------|-------------|-------------|
| 1         | 69.78       | 19.19       |
| 2         | 71.76       | 19.43       |
| 3         | 73.70       | 19.92       |
| 4         | 75.57       | 20.64       |
| 5         | 77.32       | 21.60       |
| 6         | 78.94       | 22.78       |
| 7         | 80.40       | 24.15       |
| 8         | 81.67       | 25.69       |
| 9         | 82.74       | 27.38       |
| 10        | 83.58       | 29.19       |
| 11        | 83.96       | 30.38       |

\*\*\* 2.185 \*\*\*

1

Failure Surface Specified By 11 Coordinate Points

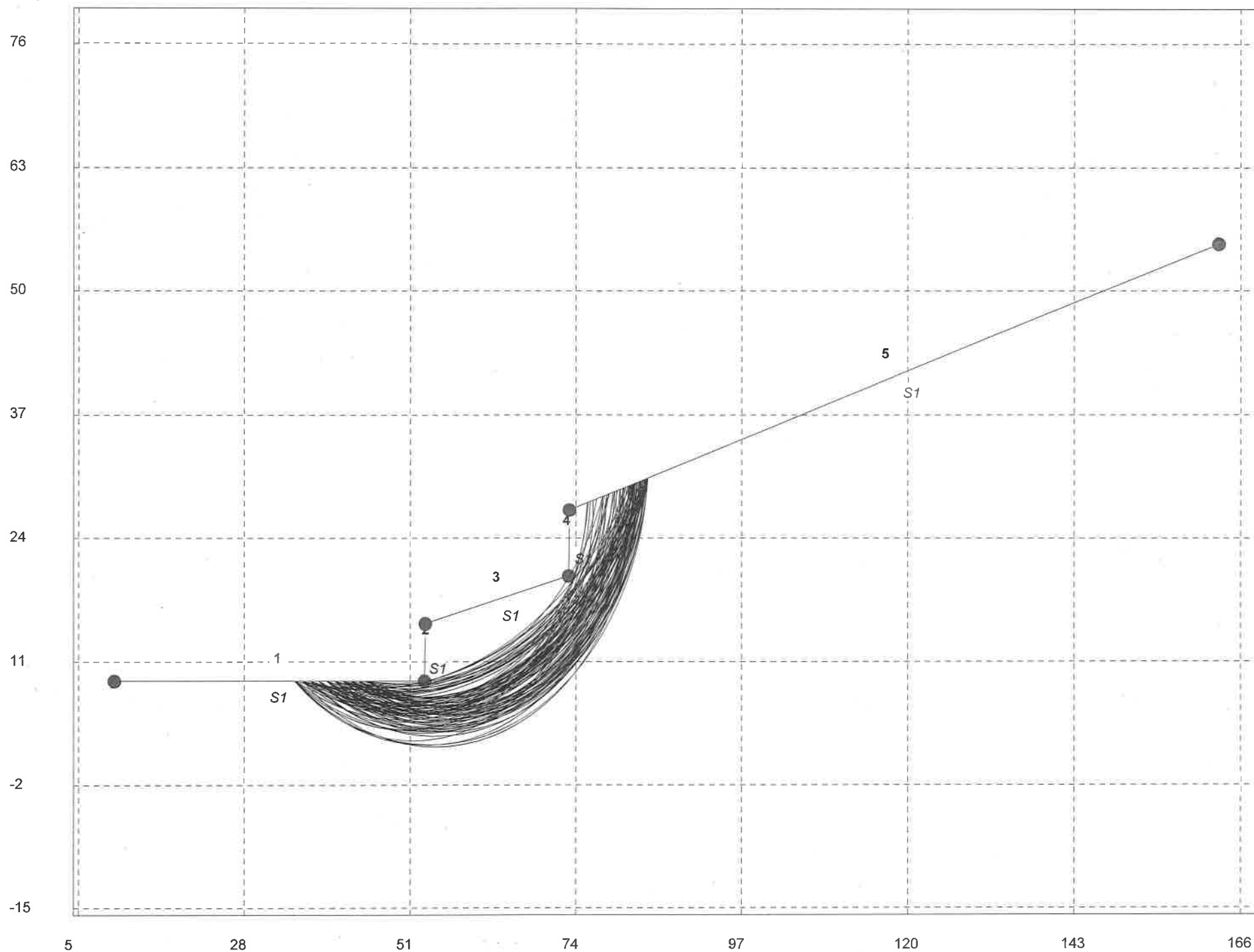
| Point No. | X-Surf (ft) | Y-Surf (ft) |
|-----------|-------------|-------------|
| 1         | 69.78       | 19.19       |
| 2         | 71.77       | 19.38       |
| 3         | 73.72       | 19.84       |
| 4         | 75.59       | 20.54       |
| 5         | 77.35       | 21.49       |
| 6         | 78.97       | 22.67       |
| 7         | 80.41       | 24.05       |
| 8         | 81.67       | 25.61       |
| 9         | 82.70       | 27.32       |
| 10        | 83.50       | 29.15       |
| 11        | 83.84       | 30.35       |

\*\*\* 2.189 \*\*\*

Failure Surface Specified By 11 Coordinate Points

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

# 1726-04 Section B-B' - FS Min = 2.024



result.out  
\*\* PCSTABL6 \*\*

by  
Purdue University

--Slope Stability Analysis--  
Simplified Janbu, Simplified Bishop  
or Spencer's Method of Slices

Run Date:  
Time of Run:  
Run By:  
Input Data Filename: run.in  
Output Filename: result.out  
Unit: ENGLISH  
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION 1726-04 Section B-B'

BOUNDARY COORDINATES

5 Top Boundaries  
5 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|--------------|-------------|-------------|--------------|--------------|---------------------|
| 1            | 10.00       | 9.00        | 53.00        | 9.00         | 1                   |
| 2            | 53.00       | 9.00        | 53.10        | 15.00        | 1                   |
| 3            | 53.10       | 15.00       | 73.00        | 20.00        | 1                   |
| 4            | 73.00       | 20.00       | 73.10        | 27.00        | 1                   |
| 5            | 73.10       | 27.00       | 163.00       | 55.00        | 1                   |

ISOTROPIC SOIL PARAMETERS

1 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             | 114.0                | 114.0                    | 250.0                    | 30.0                 | 0.00                 | 0.0                     | 0                 |

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

result.out  
100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced  
Along The Ground Surface Between X = 35.00 ft.  
and X = 45.00 ft.

Each Surface Terminates Between X = 74.00 ft.  
and X = 84.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation  
At Which A Surface Extends Is Y = 2.00 ft.

2.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

\* \* Safety Factors Are Calculated By The Modified Janbu Method \* \*

Failure Surface Specified By 27 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) |
|--------------|----------------|----------------|
| 1            | 45.00          | 9.00           |
| 2            | 46.90          | 8.37           |
| 3            | 48.84          | 7.87           |
| 4            | 50.80          | 7.51           |
| 5            | 52.79          | 7.28           |
| 6            | 54.79          | 7.19           |
| 7            | 56.79          | 7.23           |
| 8            | 58.78          | 7.41           |
| 9            | 60.75          | 7.73           |
| 10           | 62.70          | 8.18           |
| 11           | 64.62          | 8.76           |
| 12           | 66.49          | 9.47           |
| 13           | 68.30          | 10.31          |
| 14           | 70.06          | 11.27          |
| 15           | 71.74          | 12.34          |
| 16           | 73.35          | 13.53          |
| 17           | 74.88          | 14.83          |
| 18           | 76.31          | 16.23          |
| 19           | 77.64          | 17.72          |
| 20           | 78.87          | 19.30          |
| 21           | 79.98          | 20.95          |
| 22           | 80.99          | 22.68          |
| 23           | 81.87          | 24.48          |
| 24           | 82.62          | 26.33          |
| 25           | 83.25          | 28.23          |
| 26           | 83.75          | 30.17          |
| 27           | 83.78          | 30.33          |

result.out

\*\*\* 2.024 \*\*\*

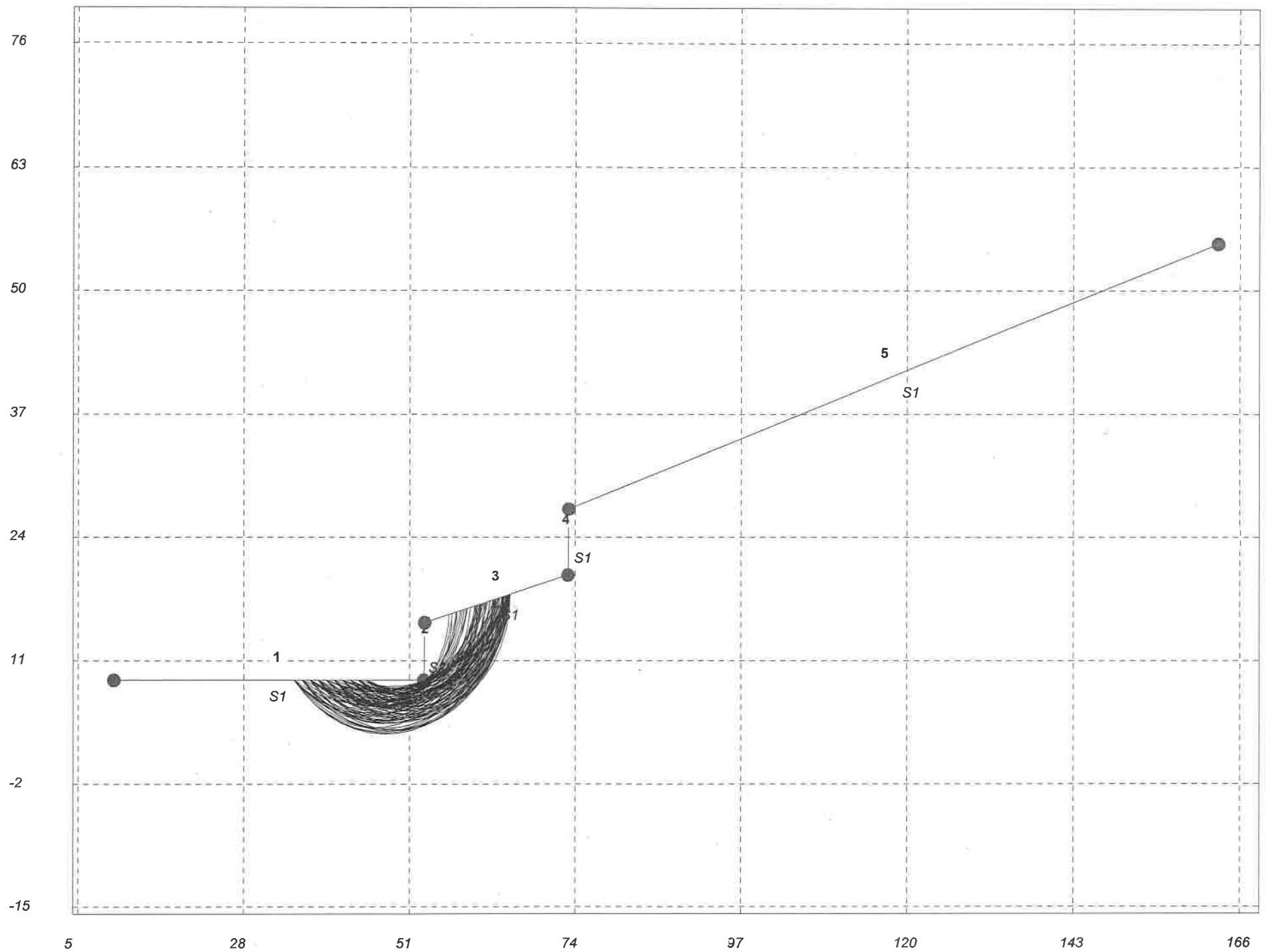
Individual data on the 30 slices

| Slice<br>No. | Width<br>(ft) | Weight<br>(lbs) | Water                 | Water                 | Force<br>Norm<br>(lbs) | Force<br>Tan<br>(lbs) | Earthquake            |                       | Surcharge<br>Load<br>(lbs) |
|--------------|---------------|-----------------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|-----------------------|----------------------------|
|              |               |                 | Force<br>Top<br>(lbs) | Force<br>Bot<br>(lbs) |                        |                       | Force<br>Hor<br>(lbs) | Force<br>Ver<br>(lbs) |                            |
| 1            | 1.9           | 68.0            | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 2            | 1.9           | 193.6           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 3            | 2.0           | 293.0           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 4            | 2.0           | 363.2           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 5            | 0.2           | 41.2            | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 6            | 0.1           | 53.9            | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 7            | 1.7           | 1536.2          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 8            | 2.0           | 1929.2          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 9            | 2.0           | 2010.3          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 10           | 2.0           | 2049.5          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 11           | 1.9           | 2046.9          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 12           | 1.9           | 2003.2          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 13           | 1.9           | 1920.5          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 14           | 1.8           | 1801.9          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 15           | 1.8           | 1651.2          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 16           | 1.7           | 1473.3          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 17           | 1.3           | 1007.7          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 18           | 0.1           | 116.2           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 19           | 0.3           | 390.2           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 20           | 1.5           | 2281.2          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 21           | 1.4           | 1998.9          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 22           | 1.3           | 1707.1          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 23           | 1.2           | 1413.8          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 24           | 1.1           | 1126.8          | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 25           | 1.0           | 854.2           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 26           | 0.9           | 603.8           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 27           | 0.8           | 383.2           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 28           | 0.6           | 199.4           | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 29           | 0.5           | 59.0            | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |
| 30           | 0.0           | 0.3             | 0.0                   | 0.0                   | 0.0                    | 0.0                   | 0.0                   | 0.0                   | 0.0                        |

Failure surface Specified By 27 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) |
|--------------|----------------|----------------|
| 1            | 45.00          | 9.00           |
| 2            | 46.83          | 8.20           |
| 3            | 48.72          | 7.53           |
| 4            | 50.65          | 7.01           |
| 5            | 52.61          | 6.62           |
| 6            | 54.60          | 6.39           |
| 7            | 56.59          | 6.30           |
| 8            | 58.59          | 6.35           |
| 9            | 60.58          | 6.56           |
| 10           | 62.55          | 6.91           |
| 11           | 64.49          | 7.40           |
| 12           | 66.39          | 8.03           |

1726-04 Section B-B' - FS Min = 2.924



result.out  
\*\* PCSTABL6 \*\*

by  
Purdue University

--Slope Stability Analysis--  
Simplified Janbu, Simplified Bishop  
or Spencer's Method of Slices

Run Date:  
Time of Run:  
Run By:  
Input Data Filename: run.in  
Output Filename: result.out  
Unit: ENGLISH  
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION 1726-04 Section B-B'

#### BOUNDARY COORDINATES

5 Top Boundaries  
5 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|--------------|-------------|-------------|--------------|--------------|---------------------|
| 1            | 10.00       | 9.00        | 53.00        | 9.00         | 1                   |
| 2            | 53.00       | 9.00        | 53.10        | 15.00        | 1                   |
| 3            | 53.10       | 15.00       | 73.00        | 20.00        | 1                   |
| 4            | 73.00       | 20.00       | 73.10        | 27.00        | 1                   |
| 5            | 73.10       | 27.00       | 163.00       | 55.00        | 1                   |

#### ISOTROPIC SOIL PARAMETERS

1 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             | 114.0                | 114.0                    | 250.0                    | 30.0                 | 0.00                 | 0.0                     | 0                 |

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

result.out

100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced  
Along The Ground Surface Between X = 35.00 ft.  
and X = 45.00 ft.

Each Surface Terminates Between X = 55.00 ft.  
and X = 65.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation  
At Which A Surface Extends Is Y = 2.00 ft.

2.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

\* \* Safety Factors Are Calculated By The Modified Janbu Method \* \*

Failure Surface Specified By 14 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) |
|--------------|----------------|----------------|
| 1            | 45.00          | 9.00           |
| 2            | 46.86          | 8.27           |
| 3            | 48.81          | 7.80           |
| 4            | 50.80          | 7.61           |
| 5            | 52.79          | 7.69           |
| 6            | 54.76          | 8.06           |
| 7            | 56.66          | 8.69           |
| 8            | 58.45          | 9.58           |
| 9            | 60.10          | 10.71          |
| 10           | 61.58          | 12.06          |
| 11           | 62.85          | 13.60          |
| 12           | 63.90          | 15.31          |
| 13           | 64.70          | 17.14          |
| 14           | 64.93          | 17.97          |

\*\*\* 2.924 \*\*\*

Individual data on the 15 slices

| Slice | width | weight | Water<br>Force<br>Top | Water<br>Force<br>Bot | Force<br>Norm | Force<br>Tan | Earthquake<br>Force<br>Hor | Force<br>Ver | Surcharge<br>Load |
|-------|-------|--------|-----------------------|-----------------------|---------------|--------------|----------------------------|--------------|-------------------|
|-------|-------|--------|-----------------------|-----------------------|---------------|--------------|----------------------------|--------------|-------------------|

Page 2

| No. | (ft) | (lbs)  | (lbs) | result.out |       | (lbs) | (lbs) | (lbs) | (lbs) |
|-----|------|--------|-------|------------|-------|-------|-------|-------|-------|
|     |      |        |       | (lbs)      | (lbs) |       |       |       |       |
| 1   | 1.9  | 77.8   | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 2   | 1.9  | 214.3  | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 3   | 2.0  | 294.3  | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 4   | 2.0  | 307.5  | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 5   | 0.2  | 30.1   | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 6   | 0.1  | 48.6   | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 7   | 1.7  | 1383.8 | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 8   | 1.9  | 1575.1 | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 9   | 1.8  | 1425.8 | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 10  | 1.6  | 1204.5 | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 11  | 1.5  | 935.4  | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 12  | 1.3  | 647.7  | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 13  | 1.0  | 373.5  | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 14  | 0.8  | 145.2  | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| 15  | 0.2  | 10.3   | 0.0   | 0.0        | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |

Failure Surface Specified By 14 Coordinate Points

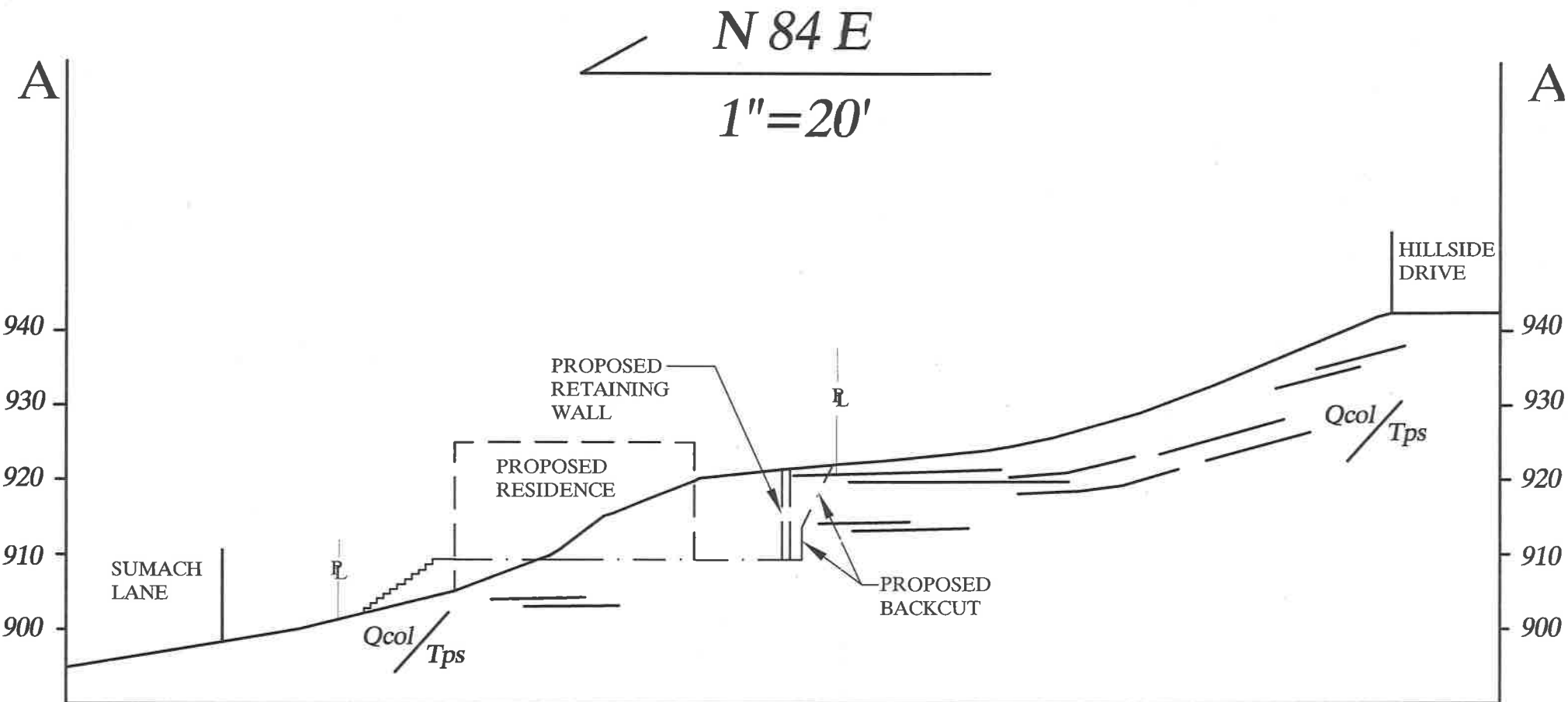
| Point No. | X-Surf (ft) | Y-Surf (ft) |
|-----------|-------------|-------------|
| 1         | 45.00       | 9.00        |
| 2         | 46.80       | 8.12        |
| 3         | 48.71       | 7.52        |
| 4         | 50.68       | 7.21        |
| 5         | 52.68       | 7.19        |
| 6         | 54.66       | 7.48        |
| 7         | 56.58       | 8.05        |
| 8         | 58.39       | 8.89        |
| 9         | 60.06       | 10.00       |
| 10        | 61.54       | 11.34       |
| 11        | 62.81       | 12.89       |
| 12        | 63.83       | 14.61       |
| 13        | 64.59       | 16.46       |
| 14        | 64.97       | 17.98       |

\*\*\* 2.932 \*\*\*

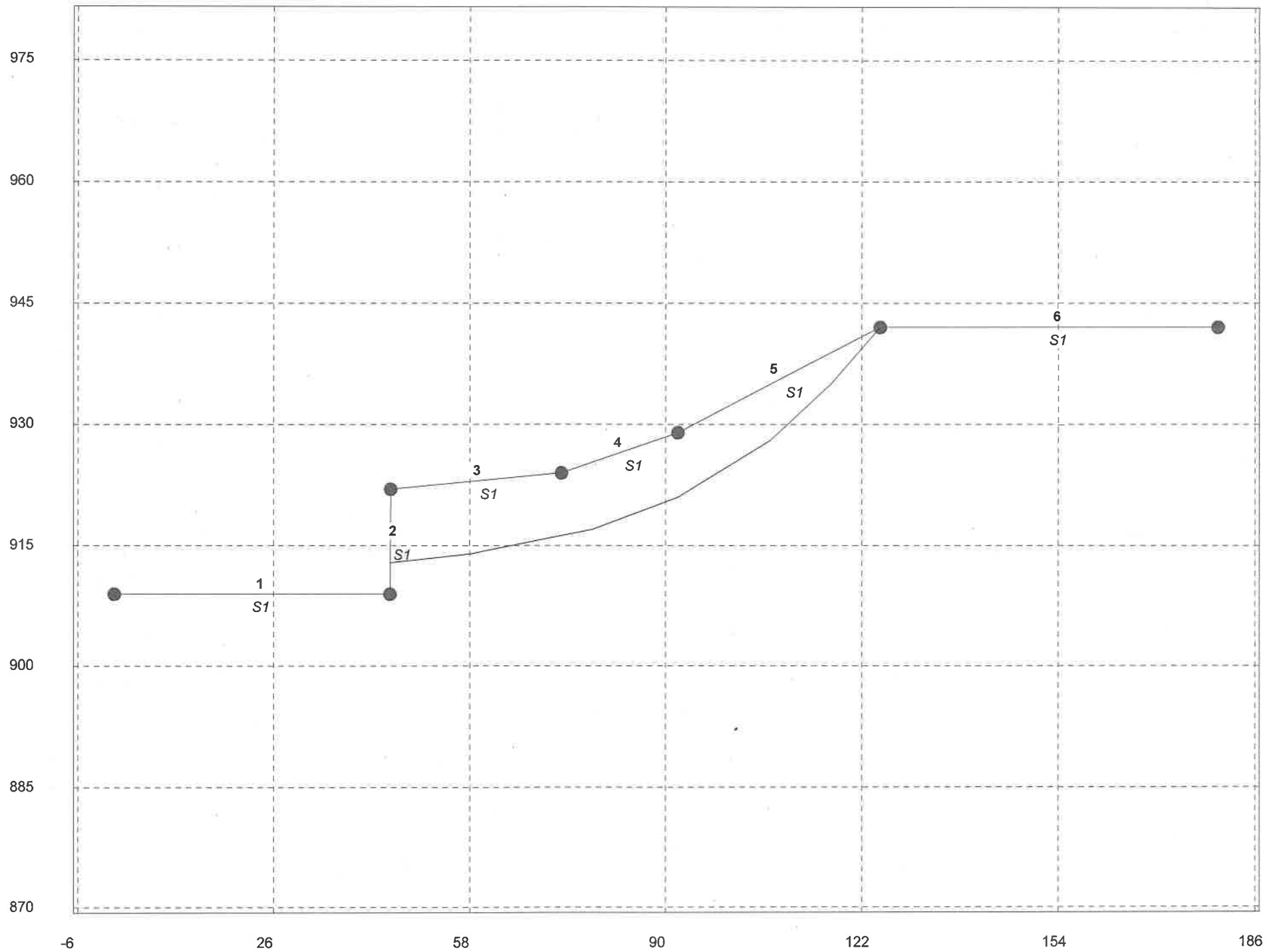
1

Failure Surface Specified By 14 Coordinate Points

| Point No. | X-Surf (ft) | Y-Surf (ft) |
|-----------|-------------|-------------|
| 1         | 45.00       | 9.00        |
| 2         | 46.79       | 8.11        |
| 3         | 48.70       | 7.50        |
| 4         | 50.67       | 7.18        |
| 5         | 52.67       | 7.17        |
| 6         | 54.65       | 7.46        |
| 7         | 56.56       | 8.04        |
| 8         | 58.37       | 8.90        |
| 9         | 60.02       | 10.03       |
| 10        | 61.48       | 11.39       |
| 11        | 62.73       | 12.96       |
| 12        | 63.72       | 14.70       |



1726-04 - Section A-A' - FS Min = 1.764



result.out  
\*\* PCSTABL6 \*\*

by  
Purdue University

--Slope Stability Analysis--  
Simplified Janbu, Simplified Bishop  
or Spencer's Method of Slices

Run Date:  
Time of Run:  
Run By:  
Input Data Filename: run.in  
Output Filename: result.out  
Unit: ENGLISH  
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION 1726-04 - Section A-A'

#### BOUNDARY COORDINATES

6 Top Boundaries  
6 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|--------------|-------------|-------------|--------------|--------------|---------------------|
| 1            | 0.00        | 909.00      | 45.00        | 909.00       | 1                   |
| 2            | 45.00       | 909.00      | 45.10        | 922.00       | 1                   |
| 3            | 45.10       | 922.00      | 73.00        | 924.00       | 1                   |
| 4            | 73.00       | 924.00      | 92.00        | 929.00       | 1                   |
| 5            | 92.00       | 929.00      | 125.00       | 942.00       | 1                   |
| 6            | 125.00      | 942.00      | 180.00       | 942.00       | 1                   |

#### ISOTROPIC SOIL PARAMETERS

1 Type(s) of soil

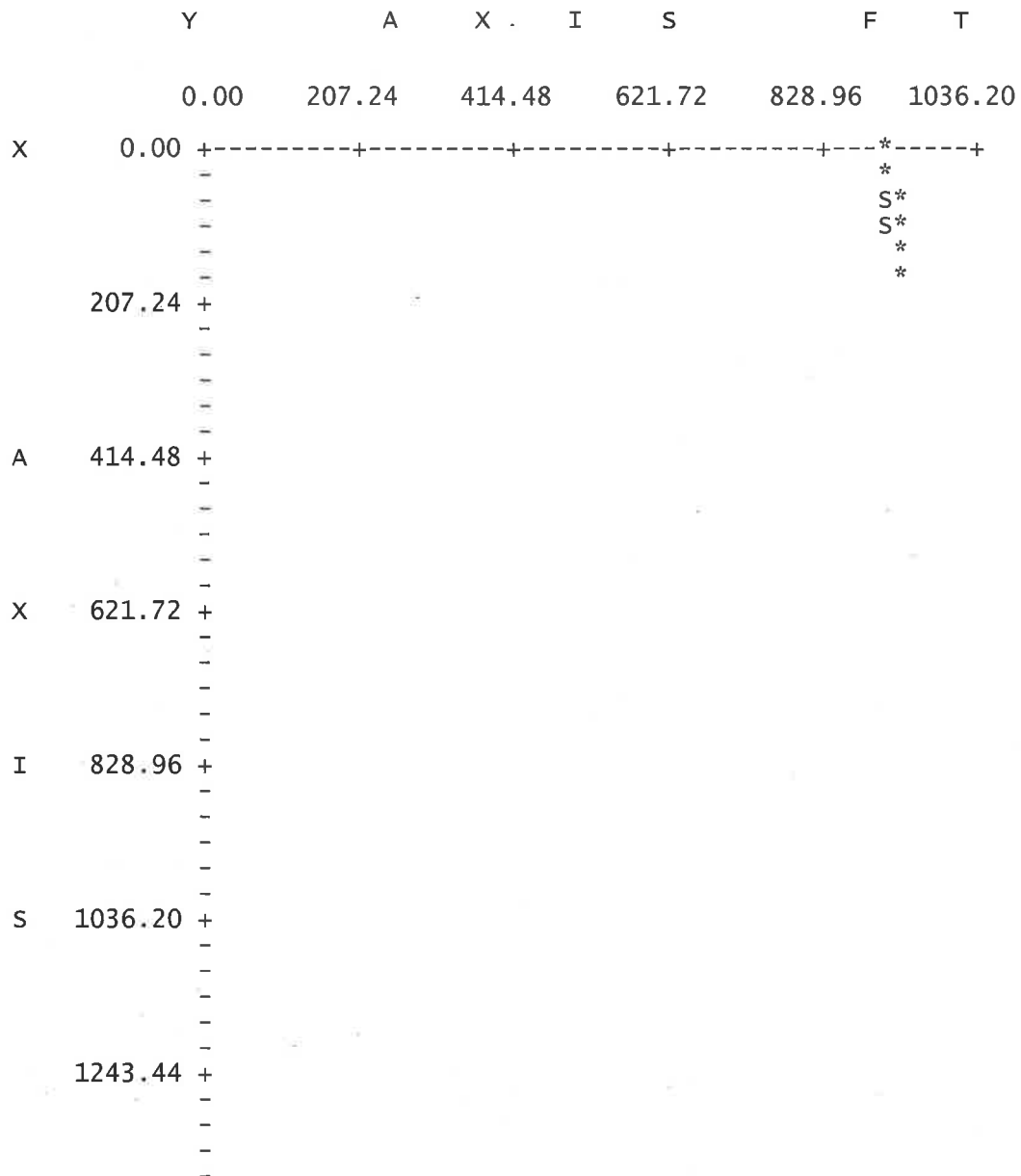
| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---------------|----------------------|--------------------------|--------------------------|----------------------|----------------------|-------------------------|-------------------|
| 1             | 114.0                | 114.0                    | 100.0                    | 20.0                 | 0.00                 | 0.0                     | 0                 |

Trial Failure Surface Specified By 7 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | Y-Surf<br>(ft) | result.out |
|--------------|----------------|----------------|------------|
| 1            | 45.03          | 912.90         |            |
| 2            | 58.00          | 914.00         |            |
| 3            | 78.00          | 917.00         |            |
| 4            | 92.00          | 921.00         |            |
| 5            | 107.00         | 928.00         |            |
| 6            | 117.00         | 935.00         |            |
| 7            | 125.00         | 942.00         |            |

Factor Of Safety For The Preceding Specified Surface = 1.764

1

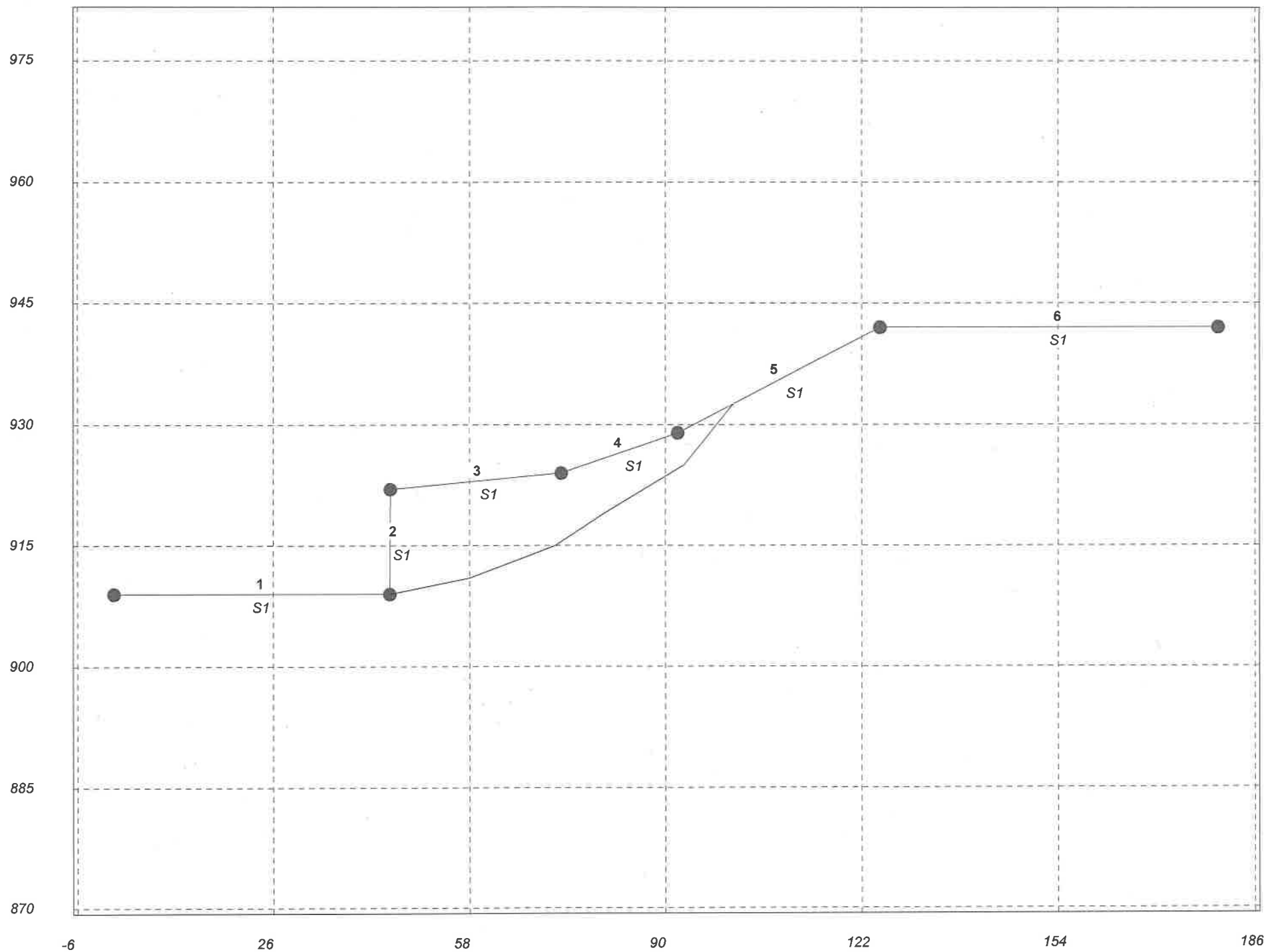


result.out

F 1450.68 +

T 1657.92 +

1726-04 - Section A-A' - FS Min = 1.564



result.out  
\*\* PCSTABL6 \*\*

by  
Purdue University

--Slope Stability Analysis--  
Simplified Janbu, Simplified Bishop  
or Spencer's Method of Slices

Run Date:  
Time of Run:  
Run By:  
Input Data Filename: run.in  
Output Filename: result.out  
Unit: ENGLISH  
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION 1726-04 - Section A-A'

BOUNDARY COORDINATES

6 Top Boundaries  
6 Total Boundaries

| Boundary No. | X-Left (ft) | Y-Left (ft) | X-Right (ft) | Y-Right (ft) | Soil Type Below Bnd |
|--------------|-------------|-------------|--------------|--------------|---------------------|
| 1            | 0.00        | 909.00      | 45.00        | 909.00       | 1                   |
| 2            | 45.00       | 909.00      | 45.10        | 922.00       | 1                   |
| 3            | 45.10       | 922.00      | 73.00        | 924.00       | 1                   |
| 4            | 73.00       | 924.00      | 92.00        | 929.00       | 1                   |
| 5            | 92.00       | 929.00      | 125.00       | 942.00       | 1                   |
| 6            | 125.00      | 942.00      | 180.00       | 942.00       | 1                   |

ISOTROPIC SOIL PARAMETERS

1 Type(s) of Soil

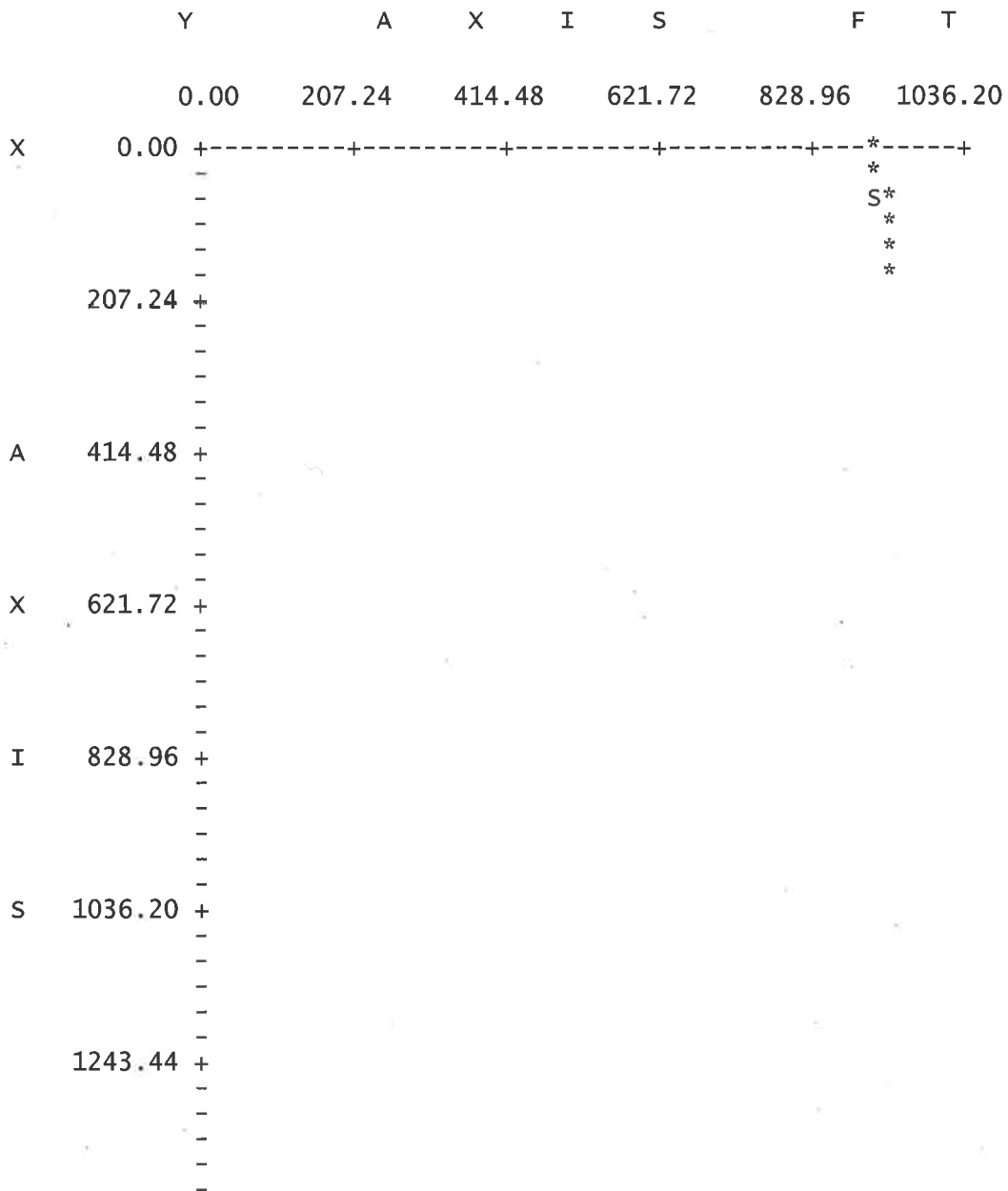
| Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---------------|----------------------|--------------------------|--------------------------|----------------------|----------------------|-------------------------|-------------------|
| 1             | 114.0                | 114.0                    | 100.0                    | 20.0                 | 0.00                 | 0.0                     | 0                 |

Trial Failure Surface Specified By 6 Coordinate Points

| Point<br>No. | X-Surf<br>(ft) | result.out<br>Y-Surf<br>(ft) |
|--------------|----------------|------------------------------|
| 1            | 45.00          | 909.00                       |
| 2            | 58.00          | 911.00                       |
| 3            | 72.00          | 915.00                       |
| 4            | 80.00          | 919.00                       |
| 5            | 93.00          | 925.00                       |
| 6            | 101.00         | 932.55                       |

1

Factor Of Safety For The Preceding Specified Surface = 1.564



result.out

F 1450.68 +

-

-

-

-

-

T 1657.92 +

# GEOTECHNICAL PLAN AND CROSS SECTIONS

