Report of
Geotechnical Engineering Services
Lena Road Landfill
Stage 2
Manatee County, Florida

September 30, 2010

Andreyev Engineering, Inc.

CLERMONT OFFICE
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▼ Groundwater ▼ Environmental ▼ Geotechnical ▼ Construction Materials Testing

Project No. CPGT-10-0062
September 28, 2010

TO: **PBS&J**
482 South Keller Road
Orlando, FL 32810
Attention: Mr. Joseph Miller, P.E.

SUBJECT: **Results of Geotechnical Investigation**
Lena Road Landfill, Stage 2,
Manatee County, Florida

Dear Mr. Miller:

Andreyev Engineering Inc. has completed a geotechnical investigation for the Stage 2 portion of the Lena Road Class 1 Landfill operated by Manatee County. This report and the information contained are intended to address geotechnical assessment related items required for landfill design and construction.

We appreciate the opportunity to provide our services on the project and trust that this report is sufficient to address the geotechnical matters related to the project. Should you have any questions regarding this report, please feel free to contact the undersigned.

Sincerely,

ANDREYEV ENGINEERING, INC.

T. Scott Cavin, P.E.
Vice President
FL Registration No. 48125

Nicolas E. Andreyev, P.E.
President

cc: Manatee County
FDEP – Tampa District

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1.0 INTRODUCTION

This geotechnical investigation was conducted in support of renewal of the operating permit for the Lena Road Class 1 landfill in Manatee County. We understand the landfill is divided into 3 separate tracts, of which Stage 1 has been filled to capacity and Stage 3 is currently being filled. This work encompasses geotechnical assessment of the remaining stage (Stage 2). We further understand that the 3 stages contain perimeter slurry walls which are keyed into the top of the first confining layer beneath the property.

The investigation presented herein is intended to address FDEP review comments documented in the letter dated June 16, 2010 concerning renewal of the operating permit. Specifically, this investigation addresses items 3a through 3d of the letter, which request additional geotechnical and hydrogeologic information.

2.0 SCOPE OF INVESTIGATION

Our scope of investigation consisted of the following:

1. Conducted a detailed review of all previous geotechnical reports and landfill design drawings.

2. Investigated the deep subsurface conditions within Stage 2 by drilling nine (9) Standard Penetration Test borings. These additional borings were conducted to provide better coverage of the landfill footprint and investigate deep subsurface conditions in areas where this information is absent. The borings were drilled to depths ranging from 60 to 100 feet. The additional borings were drilled in the areas that were not drilled previously or where previous borings were not drilled sufficiently deep to allow proper assessment for foundation support and settlement analysis.

3. Conducted a series of engineering index property tests on the subsurface soils, including:

    - Moisture content
    - Percent fines content
    - Atterberg Limits

4. Evaluated the collected field and laboratory test data, prepared location plans, soil profiles, geologic cross sections through the soil boring alignments, presenting subsurface strata in elevation (ft-NGVD).

5. Conducted geotechnical evaluations of foundation bearing capacity including justification of selected parameters.

6. Conducted circular and block failure slope stability analyses. A total of four (4) slope conditions were be evaluated

7. Conducted analyses of immediate and long term settlement under the landfill and developed a settlement contour map using the settlement data points.

8. Evaluated the sinkhole potential using available published geologic maps and reports, FAVA report, sinkhole databases, photolineament analysis, and site specific boring data.

9. Prepared this comprehensive geotechnical report presenting the results of the testing, assessment of conditions, and engineering evaluations in support of landfill design and response to the FDEP RAI.

3.0 SITE LOCATION AND DESCRIPTION

The site is located in Section 31, Township 34 South, Range 19 East and Section 6, Township 35 South, Range 19 East, Manatee County, Florida. It is approximately 1,500 feet south of Highway 64 and 3,500 feet east of Lena Road. An existing Class 1 landfill which is owned and operated by Manatee County is located immediately south of the project area. The subject property consists of approximately 115 acres and is designated as Stage 2.

Regionally, the site is located in a relatively flat, poorly drained low recharge area. Ground surface elevations occur at approximately +34 to +35 ft-NGVD. Based on review of the USGS quadrangle map (Lorraine FL) the subject property and surrounding area contain wetlands which discharge off-site via small creeks and sloughs which drain to the Manatee River. A site vicinity map is shown superimposed on the USGS quadrangle map on the attached **Figure 1**.

The project will consist of the Stage 2 area located immediately north of the existing Stage 1 landfill. Currently the property consists of a combination of vacant property, yard waste processing area, vehicle storage area, and a borrow pit and pile. An aerial photograph showing the Stage 2 landfill area and the various current uses is shown on the attached **Figure 3**.

We understand that a bentonite slurry wall is constructed around the entire perimeter of Stage 2. The wall extends to the first competent natural clay layer below the site and is intended to be a cutoff for horizontal flow outside the landfill boundaries. In addition, we understand that a series of leachate collection pipes are installed throughout the Stage 2 property and have inverts ranging from +16 to +27 ft-NGVD. The collection piles will also serve to control groundwater level below natural levels found outside the slurry wall.

This property has been the subject of geotechnical engineering studies in the past by Ardaman and Associates, including a comprehensive geotechnical study (reports dated August 29, 1985 and October 31, 1988), and progress reports during slurry wall construction (report dates ranging from June 1989 through August 1989).

4.0 S.C.S. SOIL SURVEY

The " Soil Survey of Manatee County, Florida" published by the U.S. Department of Agriculture Soil Conservation Service (S.C.S.) was reviewed. The predominant shallow soil types identified at the site are as follows:

- Eaugallie fine sand (20), which is a nearly level, poorly drained sand. The seasonal high groundwater table is between 10 and 40 inches deep. Permeability is rapid in the surface layer, moderate or moderately rapid in the subsoil, and rapid in the substratum.

- Floridana-Immokalee-Okeelanta (26), which is a nearly level, poorly drained sand. The seasonal high groundwater table is between 25 and 40 inches deep. Permeability is very rapid.

A copy of the SCS Soil Survey is provided in **Figure 2**.

5.0 PHOTOLINEAMENT STUDY AND SINKHOLE INVENTORY

Lineaments are defined as physical features of the earth's surface which are oriented in linear arrangements. Photolineaments are lineaments which are identified using aerial photographs in combination with topographic maps. These surface features typically represent underlying fractures of the limestone bedrock and are represented by trough like depressions, ridges marked by significant vegetation changes or changes in soil colorations. The enhanced topographical surface characteristics of fractures in the underlying limestone are typically caused by increased surface recharge which causes solution of overlying strata.

Vertical fracturing in a carbonate aquifer system can occur from propagation of basement structures through the overlying carbonates in response to crustal flexing caused by earth tides (Blanchet, 1957). Surface lineaments have been long recognized as surface manifestations of underlying vertical to near-vertical zones of fracture concentrations (Lattman and Parizek, 1964). Surface lineaments are typically orthogonally oriented with angles between 45 and 55 degrees east and west of north. In a karst carbonate aquifer system, fracture zones can be enlarged by chemical dissolution.

In order to examine photolineaments existing within and in the vicinity of the subject property, AEI utilized an aerial photograph with a scale of 1"=2,000' and a topographic map with a scale of 1"=2,000'. The photograph was inspected for soil colorations, natural drainage features, depression areas possibly indicating karst conditions and vegetation changes. In addition to the aerial photograph, a five foot contour topographic map was used to inspect the surface topography for depressions and sinks which may indicate surface subsidence caused by past karst activity.

Based on this analysis, there are no significant physical features which appear to represent potential fractures (photolineaments) within, the subject site. A map showing the results of the photolineament analysis is provided on **Figure 4**.

The Florida Geological Survey (FGS) Subsidence Incident Report database documenting sinkhole activity was reviewed and no new sinkholes in the vicinity of the subject property were identified. Based on this survey and the observed surficial topographic setting within the project area and immediate vicinity, the area has no reported sinkhole activity. In addition, PBS&J conducted an inventory of sinkhole occurrences from the Center for Instructional Technology sinkhole database at the University of South Florida. A copy of the Center's published map with the subject landfill superimposed is provided on **Figure 5**. The results indicate no sinkhole occurrences within a radius of 5 miles.

An evaluation of sinkhole potential was conducted by Ardaman and Associates and is documented in their report dated August 29, 1985. The results of the evaluation did not reveal evidence of sinkhole activity or sinkhole potential. The Ardaman findings are therefore consistent with this report.

6.0 SITE SPECIFIC INVESTIGATION

A total of nine (9) SPT borings were drilled in the area of the Stage 2 property. The locations of the borings are presented on the attached **Figure 6**.

Natural Subsurface Conditions

Borings B-1 through B-9 were drilled in the throughout the Stage 2 landfill area to depths ranging from 60 to 100 feet below existing ground. Subsoils at the boring locations were found to be relatively consistent. The encountered soils generally consisted of fine sands and slightly silty fine sands starting at ground surface and extending to depths of approximately 20 to 25 feet, followed by silty fine sand with phosphates to depths ranging from 25 to 30 feet. Below these surficial sands and silty sands the borings encountered alternating layers of sandy clay, silty clay and clay with phosphates extending to the boring termination depths of 60 to 100 feet. Impervious clay soils were consistently found in all borings drilled for this assessment.

Based on the SPT-N values, the surficial sands and slightly silty sands were generally found to be in a loose to medium dense state. The underlying silty sands were also found to be in a loose to medium dense state. The underlying sandy to silty clays and clays were generally found to be in a stiff to hard condition. Zones of very soft to soft clay were noted in a depth of approximately 2 feet in some of the borings.

Results of the borings are presented in profile form on **Figure 7** along with the results of soil classification tests and groundwater level measurements indicated adjacent to the associated borings and at the tested depths.

Borings drilled previously by Ardaman and Associates were generally consistent with these boring results.

Groundwater Conditions

The groundwater table was measured in the open boreholes at the location of the borings. The groundwater table depths were found to range from 4.3 to 8.0 feet below existing grade. Based on surface elevations at the borings, these depths translate to groundwater elevations

ranging from +26.0 to +32.7 ft-NGVD. The following table provides a summary of the groundwater measurements and estimated elevations.

Well	Groundwater Depth (ft)	Groundwater Elevation (ft-NGVD)	Date of Reading
B-1	4.3	32.7	7/28/10
B-2	5.0	29.0	7/27/10
B-3	5.0	29.0	7/28/10
B-4	4.6	29.4	7/30/10
B-5	4.5	29.5	7/29/10
B-6	6.8	28.2	8/03/10
B-7	8.0	26.0	8/02/10
B-8	8.0	26.0	8/02/10
B-9	4.6	28.4	7/29/10

7.0 LABORATORY TESTING

A series of laboratory tests were conducted on the natural subsurface soils. The tests included natural moisture content, percent fines passing the number 200 sieve, and Atterberg Limits.

Moisture and -200 Tests

The percent moisture content and percent of fines passing the number 200 U.S. Standard sieve were conducted on selected soil samples. A total of fourteen (14) tests were conducted on natural soils. The results of the tests are shown adjacent to the soil profiles and at the tested depths of the soil profiles on **Figure 7**. The visual soil classification was reviewed and revised after the laboratory tests were completed.

Atterberg Limit Tests

Atterberg Limit tests were conducted on soft clay strata for the purpose of determining the liquid limit, plastic limit and plasticity index of the selected soil samples. A total of six (6) Atterberg Limit tests were conducted. The results of the tests are shown adjacent to the soil profiles and at the tested depths of the soil profiles on **Figure 7.**

8.0 GEOTECHNICAL ANALYSIS

Bearing Capacity

Analysis of the foundation bearing capacity and subgrade settlement were based on a fill elevation of +135 ft-NGVD with side slopes of 4:1 (H:V), and an average fill density of 60 pounds per cubic foot. Based on ground surface elevations, the height of the landfill will be approximately 100 feet above natural grade. The bottom of the landfill will be a minimum of 3 feet below the lowest adjacent grade.

The bearing capacity of the landfill is a function of the density of the soils and the depths of the landfill materials below the adjacent ground surface. Soil density was defined by the Standard Penetration Test (SPT) N-value. Based on the assumptions stated above and on the data obtained from the borings, a net allowable foundation bearing pressure of 19,583 pounds per square foot was calculated. The net foundation load is estimated to be approximately 6,000 pounds per square foot, for a worst case area, which is well below the capacity of the foundation soils. The results of the evaluation are presented in **Attachment A.**

An additional bearing capacity analysis was conducted at the top of the first encountered clay layer. The purpose of this analysis was to verify sufficient bearing capacity at the clay interface and to ensure bearing pressure of the landfill material does not impact the slurry wall. For this analysis it was assumed that the clay depth is 20 feet below existing grade. Based on the assumptions stated above and on the data obtained from the borings, a net allowable foundation bearing pressure of 28,102 pounds per square foot was calculated, which is well above the estimated net foundation load. The results of the additional evaluation are also presented in **Attachment A.**

Based on the analysis, bearing failure is not a concern for this landfill design. As such, the perimeter slurry wall will not be impacted by vertical or lateral ground movements resulting from foundation bearing instability. The more critical stability component with regard to the existing slurry wall will be vertical settlement due to consolidation of the sands and clays underling the landfill.

Slope Stability

The stability of the proposed Stage 2 landfill was evaluated along selected critical sections of the landfill profile. For each of the sections, the stability was analyzed for the end-of-construction conditions representing long term stability of the landfill. A total of four (4) landfill cross sections were evaluated. The cross section transect locations are presented on the attached **Figure 9.**

The long term stability analyses were performed using "Effective Stress Stability Analysis (ESSA)". The effective stress strength parameters for the various soil layers were assumed conservatively using the laboratory test data and empirical relationships.

The stability of the slopes was analyzed using STABL for Windows. The soft clay layer found at approximately 20 feet is the weakest layer in the soil profile and the minimum factor of safety for the slopes was analyzed using sliding block failure surfaces through the soft clay layer. A

critical failure surface searching method using a random technique for generating sliding block surfaces passing through the soft clay was used. The stability analyses were performed using Modified Janbu Method and the active and passive portions of the sliding surfaces were generated according to Rankine's theory.

The results of the stability analyses are presented in the plots and text outputs in **Attachment B**. The minimum factor of safety values for all sections are tabulated below:

Cross Section	Factor of Safety
A-A'	1.70
B-B'	1.90
C-C'	1.93
D-D'	1.68

The lowest resulting factor of safety of 1.68 is greater than 1.5, the required minimum factor of safety specified in 62-701.400 FAC. Thus, the landfill slopes are considered stable.

Settlement

To evaluate the impact of potential total settlement due to the loads to be placed in the Stage 2 landfill, settlement calculations were conducted for the encountered subsurface conditions at individual boring locations. The total settlement of the soil column for each boring location was calculated using elastic settlement equations for the sand layers and consolidation settlement methods for cohesive material. Settlement calculations were conducted at each of the boring locations presented herein, and at two locations within the landfill footprint from the previous geotechnical studies. The total settlement calculated for each boring location is summarized below:

Settlement Calculation Results	
Boring	**Settlement (ft)**
B-1	0.90
B-2	1.15
B-3	0.72
B-4	0.67
B-5	0.75

B-6	0.74
B-7	0.39
B-8	0.98
B-9	0.36
TH-16	0.80
TH-17	0.77

The results of the evaluation are presented in **Attachment C** along with supporting references and additional information regarding assumptions.

Settlement Contouring

The GMS computer model was utilized to import the coordinates of the settlement calculation points. The model allows generation of contour maps, color flood maps and 3-D surface maps using the imported data. The areas between data points are interpolated/extrapolated by the model. The model has several interpolative and smoothing methods to create the data sets for mapping. To minimize model related distortions and over-smoothing appearance of the data, we have selected a method that is relatively linear with minimal distortion or smoothing of the data.

The method used to grid the landfill area and to interpolate/extrapolate the data between the boring locations is the Natural Neighbor Method using a constant nodal function. Natural neighbor interpolation is based on the Thiessen polygon network of the scatter point set. The Thiessen polygon network can be constructed from the Delauney triangulation of a scatter point set. A Delauney triangulation is a TIN that has been constructed so that the Delauney criterion has been satisfied.

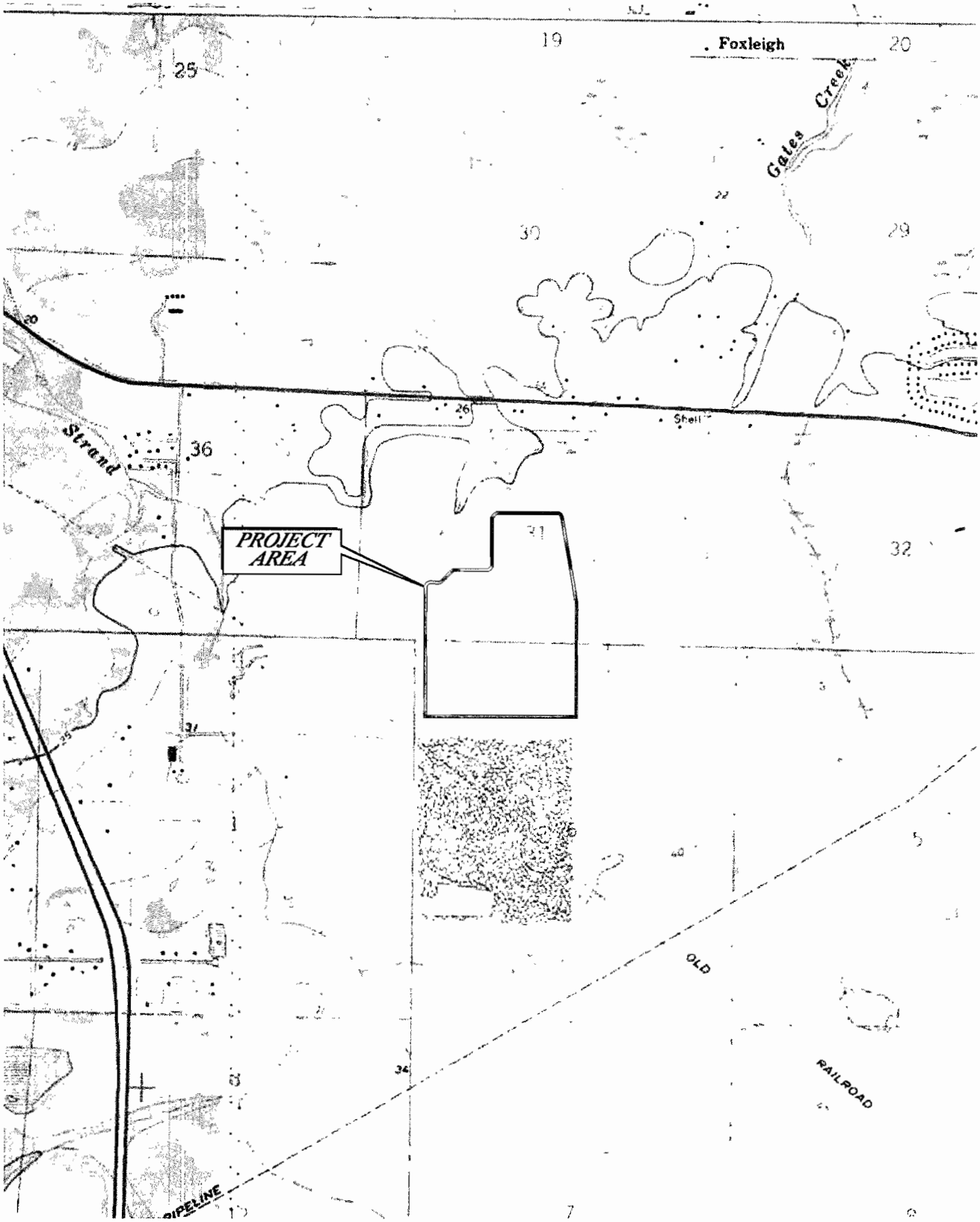
These generated contours are presented on the attached **Figure 10**, and may be used for evaluation of slurry wall impacts and/or leachate pipe slopes.

9.0 SUMMARY AND CONCLUSIONS

The results of the field and laboratory investigations indicate that the subsurface soils across the project area are relatively consistent from one location to the next and are in a dense and stable condition for the purposes of landfill bearing, slope stability and settlement.

Based on review of available literature, survey information, and site specific explorations the sinkhole potential at this site is classified as low.

FIGURES



REFERENCE:
U.S.G.S. LORRAINE, FLA.
QUADRANGLE MAP
DATED 1973
PHOTOREVISED 1987
SECTIONS 6 & 31
TOWNSHIP 34 & 35 SOUTH
RANGE 19 EAST

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

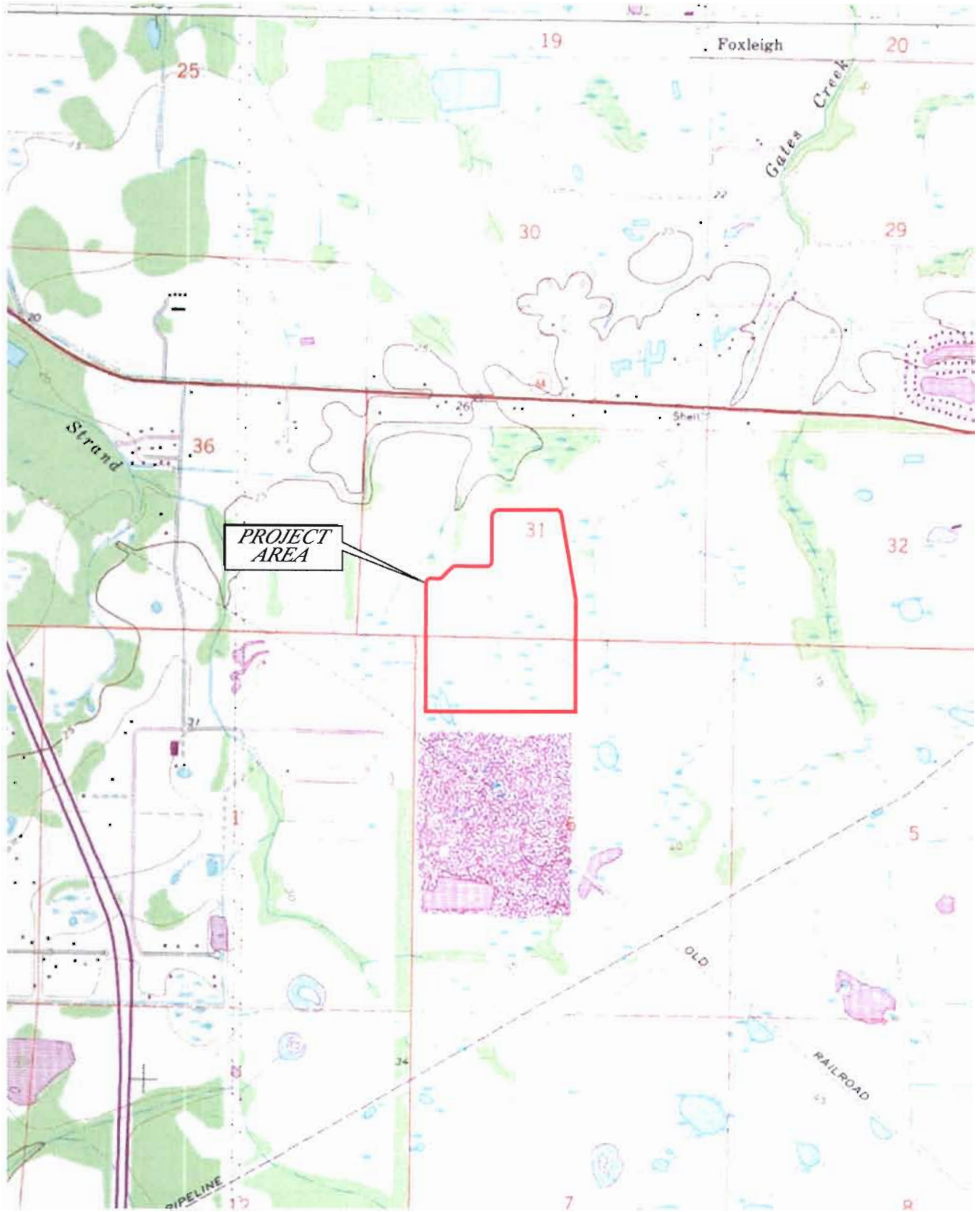
LENA ROAD LANDFILL
STAGE II

MANATEE COUNTY, FL

VICINITY MAP

FIGURE 1

APPROXIMATE SCALE:	DATE: 08/27/10	ENGINEER: SC
1"=2000'	PN: CPGT-10-0062	DRAWN BY: DLS



REFERENCE:
U.S.G.S. LORRAINE, FLA.
QUADRANGLE MAP
DATED 1973
PHOTOREVISED 1987
SECTIONS 6 & 31
TOWNSHIP 34 & 35 SOUTH
RANGE 19 EAST

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

LENA ROAD LANDFILL STAGE II

MANATEE COUNTY, FL

APPROXIMATE SCALE:	DATE: 08/27/10	ENGINEER: SC
1"=2000'	PN: CPGT-10-0062	DRAWN BY: DLS

VICINITY MAP

FIGURE 1

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

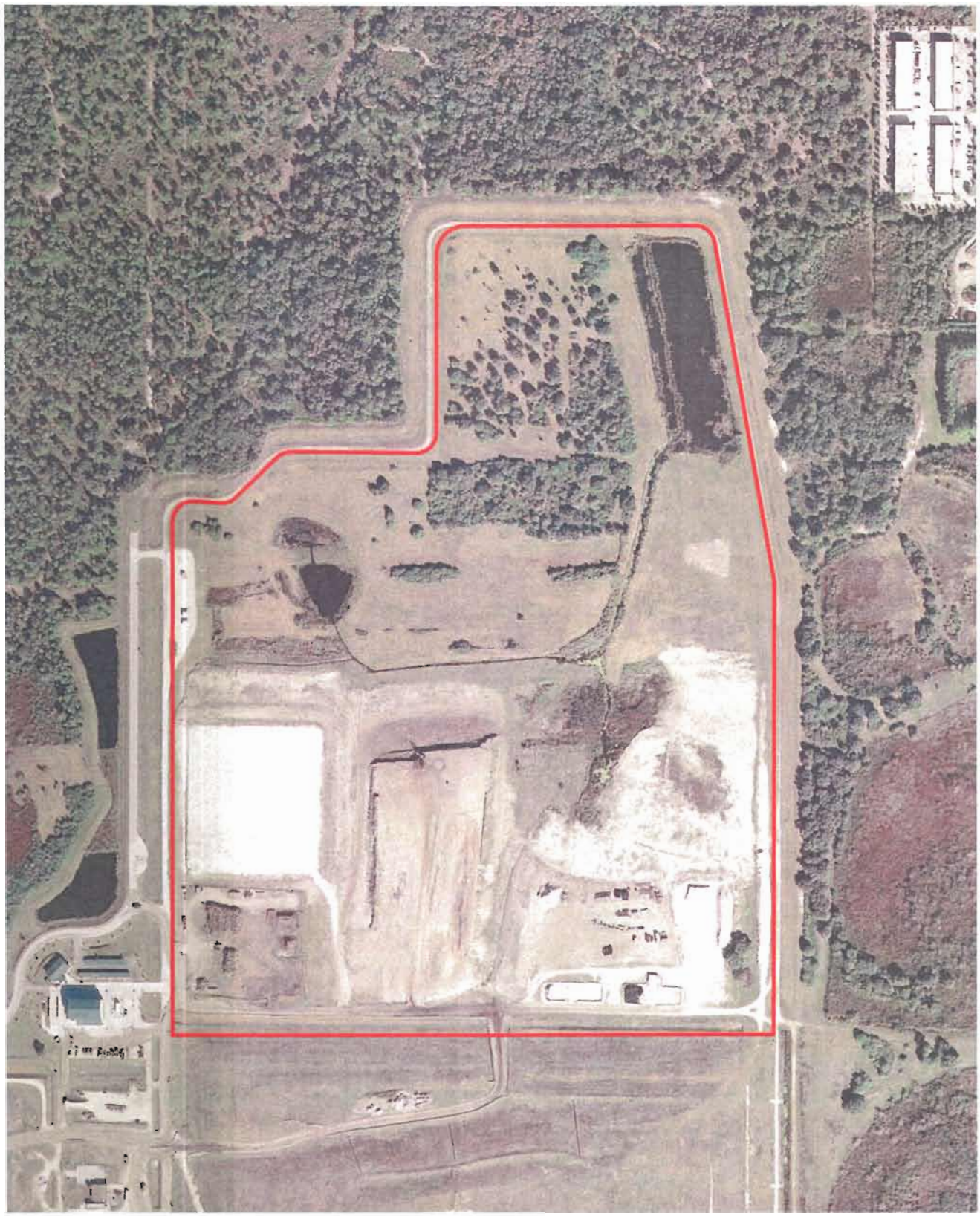
LENA ROAD LANDFILL
STAGE II

MANATEE COUNTY, FL

SCS SOIL SURVEY

APPROXIMATE SCALE:	DATE: 08/27/10	ENGINEER: SC
1"=1000'	PN: CPGT-10-0062	DRAWN BY: DLS

FIGURE 2



LEGEND:

APPROXIMATE SUBJECT PROPERTY BOUNDARY

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

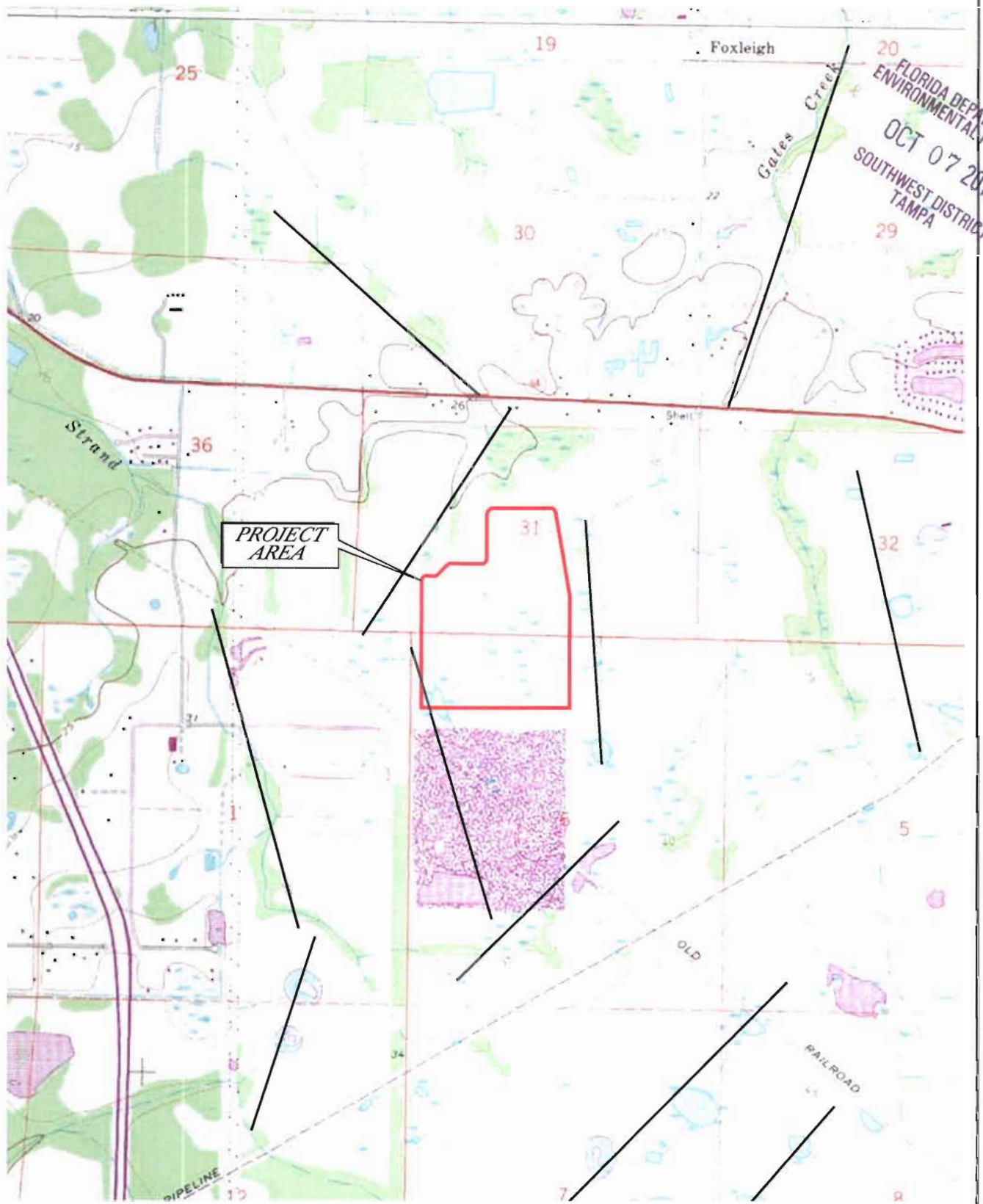
LENA ROAD LANDFILL STAGE II

MANATEE COUNTY, FL

2009 AERIAL PHOTOGRAPH

APPROXIMATE SCALE:	DATE: 08/27/10	ENGINEER: SC
1"=500'	PN: CPGT-10-0062	DRAWN BY: DLS

FIGURE 3



REFERENCE:
U.S.G.S. LORRAINE, FLA.
QUADRANGLE MAP
DATED 1973
PHOTOREVISED 1987
SECTIONS 6 & 31
TOWNSHIP 34 & 35 SOUTH
RANGE 19 EAST

Andreyev Engineering, Inc.

APPROXIMATE SCALE:	DATE: 09/24/10	ENGINEER: SC
1"=2000'	PN: CPGT-10-0062	DRAWN BY: DLS

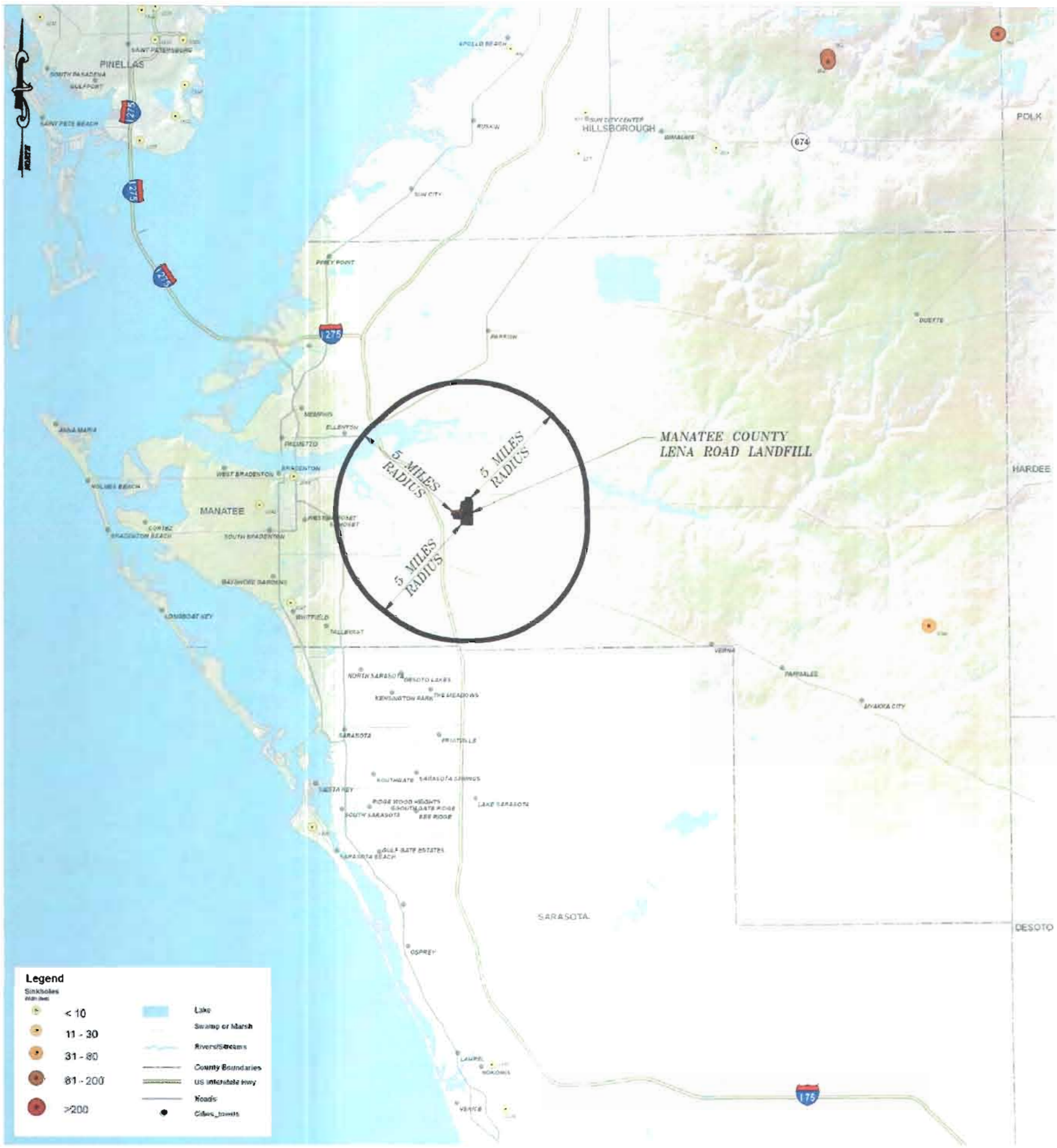
GEOTECHNICAL INVESTIGATION

LENA ROAD LANDFILL STAGE II

MANATEE COUNTY, FL

PHOTOLINEAMENT MAP

FIGURE 4



REFERENCE:
SINKHOLES OF MANATEE COUNTY, FLORIDA, 2008
FLORIDA CENTER FOR INSTRUCTIONAL TECHNOLOGY, SINKHOLES
(TAMPA, FL: UNIVERSITY OF SOUTH FLORIDA, 2008)
DOWNLOADED FROM MAPS ETC, ON THE WEB AT HTTP://ETC.USF.EDU/MAPS
[MAP#F11142]

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
OCT 07 2010
SOUTHWEST DISTRICT
TAMPA

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION
LENA ROAD LANDFILL
STAGE II
MANATEE COUNTY, FL

DOCUMENTED SINKHOLE MAP

APPROXIMATE SCALE:	DATE: 09/24/10	ENGINEER: SC
1"=5 MILES	PN: CPGT--10-0062	DRAWN BY: DLS

FIGURE: 5

LEGEND:

- APPROXIMATE LOCATION OF SPT BORING
- APPROXIMATE LOCATION OF PREVIOUS SPT BORING DRILLED BY ARDAMAN & ASSOCIATES (REFER TO REPORT DATE AUGUST 29, 1985).

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

LENA ROAD LANDFILL STAGE II

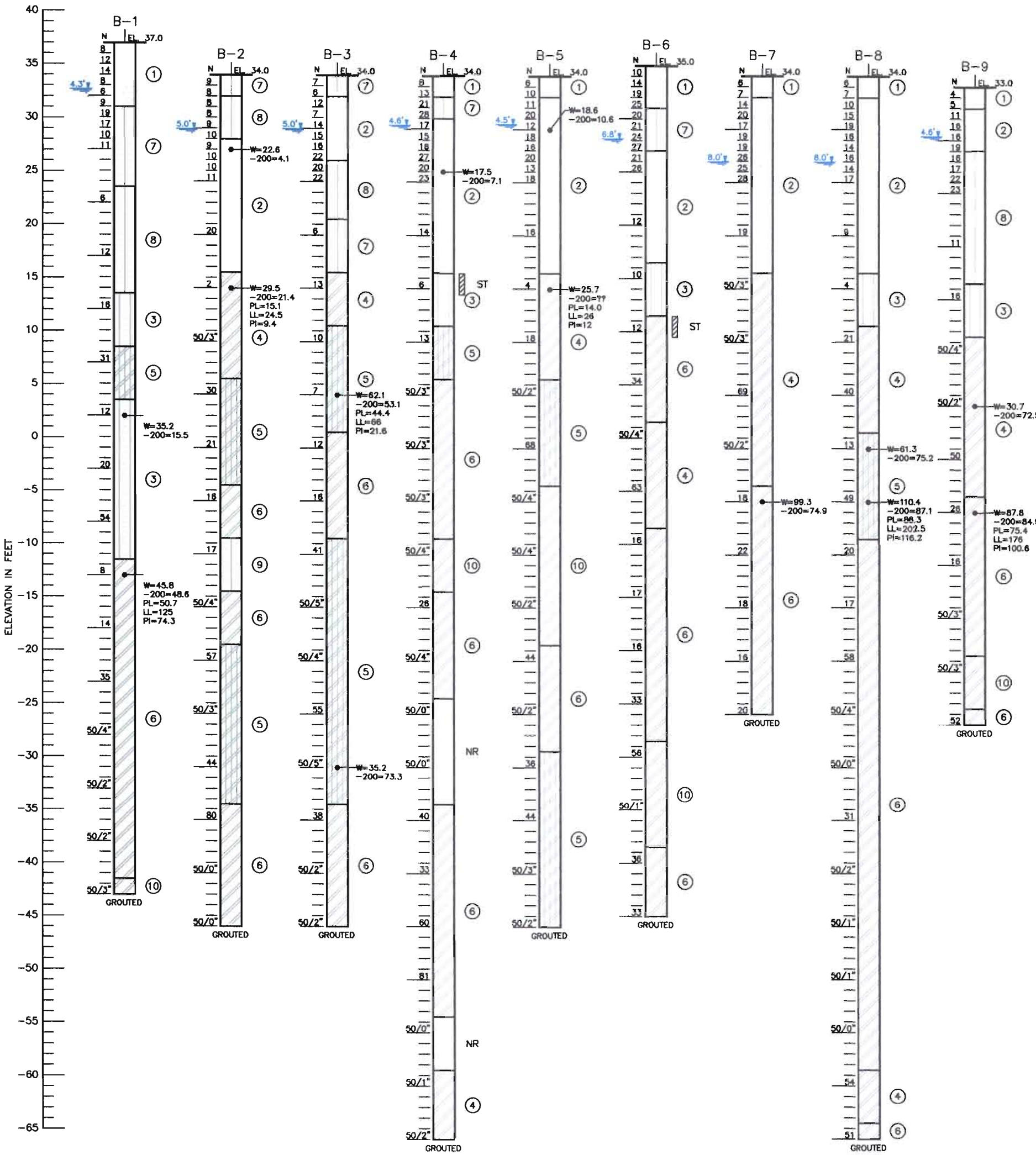
MANATEE COUNTY, FL

BORING LOCATION PLAN

FIGURE: 6

APPROXIMATE SCALE:	DATE: 08/27/10	ENGINEER: S
1"=300'	PN: CPGT-10-0062	DRAWN BY: DLS

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOLID WASTE DISTRICT
OCT 7 2010



LEGEND:

- (1) LIGHT GRAY TO GRAYISH-BROWN FINE SAND (SP)
- (2) LIGHT BROWN TO BROWN FINE SAND (SP)
- (3) GRAY SILTY FINE SAND WITH TRACES OF PHOSPHATES (SM)
- (4) LIGHT BROWN TO BROWN SANDY CLAY WITH TRACES OF PHOSPHATES (CL)
- (5) GREENISH-GRAY SILTY TO SANDY CLAY WITH TRACES OF PHOSPHATES (SM)(CL)
- (6) GREENISH-GRAY CLAY WITH TRACES OF PHOSPHATES (CL)
- (7) DARK REDDISH-BROWN SLIGHLTY SILTY FINE SAND, WEAKLY CEMENTED (SP-SM)
- (8) BROWN SLIGHTLY SILTY FINE SAND (SP-SM)
- (9) GRAYISH-BROWN SLIGHTLY SILTY FINE SAND WITH TRACES OF SHELL & PHOSPHATES (SP-SM)
- (10) BROWN HIGHLY CEMENTED CLAY WITH PHOSPHATES (CL)
- *(SP)* UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL
- 1.0 DEPTH TO GROUNDWATER, JULY, 2010
- *N* STANDARD PENETRATION RESISTANCE, IN BLOWS PER FOOT
- *50/1"* 50 BLOWS OF HAMMER TO ADVANCE SAMPLING TOOL ONE INCH
- *NR* NO SAMPLE RECOVERY
- *ST* SHELBY TUBE
- *W* MOISTURE CONTENT, IN PERCENT
- *-200* PERCENT OF FINES PASSING THE U.S. No. 200 SIEVE
- *PL* PLASTIC LIMIT, IN PERCENT
- *LL* LIQUID LIMIT, IN PERCENT
- *PI* PLASTICITY INDEX, IN PERCENT
- *EL.* GROUND ELEVATION AT BORING LOCATION (FT - STATE PLANE FLORIDA EAST ZONE NAT 83)

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

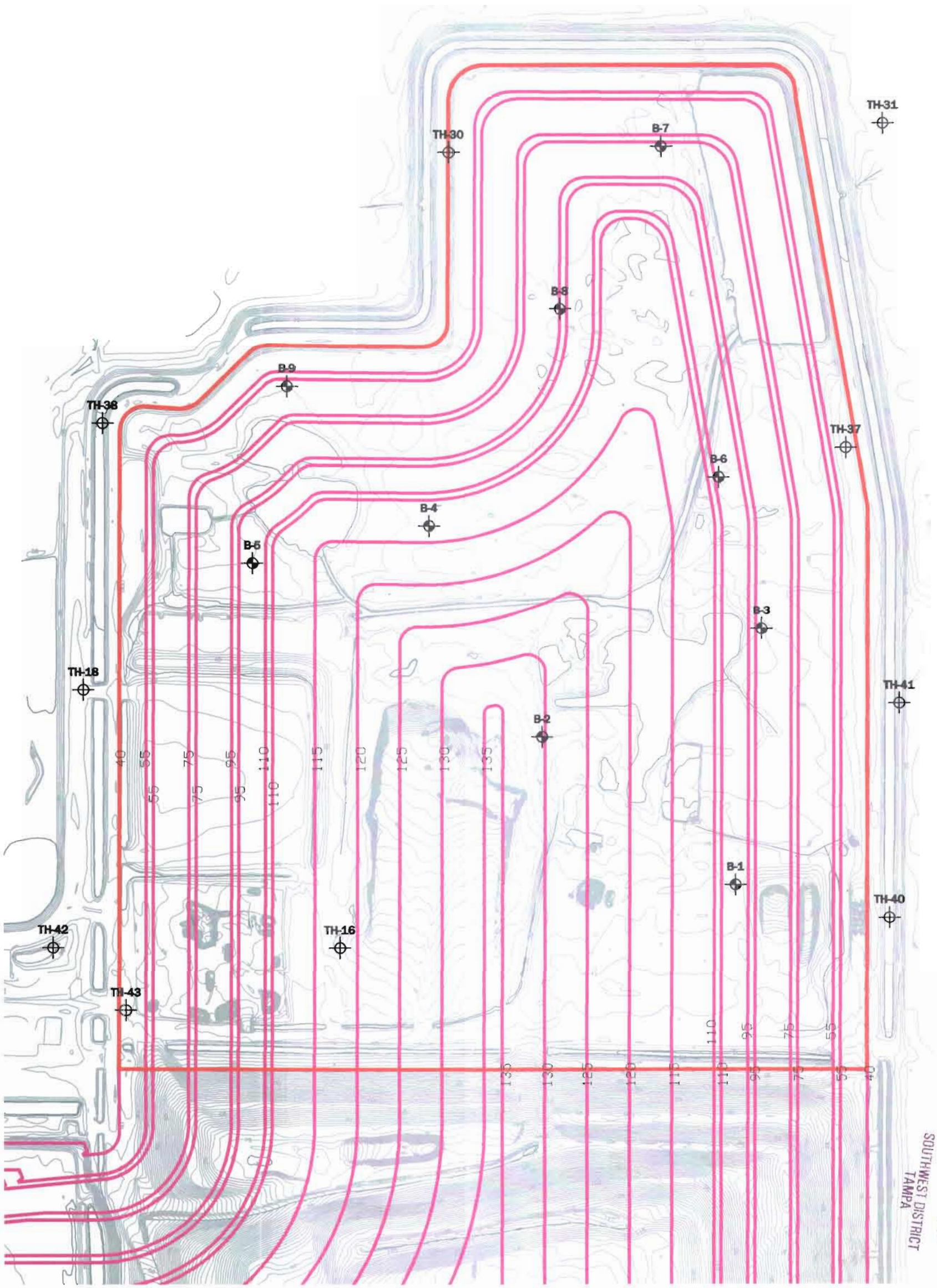
LENA ROAD LANDFILL STAGE II

MANATEE COUNTY, FL

SOIL PROFILES

APPROXIMATE SCALE:	DATE: 08/30/10	ENGINEER: SC
1"=10'	PN: CPGT-10-0062	DRAWN BY: DLS

FIGURE 7



LEGEND:

- APPROXIMATE LOCATION OF SPT BORING
- APPROXIMATE LOCATION OF PREVIOUS SPT BORING DRILLED BY ARDAMAN & ASSOCIATES (REFER TO REPORT DATE AUGUST 29, 1985)

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

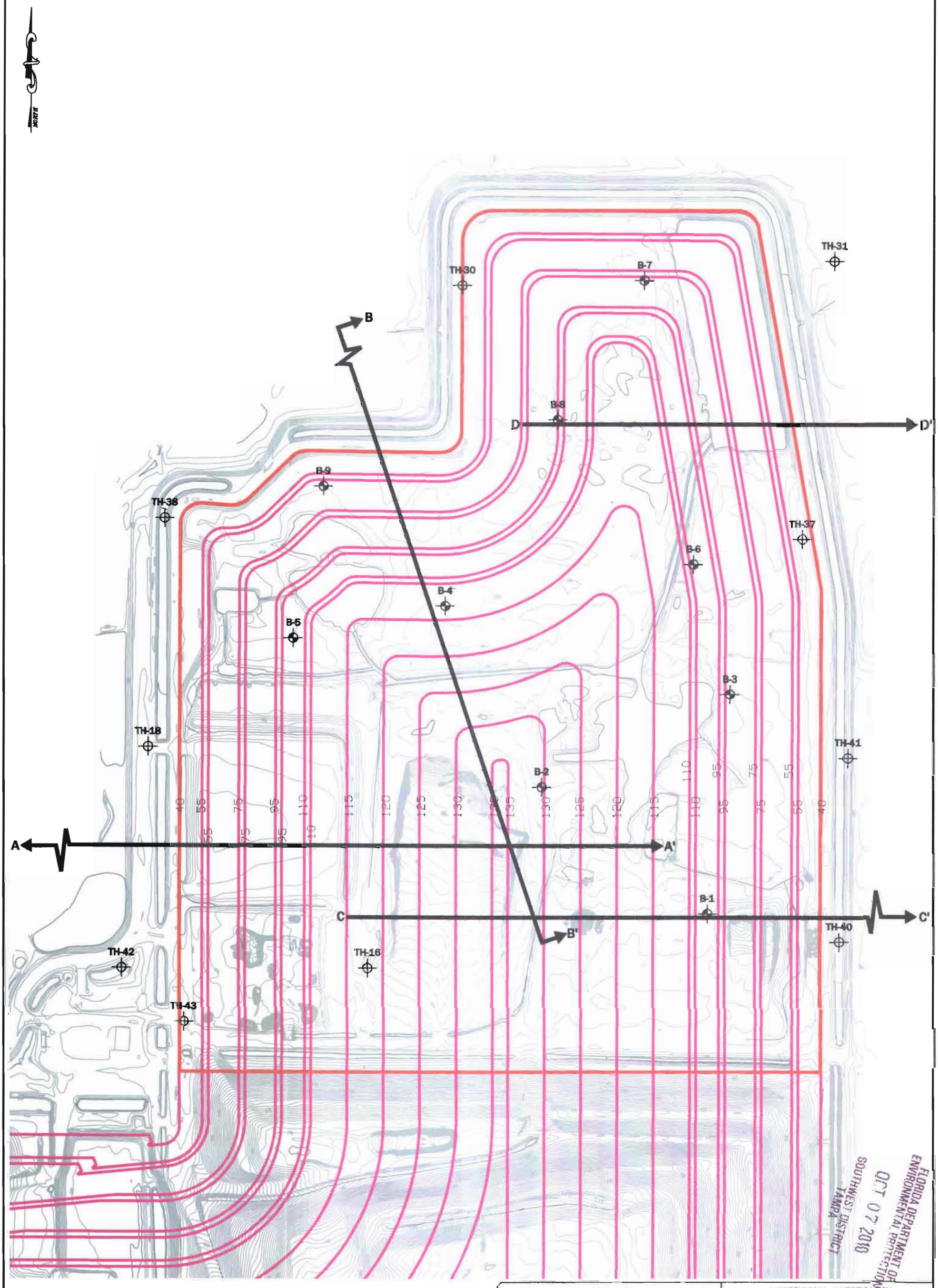
LENA ROAD LANDFILL STAGE II

MANATEE COUNTY, FL

LANDFILL GRADING PLAN

FIGURE 8

APPROXIMATE SCALE:	DATE: 08/27/10	ENGINEER: SC
1"=300'	PN: CPGT-10-0062	DRAWN BY: DLS



LEGEND:

A A' SLOPE TRANSECT ANALYZED FOR SLOPE STABILITY

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION

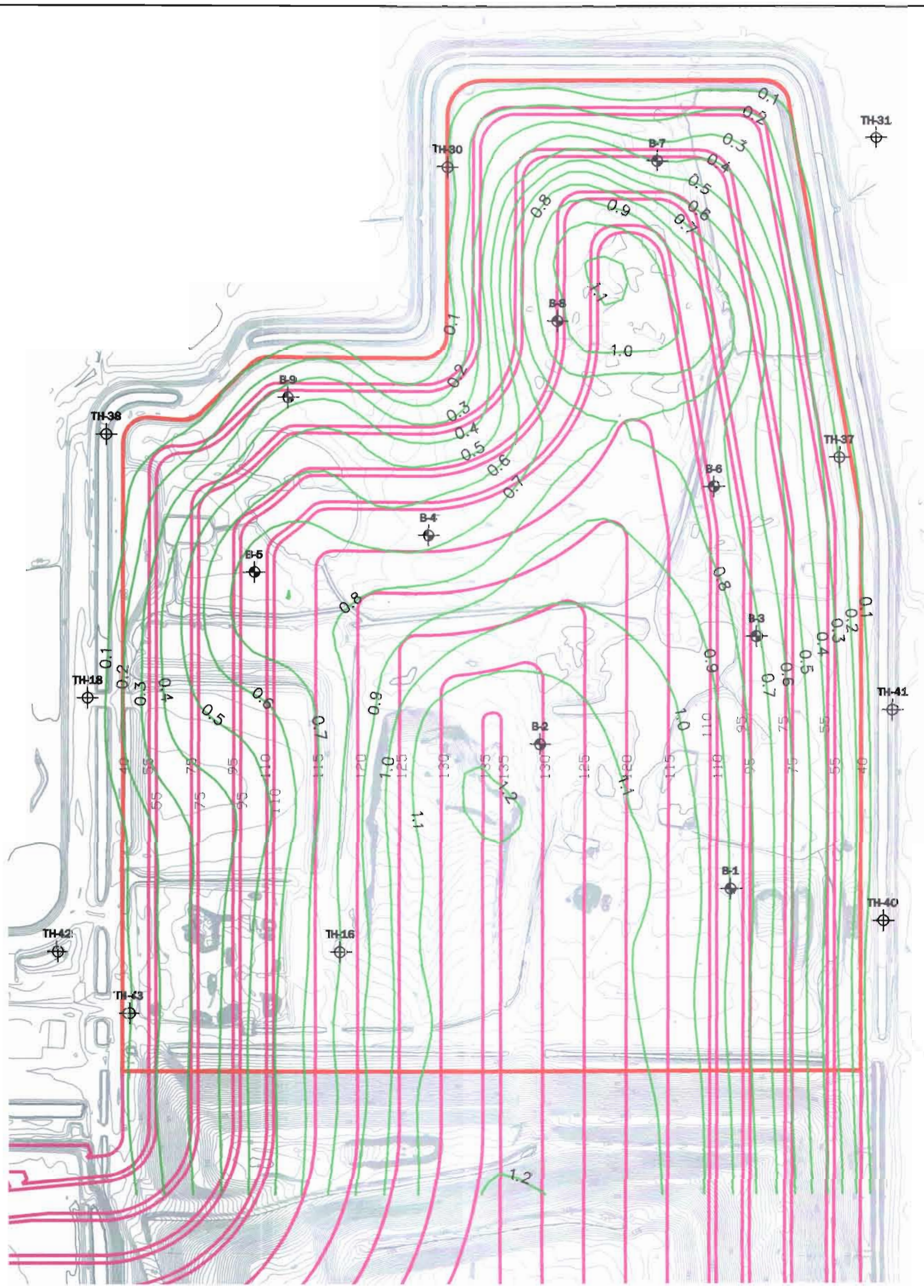
LIENA ROAD LANDFILL STAGE II

MANATEE COUNTY, FL

SLOPE STABILITY TRANSECTS

APPROXIMATE SCALE:	DATE: 09/24/10	ENGINEER: SC
1"=300'	PN:CPGT-10--0062	DRAWN BY: LS

FIGURE 9



LEGEND:

- APPROXIMATE LOCATION OF SPT BORING
- APPROXIMATE LOCATION OF PREVIOUS SPT BORING DRILLED BY ARDAMAN & ASSOCIATES (REFER TO REPORT DATE AUGUST 29, 1985)
- 0.1 SETTLEMENT CONTOUR (FT)

Andreyev Engineering, Inc.

GEOTECHNICAL INVESTIGATION
LENA ROAD LANDFILL STAGE II
MANATEE COUNTY, FL.

SETTLEMENT CONTOURS

APPROXIMATE SCALE:	DATE: 09/16/10	ENGINEER: SC
1"=300'	PN: CPGT-10-6662	DRAWN BY: DLS

FIGURE 10

ATTACHMENT A

BEARING CAPACITY ANALYSIS RESULTS

BEARING CAPACITY ANALYSIS

PROJECT: LENA ROAD LANDFILL, STAGE 2

Enter soil characteristics

Cohesion, c =	0	psf	
Friction angle, ϕ =	29	degrees	**(whole degrees, <50, preferably)**
Unit weight, γ =	100	pcf	

The above entries yield the following factors:

c' =	0.00		
ϕ' =	20.3		
*N_q' =	6.58	**N_q' =	7.5
*N_c' =	15.10	**N_c' =	18.1
*N_γ' =	5.60	**N_γ' =	5.2
*N_q =	16.44	**N_q =	20.4
*N_c =	27.86	**N_c =	33.4
*N_γ =	19.34	**N_γ =	17.8

*N factors from Eqs. 10-32,34,36. (Method 1)

**N factors from fig. 10.7 & 10.8 (Method 2)

Determine whether footing is a strip (length to width ratio >= 5); square; circular; or rectangular.

Enter St for strip, Sq for square, C for circular, or R for rectangular.

Enter here ⟶ sq

Footing shape is: square

Enter smallest lanfill dimension

B =	1000	feet
Df =	36	inches

FOR LOCAL SHEAR FAILURE:

q_u' = 20,650 psf	**q_u' = 19,583 psf**
Method 1	Method 2

FOR GENERAL SHEAR FAILURE:

q_u = 69,393 psf	**q_u = 65,453 psf**
Method 1	Method 2

Note:The above values for q_u' and q_u have been calculated by selective use of the following formulae.

$q_u' = c' N_c' + q N_q' + 0.5 \gamma B N_\gamma'$ (strip ftg.)

$q_u' = 1.3 c' N_c' + q N_q' + 0.4 \gamma B N_\gamma'$ (square ftg.)

$q_u' = 1.3 c' N_c' + q N_q' + 0.3 \gamma B N_\gamma$ (circular ftg.)

$q_u = c N_c + q N_q + 0.5 \gamma B N_\gamma$ (strip ftg.)

$q_u = 1.3 c N_c + q N_q + 0.4 \gamma B N_\gamma$ (square ftg.)

$q_u = 1.3 c N_c + q N_q + 0.3 \gamma B N_\gamma$ (circular ftg.)

Terzaghi's Ultimate Bearing Capacity Equation

Reference: Principles of Geotechnical Engineering, Das, section 10 - 2

BEARING CAPACITY ANALYSIS

PROJECT: LENA ROAD LANDFILL, STAGE 2 - Deeper clay stratum

Enter soil characteristics

Cohesion, c =	1000	psf	
Friction angle, ϕ =	22	degrees	**(whole degrees, <50, preferably)**
Unit weight, γ =	110	pcf	

The above entries yield the following factors:

c' =	666.67		
ϕ' =	15.1		
*N_q' =	3.97	**N_q' =	4.3
*N_c' =	11.02	**N_c' =	13
*N_γ' =	2.68	**N_γ' =	2.1
*N_q =	7.82	**N_q =	9.1
*N_c =	16.88	**N_c =	20.2
*N_γ =	7.13	**N_γ =	6.66
*N factors from Eqs. 10-32,34,36. (Method 1)		**N factors from fig. 10.7 & 10.8 (Method 2)	

Determine whether footing is a strip (length to width ratio >= 5); square; circular; or rectangular.

Enter St for strip, Sq for square, C for circular, or R for rectangular.

Enter here ⟶ sq

Footing shape is: square

Enter smallest landfill dimension

B =	1000	feet
Df =	240	inches

FOR LOCAL SHEAR FAILURE:

q_u' = 28,102 psf (Method 1)

q_u' = 28,427 psf (Method 2)

FOR GENERAL SHEAR FAILURE:

q_u = 65,290 psf (Method 1)

q_u = 70,700 psf (Method 2)

Note: The above values for q_u' and q_u have been calculated by selective use of the following formulae.

$q_u' = c' N_c' + q N_q' + 0.5 \gamma B N_\gamma'$ (strip ftg.)

$q_u' = 1.3 c' N_c' + q N_q' + 0.4 \gamma B N_\gamma'$ (square ftg.)

$q_u' = 1.3 c' N_c' + q N_q' + 0.3 \gamma B N_\gamma$ (circular ftg.)

$q_u = c N_c + q N_q + 0.5 \gamma B N_\gamma$ (strip ftg.)

$q_u = 1.3 c N_c + q N_q + 0.4 \gamma B N_\gamma$ (square ftg.)

$q_u = 1.3 c N_c + q N_q + 0.3 \gamma B N_\gamma$ (circular ftg.)

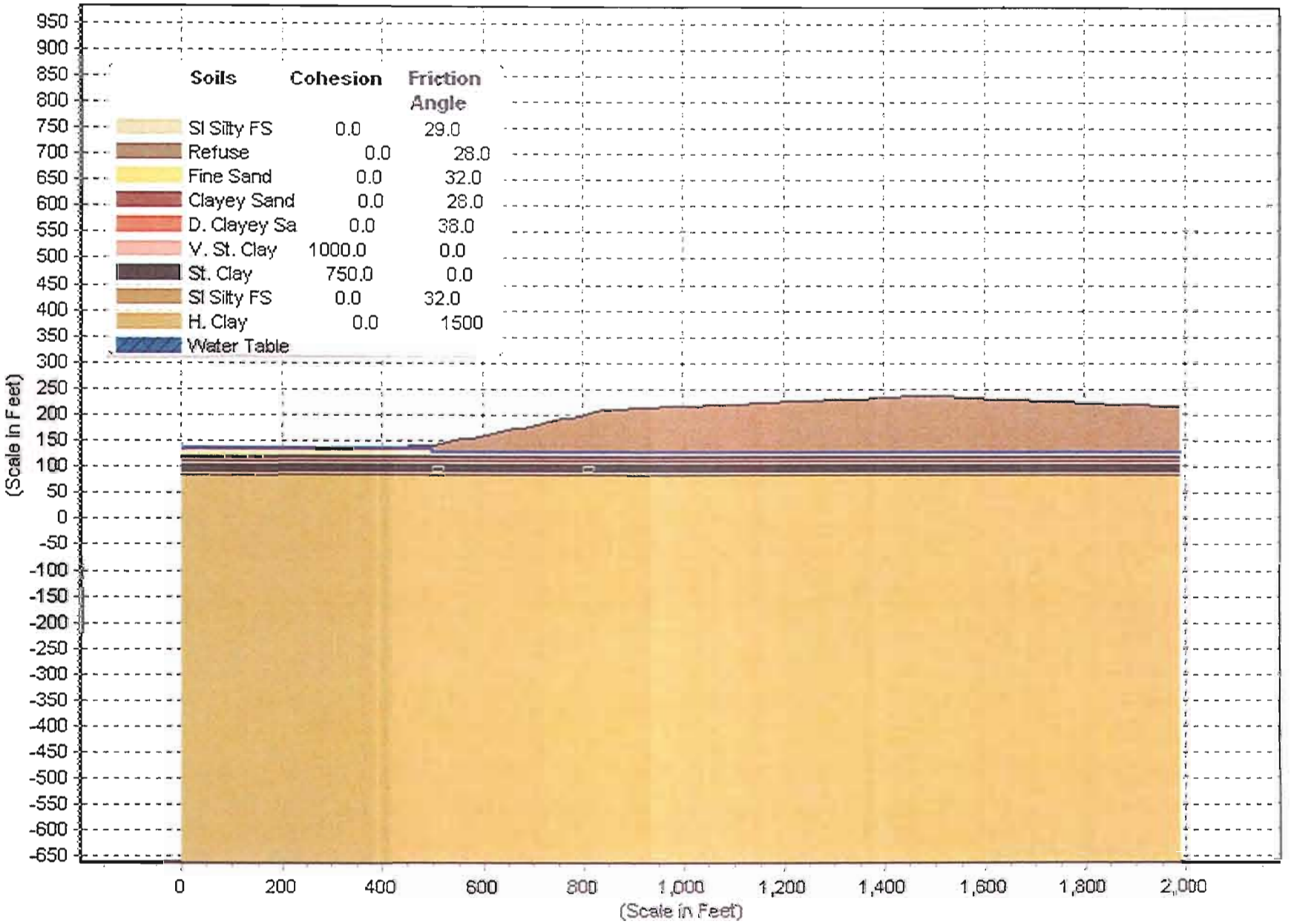
Terzaghi's Ultimate Bearing Capacity Equation

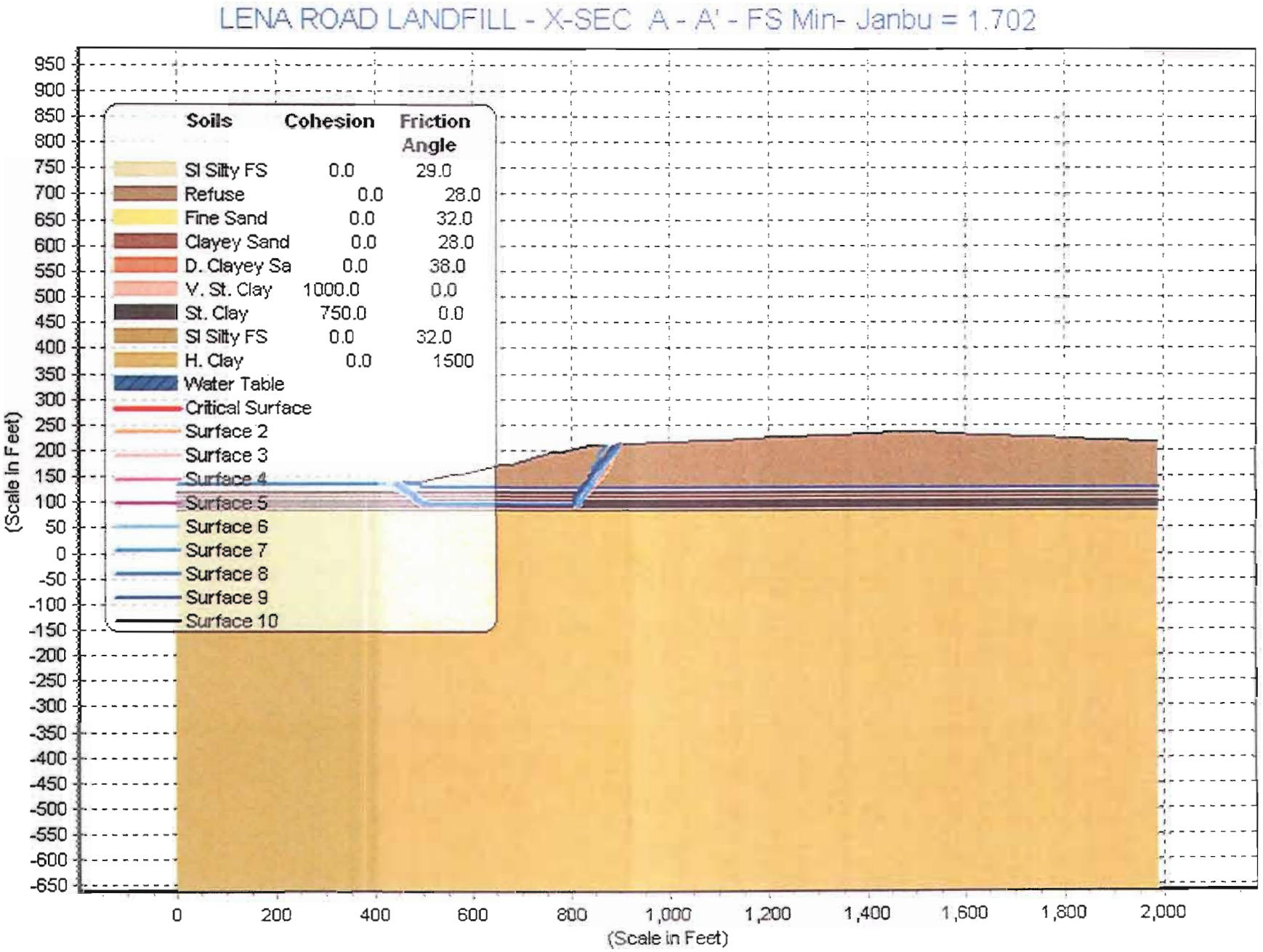
Reference: Principles of Geotechnical Engineering, Das, section 10 - 2

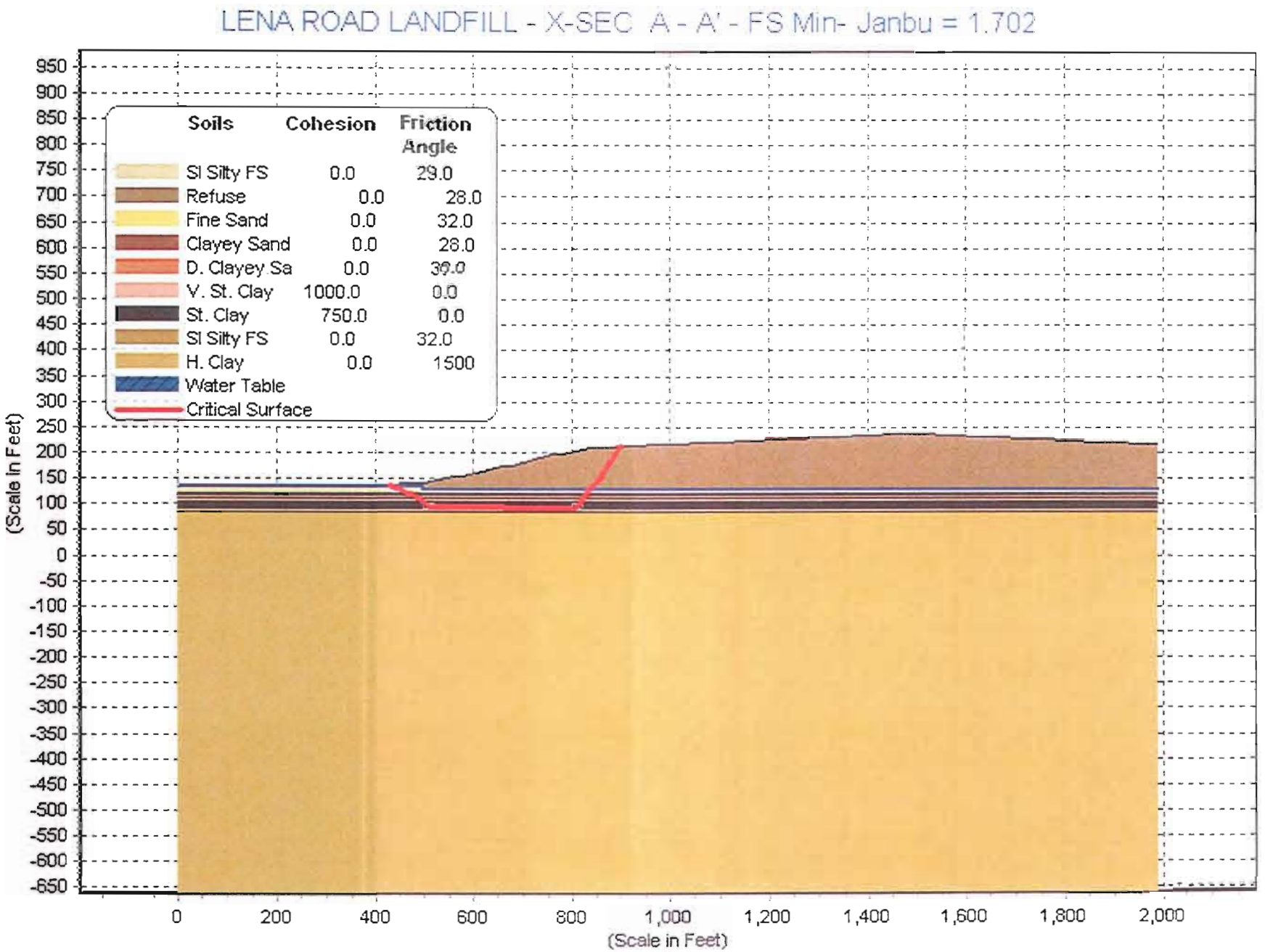
ATTACHMENT B

SLOPE STABILITY ANALYSIS RESULTS

LENA ROAD LANDFILL - X-SEC A - A'




LENA ROAD LANDFILL - X-SEC A - A' - FS Min- Janbu = 1.702
Soils
Cohesion
Friction Angle
SI Silty FS 0.0 29.0
Refuse 0.0 28.0
Fine Sand 0.0 32.0
Clayey Sand 0.0 28.0
D. Clayey Sa 0.0 38.0
V. St. Clay 1000.0 0.0
St. Clay 750.0 0.0
SI Silty FS 0.0 32.0
H. Clay 0.0 1500
Water Table
Critical Surface
Surface 2
Surface 3
Surface 4
Surface 5
Surface 6
Surface 7
Surface 8
Surface 9
Surface 10
(Scale in Feet)
(Scale in Feet)


LENA ROAD LANDFILL - X-SEC A - A' - FS Min- Janbu = 1.702
Soils
Cohesion
Friction Angle
Sl Silty FS 0.0 29.0
Refuse 0.0 28.0
Fine Sand 0.0 32.0
Clayey Sand 0.0 28.0
D. Clayey Sa 0.0 30.0
V. St. Clay 1000.0 0.0
St. Clay 750.0 0.0
Sl Silty FS 0.0 32.0
H. Clay 0.0 1500
Water Table
Critical Surface
(Scale in Feet)
(Scale in Feet)

result.out
** STABL for WINDOWS **
by
Geotechnical Software Solutions

1

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

Run Date: 9/27/10
Time of Run: 14:00
Run By: Shawkat Ali
Input Data Filename: run.in
Output Filename: result.out
Unit: U.S.C.
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION LENA ROAD LANDFILL - X-SEC A - A'

BOUNDARY COORDINATES

20 Top Boundaries
29 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	135.00	300.00	135.00	2
2	300.00	135.00	500.00	140.00	2
3	500.00	140.00	560.00	155.00	1
4	560.00	155.00	580.00	155.00	1
5	580.00	155.00	660.00	175.00	1
6	660.00	175.00	680.00	175.00	1
7	680.00	175.00	760.00	195.00	1
8	760.00	195.00	780.00	195.00	1
9	780.00	195.00	840.00	210.00	1
10	840.00	210.00	860.00	210.00	1
11	860.00	210.00	980.00	215.00	1
12	980.00	215.00	1100.00	220.00	1
13	1100.00	220.00	1220.00	225.00	1
14	1220.00	225.00	1340.00	230.00	1
15	1340.00	230.00	1460.00	235.00	1
16	1460.00	235.00	1510.00	235.00	1
17	1510.00	235.00	1630.00	230.00	1
18	1630.00	230.00	1750.00	225.00	1
19	1750.00	225.00	1870.00	220.00	1
20	1870.00	220.00	1990.00	215.00	1
21	500.10	127.00	500.20	140.00	1
22	500.10	127.00	1990.00	127.00	2
23	0.00	121.50	1990.00	121.50	3
24	0.00	116.50	1990.00	116.50	4
25	0.00	111.50	1990.00	111.50	5
26	0.00	105.50	1990.00	105.50	6
27	0.00	100.50	1990.00	100.50	7

28	0.00	90.50	1990.00	90.50	8
29	0.00	85.50	1990.00	85.50	9

1

ISOTROPIC SOIL PARAMETERS

9 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	70.0	80.0	0.0	28.0	0.00	0.0	1
2	95.0	105.0	0.0	29.0	0.00	0.0	1
3	105.0	115.0	0.0	32.0	0.00	0.0	1
4	95.0	110.0	0.0	28.0	0.00	0.0	1
5	115.0	125.0	0.0	38.0	0.00	0.0	1
6	110.0	125.0	1000.0	0.0	0.00	0.0	1
7	105.0	120.0	750.0	0.0	0.00	0.0	1
8	105.0	115.0	0.0	32.0	0.00	0.0	1
9	115.0	130.0	0.0	1500.0	0.00	0.0	0

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	133.00
2	500.00	133.00
3	500.10	127.00
4	1990.00	127.00

1

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

100 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 10.0

Box	X-Left	Y-Left	X-Right	Y-Right	Height

No.	(ft)	(ft)	(ft)	(ft)	(ft)
1	500.00	95.00	520.00	95.00	10.00
2	800.00	95.00	820.00	95.00	10.00

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 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	430.66	138.27
2	437.61	133.90
3	447.33	131.55
4	455.94	126.46
5	464.33	121.02
6	474.22	119.59
7	481.75	113.01
8	491.57	111.12
9	499.78	105.42
10	507.00	98.50
11	516.48	95.30
12	808.13	90.55
13	814.38	98.35
14	821.36	105.52
15	825.28	114.72
16	831.81	122.29
17	838.64	129.60
18	844.03	138.02
19	851.09	145.10
20	858.10	152.23
21	864.73	159.72
22	868.90	168.81
23	873.70	177.58
24	879.53	185.71
25	885.94	193.38
26	891.28	201.84
27	897.96	209.27
28	900.16	211.67

*** 1.702 ***

Individual data on the 50 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

1	6.9	1497.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.7	1781.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	6.0	3652.0	0.0	279.2	0.0	0.0	0.0	0.0	0.0
4	8.6	8346.3	0.0	2492.2	0.0	0.0	0.0	0.0	0.0
5	7.6	11600.4	0.0	5131.6	0.0	0.0	0.0	0.0	0.0
6	0.7	1342.1	0.0	645.9	0.0	0.0	0.0	0.0	0.0
7	9.9	19169.5	0.0	7920.8	0.0	0.0	0.0	0.0	0.0
8	3.5	7815.3	0.0	4380.7	0.0	0.0	0.0	0.0	0.0
9	4.0	10344.5	0.0	6040.8	0.0	0.0	0.0	0.0	0.0
10	7.8	22609.3	0.0	10346.2	0.0	0.0	0.0	0.0	0.0
11	2.0	5915.0	0.0	2718.2	0.0	0.0	0.0	0.0	0.0
12	8.1	27407.9	0.0	15183.7	0.0	0.0	0.0	0.0	0.0
13	0.1	444.7	0.0	248.0	0.0	0.0	0.0	0.0	0.0
14	0.2	826.0	0.0	524.1	0.0	0.0	0.0	0.0	0.0
15	0.1	317.4	0.0	107.4	0.0	0.0	0.0	0.0	0.0
16	0.1	342.0	0.0	189.6	0.0	0.0	0.0	0.0	0.0
17	4.7	17676.5	0.0	9874.9	0.0	0.0	0.0	0.0	0.0
18	2.1	8794.0	0.0	4962.0	0.0	0.0	0.0	0.0	0.0
19	9.5	43816.8	0.0	18783.0	0.0	0.0	0.0	0.0	0.0
20	43.5	231696.8	0.0	87073.0	0.0	0.0	0.0	0.0	0.0
21	20.0	115325.5	0.0	40656.7	0.0	0.0	0.0	0.0	0.0
22	80.0	525118.9	0.0	*******	0.0	0.0	0.0	0.0	0.0
23	20.0	147233.9	0.0	42689.3	0.0	0.0	0.0	0.0	0.0
24	80.0	652752.2	0.0	*******	0.0	0.0	0.0	0.0	0.0
25	20.0	179142.2	0.0	44721.9	0.0	0.0	0.0	0.0	0.0
26	28.1	260222.0	0.0	63592.1	0.0	0.0	0.0	0.0	0.0
27	6.3	56944.2	0.0	20310.1	0.0	0.0	0.0	0.0	0.0
28	2.1	17923.3	0.0	5150.0	0.0	0.0	0.0	0.0	0.0
29	4.9	39923.0	0.0	10447.9	0.0	0.0	0.0	0.0	0.0
30	0.0	167.6	0.0	40.6	0.0	0.0	0.0	0.0	0.0
31	2.5	19311.3	0.0	7497.2	0.0	0.0	0.0	0.0	0.0
32	1.4	9697.5	0.0	3034.9	0.0	0.0	0.0	0.0	0.0
33	1.5	10465.8	0.0	1669.8	0.0	0.0	0.0	0.0	0.0
34	4.3	27982.3	0.0	3297.6	0.0	0.0	0.0	0.0	0.0
35	0.7	4230.7	0.0	332.8	0.0	0.0	0.0	0.0	0.0
36	4.4	26187.8	0.0	946.9	0.0	0.0	0.0	0.0	0.0
37	2.4	13771.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	1.4	7554.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	4.0	21180.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	7.1	33850.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	7.0	30073.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	1.9	7549.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	4.7	17568.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	4.2	13434.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	4.8	12533.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	5.8	11838.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	6.4	9604.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	5.3	5081.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	6.7	2754.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	2.2	177.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	453.72	138.84
2	460.97	133.30
3	469.35	127.85
4	476.88	121.26
5	485.96	117.07
6	493.04	110.00

7	500.81	103.71
8	508.06	96.82
9	516.26	91.10
10	815.85	95.51
11	822.39	103.07
12	829.13	110.46
13	835.55	118.13
14	842.56	125.26
15	849.29	132.66
16	855.06	140.82
17	861.92	148.10
18	868.72	155.43
19	875.40	162.88
20	881.15	171.05
21	884.74	180.39
22	888.24	189.75
23	889.10	199.72
24	895.03	207.77
25	897.34	211.56

*** 1.707 ***

1

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	438.25	138.46
2	447.00	135.30
3	455.48	130.01
4	462.69	123.07
5	469.80	116.04
6	479.79	115.77
7	488.43	110.74
8	496.83	105.30
9	504.26	98.61
10	511.39	91.61
11	804.09	94.58
12	811.14	101.66
13	817.97	108.97
14	822.01	118.12
15	828.75	125.51
16	833.83	134.12
17	840.49	141.58
18	846.14	149.83
19	853.21	156.91
20	859.11	164.98
21	865.05	173.02
22	872.12	180.09
23	872.78	190.07
24	877.46	198.91
25	881.20	208.18
26	883.66	210.99

*** 1.740 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	443.53	138.59
2	444.99	137.41
3	454.95	136.47
4	463.74	131.70
5	470.81	124.64
6	478.55	118.31
7	487.17	113.24
8	495.25	107.34
9	503.27	101.36
10	512.34	97.16
11	806.86	96.42
12	813.88	103.54
13	820.15	111.33
14	826.41	119.13
15	832.60	126.98
16	839.36	134.35
17	846.11	141.73
18	851.12	150.39
19	857.03	158.45
20	864.10	165.53
21	868.07	174.71
22	874.55	182.31
23	877.38	191.91
24	880.61	201.37
25	884.55	210.56
26	884.79	211.03

*** 1.747 ***

1

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	434.29	138.36
2	441.29	132.24
3	449.59	126.65
4	458.57	122.26
5	466.89	116.71
6	474.38	110.09
7	483.69	106.43
8	490.95	99.56
9	500.32	96.06
10	509.34	91.74
11	816.16	90.55
12	820.01	99.78
13	826.52	107.37
14	831.95	115.77

15	838.79	123.06
16	843.32	131.98
17	847.89	140.87
18	849.44	150.75
19	856.27	158.06
20	862.97	165.48
21	870.04	172.55
22	874.37	181.56
23	879.17	190.34
24	885.68	197.93
25	892.59	205.16
26	896.01	211.50

*** 1.750 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	427.36	138.18
2	432.74	134.16
3	439.86	127.14
4	447.37	120.54
5	457.26	119.03
6	466.08	114.31
7	475.14	110.07
8	482.78	103.63
9	491.54	98.81
10	498.63	91.75
11	508.57	90.72
12	806.03	91.14
13	812.49	98.77
14	819.53	105.88
15	821.22	115.73
16	826.75	124.06
17	831.87	132.66
18	838.87	139.79
19	845.85	146.96
20	852.11	154.75
21	858.64	162.33
22	865.22	169.86
23	872.08	177.13
24	879.15	184.20
25	882.28	193.70
26	889.15	200.97
27	896.11	208.15
28	899.37	211.64

*** 1.756 ***

1

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	411.20	137.78
2	417.82	135.05
3	426.90	130.85
4	436.88	130.21
5	444.83	124.15
6	453.74	119.60
7	463.69	118.64
8	471.13	111.96
9	479.80	106.98
10	488.98	103.00
11	497.29	97.44
12	505.46	91.68
13	816.50	96.03
14	821.86	104.48
15	828.06	112.32
16	835.01	119.51
17	838.06	129.03
18	844.09	137.01
19	850.92	144.31
20	855.92	152.97
21	862.91	160.12
22	867.31	169.10
23	873.12	177.24
24	879.10	185.25
25	886.17	192.32
26	892.80	199.82
27	898.51	208.02
28	900.99	211.71

*** 1.760 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	448.92	138.72
2	451.48	137.33
3	458.82	130.54
4	467.86	126.27
5	475.88	120.30
6	483.39	113.69
7	491.60	107.98
8	499.59	101.97
9	508.04	96.62
10	517.34	92.95
11	803.55	93.01
12	808.25	101.84
13	815.30	108.94
14	819.71	117.91
15	826.65	125.11
16	831.79	133.69
17	837.72	141.74
18	843.00	150.23

19	844.86	160.05
20	846.84	169.86
21	852.79	177.89
22	858.12	186.35
23	861.33	195.82
24	866.83	204.18
25	872.10	210.50

*** 1.768 ***

1

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	441.52	138.54
2	445.48	134.68
3	454.43	130.22
4	461.83	123.50
5	469.72	117.36
6	476.80	110.29
7	485.45	105.27
8	494.98	102.24
9	503.06	96.35
10	802.53	95.45
11	807.87	103.90
12	812.21	112.91
13	817.93	121.11
14	822.84	129.83
15	829.90	136.91
16	836.26	144.63
17	843.27	151.75
18	850.10	159.06
19	857.12	166.18
20	862.37	174.69
21	869.43	181.78
22	876.47	188.88
23	883.23	196.24
24	890.22	203.39
25	896.75	210.97
26	897.32	211.55

*** 1.774 ***

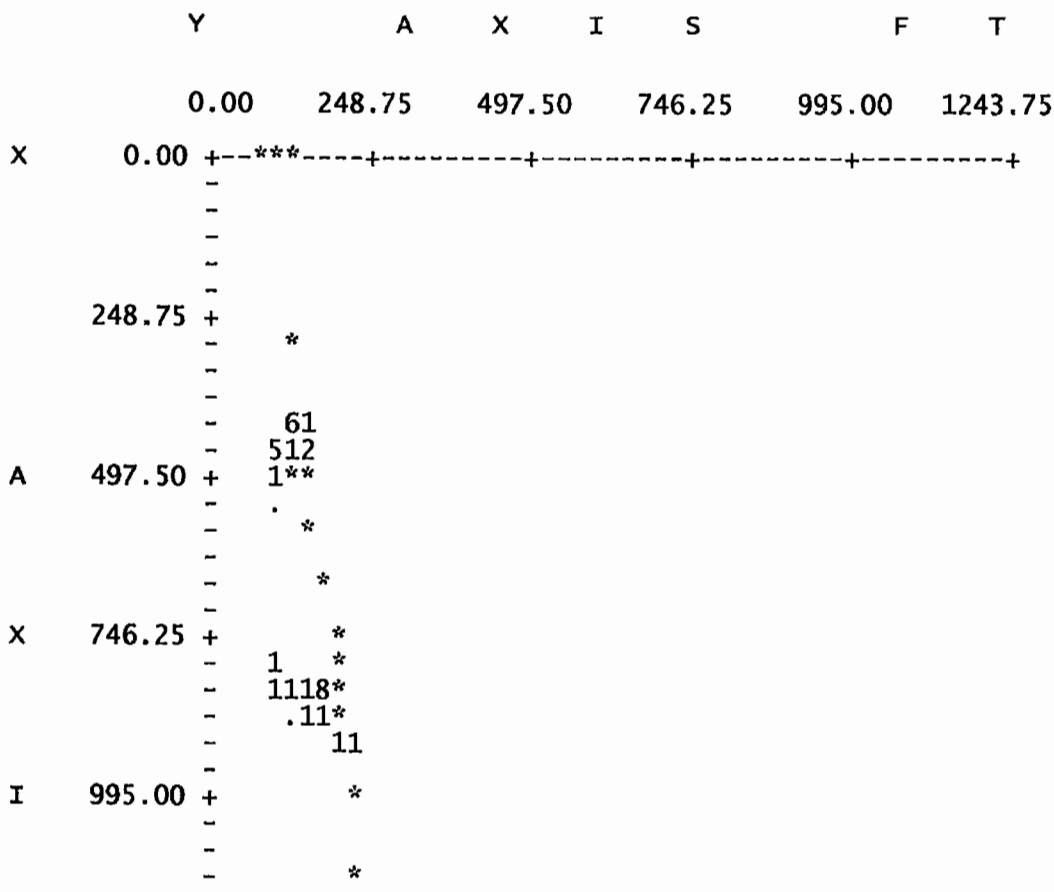
Failure Surface Specified By 25 Coordinate Points

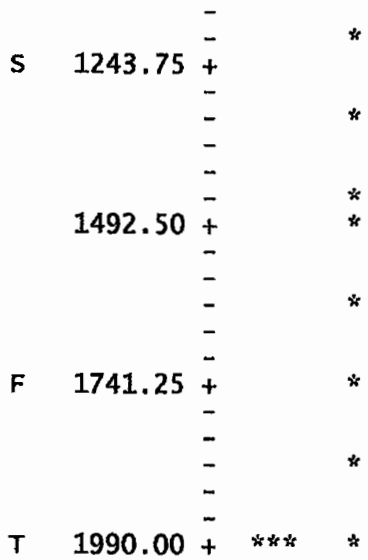
Point No.	X-Surf (ft)	Y-Surf (ft)
1	443.21	138.58
2	448.08	136.03
3	455.31	129.12

4	462.83	122.53
5	470.74	116.42
6	479.01	110.79
7	487.85	106.12
8	495.01	99.14
9	502.41	92.41
10	802.44	93.90
11	806.15	103.19
12	809.01	112.77
13	816.06	119.85
14	821.55	128.21
15	827.28	136.41
16	834.30	143.54
17	837.95	152.85
18	844.94	160.00
19	850.22	168.49
20	855.41	177.04
21	862.46	184.13
22	869.23	191.49
23	875.53	199.26
24	882.57	206.36
25	886.82	211.12

*** 1.785 ***

1

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F
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T
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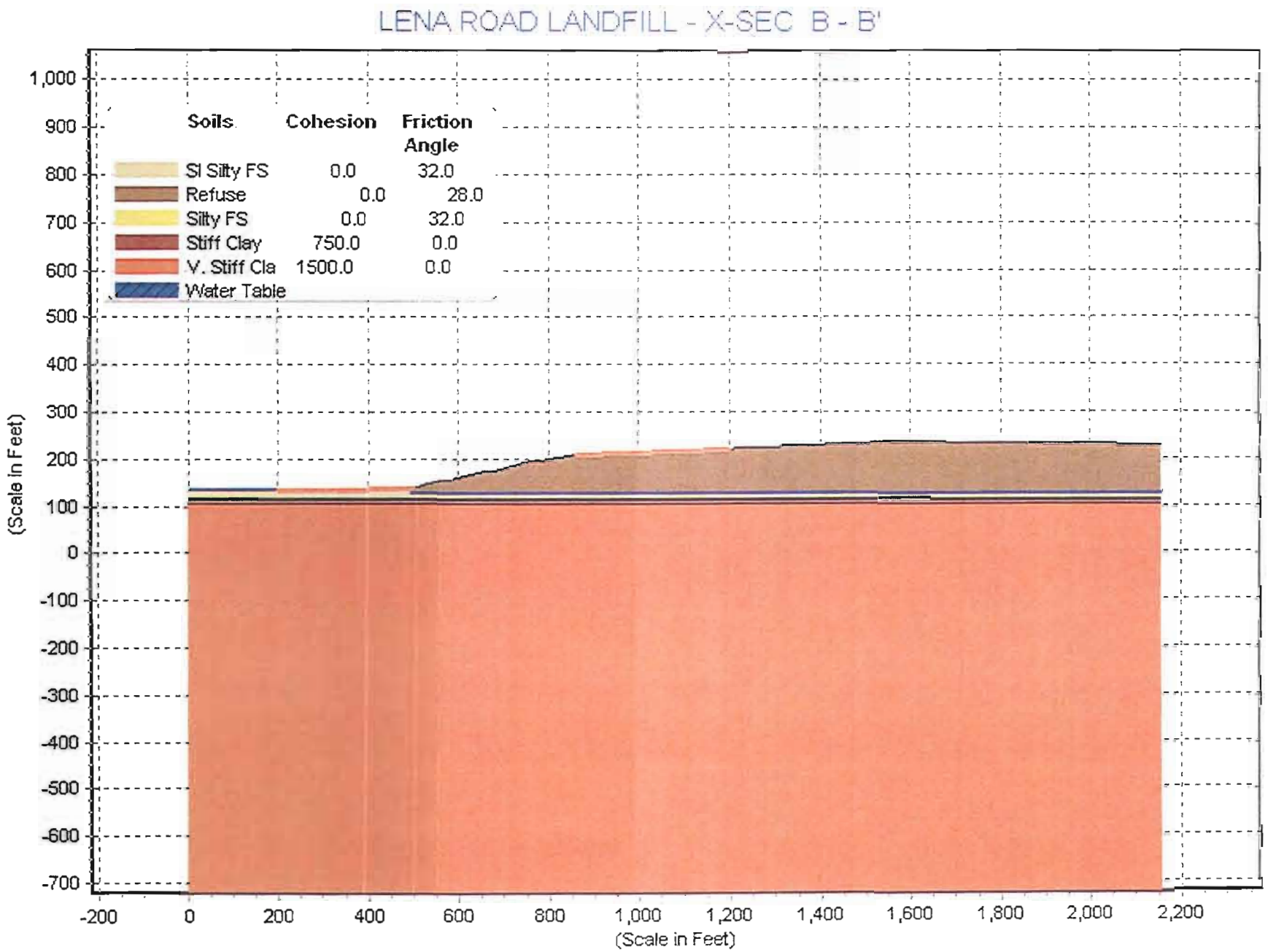
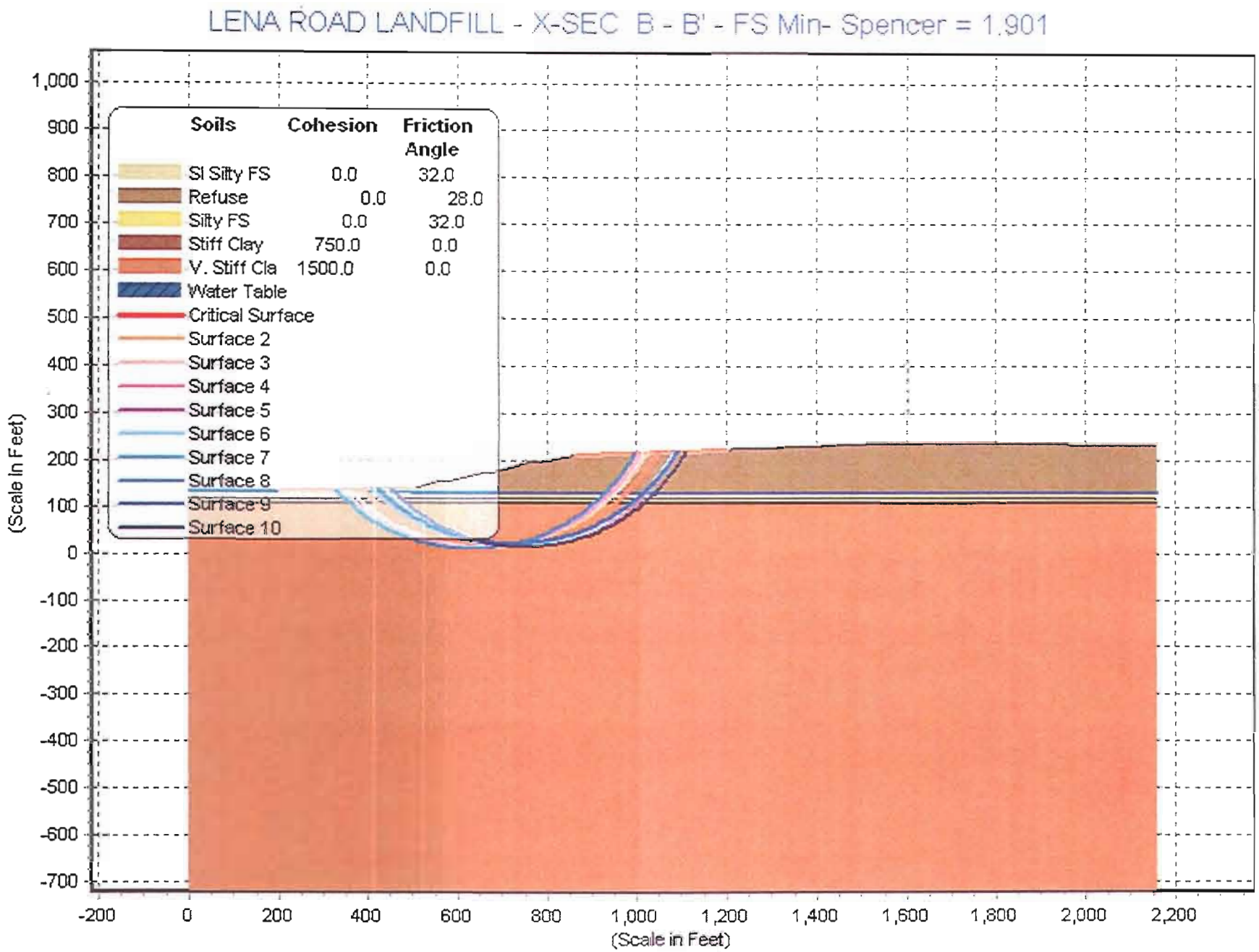
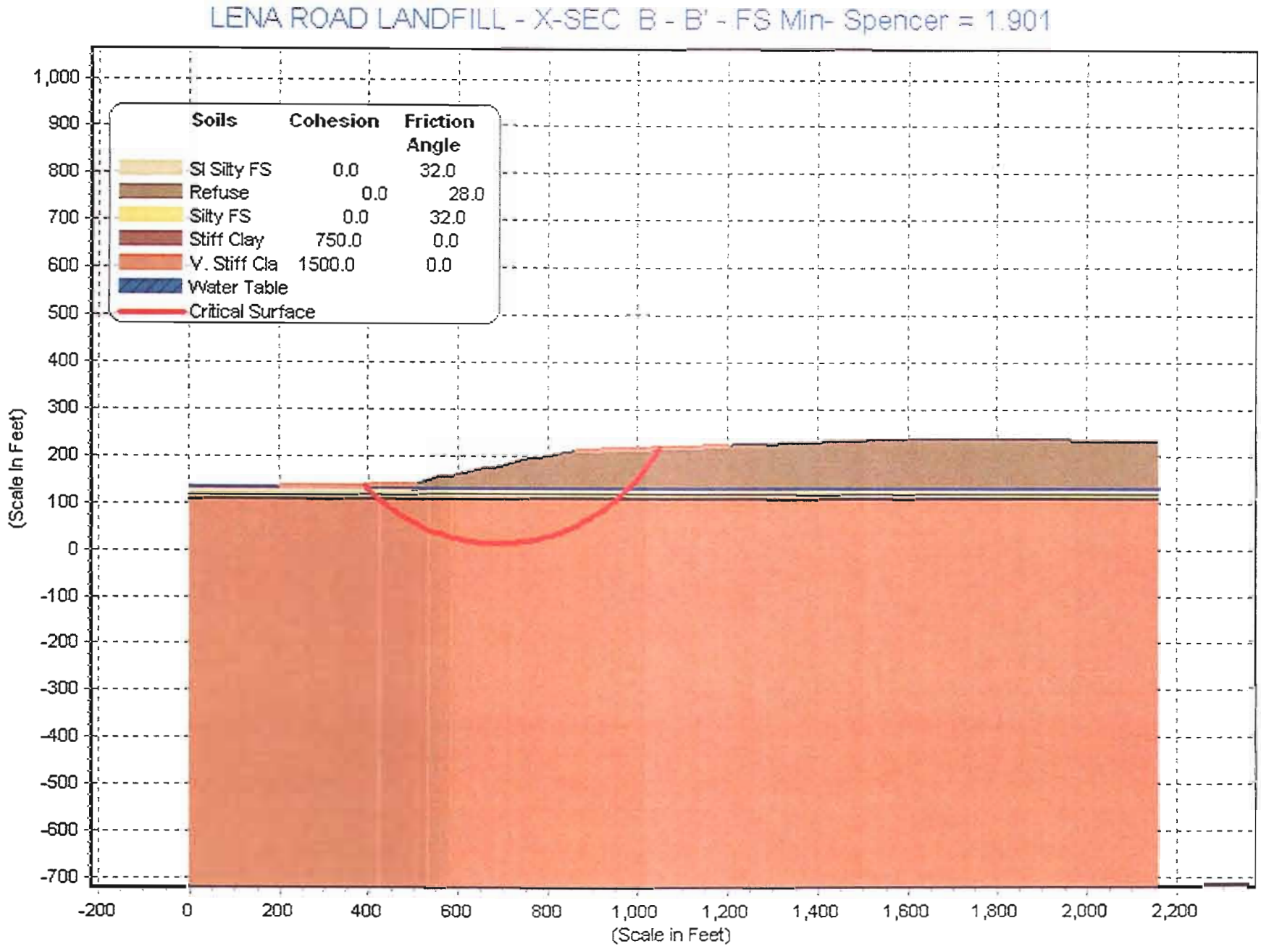

LENA ROAD LANDFILL - X-SEC B - B'
Soils
Cohesion
Friction Angle
SI Silty FS 0.0 32.0
Refuse 0.0 28.0
Silty FS 0.0 32.0
Stiff Clay 750.0 0.0
V. Stiff Cla 1500.0 0.0
Water Table
(Scale in Feet)
(Scale in Feet)
1,000
900
800
700
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
-600
-700
-200
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200


LENA ROAD LANDFILL - X-SEC B - B' - FS Min- Spencer = 1.901
Soils
Cohesion
Friction Angle
SI Silty FS 0.0 32.0
Refuse 0.0 28.0
Silty FS 0.0 32.0
Stiff Clay 750.0 0.0
V. Stiff Cla 1500.0 0.0
Water Table
Critical Surface
Surface 2
Surface 3
Surface 4
Surface 5
Surface 6
Surface 7
Surface 8
Surface 9
Surface 10
(Scale In Feet)
(Scale in Feet)


LENA ROAD LANDFILL - X-SEC B - B' - FS Min- Spencer = 1.901
Soils
Cohesion
Friction Angle
SI Silty FS 0.0 32.0
Refuse 0.0 28.0
Silty FS 0.0 32.0
Stiff Clay 750.0 0.0
V. Stiff Cla 1500.0 0.0
Water Table
Critical Surface
(Scale In Feet)
(Scale in Feet)

result.out
** STABL for WINDOWS **
by
Geotechnical Software Solutions

1

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

Run Date: 9/27/10
Time of Run: 13:00
Run By: Shawkat Ali
Input Data Filename: run.in
Output Filename: result.out
Unit: U.S.C.
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION LENA ROAD LANDFILL - X-SEC B - B'

BOUNDARY COORDINATES

12 Top Boundaries
17 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	135.00	300.00	135.00	2
2	300.00	135.00	500.00	140.00	2
3	500.00	140.00	560.00	155.00	1
4	560.00	155.00	580.00	155.00	1
5	580.00	155.00	660.00	175.00	1
6	660.00	175.00	680.00	175.00	1
7	680.00	175.00	760.00	195.00	1
8	760.00	195.00	780.00	195.00	1
9	780.00	195.00	860.00	210.00	1
10	860.00	210.00	1560.00	235.00	1
11	1560.00	235.00	1760.00	235.00	1
12	1760.00	235.00	2160.00	230.00	1
13	500.10	127.00	500.20	140.00	1
14	500.10	127.00	2160.00	127.00	2
15	0.00	116.50	2160.00	116.50	3
16	0.00	111.50	2160.00	111.50	4
17	0.00	106.50	2160.00	106.50	5

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Total Saturated Cohesion Friction Pore Pressure Piez.

Type No.	Unit Wt. (pcf)	Unit Wt. (pcf)	Intercept (psf)	Angle (deg)	Pressure Param.	Constant (psf)	Surface No.
1	70.0	80.0	0.0	28.0	0.00	0.0	1
2	100.0	110.0	0.0	32.0	0.00	0.0	1
3	95.0	105.0	0.0	32.0	0.00	0.0	1
4	105.0	120.0	750.0	0.0	0.00	0.0	1
5	115.0	130.0	1500.0	0.0	0.00	0.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	133.00
2	500.00	133.00
3	500.10	127.00
4	2160.00	127.00

1

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

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 200.00 ft.
and X = 500.00 ft.

Each Surface Terminates Between X = 860.00 ft.
and X =1200.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00 ft.

10.00 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 Spencer`s Method * *

Number of convergent trials 324
Number of non convergent trials 76

Failure Surface Specified By 78 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	389.47	137.24
2	396.57	130.19
3	403.83	123.31
4	411.25	116.61
5	418.84	110.09
6	426.57	103.76
7	434.46	97.61
8	442.49	91.65
9	450.66	85.88
10	458.96	80.31
11	467.40	74.94
12	475.96	69.78
13	484.65	64.82
14	493.45	60.07
15	502.36	55.53
16	511.38	51.21
17	520.49	47.10
18	529.71	43.22
19	539.01	39.55
20	548.40	36.11
21	557.87	32.90
22	567.41	29.91
23	577.02	27.15
24	586.70	24.62
25	596.43	22.32
26	606.22	20.26
27	616.05	18.43
28	625.92	16.84
29	635.83	15.49
30	645.77	14.37
31	655.73	13.49
32	665.71	12.85
33	675.70	12.45
34	685.70	12.28
35	695.70	12.36
36	705.69	12.67
37	715.68	13.23
38	725.65	14.02
39	735.59	15.05
40	745.51	16.32
41	755.40	17.83
42	765.24	19.57
43	775.05	21.55
44	784.80	23.76
45	794.50	26.21
46	804.13	28.88
47	813.70	31.79
48	823.20	34.92
49	832.62	38.28
50	841.95	41.86
51	851.20	45.67
52	860.35	49.70
53	869.41	53.94

54	878.36	58.40
55	887.20	63.08
56	895.92	67.96
57	904.53	73.05
58	913.01	78.34
59	921.37	83.84
60	929.59	89.54
61	937.67	95.43
62	945.61	101.51
63	953.40	107.78
64	961.04	114.23
65	968.52	120.87
66	975.84	127.68
67	982.99	134.67
68	989.98	141.82
69	996.79	149.14
70	1003.43	156.62
71	1009.88	164.26
72	1016.15	172.05
73	1022.24	179.99
74	1028.13	188.07
75	1033.82	196.29
76	1039.32	204.64
77	1044.62	213.12
78	1046.71	216.67

Circle Center At X = 687.5 ; Y = 430.1 and Radius, 417.9

*** Factor of Safety = 1.901 ***

Individual data on the 95 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.3	926.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.8	1676.3	0.0	349.7	0.0	0.0	0.0	0.0	0.0
3	7.3	8262.0	0.0	3899.0	0.0	0.0	0.0	0.0	0.0
4	7.4	14126.0	0.0	8134.5	0.0	0.0	0.0	0.0	0.0
5	0.1	303.0	0.0	179.3	0.0	0.0	0.0	0.0	0.0
6	5.8	14902.6	0.0	9091.5	0.0	0.0	0.0	0.0	0.0
7	1.6	4774.4	0.0	2988.4	0.0	0.0	0.0	0.0	0.0
8	4.4	14155.8	0.0	8741.4	0.0	0.0	0.0	0.0	0.0
9	3.3	12158.8	0.0	7529.4	0.0	0.0	0.0	0.0	0.0
10	7.9	33296.7	0.0	20166.8	0.0	0.0	0.0	0.0	0.0
11	8.0	40389.0	0.0	23945.1	0.0	0.0	0.0	0.0	0.0
12	8.2	47487.3	0.0	27603.4	0.0	0.0	0.0	0.0	0.0
13	8.3	54566.0	0.0	31139.8	0.0	0.0	0.0	0.0	0.0
14	8.4	61600.3	0.0	34552.3	0.0	0.0	0.0	0.0	0.0
15	8.6	68565.2	0.0	37838.7	0.0	0.0	0.0	0.0	0.0
16	8.7	75436.7	0.0	40997.2	0.0	0.0	0.0	0.0	0.0
17	8.8	82191.1	0.0	44026.1	0.0	0.0	0.0	0.0	0.0
18	6.6	64775.1	0.0	34231.2	0.0	0.0	0.0	0.0	0.0
19	0.1	892.2	0.0	256.7	0.0	0.0	0.0	0.0	0.0
20	0.1	967.3	0.0	492.6	0.0	0.0	0.0	0.0	0.0
21	2.2	21077.5	0.0	10716.9	0.0	0.0	0.0	0.0	0.0
22	9.0	92128.7	0.0	45944.1	0.0	0.0	0.0	0.0	0.0

23	9.1	99601.8	0.0	48573.9	0.0	0.0	0.0	0.0	0.0
24	9.2	106910.9	0.0	51067.5	0.0	0.0	0.0	0.0	0.0
25	9.3	114034.3	0.0	53423.8	0.0	0.0	0.0	0.0	0.0
26	9.4	120949.2	0.0	55640.9	0.0	0.0	0.0	0.0	0.0
27	9.5	127634.9	0.0	57717.9	0.0	0.0	0.0	0.0	0.0
28	2.1	29468.3	0.0	13154.4	0.0	0.0	0.0	0.0	0.0
29	7.4	104122.0	0.0	46499.0	0.0	0.0	0.0	0.0	0.0
30	9.6	138183.9	0.0	61446.7	0.0	0.0	0.0	0.0	0.0
31	3.0	43457.7	0.0	19235.3	0.0	0.0	0.0	0.0	0.0
32	6.7	99353.1	0.0	43860.8	0.0	0.0	0.0	0.0	0.0
33	9.7	148290.0	0.0	64601.4	0.0	0.0	0.0	0.0	0.0
34	9.8	153527.3	0.0	65961.0	0.0	0.0	0.0	0.0	0.0
35	9.8	158431.5	0.0	67174.9	0.0	0.0	0.0	0.0	0.0
36	9.9	162988.1	0.0	68242.1	0.0	0.0	0.0	0.0	0.0
37	9.9	167182.3	0.0	69161.3	0.0	0.0	0.0	0.0	0.0
38	9.9	171004.9	0.0	69933.0	0.0	0.0	0.0	0.0	0.0
39	10.0	174444.3	0.0	70556.4	0.0	0.0	0.0	0.0	0.0
40	4.3	75665.7	0.0	30358.2	0.0	0.0	0.0	0.0	0.0
41	5.7	101539.9	0.0	40672.7	0.0	0.0	0.0	0.0	0.0
42	10.0	178264.2	0.0	71356.1	0.0	0.0	0.0	0.0	0.0
43	4.3	76860.8	0.0	30755.8	0.0	0.0	0.0	0.0	0.0
44	5.7	102175.7	0.0	40776.7	0.0	0.0	0.0	0.0	0.0
45	10.0	180699.3	0.0	71559.6	0.0	0.0	0.0	0.0	0.0
46	10.0	182108.4	0.0	71437.2	0.0	0.0	0.0	0.0	0.0
47	10.0	183100.1	0.0	71166.0	0.0	0.0	0.0	0.0	0.0
48	10.0	183671.6	0.0	70745.5	0.0	0.0	0.0	0.0	0.0
49	9.9	183822.3	0.0	70176.0	0.0	0.0	0.0	0.0	0.0
50	9.9	183554.2	0.0	69458.1	0.0	0.0	0.0	0.0	0.0
51	9.9	182868.2	0.0	68591.8	0.0	0.0	0.0	0.0	0.0
52	4.6	85027.8	0.0	31722.1	0.0	0.0	0.0	0.0	0.0
53	5.2	96502.4	0.0	35856.3	0.0	0.0	0.0	0.0	0.0
54	9.8	178523.1	0.0	66417.6	0.0	0.0	0.0	0.0	0.0
55	5.0	89207.0	0.0	33241.0	0.0	0.0	0.0	0.0	0.0
56	4.8	85899.1	0.0	31869.6	0.0	0.0	0.0	0.0	0.0
57	9.7	172248.6	0.0	63657.9	0.0	0.0	0.0	0.0	0.0
58	9.6	169176.9	0.0	62060.8	0.0	0.0	0.0	0.0	0.0
59	9.6	165738.2	0.0	60319.2	0.0	0.0	0.0	0.0	0.0
60	9.5	161948.0	0.0	58435.3	0.0	0.0	0.0	0.0	0.0
61	9.4	157816.8	0.0	56409.4	0.0	0.0	0.0	0.0	0.0
62	9.3	153359.1	0.0	54242.6	0.0	0.0	0.0	0.0	0.0
63	9.2	148591.6	0.0	51936.7	0.0	0.0	0.0	0.0	0.0
64	8.8	138091.0	0.0	47639.9	0.0	0.0	0.0	0.0	0.0
65	0.4	5439.1	0.0	1852.9	0.0	0.0	0.0	0.0	0.0
66	9.1	137722.9	0.0	46912.0	0.0	0.0	0.0	0.0	0.0
67	9.0	131276.4	0.0	44196.3	0.0	0.0	0.0	0.0	0.0
68	8.8	124621.3	0.0	41346.6	0.0	0.0	0.0	0.0	0.0
69	8.7	117780.9	0.0	38365.2	0.0	0.0	0.0	0.0	0.0
70	8.6	110776.0	0.0	35253.3	0.0	0.0	0.0	0.0	0.0
71	8.5	103631.3	0.0	32012.9	0.0	0.0	0.0	0.0	0.0
72	8.4	96370.2	0.0	28646.0	0.0	0.0	0.0	0.0	0.0
73	8.2	89016.1	0.0	25154.3	0.0	0.0	0.0	0.0	0.0
74	8.1	81594.4	0.0	21539.9	0.0	0.0	0.0	0.0	0.0
75	7.9	74129.9	0.0	17804.8	0.0	0.0	0.0	0.0	0.0
76	6.2	53573.0	0.0	11426.2	0.0	0.0	0.0	0.0	0.0
77	1.6	13085.4	0.0	2524.9	0.0	0.0	0.0	0.0	0.0
78	4.4	35033.3	0.0	6248.4	0.0	0.0	0.0	0.0	0.0
79	3.2	24553.0	0.0	3732.8	0.0	0.0	0.0	0.0	0.0
80	2.6	18771.7	0.0	2481.7	0.0	0.0	0.0	0.0	0.0
81	4.9	34418.6	0.0	3415.5	0.0	0.0	0.0	0.0	0.0
82	6.6	42355.4	0.0	1722.6	0.0	0.0	0.0	0.0	0.0
83	0.7	4435.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	7.2	41619.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
85	7.0	37301.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

86	6.8	33042.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	6.6	28857.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
88	6.5	24760.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89	6.3	20766.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	6.1	16889.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	5.9	13142.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
92	5.7	9540.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	5.5	6096.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	5.3	2824.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	2.1	254.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 79 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	357.90	136.45
2	365.08	129.49
3	372.42	122.70
4	379.92	116.09
5	387.57	109.65
6	395.37	103.39
7	403.32	97.32
8	411.40	91.43
9	419.62	85.74
10	427.97	80.23
11	436.45	74.93
12	445.05	69.82
13	453.76	64.92
14	462.59	60.22
15	471.52	55.73
16	480.56	51.45
17	489.69	47.38
18	498.92	43.52
19	508.24	39.88
20	517.63	36.46
21	527.11	33.26
22	536.65	30.28
23	546.27	27.53
24	555.94	25.00
25	565.67	22.70
26	575.46	20.63
27	585.28	18.78
28	595.15	17.17
29	605.06	15.78
30	614.99	14.63
31	624.95	13.71
32	634.92	13.02
33	644.91	12.57
34	654.91	12.35
35	664.91	12.36
36	674.91	12.61
37	684.90	13.09
38	694.87	13.80
39	704.83	14.75
40	714.76	15.93
41	724.66	17.34
42	734.52	18.98
43	744.34	20.85
44	754.12	22.95
45	763.85	25.27
46	773.52	27.83

47	783.12	30.61
48	792.66	33.61
49	802.13	36.83
50	811.51	40.28
51	820.82	43.94
52	830.04	47.82
53	839.16	51.92
54	848.19	56.22
55	857.11	60.74
56	865.92	65.46
57	874.62	70.38
58	883.21	75.51
59	891.67	80.84
60	900.01	86.37
61	908.21	92.08
62	916.28	97.99
63	924.21	104.08
64	931.99	110.36
65	939.63	116.82
66	947.11	123.45
67	954.44	130.26
68	961.60	137.24
69	968.60	144.38
70	975.43	151.68
71	982.09	159.14
72	988.57	166.76
73	994.87	174.52
74	1000.99	182.43
75	1006.93	190.48
76	1012.67	198.67
77	1018.22	206.98
78	1023.58	215.43
79	1023.83	215.85

Circle Center At X = 659.4 ; Y = 440.5 and Radius, 428.1

*** Factor of Safety = 1.917 ***

1

Failure Surface Specified By 78 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	357.90	136.45
2	365.06	129.47
3	372.39	122.67
4	379.88	116.04
5	387.52	109.59
6	395.31	103.32
7	403.25	97.25
8	411.33	91.36
9	419.55	85.66
10	427.91	80.16
11	436.39	74.86
12	444.99	69.77
13	453.71	64.88
14	462.55	60.19

15	471.49	55.72
16	480.54	51.46
17	489.69	47.42
18	498.93	43.60
19	508.26	39.99
20	517.67	36.61
21	527.16	33.45
22	536.72	30.52
23	546.34	27.82
24	556.03	25.34
25	565.78	23.10
26	575.57	21.09
27	585.41	19.31
28	595.29	17.76
29	605.21	16.45
30	615.15	15.38
31	625.11	14.54
32	635.10	13.94
33	645.09	13.57
34	655.09	13.44
35	665.09	13.55
36	675.08	13.90
37	685.06	14.48
38	695.03	15.30
39	704.98	16.36
40	714.89	17.65
41	724.77	19.18
42	734.62	20.94
43	744.42	22.93
44	754.17	25.16
45	763.86	27.62
46	773.49	30.30
47	783.06	33.22
48	792.55	36.36
49	801.97	39.72
50	811.30	43.31
51	820.55	47.11
52	829.71	51.14
53	838.76	55.38
54	847.71	59.84
55	856.56	64.50
56	865.29	69.38
57	873.90	74.46
58	882.39	79.74
59	890.76	85.23
60	898.99	90.91
61	907.08	96.78
62	915.03	102.84
63	922.84	109.09
64	930.49	115.53
65	937.99	122.14
66	945.33	128.93
67	952.51	135.90
68	959.52	143.03
69	966.36	150.32
70	973.02	157.78
71	979.51	165.39
72	985.81	173.15
73	991.93	181.07
74	997.86	189.12
75	1003.59	197.31
76	1009.13	205.64
77	1014.47	214.09

78	1015.34	215.55

Circle Center At X = 655.5 ; Y = 434.9 and Radius, 421.5

*** Factor of Safety = 1.925 ***

Failure Surface Specified By 79 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.11	136.05
2	349.23	129.04
3	356.52	122.19
4	363.97	115.52
5	371.57	109.02
6	379.33	102.71
7	387.23	96.58
8	395.27	90.63
9	403.45	84.88
10	411.76	79.32
11	420.20	73.96
12	428.77	68.80
13	437.45	63.84
14	446.25	59.09
15	455.16	54.54
16	464.17	50.21
17	473.28	46.09
18	482.49	42.18
19	491.78	38.50
20	501.16	35.03
21	510.62	31.78
22	520.15	28.76
23	529.75	25.96
24	539.42	23.39
25	549.14	21.05
26	558.91	18.93
27	568.73	17.05
28	578.60	15.40
29	588.49	13.98
30	598.42	12.79
31	608.38	11.84
32	618.35	11.12
33	628.34	10.64
34	638.34	10.39
35	648.34	10.37
36	658.33	10.60
37	668.32	11.05
38	678.30	11.75
39	688.26	12.67
40	698.19	13.83
41	708.09	15.23
42	717.96	16.85
43	727.78	18.71
44	737.56	20.80
45	747.29	23.12
46	756.96	25.66
47	766.57	28.44

48	776.11	31.43
49	785.58	34.66
50	794.97	38.10
51	804.27	41.76
52	813.49	45.64
53	822.61	49.74
54	831.63	54.05
55	840.55	58.57
56	849.36	63.30
57	858.06	68.24
58	866.64	73.38
59	875.09	78.72
60	883.42	84.25
61	891.61	89.99
62	899.67	95.91
63	907.59	102.02
64	915.36	108.31
65	922.98	114.79
66	930.44	121.44
67	937.75	128.27
68	944.90	135.27
69	951.87	142.43
70	958.68	149.75
71	965.31	157.24
72	971.77	164.87
73	978.04	172.66
74	984.13	180.59
75	990.03	188.67
76	995.74	196.88
77	1001.26	205.22
78	1006.57	213.69
79	1007.51	215.27

Circle Center At X = 643.9 ; Y = 435.5 and Radius, 425.1

*** Factor of Safety = 1.927 ***

1

Failure Surface Specified By 78 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	436.84	138.42
2	443.94	131.38
3	451.21	124.51
4	458.64	117.82
5	466.23	111.30
6	473.97	104.97
7	481.86	98.83
8	489.90	92.88
9	498.08	87.13
10	506.39	81.57
11	514.84	76.22
12	523.41	71.06
13	532.10	66.12
14	540.91	61.39
15	549.83	56.86

16	558.85	52.56
17	567.98	48.47
18	577.20	44.60
19	586.51	40.96
20	595.91	37.53
21	605.38	34.34
22	614.93	31.37
23	624.55	28.64
24	634.23	26.13
25	643.97	23.86
26	653.76	21.83
27	663.60	20.03
28	673.48	18.46
29	683.39	17.13
30	693.33	16.05
31	703.29	15.20
32	713.27	14.59
33	723.27	14.22
34	733.27	14.09
35	743.27	14.20
36	753.26	14.55
37	763.24	15.14
38	773.21	15.96
39	783.15	17.03
40	793.07	18.34
41	802.95	19.88
42	812.79	21.66
43	822.58	23.68
44	832.32	25.93
45	842.01	28.42
46	851.63	31.13
47	861.19	34.08
48	870.67	37.25
49	880.08	40.65
50	889.40	44.28
51	898.62	48.13
52	907.76	52.20
53	916.79	56.49
54	925.72	60.99
55	934.54	65.71
56	943.24	70.63
57	951.82	75.77
58	960.28	81.11
59	968.60	86.65
60	976.79	92.39
61	984.84	98.32
62	992.75	104.44
63	1000.50	110.76
64	1008.11	117.25
65	1015.55	123.93
66	1022.83	130.79
67	1029.94	137.81
68	1036.89	145.01
69	1043.66	152.37
70	1050.25	159.89
71	1056.66	167.57
72	1062.88	175.40
73	1068.91	183.37
74	1074.75	191.49
75	1080.39	199.75
76	1085.83	208.14
77	1091.07	216.66
78	1092.02	218.29

Circle Center At X = 733.7 ; Y = 430.6 and Radius, 416.5

*** Factor of Safety = 1.934 ***

Failure Surface Specified By 77 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	436.84	138.42
2	443.94	131.38
3	451.21	124.51
4	458.65	117.83
5	466.24	111.32
6	474.00	105.01
7	481.90	98.88
8	489.95	92.95
9	498.15	87.22
10	506.48	81.69
11	514.94	76.36
12	523.53	71.24
13	532.25	66.33
14	541.08	61.64
15	550.02	57.16
16	559.07	52.91
17	568.22	48.87
18	577.46	45.06
19	586.80	41.48
20	596.22	38.12
21	605.72	35.00
22	615.29	32.11
23	624.93	29.45
24	634.63	27.03
25	644.39	24.84
26	654.20	22.90
27	664.05	21.19
28	673.95	19.73
29	683.87	18.50
30	693.82	17.52
31	703.79	16.79
32	713.78	16.29
33	723.78	16.04
34	733.78	16.04
35	743.78	16.27
36	753.77	16.75
37	763.74	17.48
38	773.69	18.45
39	783.62	19.66
40	793.51	21.11
41	803.37	22.80
42	813.18	24.73
43	822.94	26.91
44	832.65	29.31
45	842.29	31.96
46	851.87	34.84
47	861.37	37.95
48	870.79	41.29

49	880.14	44.87
50	889.39	48.66
51	898.54	52.69
52	907.59	56.93
53	916.54	61.40
54	925.38	66.08
55	934.10	70.98
56	942.70	76.08
57	951.17	81.40
58	959.50	86.92
59	967.71	92.64
60	975.77	98.56
61	983.68	104.68
62	991.44	110.98
63	999.04	117.48
64	1006.49	124.15
65	1013.77	131.01
66	1020.88	138.04
67	1027.81	145.25
68	1034.57	152.62
69	1041.15	160.15
70	1047.54	167.84
71	1053.74	175.69
72	1059.74	183.68
73	1065.56	191.82
74	1071.17	200.10
75	1076.57	208.51
76	1081.77	217.05
77	1082.29	217.94

Circle Center At X = 729.0 ; Y = 426.0 and Radius, 410.0

*** Factor of Safety = 1.936 ***

1

Failure Surface Specified By 80 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	405.26	137.63
2	412.70	130.94
3	420.28	124.42
4	428.00	118.06
5	435.86	111.88
6	443.85	105.87
7	451.97	100.03
8	460.22	94.38
9	468.59	88.91
10	477.07	83.62
11	485.68	78.52
12	494.39	73.61
13	503.20	68.89
14	512.12	64.37
15	521.14	60.04
16	530.25	55.91
17	539.44	51.99
18	548.72	48.26

19	558.08	44.74
20	567.52	41.43
21	577.03	38.32
22	586.60	35.43
23	596.23	32.74
24	605.92	30.27
25	615.66	28.01
26	625.45	25.96
27	635.28	24.13
28	645.15	22.52
29	655.05	21.12
30	664.98	19.94
31	674.93	18.97
32	684.91	18.23
33	694.89	17.70
34	704.89	17.40
35	714.89	17.31
36	724.89	17.44
37	734.88	17.80
38	744.86	18.37
39	754.83	19.16
40	764.78	20.17
41	774.71	21.39
42	784.60	22.84
43	794.46	24.50
44	804.28	26.37
45	814.06	28.47
46	823.79	30.77
47	833.47	33.29
48	843.09	36.02
49	852.65	38.96
50	862.14	42.11
51	871.56	45.47
52	880.90	49.03
53	890.17	52.80
54	899.35	56.77
55	908.43	60.94
56	917.43	65.30
57	926.33	69.87
58	935.12	74.63
59	943.81	79.58
60	952.39	84.72
61	960.85	90.04
62	969.20	95.55
63	977.42	101.25
64	985.51	107.12
65	993.48	113.17
66	1001.31	119.39
67	1009.00	125.78
68	1016.55	132.34
69	1023.95	139.06
70	1031.20	145.94
71	1038.31	152.98
72	1045.25	160.18
73	1052.04	167.52
74	1058.66	175.02
75	1065.12	182.65
76	1071.40	190.43
77	1077.52	198.34
78	1083.46	206.38
79	1089.22	214.56
80	1091.72	218.28

Circle Center At X = 713.8 ; Y = 473.1 and Radius, 455.8

*** Factor of Safety = 1.936 ***

Failure Surface Specified By 79 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	326.32	135.66
2	333.41	128.61
3	340.67	121.73
4	348.09	115.03
5	355.66	108.50
6	363.39	102.15
7	371.26	95.98
8	379.27	90.00
9	387.43	84.21
10	395.71	78.61
11	404.13	73.21
12	412.67	68.01
13	421.33	63.01
14	430.10	58.21
15	438.99	53.62
16	447.98	49.24
17	457.07	45.08
18	466.26	41.12
19	475.53	37.39
20	484.89	33.87
21	494.33	30.58
22	503.85	27.50
23	513.44	24.66
24	523.09	22.03
25	532.80	19.64
26	542.56	17.47
27	552.37	15.53
28	562.22	13.83
29	572.11	12.35
30	582.03	11.11
31	591.98	10.10
32	601.95	9.33
33	611.94	8.79
34	621.93	8.48
35	631.93	8.41
36	641.93	8.57
37	651.92	8.97
38	661.90	9.60
39	671.87	10.47
40	681.81	11.57
41	691.72	12.91
42	701.59	14.47
43	711.43	16.27
44	721.22	18.30
45	730.97	20.55
46	740.65	23.04
47	750.28	25.75
48	759.84	28.69
49	769.32	31.85

50	778.73	35.23
51	788.06	38.84
52	797.30	42.66
53	806.45	46.69
54	815.50	50.94
55	824.45	55.41
56	833.30	60.08
57	842.03	64.95
58	850.64	70.03
59	859.13	75.31
60	867.50	80.79
61	875.73	86.47
62	883.83	92.33
63	891.79	98.39
64	899.60	104.63
65	907.27	111.05
66	914.78	117.65
67	922.14	124.42
68	929.33	131.37
69	936.36	138.48
70	943.22	145.76
71	949.91	153.19
72	956.42	160.78
73	962.75	168.52
74	968.90	176.41
75	974.86	184.43
76	980.64	192.60
77	986.21	200.90
78	991.60	209.33
79	994.92	214.82

Circle Center At X = 630.0 ; Y = 434.3 and Radius, 425.9

*** Factor of Safety = 1.940 ***

1

Failure Surface Specified By 78 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	421.05	138.03
2	428.48	131.33
3	436.06	124.81
4	443.79	118.46
5	451.65	112.28
6	459.66	106.29
7	467.79	100.47
8	476.06	94.85
9	484.45	89.40
10	492.96	84.15
11	501.59	79.10
12	510.32	74.24
13	519.17	69.57
14	528.12	65.11
15	537.17	60.85
16	546.31	56.80
17	555.54	52.95

18	564.85	49.31
19	574.25	45.89
20	583.72	42.67
21	593.26	39.67
22	602.86	36.89
23	612.53	34.32
24	622.25	31.97
25	632.02	29.85
26	641.84	27.94
27	651.69	26.25
28	661.58	24.79
29	671.51	23.55
30	681.46	22.54
31	691.42	21.75
32	701.41	21.18
33	711.40	20.84
34	721.40	20.73
35	731.40	20.84
36	741.40	21.18
37	751.38	21.74
38	761.35	22.53
39	771.30	23.54
40	781.22	24.78
41	791.11	26.23
42	800.97	27.92
43	810.79	29.82
44	820.56	31.95
45	830.28	34.29
46	839.95	36.86
47	849.55	39.64
48	859.09	42.63
49	868.56	45.84
50	877.96	49.27
51	887.27	52.90
52	896.51	56.75
53	905.65	60.80
54	914.70	65.06
55	923.65	69.52
56	932.50	74.18
57	941.24	79.04
58	949.86	84.09
59	958.38	89.34
60	966.77	94.78
61	975.03	100.40
62	983.17	106.22
63	991.18	112.21
64	999.04	118.38
65	1006.77	124.73
66	1014.35	131.25
67	1021.78	137.94
68	1029.06	144.80
69	1036.19	151.82
70	1043.15	159.00
71	1049.95	166.33
72	1056.58	173.81
73	1063.04	181.45
74	1069.33	189.22
75	1075.44	197.14
76	1081.37	205.19
77	1087.12	213.37
78	1090.37	218.23

Circle Center At X = 721.5 ; Y = 464.0 and Radius, 443.3

*** Factor of Safety = 1.955 ***

Failure Surface Specified By 78 Coordinate Points

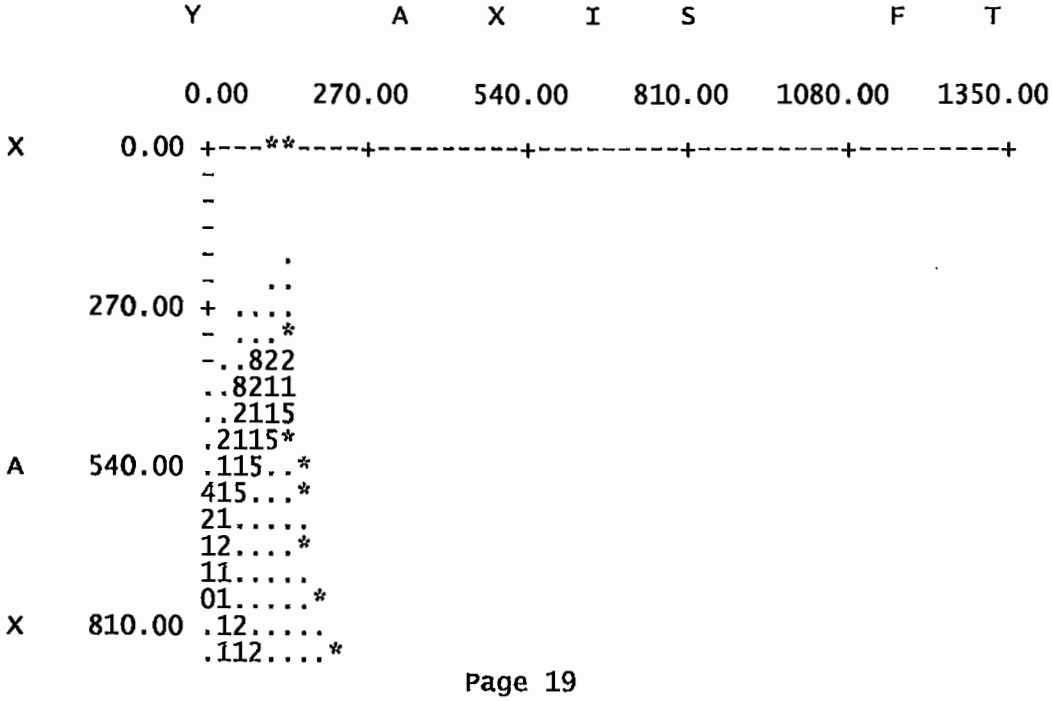
Point No.	X-Surf (ft)	Y-Surf (ft)
1	452.63	138.82
2	459.70	131.75
3	466.95	124.85
4	474.35	118.13
5	481.91	111.59
6	489.63	105.23
7	497.50	99.06
8	505.52	93.08
9	513.67	87.29
10	521.97	81.71
11	530.39	76.32
12	538.95	71.14
13	547.62	66.16
14	556.41	61.40
15	565.32	56.85
16	574.33	52.51
17	583.44	48.39
18	592.65	44.49
19	601.95	40.81
20	611.33	37.36
21	620.80	34.14
22	630.34	31.14
23	639.95	28.37
24	649.62	25.84
25	659.35	23.54
26	669.14	21.47
27	678.97	19.64
28	688.84	18.04
29	698.75	16.69
30	708.68	15.57
31	718.65	14.69
32	728.63	14.05
33	738.62	13.65
34	748.62	13.49
35	758.62	13.58
36	768.61	13.90
37	778.59	14.46
38	788.56	15.26
39	798.51	16.30
40	808.43	17.58
41	818.31	19.10
42	828.15	20.86
43	837.95	22.85
44	847.70	25.07
45	857.40	27.53
46	867.03	30.23
47	876.59	33.15
48	886.08	36.30
49	895.49	39.68
50	904.82	43.28

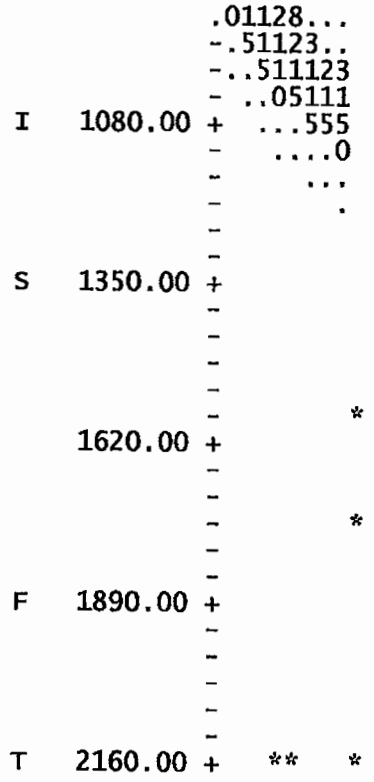
51	914.06	47.11
52	923.20	51.16
53	932.25	55.43
54	941.18	59.91
55	950.01	64.61
56	958.73	69.52
57	967.32	74.63
58	975.79	79.95
59	984.12	85.48
60	992.32	91.20
61	1000.38	97.11
62	1008.30	103.22
63	1016.07	109.52
64	1023.68	116.00
65	1031.14	122.67
66	1038.43	129.51
67	1045.56	136.52
68	1052.52	143.71
69	1059.30	151.06
70	1065.90	158.57
71	1072.32	166.23
72	1078.56	174.05
73	1084.60	182.02
74	1090.45	190.13
75	1096.11	198.37
76	1101.57	206.75
77	1106.82	215.26
78	1108.94	218.89

Circle Center At X = 750.2 ; Y = 429.4 and Radius, 416.0

*** Factor of Safety = 1.956 ***

1

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-
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F 1890.00 +
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-
-
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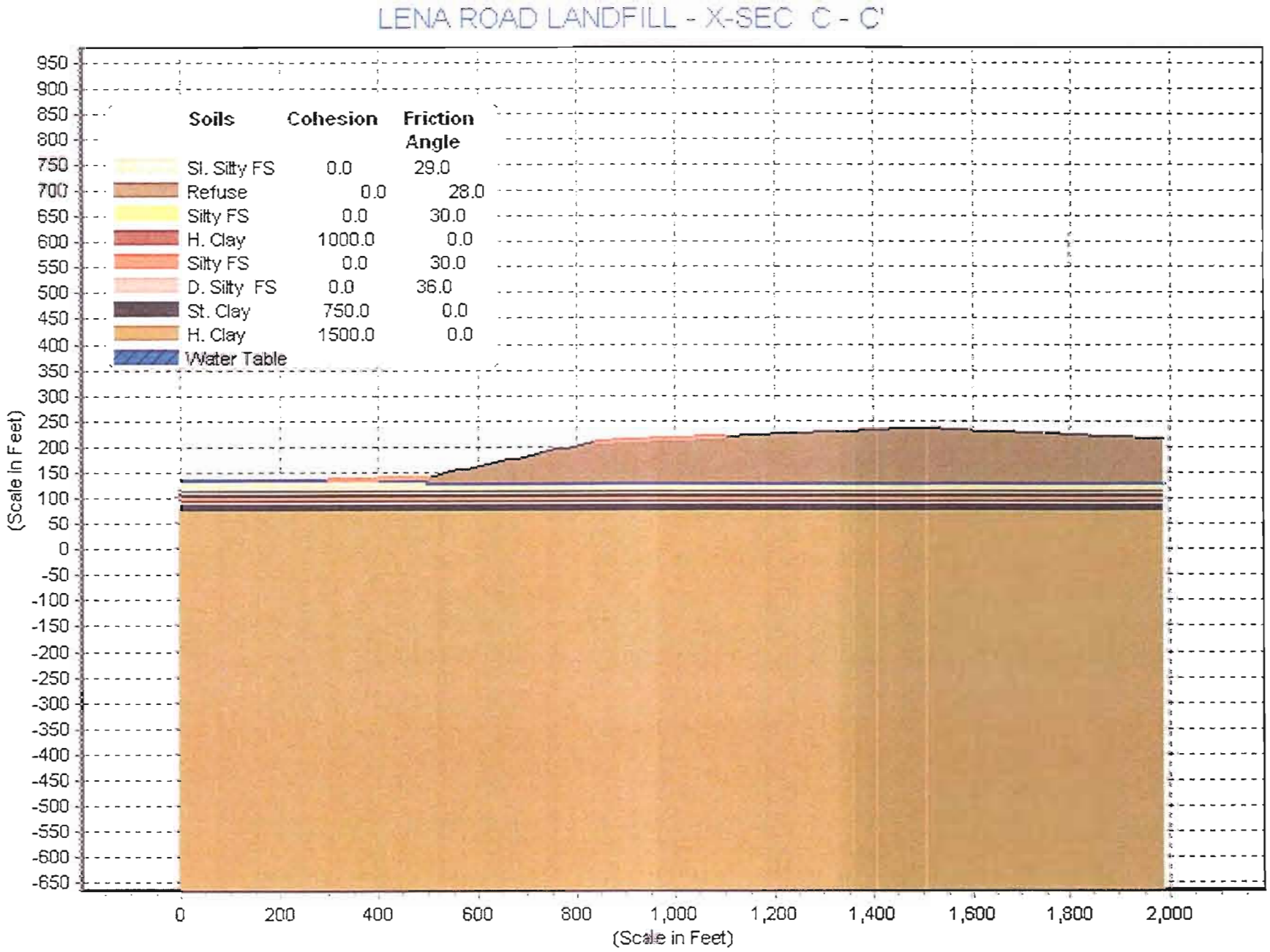
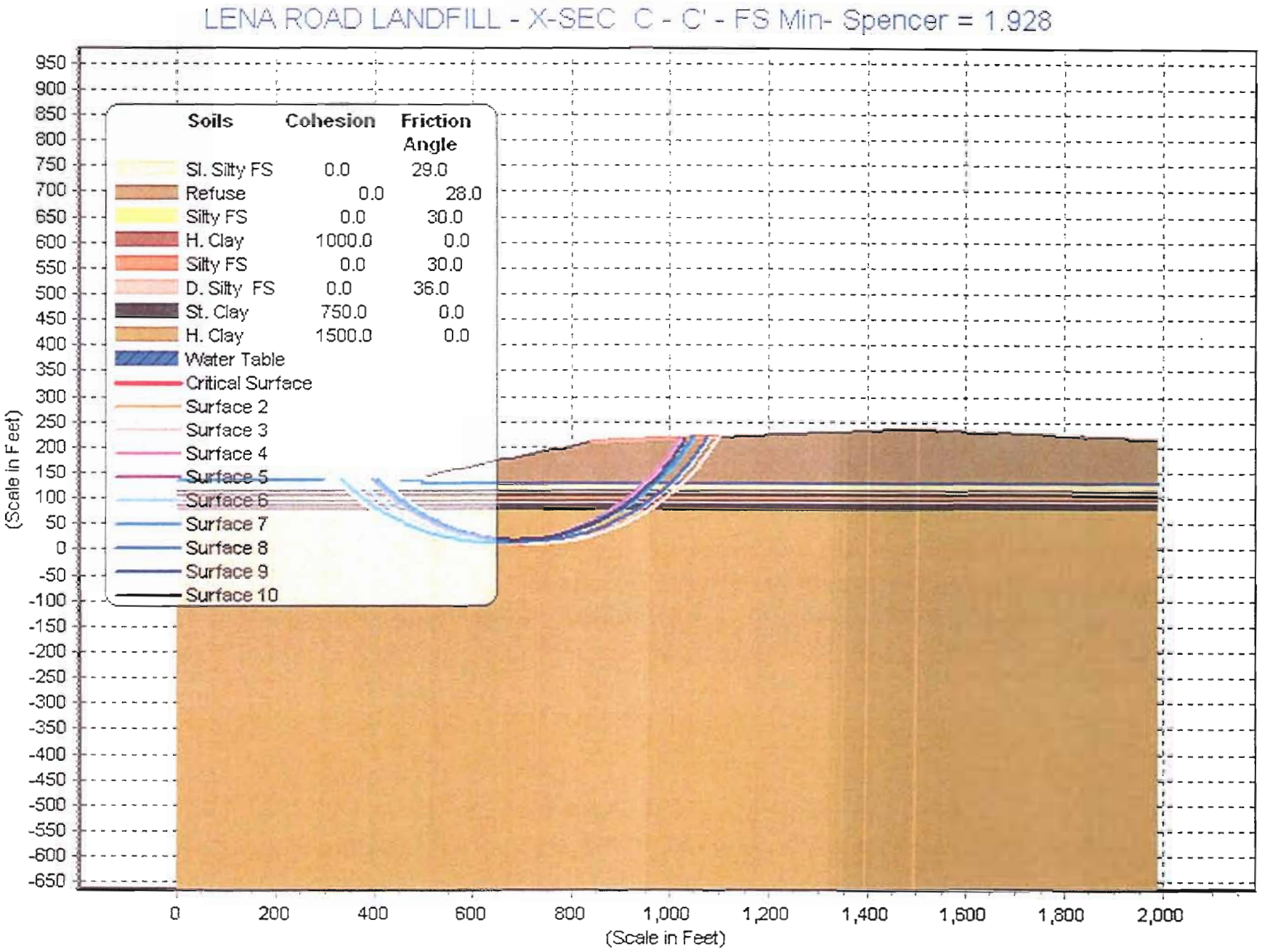
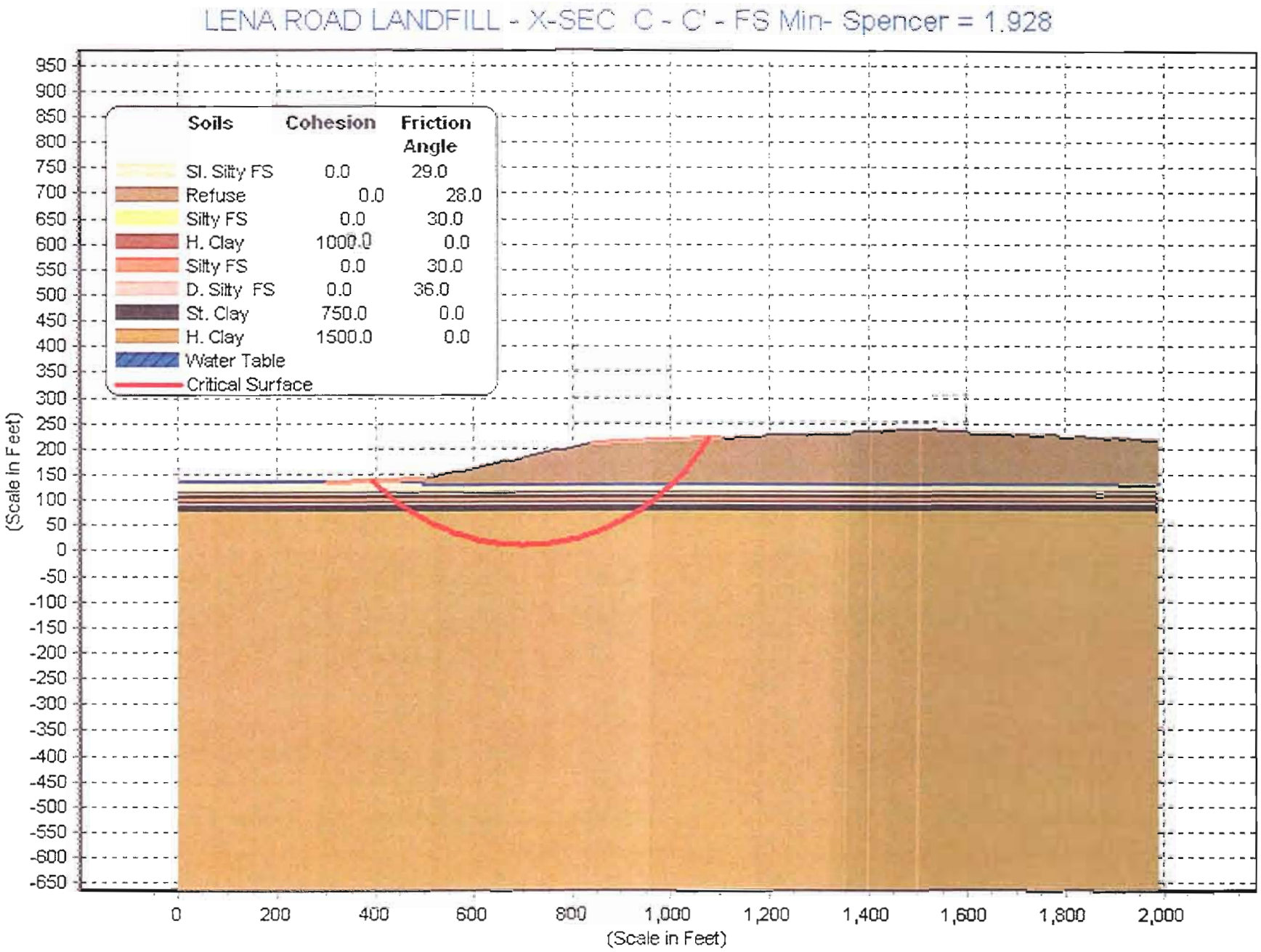
-
T 2160.00 + ** *


LENA ROAD LANDFILL - X-SEC C - C'
Soils
Cohesion
Friction Angle
Sl. Silty FS 0.0 29.0
Refuse 0.0 28.0
Silty FS 0.0 30.0
H. Clay 1000.0 0.0
Silty FS 0.0 30.0
D. Silty FS 0.0 36.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
Water Table
(Scale In Feet)
950 900 850 800 750 700 650 600 550 500 450 400 350 300 250 200 150 100 50 0 -50 -100 -150 -200 -250 -300 -350 -400 -450 -500 -550 -600 -650
0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000
(Scale in Feet)


LENA ROAD LANDFILL - X-SEC C - C' - FS Min- Spencer = 1.928
Soils
Cohesion
Friction Angle
Sl. Silty FS 0.0 29.0
Refuse 0.0 28.0
Silty FS 0.0 30.0
H. Clay 1000.0 0.0
Silty FS 0.0 30.0
D. Silty FS 0.0 36.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
Water Table
Critical Surface
Surface 2
Surface 3
Surface 4
Surface 5
Surface 6
Surface 7
Surface 8
Surface 9
Surface 10
(Scale in Feet)
(Scale in Feet)


LENA ROAD LANDFILL - X-SEC C - C' - FS Min- Spencer = 1.928
Soils
Cohesion
Friction Angle
Sl. Silty FS 0.0 29.0
Refuse 0.0 28.0
Silty FS 0.0 30.0
H. Clay 1000.0 0.0
Silty FS 0.0 30.0
D. Silty FS 0.0 36.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
Water Table
Critical Surface
(Scale In Feet)
950 900 850 800 750 700 650 600 550 500 450 400 350 300 250 200 150 100 50 0 -50 -100 -150 -200 -250 -300 -350 -400 -450 -500 -550 -600 -650
0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000
(Scale in Feet)

result.out
** STABL for WINDOWS **
by
Geotechnical Software Solutions

1

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

Run Date: 9/27/10
Time of Run: 14:30
Run By: Shawkat Ali
Input Data Filename: run.in
Output Filename: result.out
Unit: U.S.C.
Plotted Output Filename: result.plt

PROBLEM DESCRIPTION LENA ROAD LANDFILL - X-SEC C - C'

BOUNDARY COORDINATES

20 Top Boundaries
28 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	135.00	300.00	135.00	2
2	300.00	135.00	500.00	140.00	2
3	500.00	140.00	560.00	155.00	1
4	560.00	155.00	580.00	155.00	1
5	580.00	155.00	660.00	175.00	1
6	660.00	175.00	680.00	175.00	1
7	680.00	175.00	760.00	195.00	1
8	760.00	195.00	780.00	195.00	1
9	780.00	195.00	840.00	210.00	1
10	840.00	210.00	840.00	210.00	1
11	840.00	210.00	980.00	215.00	1
12	980.00	215.00	1100.00	220.00	1
13	1100.00	220.00	1220.00	225.00	1
14	1220.00	225.00	1340.00	230.00	1
15	1340.00	230.00	1460.00	235.00	1
16	1460.00	235.00	1510.00	235.00	1
17	1510.00	235.00	1630.00	230.00	1
18	1630.00	230.00	1750.00	225.00	1
19	1750.00	225.00	1870.00	220.00	1
20	1870.00	220.00	1990.00	215.00	1
21	500.10	127.00	500.20	140.00	1
22	500.10	127.00	1990.00	127.00	2
23	0.00	113.00	1990.00	113.00	3
24	0.00	108.00	1990.00	108.00	4
25	0.00	103.00	1990.00	103.00	5
26	0.00	93.00	1990.00	93.00	6
27	0.00	88.00	1990.00	88.00	7

28	0.00	78.00	1990.00	78.00	8

1

ISOTROPIC SOIL PARAMETERS

8 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	70.0	80.0	0.0	28.0	0.00	0.0	1
2	95.0	105.0	0.0	29.0	0.00	0.0	1
3	100.0	110.0	0.0	30.0	0.00	0.0	1
4	110.0	125.0	1000.0	0.0	0.00	0.0	1
5	100.0	110.0	0.0	30.0	0.00	0.0	1
6	110.0	120.0	0.0	36.0	0.00	0.0	1
7	105.0	120.0	750.0	0.0	0.00	0.0	1
8	115.0	130.0	1500.0	0.0	0.00	0.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	133.00
2	500.00	133.00
3	500.10	127.00
4	1990.00	127.00

1

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

400 Trial Surfaces Have Been Generated.

20 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 300.00 ft.
and X = 500.00 ft.

Each Surface Terminates Between X = 840.00 ft.
and X =1100.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 0.00 ft.

10.00 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 Spencer`s Method * *

Number of convergent trials 379
Number of non convergent trials 21

Failure Surface Specified By 80 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	394.74	137.37
2	401.88	130.37
3	409.19	123.55
4	416.65	116.89
5	424.26	110.40
6	432.02	104.09
7	439.92	97.96
8	447.96	92.02
9	456.14	86.25
10	464.44	80.68
11	472.87	75.30
12	481.42	70.12
13	490.09	65.13
14	498.87	60.35
15	507.76	55.76
16	516.75	51.38
17	525.83	47.21
18	535.02	43.25
19	544.29	39.50
20	553.64	35.96
21	563.07	32.64
22	572.58	29.54
23	582.15	26.66
24	591.79	23.99
25	601.49	21.55
26	611.24	19.33
27	621.04	17.34
28	630.88	15.57
29	640.76	14.03
30	650.68	12.71
31	660.62	11.63
32	670.58	10.77
33	680.56	10.14
34	690.55	9.74
35	700.55	9.57
36	710.55	9.62
37	720.55	9.91
38	730.53	10.43
39	740.51	11.17

40	750.46	12.15
41	760.38	13.35
42	770.28	14.78
43	780.14	16.44
44	789.96	18.32
45	799.74	20.43
46	809.46	22.76
47	819.13	25.32
48	828.74	28.09
49	838.28	31.09
50	847.75	34.30
51	857.14	37.73
52	866.46	41.38
53	875.68	45.24
54	884.82	49.30
55	893.86	53.58
56	902.79	58.06
57	911.63	62.75
58	920.35	67.64
59	928.96	72.73
60	937.45	78.01
61	945.82	83.49
62	954.06	89.16
63	962.16	95.01
64	970.13	101.05
65	977.96	107.27
66	985.65	113.67
67	993.18	120.25
68	1000.56	126.99
69	1007.79	133.91
70	1014.85	140.98
71	1021.75	148.22
72	1028.49	155.61
73	1035.05	163.16
74	1041.44	170.85
75	1047.64	178.69
76	1053.67	186.67
77	1059.51	194.79
78	1065.17	203.04
79	1070.63	211.41
80	1075.32	218.97

Circle Center At X = 703.0 ; Y = 445.2 and Radius, 435.7

*** Factor of Safety = 1.928 ***

Individual data on the 104 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.5	949.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.7	1520.4	0.0	307.5	0.0	0.0	0.0	0.0	0.0
3	7.3	7852.5	0.0	3768.9	0.0	0.0	0.0	0.0	0.0
4	7.5	13432.3	0.0	7976.8	0.0	0.0	0.0	0.0	0.0
5	4.6	10804.2	0.0	6752.9	0.0	0.0	0.0	0.0	0.0
6	3.0	8308.5	0.0	5325.1	0.0	0.0	0.0	0.0	0.0

7	3.0	8877.8	0.0	5652.2	0.0	0.0	0.0	0.0	0.0
8	4.8	16300.6	0.0	10417.9	0.0	0.0	0.0	0.0	0.0
9	1.4	5224.6	0.0	3274.1	0.0	0.0	0.0	0.0	0.0
10	6.5	26407.2	0.0	16677.0	0.0	0.0	0.0	0.0	0.0
11	6.7	31077.1	0.0	19536.0	0.0	0.0	0.0	0.0	0.0
12	1.3	6620.1	0.0	4183.0	0.0	0.0	0.0	0.0	0.0
13	5.7	30097.1	0.0	18700.1	0.0	0.0	0.0	0.0	0.0
14	2.5	13960.1	0.0	8671.6	0.0	0.0	0.0	0.0	0.0
15	8.3	50567.0	0.0	30907.3	0.0	0.0	0.0	0.0	0.0
16	4.2	27749.8	0.0	16701.3	0.0	0.0	0.0	0.0	0.0
17	4.2	29345.8	0.0	17622.7	0.0	0.0	0.0	0.0	0.0
18	8.6	63903.7	0.0	37620.0	0.0	0.0	0.0	0.0	0.0
19	8.7	70684.0	0.0	40793.5	0.0	0.0	0.0	0.0	0.0
20	8.8	77358.5	0.0	43842.9	0.0	0.0	0.0	0.0	0.0
21	1.1	10383.4	0.0	5798.3	0.0	0.0	0.0	0.0	0.0
22	0.1	813.4	0.0	246.8	0.0	0.0	0.0	0.0	0.0
23	0.1	883.9	0.0	472.7	0.0	0.0	0.0	0.0	0.0
24	7.6	69224.5	0.0	36756.2	0.0	0.0	0.0	0.0	0.0
25	9.0	88510.0	0.0	45819.0	0.0	0.0	0.0	0.0	0.0
26	9.1	95964.9	0.0	48486.6	0.0	0.0	0.0	0.0	0.0
27	9.2	103272.0	0.0	51024.0	0.0	0.0	0.0	0.0	0.0
28	9.3	110410.8	0.0	53429.9	0.0	0.0	0.0	0.0	0.0
29	9.4	117360.9	0.0	55703.1	0.0	0.0	0.0	0.0	0.0
30	6.4	83054.5	0.0	38771.0	0.0	0.0	0.0	0.0	0.0
31	3.1	40965.4	0.0	19071.3	0.0	0.0	0.0	0.0	0.0
32	9.5	129315.0	0.0	59846.4	0.0	0.0	0.0	0.0	0.0
33	7.4	103519.0	0.0	47672.0	0.0	0.0	0.0	0.0	0.0
34	2.2	30497.8	0.0	14042.4	0.0	0.0	0.0	0.0	0.0
35	9.6	139519.0	0.0	63445.3	0.0	0.0	0.0	0.0	0.0
36	9.7	145225.7	0.0	65038.1	0.0	0.0	0.0	0.0	0.0
37	9.8	150640.2	0.0	66492.3	0.0	0.0	0.0	0.0	0.0
38	9.8	155746.4	0.0	67806.5	0.0	0.0	0.0	0.0	0.0
39	9.8	160531.0	0.0	68980.3	0.0	0.0	0.0	0.0	0.0
40	9.9	164982.6	0.0	70013.5	0.0	0.0	0.0	0.0	0.0
41	9.9	169087.9	0.0	70904.8	0.0	0.0	0.0	0.0	0.0
42	9.3	162017.6	0.0	67186.8	0.0	0.0	0.0	0.0	0.0
43	0.6	10816.7	0.0	4467.7	0.0	0.0	0.0	0.0	0.0
44	10.0	175245.3	0.0	72261.6	0.0	0.0	0.0	0.0	0.0
45	9.4	166580.3	0.0	68632.8	0.0	0.0	0.0	0.0	0.0
46	0.6	9934.1	0.0	4093.4	0.0	0.0	0.0	0.0	0.0
47	10.0	178360.9	0.0	73047.3	0.0	0.0	0.0	0.0	0.0
48	10.0	180599.1	0.0	73226.0	0.0	0.0	0.0	0.0	0.0
49	10.0	182445.5	0.0	73261.1	0.0	0.0	0.0	0.0	0.0
50	10.0	183897.2	0.0	73153.2	0.0	0.0	0.0	0.0	0.0
51	10.0	184951.3	0.0	72902.2	0.0	0.0	0.0	0.0	0.0
52	10.0	185604.9	0.0	72507.8	0.0	0.0	0.0	0.0	0.0
53	10.0	185859.8	0.0	71971.2	0.0	0.0	0.0	0.0	0.0
54	9.5	178509.4	0.0	68541.0	0.0	0.0	0.0	0.0	0.0
55	0.4	7203.2	0.0	2750.4	0.0	0.0	0.0	0.0	0.0
56	9.9	184247.6	0.0	70469.9	0.0	0.0	0.0	0.0	0.0
57	9.7	178975.2	0.0	68500.2	0.0	0.0	0.0	0.0	0.0
58	0.1	2633.0	0.0	1006.1	0.0	0.0	0.0	0.0	0.0
59	9.8	179468.0	0.0	68401.6	0.0	0.0	0.0	0.0	0.0
60	9.8	177771.5	0.0	67156.5	0.0	0.0	0.0	0.0	0.0
61	9.7	175697.4	0.0	65771.1	0.0	0.0	0.0	0.0	0.0
62	9.7	173253.7	0.0	64246.5	0.0	0.0	0.0	0.0	0.0
63	9.6	170449.5	0.0	62583.6	0.0	0.0	0.0	0.0	0.0
64	9.5	167294.1	0.0	60783.1	0.0	0.0	0.0	0.0	0.0
65	1.7	29919.7	0.0	10834.2	0.0	0.0	0.0	0.0	0.0
66	7.8	133427.2	0.0	48011.4	0.0	0.0	0.0	0.0	0.0
67	9.4	158218.9	0.0	56772.9	0.0	0.0	0.0	0.0	0.0
68	9.3	152785.8	0.0	54565.3	0.0	0.0	0.0	0.0	0.0
69	9.2	147088.5	0.0	52224.7	0.0	0.0	0.0	0.0	0.0

70	9.1	141141.1	0.0	49751.7	0.0	0.0	0.0	0.0	0.0
71	9.0	134963.6	0.0	47148.0	0.0	0.0	0.0	0.0	0.0
72	8.9	128573.7	0.0	44414.9	0.0	0.0	0.0	0.0	0.0
73	8.8	121990.0	0.0	41553.6	0.0	0.0	0.0	0.0	0.0
74	8.7	115234.4	0.0	38566.0	0.0	0.0	0.0	0.0	0.0
75	8.6	108325.7	0.0	35453.4	0.0	0.0	0.0	0.0	0.0
76	8.5	101070.1	0.0	32150.5	0.0	0.0	0.0	0.0	0.0
77	0.0	215.2	0.0	66.8	0.0	0.0	0.0	0.0	0.0
78	8.4	94366.4	0.0	28859.9	0.0	0.0	0.0	0.0	0.0
79	6.6	70149.5	0.0	20488.9	0.0	0.0	0.0	0.0	0.0
80	1.7	17435.7	0.0	4893.5	0.0	0.0	0.0	0.0	0.0
81	5.3	53614.8	0.0	14711.4	0.0	0.0	0.0	0.0	0.0
82	2.8	27153.1	0.0	7075.8	0.0	0.0	0.0	0.0	0.0
83	8.0	74252.9	0.0	18075.7	0.0	0.0	0.0	0.0	0.0
84	2.5	21788.9	0.0	4878.3	0.0	0.0	0.0	0.0	0.0
85	5.4	45855.7	0.0	9371.9	0.0	0.0	0.0	0.0	0.0
86	0.9	7168.1	0.0	1370.9	0.0	0.0	0.0	0.0	0.0
87	1.2	9484.4	0.0	1755.0	0.0	0.0	0.0	0.0	0.0
88	4.8	38008.4	0.0	6289.5	0.0	0.0	0.0	0.0	0.0
89	0.8	6152.4	0.0	897.0	0.0	0.0	0.0	0.0	0.0
90	7.5	54568.0	0.0	6264.7	0.0	0.0	0.0	0.0	0.0
91	7.4	48459.1	0.0	2109.1	0.0	0.0	0.0	0.0	0.0
92	0.0	47.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
93	7.2	43227.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
94	7.1	39001.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
95	6.9	34777.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
96	6.7	30617.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
97	6.6	26534.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98	6.4	22540.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99	6.2	18649.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	6.0	14875.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	5.8	11228.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	5.7	7724.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103	5.5	4373.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
104	4.7	1207.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 81 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	415.79	137.89
2	422.92	130.88
3	430.20	124.03
4	437.64	117.35
5	445.23	110.84
6	452.97	104.50
7	460.85	98.35
8	468.87	92.38
9	477.03	86.59
10	485.31	80.99
11	493.73	75.58
12	502.26	70.37
13	510.91	65.35
14	519.67	60.54
15	528.55	55.92
16	537.52	51.51
17	546.59	47.31
18	555.76	43.31
19	565.02	39.53
20	574.36	35.96
21	583.78	32.61

22	593.27	29.47
23	602.84	26.55
24	612.47	23.85
25	622.16	21.37
26	631.90	19.11
27	641.69	17.08
28	651.52	15.27
29	661.40	13.69
30	671.31	12.34
31	681.24	11.21
32	691.20	10.31
33	701.18	9.64
34	711.17	9.20
35	721.17	8.99
36	731.17	9.00
37	741.16	9.25
38	751.15	9.72
39	761.13	10.43
40	771.09	11.36
41	781.02	12.52
42	790.92	13.91
43	800.79	15.52
44	810.62	17.36
45	820.40	19.42
46	830.14	21.71
47	839.82	24.22
48	849.44	26.95
49	858.99	29.90
50	868.48	33.07
51	877.89	36.46
52	887.22	40.06
53	896.46	43.87
54	905.62	47.90
55	914.68	52.13
56	923.64	56.57
57	932.49	61.21
58	941.24	66.06
59	949.87	71.10
60	958.39	76.34
61	966.79	81.78
62	975.05	87.40
63	983.19	93.22
64	991.19	99.22
65	999.05	105.40
66	1006.77	111.75
67	1014.34	118.29
68	1021.76	124.99
69	1029.02	131.87
70	1036.12	138.91
71	1043.06	146.11
72	1049.84	153.46
73	1056.44	160.97
74	1062.87	168.63
75	1069.12	176.44
76	1075.19	184.38
77	1081.08	192.47
78	1086.78	200.68
79	1092.29	209.03
80	1097.61	217.50
81	1099.08	219.96

Circle Center At X = 725.5 ; Y = 445.3 and Radius, 436.3

*** Factor of Safety = 1.942 ***

1

Failure Surface Specified By 81 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	415.79	137.89
2	422.92	130.89
3	430.21	124.04
4	437.66	117.37
5	445.26	110.87
6	453.00	104.54
7	460.89	98.39
8	468.92	92.43
9	477.08	86.65
10	485.37	81.06
11	493.79	75.66
12	502.33	70.46
13	510.99	65.45
14	519.75	60.65
15	528.63	56.04
16	537.61	51.65
17	546.69	47.45
18	555.86	43.47
19	565.13	39.70
20	574.47	36.14
21	583.90	32.80
22	593.40	29.68
23	602.96	26.77
24	612.60	24.08
25	622.29	21.62
26	632.03	19.38
27	641.83	17.36
28	651.67	15.57
29	661.54	14.00
30	671.45	12.67
31	681.39	11.55
32	691.35	10.67
33	701.33	10.02
34	711.32	9.59
35	721.32	9.40
36	731.32	9.43
37	741.32	9.69
38	751.30	10.19
39	761.28	10.91
40	771.23	11.86
41	781.16	13.04
42	791.06	14.44
43	800.93	16.08
44	810.76	17.93
45	820.54	20.02
46	830.27	22.32
47	839.94	24.85
48	849.56	27.61
49	859.10	30.58
50	868.58	33.77

51	877.98	37.17
52	887.31	40.79
53	896.54	44.63
54	905.69	48.67
55	914.74	52.92
56	923.69	57.38
57	932.53	62.05
58	941.27	66.91
59	949.89	71.98
60	958.40	77.24
61	966.78	82.69
62	975.03	88.34
63	983.16	94.17
64	991.14	100.19
65	998.99	106.39
66	1006.69	112.77
67	1014.24	119.32
68	1021.64	126.05
69	1028.89	132.94
70	1035.97	140.00
71	1042.89	147.21
72	1049.65	154.59
73	1056.23	162.12
74	1062.64	169.79
75	1068.87	177.62
76	1074.92	185.58
77	1080.78	193.68
78	1086.46	201.91
79	1091.95	210.27
80	1097.24	218.75
81	1097.93	219.91

Circle Center At X = 724.8 ; Y = 445.3 and Radius, 435.9

*** Factor of Safety = 1.944 ***

Failure Surface Specified By 82 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	321.05	135.53
2	328.33	128.67
3	335.76	121.98
4	343.34	115.45
5	351.05	109.08
6	358.90	102.89
7	366.88	96.87
8	375.00	91.02
9	383.24	85.35
10	391.60	79.87
11	400.07	74.56
12	408.66	69.44
13	417.36	64.51
14	426.17	59.77
15	435.08	55.23
16	444.08	50.88
17	453.18	46.72

18	462.36	42.77
19	471.63	39.01
20	480.98	35.46
21	490.40	32.12
22	499.90	28.98
23	509.46	26.04
24	519.08	23.32
25	528.76	20.81
26	538.49	18.51
27	548.27	16.42
28	558.09	14.54
29	567.95	12.88
30	577.85	11.43
31	587.77	10.20
32	597.72	9.19
33	607.69	8.39
34	617.67	7.81
35	627.66	7.45
36	637.66	7.31
37	647.66	7.38
38	657.66	7.67
39	667.65	8.18
40	677.62	8.91
41	687.57	9.85
42	697.51	11.01
43	707.41	12.39
44	717.28	13.98
45	727.12	15.79
46	736.91	17.81
47	746.66	20.04
48	756.36	22.49
49	766.00	25.14
50	775.58	28.01
51	785.10	31.08
52	794.54	34.36
53	803.92	37.85
54	813.21	41.53
55	822.42	45.42
56	831.55	49.51
57	840.58	53.80
58	849.52	58.28
59	858.36	62.96
60	867.09	67.83
61	875.72	72.89
62	884.24	78.13
63	892.63	83.56
64	900.91	89.17
65	909.07	94.96
66	917.09	100.92
67	924.99	107.06
68	932.74	113.37
69	940.36	119.85
70	947.84	126.49
71	955.17	133.29
72	962.35	140.25
73	969.37	147.37
74	976.24	154.64
75	982.95	162.05
76	989.50	169.61
77	995.88	177.31
78	1002.09	185.15
79	1008.13	193.12
80	1013.99	201.22

81	1019.68	209.45
82	1024.57	216.86

Circle Center At X = 639.3 ; Y = 466.3 and Radius, 459.0

*** Factor of Safety = 1.946 ***

1

Failure Surface Specified By 80 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.11	136.05
2	349.28	129.09
3	356.62	122.30
4	364.11	115.67
5	371.75	109.22
6	379.54	102.95
7	387.47	96.86
8	395.54	90.95
9	403.75	85.23
10	412.08	79.70
11	420.54	74.37
12	429.11	69.23
13	437.81	64.29
14	446.61	59.55
15	455.53	55.01
16	464.54	50.69
17	473.65	46.57
18	482.86	42.66
19	492.15	38.96
20	501.52	35.48
21	510.98	32.21
22	520.50	29.17
23	530.09	26.34
24	539.75	23.74
25	549.46	21.36
26	559.23	19.20
27	569.04	17.27
28	578.89	15.57
29	588.78	14.09
30	598.70	12.84
31	608.65	11.82
32	618.62	11.03
33	628.60	10.47
34	638.60	10.13
35	648.60	10.03
36	658.60	10.16
37	668.59	10.52
38	678.57	11.11
39	688.54	11.93
40	698.48	12.98
41	708.40	14.25
42	718.29	15.76
43	728.14	17.49
44	737.94	19.45
45	747.70	21.63

46	757.41	24.04
47	767.06	26.67
48	776.64	29.53
49	786.16	32.60
50	795.60	35.89
51	804.96	39.40
52	814.25	43.12
53	823.44	47.05
54	832.54	51.20
55	841.54	55.55
56	850.44	60.11
57	859.23	64.88
58	867.92	69.84
59	876.48	75.00
60	884.92	80.36
61	893.24	85.92
62	901.43	91.66
63	909.48	97.59
64	917.39	103.70
65	925.16	109.99
66	932.79	116.46
67	940.26	123.11
68	947.58	129.92
69	954.74	136.91
70	961.73	144.05
71	968.56	151.36
72	975.22	158.82
73	981.71	166.43
74	988.02	174.18
75	994.15	182.09
76	1000.09	190.13
77	1005.85	198.30
78	1011.42	206.61
79	1016.80	215.04
80	1017.73	216.57

Circle Center At X = 648.0 ; Y = 444.3 and Radius, 434.2

*** Factor of Safety = 1.947 ***

Failure Surface Specified By 80 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	394.74	137.37
2	402.03	130.52
3	409.47	123.84
4	417.05	117.33
5	424.79	110.98
6	432.66	104.82
7	440.67	98.83
8	448.80	93.02
9	457.07	87.39
10	465.46	81.95
11	473.98	76.70
12	482.60	71.65
13	491.34	66.78

14	500.18	62.12
15	509.13	57.65
16	518.17	53.38
17	527.31	49.32
18	536.54	45.46
19	545.85	41.81
20	555.24	38.37
21	564.70	35.14
22	574.24	32.12
23	583.83	29.32
24	593.49	26.73
25	603.21	24.36
26	612.97	22.21
27	622.79	20.28
28	632.64	18.56
29	642.53	17.07
30	652.44	15.80
31	662.39	14.75
32	672.36	13.93
33	682.34	13.32
34	692.33	12.94
35	702.33	12.79
36	712.33	12.86
37	722.32	13.15
38	732.31	13.67
39	742.28	14.40
40	752.24	15.37
41	762.17	16.55
42	772.07	17.96
43	781.93	19.59
44	791.76	21.43
45	801.55	23.50
46	811.28	25.79
47	820.96	28.29
48	830.59	31.01
49	840.14	33.95
50	849.64	37.09
51	859.06	40.45
52	868.40	44.02
53	877.66	47.80
54	886.83	51.78
55	895.91	55.97
56	904.89	60.36
57	913.78	64.95
58	922.56	69.74
59	931.23	74.72
60	939.78	79.90
61	948.22	85.26
62	956.54	90.82
63	964.73	96.55
64	972.79	102.47
65	980.71	108.57
66	988.50	114.85
67	996.14	121.30
68	1003.64	127.91
69	1010.99	134.69
70	1018.18	141.64
71	1025.22	148.75
72	1032.10	156.01
73	1038.81	163.42
74	1045.35	170.98
75	1051.73	178.69
76	1057.93	186.53

77	1063.95	194.52
78	1069.79	202.63
79	1075.45	210.88
80	1080.90	219.20

Circle Center At X = 704.3 ; Y = 459.6 and Radius, 446.8

*** Factor of Safety = 1.947 ***

1

Failure Surface Specified By 80 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	363.16	136.58
2	370.50	129.78
3	377.98	123.15
4	385.61	116.69
5	393.39	110.40
6	401.30	104.28
7	409.34	98.35
8	417.52	92.59
9	425.82	87.01
10	434.24	81.62
11	442.79	76.42
12	451.44	71.41
13	460.20	66.60
14	469.07	61.98
15	478.04	57.56
16	487.11	53.34
17	496.27	49.32
18	505.51	45.50
19	514.84	41.90
20	524.24	38.50
21	533.72	35.31
22	543.27	32.33
23	552.88	29.57
24	562.55	27.02
25	572.27	24.69
26	582.04	22.57
27	591.86	20.67
28	601.72	18.99
29	611.61	17.53
30	621.53	16.29
31	631.48	15.27
32	641.45	14.47
33	651.43	13.89
34	661.43	13.54
35	671.43	13.41
36	681.43	13.50
37	691.42	13.81
38	701.41	14.35
39	711.38	15.10
40	721.33	16.08
41	731.26	17.28
42	741.16	18.70
43	751.02	20.34

44	760.85	22.20
45	770.63	24.28
46	780.36	26.57
47	790.04	29.08
48	799.66	31.81
49	809.22	34.74
50	818.71	37.89
51	828.13	41.25
52	837.47	44.82
53	846.73	48.60
54	855.91	52.58
55	864.99	56.76
56	873.98	61.15
57	882.87	65.73
58	891.65	70.51
59	900.33	75.48
60	908.89	80.65
61	917.33	86.00
62	925.66	91.54
63	933.86	97.27
64	941.93	103.17
65	949.86	109.26
66	957.66	115.52
67	965.32	121.95
68	972.83	128.55
69	980.20	135.31
70	987.41	142.24
71	994.47	149.32
72	1001.37	156.56
73	1008.10	163.96
74	1014.67	171.50
75	1021.07	179.18
76	1027.29	187.01
77	1033.35	194.97
78	1039.22	203.06
79	1044.91	211.28
80	1049.27	217.89

Circle Center At X = 672.3 ; Y = 463.0 and Radius, 449.6

*** Factor of Safety = 1.949 ***

Failure Surface Specified By 83 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	331.58	135.79
2	339.01	129.09
3	346.57	122.56
4	354.28	116.18
5	362.12	109.97
6	370.08	103.92
7	378.17	98.05
8	386.39	92.34
9	394.72	86.81
10	403.17	81.46
11	411.72	76.29

12	420.39	71.30
13	429.16	66.49
14	438.03	61.87
15	446.99	57.44
16	456.04	53.19
17	465.19	49.14
18	474.41	45.28
19	483.72	41.62
20	493.10	38.16
21	502.55	34.89
22	512.07	31.82
23	521.65	28.96
24	531.29	26.30
25	540.98	23.84
26	550.72	21.59
27	560.51	19.54
28	570.34	17.70
29	580.21	16.07
30	590.11	14.64
31	600.03	13.43
32	609.98	12.43
33	619.95	11.63
34	629.93	11.05
35	639.93	10.67
36	649.92	10.51
37	659.92	10.56
38	669.92	10.82
39	679.91	11.29
40	689.89	11.97
41	699.85	12.86
42	709.79	13.96
43	719.70	15.27
44	729.58	16.79
45	739.43	18.52
46	749.24	20.45
47	759.01	22.59
48	768.73	24.94
49	778.40	27.49
50	788.02	30.25
51	797.57	33.20
52	807.06	36.36
53	816.48	39.72
54	825.82	43.27
55	835.09	47.02
56	844.28	50.97
57	853.38	55.11
58	862.40	59.44
59	871.32	63.96
60	880.14	68.67
61	888.86	73.56
62	897.48	78.63
63	905.99	83.89
64	914.38	89.32
65	922.66	94.93
66	930.82	100.71
67	938.85	106.67
68	946.76	112.79
69	954.54	119.08
70	962.18	125.53
71	969.68	132.14
72	977.05	138.90
73	984.27	145.82
74	991.34	152.89

75	998.26	160.11
76	1005.02	167.48
77	1011.63	174.98
78	1018.08	182.62
79	1024.37	190.40
80	1030.49	198.31
81	1036.44	206.34
82	1042.23	214.50
83	1044.38	217.68

Circle Center At X = 652.6 ; Y = 484.5 and Radius, 474.0

*** Factor of Safety = 1.952 ***

1

Failure Surface Specified By 79 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	405.26	137.63
2	412.48	130.71
3	419.86	123.96
4	427.38	117.38
5	435.07	110.97
6	442.89	104.75
7	450.86	98.70
8	458.97	92.85
9	467.21	87.18
10	475.58	81.71
11	484.07	76.43
12	492.68	71.35
13	501.41	66.48
14	510.25	61.80
15	519.20	57.33
16	528.25	53.07
17	537.39	49.02
18	546.63	45.19
19	555.95	41.57
20	565.35	38.16
21	574.83	34.98
22	584.38	32.01
23	594.00	29.27
24	603.67	26.75
25	613.41	24.46
26	623.19	22.39
27	633.02	20.55
28	642.89	18.94
29	652.79	17.55
30	662.73	16.40
31	672.68	15.48
32	682.66	14.79
33	692.65	14.33
34	702.65	14.10
35	712.65	14.10
36	722.64	14.34
37	732.63	14.80
38	742.61	15.50

39	752.56	16.43
40	762.50	17.59
41	772.40	18.98
42	782.27	20.60
43	792.10	22.45
44	801.88	24.52
45	811.61	26.82
46	821.29	29.35
47	830.90	32.10
48	840.45	35.07
49	849.93	38.26
50	859.33	41.67
51	868.65	45.30
52	877.88	49.14
53	887.02	53.19
54	896.06	57.46
55	905.01	61.94
56	913.84	66.62
57	922.57	71.50
58	931.18	76.59
59	939.67	81.87
60	948.03	87.35
61	956.27	93.02
62	964.37	98.88
63	972.34	104.93
64	980.16	111.16
65	987.84	117.57
66	995.36	124.15
67	1002.73	130.91
68	1009.94	137.84
69	1016.99	144.93
70	1023.88	152.19
71	1030.59	159.60
72	1037.13	167.16
73	1043.49	174.88
74	1049.67	182.74
75	1055.67	190.74
76	1061.48	198.88
77	1067.10	207.15
78	1072.53	215.55
79	1074.61	218.94

Circle Center At X = 707.5 ; Y = 445.5 and Radius, 431.4

*** Factor of Safety = 1.952 ***

Failure Surface Specified By 76 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	394.74	137.37
2	401.81	130.30
3	409.06	123.41
4	416.47	116.70
5	424.05	110.18
6	431.79	103.85
7	439.69	97.71

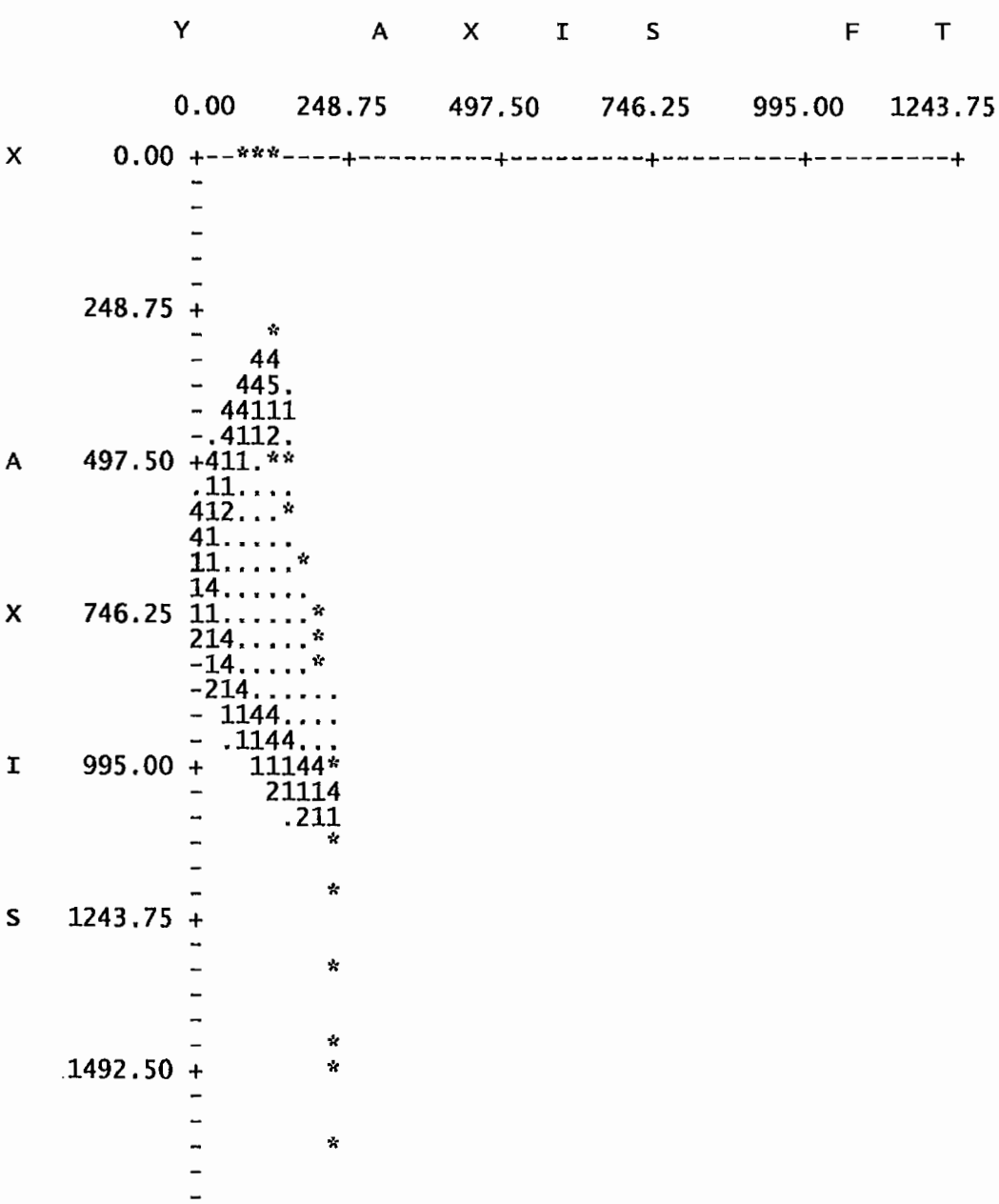
8	447.74	91.77
9	455.93	86.04
10	464.26	80.50
11	472.72	75.18
12	481.32	70.07
13	490.04	65.18
14	498.88	60.50
15	507.83	56.04
16	516.89	51.81
17	526.05	47.81
18	535.31	44.03
19	544.67	40.49
20	554.10	37.18
21	563.62	34.10
22	573.21	31.27
23	582.86	28.67
24	592.58	26.31
25	602.36	24.20
26	612.18	22.33
27	622.05	20.70
28	631.95	19.32
29	641.89	18.19
30	651.85	17.30
31	661.83	16.66
32	671.82	16.27
33	681.82	16.13
34	691.82	16.24
35	701.81	16.60
36	711.79	17.20
37	721.76	18.05
38	731.69	19.15
39	741.60	20.50
40	751.48	22.09
41	761.31	23.93
42	771.09	26.01
43	780.81	28.34
44	790.48	30.90
45	800.08	33.71
46	809.60	36.75
47	819.05	40.03
48	828.41	43.54
49	837.68	47.29
50	846.86	51.26
51	855.94	55.46
52	864.90	59.89
53	873.76	64.54
54	882.49	69.40
55	891.11	74.48
56	899.59	79.78
57	907.94	85.28
58	916.15	90.99
59	924.22	96.90
60	932.13	103.01
61	939.89	109.32
62	947.50	115.81
63	954.93	122.50
64	962.20	129.36
65	969.30	136.41
66	976.22	143.63
67	982.96	151.02
68	989.51	158.57
69	995.87	166.29
70	1002.04	174.16

71	1008.01	182.18
72	1013.78	190.35
73	1019.35	198.66
74	1024.70	207.10
75	1029.85	215.68
76	1030.66	217.11

Circle Center At X = 682.5 ; Y = 418.2 and Radius, 402.1

*** Factor of Safety = 1.953 ***

1



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F   1741.25 +         *
            -
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            -
T   1990.00 +  ***    *
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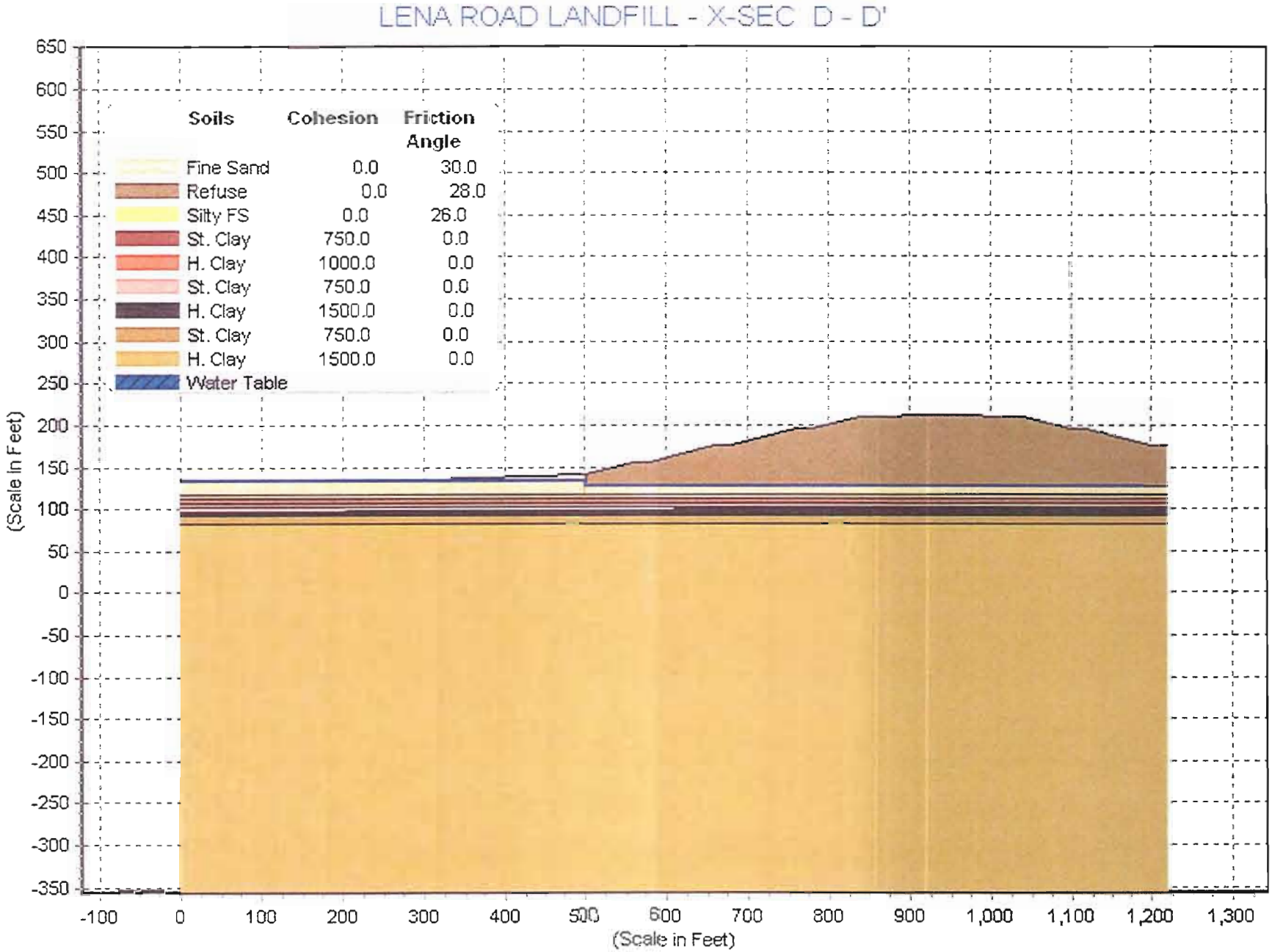
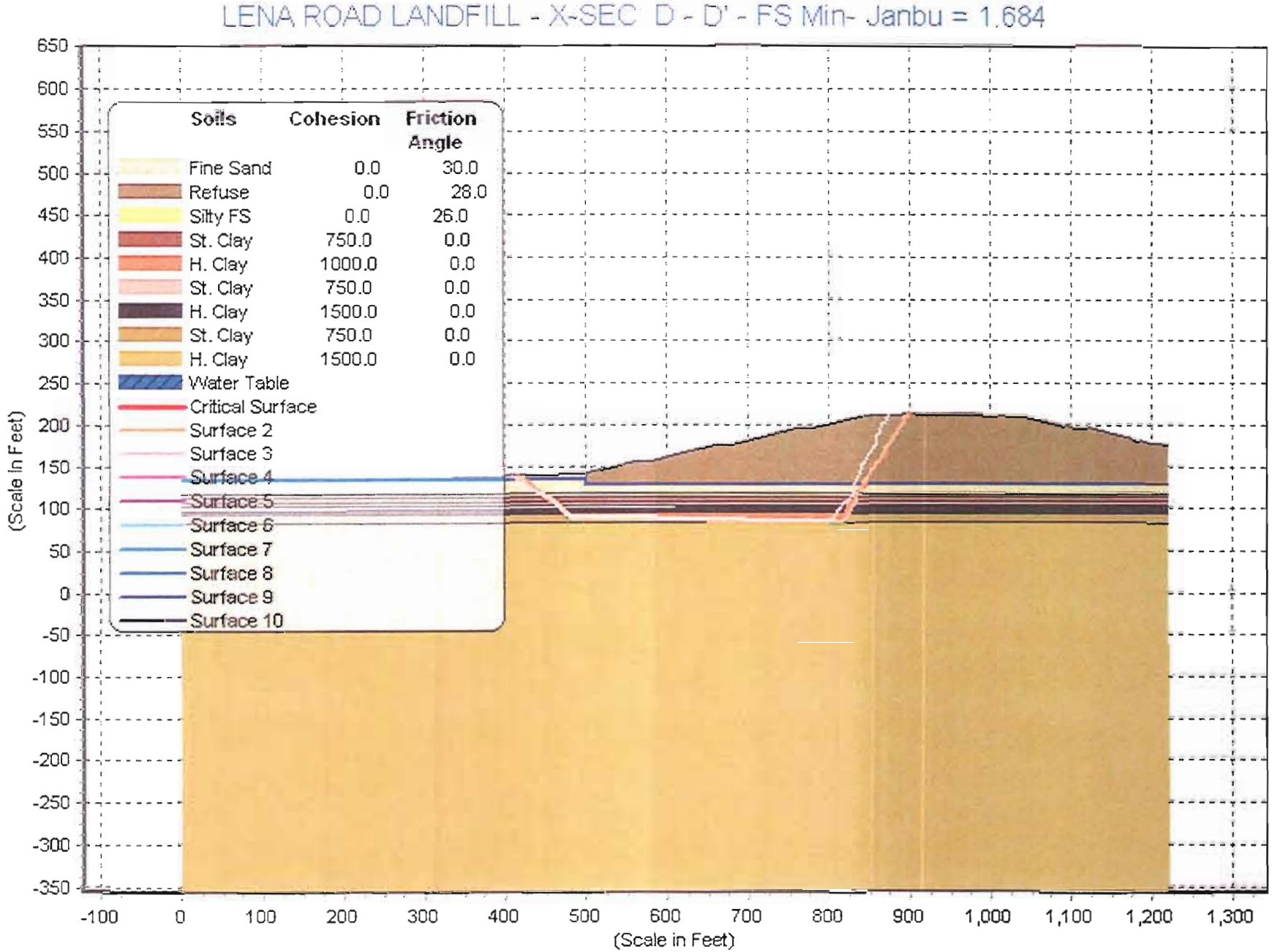
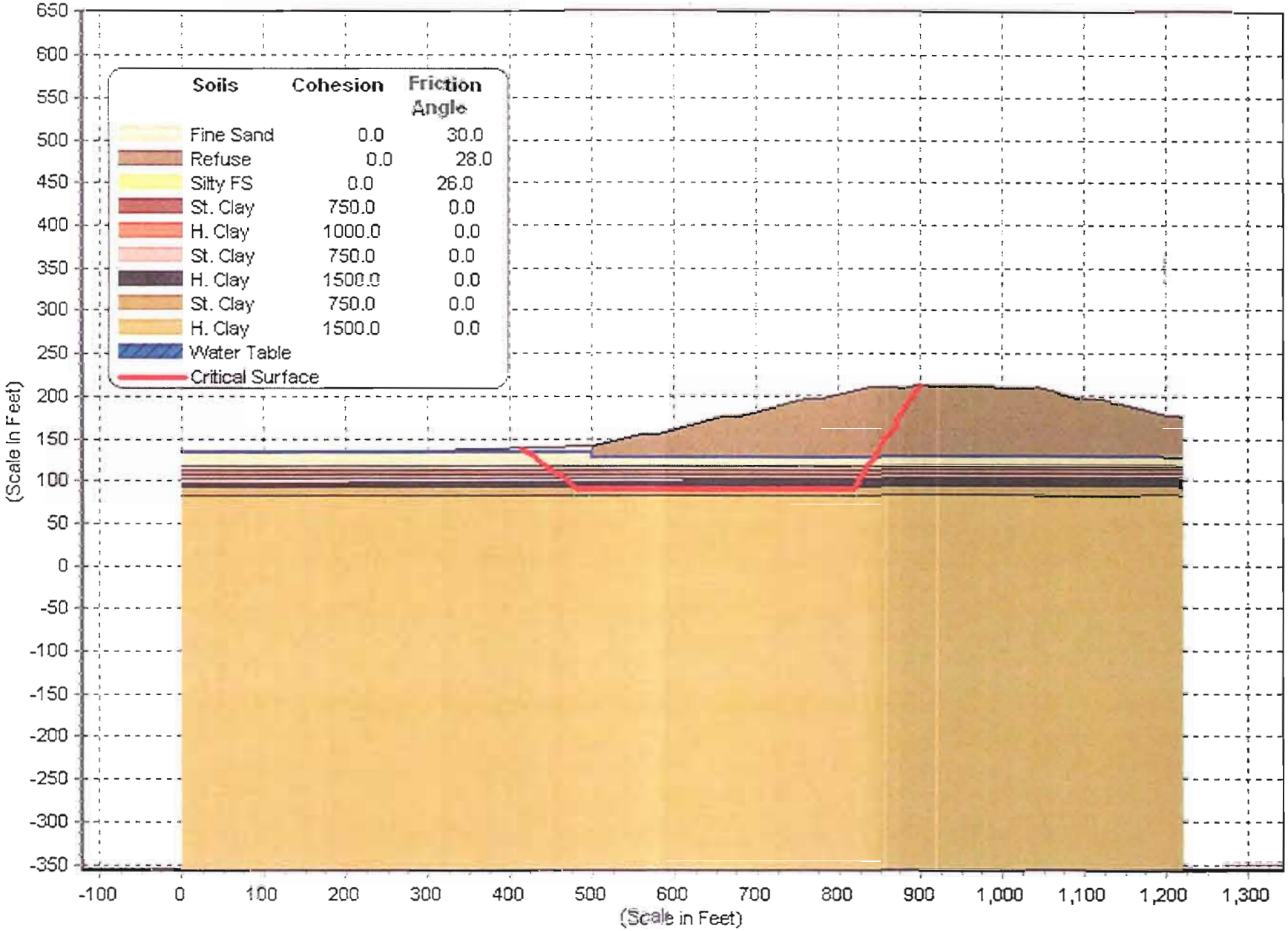

LENA ROAD LANDFILL - X-SEC D - D'
Soils
Cohesion
Friction Angle
Fine Sand 0.0 30.0
Refuse 0.0 28.0
Silty FS 0.0 26.0
St. Clay 750.0 0.0
H. Clay 1000.0 0.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
Water Table
(Scale In Feet)
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
-350
-100
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
(Scale in Feet)


LENA ROAD LANDFILL - X-SEC D - D' - FS Min- Janbu = 1.684
Soils
Cohesion
Friction Angle
Fine Sand 0.0 30.0
Refuse 0.0 28.0
Silty FS 0.0 26.0
St. Clay 750.0 0.0
H. Clay 1000.0 0.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
Water Table
Critical Surface
Surface 2
Surface 3
Surface 4
Surface 5
Surface 6
Surface 7
Surface 8
Surface 9
Surface 10
(Scale in Feet)
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
-350
-100
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
(Scale in Feet)


LENA ROAD LANDFILL - X-SEC D - D' - FS Min- Janbu = 1.684
Soils
Cohesion
Friction Angle
Fine Sand 0.0 30.0
Refuse 0.0 28.0
Silty FS 0.0 26.0
St. Clay 750.0 0.0
H. Clay 1000.0 0.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
St. Clay 750.0 0.0
H. Clay 1500.0 0.0
Water Table
Critical Surface
(Scale In Feet)
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
-100
-150
-200
-250
-300
-350
-100
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
(Scale in Feet)

result.out
** STABL for WINDOWS **
by
Geotechnical Software Solutions

1

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

Run Date:	9/27/10
Time of Run:	16:00
Run By:	Shawkat Ali
Input Data Filename:	run.in
Output Filename:	result.out
Unit:	U.S.C.
Plotted Output Filename:	result.plt

PROBLEM DESCRIPTION LENA ROAD LANDFILL - X-SEC D - D'

BOUNDARY COORDINATES

15 Top Boundaries
24 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	135.00	300.00	135.00	2
2	300.00	135.00	500.00	140.00	2
3	500.00	140.00	560.00	155.00	1
4	560.00	155.00	580.00	155.00	1
5	580.00	155.00	660.00	175.00	1
6	660.00	175.00	680.00	175.00	1
7	680.00	175.00	760.00	195.00	1
8	760.00	195.00	780.00	195.00	1
9	780.00	195.00	840.00	210.00	1
10	840.00	210.00	940.00	212.00	1
11	940.00	212.00	1040.00	210.00	1
12	1040.00	210.00	1100.00	195.00	1
13	1100.00	195.00	1120.00	195.00	1
14	1120.00	195.00	1200.00	175.00	1
15	1200.00	175.00	1220.00	175.00	1
16	500.10	127.00	500.20	140.00	1
17	500.10	127.00	1220.00	127.00	2
18	0.00	117.00	1220.00	117.00	3
19	0.00	112.00	1220.00	112.00	4
20	0.00	107.00	1220.00	107.00	5
21	0.00	102.00	1220.00	102.00	6
22	0.00	97.00	1220.00	102.00	7
23	0.00	92.00	1220.00	92.00	8
24	0.00	82.00	1220.00	82.00	9

1

ISOTROPIC SOIL PARAMETERS

9 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	70.0	80.0	0.0	28.0	0.00	0.0	1
2	100.0	110.0	0.0	30.0	0.00	0.0	1
3	95.0	105.0	0.0	26.0	0.00	0.0	1
4	105.0	120.0	750.0	0.0	0.00	0.0	1
5	110.0	125.0	1000.0	0.0	0.00	0.0	1
6	105.0	120.0	750.0	0.0	0.00	0.0	1
7	115.0	130.0	1500.0	0.0	0.00	0.0	1
8	105.0	120.0	750.0	0.0	0.00	0.0	1
9	115.0	130.0	1500.0	0.0	0.00	0.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	133.00
2	500.00	133.00
3	500.10	127.00
4	1190.00	127.00

1

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

200 Trial Surfaces Have Been Generated.

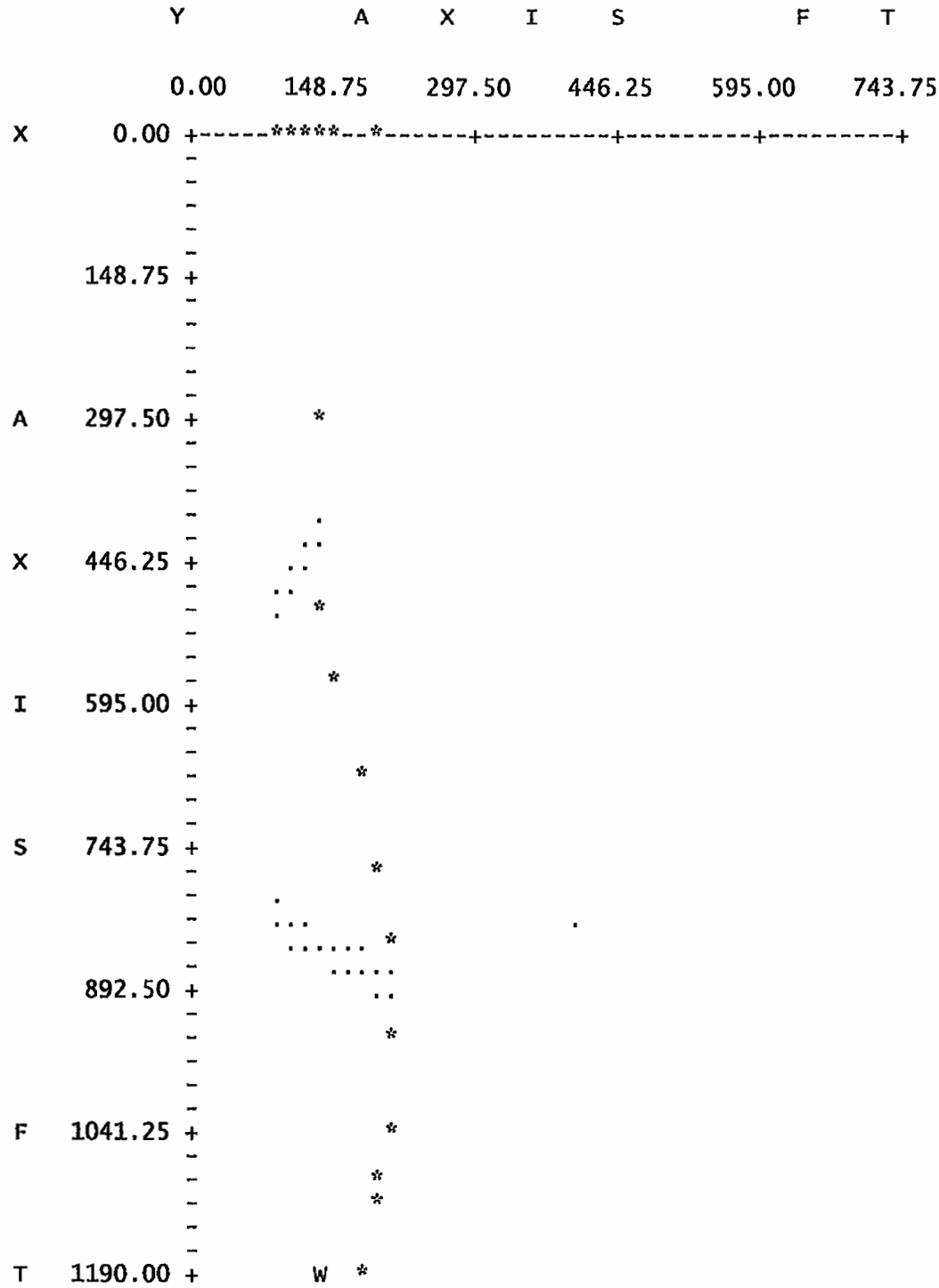
2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	475.00	86.00	495.00	86.00	10.00
2	800.00	86.00	820.00	86.00	10.00

**** ERROR - BK10 ****

1



****
****** EXECUTION OF STABL ABORTED ******
****

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 50 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	412.71	137.82
2	415.70	134.84
3	419.99	132.27
4	424.88	131.23
5	429.13	128.60
6	432.70	125.09
7	436.53	121.89
8	440.42	118.74
9	445.01	116.77
10	448.59	113.27
11	452.51	110.17
12	456.13	106.72
13	461.01	105.63
14	464.63	102.18
15	469.25	100.26
16	472.95	96.91
17	476.63	93.52
18	480.94	90.98
19	485.89	90.29
20	817.56	90.67
21	819.97	95.04
22	823.06	98.98
23	824.90	103.63
24	828.23	107.36
25	831.39	111.23
26	833.45	115.79
27	836.03	120.07
28	839.49	123.68
29	843.02	127.22
30	844.99	131.82
31	847.79	135.96
32	850.96	139.83
33	852.83	144.46
34	856.16	148.20
35	859.68	151.74
36	863.21	155.28
37	866.75	158.82
38	868.68	163.43
39	870.30	168.16
40	872.32	172.73
41	875.56	176.54
42	877.94	180.94
43	879.67	185.63
44	882.07	190.02
45	885.59	193.56

46	889.03	197.19
47	891.52	201.53
48	894.31	205.68
49	897.76	209.30
50	899.40	211.19

*** 1.684 ***

Individual data on the 73 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	3.0	456.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.1	1232.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	1.2	654.3	0.0	32.2	0.0	0.0	0.0	0.0	0.0
4	4.9	3146.7	0.0	389.7	0.0	0.0	0.0	0.0	0.0
5	4.3	3642.9	0.0	963.2	0.0	0.0	0.0	0.0	0.0
6	3.6	4296.3	0.0	1920.6	0.0	0.0	0.0	0.0	0.0
7	3.8	6074.3	0.0	2967.0	0.0	0.0	0.0	0.0	0.0
8	3.9	7539.6	0.0	3958.4	0.0	0.0	0.0	0.0	0.0
9	4.0	8988.8	0.0	4159.4	0.0	0.0	0.0	0.0	0.0
10	0.5	1275.5	0.0	598.1	0.0	0.0	0.0	0.0	0.0
11	3.6	9061.0	0.0	5610.7	0.0	0.0	0.0	0.0	0.0
12	1.6	4490.1	0.0	2603.3	0.0	0.0	0.0	0.0	0.0
13	2.3	6889.0	0.0	4035.9	0.0	0.0	0.0	0.0	0.0
14	3.3	10909.8	0.0	7001.8	0.0	0.0	0.0	0.0	0.0
15	0.3	1020.9	0.0	658.9	0.0	0.0	0.0	0.0	0.0
16	4.9	17489.5	0.0	8369.5	0.0	0.0	0.0	0.0	0.0
17	3.6	14047.4	0.0	9077.8	0.0	0.0	0.0	0.0	0.0
18	0.4	1791.5	0.0	910.0	0.0	0.0	0.0	0.0	0.0
19	4.2	17700.4	0.0	9004.5	0.0	0.0	0.0	0.0	0.0
20	1.5	6511.7	0.0	4143.0	0.0	0.0	0.0	0.0	0.0
21	2.2	10351.5	0.0	6594.5	0.0	0.0	0.0	0.0	0.0
22	3.7	18397.2	0.0	11789.5	0.0	0.0	0.0	0.0	0.0
23	2.6	13737.1	0.0	7518.7	0.0	0.0	0.0	0.0	0.0
24	1.7	9487.0	0.0	5195.0	0.0	0.0	0.0	0.0	0.0
25	5.0	27741.6	0.0	13217.5	0.0	0.0	0.0	0.0	0.0
26	14.1	79954.0	0.0	37595.4	0.0	0.0	0.0	0.0	0.0
27	0.1	475.7	0.0	123.9	0.0	0.0	0.0	0.0	0.0
28	0.1	523.7	0.0	229.0	0.0	0.0	0.0	0.0	0.0
29	59.8	344302.5	0.0	*******	0.0	0.0	0.0	0.0	0.0
30	20.0	125540.7	0.0	45694.2	0.0	0.0	0.0	0.0	0.0
31	80.0	557783.4	0.0	*******	0.0	0.0	0.0	0.0	0.0
32	20.0	153351.0	0.0	45553.0	0.0	0.0	0.0	0.0	0.0
33	80.0	669024.8	0.0	*******	0.0	0.0	0.0	0.0	0.0
34	20.0	181161.4	0.0	45411.7	0.0	0.0	0.0	0.0	0.0
35	37.6	352434.8	0.0	85200.4	0.0	0.0	0.0	0.0	0.0
36	0.7	7093.8	0.0	3390.5	0.0	0.0	0.0	0.0	0.0
37	1.7	15758.1	0.0	7262.8	0.0	0.0	0.0	0.0	0.0
38	3.1	27665.4	0.0	9356.5	0.0	0.0	0.0	0.0	0.0
39	0.6	4801.9	0.0	2562.2	0.0	0.0	0.0	0.0	0.0
40	0.6	5470.5	0.0	2815.4	0.0	0.0	0.0	0.0	0.0
41	0.6	5353.4	0.0	2640.1	0.0	0.0	0.0	0.0	0.0
42	3.0	24122.5	0.0	6121.3	0.0	0.0	0.0	0.0	0.0
43	0.3	2477.6	0.0	589.6	0.0	0.0	0.0	0.0	0.0
44	3.2	23962.3	0.0	5524.7	0.0	0.0	0.0	0.0	0.0

45	0.3	2548.7	0.0	811.0	0.0	0.0	0.0	0.0	0.0
46	1.7	12148.6	0.0	3398.3	0.0	0.0	0.0	0.0	0.0
47	0.7	5005.8	0.0	936.5	0.0	0.0	0.0	0.0	0.0
48	1.8	12293.9	0.0	1893.4	0.0	0.0	0.0	0.0	0.0
49	3.5	21905.1	0.0	1598.1	0.0	0.0	0.0	0.0	0.0
50	0.5	3158.4	0.0	138.8	0.0	0.0	0.0	0.0	0.0
51	2.8	16710.0	0.0	346.4	0.0	0.0	0.0	0.0	0.0
52	0.2	1275.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	2.0	11107.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	2.8	14917.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	3.2	16041.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	1.9	8924.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	3.3	14901.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	3.5	14891.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	3.5	14085.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	3.5	13219.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	1.9	6695.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	1.6	5061.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	2.0	5705.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	3.2	8164.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	2.4	5337.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	1.7	3331.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	2.4	3853.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
68	3.5	4710.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
69	3.4	3748.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70	2.5	2022.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	2.8	1457.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
72	3.4	875.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
73	1.6	106.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 52 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	413.98	137.85
2	415.62	136.80
3	419.70	133.92
4	423.85	131.13
5	427.48	127.68
6	431.02	124.16
7	434.60	120.66
8	439.10	118.48
9	443.63	116.37
10	448.00	113.94
11	451.64	110.51
12	456.58	109.75
13	460.59	106.77
14	464.46	103.60
15	468.04	100.11
16	471.80	96.82
17	475.42	93.37
18	479.38	90.32
19	482.96	86.83
20	816.83	81.98
21	818.52	86.68
22	821.76	90.49
23	825.20	94.12
24	826.99	98.79
25	829.42	103.16
26	832.49	107.11
27	832.97	112.08

28	836.43	115.69
29	837.64	120.54
30	839.31	125.26
31	841.19	129.89
32	844.53	133.61
33	848.05	137.16
34	851.31	140.95
35	853.16	145.59
36	856.68	149.15
37	859.95	152.93
38	863.45	156.51
39	866.02	160.79
40	867.40	165.60
41	868.95	170.35
42	872.41	173.96
43	875.74	177.69
44	879.27	181.23
45	880.36	186.11
46	883.83	189.71
47	886.25	194.09
48	889.47	197.91
49	892.54	201.86
50	893.02	206.84
51	896.34	210.58
52	896.73	211.13

*** 1.731 ***

1

Failure Surface Specified By 50 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	405.44	137.64
2	407.82	137.10
3	411.80	134.07
4	415.84	131.12
5	420.26	128.78
6	424.19	125.69
7	428.28	122.81
8	432.21	119.72
9	436.82	117.79
10	441.76	117.00
11	446.03	114.40
12	450.02	111.39
13	454.81	109.98
14	458.45	106.54
15	462.14	103.18
16	465.68	99.65
17	469.32	96.21
18	472.86	92.68
19	477.02	89.91
20	803.13	83.71
21	806.24	87.62
22	807.69	92.41
23	811.06	96.10
24	814.57	99.67

25	817.44	103.76
26	820.98	107.30
27	824.51	110.83
28	827.96	114.45
29	830.81	118.56
30	831.05	123.55
31	831.85	128.49
32	834.45	132.76
33	835.83	137.56
34	837.47	142.29
35	838.98	147.05
36	840.27	151.88
37	843.67	155.55
38	846.36	159.76
39	849.19	163.89
40	852.39	167.72
41	854.74	172.14
42	858.07	175.87
43	858.47	180.86
44	859.71	185.70
45	862.94	189.52
46	863.62	194.47
47	866.00	198.87
48	869.53	202.41
49	871.13	207.15
50	874.44	210.69

*** 1.767 ***

Failure Surface Specified By 0 Coordinate Points

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

*** 0.000 ***

1

Failure Surface Specified By 0 Coordinate Points

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

*** 0.000 ***

Failure Surface Specified By 0 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
***	0.000	***

1

Failure Surface Specified By 0 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
***	0.000	***

Failure Surface Specified By 0 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
***	0.000	***

1

Failure Surface Specified By 0 Coordinate Points

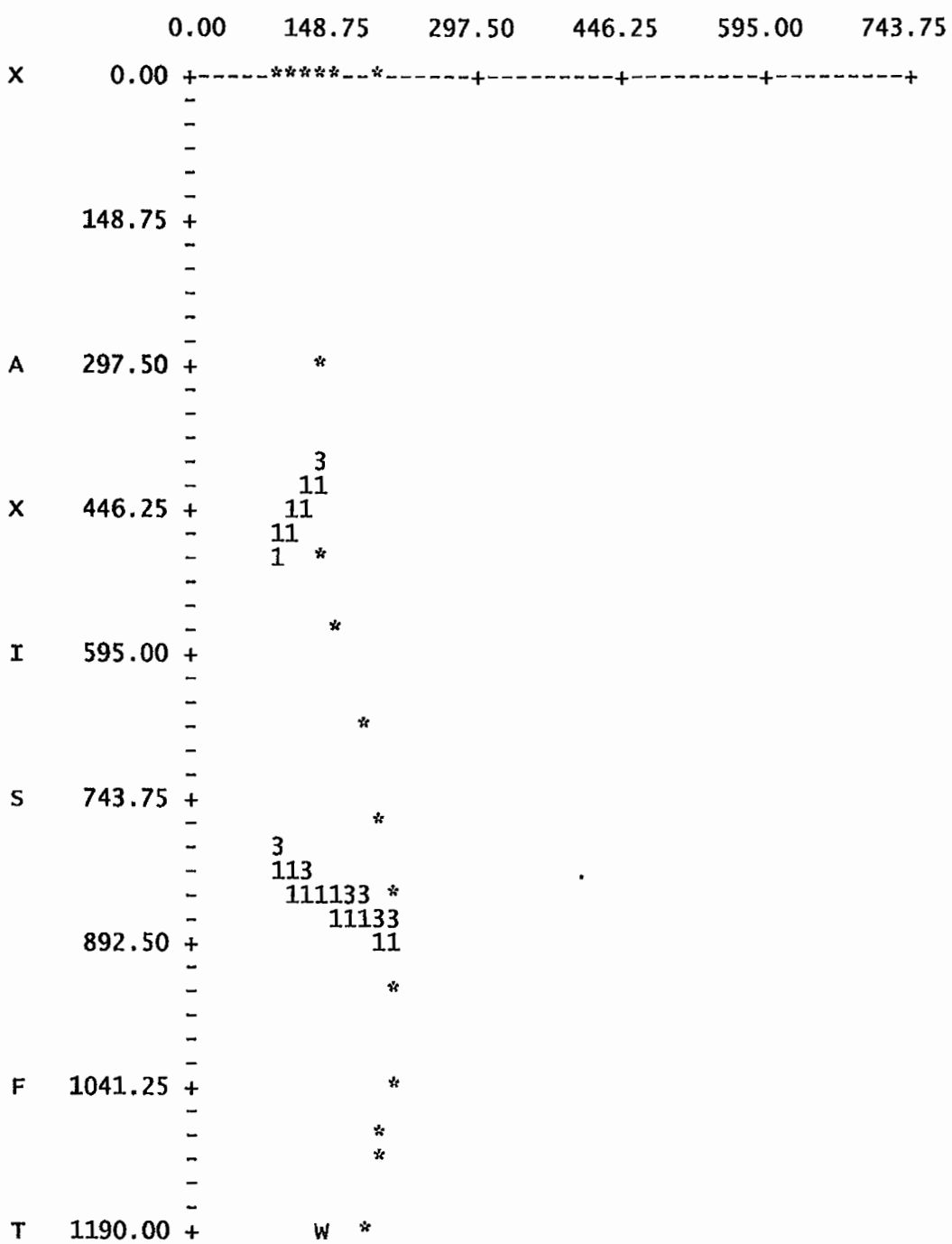
Point No.	X-Surf (ft)	Y-Surf (ft)
***	0.000	***

Failure Surface Specified By 0 Coordinate Points

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

*** 0.000 ***

1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I 595.00
S 743.75
892.50
F 1041.25
T 1190.00

ATTACHMENT C

SETTLEMENT ANALYSIS RESULTS

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-1** Elev 37 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	105 ft-NGVD									
	Unit Weight of Landfill Material	110 pcf									
	Separation of Landfill Bottom from GWL	5 ft									
	Assumed HGWL Elevation =	32 ft									
	Thickness	68 ft									
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	432,000 lb/ft2							
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	432,000 lb/ft2							
	Thickness above GWL	5 ft									
	Thickness below GWL	23.5 ft									
	Medium Dense Silty Sand, Unit wt below GWL	120 pcf	Es	720,000 lb/ft2							
	Thickness	15 ft									
	Very Stiff Silty Clay, Unit wt below GWL	115 pcf	w	62 %	eo	1.67	Cc	0.300	Cr	0.060	
	Very Stiff Clay, OCR	3.5									
	Thickness	5 ft									
	Stiff Clay, Unit weight below GWL	110 pcf	w	46 %	eo	1.23	Cc	0.200	Cr	0.040	
	Stiff Clay, OCR	3									
	Thickness	13.5 ft									
	Hard Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020	
	Hard Clay, OCR	4									
	Thickness	18 ft									

Excavation to bottom of landfill	0
Landfill Load	7480
Net Loading (delta sigma)	7480

Settlement of Loose/Med. Dense Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
28.5	0.49

Settlement of Med. Dense Silty Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
15	0.16

Settlement of Silty Clay Layer

	Primary	
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
5	2049.1	0.06

Settlement of Stiff Clay layer

	Primary	
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
13.5	3555.7	0.12

Settlement of Hard Clay layer

	Primary	
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
18	4592.5	0.07

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.49 ft
Elastic (Immediate) Settlement of Medium Dense Silty Sand	0.16 ft
Primary Consolidation Settlement of Very Stiff Silty Clay	0.06 ft
Primary Consolidation Settlement ofStiff Clay	0.12 ft
Primary Consolidation Settlement of Hard Clay	0.07 ft
Total	**0.90 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-2** Elev 34 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	130 ft-NGVD												
	Unit Weight of Landfill Material	110 pcf												
	Separation of Landfill Bottom from GWL	5 ft												
	Assumed HGWL Elevation =	32 ft												
	Thickness	96 ft												
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	432,000 lb/ft2										
	Loose/Med. Dense Send, Unit wt below GWL	115 pcf	Es	432,000 lb/ft2										
	Thickness above GWL	5 ft												
	Thickness below GWL	13.5 ft												
	Medium Dense Silty Sand, Unit wt below GWL	115 pcf	Es	720,000 lb/ft2										
	Thickness	5 ft												
	Very Soft Sandy Clay, Unit wt below GWL	95 pcf	w	30 %	eo	0.80	Cc	0.500	Cr	0.100	Cv	0.3	Ca	0.02
	Very Soft Sandy Clay, OCR	1.2												
	Thickness	6.5 ft												
	Very Stiff Clay, Unit weight below GWL	115 pcf	w	62 %	eo	1.66	Cc	0.200	Cr	0.040				
	Very Stiff Clay, OCR	3.5												
	Thickness	18.5 ft												
	Hard Silty Clay to Cley, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020				
	Hard Silty Clay to Clay, OCR	4												
	Thickness	31.5 ft												

Excavation to bottom of landfill	0
Landfill Load	10560
Net Loading (delta sigma)	10560

Settlement of Loose/Med. Dense Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
18.5	0.45

Settlement of Med. Dense Silty Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
5	0.07

Settlement of Very Soft Sandy Clay

	Primary		
Thickness (ft)	Eff Stress (psf)	Settlement (ft)	
6.5	1472	0.16	
	Secondary for 50 years		
Thickness (ft)	Drainage (ft)	tp (years)	Settlement (ft)
6.5	3.25	0.11	0.19

Settlement of Very Stiff Clay

	Primary	
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
18.5	2445.1	0.16

Settlement of Hard Clay layer

	Primary	
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
31.5	4522.5	0.12

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.45 ft
Elastic (Immediate) Settlement of Medium Dense Silty Sand	0.07 ft
Primary Consolidation Settlement of Very Stiff Silty Clay	0.16 ft
Primary Consolidation Settlement ofStiff Clay	0.16 ft
Primary Consolidation Settlement of Hard Clay	0.12 ft
Secondary Consolidation Settlement of Soft Clay	0.19 ft
Total	**1.15 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-3** Elev 34 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	95 ft-NGVD									
	Unit Weight of Landfill Material	110 pcf									
	Separation of Landfill Bottom from GWL	5 ft									
	Assumed HGWL Elevation =	32 ft									
	Thickness	61 ft									
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	432,000 lb/ft2							
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	432,000 lb/ft2							
	Thickness above GWL	5 ft									
	Thickness below GWL	13.5 ft									
	Medium Stiff Silty Clay, Unit wt below GWL	105 pcf	w	62 %	eo	1.67	Cc	0.300	Cr	0.060	
	Very Stiff Silty Clay, OCR	3									
	Thickness	15 ft									
	Stiff Clay, Unit weight below GWL	110 pcf	w	46 %	eo	1.23	Cc	0.250	Cr	0.050	
	Stiff Clay, OCR	3.5									
	Thickness	10 ft									
	Hard Silty Clay to Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020	
	Hard Silty Clay to Clay, OCR	4									
	Thickness	36.5 ft									

Excavation to bottom of landfill	0
Landfill Load	6710
Net Loading (delta sigma)	6710

Settlement of Loose/Med. Dense Sand

Elastic Settlement

Thickness (ft)	Settlement (ft)
18.5	0.29

Settlement of Medium Stiff Silty Clay

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
15	1899.1	0.17

Settlement of Stiff Clay

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
10	2375.1	0.12

Settlement of Hard Clay layer

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
36.5	4477.5	0.13

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.29 ft
Primary Consolidation Settlement of Medium Stiff Silty Clay	0.17 ft
Primary Consolidation Settlement of Stiff Clay	0.12 ft
Primary Consolidation Settlement of Hard Clay	0.13 ft
Total	**0.72 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-4** Elev 34 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	115 ft-NGVD								
	Unit Weight of Landfill Material	110 pcf								
	Separation of Landfill Bottom from GWL	5 ft								
	Assumed HGWL Elevation =	32 ft								
	Thickness	81 ft								
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	576,000 lb/ft2						
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	576,000 lb/ft2						
	Thickness above GWL	5 ft								
	Thickness below GWL	13.5 ft								
	Medium Stiff Silty Clay, Unit wt below GWL	105 pcf	w	62 %	eo	1.67	Cc	0.300	Cr	0.060
	Very Stiff Silty Clay, OCR	3								
	Thickness	10 ft								
	Hard Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020
	Hard Clay, OCR	4								
	Thickness	20 ft								
	Very Stiff Clay, Unit weight below GWL	115 pcf	w	46 %	eo	1.23	Cc	0.200	Cr	0.040
	Very Stiff Clay, OCR	3								
	Thickness	5 ft								
	Hard Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020
	Hard Clay, OCR	4								
	Thickness	46.5 ft								

Excavation to bottom of landfill	0
Landfill Load	8910
Net Loading (delta sigma)	8910

Settlement of Loose/Med. Dense Sand

Elastic Settlement Thickness (ft)	Settlement (ft)
18.5	0.29

Settlement of Med Stiff Clay Layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
10	1686.1	0.12

Settlement of Hard Clay Layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
20	2838.1	0.08

Settlement of Very Stiff Clay layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
13.5	2802.9	0.12

Settlement of Hard Clay layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
18	5481.3	0.07

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.29 ft
Primary Consolidation Settlement of Medium Stiff Silty Clay	0.12 ft
Primary Consolidation Settlement of Hard Clay	0.08 ft
Primary Consolidation Settlement of Very Stiff Clay	0.12 ft
Primary Consolidation Settlement of Hard Clay	0.07 ft
Total	**0.67 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-5** Elev 34 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	105 ft-NGVD													
	Unit Weight of Landfill Material	110 pcf													
	Separation of Landfill Bottom from GWL	5 ft													
	Assumed HGWL Elevation =	32 ft													
	Thickness	71 ft													
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	576,000 lb/ft2											
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	576,000 lb/ft2											
	Thickness above GWL	5 ft													
	Thickness below GWL	13.5 ft													
	Very Soft Sendy Clay, Unit wt below GWL	95 pcf	w	26 %	eo	0.70	Cc	0.500	Cr	0.100	Cv	0.3	Ca	0.02	
	Very Soft Sandy Clay, OCR	1.2													
	Thickness	5 ft													
	Very Stiff Clay, Unit weight below GWL	115 pcf	w	62 %	eo	1.66	Cc	0.200	Cr	0.040					
	Very Stiff Clay, OCR	3.5													
	Thickness	5 ft													
	Hard Silty Clay to Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020					
	Hard Silty Clay to Clay, OCR	4													
	Thickness	51.5 ft													

Excavation to bottom of landfill	0
Landfill Load	7810
Net Loading (delta sigma)	7810

Settlement of Loose/Med. Dense Sand

Elastic Settlement

Thickness (ft)	Settlement (ft)
18.5	0.25

Settlement of Very Soft Sandy Clay

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
5	1423.1	0.10

Settlement of Very Stiff Clay

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
5	1686.1	0.04

Secondary for 50 years

Thickness (ft)	Drainage (ft)	tp (years)	Settlement (ft)
5	2.5	0.06	0.17

Settlement of Hard Clay layer

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
51.5	4652.5	0.19

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.25 ft
Elastic (Immediate) Settlement of Medium Dense Silty Sand	0.00 ft
Primary Consolidation Settlement of Very Stiff Silty Clay	0.10 ft
Primary Consolidation Settlement ofStiff Clay	0.04 ft
Primary Consolidation Settlement of Hard Clay	0.19 ft
Secondary Consolidation Settlement of Soft Clay	0.17
Total	**0.75 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-6** Elev 35 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	110 ft-NGVD									
	Unit Weight of Landfill Material	110 pcf									
	Separation of Landfill Bottom from GWL	5 ft									
	Assumed HGWL Elevation =	32 ft									
	Thickness	75 ft									
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	115 pcf	Es	576,000 lb/ft2							
	Loose/Med. Dense Sand, Unit wt below GWL	120 pcf	Es	576,000 lb/ft2							
	Thickness above GWL	5 ft									
	Thickness below GWL	18.5 ft									
	Stiff Sandy Clay, Unit wt below GWL	110 pcf	w	41 %	eo	1.11	Cc	0.300	Cr	0.060	
	Stiff Sandy Clay, OCR	3									
	Thickness	5 ft									
	Hard Sandy Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020	
	Hard Sandy Clay, OCR	4									
	Thickness	15 ft									
	Stiff Clay, Unit weight below GWL	110 pcf	w	46 %	eo	1.23	Cc	0.300	Cr	0.060	
	Stiff Clay, OCR	3									
	Thickness	14 ft									
	Hard Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020	
	Hard Clay, OCR	4									
	Thickness	22.5 ft									

Excavation to bottom of landfill	0
Landfill Load	8250
Net Loading (delta sigma)	8250

Settlement of Loose/Med. Dense Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
23.5	0.34

Settlement of Stiff Sandy Clay Layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
5	1878.6	0.07

Settlement of Hard Sandy Clay Layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
15	2742.6	0.06

Settlement of Stiff Clay layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
14	3313.8	0.19

Settlement of Hard Clay layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
22.5	4609.8	0.08

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.34 ft
Primary Consolidation Settlement of Stiff Clay	0.07 ft
Primary Consolidation Settlement of Hard Silty Clay	0.06 ft
Primary Consolidation Settlement of Stiff Clay	0.19 ft
Primary Consolidation Settlement of Hard Clay	0.08 ft
Total	**0.74 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-7** Elev 34 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	75	ft-NGVD							
	Unit Weight of Landfill Material	110	pcf							
	Separation of Landfill Bottom from GWL	5	ft							
	Assumed HGWL Elevation =	32	ft							
	Thickness	41	ft							
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110	pcf	Es	432,000	lb/ft2				
	Loose/Med. Dense Sand, Unit wt below GWL	115	pcf	Es	432,000	lb/ft2				
	Thickness above GWL	5	ft							
	Thickness below GWL	13.5	ft							
	Hard Sandy Clay, Unit weight below GWL	120	pcf	w	80	%	eo	2.14	Cc	0.100	Cr	0.020
	Hard Sandy Clay, OCR	4								
	Thickness	20	ft							
	Very Stiff Clay, Unit weight below GWL	115	pcf	w	99	%	eo	2.65	Cc	0.200	Cr	0.040
	Very Stiff Clay, OCR	3.5								
	Thickness	21.5	ft							

Excavation to bottom of landfill	0
Landfill Load	4510
Net Loading (delta sigma)	4510

Settlement of Loose/Med. Dense Sand

Elastic Settlement Thickness (ft)	Settlement (ft)
18.5	0.19

Settlement of Hard Sandy Clay Layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
20	2412.1	0.08

Settlement of Very Stiff Clay Layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
21.5	3543	0.12

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.19	ft
Primary Consolidation Settlement of Hard Sandy Clay	0.08	ft
Primary Consolidation Settlement of Very Stiff Clay	0.12	ft
Total	**0.39**	**ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-8** Elev 34 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	95 ft-NGVD												
	Unit Weight of Landfill Material	110 pcf												
	Separation of Landfill Bottom from GWL	5 ft												
	Assumed HGWL Elevation =	32 ft												
	Thickness	61 ft												
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	432,000 lb/ft2										
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	432,000 lb/ft2										
	Thickness above GWL	5 ft												
	Thickness below GWL	13.5 ft												
	Soft Silty Sand, Unit wt below GWL	100 pcf	Es	100,800 lb/ft2										
	Thickness	5 ft												
	Very Stiff Sandy Clay, Unit weight below GWL	115 pcf	w	62 %	eo	1.66	Cc	0.200	Cr	0.040	0.3	Ca	0.008	
	Very Stiff Sandy Clay, OCR	3.5												
	Thickness	10 ft												
	Very Stiff Clay, Unit weight below GWL	115 pcf	w	110 %	eo	2.95	Cc	0.200	Cr	0.040				
	Very Stiff Clay, OCR	3.5												
	Thickness	20 ft												
	Hard Silty Clay to Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020				
	Hard Silty Clay to Clay, OCR	4												
	Thickness	46.5 ft												

Excavation to bottom of landfill	0
Landfill Load	6710
Net Loading (delta sigma)	6710

Settlement of Loose/Med. Dense Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
18.5	0.29

Settlement of Soft Silty Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
5	0.33

Settlement of Very Stiff Sandy Clay

Primary		
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
10	1974.1	0.08

Settlement of Very Stiff Clay

Primary		
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
20	3026.1	0.11

Settlement of Hard Clay layer

Primary		
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
46.5	5704.5	0.16

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.29 ft
Elastic (Immediate) Settlement of Soft Silty Sand	0.33 ft
Primary Consolidation Settlement of Very Stiff Sandy Clay	0.08 ft
Primary Consolidation Settlement of Very Stiff Clay	0.11 ft
Primary Consolidation Settlement of Hard Clay	0.16 ft
Total	**0.98 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **B-9** Elev 33 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	60 ft-NGVD									
	Unit Weight of Landfill Material	110 pcf									
	Separation of Landfill Bottom from GWL	5 ft									
	Assumed HGWL Elevation =	32 ft									
	Thickness	27 ft									
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	576,000 lb/ft2							
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	576,000 lb/ft2							
	Thickness above GWL	5 ft									
	Thickness below GWL	18.5 ft									
	Hard Sandy Clay, Unit weight below GWL	120 pcf	w	31 %	eo	0.82	Cc	0.100	Cr	0.020	
	Hard Sandy Clay, OCR	4									
	Thickness	15 ft									
	Very Stiff Clay, Unit weight below GWL	115 pcf	w	88 %	eo	2.35	Cc	0.200	Cr	0.040	
	Very Stiff Clay, OCR	3									
	Thickness	10 ft									
	Hard Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020	
	Hard Clay, OCR	4									
	Thickness	11.5 ft									

Excavation to bottom of landfill	0
Landfill Load	2970
Net Loading (delta sigma)	2970

Settlement of Loose/Med. Dense Sand

Elastic Settlement

Thickness (ft)	Settlement (ft)
23.5	0.12

Settlement of Hard Sandy Clay Layer

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
15	2387.1	0.10

Settlement of Very Stiff Clay layer

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
13.5	2913.1	0.07

Settlement of Hard Clay layer

Primary

Thickness (ft)	Eff Stress (psf)	Settlement (ft)
18	3575.5	0.07

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.12 ft
Primary Consolidation Settlement of Hard Clay	0.10 ft
Primary Consolidation Settlement of Very Stiff Clay	0.07 ft
Primary Consolidation Settlement of Hard Clay	0.07 ft
Total	**0.36 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **TH-16** Elev 33 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	118 ft-NGVD									
	Unit Weight of Landfill Material	110 pcf									
	Separation of Landfill Bottom from GWL	5 ft									
	Assumed HGWL Elevation =	32 ft									
	Thickness	85 ft									
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	432,000 lb/ft2							
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	432,000 lb/ft2							
	Thickness above GWL	5 ft									
	Thickness below GWL	13.5 ft									
	Medium Dense Silty Sand, Unit wt below GWL	120 pcf	Es	576,000 lb/ft2							
	Thickness	17.5 ft									
	Medium Stiff Silty Clay, Unit wt below GWL	115 pcf	w	80 %	eo	2.16	Cc	0.400	Cr	0.080	
	Medium Stiff Silty Clay, OCR	3									
	Thickness	2.5 ft									
	Hard Silty Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020	
	Hard Silty Clay, OCR	4									
	Thickness	21.5 ft									

Excavation to bottom of landfill	0
Landfill Load	9350
Net Loading (delta sigma)	9350

Settlement of Loose/Med. Dense Sand

Elastic Settlement Thickness (ft)	Settlement (ft)
18.5	0.40

Settlement of Med. Dense Silty Sand

Elastic Settlement Thickness (ft)	Settlement (ft)
17.5	0.28

Settlement of Medium Stiff Silty Clay Layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
2.5	1391.6	0.03

Settlement of Hard Silty Clay layer

Thickness (ft)	Primary Eff Stress (psf)	Settlement (ft)
21.5	3638	0.08

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.40 ft
Elastic (Immediate) Settlement of Medium Dense Silty Sand	0.28 ft
Primary Consolidation Settlement of Medium Stiff Silty Clay	0.03 ft
Primary Consolidation Settlement of Hard Silty Clay	0.08 ft
Total	**0.80 ft**

Lena Road Stage II Landfill - Manatee County, FL

Bore Hole **TH-17** Elev 33 ft-NGVD

Assumptions:

Landfill:	Max. Height of Landfill @ Elevation	118 ft-NGVD								
	Unit Weight of Landfill Material	110 pcf								
	Separation of Landfill Bottom from GWL	5 ft								
	Assumed HGWL Elevation =	32 ft								
	Thickness	85 ft								
Soils:	Loose/Med. Dense Sand, Unit wt above GWL	110 pcf	Es	432,000 lb/ft2						
	Loose/Med. Dense Sand, Unit wt below GWL	115 pcf	Es	432,000 lb/ft2						
	Thickness above GWL	5 ft								
	Thickness below GWL	18.5 ft								
	Medium Dense Silty Sand, Unit wt below GWL	120 pcf	Es	576,000 lb/ft2						
	Thickness	10 ft								
	Hard Sandy Clay, Unit wt below GWL	120 pcf	w	80 %	eo	2.16	Cc	0.100	Cr	0.020
	Hard Sandy Clay, OCR	4								
	Thickness	5 ft								
	Hard Silty Clay, Unit weight below GWL	120 pcf	w	80 %	eo	2.14	Cc	0.100	Cr	0.020
	Hard Silty Clay, OCR	4								
	Thickness	21.5 ft								

Excavation to bottom of landfill	0
Landfill Load	9350
Net Loading (delta sigma)	9350

Settlement of Loose/Med. Dense Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
23.5	0.51

Settlement of Med. Dense Silty Sand

Elastic Settlement	
Thickness (ft)	Settlement (ft)
10	0.16

Settlement of Medium Stiff Silty Clay Layer

	Primary	
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
5	1811.1	0.02

Settlement of Hard Clay layer

	Primary	
Thickness (ft)	Eff Stress (psf)	Settlement (ft)
21.5	3625.5	0.08

Total Settlements

Elastic (Immediate) Settlement of Loose and Med Sand	0.51 ft
Elastic (Immediate) Settlement of Medium Dense Silty Sand	0.16 ft
Primary Consolidation Settlement of Medium Stiff Silty Clay	0.02 ft
Primary Consolidation Settlement of Hard Clay	0.08 ft
Total	**0.77 ft**