APPENDIX F

SEISMIC STABILITY ANALYSIS

February 19, 2011
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MEMORANDUM

TO: Joe Miller
Ambrose McCready

FROM: James Law

SUBJECT: Slope Stability Analysis
RJTD & PFCP Sonoma County Central Disposal Site
Sonoma County, CA

This memorandum summarizes the results of the global and veneer slope stability analyses using the proposed new cell excavation/construction and final slope configurations as presented herein. This global slope stability analysis was performed using the specified minimum values for interface shear strengths to calculate the minimum factor of safety of 1.5 for static loading condition. Both circular and block-type failure modes under static and seismic loading conditions were evaluated for the selected cross-sections. Seismic deformation analyses were also performed using procedures described by Bray et al (1998).

In addition to the global slope stability analysis, a veneer stability analysis is also evaluated and presented in this memorandum to determine the minimum shear strength of the proposed final cover system to yield an acceptable factor of safety against sliding.

California regulations embodied in 27CCR §20240, §20260, and corresponding federal regulations state that Class III landfills shall be designed to withstand the Maximum Probable Earthquake (MPE) without damage to the foundation or containment structures. Specific requirements for the analysis are listed in 27CCR §21750(f)(5) and were utilized in SCS's analysis.

Based on industry practice in California, acceptable factors of safety against landfill slope failure using residual shear strengths are 1.5 for static slope stability. For pseudo-static (seismic) analysis, a more rigorous analysis can be used to estimate displacement. This is consistent with 27CCR §21750(f)(5)(D). In our experience and based on regulatory precedence, it is considered acceptable if the calculated permanent displacement of the landfill is less than 12 inches (US EPA, 1995).

Prepared by: JL
Checked by: AM

LINER SYSTEMS

Bottom Liner System

The currently-proposed bottom liner system for LF-2 canyon expansion area and in the Rock Extraction Area (REA) consists of the following (from top to bottom):

- 24-inch operations layer;
- 10-oz. nonwoven geotextile;
- 12-inch LCRS drain rock layer (or a geocomposite drainage net on sideslope);
- 12-oz. nonwoven geotextile;
- 60-mil HDPE geomembrane (textured both sides);
- Geocomposite drainage layer;
- 60-mil HDPE geomembrane (textured both sides);
- Geosynthetic clay liner layer (GCL);
- 12-inch compacted low-permeability soil liner;
- 3-ft thick compacted foundation soil layer (REA only)
- 12-inch underdrain layer; and
- Prepared subgrade.

It should be noted that the existing footprint of LF-1 is unlined. LF-2 and the REA are the only areas that will be lined as described above.

Final Cover System

The currently proposed final cover system for LF-2 consists of the following, from top to bottom:

- 18-inch vegetative layer;
- Geocomposite drainage layer, also referred to as a geocomposite drainage net (GDN)
- 60-mil geomembrane (textured both sides);
- Geosynthetic clay liner layer (GCL); and
- 24-inch compacted foundation layer.

The LF-1 final cover is similar, except it does not have a GCL layer in its configuration.

GEOSYNTHETIC/SOIL INTERFACE SHEAR STRENGTHS

All soil/geosynthetic and geosynthetic/geosynthetic interface shear strength parameters used in the analysis were based on test values using site-specific soil materials and specified geosynthetic material samples obtained from GSE Lining Technology, Inc. Bulk samples of soils, clay and drainage gravel were obtained from on-site stockpiles or the nearby Stony Point Quarry by SCS on December 16, 2010. The Stony Point Quarry has been identified as a source for low-permeability (clay) soils to be used in the liner systems. These samples and the geosynthetic materials were transported to the soils and geosynthetic labs for analyses. The geosynthetic material tests were performed by Precision Geosynthetic Laboratories, Inc. The soils tests were performed by Cooper Testing Laboratory. Lab test results are provided in ***Attachment A***.

Bottom Liner System

The interface shear strengths used in the bottom liner system are summarized as follows (detailed laboratory test data sheets are presented in ***Attachment A***):

- The interface friction angle (peak shear strength) between the non-woven geotextile and textured geomembrane interface is 27.1 degrees and zero adhesion. The interface friction angle (residual shear strength) between the non-woven geotextile and textured geomembrane interface is 11.2 degrees and 410 pounds per square foot (psf) adhesion.
- The interface friction angle (peak shear strength) between the non-woven geotextile and soil interface is 37.1 degrees and zero adhesion. The interface friction angle (residual shear strength) between the non-woven geotextile and soil interface is 29.3 degrees and 321 psf adhesion.
- The interface friction angle (peak shear strength) between the non-woven geotextile and clay interface is 17.7 degrees and 985 psf adhesion. The interface friction angle (residual shear strength) between the non-woven geotextile and clay interface is 10.4 degrees and 983 psf adhesion.
- The interface friction angle (peak shear strength) between the non-woven geotextile and drainage gravel (LCRS) interface is 22.2 degrees and 1,688 psf adhesion. The interface friction angle (residual shear strength) between the non-woven geotextile and drainage gravel (LCRS) interface is 11.1 degrees and 2,242 psf adhesion.
- The interface friction angle (peak shear strength) between the GDN and textured geomembrane interface is 23.6 degrees and 260 psf adhesion. The interface friction angle (residual shear strength) between the geocomposite drainage net and textured geomembrane interface is 10.6 degrees and 232 psf adhesion.
- The interface friction angle (peak shear strength) between the clay liner and textured geomembrane interface is 23.4 degrees and 1,139 psf adhesion. The interface friction angle (residual shear strength) between the clay soil liner and textured geomembrane interface is 14.6 degrees and 997 psf adhesion.
- The interface friction angle (peak shear strength) between the GCL and textured geomembrane interface is 24.1 degrees and 294 psf adhesion. The interface friction angle (residual shear strength) between the GCL and textured geomembrane interface is 17.2 degrees and 33 psf adhesion.
- The interface friction angle (peak shear strength) between the GCL and clay liner interface is 18.8 degrees and 379 psf adhesion. The interface friction angle (residual shear strength) between the GCL and clay liner soil interface is 11.2 degrees and 311 psf adhesion.

Based on the above test data, the critical interface is located along the textured geomembrane and geocomposite drainage net interface. Thus the critical interface friction angle of the bottom liner system used in the analysis is 10.6 degrees and 232 psf adhesion for residual shear strength. During the analysis, it was determined that it is necessary to use 14.9 degrees residual shear strength with no adhesion in order to obtain a minimum factor of safety under static loading conditions.

Final Cover System

The interface shear strengths used in the final cover liner system are summarized as follows: (detailed laboratory test data sheets are presented in Attachment A):

- The interface friction angle (peak shear strength) between the GDN and textured geomembrane interface is 36.1 degrees and 50 psf adhesion. The interface friction angle (residual shear strength) between the geocomposite drainage net and textured geomembrane interface is 27.5 degrees and 8 psf adhesion.
- The interface friction angle (peak shear strength) between the GDN and soil interface is 34 degrees and zero adhesion. The interface friction angle (residual shear strength) between the GDN and soil interface is 30.5 degrees and zero adhesion.
- The interface friction angle (peak shear strength) between the GCL and soil interface is 19.8 degrees and 43 psf adhesion. The interface friction angle (residual shear strength) between the GCL and soil interface is 19.8 degrees and 31 psf adhesion.
- The interface friction angle (peak shear strength) between the GCL and geomembrane interface is 28.6 degrees and 202 psf adhesion. The interface friction angle (residual shear strength) between the GCL and geomembrane interface is 18.8 degrees and 147 psf adhesion.
- The interface friction angle (peak shear strength) between the soil and geomembrane interface is 28.8 degrees and 40 psf adhesion. The interface friction angle (residual shear strength) between the soil and geomembrane interface is 27.9 degrees and 37 psf adhesion.

Based on the above test data, the critical interface is located along the GCL/soil interface. Thus the critical interface shear strength used in the final cover static stability analysis is 19.8 degrees and 43 psf adhesion for peak shear strength. For the seismic stability analysis, only half of the adhesion was used, to be conservative.

It should be noted, however, that these interface friction values are dependent on the specific geosynthetic manufacturer and the manufacturing process. Therefore, values used in the analyses represent performance-specified values that need to be specified in the applicable specification sections. During material selection, these minimum values need to be verified during construction. If the values obtained during pre-construction testing are lower than the values used in the analysis, the slope stability needs to be re-calculated to ensure that the factor of safety is acceptable and the slope will remain stable.

SLOPE CRITICAL CROSS-SECTIONS

There were seven slope cross-sections (designated Sections 201 to 207, respectively) selected for the global slope stability analysis in the LF-2 canyon expansion area, the compost area, and the REA. Two other sections, Section 208 and Section 209, were selected to evaluate the stability of the LF-2 and REA cell excavation slopes prior to liner construction. These section locations are shown in ***Figures 1 and 2***. Section profiles that were used in the analysis are shown in ***Figures 3 through 11***. These sections were selected based on their locations relative to the overall slope configuration, their relative heights with the surrounding ground, and the excavation/waste fill depths to the bottom liner system.

GLOBAL SLOPE STABILITY ANALYSIS

The global slope stability of the final build-up slope configuration for the Sonoma County Central Landfill (LF-1, REA, LF-2 canyon expansion area) has been evaluated for each selected section using residual shear strength of the most critical interface within the bottom liner system. The values of critical interface friction angles used in this study were taken from our recent site-specific soils and geosynthetic materials laboratory testing performed by Cooper Laboratories and Precision Laboratories, Inc., respectively (see ***Attachment A***).

Method of Analysis

The global slope stability was evaluated using the computer program PCSTABL5M. PCSTABL5M (Achilleos, 1988) was developed by Purdue University. This program uses two-dimensional limit equilibrium methods to calculate a factor of safety (FS) against sliding for slope sections analyzed. This program is able to use an automatic search routine to generate multiple shear failure surfaces for both circular failures and block or wedge-type failure modes until the surface with the lowest FS-value is found. The analytical methods used for the circular and sliding block failure modes in the slope stability analysis are the Bishop Simplified and Janbu Simplified methods of slices, respectively. Only residual shear strengths of the critical interface were used in this study to check the FS against sliding.

The slope stability analysis was performed to determine the FS of the proposed final landfill slopes at 3:1 with benches. Typically, in geotechnical engineering practice, a FS of equal to or greater than 1.5 is considered acceptable for static stability analysis. For pseudo-static (or seismic) stability analysis, a yield acceleration, k_y, corresponding to a FS of equal to 1.0 is calculated using PCSTABL5M. A FS of less than 1.0 indicates the slope may be unstable under assumed loading conditions and hence a permanent displacement analysis using Bray's method (1998) was utilized to ensure an acceptable maximum displacement of less than 12 inches. This analysis is consistent with 27CCR §21750(f)(5).

To be conservative, residual shear strengths of the critical interface (along the geocomposite clay liner / geomembrane interface) were used to check the FS against sliding. A yield acceleration (designated as k_y) was also determined for each section profile as necessary to compute the permanent displacement using methods described by Bray, et al (1998). The permanent displacement was estimated using the upper bound at 84% percentile line.

Scenarios Evaluated

To calculate minimum factors of safety for the global final slope configuration, stability analyses were performed for selected slope sections assuming four basic scenarios for each slope section:

- Static analysis using circular-type failure surface within the waste mass
- Seismic (pseudo-static) analysis using circular-type failure surface within the waste mass
- Static analysis using block-type failure surface along the weakest interface within the bottom liner system
- Seismic (pseudo-static) analysis using block-type failure along the weakest interface within the liner system

All global slope stability analyses were performed and evaluated considering residual shear strength values of the critical interface to determine FS against global slope stability.

Assumptions

The assumptions used in the analysis are presented as follows:

- The unit weight of the soil/geosynthetic or geosynthetic/geosynthetic layer is 100 pcf.
- The structural fill used for site development will consist of reprocessed on-site material. The unit weight of the structural fill was estimated to be 125 pcf, which is a reasonable value for the on-site reprocessed excavated fill materials, after placement and compaction. The shear strength of the structural fill was assumed a conservative value, with an internal friction angle of 30 degrees and zero cohesion.
- The unit weights of the moist and saturated waste material used in the analyses are 70 pcf and 98 pounds per cubic foot (pcf), respectively, based on previous seismic analysis for the CDS (Geosyntec, 2008).
- The internal friction angle of waste material is assumed to be 33 degrees, with zero cohesion. This is based on previous seismic analysis for the CDS (Geosyntec, 2008). A 2001 paper from the 6th Annual Landfill Symposium entitled, "Geotechnical Aspects of Landfill Bioreactor Design: Is Stability a Fatal Flaw" assumed that the friction angle of waste in a non-bioreactor landfill ranged from 26 to 34 degrees and that the cohesion ranged from 200 to 300 psf. These ranges are the same as indicated by Singh and Murphy (1990). Therefore, the internal friction angle and the cohesion of the waste used for this analysis are conservative for this type of analysis
- The unit weight of the foundation soil, mainly rock formation, was estimated to be 136 pcf. The shear strengths assumed in the slope stability analysis is 21 degrees and 1,480 psf for cohesion, based on Geosyntec's 2008 report.

- The thicknesses of the bottom liner system and the final cover system are 3 feet and 3.5 feet, respectively. The unit weight of the final cover system is 120 pcf. The thickness of the bottom liner system above refers to LCRS and operations layer materials placed above the HDPE liner.
- The maximum final landfill mass sideslope angle is approximately 3(H): 1(V).
- The analysis assumes block-type failure surface along the weakest interface of geosynthetic/geosynthetic or soil/geosynthetic components of the liner system. If failure occurs within the waste mass, a circular failure surface is assumed.
- The groundwater (piezometric) surface data specified in the model for each section analyzed was interpolated from available site data. The interior of the unlined LF-1 has a static liquid level of approximately 100 feet measured from the bottom of the landfill. We consider this a worst-case condition; ongoing and future leachate extraction as part of corrective action at LF-1 is expected to draw down the liquids volume (and static liquid levels) in LF-1 by up to 2 million gallons per year (RMC Geoscience, 2008).
- An uplift of the bottom of liner system due to presence of seepage forces is not anticipated below the proposed liner system, since there will be a gravel underdrain blanket and piping to prevent any potential uplift pressure build-up. A drainage net will be installed in cell excavation sideslopes. Any groundwater will effectively be removed by the engineered underdrain system below the liner system.
- Global stability was evaluated using a near-field MPE of 6.75M and a PHGA of 0.32g. The seismic event of a magnitude is reported in Geosyntec 2008 report as 6.75 on the Richter scale and at a distance of 9.2 km from the site (Healdsburg-Rodgers Creek fault). Analyses performed for this project by RMC Geoscience (2011) confirmed this acceleration is suitable and is in fact conservative.
- Based on industry practice in California, acceptable factor of safety using residual shear strengths is 1.5 for static slope stability analysis. For a scenario where the yield acceleration is less than the maximum horizontal acceleration under seismic loading conditions, a permanent deformation up to 12 inches is considered acceptable for a landfill facility located in a seismic zone (USEPA).

Results of Analysis

The results of the global slope stability analysis for the above various scenarios and sections are summarized in ***Table 1***. The seismic base liner permanent displacement calculated using Bray's 1998 method is also presented in ***Table 1***. Based on the location of the sections and the assumptions, the results of the scenarios analyzed meet the safety factor requirements for long-term global slope stability. The locations of the critical failure surfaces for each wedge/block and circular failure are shown on the graphs included in ***Attachment B-1***. Detailed PCSTABL5M output files are also provided in ***Attachment B-1***. Permanent displacement analysis and calculations using Bray's method are provided in ***Attachment B-2***.

FINAL COVER (VENEER) STABILITY ANALYSIS

The final cover (veneer) stability calculations were performed to confirm the overall stability of the final cover system using critical interface peak shear strength parameters taken from recent site-specific test results as stated above.

Veneer slope stability calculations were performed to: (1) confirm stability of the final cover system; and (2) determine the 50-foot vertical spacing between horizontal benches is adequate on the 3(H):1(V) slopes to prevent saturation of the final soil cover, while meeting the minimum factor of safety of 1.5 for static loading conditions required for the facility.

Methodology

SCS developed spreadsheets to evaluate the static and seismic veneer slope stability analyses of the proposed final cover system, with consideration of the seepage force within the final cover soil. The methods of analysis were based on the 1998 technical paper by Koerner and Soong entitled "Analysis and Design of Veneer Cover Soils."

Equipment loadings were not included in this report as they represent temporary, isolated loading conditions and also depend on the type of construction equipment used during construction. Since the technical specifications have submittal requirements for the approval of construction equipment to be used during construction, the Engineer of Record will have an opportunity to evaluate and to approve a list of construction equipment proposed by the Contractor that will not cause damage to the cap system.

For the veneer stability of the final cover system, it is assumed that the most critical scenario used in the analysis is the block-type failure surface mode located at the interface with lowest interface shear strength. A minimum FS of 1.5 for static stability analysis is considered acceptable. For seismic consideration, the permanent displacement is calculated for the final cover using methods described by Bray, et al (1998). The permanent displacement was estimated using the median line. We understand that the Regional Water Quality Control Board (RWQCB) has considered displacements up to 36 inches in the final cover to be acceptable for the CDS, based on a previous analysis by others (Geosyntec, 2008).

Scenarios Evaluated

The analysis was performed under both static and seismic conditions. Furthermore, the static slope stability of the final cover system with seepage force applied was considered and the potential for soil cover saturation was evaluated.

Assumptions

Assumptions used in the veneer slope stability calculations are based on site-specific data, our best engineering judgment or landfill industry convention and are as follows:

- The Sonoma County Central Disposal Site is in a region that receives approximately 6.95 inches rainfall for a 100-year, 24-hour storm event (7.36 mm/hour). A typical runoff coefficient equal to 0.4 was assumed based on “good” vegetation cover after closure.
- The permeability of the vegetative layer is taken to be 5.5 x 10^{-5} cm/sec, or the weighted average value of the two soil types used for the vegetative layer in HELP model.
- The overall slope length between benches used in the static and seismic final cover stability analyses is 158 feet (48.2 m). The maximum vertical slope height between benches is 50 feet.
- The moist and saturated unit weights of the final cover system are 120 pcf (18.85 KN/m^3) and 125 pcf (19.63 KN/m^3), respectively. The thickness of the final cover system is about 1.5 feet above the liner system and 2 feet foundation layer.
- The geocomposite drainage layer has a design hydraulic conductivity (permeability) of 3 cm/sec and a design thickness of 0.25 inches.
- Seepage forces and saturation of the soil cover were considered in the final cover analysis.
- Equipment loadings were not included as they represent temporary and isolated loading conditions; such loadings should be addressed as part of the construction requirements.
- Permanent displacement of the final cover system was evaluated using a near-field MPE of 6.75M and at a seismic event of 9.2 km from the site.

Results of Analysis

The results of the final cover (veneer) slope stability analysis are summarized in Table 2. Detailed calculations for each scenario are included in Attachment C-1 for the veneer stability analysis using Koerner and Soong’s equations and Attachment C-2 for the permanent displacement analysis using Bray’s method.

DISCUSSION AND CONCLUSIONS

Global Stability

Based on the results presented in this section, a minimum FS of 1.5 for static slope stability analysis can be obtained for the proposed 3(H): 1(V) final sideslopes and at the maximum waste height of about 200 feet, provided that the minimum residual shear strength of the critical interface within the bottom liner system is at least 14.9 degrees. Section 203 represents the most critical cross-section for the overall global stability of the landfill area, where the static FS is at least 1.50 under residual shear strength conditions within the bottom liner system. The block-type failure mode within the bottom liner system yields the lowest factor of safety against slope sliding.

The permanent displacement at the base of the landfill was calculated using Bray's method for each calculated k_y/k_{max} ratio. If this ratio is greater than 0.9, then the permanent displacement is negligible. As shown in ***Table 1***, the largest permanent displacement of 4.9 inches was calculated at Section 203. Most permanent displacements calculated were negligible and are less than 12 inches and therefore fall within the acceptable range as described earlier.

Based on the final global slope conditions analyzed and the assumptions used in the evaluations, it is concluded that the final slope section and liner configuration used for the Central Disposal Site expansion areas are considered stable under both static and seismic conditions. The estimated permanent displacement in an event of a near-field 6.75M earthquake is within the acceptable range and is less than 12 inches.

Veneer Stability

In the veneer static slope stability analysis with a slope length of 158 feet between benches at Section 203 and using a critical interface friction angle of 19.8 degrees and adhesion of 31 psf (GCL versus soil interface), the FS calculated is 1.66. This FS indicates that the final cover system is stable under the slope conditions analyzed.

The veneer slope stability analysis under seismic condition and using a critical interface friction angle of 19.8 degrees and an adhesion of 15.5 psf (which is half of the residual adhesion tested values) yields a k_y of 0.115g corresponding to a FS of 1.0. Using Bray's method, the permanent displacement of the final cover system is approximately 6.7 inches, as shown in Table 2.

When considering seepage forces in the veneer stability analysis, with the slope length equal to approximately 158 feet and a vegetative soil cover layer having a permeability of $5.5x10^{-5}$ cm/sec, saturation of the cover soil can be avoided during a 100-year, 24-hour storm event using a geocomposite drainage with transmissivity of 3 cm/sec and a thickness of 0.25 inches. These conditions yield a FS of 1.11, indicating that there is adequate shear strength available to prevent the final cover system from sliding during extreme weather and short-term conditions.

Based on the slope conditions analyzed for veneer slope stabilities and the assumptions in the evaluations, it is concluded that the veneer slope section analyzed for the Sonoma County Central Disposal site is considered stable under both static and seismic conditions.

The calculated FS values depend on the critical shear strength parameters used in the analysis for both liner interfaces, the waste mass at a given waste height, and at 3(H): 1(V) final side slopes. Due to the sensitivity of the shear strength values used in the analysis to determine factors of safety, project-specific interface friction angle testing using ASTM D 5321/6243 (Direct Shear Testing) of the critical geosynthetic/soil or geosynthetic/geosynthetic interface should be conducted and evaluated prior to actual material selections, especially if the materials deviated from what were presented in this report.

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Table 1 Results of Global and Excavation Slope Stability Analysis

DESCRIPTION (FILENAME)	SCENARIO AND FAILURE MODE ANALYZED[1]	MAXIMUM HORIZ. ACCELERATION AT BEDROCK, MHA	STATIC FACTOR OF SAFETY (FS)	MAX. ACCELERATION AT BASE (k_{max}), g	YIELD ACCELERATION (k_y), g	RATIO OF k_y/k_{max}	ESTIMATED PERMANENT DISPLACEMENT[2], U mm (inch)
SECTION 201							
201SC121W	static, circular		2.39				
201EC122W	seismic, circular	0.32	-	0.18	0.24	1.3 > 1.0	negligible
SECTION 202							
202SC121W	static, circular		2.27				
202EC122W	seismic, circular	0.32	-	0.42	0.31	0.74	25.2 (1.0)
SECTION 203							
203SC224W	static, circular		2.31				
203EC225W	seismic, circular	0.32	-	0.20	0.27	1.3 > 1.0	negligible
203SB224W	static, block		1.50				
203EB235W	seismic, block	0.32	-	0.24	0.11	0.46	126 (4.9)
SECTION 204							
204SC121W	static, circular		2.68				
204EC125W	seismic, circular	0.32	-	0.41	0.36	0.88	7.9 (0.3)
204SB123W	static, block		2.04				
204EB125W	seismic, block	0.32	-	0.21	0.20	0.96	1.0 (0.04)

DESCRIPTION (FILENAME)	SCENARIO AND FAILURE MODE ANALYZED[1]	MAXIMUM HORIZ. ACCELERATION AT BEDROCK, MHA	STATIC FACTOR OF SAFETY (FS)	MAX. ACCELERATION AT BASE (k_{max}), g	YIELD ACCELERATION (k_y), g	RATIO OF k_y/k_{max}	ESTIMATED PERMANENT DISPLACEMENT[2], U mm (inch)
SECTION 205							
205SC125W	static, circular		2.00				
205EC128W	seismic, circular	0.32	-	0.27	0.26	0.95	3.0 (0.1)
205SB121W	static, block		1.57				
205EB129W	seismic, block	0.32	-	0.26	0.15	0.57	57 (2.2)
SECTION 206							
206SC126W	static, circular		2.03				
206EC128W	seismic, circular	0.32	-	0.48	0.29	0.61	85.6 (3.4)
SECTION 207							
207SC121W	static, circular		2.51				
207EC122W	seismic, circular	0.32	-	0.26	0.33	1.25 > 1.0	negligible
207SB121W	static, block		1.94				
207EB124W	seismic, block	0.32	-	0.27	0.18	0.67	29 (1.2)
SECTION 208							
208SC121W	static, circular		2.08				
208EC123W	seismic, circular	0.32	-	0.26	0.31	1.18 > 1.0	negligible
SECTION 209							
209SC121W	static, circular		2.27				
209EC122W	seismic, circular	0.32	-	0.26	0.34	1.33 > 1.0	negligible

Notes:

1. The circular failure mode occurs within waste mass and block-type failure mode occurs along the weakest interface of the bottom liner system. Minimum interface shear strength (residual) used in the analysis = 14.9 degrees and zero adhesion.

2. The permanent displacement calculated using Bray's method (1998).

Table 2. Results of Final Cover (Veneer) Stability and Permanent Displacement Analyses

SCENARIO	INTERFACE SHEAR STRENGTH		STATIC FACTOR OF SAFETY (FS)	MAX. ACCELERATION AT COVER (k_{max})	RATIO OF k_y/k_{max}	PERMANENT DISPLACEMENT, U mm (inch)
	FRICTION ANGLE (degrees)	ADHESION (psf)				
Static Condition*	19.8	31	1.66			-
Seismic Condition** (k_y = 0.115g)	19.8	15.5	-	0.35	0.32	170 (6.7)
Static condition under 24-hour 100-year storm event with seepage forces and soil cover saturation potential***	19.8	0	1.11			-

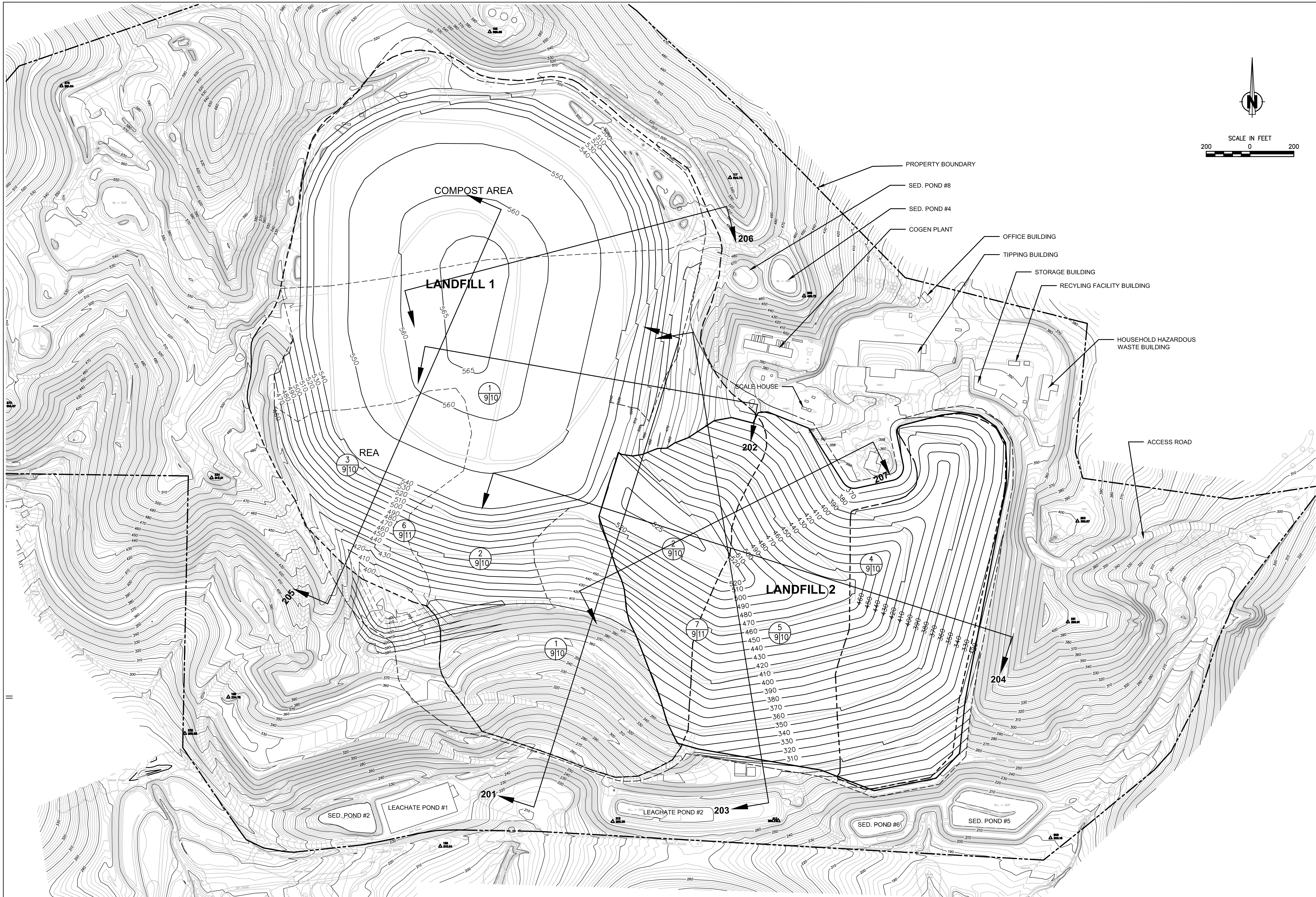
Notes:

* For static analysis, use full value of the residual adhesion tested value.

** For seismic analysis, use half of the residual adhesion tested values.

*** For saturation condition, assume adhesion equal to zero to be conservative.

FIGURES



NO.	REVISION	DATE

SHEET TITLE
SLOPE STABILITY SECTION

PROJECT TITLE
RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL
SONOMA COUNTY
PETALUMA, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION
AND PUBLIC WORKS
PETALUMA, CALIFORNIA

SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01
DWN. BY: ATV
CHK. BY: AAM
DSN. BY: ATV
ACAD FILE: SHT-1
APP. BY: J. MILLER

DATE: 1/04/11
SCALE: AS SHOWN
DRAWING NO. 1

NO.	REVISION	DATE

SHEET TITLE
SLOPE STABILITY SECTION

PROJECT TITLE
RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL
SONOMA COUNTY
PETALUMA, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION
AND PUBLIC WORKS
PETALUMA, CALIFORNIA

SCS ENGINEERS
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3117 FITE CIRCLE SUITE 108
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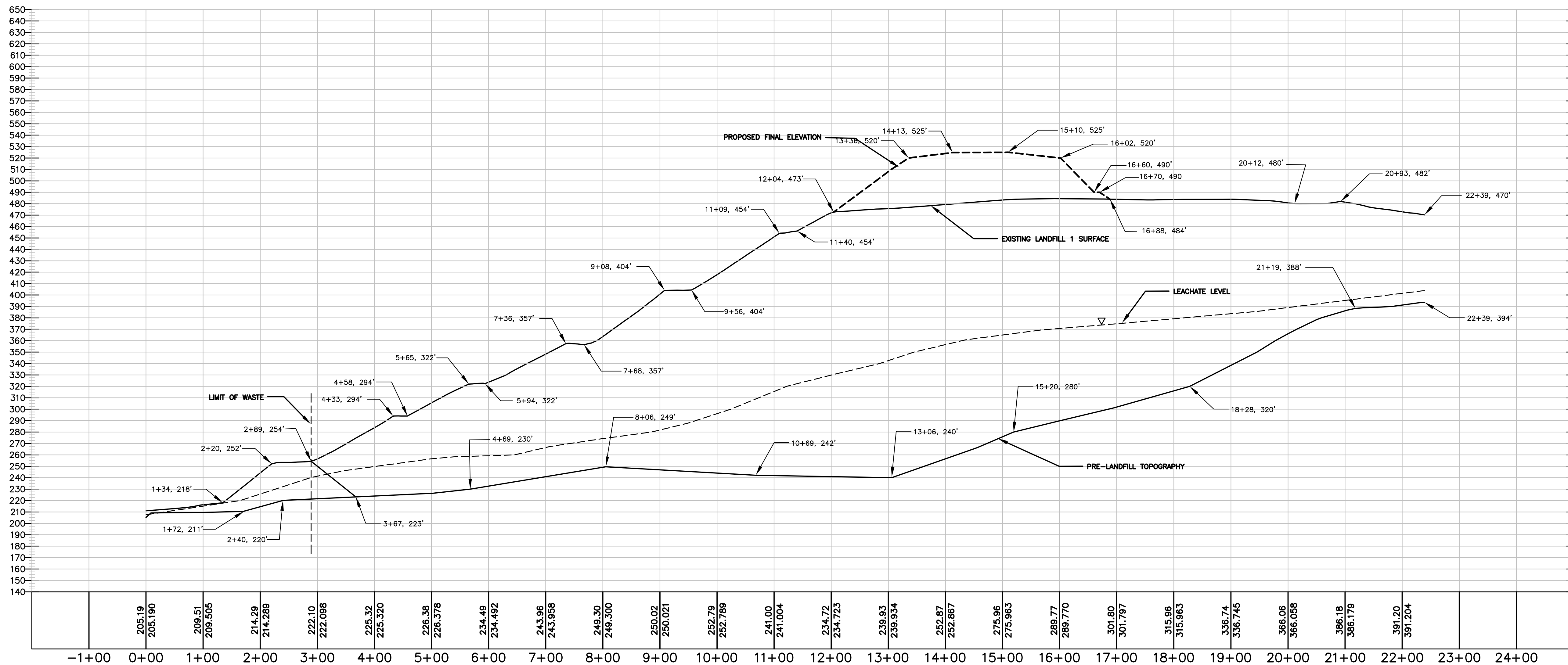
PROJ. NO. 01210155.00
DSN. BY: ATV
DWN. BY: ATV
CHK. BY: AAM
ACAD FILE: SHT-2
APP. BY: J. MILLER

DATE: 11/04/10

SCALE: AS SHOWN

DRAWING NO. 2



SECTION _201 PROFILE
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE
SECTION -201

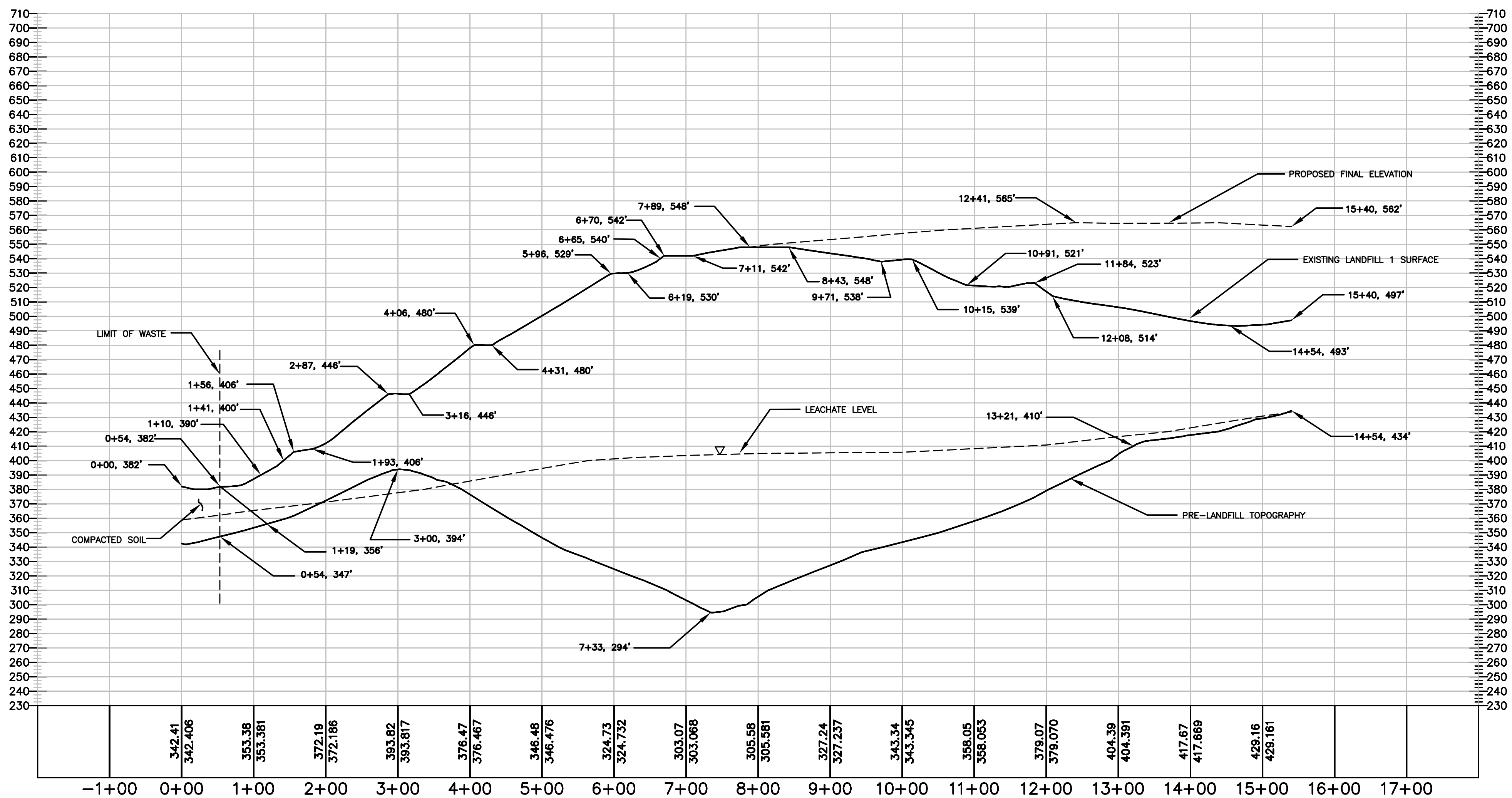
PROJECT TITLE
RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL
SONOMA COUNTY
PETALUMA, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION
AND PUBLIC WORKS
PETALUMA, CALIFORNIA

S C S ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01 | DWN. BY: ATV | ACAD FILE: SHT-4
DSN. BY: ATV | CHK. BY: AAM | APP. BY: J. MILLER

DATE: 1/17/11
SCALE: AS SHOWN
DRAWING NO. 4



SECTION _202 PROFILE

HORIZONTAL SCALE: 1"=100'

VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE
1		
2		
3		
4		
5		
6		

SHEET TITLE SECTION -202

PROJECT TITLE RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL SONOMA COUNTY PETALUMA, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION AND PUBLIC WORKS PETALUMA, CALIFORNIA

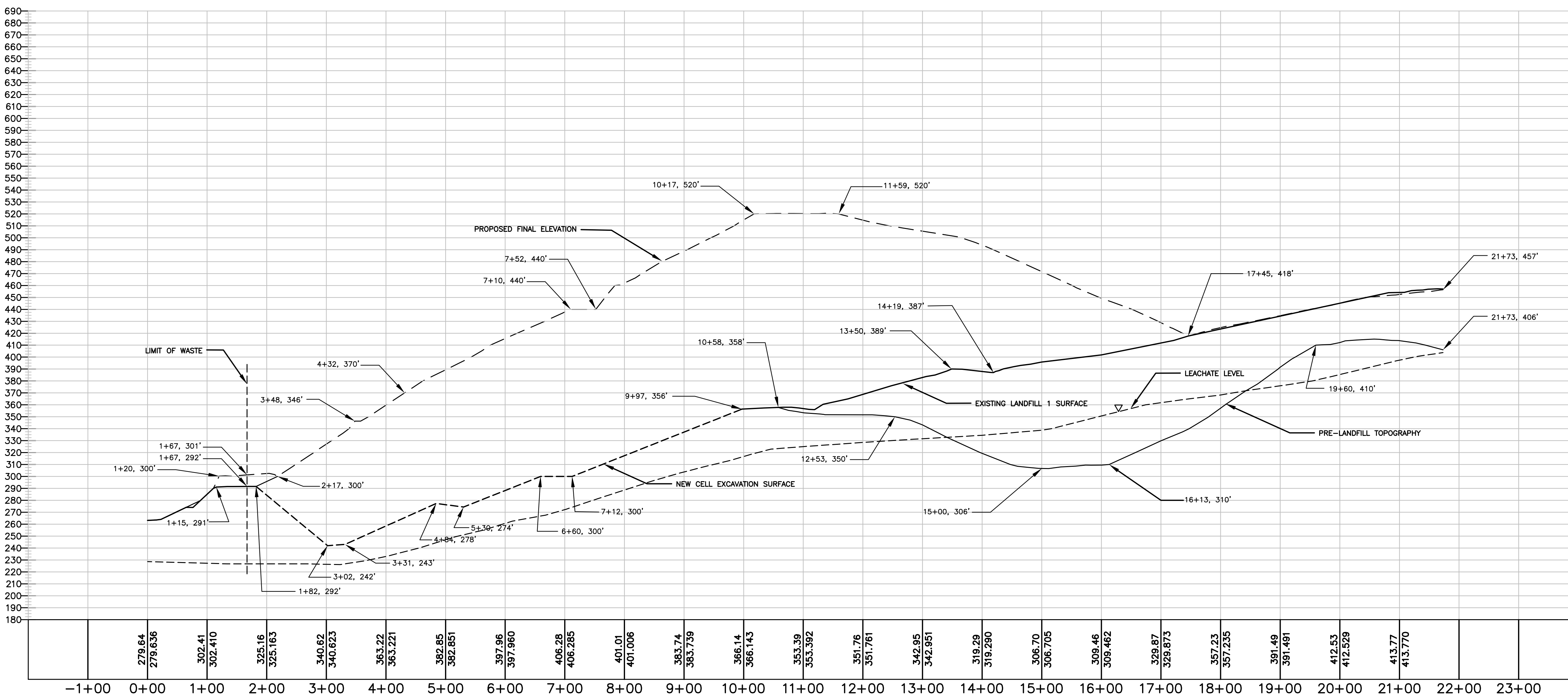
SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01 DWN. BY: ATV ACAD FILE: SHT-5
DSN. BY: ATV CHK. BY: AAM APP. BY: J. MILLER

DATE: 1/28/11

SCALE: AS SHOWN

DRAWING NO. 5



SECTION _203 PROFILE

HORIZONTAL SCALE: 1"=100'

VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE

SECTION -203

PROJECT TITLE

RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL
SONOMA COUNTY
PETALUMA, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION
AND PUBLIC WORKS
PETALUMA, CALIFORNIA

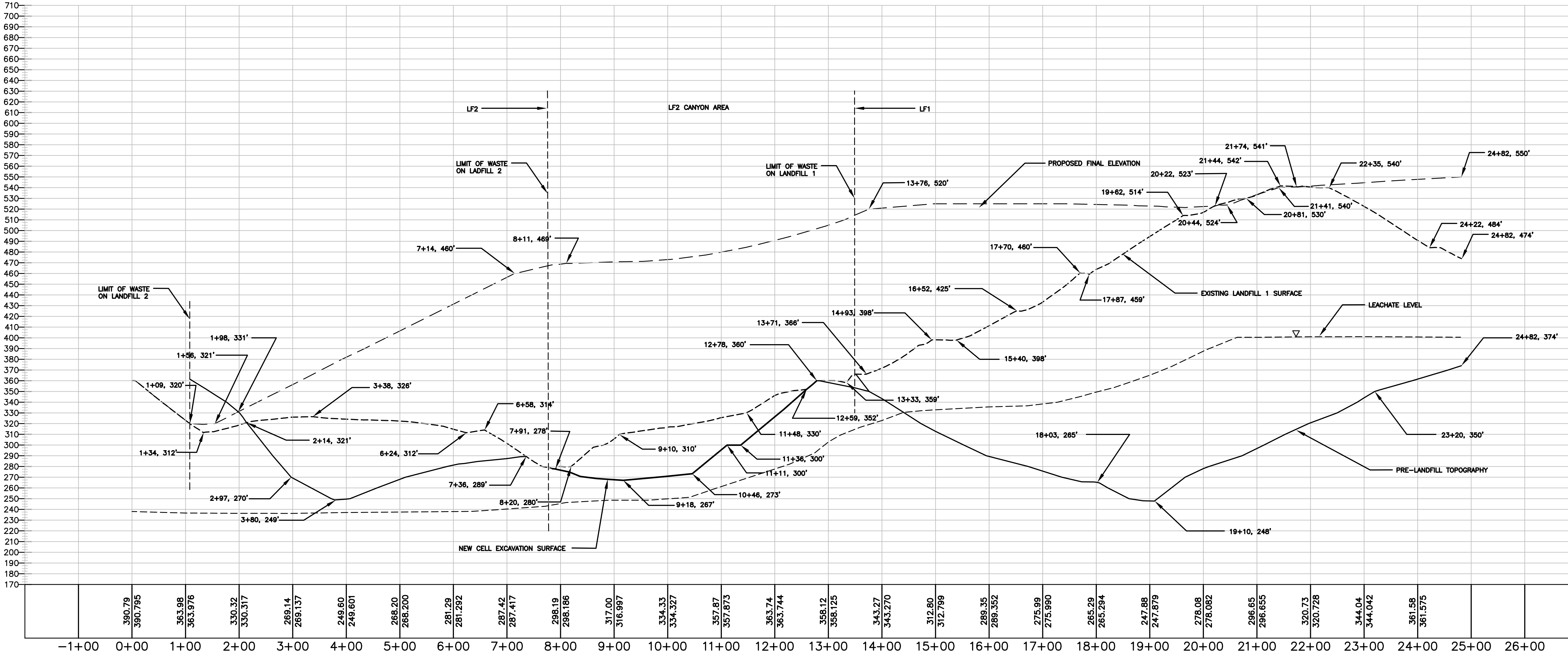
SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01 | DWN. BY: ATV | ACAD FILE: SHT-6
DSN. BY: ATV | CHK. BY: AAM | APP. BY: J. MILLER

DATE: 1/28/11

SCALE: AS SHOWN

DRAWING NO. 6



SECTION _204 PROFILE

HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE
SECTION -204

PROJECT TITLE
RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL
SONOMA COUNTY
PETALUMA, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION
AND PUBLIC WORKS
PETALUMA, CALIFORNIA

SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
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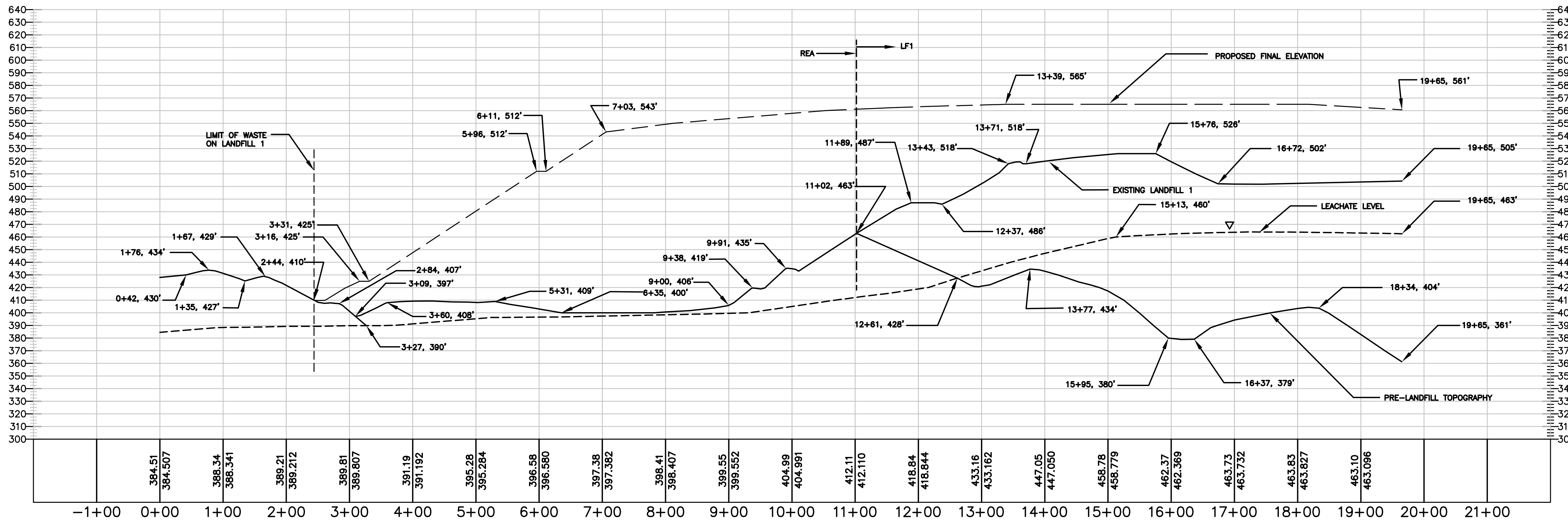
PROJ. NO. 01204201.01 | DWN. BY: ATV | ACAD FILE: SHT-7
DSN. BY: ATV | CHK. BY: AAM | APP. BY: J. MILLER

DATE: 1/28/11
SCALE: AS SHOWN
DRAWING NO. 7



SECTION _205 PROFILE

HORIZONTAL SCALE: 1"=100'

VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE: SECTION -205A

PROJECT TITLE: RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL SITE SONOMA COUNTY, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION AND PUBLIC WORKS PETALUMA, CALIFORNIA

SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
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PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01 | DWN. BY: ATV | CHK. BY: AAM | DSN. BY: ATV | ACAD FILE: SHT-8 | APP. BY: J. MILLER

DATE: 1/28/11

SCALE: AS SHOWN

DRAWING NO. 8

SECTION _206 PROFILE

HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE: SECTION -206

PROJECT TITLE: RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL SITE SONOMA COUNTY, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION AND PUBLIC WORKS PETALUMA, CALIFORNIA

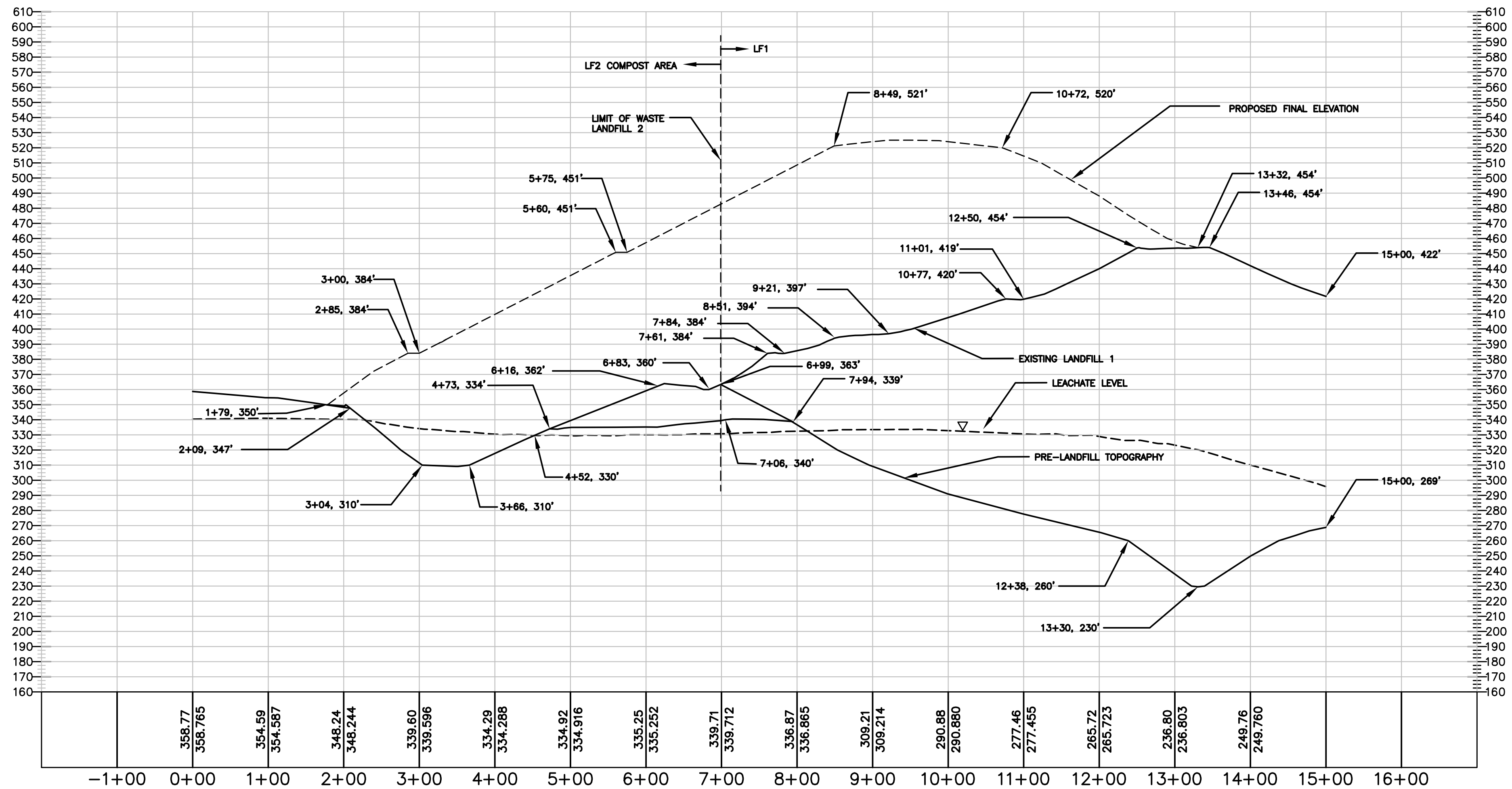
SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01 | DWN. BY: ATV | ACAD FILE: SH-9
DSN. BY: ATV | CHK. BY: AAM | APP. BY: J. MILLER

DATE: 1/28/11

SCALE: AS SHOWN

DRAWING NO. 9



SECTION _207 PROFILE

HORIZONTAL SCALE: 1"=100'

VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE
SECTION -207

PROJECT TITLE
RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL SITE
SONOMA COUNTY, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION
AND PUBLIC WORKS
PETALUMA, CALIFORNIA

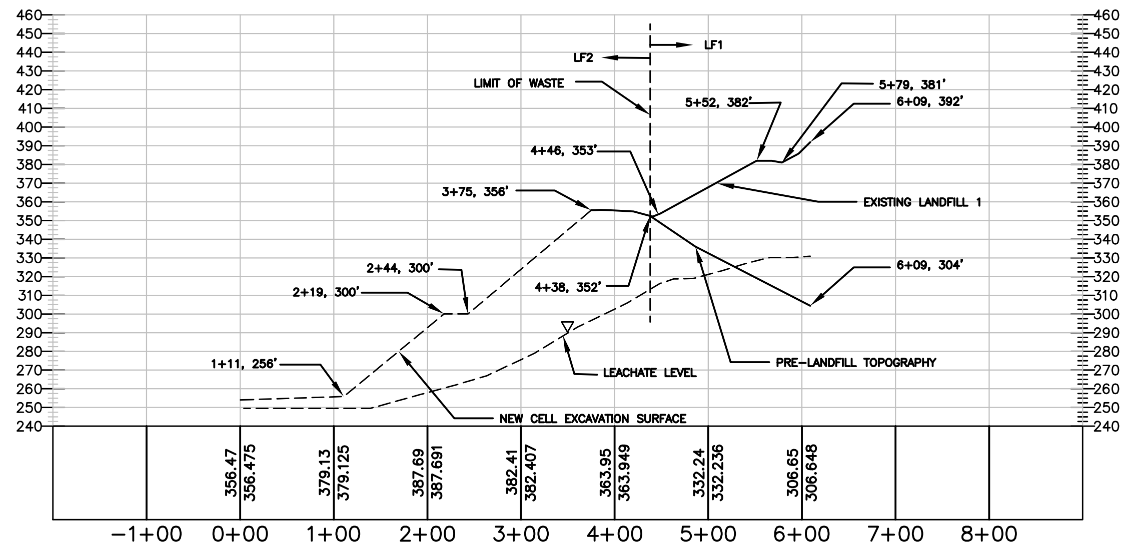
SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01 | DWN. BY: ATV | ACAD FILE: SHT-10
DSN. BY: ATV | CHK. BY: AAM | APP. BY: J. MILLER

DATE: 1/28/11

SCALE: AS SHOWN

DRAWING NO. 10



SECTION _208 PROFILE

HORIZONTAL SCALE: 1"=100'

VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE: SECTION -208

PROJECT TITLE: RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL SITE, SONOMA COUNTY, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION AND PUBLIC WORKS
PETALUMA, CALIFORNIA

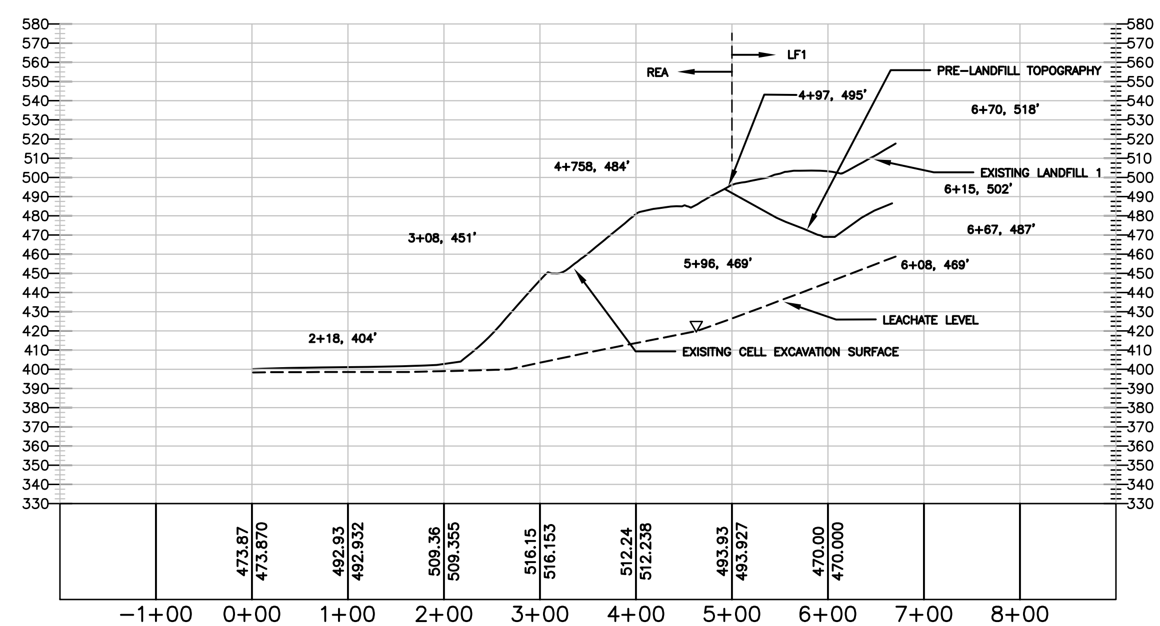
SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
PH. (925) 426-0080 FAX. (925) 426-0707

PROJ. NO. 01204201.01 | DWN. BY: ATV | ACAD FILE: SHT-11
DSN. BY: ATV | CHK. BY: AAM | APP. BY: J. MILLER

DATE: 1/28/11

SCALE: AS SHOWN

DRAWING NO. 11



SECTION _209 PROFILE
HORIZONTAL SCALE: 1"=100'
VERTICAL SCALE: 1"=50'

NO.	REVISION	DATE

SHEET TITLE
SECTION -209

PROJECT TITLE
RJTD & PFCP SONOMA COUNTY CENTRAL DISPOSAL SITE
SONOMA COUNTY, CALIFORNIA

COUNTY OF SONOMA DEPT. TRANSPORTATION
AND PUBLIC WORKS
PETALUMA, CALIFORNIA

SCS ENGINEERS
ENVIRONMENTAL CONSULTANTS
6601 KOLL CENTER PKWY, SUITE 140
PLEASANTON, CA 94566
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PROJ. NO. 01204201.01
DSN. BY: ATV
DWN. BY: ATV
CHK. BY: AAM
ACAD FILE: SHT-12
APP. BY: J. MILLER

DATE: 1/28/11
SCALE: AS SHOWN
DRAWING NO. 12

ATTACHMENT A

MATERIAL/INTERFACE LABORATORY TEST RESULTS

INTERFACE SHEAR STRENGTH TESTS

(Precision Geosynthetic Laboratories)

Precision Geosynthetic Laboratories

GAI-LAP

Initial: CVZ #:0.13

DATE: 2/1/2011

Ambrose McCready
SCS ENGINEERS
3117 Fite Circle, Suite 101
Sacramento, CA 95827

Dear Mr. McCready:

Thank you for consulting Precision Geosynthetic Laboratories (PGL) for your material testing needs.

Enclosed is the ***final*** laboratory report for the **Interface Shear** testing of the materials in accordance to the test configurations listed below.

PROJECT NAME: Sonoma Central Landfill

REFERENCE PGL JOB NO.: G101673

DATE REPORTED: Feb. 1, 2011

SAMPLES SENT BY: GSE

MATERIAL DESCRIPTION & IDENTIFICATIONS:

Material	Type	Manufacturer	Roll No.	PGL Control No.	Date Received
1. Clay	Clay	N/A	N/A	57979-57981	12/21/2010
2. Soil	Soil	N/A	N/A	57983-57987	12/21/2010
3. LCRS	LCRS	N/A	N/A	57982	12/21/2010
4. Geomembrane	60mil textured HDPE	GSE	10376684	58039	12/22/2010
5. Geotextile	10oz NW Geotextile	GSE	130356139	58040	12/22/2010
6. Geotextile	12oz NW Geotextile	GSE	130226915	58041	12/22/2010
7. GCL	Bentoliner NWL-35	GSE	502160831	58067	12/27/2010
8. GCL	Bentoliner NWL-60	GSE		58068	12/27/2010
9. Geocomposite	250mil double-sided	GSE	131358282	58158	1/14/2011

TESTS REQUIRED:

TEST METHOD	DESCRIPTION
ASTM D5321	Interface Shear
ASTM D6243	Interface Shear

TEST CONFIGURATIONS:

1. 60mil textured HDPE vs 12oz NW Geotextile (Liner System)
2. Soil vs 10oz NW Geotextile (Liner System)
3. Clay vs 10oz NW Geotextile (Liner System)
4. LCRS vs 12oz NW Geotextile (Liner System)
5. 60mil textured HDPE vs 250mil DS Geocomposite (Liner System)
6. 60mil textured HDPE vs Soil (Liner System)
7. 60mil textured HDPE vs NWL-60 GCL (Liner System)
8. NWL-60 GCL VS Clay (Liner System)
9. 60mil textured HDPE vs 250mil DS Geocomposite (Cover System)
10. 250mil DS Geocomposite vs Soil (Cover System)
11. NWL-35 GCL VS Soil (Cover System)
12. 60mil textured HDPE vs NWL-35 GCL (Cover System)
13. 60mil textured HDPE vs Soil (Cover System)

TEST CONDITIONS: The samples were conditioned for a minimum of one hour in the laboratory at 22 $\pm$ 2°C (71.6 $\pm$ 3.6°F) and at 60 $\pm$ 10% relative humidity prior to test.

Precision Geosynthetic Laboratories

TEST RESULTS: The test results are summarized in Tables 1 to 13.

PRECISION GEOSYNTHETIC LABORATORIES

Carmelo V. Zantua
Technical/Laboratory Director

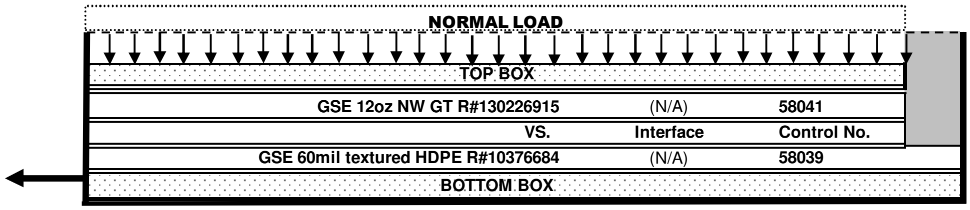
It shall be noted that the samples tested are believed to be true representatives of the material produced under the designation herein stated. In addition, the attached laboratory tests results are considered indicative only of the quality of samples/specimens that were actually tested. The appropriate test methods hereby employed are based on the current and accepted industry practices. Precision Geosynthetic Laboratories neither accepts responsibility for nor makes claims to the intended final use and purpose of the material. The test data and all associated project information shall be held confidential and not to be reproduced and/or disclosed to other parties except in full and with prior written approval from pertinent entity duly authorized by the respective client or from the client itself. It is a policy of the company to keep physical records of each job for two (2) years commencing from the date of receipt of the samples and keep its corresponding electronic file for seven (7) years. ***Tested specimens and retained samples are kept for one (1) month.*** On the other hand, should you need us to keep them at longer time, please advise us in writing.

TABLE 1
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By: ________
Date: January 27, 2011

TEST CONFIGURATION 1



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under **saturated** condition for **4 hours** @ normal load before shearing.
2. Normal loads were applied using **hydraulic** for the highest load and **bladder** for the medium and low loads.

SHEAR TEST:

1. Shear test was conducted @ **0.040** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **saturated** condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Height (mils)		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
				Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	Before	After	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	22	18	1937	26	1155	16
55.56	8,000	22	16	4196	28	2065	14
111.11	16,000	22	15	8125	27	3556	13
Note: N/A - Not Applicable		COHESION (psf) :		0		410	
		COEFFICIENT OF FRICTION :		0.51		0.20	
		FRICTION ANGLE (degrees) :		27.1		11.2	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

Figure #1
Normal Stress/ Interface Stress

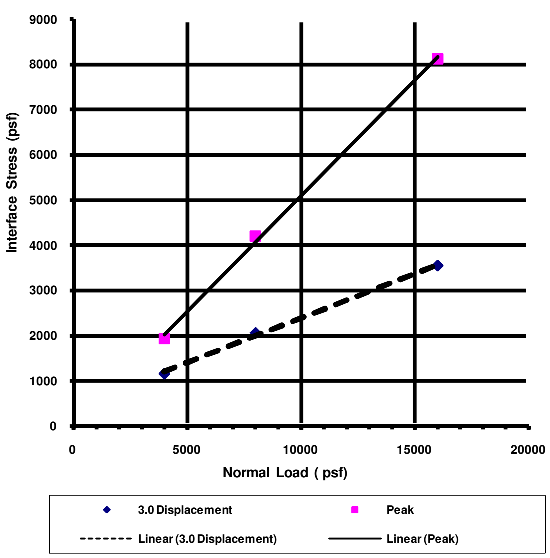
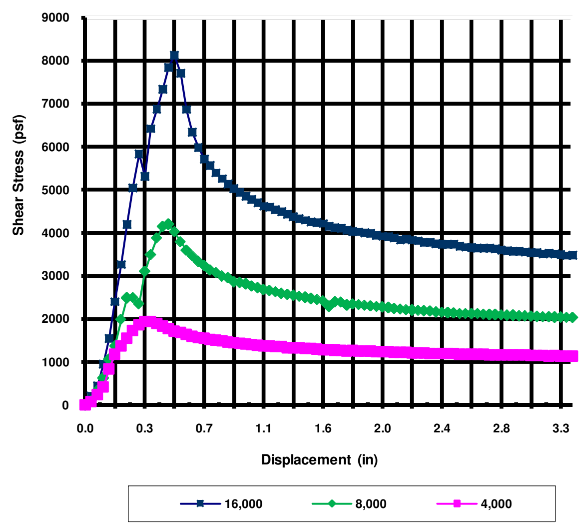


Figure #2
Shear Stress/ Displacement Curve



ISO 9001 - 2000

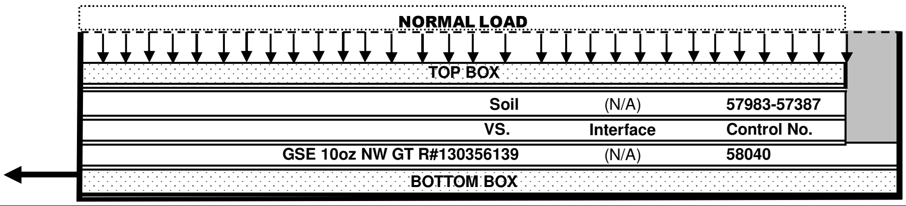
Precision Geosynthetic Laboratories

TABLE 2
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 2



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is **138.7** **pcf** at **8.8%** Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to **124.8** **pcf** at **8.8%** moisture content forming 2 inch layer in the TOP box.
4. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under **wet spray** condition for **24 hours** @ normal load before shearing.
2. Normal loads were applied using **hydraulic** for the highest load, **bladder** for the medium load and lowest loads.

SHEAR TEST:

1. Shear test was conducted @ **0.040** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **wet spray** condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Moisture Content		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	8.8	8.8	2726	34	2564	33
55.56	8,000	8.8	8.8	5584	35	4825	31
111.11	16,000	8.8	8.7	11760	36	9310	30
Note: N/A - Not Applicable		**COHESION (psf) :**		0		321	
		COEFFICIENT OF FRICTION :		0.76		0.56	
		FRICTION ANGLE (degrees) :		37.1		29.3	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding may have occurred within the soil substrate as soil film was retained on the surface of the geotextile. See photos.

Figure #1
Normal Stress/ Interface Stress

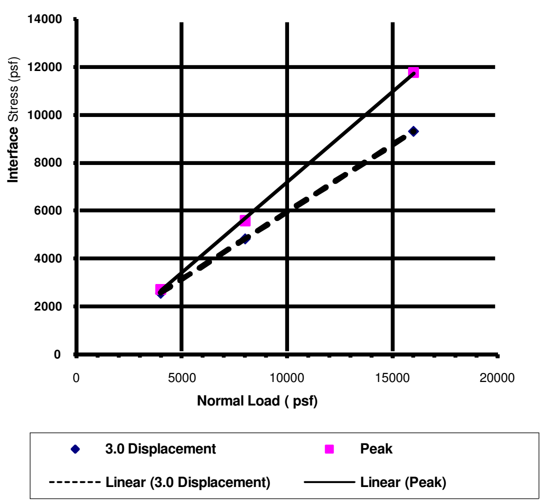
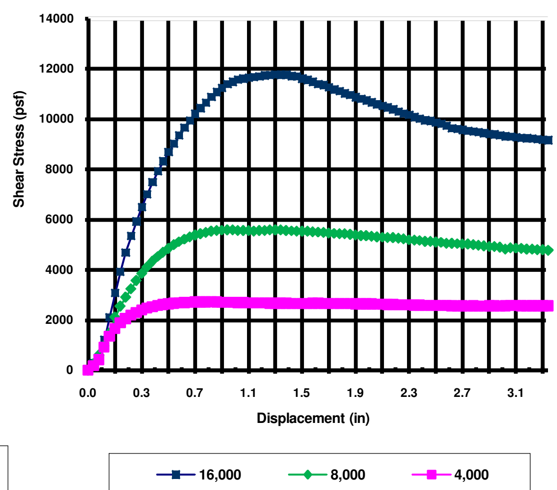


Figure #2
Shear Stress/ Displacement Curve



Precision Geosynthetic Laboratories

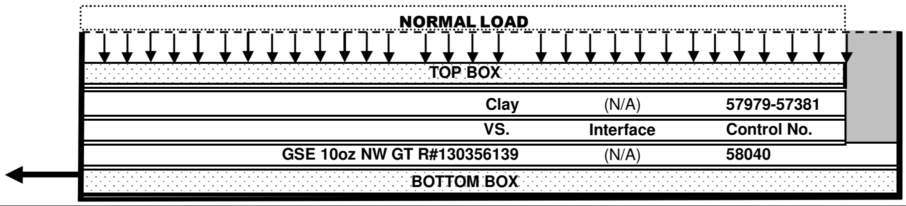
ISO 9001 - 2000

TABLE 3
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 3



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the BOTTOM box, with effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is 117.2 pcf at 13% Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to 105.5 pcf at 16.3% moisture content forming 2 inch layer in the TOP box.
4. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under wet spray condition for 24 hours @ normal load before shearing.
2. Normal loads were applied using hydraulic for the highest load, bladder for the medium load and lowest loads.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/ min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at wet spray condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Moisture Content		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	16.3	16.9	2501	32	1687	23
55.56	8,000	16.3	16.8	3170	22	2503	17
111.11	16,000	16.3	16.2	6203	21	3912	14
Note: N/A - Not Applicable		COHESION (psf) :		985		983	
		COEFFICIENT OF FRICTION :		0.32		0.18	
		FRICTION ANGLE (degrees) :		17.7		10.4	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding may have occurred within the clay substrate as clay film was retained on the surface of the geotextile. See photos.

Figure #1
Normal Stress/ Interface Stress

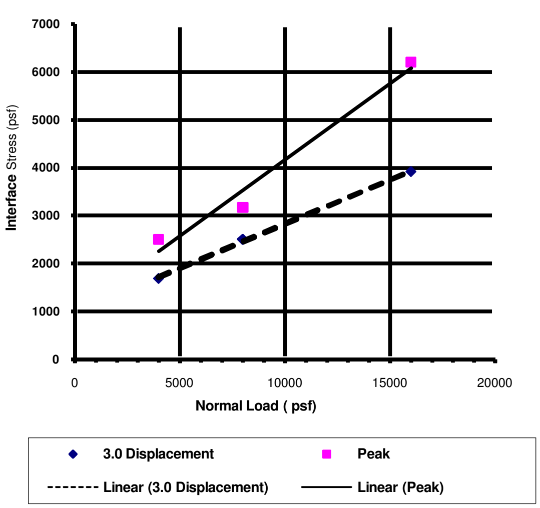


Figure #2
Shear Stress/ Displacement Curve

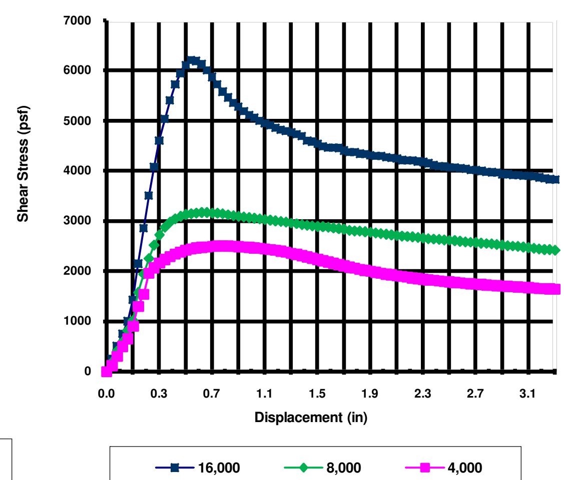
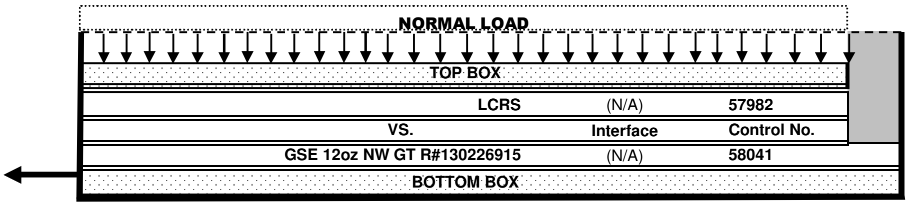


TABLE 4
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 4



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under **wet spray** condition for **24 hours** @ normal load before shearing.
2. Normal loads were applied using **hydraulic** for the highest load, **bladder** for the medium and lowest loads.

SHEAR TEST:

1. Shear test was conducted @ **0.040** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **wet spray** condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		PEAK STRENGTH		POST PEAK STRENGTH AT 3.0 INCHES	
		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	2904	36	2837	35
55.56	8,000	5573	35	4098	27
111.11	16,000	8006	27	5289	18
Note:		1,688		2,242	
N/A - Not Applicable		0.41		0.20	
		22.2		11.1	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. There were stretching and tearing of the geotextiles. See photos.

Figure #1
Normal Stress/ Interface Stress

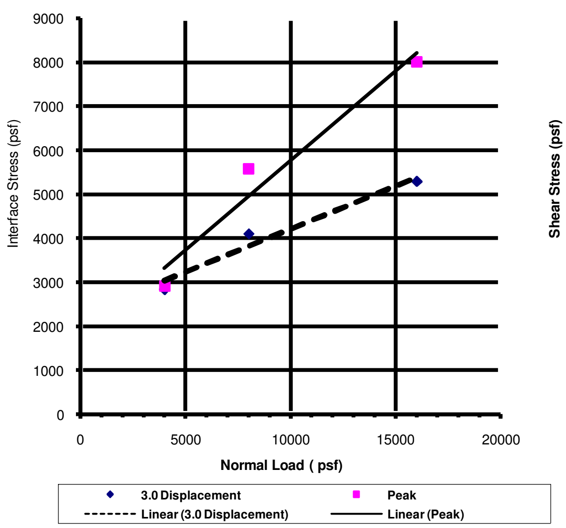
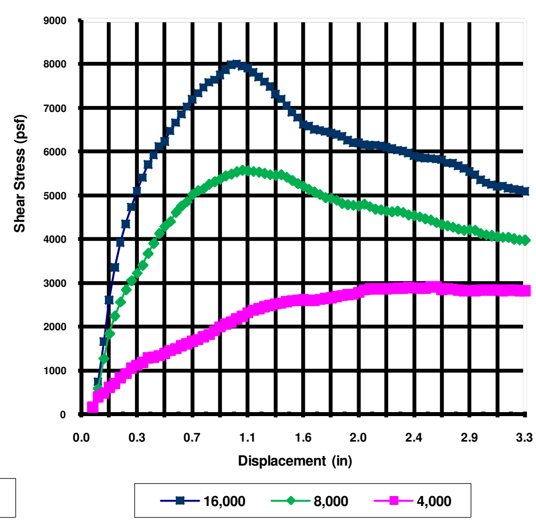


Figure #2
Shear Stress/ Displacement Curve



By accepting the data and results presented on this report, the Client agrees to limit the liability of Precision Geosynthetic Laboratories from Client and all other parties for claims on issues, due to the use of this data, to the cost for the respective tests presented in this report; and the Client agrees to indemnify and hold harmless Precision Geosynthetic Laboratories from and against all liabilities in excess of the aforementioned limit.

Precision Geosynthetic Laboratories

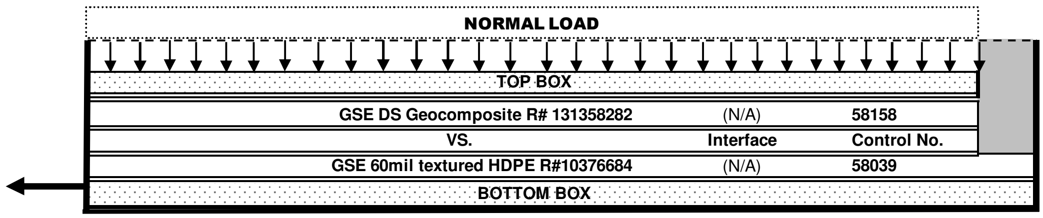
ISO 9001 - 2000

TABLE 5
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 5



TEST CONDITIONS:
SAMPLE PREPARATION:
1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box,with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:
1. Each set of specimen was consolidated under **saturated** condition for **4 hours** @ normal load before shearing.
2. Normal loads were applied using **hydraulic** for the highest load, **bladder** for the medium and lowest loads.

SHEAR TEST:
1. Shear test was conducted @ **0.04** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **saturated** condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	21	17	2123	28	1026	14
55.56	8,000	22	16	3570	24	1666	12
111.11	16,000	21	14	7297	25	3254	11
Note:		COHESION (psf) :		260		232	
N/A - Not Applicable		COEFFICIENT OF FRICTION :		0.44		0.19	
		FRICTION ANGLE (degrees) :		23.6		10.6	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:
1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

Figure #1
Normal Stress/ Interface Stress

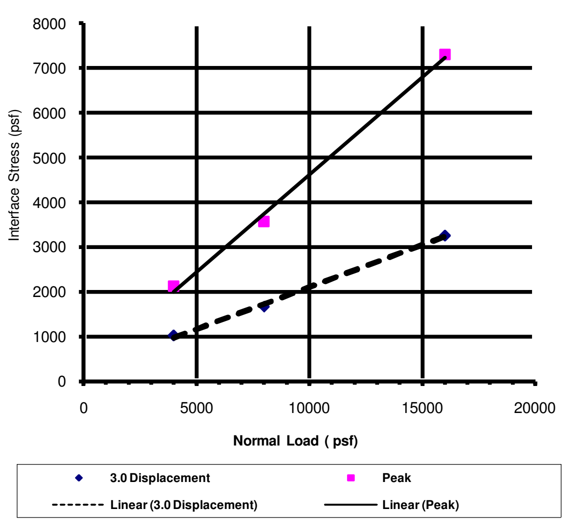


Figure #2
Shear Stress/ Displacement Curve

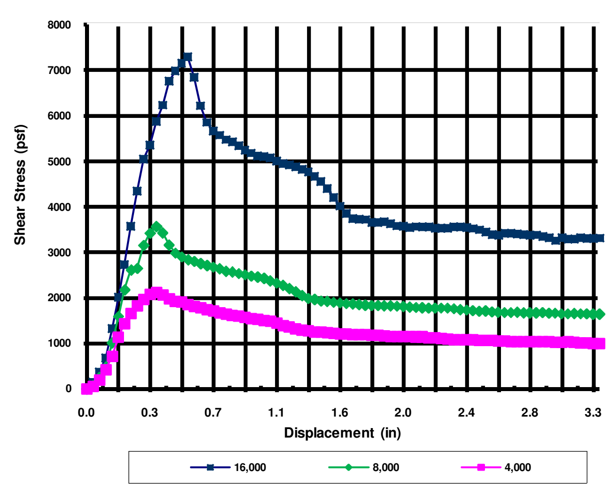


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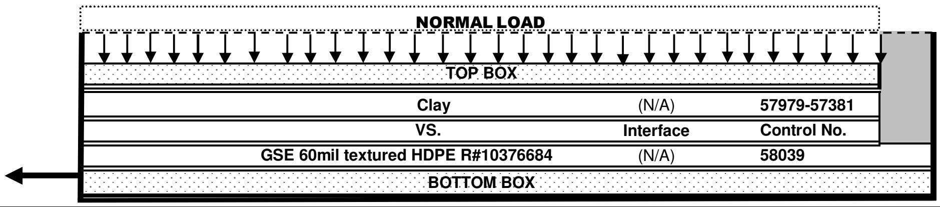
TABLE 6
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: February 1, 2011

TEST CONFIGURATION 6



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is **117.2** **pcf** at **13.3%** Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to **105.5** **pcf at** **16.3%** moisture content forming 2 inch layer in the TOP box..
4. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under **saturated** condition for **24 hours** @ normal load before shearing.
2. Normal loads were applied using **hydraulic** for the highest load, **bladder** for the medium load and lowest loads.

SHEAR TEST:

1. Shear test was conducted @ **0.002** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **saturated** condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Moisture Content		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	16.3	21.3	22	21	2745	34	1818	24
55.56	8,000	16.3	19.8	22	20	4784	31	3410	23
111.11	16,000	16.3	17.0	22	19	7997	27	5052	18
Note:		COHESION (psf) :				1139		997	
N/A - Not Applicable		COEFFICIENT OF FRICTION :				0.43		0.26	
		FRICTION ANGLE (degrees) :				23.4		14.6	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding may have occurred within the clay substrate as clay film was retained on the surface of the geomembrane. See photos.

Figure #1
Normal Stress/ Interface Stress

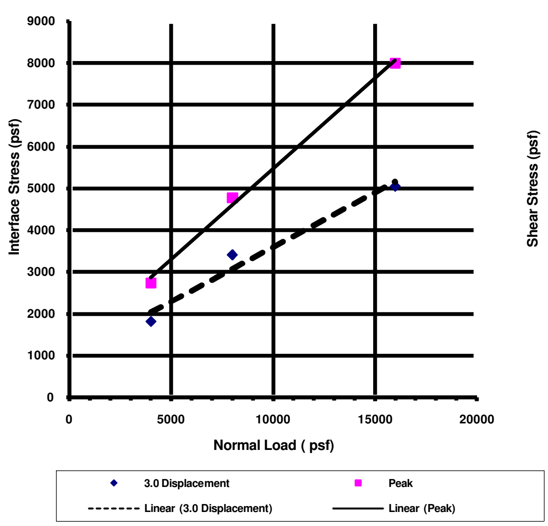


Figure #2
Shear Stress/ Displacement Curve

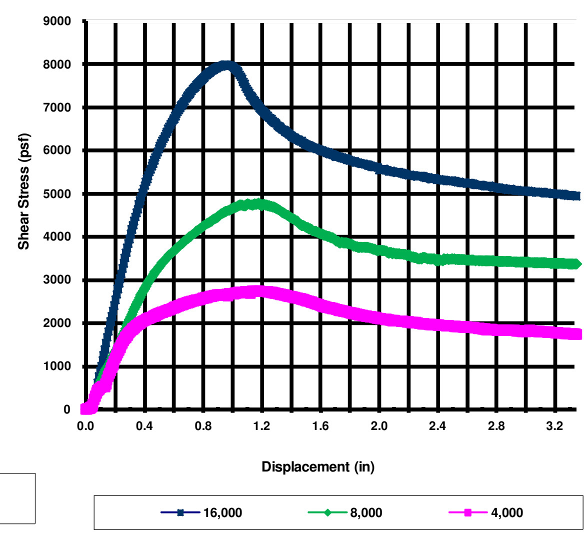
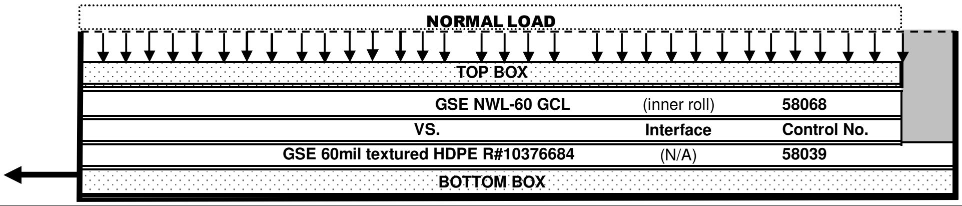


TABLE 7
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D6243)
PGL Job No. G101673

Reviewed By:
Date: February 1, 2011

TEST CONFIGURATION 7



TEST CONDITIONS:

SAMPLE PREPARATION:
1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:
1. Each set of specimen was consolidated under **saturated** condition for **24 hours** @ normal load before shearing.
2. Normal loads were applied using **hydraulic** for the highest load, **bladder** for the medium load and lowest loads.

SHEAR TEST:
1. Shear test was conducted @ **0.002** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **saturated** condition .
4. Test were performed in general accordance with ASTM D6243 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	9.2	74.2	22	21	2007	27	1277	18
55.56	8,000	9.2	66.1	22	20	3981	26	2497	17
111.11	16,000	9.2	56.6	22	19	7407	25	4984	17
Note: N/A - Not Applicable					**COHESION (psf) :**	**294**		**33**	
					COEFFICIENT OF FRICTION :	**0.45**		**0.31**	
					FRICTION ANGLE (degrees) :	**24.1**		**17.2**	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:
1. Sliding occurred between the two interfacing materials.
2. No tilting of the system or any abnormalities observed during and after the test.
3. There was some stretching of the GCL at medium load. See photo.

Figure #1
Normal Stress/ Interface Stress

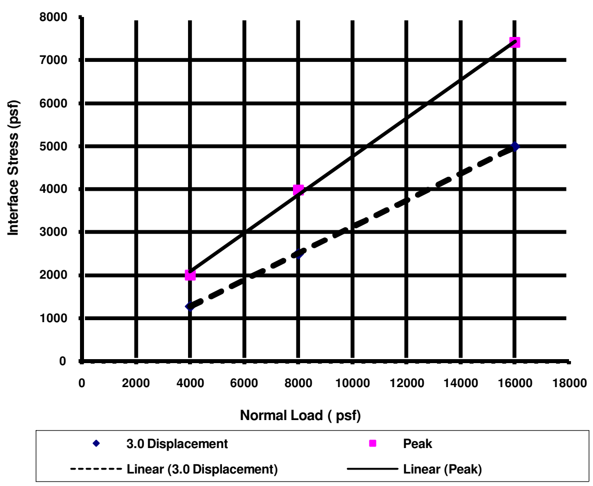


Figure #2
Shear Stress/ Displacement Curve

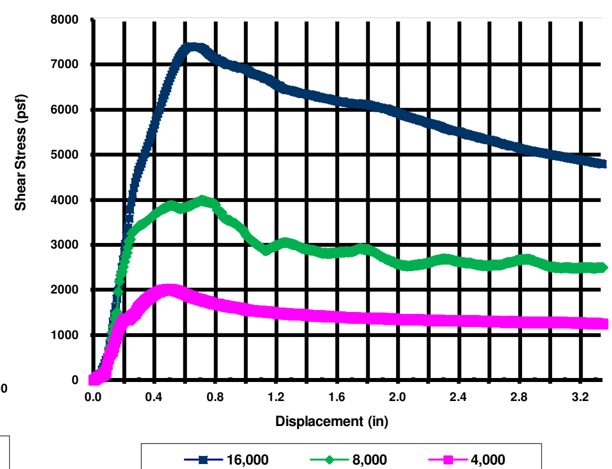
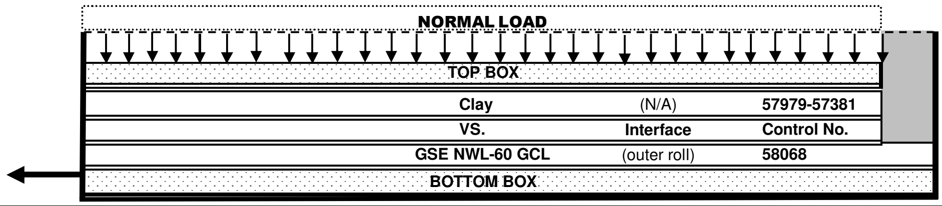


TABLE 8
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D6243)
PGL Job No. G101673

Reviewed By:
Date: February 1, 2011

TEST CONFIGURATION 8



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is **117.2** pcf at **13.3%** Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to **105.5** pcf at **16.3%** moisture content forming 2 inch layer in the TOP box..
4. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under **saturated** condition for **24 hours** @ normal load before shearing.
2. Normal loads were applied using **hydraulic** for the highest load, **bladder** for the medium load and lowest loads.

SHEAR TEST:

1. Shear test was conducted @ **0.002** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **saturated** condition .
4. Test were performed in general accordance with ASTM D6243 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		GCL Moisture Content		Soil Moisture Content		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(%)	(%)	(psf)	(degrees)	(psf)	(degrees)
27.78	4,000	9.2	86.1	16.3	25.0	1740	24	1139	16
55.56	8,000	9.2	76.5	16.3	23.4	3117	21	1833	13
111.11	16,000	9.2	66.9	16.3	21.7	5839	20	3490	12
Note:						**COHESION (psf) :**	379	311	
N/A - Not Applicable						**COEFFICIENT OF FRICTION :**	0.34	0.20	
						FRICTION ANGLE (degrees) :	18.8	11.2	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding may have occurred within the soil substrate as soil film was retained on the surface of the GCL. See photos.

Figure #1
Normal Stress/ Interface Stress

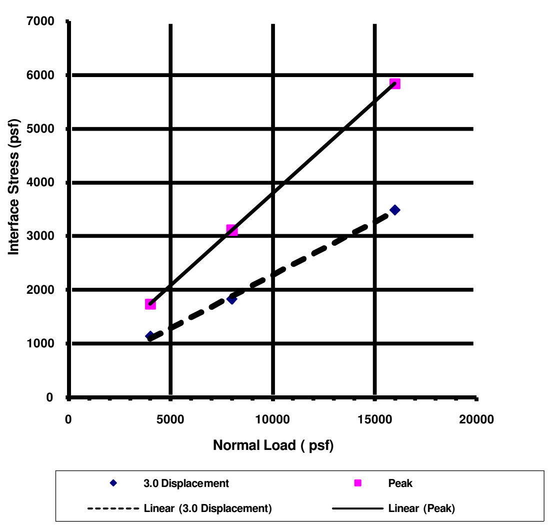


Figure #2
Shear Stress/ Displacement Curve

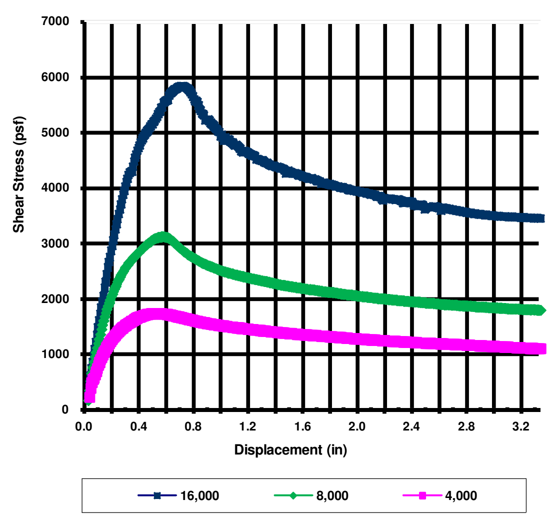


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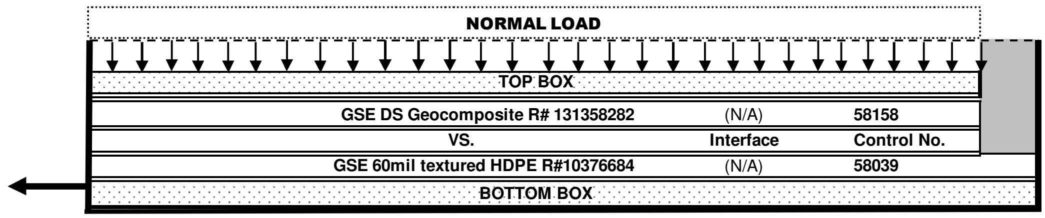
TABLE 9
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 9



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box,with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under saturated condition for 4 hours @ normal load before shearing.
2. Normal loads were applied using dead weights.

SHEAR TEST:

1. Shear test was conducted @ 0.04 in/ min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at saturated condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
0.69	100	22	21	114	49	59	31
1.39	200	22	21	214	47	115	30
2.08	300	22	20	260	41	163	29
Note: N/A - Not Applicable			COHESION (psf) :	50		8	
			COEFFICIENT OF FRICTION :	0.73		0.52	
			FRICTION ANGLE (degrees) :	36.1		27.5	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

Figure #1
Normal Stress/ Interface Stress

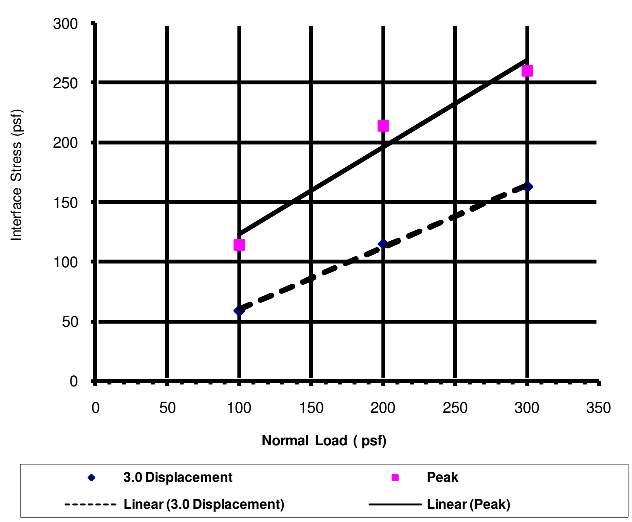
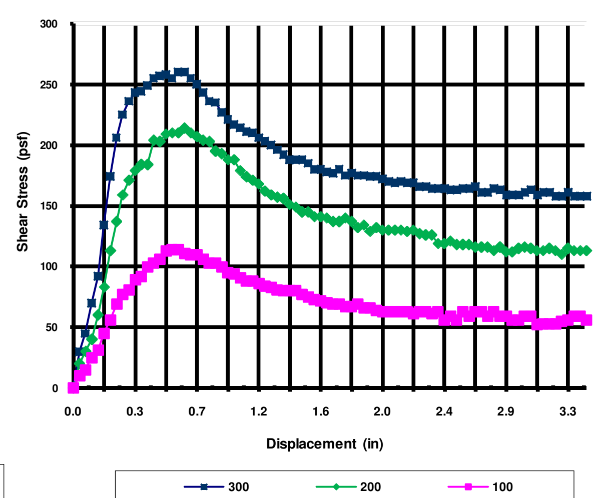


Figure #2
Shear Stress/ Displacement Curve



Precision Geosynthetic Laboratories

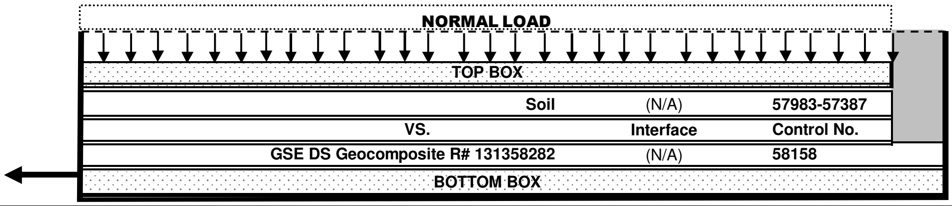
ISO 9001 - 2000

TABLE 10
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 10



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is **138.7** **pcf** at **8.8%** Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to **124.8** **pcf at** **8.8%** moisture content forming 2 inch layer in the TOP box.
4. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under **wet spray** condition for **24 hours** @ normal load before shearing.
2. Normal loads were applied using **dead weights.**

SHEAR TEST:

1. Shear test was conducted @ **0.040** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **wet spray** condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Soil Moisture Content		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		%		Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	Before	After	(psf)	(degrees)	(psf)	(degrees)
0.69	100	8.8	8.9	61	31	55	29
1.39	200	8.8	8.8	108	28	94	25
2.08	300	8.8	8.6	196	33	173	30
Note:		COHESION (psf) :		0		0	
N/A - Not Applicable		COEFFICIENT OF FRICTION :		0.68		0.59	
		FRICTION ANGLE (degrees) :		34.0		30.5	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing surfaces.

Figure #1
Normal Stress/ Interface Stress

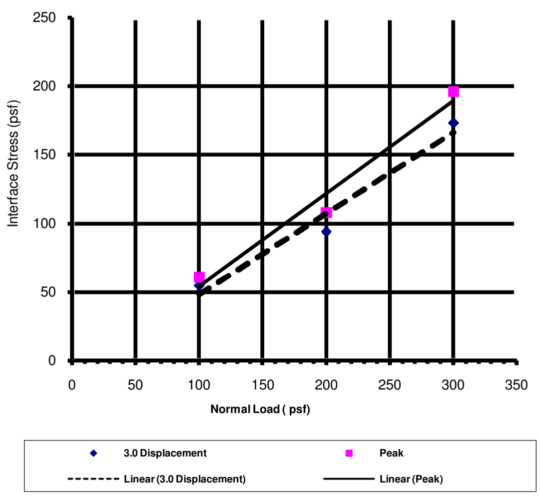


Figure #2
Shear Stress/ Displacement Curve

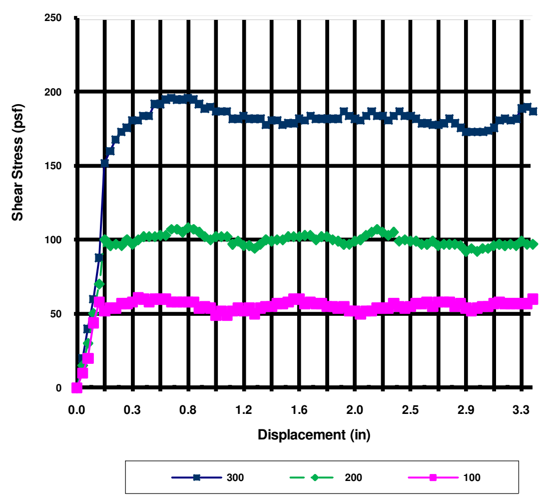
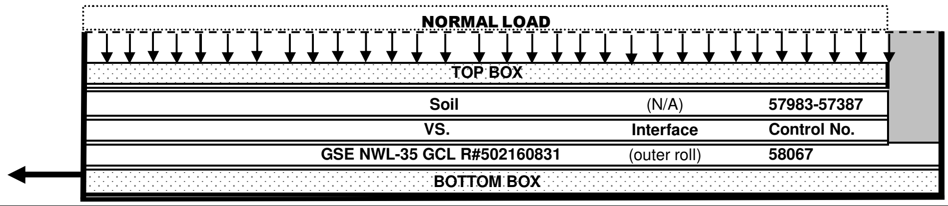


TABLE 11
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D6243)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 11



TEST CONDITIONS:
SAMPLE PREPARATION:
1. The TOP box contained the soil .
   Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is 138.7 pcf at 8.8% Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to 124.8 pcf at 8.8% moisture content forming 2 inch layer in the TOP box..
4. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:
1. Each set of specimen was consolidated under wet spray condition for 24 hours @ normal load before shearing.
2. Normal loads were applied using dead weights.

SHEAR TEST:
1. Shear test was conducted @ 0.040 in/ min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at wet spray condition .
4. Test were performed in general accordance with ASTM D6243 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Soil Moisture Content		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(psf)	(degrees)	(psf)	(degrees)
0.69	100	8.8	8.8	80	39	70	35
1.39	200	8.8	8.8	113	29	98	26
2.08	300	8.8	8.7	152	27	142	25
Note:		COHESION (psf) :		43		31	
N/A - Not Applicable		COEFFICIENT OF FRICTION :		0.36		0.36	
		FRICTION ANGLE (degrees) :		19.8		19.8	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:
1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding occurred between the two interfacing materials.

Figure #1
Normal Stress/ Interface Stress

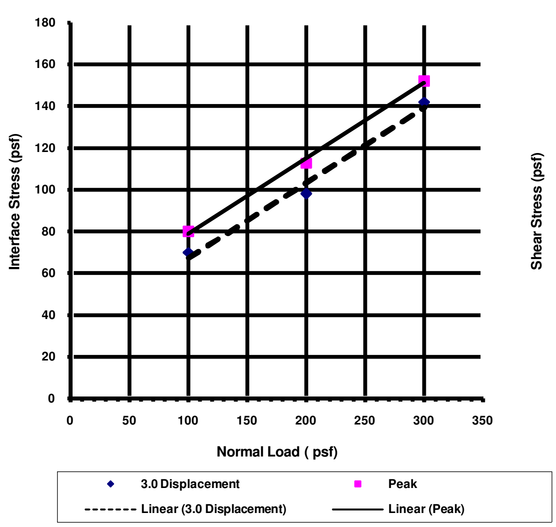
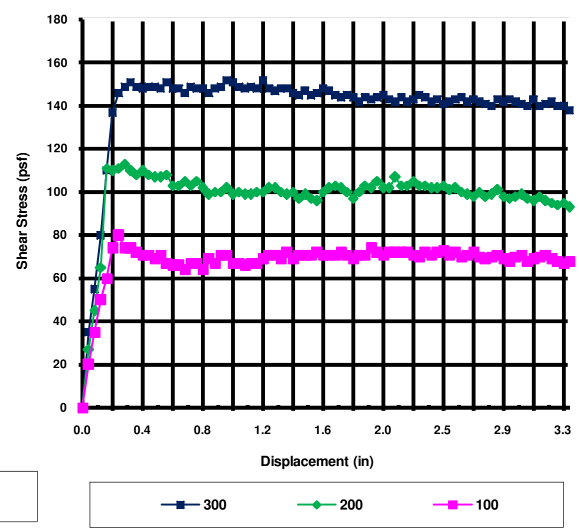


Figure #2
Shear Stress/ Displacement Curve



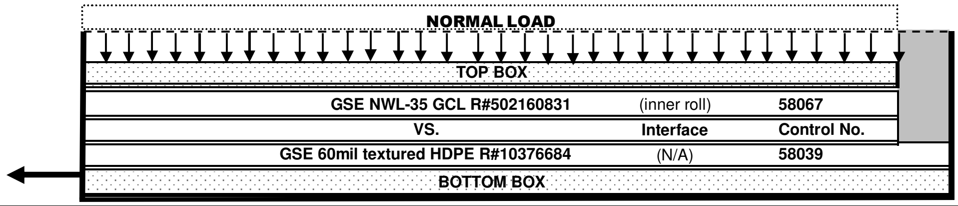
Precision Geosynthetic Laboratories

TABLE 12
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D6243)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 12



TEST CONDITIONS:

SAMPLE PREPARATION:

1. Specimens were cut along machine direction to 14" x 17" for the upper box, and 14" x 19" for the lower box, with an effective test area of 12" x 12".
2. Geosynthetic specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under **saturated** condition for **24 hours** @ normal load before shearing.
2. Normal loads were applied using **dead weights.**

SHEAR TEST:

1. Shear test was conducted @ **0.040** in/ min.
2. Sheared @ minimum **3.0** inch horizontal displacement.
3. The test specimens were sheared at **saturated** condition .
4. Test were performed in general accordance with ASTM D6243 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		GCL Moisture Content		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
0.69	100	7.4	123.5	21	20	252	68	186	62
1.39	200	7.4	116.7	21	19	319	58	205	46
2.08	300	7.4	104.9	21	18	361	50	254	40
Note:					COHESION (psf) :	202		147	
N/A - Not Applicable					COEFFICIENT OF FRICTION :	0.55		0.34	
					FRICTION ANGLE (degrees) :	28.6		18.8	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. Sliding occurred between the two interfacing materials.
2. No tilting of the system or any abnormalities observed during and after the test.
3. Superficial abrasion on the geosynthetics interfacing side (typical to all loads)

Figure #1
Normal Stress/ Interface Stress

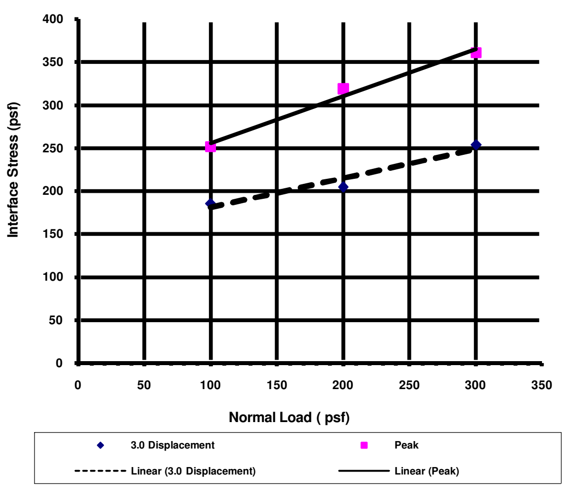


Figure #2
Shear Stress/ Displacement Curve

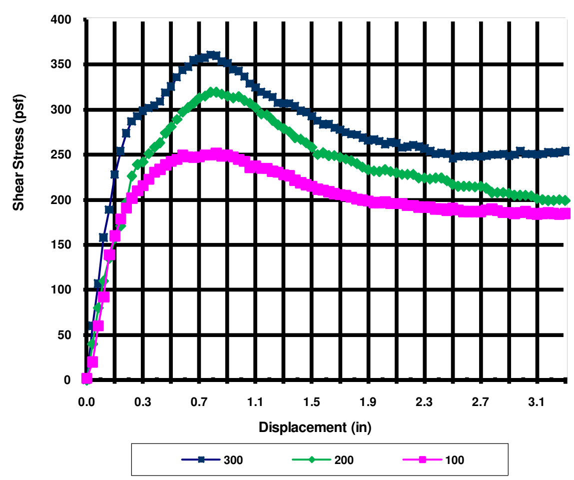
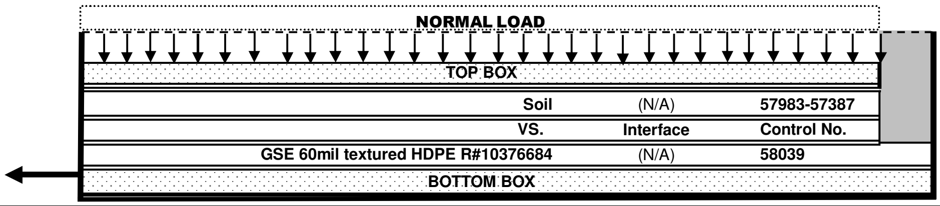


TABLE 13
CLIENT: SCS Engineers
PROJECT: Sonoma Central LF

INTERFACE SHEAR TEST RESULT (ASTM D5321)
PGL Job No. G101673

Reviewed By:
Date: January 27, 2011

TEST CONFIGURATION 13



TEST CONDITIONS:

SAMPLE PREPARATION:

1. The TOP box contained the soil .
   Specimens were cut along machine direction to 14" x 19" for the BOTTOM box, with effective test area of 12" x 12".
2. The Maximum Dry Density (**MDD**) of the soil is 138.7 **pcf** at 8.8% Optimum Moisture Content (**OMC**).
3. Soil specimen was remolded to 124.8 **pcf at** 8.8% moisture content forming 2 inch layer in the TOP box..
4. Specimens were secured via flat bar clamping mechanisms complete with bolts and nuts (7-pairs).

CONSOLIDATION:

1. Each set of specimen was consolidated under saturated condition for 24 hours @ normal load before shearing.
2. Normal loads were applied using dead weights.

SHEAR TEST:

1. Shear test was conducted @ 0.040 in/ min.
2. Sheared @ minimum 3.0 inch horizontal displacement.
3. The test specimens were sheared at saturated condition .
4. Test were performed in general accordance with ASTM D5321 using Brainard-Kilman LG-112 Direct Shear machine with effective test area of 12 in X 12 in.

TEST RESULTS:

Normal Stresses Applied		Moisture Content		Asperity Heights		PEAK STRENGTH		POST- PEAK STRENGTH AT 3.0 INCHES	
		Before	After	Before	After	Shear Stress	Secant Angle	Shear Stress	Secant Angle
(psi)	(psf)	(%)	(%)	(mils)	(mils)	(psf)	(degrees)	(psf)	(degrees)
0.69	100	8.8	19.5	22	21	96	44	89	42
1.39	200	8.8	16.7	22	20	149	37	145	36
2.08	300	8.8	15.7	22	19	206	34	195	33
Note: N/A - Not Applicable		COHESION (psf) :				40		37	
		COEFFICIENT OF FRICTION :				0.55		0.53	
		FRICTION ANGLE (degrees) :				28.8		27.9	

NOTE: The friction angles and cohesion results given here are based on mathematically determined best fit line.

OBSERVATIONS:

1. No tilting of the system or any abnormalities observed during and after the test.
2. Superficial abrasion on the geosynthetics interfacing sides (typical to all loads).
3. Sliding may have occurred within the soil substrate as soil film was retained on the surface of the HDPE.

Figure #1
Normal Stress/ Interface Stress

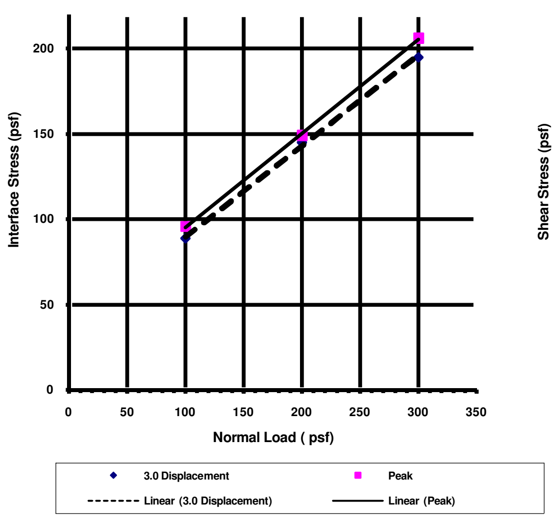
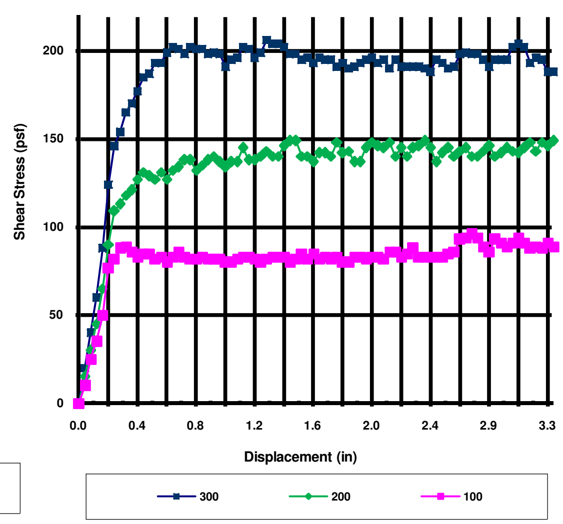


Figure #2
Shear Stress/ Displacement Curve

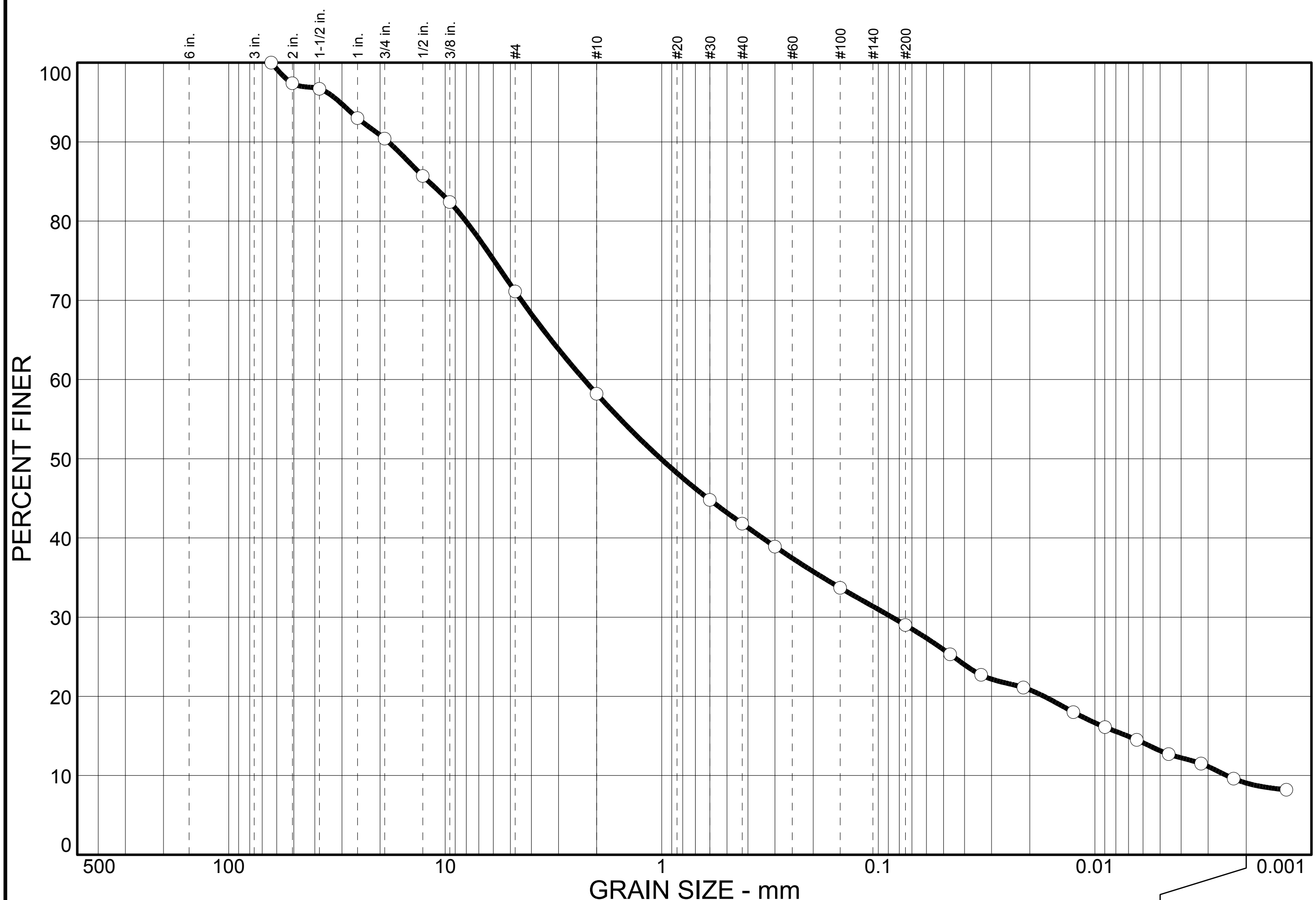


Precision Geosynthetic Laboratories

SOIL INDEX TESTS

(Cooper Testing Laboratory)

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	28.9	42.1	19.9	9.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2.5 in.	100.0		
2 in.	97.4		
1.5 in.	96.7		
1 in.	93.0		
3/4 in.	90.4		
1/2 in.	85.7		
3/8 in.	82.4		
#4	71.1		
#10	58.2		
#30	44.8		
#40	41.8		
#50	38.9		
#100	33.7		
#200	29.0		
0.0466 mm.	25.3		
0.0335 mm.	22.7		
0.0214 mm.	21.1		
0.0126 mm.	18.0		
0.0090 mm.	16.1		
0.0064 mm.	14.5		
0.0046 mm.	12.7		
0.0032 mm.	11.5		
0.0023 mm.	9.6		
0.0013 mm.	8.2		

* (no specification provided)

Soil Description

Brown Lean Clayey SAND w/ Gravel

Atterberg Limits

PL= 18.9 LL= 31.8 PI= 12.9

Coefficients

D_{85}= 11.9 D_{60}= 2.29 D_{50}= 1.01
D_{30}= 0.0866 D_{15}= 0.0071 D_{10}= 0.0025
C_u= 928.67 C_c= 1.33

Classification

USCS= SC AASHTO=

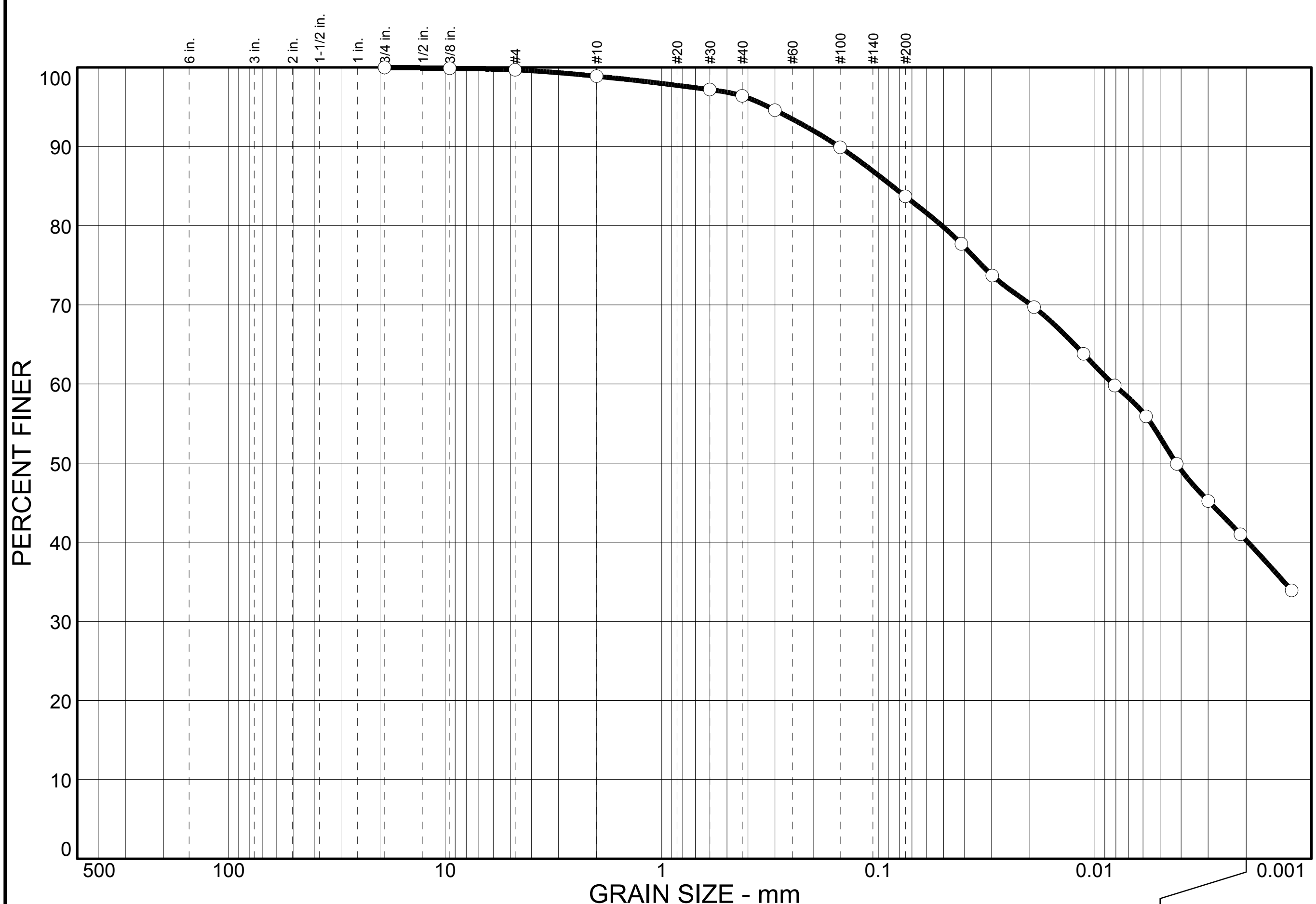
Remarks

Sample No.: 3-4-6 **Source of Sample:** On-Site **Date:**
Location: **Elev./Depth:**

COOPER TESTING LABORATORY

Client: SCS Engineers
Project: Sonoma Central Landfill - 01210155.00;T1
Project No: 363-027 **Figure**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.3	16.0	43.5	40.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
3/8 in.	99.9		
#4	99.7		
#10	98.9		
#30	97.2		
#40	96.4		
#50	94.6		
#100	89.9		
#200	83.7		
0.0413 mm.	77.7		
0.0297 mm.	73.7		
0.0191 mm.	69.7		
0.0113 mm.	63.8		
0.0081 mm.	59.8		
0.0058 mm.	55.9		
0.0042 mm.	49.9		
0.0030 mm.	45.2		
0.0021 mm.	41.0		
0.0012 mm.	33.9		

* (no specification provided)

Soil Description

Grayish Brown Fat CLAY w/ Sand

Atterberg Limits

PL= 20.4 LL= 52.5 PI= 32.1

Coefficients

D_{85}= 0.0863 D_{60}= 0.0082 D_{50}= 0.0042
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

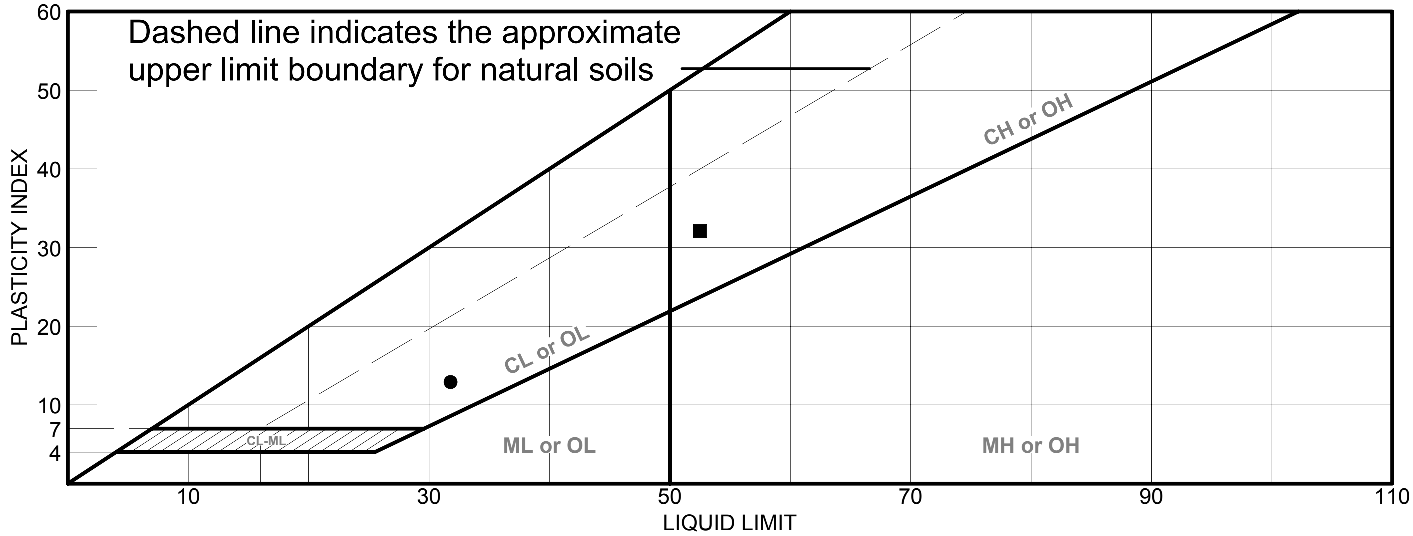
Sample No.: 2 **Source of Sample:** Stony Point Quarry Clay **Date:**
Location: **Elev./Depth:**

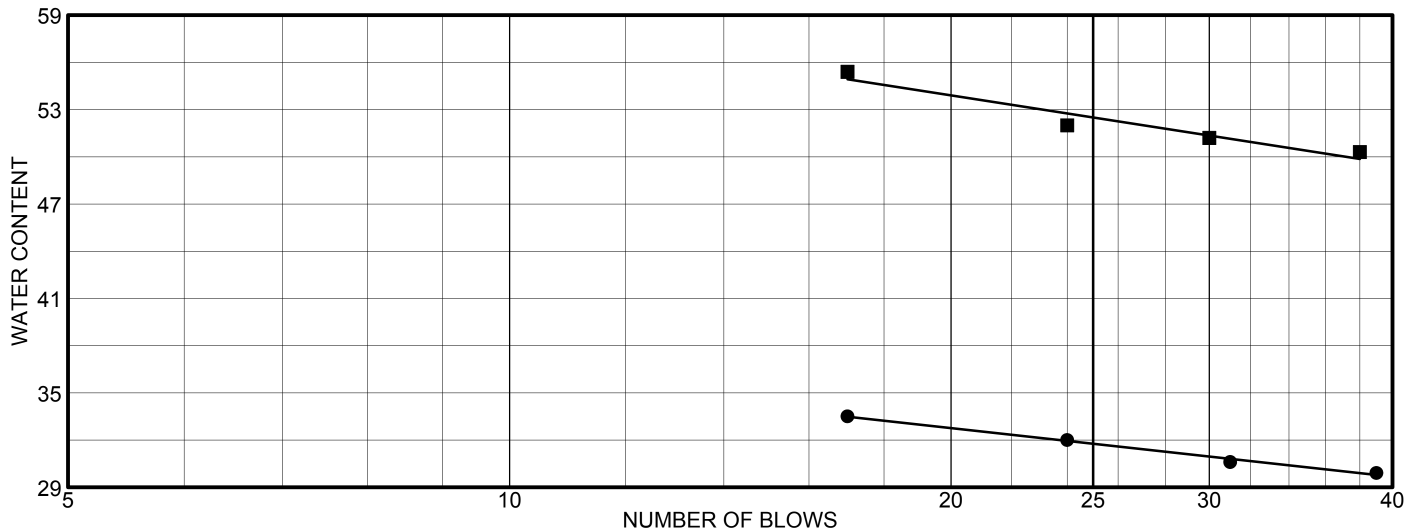
COOPER TESTING LABORATORY

Client: SCS Engineers
Project: Sonoma Central Landfill - 01210155.00;T1

Project No: 363-027 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Lean Clayey SAND w/ Gravel	31.8	18.9	12.9	41.8	29.0	SC
■	Grayish Brown Fat CLAY w/ Sand	52.5	20.4	32.1	96.4	83.7	CH

Project No. 363-027 **Client:** SCS Engineers

Project: Sonoma Central Landfill - 01210155.00;T1

● **Source:** On-Site **Sample No.:** 3-4-6

■ **Source:** Stony Point Quarry Clay **Sample No.:** 2

Remarks:

●

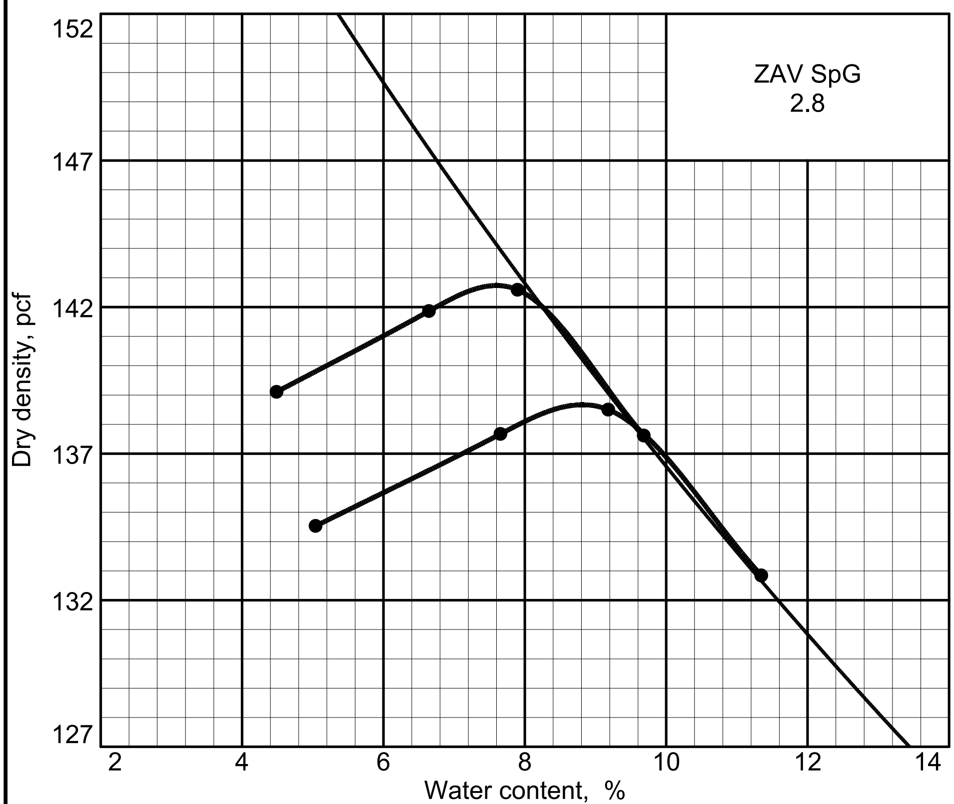
■

LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

COMPACTION TEST REPORT



Curve No.

Test Specification:
ASTM D 1557-00 Method B Modified
Oversize correction applied to each point

Hammer Wt.: 10 lb.
Hammer Drop: 18 in.
Number of Layers: five
Blows per Layer: 25
Mold Size: .03333 cu.ft.
Test Performed on Material Passing 3/8 in. **Sieve**

Soil Data

NM		**Sp.G.**	2.7
LL	31.8	**PI**	12.9
%>3/8 in.	17.6	**%<#200**	29.0
USCS	SC	**AASHTO**	

TESTING DATA

	1	2	3	4	5	6
WM + WS	9.46	9.35	9.36	9.13		
WM	4.42	4.42	4.42	4.42		
WW + T #1	812.10	704.10	729.70	715.70		
WD + T #1	760.30	652.80	691.60	690.90		
TARE #1	196.00	200.60	194.00	198.90		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	7.9	9.7	6.6	4.5		
DRY DENSITY	142.6	137.6	141.9	139.1		

ROCK CORRECTED TEST RESULTS	UNCORRECTED	Material Description
Maximum dry density = 142.7 pcf	138.7 pcf	Brown Lean Clayey SAND w/ Gravel
Optimum moisture = 7.6 %	8.8 %	

Project No. 363-027 **Client:** SCS Engineers
Project: Sonoma Central Landfill - 01210155.00;T1

● **Source:** On-Site **Sample No.:** 3-4-6

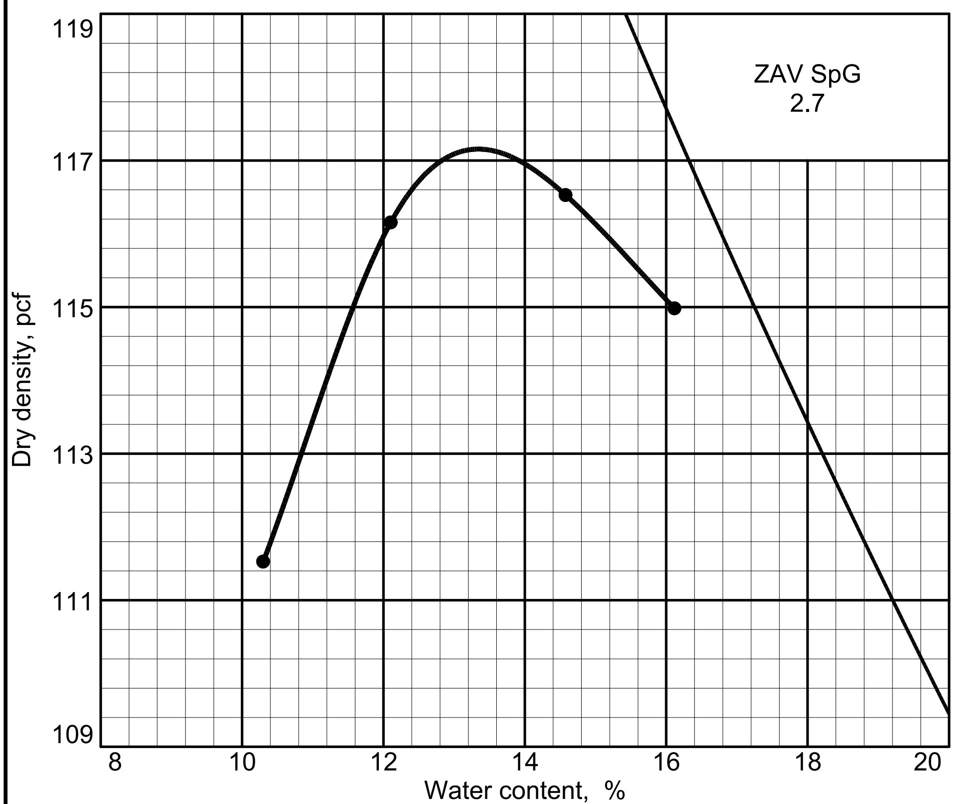
Remarks:

COMPACTION TEST REPORT

COOPER TESTING LABORATORY

Figure

COMPACTION TEST REPORT



Curve No.

Test Specification:
ASTM D 1557-00 Method A Modified

Hammer Wt.: 10 lb.
Hammer Drop: 18 in.
Number of Layers: five
Blows per Layer: 25
Mold Size: .03333 cu.ft.

Test Performed on Material Passing No.4 **Sieve**

Soil Data

NM ______ **Sp.G.** 2.7
LL 52.5 **PI** 32.1
%>No.4 ______ **%<#200** 83.7
USCS CH **AASHTO** ______

TESTING DATA

	1	2	3	4	5	6
WM + WS	8.87	8.87	8.76	8.52		
WM	4.42	4.42	4.42	4.42		
WW + T #1	773.30	525.50	662.60	660.70		
WD + T #1	693.60	482.60	612.70	617.70		
TARE #1	199.10	188.30	200.40	200.20		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	16.1	14.6	12.1	10.3		
DRY DENSITY	115.0	116.5	116.2	111.5		

TEST RESULTS	Material Description
Maximum dry density = 117.2 pcf Optimum moisture = 13.3 %	Grayish Brown Fat CLAY w/ Sand

Project No. 363-027 **Client:** SCS Engineers
Project: Sonoma Central Landfill - 01210155.00;T1

● **Source:** Stony Point Quarry Clay **Sample No.:** 2

Remarks:

COMPACTION TEST REPORT

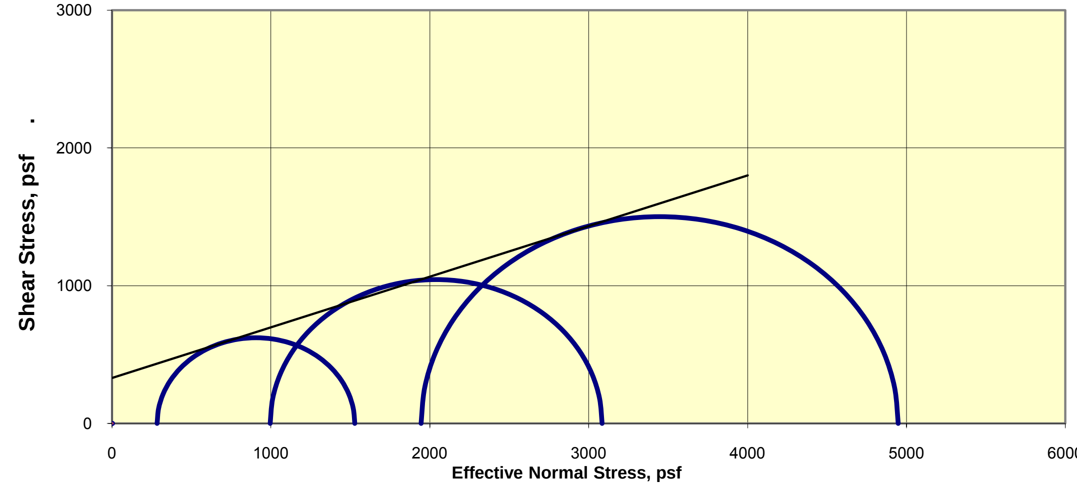
COOPER TESTING LABORATORY

Figure

Cooper Testing Labs, Inc.
937 Commercial Street
Palo Alto, CA 94303

COOPER TESTING LABORATORY

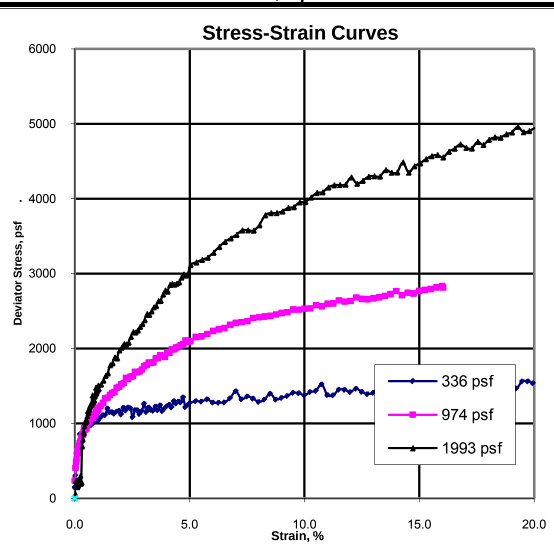
Triaxial Compression Test
Consolidated-Drained



Specimen Number	1	2	3	4
Moisture %	16.3%	16.0%	15.1%	
Dry Density pcf	104.9	105.3	106.1	
Void Ratio	0.600	0.595	0.582	
Saturation %	84.9%	83.8%	80.0%	
Height in	5.00	5.00	5.00	
Diameter in	2.38	2.38	2.38	
Final Sample Data				
Moisture %	32.7%	34.4%	25.6%	
Dry Density pcf	105.0	107.1	110.4	
Saturation %	100.0%	100.0%	100.0%	
Rate of Strain, %/Hour	0.60	0.60	0.60	
Stress Ratio, σ_1/σ_3	5.39	3.10	2.54	
Values Picked @ Strain, Є%	5.0	5.0	5.0	
Major Principal Stress, $\sigma_{1,\ psf}$	1528	3084	4948	
Minor Principal Stress, $\sigma_{3,\ psf}$	284	995	1945	

Remarks:

Remolding Target: 90% of 117.2 pcf @ 16.3% (opt. +3%) **The strength envelope appears to be non linear. A linear best fit may overstate the apparent cohesion. Engineering judgment is recommended.



Job No.:	363-027		**Date:**	1/31/2011
Client:	SCS Engineers		**Phi**	**20.2**
Project:	01210155.00;T1		**C, psf**	**330.0**
Sample #	**Boring**	**Sample**	**Depth**	**Remolded**
1	Stony Point Quarry Clay 2			90% rc
2	Stony Point Quarry Clay 2			90% rc
3	Stony Point Quarry Clay 2			905 rc
4				
5				
6				

Remarks: Values picked at 5% strain.

1	Grayish Brown Fat CLAY w/ Sand
2	Grayish Brown Fat CLAY w/ Sand
3	Grayish Brown Fat CLAY w/ Sand
4	
5	
6	

Sp. Gravity: **(Assumed),** **(Determined),** 2.69

ATTACHMENT B

GLOBAL SLOPE STABILITY ANALYSIS

ATTACHMENT B-1

PCSTABL5M GRAPHS & PRINTOUTS

SECTION 201

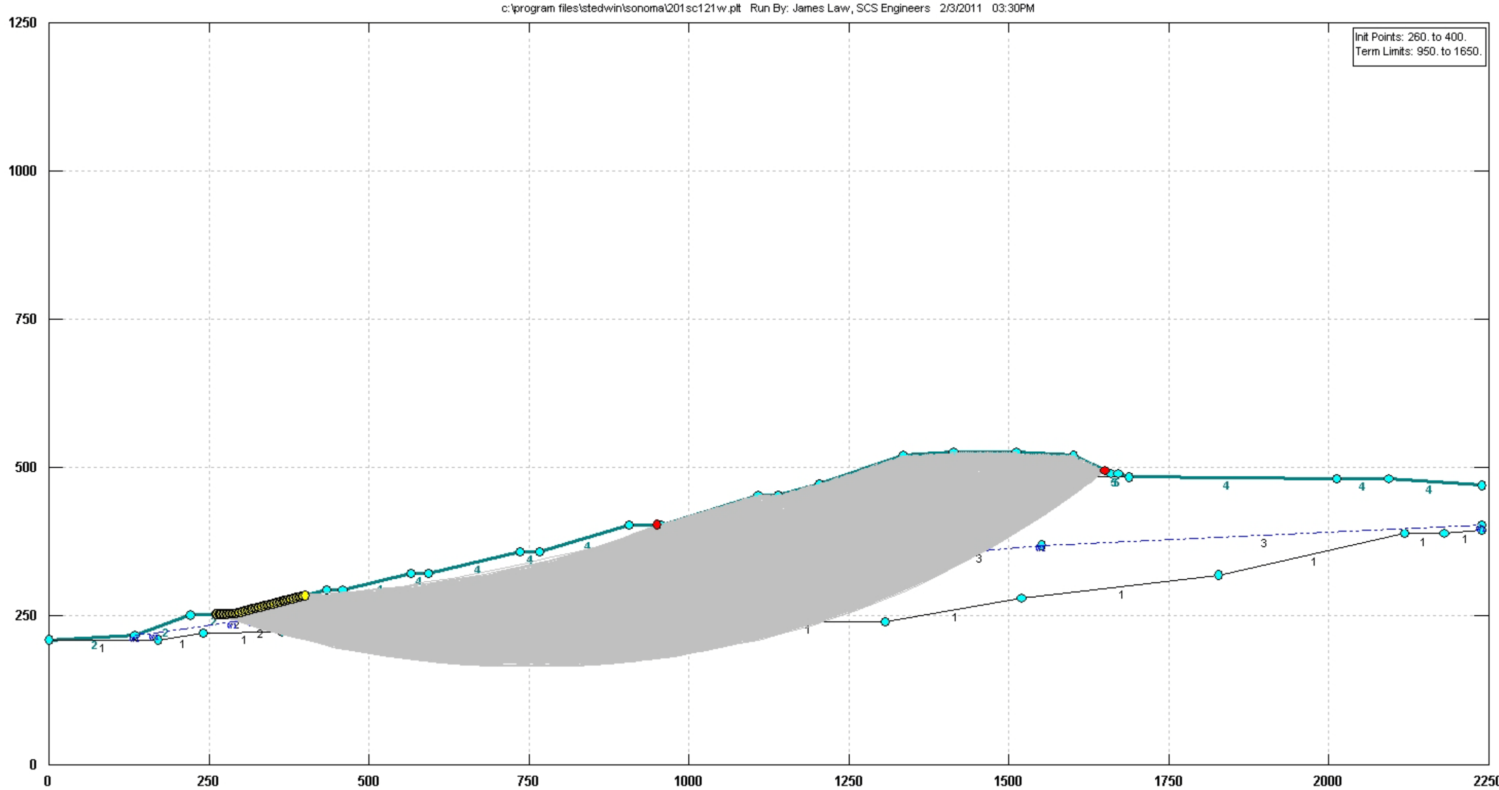
Circular Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 201, Global, circle, static, liquid

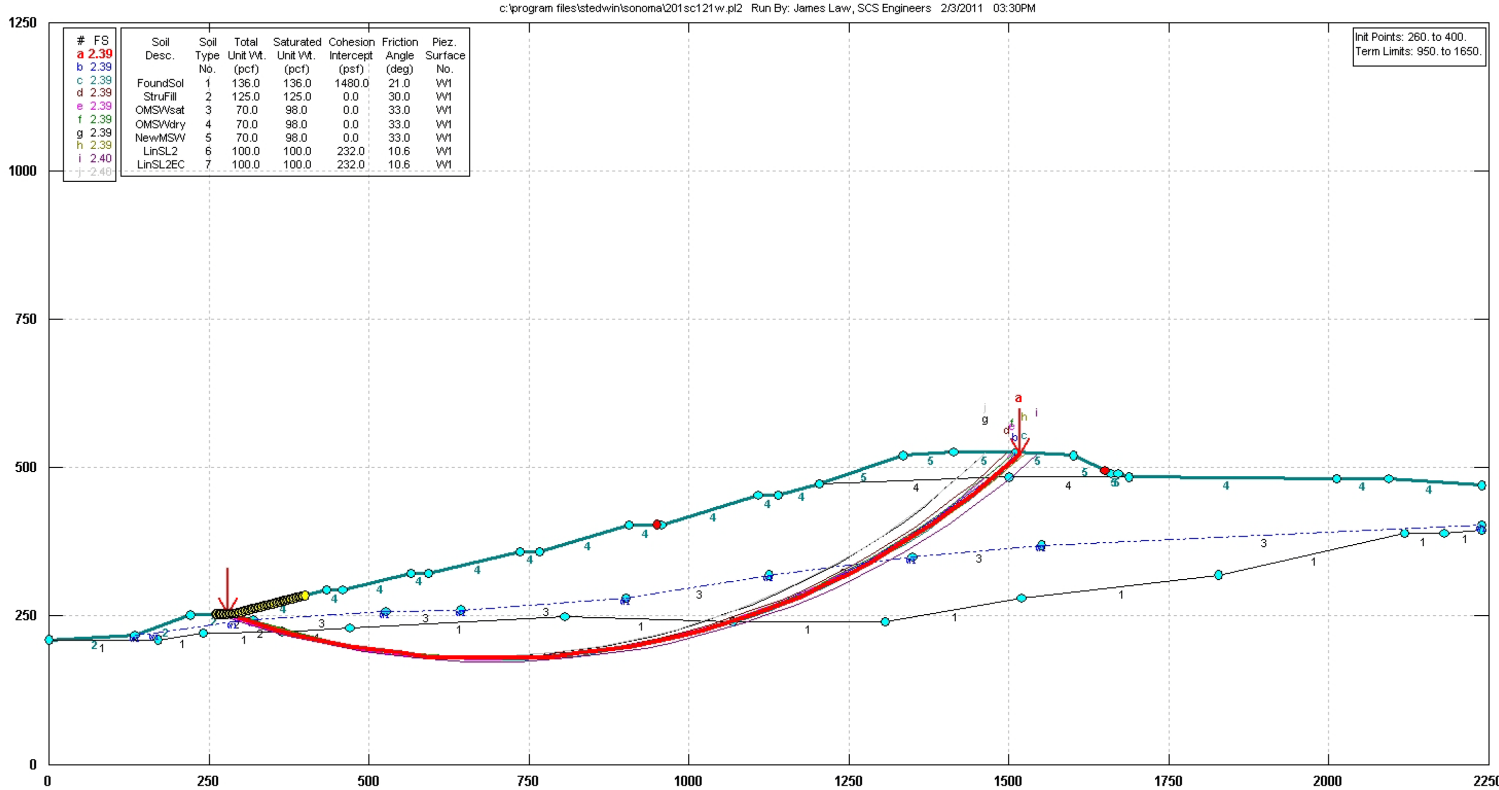
c:\program files\stedwin\sonoma\201sc121w.plt Run By: James Law, SCS Engineers 2/3/2011 03:30PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 201, Global, circle, static, liquid

c:\program files\stedwin\sonoma\201sc121w.pl2 Run By: James Law, SCS Engineers 2/3/2011 03:30PM



PCSTABL5M3 FSmin=2.39

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/3/2011
Time of Run:	03:30PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:201sc121w.in
Output Filename:	C:201sc121w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:201sc121w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 201,
Global, circle, static, liquid

BOUNDARY COORDINATES

24 Top Boundaries
47 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	211.00	134.00	218.00	2
2	134.00	218.00	220.00	252.00	2
3	220.00	252.00	289.00	254.00	2
4	289.00	254.00	433.00	294.00	4
5	433.00	294.00	458.00	294.00	4
6	458.00	294.00	565.00	322.00	4
7	565.00	322.00	594.00	322.00	4
8	594.00	322.00	736.00	357.00	4
9	736.00	357.00	768.00	357.00	4
10	768.00	357.00	908.00	404.00	4
11	908.00	404.00	956.00	404.00	4
12	956.00	404.00	1109.00	454.00	4
13	1109.00	454.00	1140.00	454.00	4
14	1140.00	454.00	1204.00	473.00	4
15	1204.00	473.00	1336.00	520.00	5
16	1336.00	520.00	1413.00	525.00	5
17	1413.00	525.00	1510.00	525.00	5
18	1510.00	525.00	1602.00	520.00	5
19	1602.00	520.00	1660.00	490.00	5
20	1660.00	490.00	1670.00	490.00	5
21	1670.00	490.00	1688.00	484.00	5
22	1688.00	484.00	2012.00	480.00	4
23	2012.00	480.00	2093.00	482.00	4
24	2093.00	482.00	2239.00	470.00	4
25	1204.00	473.00	1500.00	484.00	4
26	1500.00	484.00	1688.00	484.00	4

27	289.00	254.00	318.00	243.00	2
28	318.00	243.00	525.00	258.00	3
29	525.00	258.00	645.00	260.00	3
30	645.00	260.00	900.00	280.00	3
31	900.00	280.00	1125.00	320.00	3
32	1125.00	320.00	1350.00	350.00	3
33	1350.00	350.00	1550.00	370.00	3
34	1550.00	370.00	2239.00	403.00	3
35	318.00	243.00	363.00	225.00	2
36	0.00	210.00	172.00	211.00	1
37	172.00	211.00	240.00	220.00	1
38	240.00	220.00	363.00	225.00	1
39	363.00	225.00	469.00	230.00	1
40	469.00	230.00	806.00	249.00	1
41	806.00	249.00	1069.00	242.00	1
42	1069.00	242.00	1306.00	240.00	1
43	1306.00	240.00	1520.00	280.00	1
44	1520.00	280.00	1828.00	320.00	1
45	1828.00	320.00	2119.00	388.00	1
46	2119.00	388.00	2180.00	388.00	1
47	2180.00	388.00	2239.00	394.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	232.0	10.6	0.00	0.0	1
7	100.0	100.0	232.0	10.6	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 11 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	134.00	218.00
2	165.00	220.00
3	289.00	240.00
4	318.00	243.00
5	525.00	258.00
6	645.00	260.00

7	900.00	280.00
8	1125.00	320.00
9	1350.00	350.00
10	1550.00	370.00
11	2239.00	403.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 260.00 ft.
and X = 400.00 ft.

Each Surface Terminates Between   X = 950.00 ft.
and   X =1650.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -20.0 And   5.0 deg.

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 Bishop Method * *

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	278.98	253.71
2	316.60	240.12
3	354.67	227.83
4	393.14	216.87
5	431.96	207.25
6	471.10	198.97
7	510.50	192.05
8	550.11	186.50
9	589.89	182.32
10	629.79	179.52

11	669.77	178.10
12	709.77	178.06
13	749.74	179.41
14	789.65	182.14
15	829.44	186.24
16	869.06	191.72
17	908.47	198.57
18	947.62	206.77
19	986.46	216.32
20	1024.95	227.21
21	1063.04	239.43
22	1100.69	252.95
23	1137.84	267.77
24	1174.46	283.86
25	1210.50	301.21
26	1245.92	319.80
27	1280.68	339.59
28	1314.73	360.58
29	1348.04	382.74
30	1380.55	406.03
31	1412.25	430.43
32	1443.08	455.91
33	1473.01	482.45
34	1502.01	510.00
35	1516.40	524.65

Circle Center At X = 690.8 ; Y = 1334.6 and Radius, 1156.7

*** 2.387 ***

Individual data on the 63 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.0	2447.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	21.7	20919.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	5.9	9237.3	0.0	532.7	0.0	0.0	0.0	0.0	0.0
4	1.4	2407.6	0.0	276.7	0.0	0.0	0.0	0.0	0.0
5	36.7	98467.3	0.0	25372.1	0.0	0.0	0.0	0.0	0.0
6	4.3	16173.4	0.0	5233.1	0.0	0.0	0.0	0.0	0.0
7	5.4	21202.7	0.0	7058.4	0.0	0.0	0.0	0.0	0.0
8	28.8	143140.8	0.0	49198.1	0.0	0.0	0.0	0.0	0.0
9	38.8	270777.1	0.0	94084.9	0.0	0.0	0.0	0.0	0.0
10	1.0	8400.8	0.0	2911.0	0.0	0.0	0.0	0.0	0.0
11	25.0	213522.5	0.0	76106.5	0.0	0.0	0.0	0.0	0.0
12	11.0	101505.5	0.0	37063.3	0.0	0.0	0.0	0.0	0.0
13	2.1	20061.4	0.0	7317.8	0.0	0.0	0.0	0.0	0.0
14	39.4	414781.0	0.0	149395.3	0.0	0.0	0.0	0.0	0.0
15	14.5	170321.3	0.0	60562.7	0.0	0.0	0.0	0.0	0.0
16	25.1	315118.8	0.0	110649.9	0.0	0.0	0.0	0.0	0.0
17	14.9	198279.9	0.0	68035.8	0.0	0.0	0.0	0.0	0.0
18	24.9	343150.6	0.0	117490.6	0.0	0.0	0.0	0.0	0.0
19	4.1	57642.8	0.0	19781.8	0.0	0.0	0.0	0.0	0.0
20	35.8	521605.8	0.0	176112.0	0.0	0.0	0.0	0.0	0.0
21	15.2	232510.9	0.0	76553.0	0.0	0.0	0.0	0.0	0.0
22	24.8	391199.8	0.0	127079.8	0.0	0.0	0.0	0.0	0.0

23	40.0	662289.9	0.0	212581.5	0.0	0.0	0.0	0.0	0.0
24	26.2	451610.4	0.0	143051.9	0.0	0.0	0.0	0.0	0.0
25	13.7	239625.8	0.0	75705.2	0.0	0.0	0.0	0.0	0.0
26	18.3	317469.4	0.0	101201.5	0.0	0.0	0.0	0.0	0.0
27	21.7	379840.8	0.0	120282.8	0.0	0.0	0.0	0.0	0.0
28	16.3	291979.1	0.0	91010.7	0.0	0.0	0.0	0.0	0.0
29	23.4	424146.3	0.0	129748.9	0.0	0.0	0.0	0.0	0.0
30	39.6	726578.8	0.0	216583.9	0.0	0.0	0.0	0.0	0.0
31	30.9	571441.4	0.0	164831.4	0.0	0.0	0.0	0.0	0.0
32	8.0	147791.0	0.0	41370.8	0.0	0.0	0.0	0.0	0.0
33	0.5	8719.9	0.0	2440.0	0.0	0.0	0.0	0.0	0.0
34	39.1	704694.1	0.0	202318.4	0.0	0.0	0.0	0.0	0.0
35	8.4	145759.7	0.0	43160.2	0.0	0.0	0.0	0.0	0.0
36	30.5	523161.8	0.0	154376.0	0.0	0.0	0.0	0.0	0.0
37	38.5	648537.4	0.0	189309.4	0.0	0.0	0.0	0.0	0.0
38	38.1	621188.1	0.0	177647.1	0.0	0.0	0.0	0.0	0.0
39	6.0	94870.0	0.0	26844.1	0.0	0.0	0.0	0.0	0.0
40	1.2	18658.0	0.0	5255.6	0.0	0.0	0.0	0.0	0.0
41	30.5	479727.0	0.0	130463.4	0.0	0.0	0.0	0.0	0.0
42	8.3	129401.9	0.0	33988.2	0.0	0.0	0.0	0.0	0.0
43	16.0	243969.5	0.0	62574.2	0.0	0.0	0.0	0.0	0.0
44	12.8	189541.8	0.0	47588.0	0.0	0.0	0.0	0.0	0.0
45	2.2	31278.3	0.0	7818.7	0.0	0.0	0.0	0.0	0.0
46	34.5	486952.2	0.0	111781.6	0.0	0.0	0.0	0.0	0.0
47	29.5	398137.2	0.0	76231.3	0.0	0.0	0.0	0.0	0.0
48	6.5	85092.1	0.0	13982.4	0.0	0.0	0.0	0.0	0.0
49	35.4	447137.5	0.0	57546.1	0.0	0.0	0.0	0.0	0.0
50	34.8	408459.4	0.0	21636.5	0.0	0.0	0.0	0.0	0.0
51	2.4	27059.4	0.0	101.6	0.0	0.0	0.0	0.0	0.0
52	31.6	345473.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	21.3	221180.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	12.0	119343.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	32.5	290130.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
56	31.7	234490.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57	0.8	4953.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	30.1	171648.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
59	29.9	116954.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.6	1779.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	28.4	56628.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
62	8.0	6113.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	6.4	1536.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	281.36	253.78
2	319.02	240.30
3	357.12	228.14
4	395.63	217.31
5	434.49	207.82
6	473.65	199.68
7	513.07	192.91
8	552.71	187.51
9	592.51	183.49
10	632.42	180.85
11	672.40	179.59
12	712.40	179.73
13	752.37	181.25
14	792.26	184.16
15	832.03	188.45

16	871.63	194.11
17	911.01	201.15
18	950.11	209.55
19	988.91	219.29
20	1027.34	230.38
21	1065.37	242.80
22	1102.94	256.53
23	1140.01	271.55
24	1176.54	287.85
25	1212.48	305.40
26	1247.79	324.20
27	1282.43	344.20
28	1316.35	365.40
29	1349.52	387.76
30	1381.89	411.25
31	1413.42	435.86
32	1444.09	461.54
33	1473.84	488.28
34	1502.65	516.02
35	1511.28	524.93

Circle Center At X = 688.5 ; Y = 1332.4 and Radius, 1153.0

*** 2.390 ***

1

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	269.49	253.43
2	307.09	239.80
3	345.14	227.44
4	383.58	216.39
5	422.38	206.65
6	461.48	198.23
7	500.85	191.15
8	540.44	185.41
9	580.20	181.03
10	620.08	177.99
11	660.05	176.31
12	700.04	175.99
13	740.03	177.03
14	779.96	179.43
15	819.78	183.19
16	859.45	188.30
17	898.93	194.75
18	938.16	202.54
19	977.11	211.66
20	1015.72	222.10
21	1053.96	233.85
22	1091.78	246.89
23	1129.13	261.21
24	1165.97	276.78
25	1202.26	293.61
26	1237.96	311.65
27	1273.02	330.90

28	1307.41	351.33
29	1341.08	372.92
30	1374.01	395.64
31	1406.14	419.46
32	1437.44	444.37
33	1467.88	470.32
34	1497.41	497.29
35	1524.93	524.19

Circle Center At X = 689.4 ; Y = 1352.5 and Radius, 1176.5

*** 2.390 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	286.10	253.92
2	323.75	240.39
3	361.85	228.21
4	400.35	217.39
5	439.22	207.94
6	478.40	199.88
7	517.84	193.22
8	557.50	187.96
9	597.31	184.12
10	637.24	181.69
11	677.23	180.68
12	717.22	181.09
13	757.18	182.92
14	797.05	186.17
15	836.78	190.83
16	876.31	196.91
17	915.61	204.38
18	954.61	213.24
19	993.28	223.49
20	1031.56	235.10
21	1069.40	248.06
22	1106.76	262.36
23	1143.58	277.97
24	1179.83	294.89
25	1215.46	313.08
26	1250.41	332.52
27	1284.65	353.19
28	1318.14	375.07
29	1350.83	398.12
30	1382.68	422.32
31	1413.65	447.64
32	1443.70	474.04
33	1472.80	501.49
34	1496.01	525.00

Circle Center At X = 685.6 ; Y = 1306.3 and Radius, 1125.7

*** 2.390 ***

1

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	267.12	253.37
2	304.74	239.77
3	342.80	227.47
4	381.27	216.50
5	420.09	206.87
6	459.22	198.58
7	498.62	191.65
8	538.23	186.08
9	578.01	181.88
10	617.91	179.06
11	657.88	177.62
12	697.88	177.56
13	737.86	178.89
14	777.77	181.59
15	817.56	185.67
16	857.18	191.12
17	896.60	197.94
18	935.76	206.11
19	974.61	215.63
20	1013.10	226.49
21	1051.20	238.67
22	1088.86	252.16
23	1126.03	266.94
24	1162.66	283.00
25	1198.72	300.31
26	1234.16	318.86
27	1268.94	338.62
28	1303.02	359.57
29	1336.35	381.69
30	1368.89	404.94
31	1400.62	429.30
32	1431.48	454.75
33	1461.45	481.24
34	1490.49	508.75
35	1506.48	525.00

Circle Center At X = 679.6 ; Y = 1335.4 and Radius, 1158.0

*** 2.391 ***

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.48	253.98
2	326.11	240.43
3	364.20	228.21

4	402.69	217.34
5	441.54	207.83
6	480.71	199.71
7	520.14	192.97
8	559.78	187.62
9	599.58	183.68
10	639.50	181.14
11	679.49	180.02
12	719.49	180.30
13	759.45	182.00
14	799.33	185.11
15	839.08	189.62
16	878.64	195.53
17	917.96	202.83
18	957.01	211.52
19	995.72	221.58
20	1034.06	233.00
21	1071.97	245.76
22	1109.40	259.85
23	1146.32	275.26
24	1182.67	291.96
25	1218.40	309.93
26	1253.48	329.15
27	1287.86	349.60
28	1321.50	371.24
29	1354.35	394.06
30	1386.37	418.03
31	1417.53	443.11
32	1447.79	469.27
33	1477.10	496.49
34	1505.44	524.72
35	1505.70	525.00

Circle Center At X = 691.4 ; Y = 1313.4 and Radius, 1133.4

*** 2.391 ***

1

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.61	253.64
2	314.20	239.96
3	352.27	227.68
4	390.76	216.79
5	429.62	207.33
6	468.81	199.30
7	508.26	192.71
8	547.93	187.57
9	587.76	183.90
10	627.70	181.68
11	667.69	180.93
12	707.69	181.65
13	747.63	183.84
14	787.46	187.49
15	827.13	192.60

16	866.59	199.16
17	905.78	207.17
18	944.65	216.60
19	983.15	227.46
20	1021.22	239.72
21	1058.82	253.37
22	1095.90	268.39
23	1132.39	284.76
24	1168.26	302.46
25	1203.46	321.46
26	1237.94	341.74
27	1271.65	363.27
28	1304.55	386.03
29	1336.59	409.97
30	1367.73	435.08
31	1397.93	461.31
32	1427.14	488.63
33	1455.34	517.00
34	1462.72	525.00

Circle Center At X = 668.0 ; Y = 1270.6 and Radius, 1089.7

*** 2.392 ***

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	283.73	253.85
2	321.43	240.47
3	359.56	228.38
4	398.08	217.61
5	436.94	208.15
6	476.11	200.03
7	515.53	193.24
8	555.16	187.81
9	594.95	183.73
10	634.86	181.01
11	674.84	179.66
12	714.84	179.66
13	754.81	181.04
14	794.72	183.77
15	834.51	187.87
16	874.14	193.32
17	913.55	200.12
18	952.72	208.26
19	991.58	217.74
20	1030.09	228.53
21	1068.22	240.63
22	1105.91	254.03
23	1143.12	268.70
24	1179.81	284.63
25	1215.94	301.81
26	1251.45	320.21
27	1286.32	339.81
28	1320.50	360.59
29	1353.95	382.52

30	1386.64	405.58
31	1418.51	429.74
32	1449.55	454.98
33	1479.70	481.26
34	1508.94	508.55
35	1524.61	524.21

Circle Center At X = 694.6 ; Y = 1351.7 and Radius, 1172.2

*** 2.393 ***

1

Failure Surface Specified By 36 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	262.37	253.23
2	299.97	239.58
3	338.00	227.19
4	376.42	216.05
5	415.19	206.19
6	454.26	197.62
7	493.59	190.34
8	533.14	184.36
9	572.87	179.69
10	612.73	176.34
11	652.68	174.30
12	692.67	173.58
13	732.67	174.19
14	772.62	176.11
15	812.49	179.35
16	852.23	183.91
17	891.80	189.77
18	931.15	196.94
19	970.24	205.40
20	1009.04	215.15
21	1047.49	226.17
22	1085.55	238.46
23	1123.19	252.00
24	1160.36	266.77
25	1197.03	282.76
26	1233.14	299.96
27	1268.67	318.33
28	1303.58	337.87
29	1337.82	358.55
30	1371.35	380.35
31	1404.15	403.25
32	1436.18	427.21
33	1467.40	452.22
34	1497.77	478.25
35	1527.27	505.26
36	1545.47	523.07

Circle Center At X = 694.4 ; Y = 1384.6 and Radius, 1211.1

*** 2.395 ***

Failure Surface Specified By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.86	253.50
2	309.50	239.97
3	347.61	227.80
4	386.13	217.03
5	425.02	207.67
6	464.22	199.72
7	503.69	193.19
8	543.36	188.11
9	583.20	184.46
10	623.14	182.27
11	663.13	181.52
12	703.12	182.23
13	743.07	184.39
14	782.90	187.99
15	822.58	193.04
16	862.05	199.52
17	901.26	207.43
18	940.16	216.76
19	978.69	227.50
20	1016.81	239.62
21	1054.46	253.12
22	1091.60	267.98
23	1128.18	284.18
24	1164.14	301.69
25	1199.44	320.49
26	1234.04	340.57
27	1267.89	361.88
28	1300.94	384.41
29	1333.16	408.12
30	1364.49	432.99
31	1394.90	458.98
32	1424.34	486.05
33	1452.78	514.17
34	1462.97	525.00

Circle Center At X = 663.6 ; Y = 1283.3 and Radius, 1101.8

*** 2.396 ***

SECTION 201

Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 201, Global, circle, seismic=0.24g, liquid

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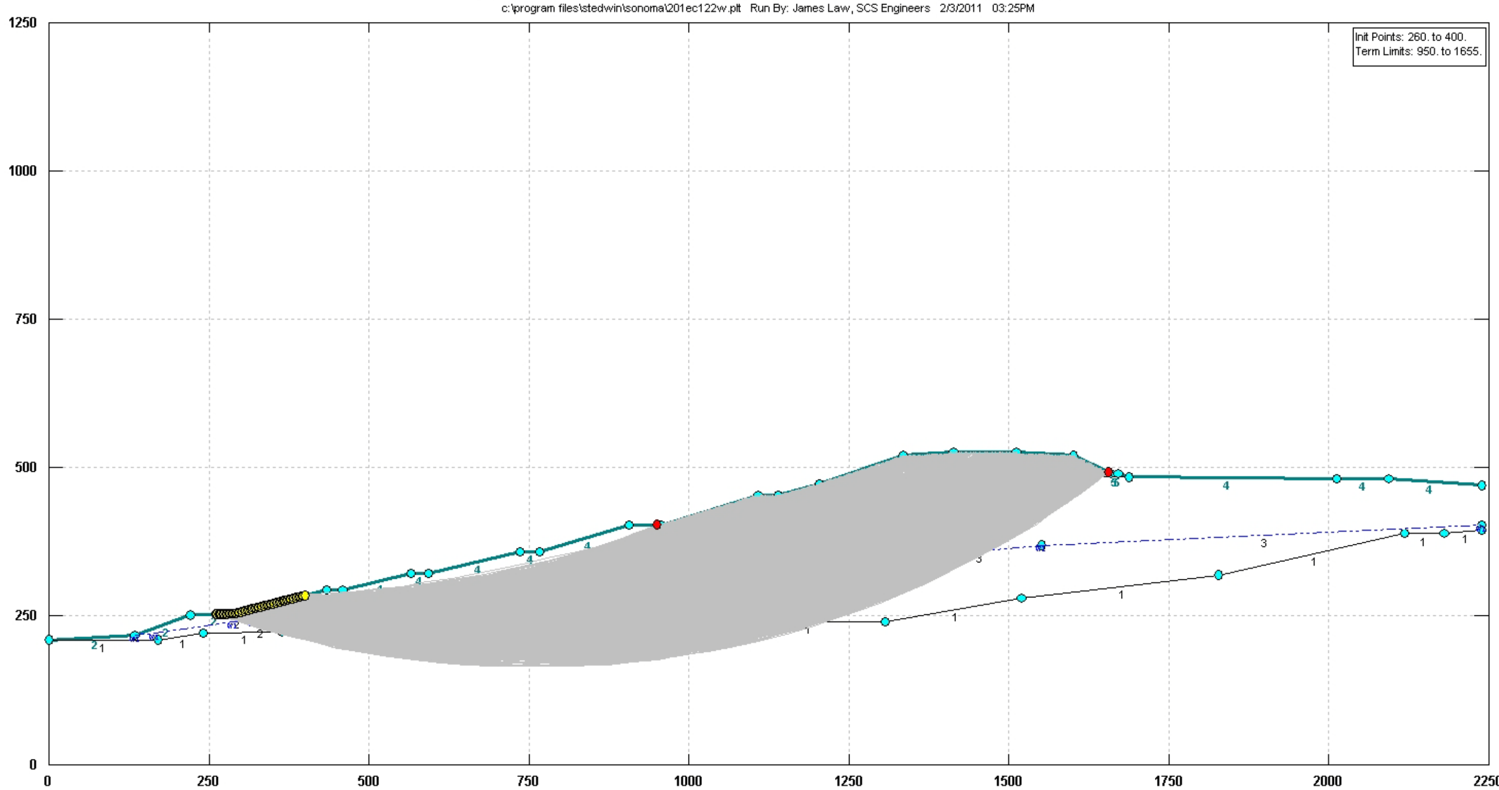
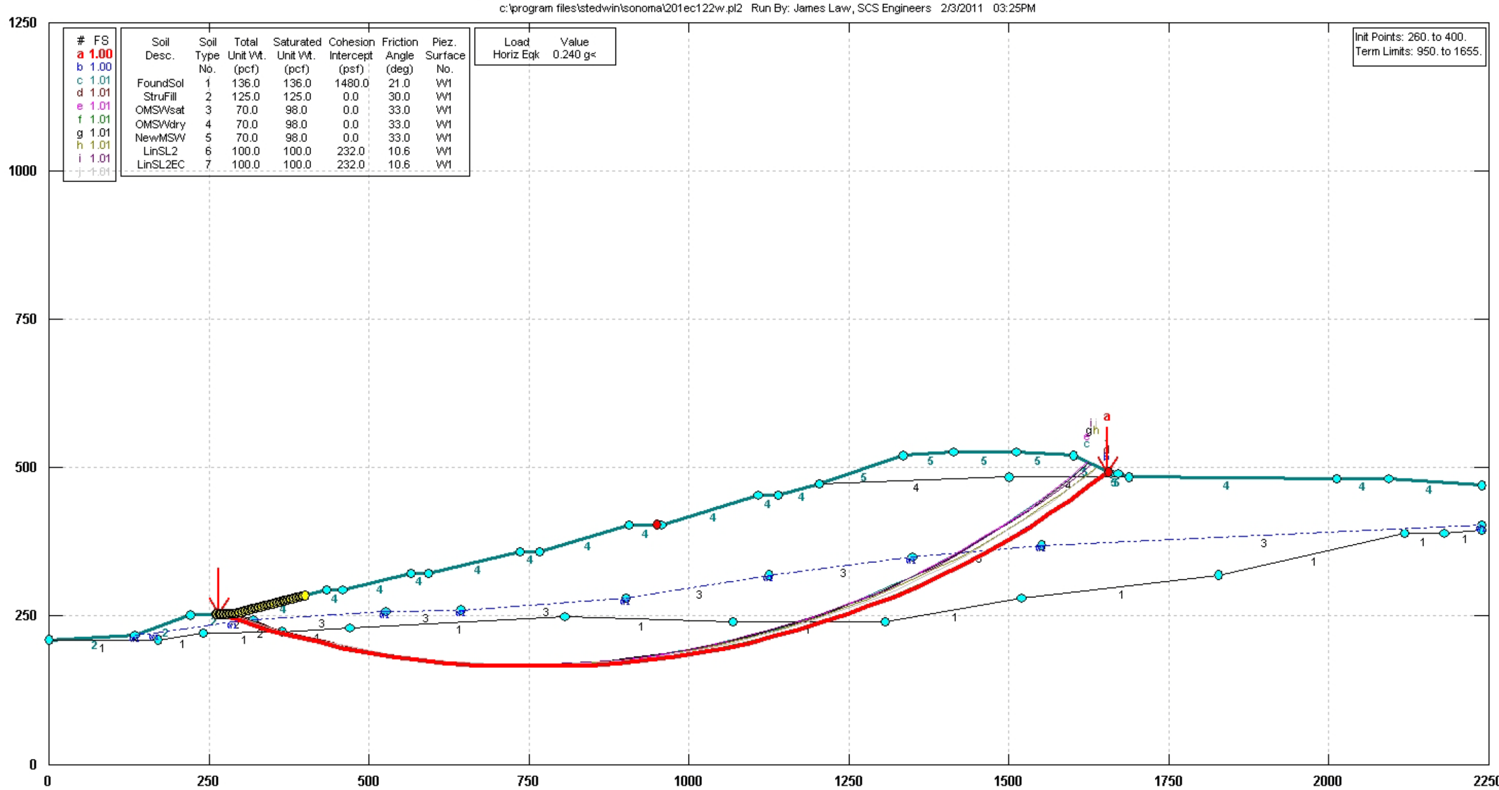


SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 201, Global, circle, seismic=0.24g, liquid

c:\program files\stedwin\sonoma\201ec122w.pl2 Run By: James Law, SCS Engineers 2/3/2011 03:25PM



PCSTABL5M3 FSmin=1.00

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/3/2011
Time of Run:	03:25PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:201ec122w.in
Output Filename:	C:201ec122w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:201ec122w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 201,
Global, circle, seismic=0.24g, liquid

BOUNDARY COORDINATES

24 Top Boundaries
47 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	211.00	134.00	218.00	2
2	134.00	218.00	220.00	252.00	2
3	220.00	252.00	289.00	254.00	2
4	289.00	254.00	433.00	294.00	4
5	433.00	294.00	458.00	294.00	4
6	458.00	294.00	565.00	322.00	4
7	565.00	322.00	594.00	322.00	4
8	594.00	322.00	736.00	357.00	4
9	736.00	357.00	768.00	357.00	4
10	768.00	357.00	908.00	404.00	4
11	908.00	404.00	956.00	404.00	4
12	956.00	404.00	1109.00	454.00	4
13	1109.00	454.00	1140.00	454.00	4
14	1140.00	454.00	1204.00	473.00	4
15	1204.00	473.00	1336.00	520.00	5
16	1336.00	520.00	1413.00	525.00	5
17	1413.00	525.00	1510.00	525.00	5
18	1510.00	525.00	1602.00	520.00	5
19	1602.00	520.00	1660.00	490.00	5
20	1660.00	490.00	1670.00	490.00	5
21	1670.00	490.00	1688.00	484.00	5
22	1688.00	484.00	2012.00	480.00	4
23	2012.00	480.00	2093.00	482.00	4
24	2093.00	482.00	2239.00	470.00	4
25	1204.00	473.00	1500.00	484.00	4
26	1500.00	484.00	1688.00	484.00	4

27	289.00	254.00	318.00	243.00	2
28	318.00	243.00	525.00	258.00	3
29	525.00	258.00	645.00	260.00	3
30	645.00	260.00	900.00	280.00	3
31	900.00	280.00	1125.00	320.00	3
32	1125.00	320.00	1350.00	350.00	3
33	1350.00	350.00	1550.00	370.00	3
34	1550.00	370.00	2239.00	403.00	3
35	318.00	243.00	363.00	225.00	2
36	0.00	210.00	172.00	211.00	1
37	172.00	211.00	240.00	220.00	1
38	240.00	220.00	363.00	225.00	1
39	363.00	225.00	469.00	230.00	1
40	469.00	230.00	806.00	249.00	1
41	806.00	249.00	1069.00	242.00	1
42	1069.00	242.00	1306.00	240.00	1
43	1306.00	240.00	1520.00	280.00	1
44	1520.00	280.00	1828.00	320.00	1
45	1828.00	320.00	2119.00	388.00	1
46	2119.00	388.00	2180.00	388.00	1
47	2180.00	388.00	2239.00	394.00	1

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ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	232.0	10.6	0.00	0.0	1
7	100.0	100.0	232.0	10.6	0.00	0.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 11 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	134.00	218.00
2	165.00	220.00
3	289.00	240.00
4	318.00	243.00
5	525.00	258.00
6	645.00	260.00

7	900.00	280.00
8	1125.00	320.00
9	1350.00	350.00
10	1550.00	370.00
11	2239.00	403.00

A Horizontal Earthquake Loading Coefficient
Of0.240 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 260.00 ft.
and X = 400.00 ft.

Each Surface Terminates Between X = 950.00 ft.
and X =1655.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -20.0
And 5.0 deg.

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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 Bishop Method * *

Failure Surface Specified By 38 Coordinate Points

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

1	267.12	253.37
2	304.76	239.82
3	342.77	227.37
4	381.12	216.01
5	419.79	205.76
6	458.73	196.63
7	497.92	188.62
8	537.32	181.74
9	576.91	175.99
10	616.64	171.38
11	656.49	167.92
12	696.43	165.60
13	736.41	164.43
14	776.41	164.42
15	816.39	165.55
16	856.33	167.83
17	896.18	171.25
18	935.92	175.82
19	975.51	181.53
20	1014.92	188.38
21	1054.12	196.35
22	1093.07	205.45
23	1131.74	215.66
24	1170.11	226.98
25	1208.13	239.40
26	1245.78	252.91
27	1283.03	267.49
28	1319.84	283.14
29	1356.19	299.84
30	1392.04	317.57
31	1427.37	336.33
32	1462.14	356.10
33	1496.34	376.86
34	1529.92	398.59
35	1562.86	421.27
36	1595.14	444.90
37	1626.73	469.44
38	1654.88	492.65

Circle Center At X = 757.0 ; Y = 1555.9 and Radius, 1391.6

*** 1.004 ***

Individual data on the 69 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	21.9	11632.9	0.0	0.0	0.0	0.0	2791.9	0.0	0.0
2	11.9	15673.3	0.0	0.0	0.0	0.0	3761.6	0.0	0.0
3	3.9	6488.6	0.0	232.1	0.0	0.0	1557.3	0.0	0.0
4	13.2	26635.9	0.0	4030.6	0.0	0.0	6392.6	0.0	0.0
5	24.8	72119.0	0.0	20227.5	0.0	0.0	17308.6	0.0	0.0
6	9.5	35808.3	0.0	11798.8	0.0	0.0	8594.0	0.0	0.0
7	10.7	45991.6	0.0	15977.4	0.0	0.0	11038.0	0.0	0.0
8	18.1	92974.7	0.0	33196.8	0.0	0.0	22313.9	0.0	0.0
9	38.7	264926.0	0.0	94814.1	0.0	0.0	63582.2	0.0	0.0

10	13.2	110487.8	0.0	39392.6	0.0	0.0	26517.1	0.0	0.0
11	25.0	229325.2	0.0	83912.4	0.0	0.0	55038.0	0.0	0.0
12	0.7	7043.9	0.0	2637.4	0.0	0.0	1690.5	0.0	0.0
13	10.3	101819.8	0.0	37829.3	0.0	0.0	24436.8	0.0	0.0
14	28.9	315181.7	0.0	116502.7	0.0	0.0	75643.6	0.0	0.0
15	27.1	331756.7	0.0	121070.5	0.0	0.0	79621.6	0.0	0.0
16	12.3	162149.2	0.0	58766.7	0.0	0.0	38915.8	0.0	0.0
17	27.7	387342.9	0.0	137335.3	0.0	0.0	92962.3	0.0	0.0
18	11.9	174957.3	0.0	61499.1	0.0	0.0	41989.8	0.0	0.0
19	17.1	256052.5	0.0	90182.3	0.0	0.0	61452.6	0.0	0.0
20	22.6	351911.5	0.0	123221.5	0.0	0.0	84458.8	0.0	0.0
21	28.4	464906.8	0.0	159146.3	0.0	0.0	*******	0.0	0.0
22	11.5	195695.9	0.0	66044.9	0.0	0.0	46967.0	0.0	0.0
23	39.9	711146.7	0.0	238152.6	0.0	0.0	*******	0.0	0.0
24	39.6	748067.1	0.0	247677.1	0.0	0.0	*******	0.0	0.0
25	0.4	7923.2	0.0	2609.4	0.0	0.0	1901.6	0.0	0.0
26	31.6	615444.9	0.0	204353.8	0.0	0.0	*******	0.0	0.0
27	8.4	165371.4	0.0	55214.5	0.0	0.0	39689.1	0.0	0.0
28	29.6	595980.6	0.0	196376.6	0.0	0.0	*******	0.0	0.0
29	10.4	214113.2	0.0	69613.0	0.0	0.0	51387.2	0.0	0.0
30	39.9	840605.9	0.0	269545.4	0.0	0.0	*******	0.0	0.0
31	39.9	862664.0	0.0	270233.0	0.0	0.0	*******	0.0	0.0
32	3.8	83738.1	0.0	25923.1	0.0	0.0	20097.2	0.0	0.0
33	8.0	175597.1	0.0	53714.5	0.0	0.0	42143.3	0.0	0.0
34	27.9	609555.1	0.0	189399.4	0.0	0.0	*******	0.0	0.0
35	20.1	432015.1	0.0	138255.9	0.0	0.0	*******	0.0	0.0
36	19.5	417994.2	0.0	135115.8	0.0	0.0	*******	0.0	0.0
37	39.4	849669.2	0.0	275201.6	0.0	0.0	*******	0.0	0.0
38	39.2	846935.9	0.0	274162.7	0.0	0.0	*******	0.0	0.0
39	14.9	320828.8	0.0	103901.9	0.0	0.0	76998.9	0.0	0.0
40	24.1	516663.5	0.0	166352.7	0.0	0.0	*******	0.0	0.0
41	15.9	340173.7	0.0	109542.5	0.0	0.0	81641.7	0.0	0.0
42	16.0	336546.7	0.0	108602.8	0.0	0.0	80771.2	0.0	0.0
43	6.7	139506.0	0.0	45575.2	0.0	0.0	33481.4	0.0	0.0
44	8.3	168756.7	0.0	55695.0	0.0	0.0	40501.6	0.0	0.0
45	30.1	603405.6	0.0	197001.3	0.0	0.0	*******	0.0	0.0
46	33.9	659633.6	0.0	211187.0	0.0	0.0	*******	0.0	0.0
47	4.1	78813.5	0.0	24741.3	0.0	0.0	18915.2	0.0	0.0
48	3.9	73688.2	0.0	23237.6	0.0	0.0	17685.2	0.0	0.0
49	33.8	637193.1	0.0	193101.5	0.0	0.0	*******	0.0	0.0
50	37.2	691946.9	0.0	193944.8	0.0	0.0	*******	0.0	0.0
51	36.8	668504.6	0.0	168764.0	0.0	0.0	*******	0.0	0.0
52	16.2	287486.9	0.0	66226.6	0.0	0.0	68996.9	0.0	0.0
53	14.0	243626.8	0.0	52688.9	0.0	0.0	58470.4	0.0	0.0
54	6.2	105409.1	0.0	21942.1	0.0	0.0	25298.2	0.0	0.0
55	35.9	580161.8	0.0	108552.4	0.0	0.0	*******	0.0	0.0
56	21.0	313914.4	0.0	47319.9	0.0	0.0	75339.5	0.0	0.0
57	14.4	203424.0	0.0	24752.2	0.0	0.0	48821.8	0.0	0.0
58	34.8	448056.2	0.0	32936.3	0.0	0.0	*******	0.0	0.0
59	10.1	117862.7	0.0	1875.3	0.0	0.0	28287.0	0.0	0.0
60	24.1	262279.2	0.0	0.0	0.0	0.0	62947.0	0.0	0.0
61	3.7	37681.6	0.0	0.0	0.0	0.0	9043.6	0.0	0.0
62	10.0	99777.3	0.0	0.0	0.0	0.0	23946.6	0.0	0.0
63	19.9	184493.4	0.0	0.0	0.0	0.0	44278.4	0.0	0.0
64	32.9	260795.3	0.0	0.0	0.0	0.0	62590.9	0.0	0.0
65	32.3	199201.6	0.0	0.0	0.0	0.0	47808.4	0.0	0.0
66	6.9	34871.4	0.0	0.0	0.0	0.0	8369.1	0.0	0.0
67	24.7	93066.8	0.0	0.0	0.0	0.0	22336.0	0.0	0.0
68	17.7	32052.1	0.0	0.0	0.0	0.0	7692.5	0.0	0.0
69	10.5	5168.2	0.0	0.0	0.0	0.0	1240.4	0.0	0.0

Failure Surface Specified By 39 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	262.37	253.23
2	300.03	239.74
3	338.06	227.34
4	376.42	216.02
5	415.10	205.80
6	454.05	196.70
7	493.24	188.70
8	532.65	181.83
9	572.23	176.09
10	611.96	171.48
11	651.81	168.00
12	691.75	165.66
13	731.73	164.47
14	771.73	164.41
15	811.71	165.50
16	851.65	167.73
17	891.51	171.09
18	931.25	175.60
19	970.86	181.23
20	1010.28	188.00
21	1049.49	195.88
22	1088.47	204.88
23	1127.17	214.99
24	1165.57	226.20
25	1203.63	238.51
26	1241.32	251.89
27	1278.62	266.34
28	1315.49	281.86
29	1351.90	298.41
30	1387.83	316.01
31	1423.23	334.61
32	1458.10	354.23
33	1492.38	374.82
34	1526.07	396.39
35	1559.13	418.92
36	1591.53	442.37
37	1623.25	466.74
38	1654.26	492.01
39	1654.95	492.61

Circle Center At X = 753.6 ; Y = 1565.7 and Radius, 1401.4

*** 1.004 ***

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Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	269.49	253.43
2	307.09	239.79
3	345.09	227.29
4	383.45	215.94

5	422.13	205.77
6	461.10	196.76
7	500.33	188.95
8	539.78	182.32
9	579.41	176.89
10	619.19	172.66
11	659.07	169.64
12	699.03	167.83
13	739.03	167.23
14	779.02	167.84
15	818.98	169.66
16	858.86	172.69
17	898.64	176.93
18	938.27	182.37
19	977.71	189.00
20	1016.94	196.83
21	1055.91	205.84
22	1094.59	216.03
23	1132.95	227.38
24	1170.94	239.89
25	1208.54	253.55
26	1245.70	268.34
27	1282.41	284.24
28	1318.61	301.25
29	1354.28	319.35
30	1389.39	338.52
31	1423.90	358.74
32	1457.78	380.00
33	1491.01	402.28
34	1523.54	425.55
35	1555.35	449.80
36	1586.42	474.99
37	1616.71	501.12
38	1624.57	508.33

Circle Center At X = 738.8 ; Y = 1487.7 and Radius, 1320.5

*** 1.006 ***

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	283.73	253.85
2	321.33	240.20
3	359.31	227.66
4	397.65	216.25
5	436.30	205.95
6	475.24	196.80
7	514.43	188.79
8	553.84	181.94
9	593.43	176.24
10	633.17	171.70
11	673.03	168.34
12	712.97	166.14
13	752.96	165.11
14	792.96	165.25

15	832.94	166.57
16	872.86	169.06
17	912.69	172.72
18	952.40	177.54
19	991.95	183.52
20	1031.31	190.67
21	1070.44	198.96
22	1109.31	208.39
23	1147.89	218.96
24	1186.14	230.66
25	1224.03	243.47
26	1261.53	257.39
27	1298.61	272.40
28	1335.23	288.49
29	1371.36	305.65
30	1406.98	323.86
31	1442.05	343.10
32	1476.53	363.36
33	1510.41	384.63
34	1543.65	406.88
35	1576.23	430.10
36	1608.11	454.25
37	1639.26	479.34
38	1654.85	492.66

Circle Center At X = 768.0 ; Y = 1529.2 and Radius, 1364.1

*** 1.006 ***

1

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	274.24	253.57
2	311.83	239.90
3	349.82	227.39
4	388.18	216.04
5	426.86	205.86
6	465.84	196.87
7	505.07	189.07
8	544.52	182.47
9	584.16	177.08
10	623.94	172.90
11	663.83	169.93
12	703.79	168.18
13	743.79	167.65
14	783.78	168.34
15	823.73	170.25
16	863.61	173.38
17	903.38	177.72
18	942.99	183.27
19	982.41	190.02
20	1021.62	197.98
21	1060.56	207.12
22	1099.20	217.45
23	1137.51	228.96

24	1175.45	241.62
25	1212.99	255.44
26	1250.09	270.40
27	1286.71	286.48
28	1322.83	303.66
29	1358.41	321.95
30	1393.41	341.30
31	1427.81	361.72
32	1461.57	383.18
33	1494.66	405.65
34	1527.05	429.13
35	1558.70	453.58
36	1589.60	478.98
37	1619.71	505.31
38	1623.53	508.87

Circle Center At X = 741.2 ; Y = 1479.1 and Radius, 1311.5

*** 1.006 ***

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	269.49	253.43
2	307.17	240.01
3	345.22	227.67
4	383.61	216.43
5	422.30	206.29
6	461.27	197.26
7	500.48	189.36
8	539.90	182.58
9	579.50	176.93
10	619.25	172.41
11	659.10	169.04
12	699.04	166.81
13	739.03	165.72
14	779.03	165.78
15	819.01	166.99
16	858.94	169.34
17	898.79	172.83
18	938.52	177.46
19	978.10	183.23
20	1017.50	190.12
21	1056.69	198.15
22	1095.63	207.29
23	1134.29	217.54
24	1172.65	228.90
25	1210.66	241.35
26	1248.30	254.89
27	1285.54	269.49
28	1322.34	285.16
29	1358.68	301.87
30	1394.53	319.62
31	1429.85	338.39
32	1464.62	358.16
33	1498.82	378.92

34	1532.40	400.65
35	1565.35	423.33
36	1597.63	446.95
37	1629.23	471.48
38	1654.91	492.63

Circle Center At X = 756.9 ; Y = 1562.0 and Radius, 1396.4

*** 1.006 ***

1

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.61	253.64
2	314.22	240.02
3	352.23	227.55
4	390.59	216.23
5	429.29	206.10
6	468.27	197.14
7	507.51	189.37
8	546.97	182.80
9	586.60	177.44
10	626.39	173.28
11	666.28	170.33
12	706.24	168.60
13	746.24	168.08
14	786.23	168.79
15	826.19	170.70
16	866.06	173.84
17	905.83	178.18
18	945.44	183.73
19	984.87	190.48
20	1024.07	198.43
21	1063.01	207.57
22	1101.66	217.89
23	1139.97	229.38
24	1177.92	242.03
25	1215.46	255.83
26	1252.57	270.76
27	1289.21	286.82
28	1325.34	303.98
29	1360.93	322.23
30	1395.95	341.56
31	1430.37	361.95
32	1464.15	383.37
33	1497.26	405.81
34	1529.68	429.24
35	1561.36	453.65
36	1592.29	479.02
37	1622.44	505.31
38	1625.29	507.95

Circle Center At X = 743.2 ; Y = 1482.8 and Radius, 1314.7

*** 1.007 ***

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	262.37	253.23
2	300.05	239.81
3	338.11	227.49
4	376.51	216.30
5	415.23	206.23
6	454.22	197.30
7	493.45	189.51
8	532.90	182.88
9	572.52	177.40
10	612.29	173.08
11	652.16	169.92
12	692.11	167.93
13	732.10	167.11
14	772.10	167.46
15	812.07	168.98
16	851.98	171.67
17	891.80	175.53
18	931.48	180.54
19	971.00	186.72
20	1010.32	194.04
21	1049.42	202.52
22	1088.24	212.13
23	1126.77	222.88
24	1164.97	234.74
25	1202.81	247.72
26	1240.25	261.80
27	1277.26	276.97
28	1313.82	293.21
29	1349.88	310.52
30	1385.42	328.87
31	1420.41	348.25
32	1454.82	368.65
33	1488.61	390.04
34	1521.77	412.42
35	1554.26	435.75
36	1586.05	460.03
37	1617.12	485.22
38	1636.69	502.06

Circle Center At X = 740.1 ; Y = 1534.5 and Radius, 1367.4

*** 1.007 ***

1

Failure Surface Specified By 38 Coordinate Points

Point X-Surf Y-Surf

No.	(ft)	(ft)
1	262.37	253.23
2	300.04	239.76
3	338.08	227.41
4	376.48	216.19
5	415.19	206.12
6	454.18	197.21
7	493.42	189.45
8	532.88	182.87
9	572.51	177.45
10	612.29	173.22
11	652.17	170.16
12	692.13	168.30
13	732.12	167.61
14	772.12	168.12
15	812.08	169.81
16	851.98	172.69
17	891.77	176.75
18	931.43	181.99
19	970.91	188.41
20	1010.18	195.99
21	1049.21	204.74
22	1087.97	214.63
23	1126.42	225.68
24	1164.52	237.86
25	1202.24	251.17
26	1239.55	265.59
27	1276.41	281.11
28	1312.80	297.72
29	1348.68	315.40
30	1384.02	334.14
31	1418.79	353.92
32	1452.95	374.72
33	1486.49	396.53
34	1519.36	419.32
35	1551.54	443.08
36	1583.00	467.78
37	1613.71	493.40
38	1628.35	506.37

Circle Center At X = 735.0 ; Y = 1514.8 and Radius, 1347.2

*** 1.007 ***

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	278.98	253.71
2	316.62	240.17
3	354.65	227.77
4	393.03	216.49
5	431.73	206.37
6	470.71	197.40
7	509.94	189.60
8	549.39	182.96

9	589.01	177.50
10	628.78	173.23
11	668.66	170.14
12	708.62	168.23
13	748.61	167.52
14	788.61	168.00
15	828.57	169.66
16	868.47	172.52
17	908.27	176.56
18	947.92	181.78
19	987.41	188.18
20	1026.69	195.76
21	1065.72	204.49
22	1104.48	214.39
23	1142.92	225.43
24	1181.02	237.62
25	1218.74	250.93
26	1256.05	265.36
27	1292.91	280.89
28	1329.29	297.51
29	1365.16	315.21
30	1400.49	333.97
31	1435.25	353.77
32	1469.40	374.59
33	1502.92	396.42
34	1535.77	419.24
35	1567.93	443.03
36	1599.37	467.76
37	1630.05	493.42
38	1638.64	501.05

Circle Center At X = 752.5 ; Y = 1511.3 and Radius, 1343.8

*** 1.007 ***

SECTION 202

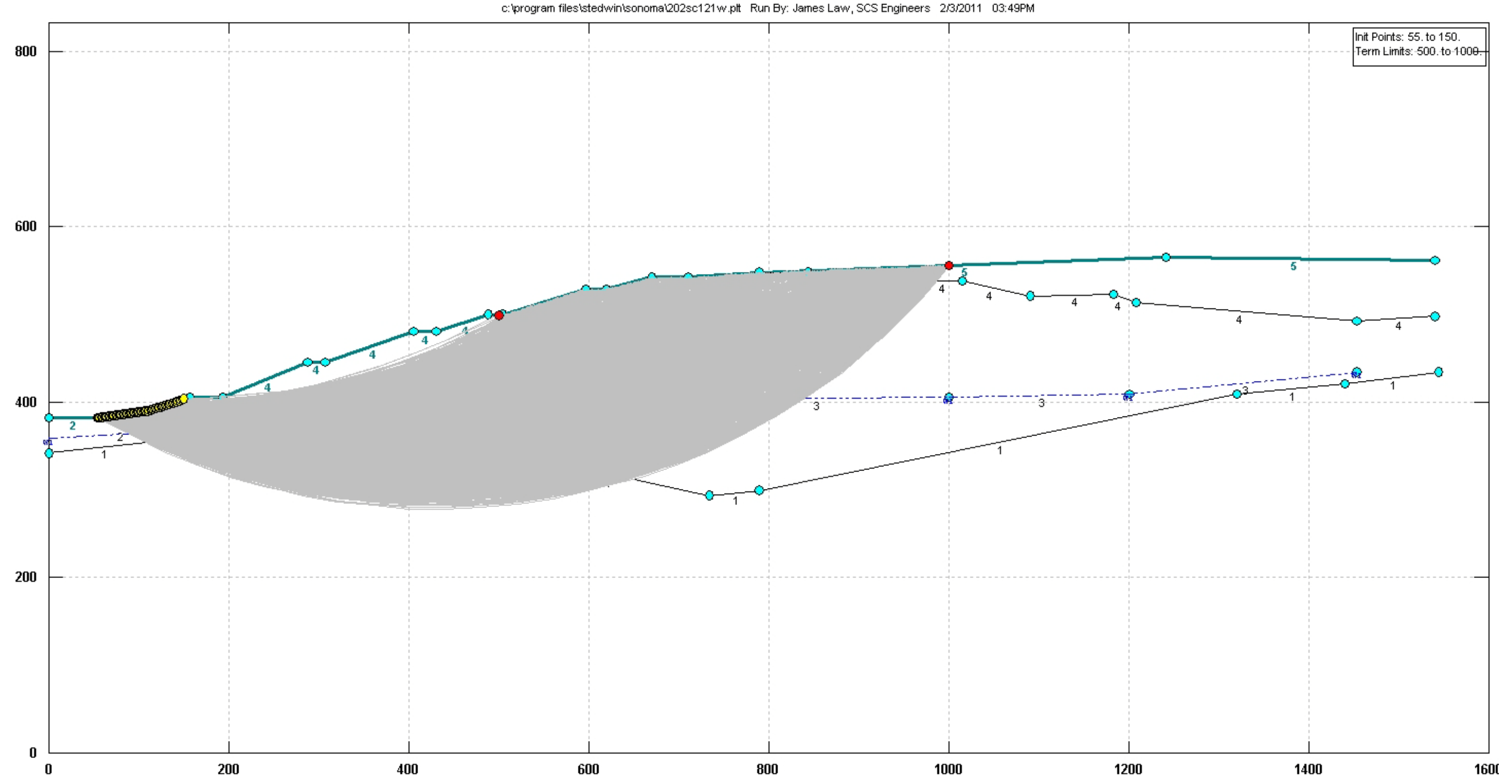
Circular Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 202, Global, circle, static, liquid

c:\program files\stedwin\sonoma\202sc121w.plt Run By: James Law, SCS Engineers 2/3/2011 03:49PM



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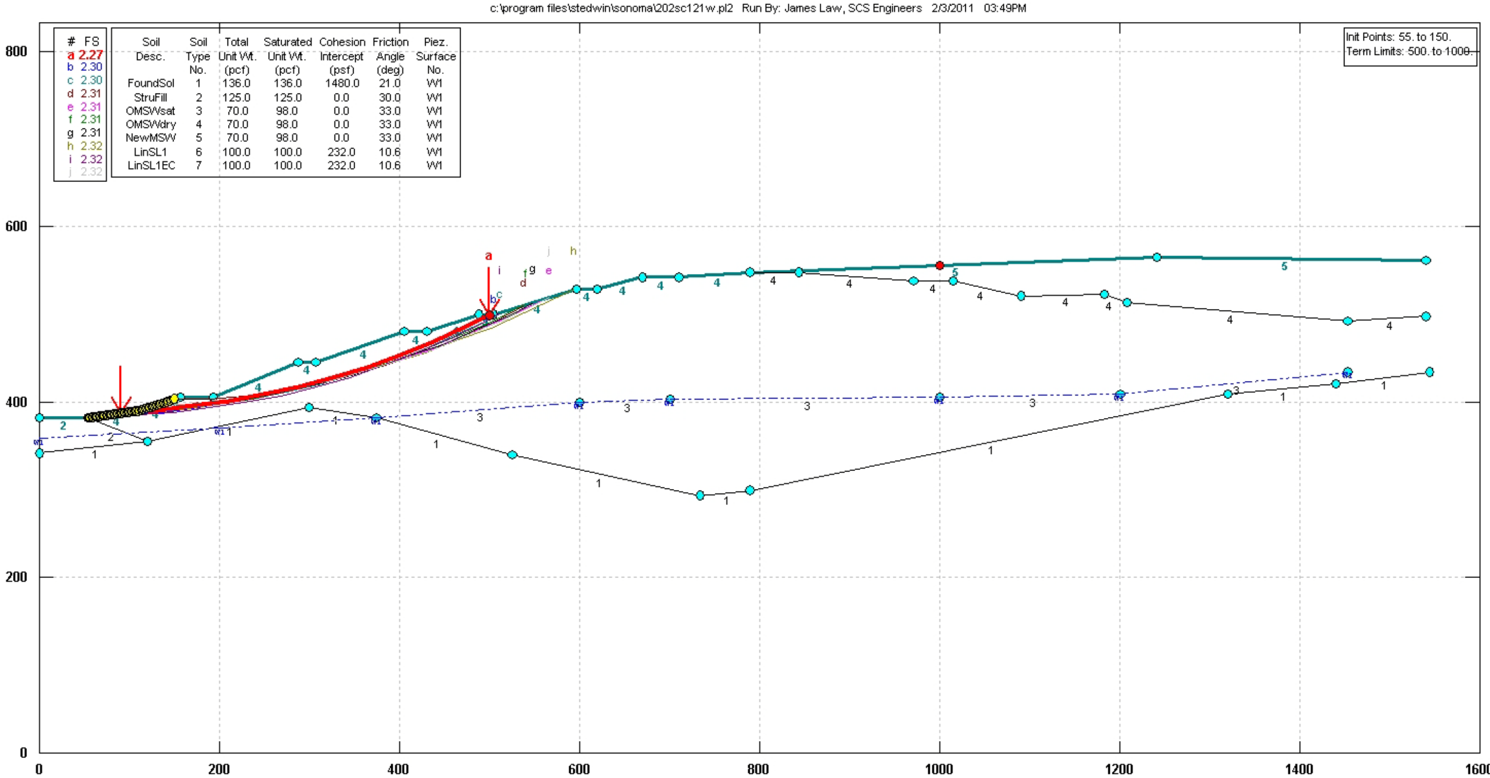
Sonoma Cty Central Disposal, Sect 202, Global, circle, static, liquid

c:\program files\stedwin\sonoma\202sc121w.pl2 Run By: James Law, SCS Engineers 2/3/2011 03:49PM



PCSTABL5M3 FSmin=2.27
Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

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rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/3/2011
Time of Run:	03:49PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:202sc121w.in
Output Filename:	C:202sc121w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:202sc121w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 202,
Global, circle, static, liquid

BOUNDARY COORDINATES

18 Top   Boundaries
41 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	382.00	54.00	382.00	2
2	54.00	382.00	110.00	390.00	4
3	110.00	390.00	141.00	400.00	4
4	141.00	400.00	156.00	406.00	4
5	156.00	406.00	193.00	406.00	4
6	193.00	406.00	287.00	446.00	4
7	287.00	446.00	306.00	446.00	4
8	306.00	446.00	406.00	480.00	4
9	406.00	480.00	431.00	480.00	4
10	431.00	480.00	489.00	499.00	4
11	489.00	499.00	503.00	499.00	4
12	503.00	499.00	596.00	529.00	4
13	596.00	529.00	619.00	529.00	4
14	619.00	529.00	670.00	542.00	4
15	670.00	542.00	711.00	542.00	4
16	711.00	542.00	789.00	548.00	4
17	789.00	548.00	1241.00	565.00	5
18	1241.00	565.00	1540.00	562.00	5
19	789.00	548.00	843.00	548.00	4
20	843.00	548.00	971.00	538.00	4
21	971.00	538.00	1015.00	539.00	4
22	1015.00	539.00	1091.00	521.00	4
23	1091.00	521.00	1184.00	523.00	4
24	1184.00	523.00	1208.00	514.00	4
25	1208.00	514.00	1454.00	493.00	4
26	1454.00	493.00	1540.00	497.00	4

27	54.00	382.00	119.00	356.00	2
28	0.00	342.00	119.00	356.00	1
29	119.00	356.00	300.00	394.00	1
30	300.00	394.00	375.00	383.00	1
31	375.00	383.00	600.00	400.00	3
32	600.00	400.00	700.00	403.00	3
33	700.00	403.00	1000.00	405.00	3
34	1000.00	405.00	1200.00	410.00	3
35	1200.00	410.00	1454.00	434.00	3
36	375.00	383.00	525.00	340.00	1
37	525.00	340.00	733.00	294.00	1
38	733.00	294.00	790.00	300.00	1
39	790.00	300.00	1321.00	410.00	1
40	1321.00	410.00	1440.00	420.00	1
41	1440.00	420.00	1544.00	434.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	232.0	10.6	0.00	0.0	1
7	100.0	100.0	232.0	10.6	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 8 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	359.00
2	200.00	370.00
3	375.00	383.00
4	600.00	400.00
5	700.00	403.00
6	1000.00	405.00
7	1200.00	410.00
8	1454.00	434.00

1

A Critical Failure Surface Searching Method, Using A Random

Technique For Generating Circular Surfaces, Has Been Specified.

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 55.00 ft.
and X = 150.00 ft.

Each Surface Terminates Between X = 500.00 ft.
and X =1000.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -30.0
And 5.0 deg.

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 Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.42	387.20
2	130.31	390.17
3	170.06	394.71
4	209.59	400.81
5	248.85	408.48
6	287.77	417.69
7	326.30	428.44
8	364.37	440.70
9	401.93	454.46
10	438.92	469.70
11	475.27	486.39
12	500.11	499.00

Circle Center At X = 36.1 ; Y = 1393.0 and Radius, 1007.2

*** 2.274 ***

Individual data on the 20 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	19.6	919.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	20.3	5495.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	10.7	5610.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	15.0	11294.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	14.1	11903.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	22.9	15293.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	16.6	11608.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	39.3	46070.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	38.2	66466.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.8	1529.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	18.2	32877.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	20.3	33874.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	38.1	66098.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	37.6	64799.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	4.1	6837.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	25.0	32742.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	7.9	7329.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	36.4	26729.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	13.7	6610.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	11.1	2192.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.61	382.37
2	96.53	384.86
3	136.34	388.78
4	175.98	394.15
5	215.40	400.94
6	254.54	409.16
7	293.37	418.79
8	331.82	429.83
9	369.84	442.24
10	407.39	456.03
11	444.42	471.16
12	480.87	487.63
13	505.29	499.74

Circle Center At X = 8.0 ; Y = 1485.9 and Radius, 1104.6

*** 2.301 ***

1

Failure Surface Specified By 12 Coordinate Points

Point X-Surf Y-Surf

No.	(ft)	(ft)
1	116.19	392.00
2	156.14	394.00
3	195.95	397.88
4	235.53	403.62
5	274.81	411.22
6	313.68	420.65
7	352.07	431.89
8	389.89	444.92
9	427.05	459.71
10	463.48	476.23
11	499.10	494.44
12	512.35	502.01

Circle Center At X = 93.9 ; Y = 1240.4 and Radius, 848.7

*** 2.301 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	148.39	402.96
2	188.37	404.33
3	228.22	407.74
4	267.85	413.16
5	307.16	420.59
6	346.03	430.01
7	384.38	441.39
8	422.10	454.71
9	459.09	469.92
10	495.26	486.99
11	530.52	505.88
12	537.65	510.18

Circle Center At X = 141.6 ; Y = 1187.6 and Radius, 784.7

*** 2.309 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.59	386.51
2	125.46	389.78
3	165.20	394.34
4	204.77	400.19
5	244.13	407.32
6	283.24	415.72

7	322.05	425.39
8	360.53	436.31
9	398.64	448.47
10	436.33	461.86
11	473.57	476.47
12	510.31	492.28
13	546.52	509.27
14	566.69	519.55

Circle Center At X = 5.4 ; Y = 1613.1 and Radius, 1229.2

*** 2.311 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.93	385.13
2	115.85	387.77
3	155.64	391.83
4	195.26	397.30
5	234.66	404.19
6	273.80	412.49
7	312.61	422.17
8	351.04	433.24
9	389.06	445.67
10	426.61	459.46
11	463.65	474.57
12	500.12	491.00
13	535.98	508.72
14	540.19	511.00

Circle Center At X = 22.4 ; Y = 1501.7 and Radius, 1117.8

*** 2.312 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.70	388.81
2	141.59	391.76
3	181.34	396.19
4	220.90	402.09
5	260.22	409.45
6	299.24	418.27
7	337.90	428.52
8	376.16	440.20
9	413.95	453.29
10	451.24	467.77

11	487.96	483.63
12	524.07	500.83
13	548.87	513.80

Circle Center At X =   42.1 ; Y = 1466.0 and Radius, 1078.8

*** 2.312 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.93	385.13
2	115.81	388.24
3	155.58	392.56
4	195.19	398.09
5	234.62	404.83
6	273.82	412.78
7	312.77	421.91
8	351.41	432.24
9	389.72	443.73
10	427.67	456.40
11	465.20	470.21
12	502.30	485.17
13	538.93	501.25
14	575.04	518.45
15	594.83	528.62

Circle Center At X =   -5.7 ; Y = 1691.8 and Radius, 1309.2

*** 2.316 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.49	384.21
2	109.47	385.44
3	149.36	388.40
4	189.09	393.08
5	228.57	399.47
6	267.75	407.57
7	306.53	417.35
8	344.86	428.81
9	382.65	441.91
10	419.84	456.64
11	456.36	472.96
12	492.14	490.84
13	512.15	501.95

Circle Center At X =   61.1 ; Y = 1308.3 and Radius, 924.2

***   2.317   ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	127.46	395.63
2	167.36	398.42
3	207.12	402.76
4	246.69	408.64
5	286.00	416.06
6	324.98	425.01
7	363.59	435.47
8	401.76	447.42
9	439.44	460.86
10	476.56	475.75
11	513.08	492.07
12	548.93	509.81
13	567.02	519.65

Circle Center At X =   75.9 ; Y = 1420.9 and Radius, 1026.6

***   2.317   ***

SECTION 202

Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 202, Global, circle, seismic=0.3g, liquid

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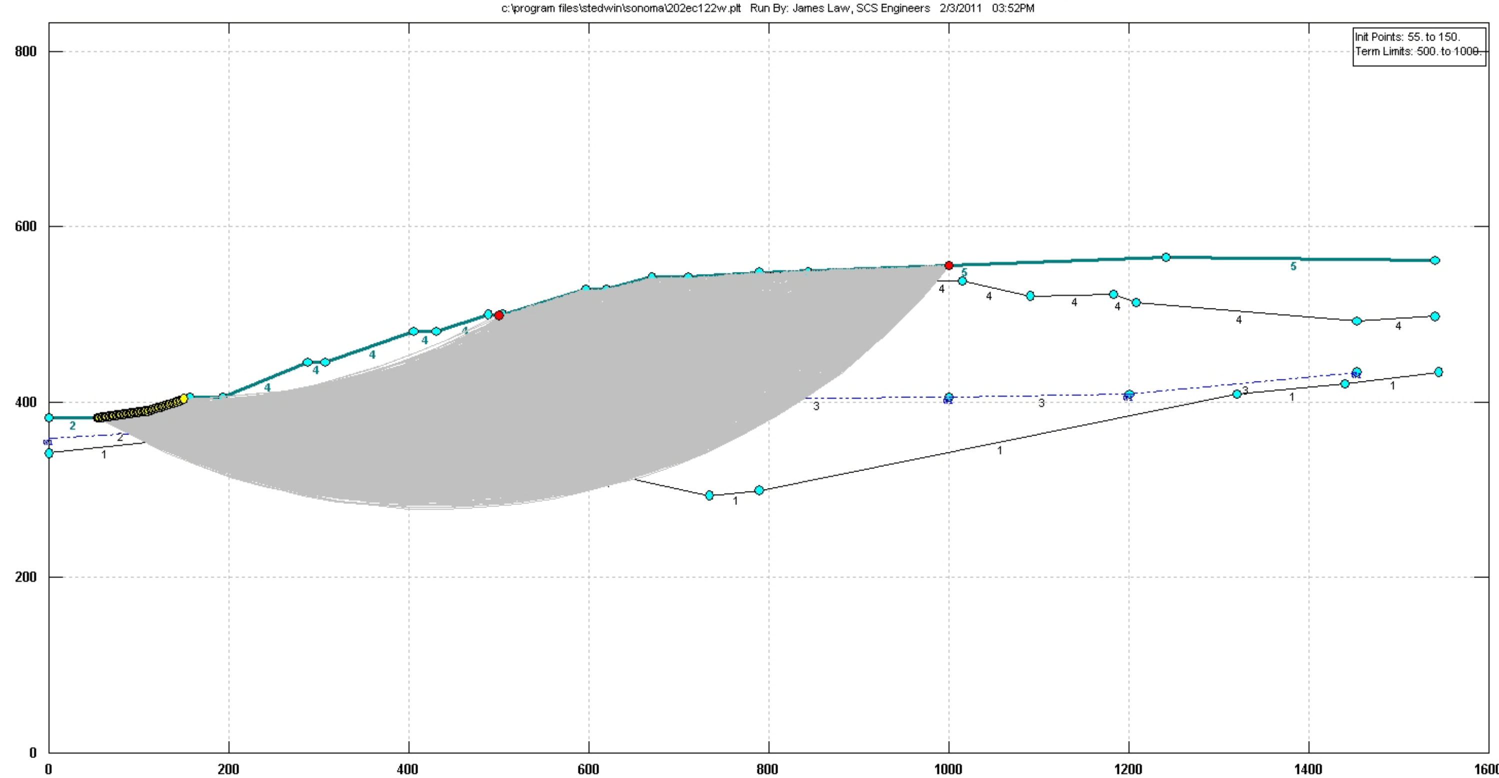

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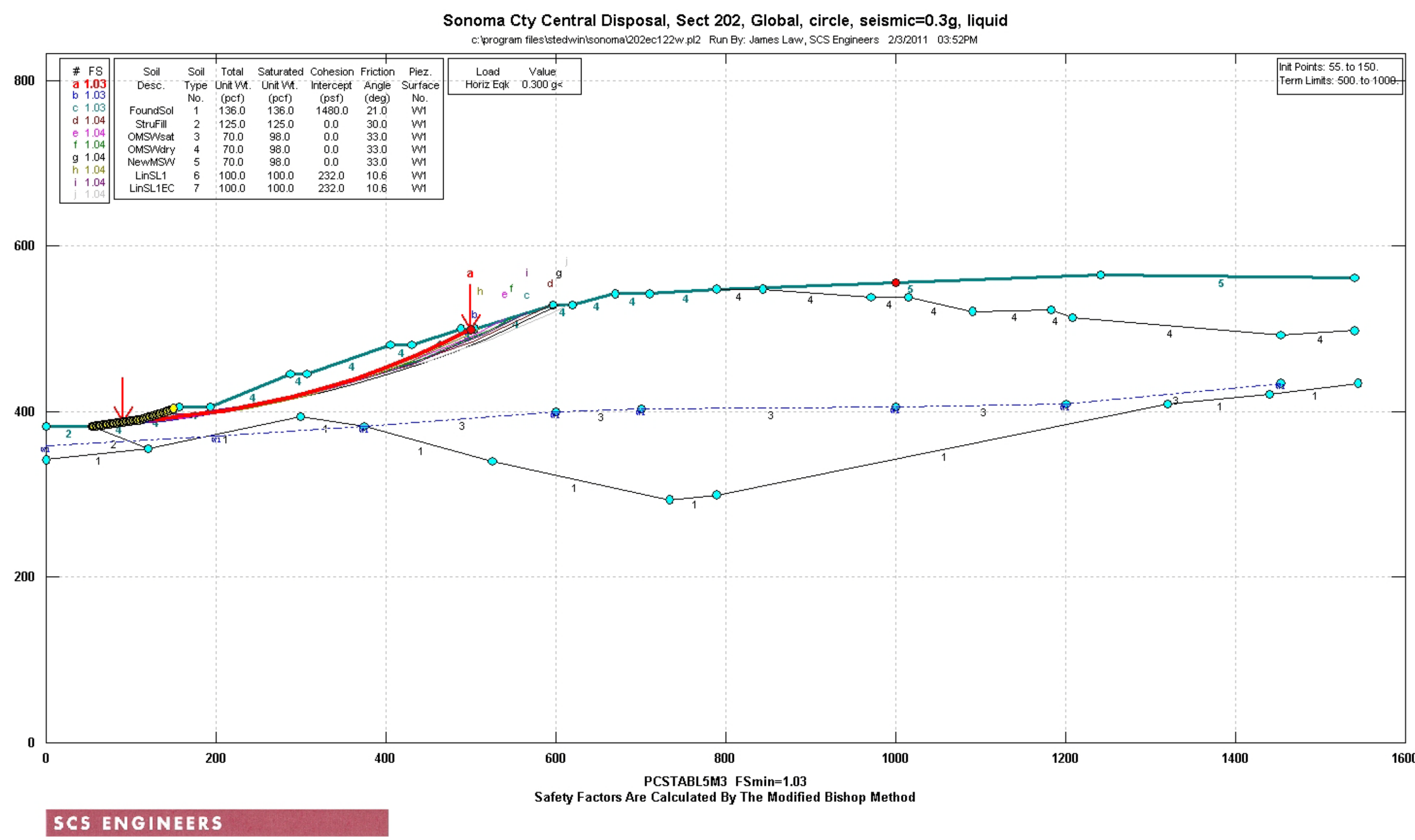
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FS
a 1.03
b 1.03
c 1.03
d 1.04
e 1.04
f 1.04
g 1.04
h 1.04
i 1.04
j 1.04
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No.
FoundSol 1 136.0 136.0 1480.0 21.0 W1
StruFill 2 125.0 125.0 0.0 30.0 W1
OMSWsat 3 70.0 98.0 0.0 33.0 W1
OMSWdry 4 70.0 98.0 0.0 33.0 W1
NewMSW 5 70.0 98.0 0.0 33.0 W1
LinSL1 6 100.0 100.0 232.0 10.6 W1
LinSL1EC 7 100.0 100.0 232.0 10.6 W1
Load Value
Horiz Eqk 0.300 g<
Init Points: 55. to 150.
Term Limits: 500. to 1000.
0
200
400
600
800
1000
1200
1400
1600
PCSTABL5M3 FSmin=1.03
Safety Factors Are Calculated By The Modified Bishop Method
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** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/3/2011
Time of Run:	03:52PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:202ec122w.in
Output Filename:	C:202ec122w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:202ec122w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 202,
Global, circle, seismic=0.3g, liquid

BOUNDARY COORDINATES

18 Top Boundaries
41 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	382.00	54.00	382.00	2
2	54.00	382.00	110.00	390.00	4
3	110.00	390.00	141.00	400.00	4
4	141.00	400.00	156.00	406.00	4
5	156.00	406.00	193.00	406.00	4
6	193.00	406.00	287.00	446.00	4
7	287.00	446.00	306.00	446.00	4
8	306.00	446.00	406.00	480.00	4
9	406.00	480.00	431.00	480.00	4
10	431.00	480.00	489.00	499.00	4
11	489.00	499.00	503.00	499.00	4
12	503.00	499.00	596.00	529.00	4
13	596.00	529.00	619.00	529.00	4
14	619.00	529.00	670.00	542.00	4
15	670.00	542.00	711.00	542.00	4
16	711.00	542.00	789.00	548.00	4
17	789.00	548.00	1241.00	565.00	5
18	1241.00	565.00	1540.00	562.00	5
19	789.00	548.00	843.00	548.00	4
20	843.00	548.00	971.00	538.00	4
21	971.00	538.00	1015.00	539.00	4
22	1015.00	539.00	1091.00	521.00	4
23	1091.00	521.00	1184.00	523.00	4
24	1184.00	523.00	1208.00	514.00	4
25	1208.00	514.00	1454.00	493.00	4
26	1454.00	493.00	1540.00	497.00	4

27	54.00	382.00	119.00	356.00	2
28	0.00	342.00	119.00	356.00	1
29	119.00	356.00	300.00	394.00	1
30	300.00	394.00	375.00	383.00	1
31	375.00	383.00	600.00	400.00	3
32	600.00	400.00	700.00	403.00	3
33	700.00	403.00	1000.00	405.00	3
34	1000.00	405.00	1200.00	410.00	3
35	1200.00	410.00	1454.00	434.00	3
36	375.00	383.00	525.00	340.00	1
37	525.00	340.00	733.00	294.00	1
38	733.00	294.00	790.00	300.00	1
39	790.00	300.00	1321.00	410.00	1
40	1321.00	410.00	1440.00	420.00	1
41	1440.00	420.00	1544.00	434.00	1

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ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	232.0	10.6	0.00	0.0	1
7	100.0	100.0	232.0	10.6	0.00	0.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 8 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	359.00
2	200.00	370.00
3	375.00	383.00
4	600.00	400.00
5	700.00	403.00
6	1000.00	405.00
7	1200.00	410.00
8	1454.00	434.00

A Horizontal Earthquake Loading Coefficient

Of0.300 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure =   0.0 (psf)

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 55.00 ft.
and X = 150.00 ft.

Each Surface Terminates Between   X = 500.00 ft.
and   X =1000.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -30.0 And   5.0 deg.

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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 Bishop Method * *

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.42	387.20
2	130.31	390.17
3	170.06	394.71
4	209.59	400.81
5	248.85	408.48
6	287.77	417.69
7	326.30	428.44
8	364.37	440.70
9	401.93	454.46

10	438.92	469.70
11	475.27	486.39
12	500.11	499.00

Circle Center At X = 36.1 ; Y = 1393.0 and Radius, 1007.2

*** 1.026 ***

Individual data on the 20 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	19.6	919.8	0.0	0.0	0.0	0.0	276.0	0.0	0.0
2	20.3	5495.5	0.0	0.0	0.0	0.0	1648.7	0.0	0.0
3	10.7	5610.0	0.0	0.0	0.0	0.0	1683.0	0.0	0.0
4	15.0	11294.5	0.0	0.0	0.0	0.0	3388.4	0.0	0.0
5	14.1	11903.0	0.0	0.0	0.0	0.0	3570.9	0.0	0.0
6	22.9	15293.6	0.0	0.0	0.0	0.0	4588.1	0.0	0.0
7	16.6	11608.1	0.0	0.0	0.0	0.0	3482.4	0.0	0.0
8	39.3	46070.7	0.0	0.0	0.0	0.0	13821.2	0.0	0.0
9	38.2	66466.3	0.0	0.0	0.0	0.0	19939.9	0.0	0.0
10	0.8	1529.6	0.0	0.0	0.0	0.0	458.9	0.0	0.0
11	18.2	32877.3	0.0	0.0	0.0	0.0	9863.2	0.0	0.0
12	20.3	33874.9	0.0	0.0	0.0	0.0	10162.5	0.0	0.0
13	38.1	66098.8	0.0	0.0	0.0	0.0	19829.6	0.0	0.0
14	37.6	64799.3	0.0	0.0	0.0	0.0	19439.8	0.0	0.0
15	4.1	6837.1	0.0	0.0	0.0	0.0	2051.1	0.0	0.0
16	25.0	32742.4	0.0	0.0	0.0	0.0	9822.7	0.0	0.0
17	7.9	7329.4	0.0	0.0	0.0	0.0	2198.8	0.0	0.0
18	36.4	26729.7	0.0	0.0	0.0	0.0	8018.9	0.0	0.0
19	13.7	6610.3	0.0	0.0	0.0	0.0	1983.1	0.0	0.0
20	11.1	2192.1	0.0	0.0	0.0	0.0	657.6	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	56.61	382.37
2	96.53	384.86
3	136.34	388.78
4	175.98	394.15
5	215.40	400.94
6	254.54	409.16
7	293.37	418.79
8	331.82	429.83
9	369.84	442.24
10	407.39	456.03
11	444.42	471.16
12	480.87	487.63
13	505.29	499.74

Circle Center At X = 8.0 ; Y = 1485.9 and Radius, 1104.6

*** 1.033 ***

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Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.59	386.51
2	125.46	389.78
3	165.20	394.34
4	204.77	400.19
5	244.13	407.32
6	283.24	415.72
7	322.05	425.39
8	360.53	436.31
9	398.64	448.47
10	436.33	461.86
11	473.57	476.47
12	510.31	492.28
13	546.52	509.27
14	566.69	519.55

Circle Center At X = 5.4 ; Y = 1613.1 and Radius, 1229.2

*** 1.034 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.93	385.13
2	115.81	388.24
3	155.58	392.56
4	195.19	398.09
5	234.62	404.83
6	273.82	412.78
7	312.77	421.91
8	351.41	432.24
9	389.72	443.73
10	427.67	456.40
11	465.20	470.21
12	502.30	485.17
13	538.93	501.25
14	575.04	518.45
15	594.83	528.62

Circle Center At X = -5.7 ; Y = 1691.8 and Radius, 1309.2

*** 1.036 ***

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Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	75.93	385.13
2	115.85	387.77
3	155.64	391.83
4	195.26	397.30
5	234.66	404.19
6	273.80	412.49
7	312.61	422.17
8	351.04	433.24
9	389.06	445.67
10	426.61	459.46
11	463.65	474.57
12	500.12	491.00
13	535.98	508.72
14	540.19	511.00

Circle Center At X = 22.4 ; Y = 1501.7 and Radius, 1117.8

*** 1.036 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	101.70	388.81
2	141.59	391.76
3	181.34	396.19
4	220.90	402.09
5	260.22	409.45
6	299.24	418.27
7	337.90	428.52
8	376.16	440.20
9	413.95	453.29
10	451.24	467.77
11	487.96	483.63
12	524.07	500.83
13	548.87	513.80

Circle Center At X = 42.1 ; Y = 1466.0 and Radius, 1078.8

*** 1.037 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.81	386.97
2	128.71	389.91
3	168.49	394.10
4	208.11	399.54
5	247.55	406.21
6	286.76	414.12
7	325.71	423.26
8	364.34	433.61
9	402.64	445.17
10	440.55	457.92
11	478.04	471.86
12	515.08	486.97
13	551.63	503.23
14	587.64	520.63
15	603.66	529.00

Circle Center At X = 15.1 ; Y = 1659.8 and Radius, 1275.0

*** 1.038 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.19	392.00
2	156.14	394.00
3	195.95	397.88
4	235.53	403.62
5	274.81	411.22
6	313.68	420.65
7	352.07	431.89
8	389.89	444.92
9	427.05	459.71
10	463.48	476.23
11	499.10	494.44
12	512.35	502.01

Circle Center At X = 93.9 ; Y = 1240.4 and Radius, 848.7

*** 1.038 ***

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Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	127.46	395.63

2	167.36	398.42
3	207.12	402.76
4	246.69	408.64
5	286.00	416.06
6	324.98	425.01
7	363.59	435.47
8	401.76	447.42
9	439.44	460.86
10	476.56	475.75
11	513.08	492.07
12	548.93	509.81
13	567.02	519.65

Circle Center At X = 75.9 ; Y = 1420.9 and Radius, 1026.6

*** 1.039 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	58.22	382.60
2	98.09	385.86
3	137.86	390.16
4	177.50	395.49
5	216.99	401.85
6	256.30	409.24
7	295.41	417.65
8	334.28	427.08
9	372.90	437.52
10	411.22	448.96
11	449.24	461.39
12	486.92	474.81
13	524.24	489.21
14	561.17	504.58
15	597.69	520.91
16	614.60	529.00

Circle Center At X = -46.3 ; Y = 1910.1 and Radius, 1531.1

*** 1.039 ***

SECTION 203

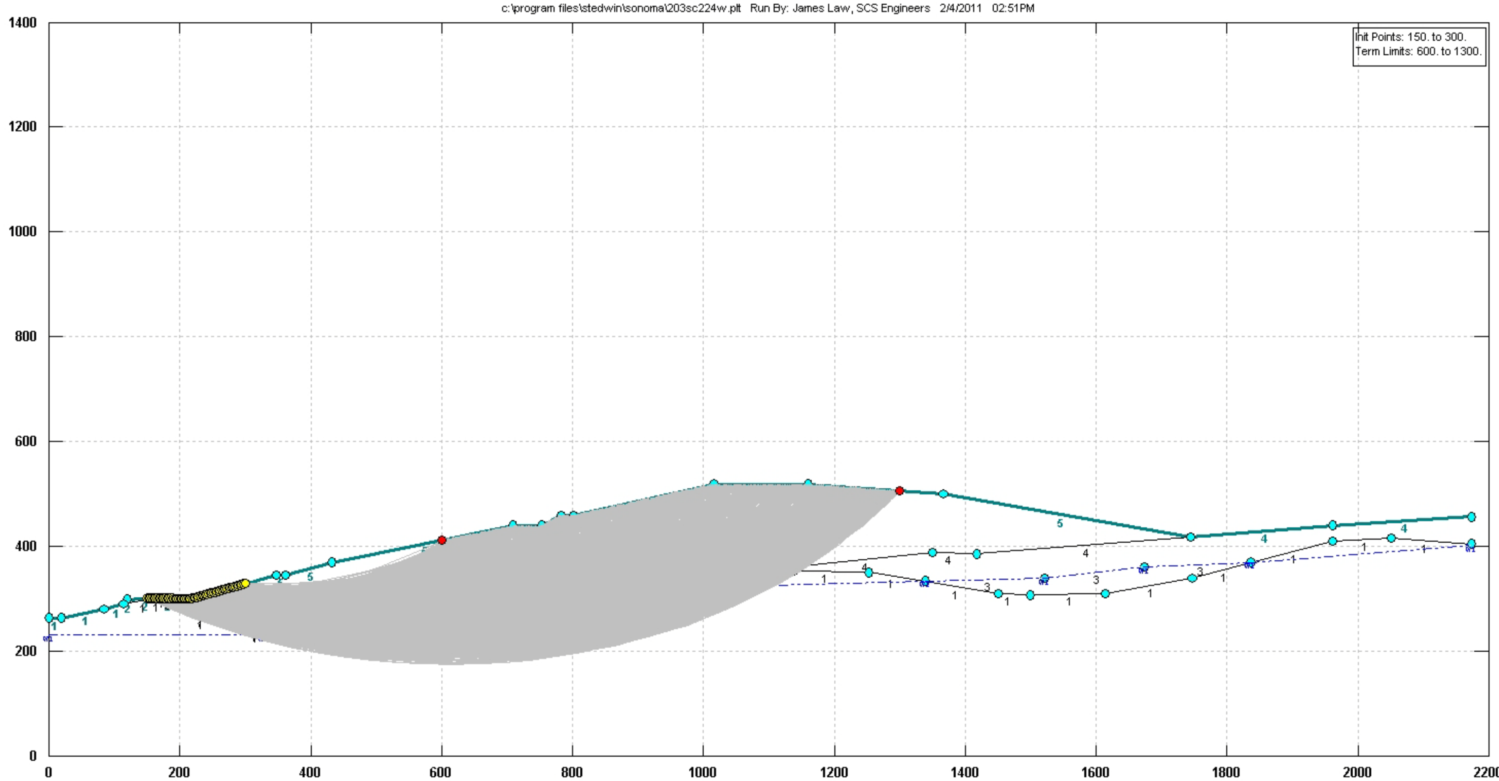
Circular Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 203, Global, circle, static, liquid

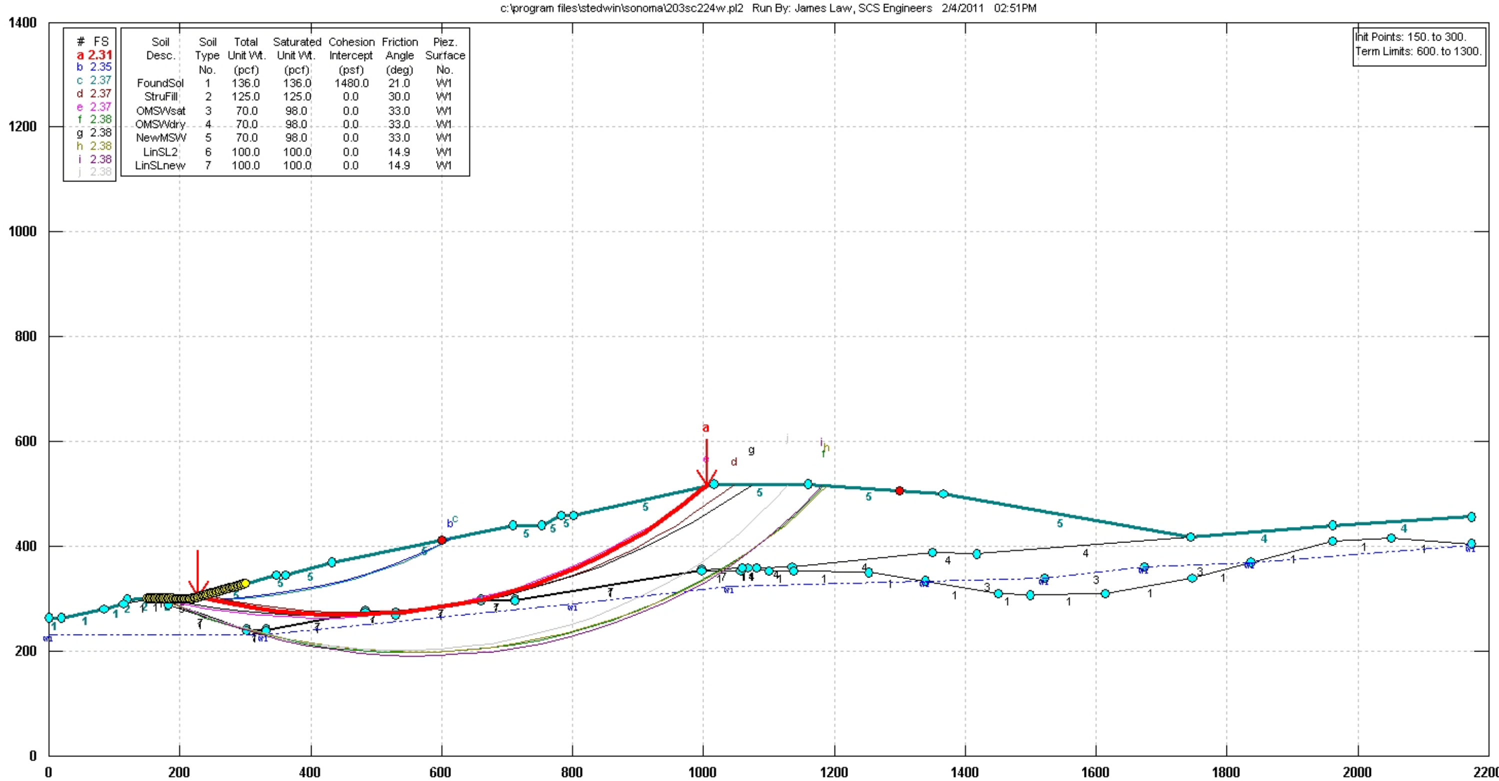
c:\program files\stedwin\sonoma\203sc224w.plt Run By: James Law, SCS Engineers 2/4/2011 02:51PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 203, Global, circle, static, liquid

c:\program files\stedwin\sonoma\203sc224w.pl2 Run By: James Law, SCS Engineers 2/4/2011 02:51PM



PCSTABL5M3 FSmin=2.31
Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

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

Run Date: 2/4/2011
Time of Run: 02:51PM
Run By: James Law, SCS Engineers
Input Data Filename: C:203sc224w.in
Output Filename: C:203sc224w.OUT
Unit: ENGLISH
Plotted Output Filename: C:203sc224w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 203,
Global, circle, static, liquid

BOUNDARY COORDINATES

19 Top Boundaries
61 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	263.00	20.00	263.00	1
2	20.00	263.00	85.00	280.00	1
3	85.00	280.00	115.00	291.00	1
4	115.00	291.00	120.00	300.00	2
5	120.00	300.00	167.00	301.00	2
6	167.00	301.00	217.00	300.00	2
7	217.00	300.00	348.00	346.00	5
8	348.00	346.00	360.00	346.00	5
9	360.00	346.00	432.00	370.00	5
10	432.00	370.00	710.00	440.00	5
11	710.00	440.00	752.00	440.00	5
12	752.00	440.00	782.00	460.00	5
13	782.00	460.00	800.00	460.00	5
14	800.00	460.00	1017.00	520.00	5
15	1017.00	520.00	1159.00	520.00	5
16	1159.00	520.00	1365.00	500.00	5
17	1365.00	500.00	1745.00	418.00	5
18	1745.00	418.00	1960.00	440.00	4
19	1960.00	440.00	2173.00	457.00	4
20	115.00	291.00	167.00	301.00	1
21	167.00	301.00	182.00	292.00	1
22	182.00	292.00	217.00	300.00	5
23	182.00	292.00	302.00	242.00	7
24	302.00	242.00	331.00	243.00	7
25	331.00	243.00	484.00	278.00	7
26	484.00	278.00	530.00	274.00	7

27	530.00	274.00	660.00	300.00	7
28	660.00	300.00	712.00	300.00	7
29	712.00	300.00	997.00	356.00	7
30	997.00	356.00	1058.00	358.00	7
31	1058.00	358.00	1068.00	358.00	1
32	1068.00	358.00	1080.00	358.00	4
33	1080.00	358.00	1135.00	360.00	4
34	1135.00	360.00	1350.00	389.00	4
35	1350.00	389.00	1419.00	387.00	4
36	1419.00	387.00	1745.00	418.00	4
37	182.00	292.00	183.00	288.00	1
38	183.00	288.00	302.00	238.00	1
39	302.00	238.00	331.00	239.00	1
40	331.00	239.00	484.00	274.00	1
41	484.00	274.00	530.00	270.00	1
42	530.00	270.00	660.00	296.00	1
43	660.00	296.00	712.00	296.00	1
44	712.00	296.00	997.00	352.00	1
45	997.00	352.00	1057.00	354.00	1
46	1057.00	354.00	1058.00	358.00	1
47	1068.00	358.00	1100.00	353.00	1
48	1100.00	353.00	1138.00	352.00	1
49	1138.00	352.00	1253.00	350.00	1
50	1253.00	350.00	1340.00	333.00	1
51	1340.00	333.00	1520.00	340.00	3
52	1520.00	340.00	1672.00	360.00	3
53	1672.00	360.00	1835.00	370.00	3
54	1835.00	370.00	1960.00	410.00	1
55	1960.00	410.00	2050.00	415.00	1
56	2050.00	415.00	2173.00	406.00	1
57	1340.00	333.00	1450.00	310.00	1
58	1450.00	310.00	1500.00	306.00	1
59	1500.00	306.00	1613.00	310.00	1
60	1613.00	310.00	1747.00	340.00	1
61	1747.00	340.00	1835.00	370.00	1

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ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	0.00	0.0	1

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1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
2	330.00	230.00
3	800.00	290.00
4	1040.00	322.00
5	1340.00	333.00
6	1520.00	340.00
7	1672.00	360.00
8	1835.00	370.00
9	2173.00	403.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced Along The Ground Surface Between X = 150.00 ft.
and X = 300.00 ft.

Each Surface Terminates Between   X = 600.00 ft.
and   X =1300.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -30.0 And   0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 23 Coordinate Points

Point   X-Surf   Y-Surf

No.	(ft)	(ft)
1	228.81	304.15
2	267.25	293.09
3	306.24	284.12
4	345.65	277.27
5	385.37	272.56
6	425.29	270.01
7	465.28	269.61
8	505.24	271.38
9	545.05	275.30
10	584.59	281.37
11	623.74	289.57
12	662.39	299.87
13	700.43	312.25
14	737.74	326.66
15	774.22	343.07
16	809.76	361.42
17	844.26	381.67
18	877.61	403.75
19	909.72	427.61
20	940.49	453.16
21	969.84	480.34
22	997.68	509.06
23	1004.08	516.43

Circle Center At X = 452.6 ; Y = 1009.4 and Radius, 739.9

*** 2.309 ***

Individual data on the 36 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	38.4	33042.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	39.0	97927.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	39.4	158785.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.4	11283.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	12.0	58564.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	25.4	135242.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	39.9	250994.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	6.7	46487.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	16.1	114958.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	16.8	125925.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.4	3446.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	18.7	149558.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	21.2	176395.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	4.2	34839.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	20.6	173200.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	15.1	128975.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	39.5	349351.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	39.2	354406.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	36.3	328160.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	2.4	21475.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.4	3526.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	37.6	333941.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

23	9.6	83553.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	27.7	230500.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	14.3	109925.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	22.2	170076.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	7.8	61164.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	18.0	136418.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	9.8	70005.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	34.5	231630.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	33.4	196429.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	32.1	157830.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	30.8	116777.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	29.3	74276.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	27.8	31389.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	6.4	1253.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	172.88	300.88
2	212.83	298.94
3	252.83	299.29
4	292.75	301.93
5	332.44	306.84
6	371.79	314.02
7	410.67	323.43
8	448.95	335.05
9	486.49	348.84
10	523.19	364.76
11	558.92	382.74
12	593.56	402.74
13	613.18	415.62

Circle Center At X = 226.7 ; Y = 998.1 and Radius, 699.3

*** 2.354 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	190.68	300.53
2	230.64	298.85
3	270.64	299.54
4	310.52	302.60
5	350.15	308.01
6	389.40	315.75
7	428.11	325.80
8	466.17	338.12
9	503.43	352.67
10	539.76	369.40
11	575.04	388.25
12	609.15	409.15
13	621.38	417.68

Circle Center At X = 239.0 ; Y = 974.9 and Radius, 676.1

*** 2.366 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	238.98	307.72
2	277.58	297.21
3	316.65	288.64
4	356.10	282.02
5	395.83	277.38
6	435.74	274.72
7	475.73	274.06
8	515.71	275.39
9	555.57	278.71
10	595.22	284.01
11	634.55	291.28
12	673.48	300.50
13	711.89	311.65
14	749.70	324.70
15	786.82	339.62
16	823.14	356.37
17	858.59	374.91
18	893.06	395.19
19	926.49	417.16
20	958.77	440.77
21	989.84	465.96
22	1019.62	492.67
23	1047.19	520.00

Circle Center At X = 469.1 ; Y = 1076.5 and Radius, 802.5

*** 2.371 ***

1

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.25	300.96
2	203.72	290.00
3	242.68	280.91
4	282.02	273.72
5	321.68	268.45
6	361.54	265.10
7	401.51	263.70
8	441.51	264.23
9	481.43	266.71

10	521.19	271.12
11	560.68	277.45
12	599.83	285.69
13	638.52	295.82
14	676.68	307.81
15	714.21	321.64
16	751.03	337.27
17	787.05	354.67
18	822.18	373.80
19	856.34	394.61
20	889.45	417.05
21	921.44	441.07
22	952.22	466.62
23	981.72	493.63
24	1004.42	516.52

Circle Center At X = 410.5 ; Y = 1087.6 and Radius, 824.0

*** 2.373 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	167.80	300.98
2	202.95	281.89
3	239.03	264.64
4	275.96	249.26
5	313.63	235.81
6	351.94	224.31
7	390.79	214.80
8	430.08	207.30
9	469.71	201.83
10	509.56	198.40
11	549.54	197.03
12	589.53	197.72
13	629.44	200.47
14	669.15	205.27
15	708.56	212.10
16	747.57	220.96
17	786.07	231.80
18	823.96	244.62
19	861.14	259.37
20	897.52	276.01
21	932.99	294.50
22	967.46	314.79
23	1000.84	336.83
24	1033.04	360.56
25	1063.98	385.91
26	1093.58	412.82
27	1121.75	441.22
28	1148.42	471.03
29	1173.52	502.17
30	1184.64	517.51

Circle Center At X = 556.0 ; Y = 973.6 and Radius, 776.6

*** 2.378 ***

1

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	177.97	300.78
2	216.81	291.24
3	256.02	283.32
4	295.52	277.03
5	335.25	272.40
6	375.14	269.41
7	415.12	268.09
8	455.12	268.43
9	495.07	270.43
10	534.90	274.09
11	574.55	279.40
12	613.94	286.36
13	653.01	294.94
14	691.68	305.14
15	729.90	316.94
16	767.60	330.32
17	804.71	345.25
18	841.16	361.71
19	876.90	379.68
20	911.87	399.11
21	945.99	419.97
22	979.22	442.24
23	1011.50	465.87
24	1042.76	490.82
25	1072.96	517.05
26	1076.09	520.00

Circle Center At X = 426.9 ; Y = 1230.1 and Radius, 962.1

*** 2.378 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	167.80	300.98
2	203.10	282.18
3	239.32	265.20
4	276.35	250.07
5	314.09	236.84
6	352.46	225.53
7	391.36	216.19
8	430.67	208.83
9	470.31	203.47

10	510.17	200.13
11	550.15	198.81
12	590.15	199.52
13	630.05	202.25
14	669.77	207.00
15	709.19	213.76
16	748.23	222.51
17	786.76	233.23
18	824.71	245.88
19	861.96	260.45
20	898.43	276.88
21	934.02	295.14
22	968.64	315.17
23	1002.20	336.94
24	1034.61	360.38
25	1065.80	385.43
26	1095.67	412.03
27	1124.16	440.11
28	1151.18	469.60
29	1176.68	500.42
30	1189.10	517.08

Circle Center At X = 556.1 ; Y = 987.3 and Radius, 788.6

*** 2.380 ***

1

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	175.42	300.83
2	210.10	280.89
3	245.79	262.83
4	282.40	246.71
5	319.82	232.57
6	357.94	220.46
7	396.65	210.40
8	435.85	202.43
9	475.42	196.57
10	515.24	192.83
11	555.21	191.23
12	595.21	191.78
13	635.12	194.46
14	674.83	199.28
15	714.22	206.21
16	753.19	215.25
17	791.62	226.35
18	829.39	239.50
19	866.41	254.65
20	902.57	271.76
21	937.76	290.78
22	971.88	311.66
23	1004.83	334.33
24	1036.52	358.73
25	1066.86	384.80
26	1095.77	412.45

27	1123.15	441.61
28	1148.93	472.19
29	1173.03	504.11
30	1182.23	517.75

Circle Center At X = 565.0 ; Y = 937.7 and Radius, 746.6

*** 2.384 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	175.42	300.83
2	210.41	281.44
3	246.43	264.05
4	283.38	248.71
5	321.12	235.48
6	359.55	224.39
7	398.55	215.48
8	437.98	208.77
9	477.73	204.30
10	517.67	202.06
11	557.67	202.08
12	597.60	204.35
13	637.35	208.86
14	676.78	215.59
15	715.77	224.54
16	754.19	235.66
17	791.92	248.93
18	828.85	264.29
19	864.86	281.72
20	899.83	301.13
21	933.65	322.49
22	966.22	345.71
23	997.43	370.73
24	1027.19	397.46
25	1055.39	425.83
26	1081.95	455.74
27	1106.79	487.09
28	1129.83	519.79
29	1129.96	520.00

Circle Center At X = 537.4 ; Y = 912.7 and Radius, 710.9

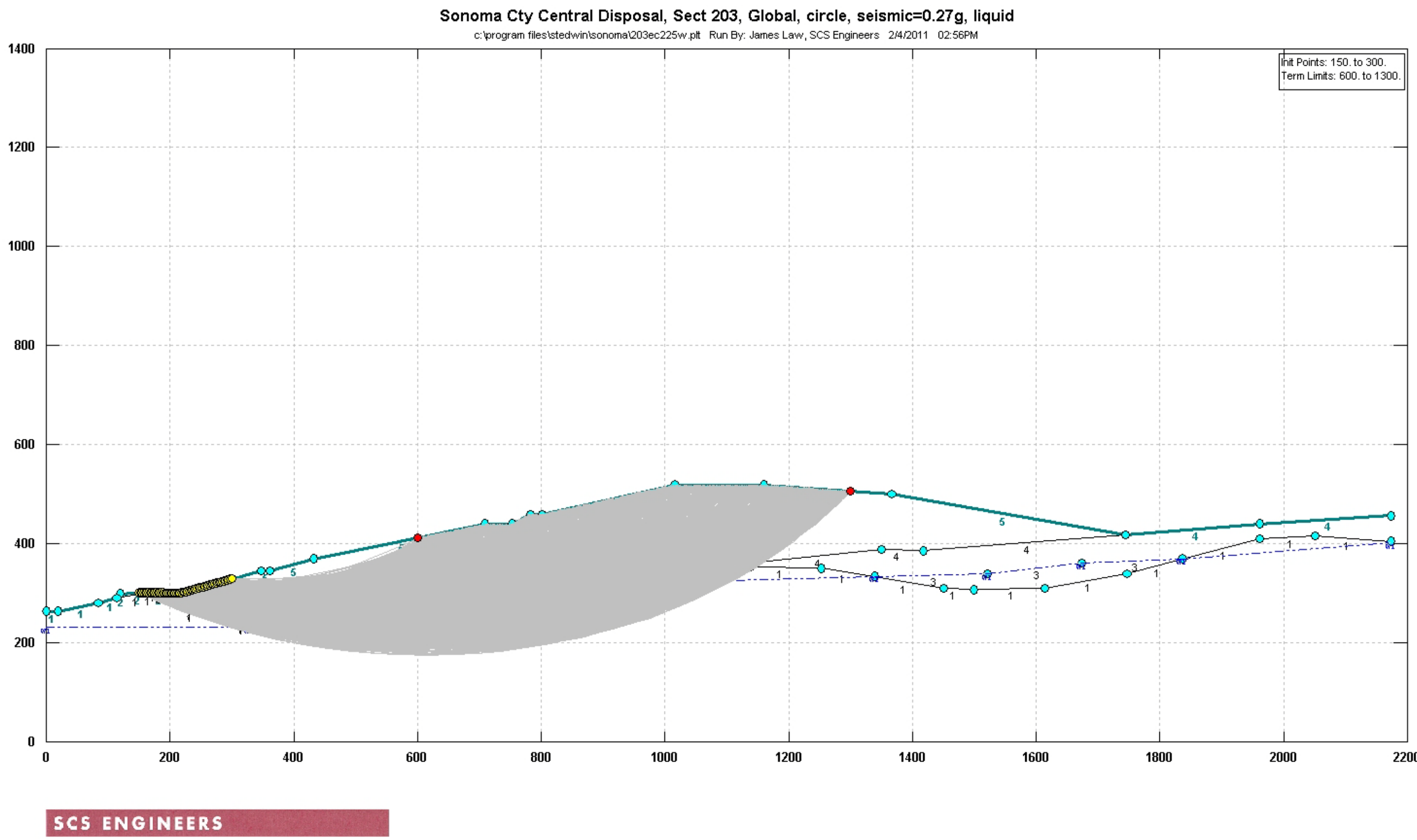
*** 2.384 ***

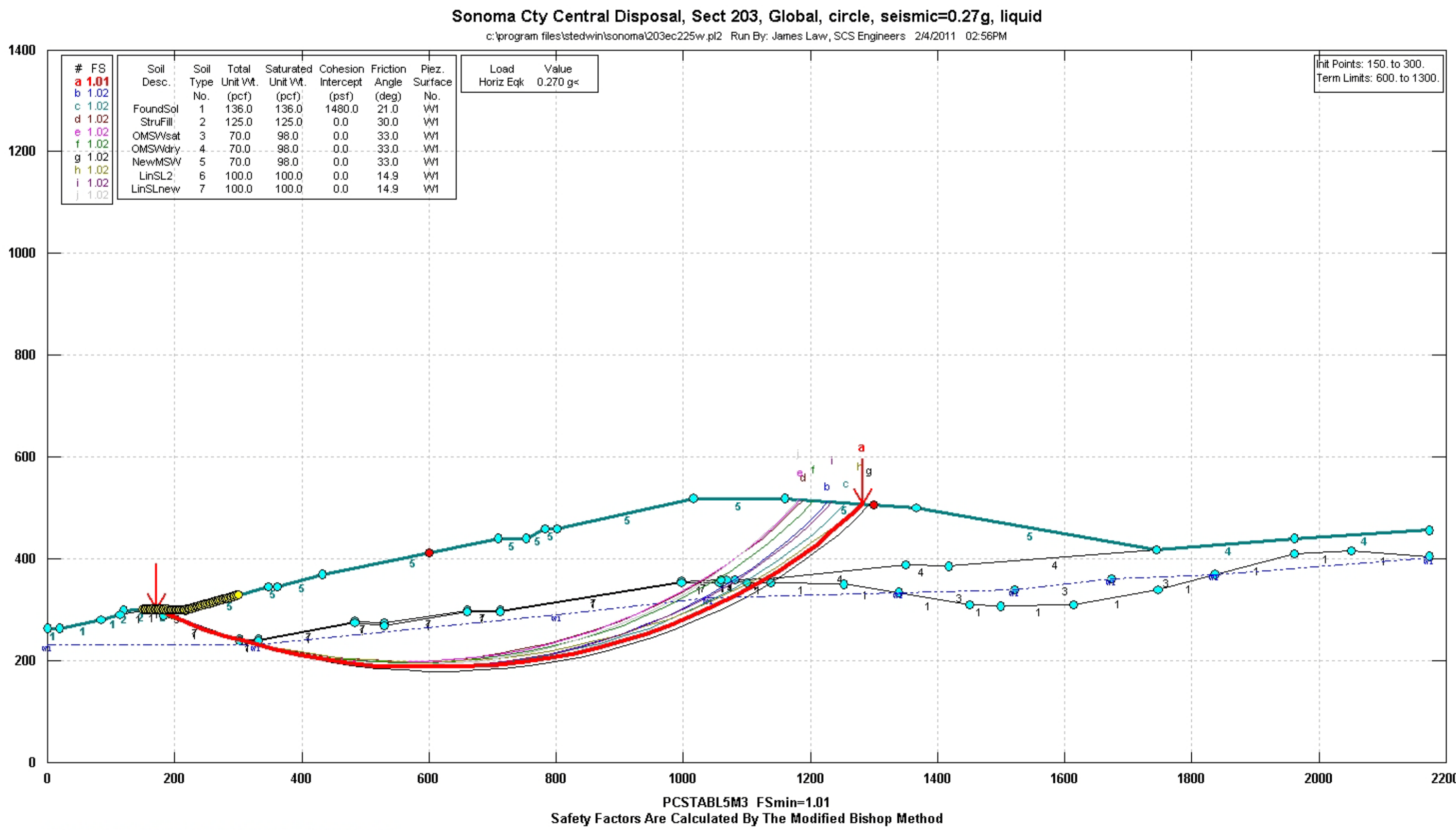
SECTION 203

Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y


Sonoma Cty Central Disposal, Sect 203, Global, circle, seismic=0.27g, liquid
c:\program files\stedwin\sonoma\203ec225w.plt Run By: James Law, SCS Engineers 2/4/2011 02:56PM
Init Points: 150. to 300.
Term Limits: 600. to 1300.
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
SCS ENGINEERS



SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/4/2011
Time of Run:	02:56PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:203ec225w.in
Output Filename:	C:203ec225w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:203ec225w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 203,
Global, circle, seismic=0.27g, liquid

BOUNDARY COORDINATES

19 Top   Boundaries
61 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	263.00	20.00	263.00	1
2	20.00	263.00	85.00	280.00	1
3	85.00	280.00	115.00	291.00	1
4	115.00	291.00	120.00	300.00	2
5	120.00	300.00	167.00	301.00	2
6	167.00	301.00	217.00	300.00	2
7	217.00	300.00	348.00	346.00	5
8	348.00	346.00	360.00	346.00	5
9	360.00	346.00	432.00	370.00	5
10	432.00	370.00	710.00	440.00	5
11	710.00	440.00	752.00	440.00	5
12	752.00	440.00	782.00	460.00	5
13	782.00	460.00	800.00	460.00	5
14	800.00	460.00	1017.00	520.00	5
15	1017.00	520.00	1159.00	520.00	5
16	1159.00	520.00	1365.00	500.00	5
17	1365.00	500.00	1745.00	418.00	5
18	1745.00	418.00	1960.00	440.00	4
19	1960.00	440.00	2173.00	457.00	4
20	115.00	291.00	167.00	301.00	1
21	167.00	301.00	182.00	292.00	1
22	182.00	292.00	217.00	300.00	5
23	182.00	292.00	302.00	242.00	7
24	302.00	242.00	331.00	243.00	7
25	331.00	243.00	484.00	278.00	7
26	484.00	278.00	530.00	274.00	7

27	530.00	274.00	660.00	300.00	7
28	660.00	300.00	712.00	300.00	7
29	712.00	300.00	997.00	356.00	7
30	997.00	356.00	1058.00	358.00	7
31	1058.00	358.00	1068.00	358.00	1
32	1068.00	358.00	1080.00	358.00	4
33	1080.00	358.00	1135.00	360.00	4
34	1135.00	360.00	1350.00	389.00	4
35	1350.00	389.00	1419.00	387.00	4
36	1419.00	387.00	1745.00	418.00	4
37	182.00	292.00	183.00	288.00	1
38	183.00	288.00	302.00	238.00	1
39	302.00	238.00	331.00	239.00	1
40	331.00	239.00	484.00	274.00	1
41	484.00	274.00	530.00	270.00	1
42	530.00	270.00	660.00	296.00	1
43	660.00	296.00	712.00	296.00	1
44	712.00	296.00	997.00	352.00	1
45	997.00	352.00	1057.00	354.00	1
46	1057.00	354.00	1058.00	358.00	1
47	1068.00	358.00	1100.00	353.00	1
48	1100.00	353.00	1138.00	352.00	1
49	1138.00	352.00	1253.00	350.00	1
50	1253.00	350.00	1340.00	333.00	1
51	1340.00	333.00	1520.00	340.00	3
52	1520.00	340.00	1672.00	360.00	3
53	1672.00	360.00	1835.00	370.00	3
54	1835.00	370.00	1960.00	410.00	1
55	1960.00	410.00	2050.00	415.00	1
56	2050.00	415.00	2173.00	406.00	1
57	1340.00	333.00	1450.00	310.00	1
58	1450.00	310.00	1500.00	306.00	1
59	1500.00	306.00	1613.00	310.00	1
60	1613.00	310.00	1747.00	340.00	1
61	1747.00	340.00	1835.00	370.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
2	330.00	230.00
3	800.00	290.00
4	1040.00	322.00
5	1340.00	333.00
6	1520.00	340.00
7	1672.00	360.00
8	1835.00	370.00
9	2173.00	403.00

A Horizontal Earthquake Loading Coefficient
Of0.270 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 150.00 ft.
and X = 300.00 ft.

Each Surface Terminates Between X = 600.00 ft.
and X =1300.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -30.0 And 0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	170.34	300.93
2	205.56	281.98
3	241.61	264.64
4	278.41	248.97
5	315.89	234.99
6	353.96	222.72
7	392.56	212.21
8	431.59	203.47
9	470.98	196.51
10	510.65	191.35
11	550.51	188.00
12	590.48	186.48
13	630.47	186.77
14	670.42	188.89
15	710.22	192.82
16	749.81	198.56
17	789.09	206.10
18	827.99	215.42
19	866.43	226.51
20	904.32	239.33
21	941.58	253.86
22	978.15	270.08
23	1013.94	287.94
24	1048.88	307.42
25	1082.89	328.46
26	1115.91	351.04
27	1147.87	375.09
28	1178.70	400.57
29	1208.34	427.44
30	1236.73	455.62
31	1263.80	485.07
32	1282.99	507.96

Circle Center At X = 603.9 ; Y = 1064.1 and Radius, 877.7

*** 1.010 ***

Individual data on the 61 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	15.1	7410.3	0.0	0.0	0.0	0.0	2000.8	0.0	0.0
2	18.4	21844.9	0.0	0.0	0.0	0.0	5898.1	0.0	0.0
3	1.7	2416.3	0.0	0.0	0.0	0.0	652.4	0.0	0.0

4	11.4	17816.7	0.0	0.0	0.0	0.0	4810.5	0.0	0.0
5	24.6	59442.5	0.0	0.0	0.0	0.0	16049.5	0.0	0.0
6	36.8	153152.8	0.0	0.0	0.0	0.0	41351.3	0.0	0.0
7	23.6	135634.6	0.0	0.0	0.0	0.0	36621.3	0.0	0.0
8	5.3	34560.4	0.0	0.0	0.0	0.0	9331.3	0.0	0.0
9	8.6	59998.4	0.0	0.0	0.0	0.0	16199.6	0.0	0.0
10	15.1	118712.5	0.0	0.0	0.0	0.0	32052.4	0.0	0.0
11	0.0	155.1	0.0	0.0	0.0	0.0	41.9	0.0	0.0
12	17.0	154860.1	0.0	4234.7	0.0	0.0	41812.2	0.0	0.0
13	6.0	59599.6	0.0	3487.6	0.0	0.0	16091.9	0.0	0.0
14	6.0	62344.9	0.0	4470.1	0.0	0.0	16833.1	0.0	0.0
15	32.6	381357.8	0.0	40233.0	0.0	0.0	*******	0.0	0.0
16	39.0	557656.8	0.0	80813.9	0.0	0.0	*******	0.0	0.0
17	0.4	6429.6	0.0	1022.1	0.0	0.0	1736.0	0.0	0.0
18	39.0	653424.9	0.0	111627.2	0.0	0.0	*******	0.0	0.0
19	13.0	236950.1	0.0	43213.5	0.0	0.0	63976.5	0.0	0.0
20	26.6	504121.5	0.0	96929.6	0.0	0.0	*******	0.0	0.0
21	19.4	378177.9	0.0	76655.7	0.0	0.0	*******	0.0	0.0
22	20.5	414157.5	0.0	86582.8	0.0	0.0	*******	0.0	0.0
23	40.0	853408.4	0.0	181886.9	0.0	0.0	*******	0.0	0.0
24	40.0	906659.4	0.0	196050.4	0.0	0.0	*******	0.0	0.0
25	29.5	697156.1	0.0	151333.8	0.0	0.0	*******	0.0	0.0
26	10.4	250208.7	0.0	54365.4	0.0	0.0	67556.4	0.0	0.0
27	39.6	955979.9	0.0	209614.3	0.0	0.0	*******	0.0	0.0
28	0.2	5450.5	0.0	1199.1	0.0	0.0	1471.6	0.0	0.0
29	1.8	42983.1	0.0	9515.2	0.0	0.0	11605.4	0.0	0.0
30	37.8	910078.1	0.0	201866.9	0.0	0.0	*******	0.0	0.0
31	2.2	52386.1	0.0	11723.9	0.0	0.0	14144.2	0.0	0.0
32	30.0	732475.8	0.0	158690.2	0.0	0.0	*******	0.0	0.0
33	7.1	176436.3	0.0	36990.4	0.0	0.0	47637.8	0.0	0.0
34	10.9	269590.2	0.0	56851.1	0.0	0.0	72789.4	0.0	0.0
35	28.0	688846.1	0.0	142076.5	0.0	0.0	*******	0.0	0.0
36	38.4	940559.4	0.0	186380.9	0.0	0.0	*******	0.0	0.0
37	37.9	912383.8	0.0	169399.6	0.0	0.0	*******	0.0	0.0
38	37.3	873322.1	0.0	147956.0	0.0	0.0	*******	0.0	0.0
39	36.6	824080.6	0.0	122095.0	0.0	0.0	*******	0.0	0.0
40	18.9	408888.8	0.0	52428.4	0.0	0.0	*******	0.0	0.0
41	16.9	355059.2	0.0	39441.5	0.0	0.0	95866.0	0.0	0.0
42	3.1	62732.0	0.0	6491.4	0.0	0.0	16937.7	0.0	0.0
43	23.0	449811.5	0.0	39757.3	0.0	0.0	*******	0.0	0.0
44	8.9	163183.3	0.0	10913.4	0.0	0.0	44059.5	0.0	0.0
45	8.1	143978.5	0.0	7473.5	0.0	0.0	38874.2	0.0	0.0
46	1.0	17421.4	0.0	725.3	0.0	0.0	4703.8	0.0	0.0
47	10.0	170310.7	0.0	4905.3	0.0	0.0	45983.9	0.0	0.0
48	6.5	105852.5	0.0	899.6	0.0	0.0	28580.2	0.0	0.0
49	5.5	86670.3	0.0	0.0	0.0	0.0	23401.0	0.0	0.0
50	2.9	44363.4	0.0	0.0	0.0	0.0	11978.1	0.0	0.0
51	17.1	244989.5	0.0	0.0	0.0	0.0	66147.2	0.0	0.0
52	15.9	201833.6	0.0	0.0	0.0	0.0	54495.1	0.0	0.0
53	2.0	23469.2	0.0	0.0	0.0	0.0	6336.7	0.0	0.0
54	9.6	109685.3	0.0	0.0	0.0	0.0	29615.0	0.0	0.0
55	20.4	218040.2	0.0	0.0	0.0	0.0	58870.9	0.0	0.0
56	11.1	109288.0	0.0	0.0	0.0	0.0	29507.8	0.0	0.0
57	19.7	174631.0	0.0	0.0	0.0	0.0	47150.4	0.0	0.0
58	29.6	212949.2	0.0	0.0	0.0	0.0	57496.3	0.0	0.0
59	28.4	143656.6	0.0	0.0	0.0	0.0	38787.3	0.0	0.0
60	27.1	77305.0	0.0	0.0	0.0	0.0	20872.4	0.0	0.0
61	19.2	16634.2	0.0	0.0	0.0	0.0	4491.2	0.0	0.0

Failure Surface Specified By 31 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	175.42	300.83
2	210.17	281.01
3	245.87	262.97
4	282.43	246.74
5	319.76	232.38
6	357.77	219.92
7	396.36	209.38
8	435.43	200.81
9	474.88	194.21
10	514.62	189.61
11	554.53	187.01
12	594.53	186.43
13	634.50	187.87
14	674.35	191.31
15	713.98	196.76
16	753.28	204.20
17	792.16	213.60
18	830.52	224.96
19	868.25	238.23
20	905.27	253.38
21	941.48	270.38
22	976.78	289.18
23	1011.10	309.74
24	1044.33	332.00
25	1076.40	355.90
26	1107.23	381.39
27	1136.73	408.40
28	1164.84	436.86
29	1191.48	466.70
30	1216.58	497.85
31	1227.81	513.32

Circle Center At X = 586.1 ; Y = 980.3 and Radius, 793.9

*** 1.017 ***

1

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	175.42	300.83
2	210.53	281.65
3	246.51	264.17
4	283.27	248.42
5	320.75	234.45
6	358.85	222.27
7	397.49	211.92
8	436.58	203.43
9	476.03	196.81
10	515.75	192.07
11	555.65	189.23
12	595.64	188.30
13	635.62	189.28
14	675.52	192.15

15	715.23	196.93
16	754.68	203.59
17	793.75	212.13
18	832.38	222.51
19	870.47	234.73
20	907.93	248.75
21	944.69	264.53
22	980.65	282.05
23	1015.73	301.27
24	1049.86	322.13
25	1082.95	344.59
26	1114.94	368.61
27	1145.75	394.12
28	1175.31	421.08
29	1203.54	449.41
30	1230.40	479.05
31	1255.81	509.94
32	1256.27	510.56

Circle Center At X = 595.2 ; Y = 1027.5 and Radius, 839.2

*** 1.017 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	167.80	300.98
2	203.10	282.18
3	239.32	265.20
4	276.35	250.07
5	314.09	236.84
6	352.46	225.53
7	391.36	216.19
8	430.67	208.83
9	470.31	203.47
10	510.17	200.13
11	550.15	198.81
12	590.15	199.52
13	630.05	202.25
14	669.77	207.00
15	709.19	213.76
16	748.23	222.51
17	786.76	233.23
18	824.71	245.88
19	861.96	260.45
20	898.43	276.88
21	934.02	295.14
22	968.64	315.17
23	1002.20	336.94
24	1034.61	360.38
25	1065.80	385.43
26	1095.67	412.03
27	1124.16	440.11
28	1151.18	469.60
29	1176.68	500.42
30	1189.10	517.08

Circle Center At X = 556.1 ; Y = 987.3 and Radius, 788.6

*** 1.018 ***

1

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	167.80	300.98
2	202.95	281.89
3	239.03	264.64
4	275.96	249.26
5	313.63	235.81
6	351.94	224.31
7	390.79	214.80
8	430.08	207.30
9	469.71	201.83
10	509.56	198.40
11	549.54	197.03
12	589.53	197.72
13	629.44	200.47
14	669.15	205.27
15	708.56	212.10
16	747.57	220.96
17	786.07	231.80
18	823.96	244.62
19	861.14	259.37
20	897.52	276.01
21	932.99	294.50
22	967.46	314.79
23	1000.84	336.83
24	1033.04	360.56
25	1063.98	385.91
26	1093.58	412.82
27	1121.75	441.22
28	1148.42	471.03
29	1173.52	502.17
30	1184.64	517.51

Circle Center At X = 556.0 ; Y = 973.6 and Radius, 776.6

*** 1.018 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	172.88	300.88
2	208.10	281.91

3	244.22	264.73
4	281.15	249.38
5	318.82	235.90
6	357.11	224.33
7	395.93	214.70
8	435.19	207.02
9	474.78	201.33
10	514.61	197.63
11	554.57	195.93
12	594.57	196.24
13	634.50	198.55
14	674.27	202.87
15	713.77	209.18
16	752.90	217.46
17	791.57	227.69
18	829.68	239.86
19	867.12	253.91
20	903.82	269.83
21	939.67	287.57
22	974.59	307.09
23	1008.48	328.33
24	1041.26	351.25
25	1072.85	375.79
26	1103.18	401.88
27	1132.15	429.45
28	1159.70	458.45
29	1185.77	488.79
30	1206.40	515.40

Circle Center At X = 568.4 ; Y = 992.5 and Radius, 796.7

*** 1.019 ***

1

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	180.51	300.73
2	215.33	281.05
3	251.03	263.01
4	287.54	246.66
5	324.77	232.03
6	362.64	219.15
7	401.07	208.05
8	439.97	198.75
9	479.27	191.28
10	518.87	185.65
11	558.69	181.87
12	598.64	179.96
13	638.64	179.90
14	678.60	181.72
15	718.43	185.39
16	758.05	190.92
17	797.36	198.29
18	836.29	207.49
19	874.75	218.49

20	912.65	231.27
21	949.92	245.81
22	986.47	262.07
23	1022.21	280.01
24	1057.09	299.60
25	1091.01	320.80
26	1123.91	343.56
27	1155.70	367.82
28	1186.34	393.54
29	1215.74	420.66
30	1243.84	449.13
31	1270.59	478.87
32	1293.55	506.94

Circle Center At X = 619.7 ; Y = 1037.1 and Radius, 857.4

*** 1.020 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	162.71	300.91
2	198.59	283.23
3	235.21	267.13
4	272.49	252.62
5	310.35	239.74
6	348.75	228.51
7	387.59	218.95
8	426.80	211.08
9	466.33	204.91
10	506.08	200.47
11	545.99	197.74
12	585.97	196.75
13	625.97	197.48
14	665.89	199.95
15	705.67	204.14
16	745.23	210.05
17	784.50	217.66
18	823.40	226.97
19	861.87	237.95
20	899.82	250.58
21	937.19	264.85
22	973.90	280.72
23	1009.90	298.16
24	1045.11	317.15
25	1079.46	337.64
26	1112.90	359.60
27	1145.35	382.98
28	1176.76	407.74
29	1207.07	433.85
30	1236.22	461.24
31	1264.16	489.86
32	1280.57	508.20

Circle Center At X = 588.9 ; Y = 1120.5 and Radius, 923.7

*** 1.020 ***

1

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	177.97	300.78
2	212.89	281.28
3	248.74	263.54
4	285.43	247.59
5	322.86	233.49
6	360.94	221.25
7	399.58	210.92
8	438.69	202.52
9	478.16	196.06
10	517.91	191.57
11	557.83	189.05
12	597.83	188.52
13	637.80	189.97
14	677.66	193.40
15	717.29	198.80
16	756.61	206.16
17	795.51	215.45
18	833.91	226.67
19	871.70	239.77
20	908.80	254.73
21	945.11	271.51
22	980.54	290.07
23	1015.01	310.36
24	1048.43	332.34
25	1080.73	355.94
26	1111.81	381.12
27	1141.60	407.81
28	1170.04	435.94
29	1197.05	465.45
30	1222.56	496.25
31	1234.81	512.64

Circle Center At X = 588.6 ; Y = 995.3 and Radius, 806.8

*** 1.021 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	175.42	300.83
2	210.10	280.89
3	245.79	262.83
4	282.40	246.71

5	319.82	232.57
6	357.94	220.46
7	396.65	210.40
8	435.85	202.43
9	475.42	196.57
10	515.24	192.83
11	555.21	191.23
12	595.21	191.78
13	635.12	194.46
14	674.83	199.28
15	714.22	206.21
16	753.19	215.25
17	791.62	226.35
18	829.39	239.50
19	866.41	254.65
20	902.57	271.76
21	937.76	290.78
22	971.88	311.66
23	1004.83	334.33
24	1036.52	358.73
25	1066.86	384.80
26	1095.77	412.45
27	1123.15	441.61
28	1148.93	472.19
29	1173.03	504.11
30	1182.23	517.75

Circle Center At X = 565.0 ; Y = 937.7 and Radius, 746.6

***   1.023   ***

SECTION 203

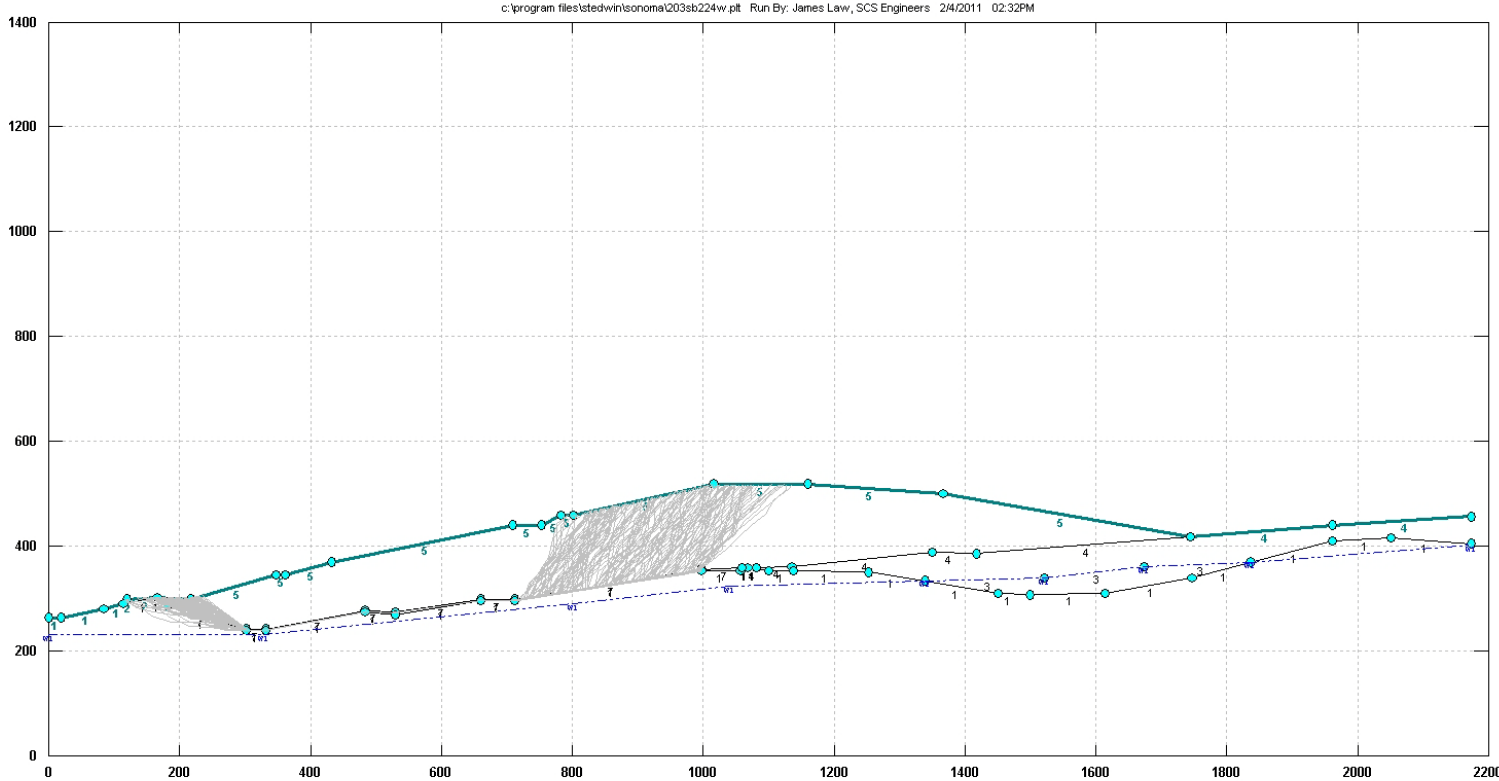
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 203, Global, block, static, liquid

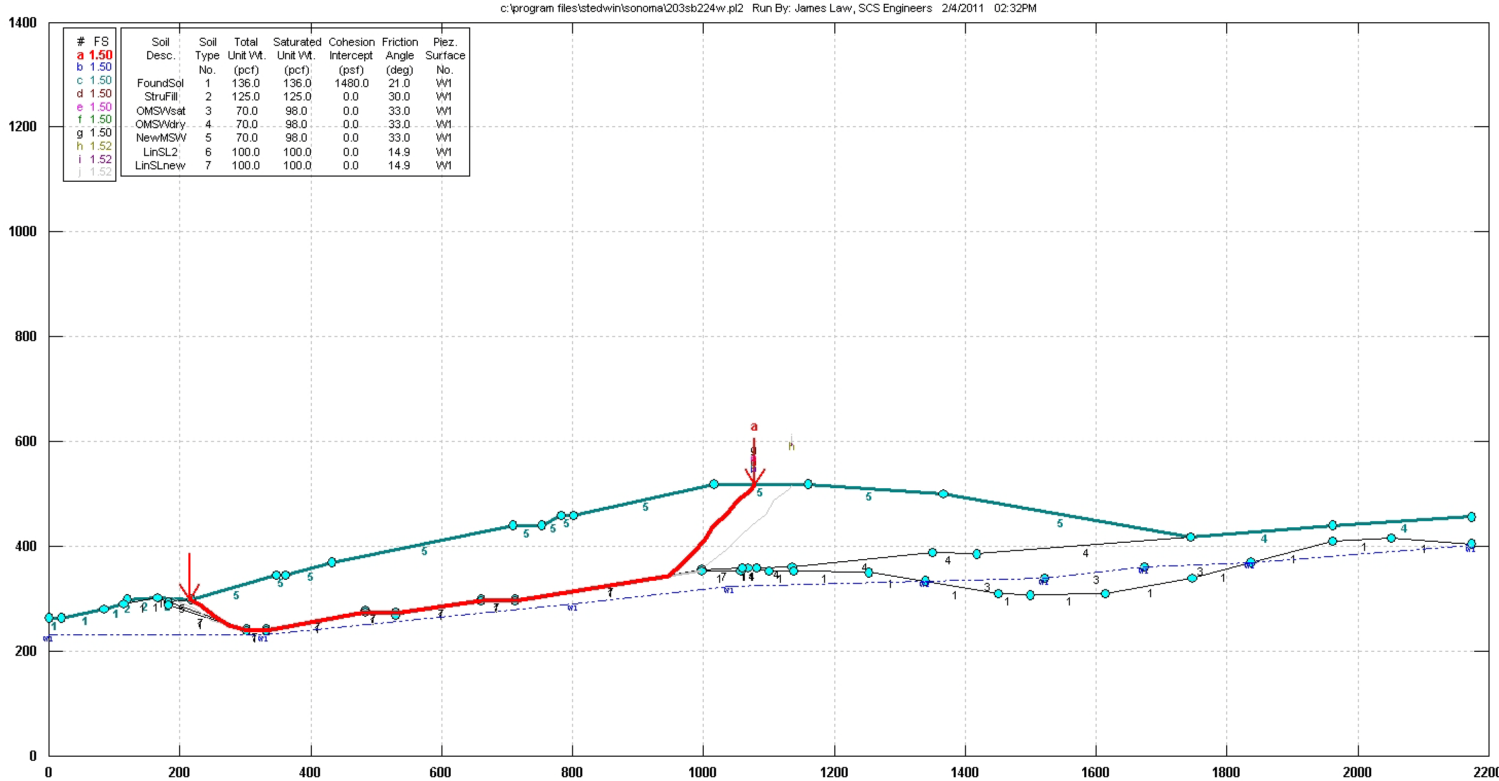
c:\program files\stedwin\sonoma\203sb224w.plt Run By: James Law, SCS Engineers 2/4/2011 02:32PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 203, Global, block, static, liquid

c:\program files\stedwin\sonoma\203sb224w.pl2 Run By: James Law, SCS Engineers 2/4/2011 02:32PM



PCSTABL5M3 FSmin=1.50
Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/4/2011
Time of Run:	02:32PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:203sb224w.in
Output Filename:	C:203sb224w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:203sb224w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 203,
Global, block, static, liquid

BOUNDARY COORDINATES

19 Top   Boundaries
61 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	263.00	20.00	263.00	1
2	20.00	263.00	85.00	280.00	1
3	85.00	280.00	115.00	291.00	1
4	115.00	291.00	120.00	300.00	2
5	120.00	300.00	167.00	301.00	2
6	167.00	301.00	217.00	300.00	2
7	217.00	300.00	348.00	346.00	5
8	348.00	346.00	360.00	346.00	5
9	360.00	346.00	432.00	370.00	5
10	432.00	370.00	710.00	440.00	5
11	710.00	440.00	752.00	440.00	5
12	752.00	440.00	782.00	460.00	5
13	782.00	460.00	800.00	460.00	5
14	800.00	460.00	1017.00	520.00	5
15	1017.00	520.00	1159.00	520.00	5
16	1159.00	520.00	1365.00	500.00	5
17	1365.00	500.00	1745.00	418.00	5
18	1745.00	418.00	1960.00	440.00	4
19	1960.00	440.00	2173.00	457.00	4
20	115.00	291.00	167.00	301.00	1
21	167.00	301.00	182.00	292.00	1
22	182.00	292.00	217.00	300.00	5
23	182.00	292.00	302.00	242.00	7
24	302.00	242.00	331.00	243.00	7
25	331.00	243.00	484.00	278.00	7
26	484.00	278.00	530.00	274.00	7

27	530.00	274.00	660.00	300.00	7
28	660.00	300.00	712.00	300.00	7
29	712.00	300.00	997.00	356.00	7
30	997.00	356.00	1058.00	358.00	7
31	1058.00	358.00	1068.00	358.00	1
32	1068.00	358.00	1080.00	358.00	4
33	1080.00	358.00	1135.00	360.00	4
34	1135.00	360.00	1350.00	389.00	4
35	1350.00	389.00	1419.00	387.00	4
36	1419.00	387.00	1745.00	418.00	4
37	182.00	292.00	183.00	288.00	1
38	183.00	288.00	302.00	238.00	1
39	302.00	238.00	331.00	239.00	1
40	331.00	239.00	484.00	274.00	1
41	484.00	274.00	530.00	270.00	1
42	530.00	270.00	660.00	296.00	1
43	660.00	296.00	712.00	296.00	1
44	712.00	296.00	997.00	352.00	1
45	997.00	352.00	1057.00	354.00	1
46	1057.00	354.00	1058.00	358.00	1
47	1068.00	358.00	1100.00	353.00	1
48	1100.00	353.00	1138.00	352.00	1
49	1138.00	352.00	1253.00	350.00	1
50	1253.00	350.00	1340.00	333.00	1
51	1340.00	333.00	1520.00	340.00	3
52	1520.00	340.00	1672.00	360.00	3
53	1672.00	360.00	1835.00	370.00	3
54	1835.00	370.00	1960.00	410.00	1
55	1960.00	410.00	2050.00	415.00	1
56	2050.00	415.00	2173.00	406.00	1
57	1340.00	333.00	1450.00	310.00	1
58	1450.00	310.00	1500.00	306.00	1
59	1500.00	306.00	1613.00	310.00	1
60	1613.00	310.00	1747.00	340.00	1
61	1747.00	340.00	1835.00	370.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
2	330.00	230.00
3	800.00	290.00
4	1040.00	322.00
5	1340.00	333.00
6	1520.00	340.00
7	1672.00	360.00
8	1835.00	370.00
9	2173.00	403.00

1

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

1000 Trial Surfaces Have Been Generated.

7 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	302.00	239.00	304.00	239.00	0.50
2	329.00	240.00	331.00	240.00	0.50
3	483.00	275.00	485.00	275.00	0.50
4	528.00	271.00	530.00	271.00	0.50
5	659.00	297.00	661.00	297.00	0.50
6	710.00	297.00	712.00	297.00	0.50
7	713.00	297.00	997.00	353.00	0.50

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 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.45	300.07

2	229.54	287.35
3	251.49	266.91
4	275.66	249.13
5	303.84	238.85
6	330.86	240.04
7	483.85	275.04
8	529.73	270.90
9	659.95	297.04
10	710.44	296.75
11	945.74	343.11
12	966.33	364.93
13	985.28	388.18
14	1003.62	411.93
15	1015.18	439.61
16	1034.70	462.39
17	1051.07	487.53
18	1071.95	509.07
19	1077.51	520.00

*** 1.500 ***

Individual data on the 36 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	0.9	36.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2.7	369.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	12.5	8681.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	22.0	47836.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	12.1	43903.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	12.1	55455.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	26.3	151679.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	1.8	11877.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	27.0	183697.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.1	972.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	17.0	121680.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	12.0	85612.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	72.0	525723.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	51.8	394386.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.2	1177.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	45.7	375129.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.3	2381.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	129.9	1167274.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.1	500.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	50.0	483491.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.4	4423.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	1.6	15802.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	40.0	392720.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	30.0	301045.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	18.0	187263.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	145.7	1557079.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	3.3	35802.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	17.3	179199.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	19.0	175232.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	18.3	145939.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	11.6	74548.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

32	1.8	10084.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	17.7	84151.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	16.4	51628.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	20.9	31716.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	5.6	2126.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.45	300.07
2	229.54	287.35
3	251.49	266.91
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*** 1.500 ***

1

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12	966.33	364.93
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14	1003.62	411.93
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*** 1.500 ***

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11	945.74	343.11
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*** 1.500 ***

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Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.45	300.07
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13	985.28	388.18
14	1003.62	411.93

15	1015.18	439.61
16	1034.70	462.39
17	1051.07	487.53
18	1071.95	509.07
19	1077.51	520.00

*** 1.500 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	189.56	300.55
2	197.94	292.86
3	224.84	279.57
4	247.02	259.37
5	275.43	249.74
6	303.46	239.06
7	329.01	240.14
8	483.95	275.20
9	528.73	271.16
10	660.29	296.83
11	710.05	296.87
12	992.20	351.88
13	1013.05	373.45
14	1033.74	395.17
15	1052.66	418.46
16	1072.47	440.98
17	1093.37	462.51
18	1109.41	487.86
19	1130.55	509.14
20	1136.09	520.00

*** 1.517 ***

1

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	189.56	300.55
2	197.94	292.86
3	224.84	279.57
4	247.02	259.37
5	275.43	249.74
6	303.46	239.06
7	329.01	240.14
8	483.95	275.20
9	528.73	271.16
10	660.29	296.83
11	710.05	296.87

12	992.20	351.88
13	1013.05	373.45
14	1033.74	395.17
15	1052.66	418.46
16	1072.47	440.98
17	1093.37	462.51
18	1109.41	487.86
19	1130.55	509.14
20	1136.09	520.00

*** 1.517 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	189.56	300.55
2	197.94	292.86
3	224.84	279.57
4	247.02	259.37
5	275.43	249.74
6	303.46	239.06
7	329.01	240.14
8	483.95	275.20
9	528.73	271.16
10	660.29	296.83
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12	992.20	351.88
13	1013.05	373.45
14	1033.74	395.17
15	1052.66	418.46
16	1072.47	440.98
17	1093.37	462.51
18	1109.41	487.86
19	1130.55	509.14
20	1136.09	520.00

*** 1.517 ***

SECTION 203

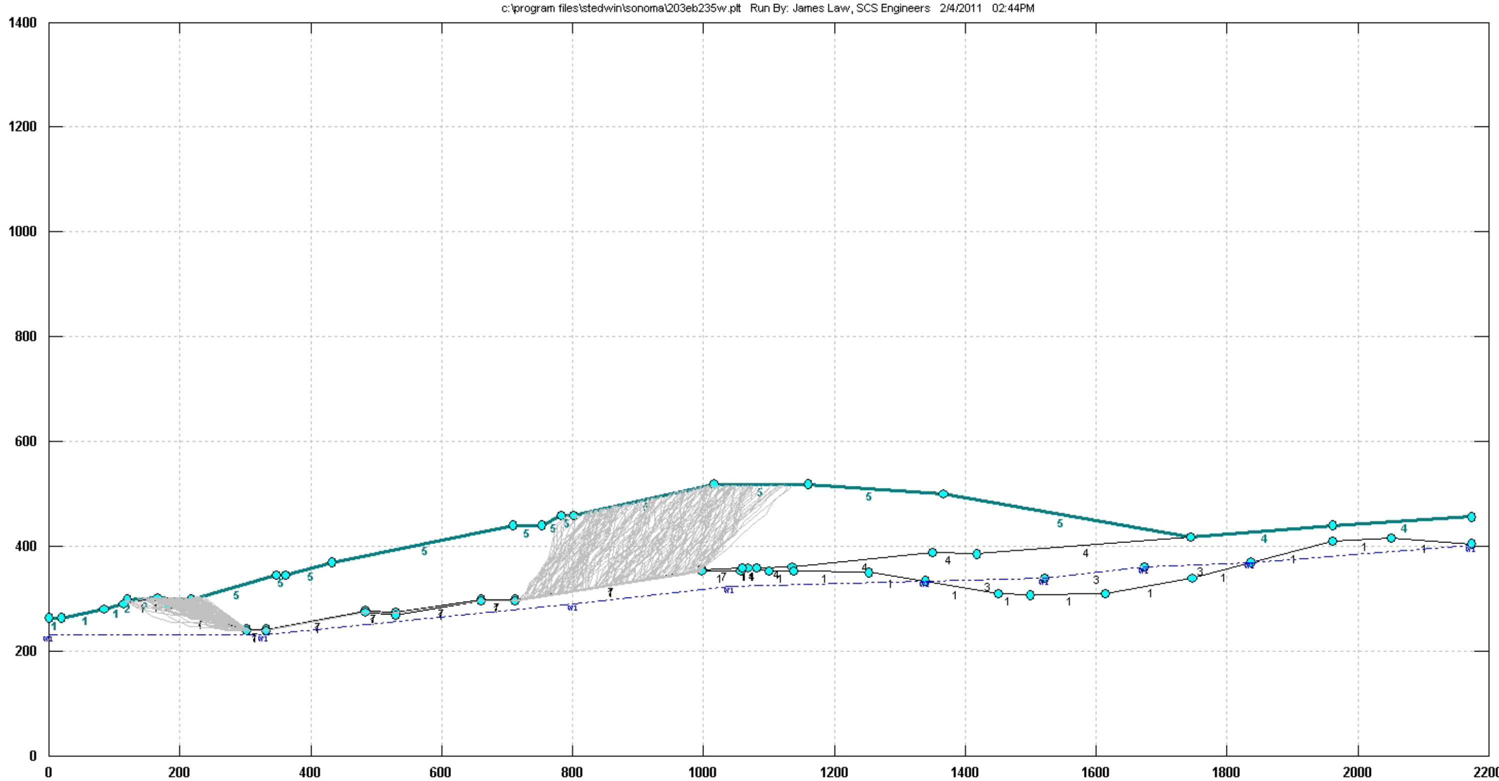
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

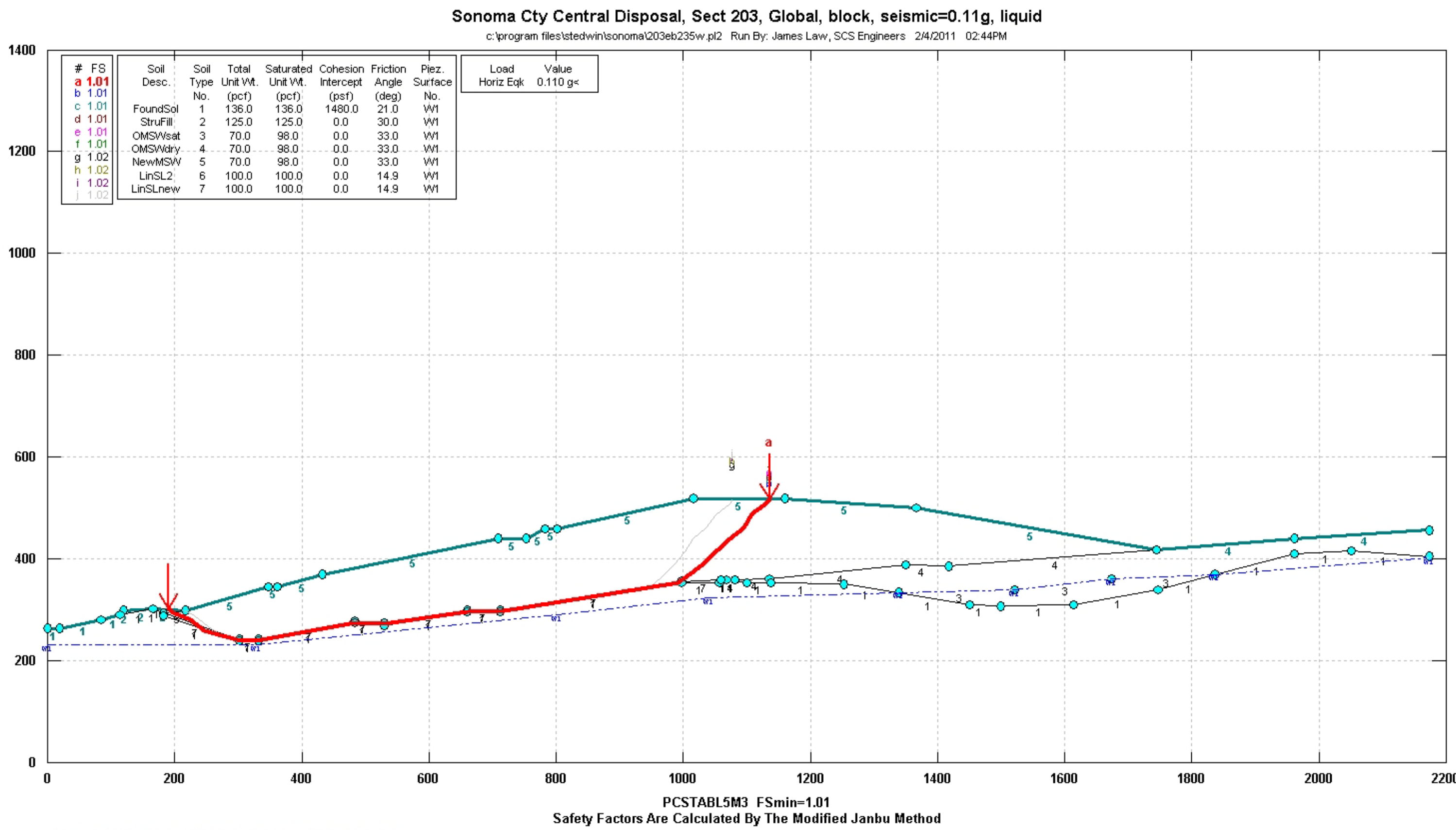
Seismic at k_y

Sonoma Cty Central Disposal, Sect 203, Global, block, seismic=0.11g, liquid

c:\program files\stedwin\sonoma\203eb235w.plt Run By: James Law, SCS Engineers 2/4/2011 02:44PM



SCS ENGINEERS



SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date: 2/4/2011
Time of Run: 02:44PM
Run By: James Law, SCS Engineers
Input Data Filename: C:203eb235w.in
Output Filename: C:203eb235w.OUT
Unit: ENGLISH
Plotted Output Filename: C:203eb235w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 203,
Global, block, seismic=0.11g, liquid

BOUNDARY COORDINATES

19 Top Boundaries
61 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	263.00	20.00	263.00	1
2	20.00	263.00	85.00	280.00	1
3	85.00	280.00	115.00	291.00	1
4	115.00	291.00	120.00	300.00	2
5	120.00	300.00	167.00	301.00	2
6	167.00	301.00	217.00	300.00	2
7	217.00	300.00	348.00	346.00	5
8	348.00	346.00	360.00	346.00	5
9	360.00	346.00	432.00	370.00	5
10	432.00	370.00	710.00	440.00	5
11	710.00	440.00	752.00	440.00	5
12	752.00	440.00	782.00	460.00	5
13	782.00	460.00	800.00	460.00	5
14	800.00	460.00	1017.00	520.00	5
15	1017.00	520.00	1159.00	520.00	5
16	1159.00	520.00	1365.00	500.00	5
17	1365.00	500.00	1745.00	418.00	5
18	1745.00	418.00	1960.00	440.00	4
19	1960.00	440.00	2173.00	457.00	4
20	115.00	291.00	167.00	301.00	1
21	167.00	301.00	182.00	292.00	1
22	182.00	292.00	217.00	300.00	5
23	182.00	292.00	302.00	242.00	7
24	302.00	242.00	331.00	243.00	7
25	331.00	243.00	484.00	278.00	7
26	484.00	278.00	530.00	274.00	7

27	530.00	274.00	660.00	300.00	7
28	660.00	300.00	712.00	300.00	7
29	712.00	300.00	997.00	356.00	7
30	997.00	356.00	1058.00	358.00	7
31	1058.00	358.00	1068.00	358.00	1
32	1068.00	358.00	1080.00	358.00	4
33	1080.00	358.00	1135.00	360.00	4
34	1135.00	360.00	1350.00	389.00	4
35	1350.00	389.00	1419.00	387.00	4
36	1419.00	387.00	1745.00	418.00	4
37	182.00	292.00	183.00	288.00	1
38	183.00	288.00	302.00	238.00	1
39	302.00	238.00	331.00	239.00	1
40	331.00	239.00	484.00	274.00	1
41	484.00	274.00	530.00	270.00	1
42	530.00	270.00	660.00	296.00	1
43	660.00	296.00	712.00	296.00	1
44	712.00	296.00	997.00	352.00	1
45	997.00	352.00	1057.00	354.00	1
46	1057.00	354.00	1058.00	358.00	1
47	1068.00	358.00	1100.00	353.00	1
48	1100.00	353.00	1138.00	352.00	1
49	1138.00	352.00	1253.00	350.00	1
50	1253.00	350.00	1340.00	333.00	1
51	1340.00	333.00	1520.00	340.00	3
52	1520.00	340.00	1672.00	360.00	3
53	1672.00	360.00	1835.00	370.00	3
54	1835.00	370.00	1960.00	410.00	1
55	1960.00	410.00	2050.00	415.00	1
56	2050.00	415.00	2173.00	406.00	1
57	1340.00	333.00	1450.00	310.00	1
58	1450.00	310.00	1500.00	306.00	1
59	1500.00	306.00	1613.00	310.00	1
60	1613.00	310.00	1747.00	340.00	1
61	1747.00	340.00	1835.00	370.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	230.00
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3	800.00	290.00
4	1040.00	322.00
5	1340.00	333.00
6	1520.00	340.00
7	1672.00	360.00
8	1835.00	370.00
9	2173.00	403.00

A Horizontal Earthquake Loading Coefficient
Of0.110 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

1

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

1000 Trial Surfaces Have Been Generated.

7 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	302.00	239.00	304.00	239.00	0.50
2	329.00	240.00	331.00	240.00	0.50
3	483.00	275.00	485.00	275.00	0.50
4	528.00	271.00	530.00	271.00	0.50
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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 20 Coordinate Points

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3	224.84	279.57
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5	275.43	249.74
6	303.46	239.06
7	329.01	240.14
8	483.95	275.20
9	528.73	271.16
10	660.29	296.83
11	710.05	296.87
12	992.20	351.88
13	1013.05	373.45
14	1033.74	395.17
15	1052.66	418.46
16	1072.47	440.98
17	1093.37	462.51
18	1109.41	487.86
19	1130.55	509.14
20	1136.09	520.00

*** 1.008 ***

Individual data on the 39 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.0	1988.4	0.0	0.0	0.0	0.0	218.7	0.0	0.0
2	2.4	1766.0	0.0	0.0	0.0	0.0	194.3	0.0	0.0
3	19.1	18540.1	0.0	0.0	0.0	0.0	2039.4	0.0	0.0
4	7.8	10900.5	0.0	0.0	0.0	0.0	1199.1	0.0	0.0
5	11.0	23095.7	0.0	0.0	0.0	0.0	2540.5	0.0	0.0
6	7.7	22947.7	0.0	0.0	0.0	0.0	2524.2	0.0	0.0
7	3.5	12724.8	0.0	0.0	0.0	0.0	1399.7	0.0	0.0
8	21.4	91316.0	0.0	0.0	0.0	0.0	10044.8	0.0	0.0
9	7.0	34409.1	0.0	0.0	0.0	0.0	3785.0	0.0	0.0
10	26.6	152022.6	0.0	0.0	0.0	0.0	16722.5	0.0	0.0
11	1.5	9421.4	0.0	0.0	0.0	0.0	1036.3	0.0	0.0
12	25.5	172542.0	0.0	0.0	0.0	0.0	18979.6	0.0	0.0
13	2.0	13989.6	0.0	0.0	0.0	0.0	1538.9	0.0	0.0
14	17.0	120841.0	0.0	0.0	0.0	0.0	13292.5	0.0	0.0
15	12.0	85063.5	0.0	0.0	0.0	0.0	9357.0	0.0	0.0
16	72.0	523185.8	0.0	0.0	0.0	0.0	57550.4	0.0	0.0
17	52.0	394190.7	0.0	0.0	0.0	0.0	43361.0	0.0	0.0
18	0.0	347.7	0.0	0.0	0.0	0.0	38.2	0.0	0.0
19	44.7	365684.0	0.0	0.0	0.0	0.0	40225.2	0.0	0.0
20	1.3	11019.2	0.0	0.0	0.0	0.0	1212.1	0.0	0.0

21	130.0	1166584.6	0.0	0.0	0.0	0.0	*******	0.0	0.0
22	0.3	2665.6	0.0	0.0	0.0	0.0	293.2	0.0	0.0
23	49.7	481049.0	0.0	0.0	0.0	0.0	52915.4	0.0	0.0
24	0.1	537.0	0.0	0.0	0.0	0.0	59.1	0.0	0.0
25	1.9	19651.9	0.0	0.0	0.0	0.0	2161.7	0.0	0.0
26	40.0	392115.6	0.0	0.0	0.0	0.0	43132.7	0.0	0.0
27	30.0	300803.2	0.0	0.0	0.0	0.0	33088.4	0.0	0.0
28	18.0	187205.3	0.0	0.0	0.0	0.0	20592.6	0.0	0.0
29	192.2	2081620.9	0.0	0.0	0.0	0.0	*******	0.0	0.0
30	3.8	42562.2	0.0	0.0	0.0	0.0	4681.8	0.0	0.0
31	17.1	181504.2	0.0	0.0	0.0	0.0	19965.5	0.0	0.0
32	3.9	39758.4	0.0	0.0	0.0	0.0	4373.4	0.0	0.0
33	16.7	156591.0	0.0	0.0	0.0	0.0	17225.0	0.0	0.0
34	18.9	149888.0	0.0	0.0	0.0	0.0	16487.7	0.0	0.0
35	19.8	125218.4	0.0	0.0	0.0	0.0	13774.0	0.0	0.0
36	20.9	99845.5	0.0	0.0	0.0	0.0	10983.0	0.0	0.0
37	16.0	50309.9	0.0	0.0	0.0	0.0	5534.1	0.0	0.0
38	21.1	31818.9	0.0	0.0	0.0	0.0	3500.1	0.0	0.0
39	5.5	2104.3	0.0	0.0	0.0	0.0	231.5	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	189.56	300.55
2	197.94	292.86
3	224.84	279.57
4	247.02	259.37
5	275.43	249.74
6	303.46	239.06
7	329.01	240.14
8	483.95	275.20
9	528.73	271.16
10	660.29	296.83
11	710.05	296.87
12	992.20	351.88
13	1013.05	373.45
14	1033.74	395.17
15	1052.66	418.46
16	1072.47	440.98
17	1093.37	462.51
18	1109.41	487.86
19	1130.55	509.14
20	1136.09	520.00

*** 1.008 ***

1

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	189.56	300.55
2	197.94	292.86
3	224.84	279.57

4	247.02	259.37
5	275.43	249.74
6	303.46	239.06
7	329.01	240.14
8	483.95	275.20
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10	660.29	296.83
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*** 1.008 ***

1

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14	1033.74	395.17
15	1052.66	418.46
16	1072.47	440.98
17	1093.37	462.51
18	1109.41	487.86
19	1130.55	509.14
20	1136.09	520.00

*** 1.008 ***

1

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.45	300.07
2	229.54	287.35
3	251.49	266.91
4	275.66	249.13
5	303.84	238.85
6	330.86	240.04
7	483.85	275.04
8	529.73	270.90
9	659.95	297.04
10	710.44	296.75
11	945.74	343.11
12	966.33	364.93
13	985.28	388.18
14	1003.62	411.93
15	1015.18	439.61
16	1034.70	462.39
17	1051.07	487.53
18	1071.95	509.07
19	1077.51	520.00

*** 1.024 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.45	300.07
2	229.54	287.35
3	251.49	266.91
4	275.66	249.13
5	303.84	238.85
6	330.86	240.04
7	483.85	275.04
8	529.73	270.90
9	659.95	297.04
10	710.44	296.75
11	945.74	343.11
12	966.33	364.93
13	985.28	388.18
14	1003.62	411.93
15	1015.18	439.61
16	1034.70	462.39
17	1051.07	487.53
18	1071.95	509.07
19	1077.51	520.00

*** 1.024 ***

1

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.45	300.07
2	229.54	287.35
3	251.49	266.91
4	275.66	249.13
5	303.84	238.85
6	330.86	240.04
7	483.85	275.04
8	529.73	270.90
9	659.95	297.04
10	710.44	296.75
11	945.74	343.11
12	966.33	364.93
13	985.28	388.18
14	1003.62	411.93
15	1015.18	439.61
16	1034.70	462.39
17	1051.07	487.53
18	1071.95	509.07
19	1077.51	520.00

*** 1.024 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	213.45	300.07
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3	251.49	266.91
4	275.66	249.13
5	303.84	238.85
6	330.86	240.04
7	483.85	275.04
8	529.73	270.90
9	659.95	297.04
10	710.44	296.75
11	945.74	343.11
12	966.33	364.93
13	985.28	388.18
14	1003.62	411.93
15	1015.18	439.61
16	1034.70	462.39
17	1051.07	487.53
18	1071.95	509.07
19	1077.51	520.00

*** 1.024 ***

SECTION 204

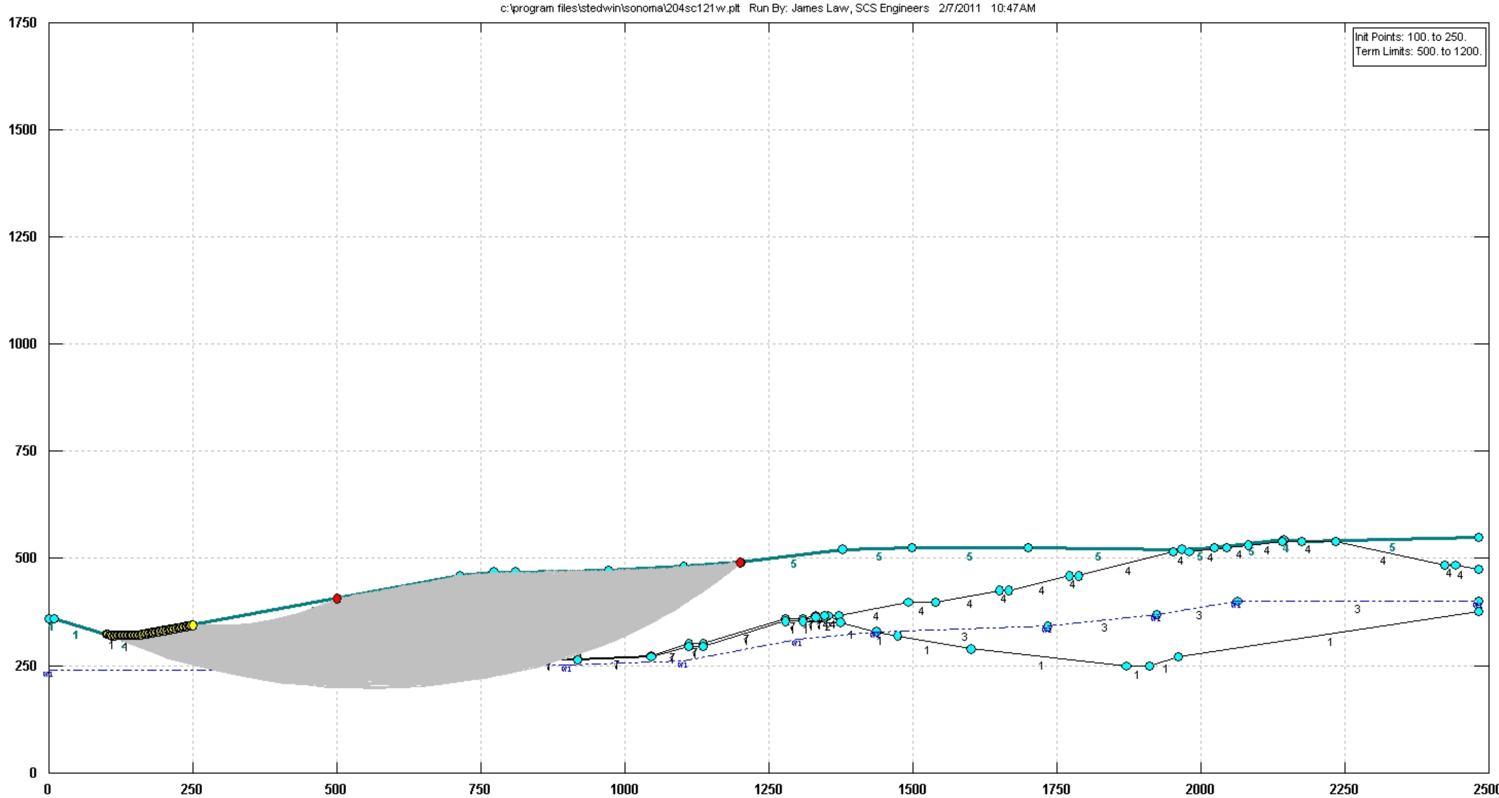
Circular Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 204, Global, circle, static, liquid

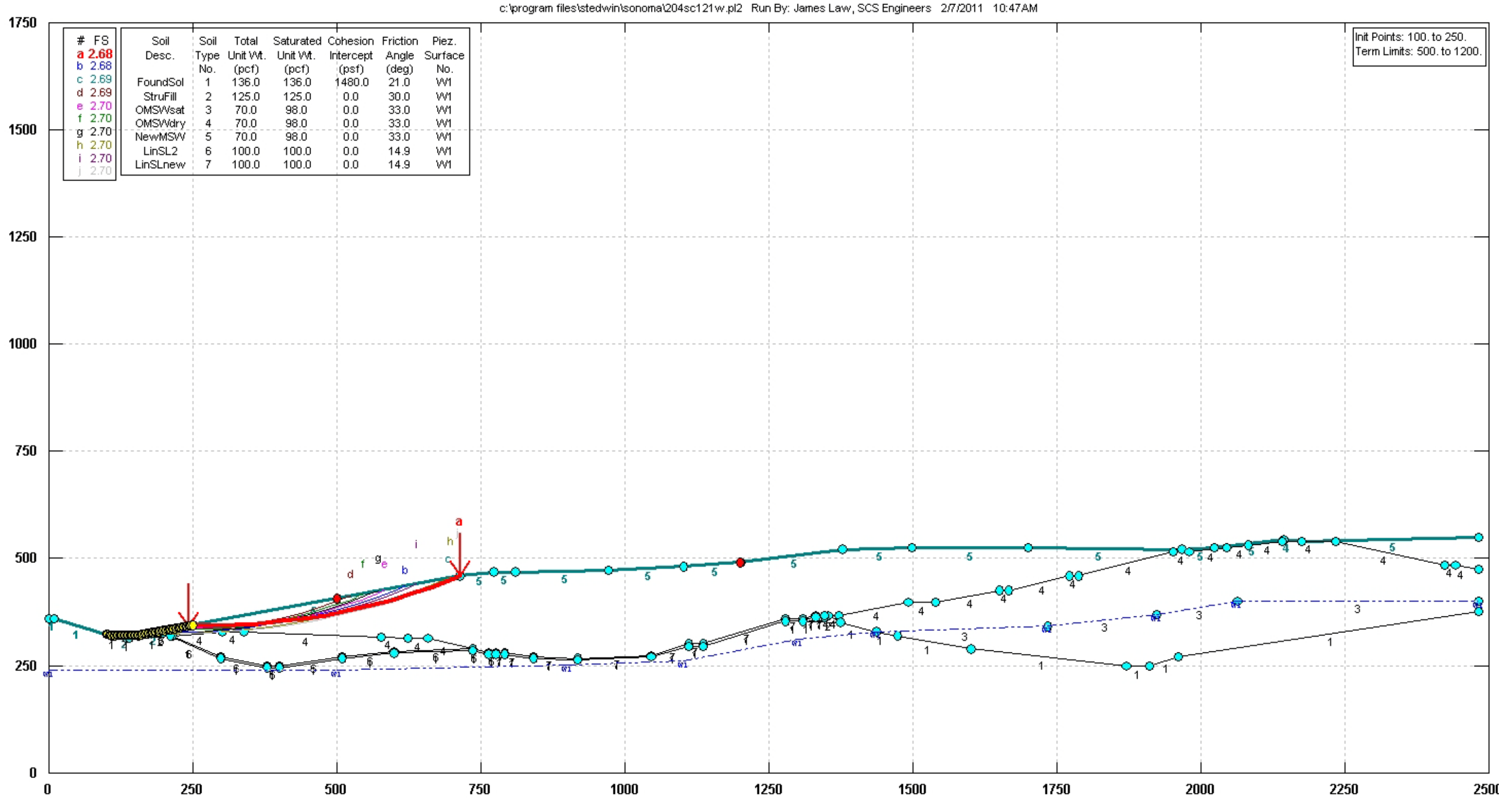
c:\program files\stedwin\sonoma\204sc121w.plt Run By: James Law, SCS Engineers 2/7/2011 10:47AM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 204, Global, circle, static, liquid

c:\program files\stedwin\sonoma\204sc121w.pl2 Run By: James Law, SCS Engineers 2/7/2011 10:47AM



PCSTABL5M3 FSmin=2.68

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date: 2/7/2011
Time of Run: 10:47AM
Run By: James Law, SCS Engineers
Input Data Filename: C:204sc121w.in
Output Filename: C:204sc121w.OUT
Unit: ENGLISH
Plotted Output Filename: C:204sc121w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 204,
Global, circle, static, liquid

BOUNDARY COORDINATES

18 Top Boundaries
97 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	360.00	10.00	360.00	1
2	10.00	360.00	109.00	320.00	1
3	109.00	320.00	156.00	321.00	2
4	156.00	321.00	198.00	331.00	2
5	198.00	331.00	714.00	460.00	5
6	714.00	460.00	774.00	468.00	5
7	774.00	468.00	811.00	469.00	5
8	811.00	469.00	970.00	472.00	5
9	970.00	472.00	1100.00	480.00	5
10	1100.00	480.00	1200.00	490.00	5
11	1200.00	490.00	1376.00	520.00	5
12	1376.00	520.00	1500.00	525.00	5
13	1500.00	525.00	1700.00	525.00	5
14	1700.00	525.00	1968.00	521.00	5
15	1968.00	521.00	2022.00	523.00	5
16	2022.00	523.00	2144.00	542.00	5
17	2144.00	542.00	2174.00	541.00	4
18	2174.00	541.00	2482.00	550.00	5
19	198.00	331.00	214.00	321.00	6
20	214.00	321.00	300.00	328.00	4
21	300.00	328.00	338.00	328.00	4
22	338.00	328.00	578.00	318.00	4
23	578.00	318.00	624.00	312.00	4
24	624.00	312.00	658.00	314.00	4
25	658.00	314.00	736.00	289.00	4
26	736.00	289.00	764.00	280.00	6

27	764.00	280.00	775.00	280.00	6
28	775.00	280.00	791.00	280.00	7
29	791.00	280.00	840.00	270.00	7
30	840.00	270.00	918.00	267.00	7
31	918.00	267.00	1046.00	273.00	7
32	1046.00	273.00	1111.00	300.00	7
33	1111.00	300.00	1136.00	300.00	7
34	1136.00	300.00	1278.00	359.00	7
35	1278.00	359.00	1310.00	359.00	7
36	1310.00	359.00	1331.00	366.00	7
37	1331.00	366.00	1347.00	366.00	7
38	1347.00	366.00	1352.00	366.00	4
39	1352.00	366.00	1371.00	366.00	4
40	1371.00	366.00	1493.00	398.00	4
41	1493.00	398.00	1540.00	398.00	4
42	1540.00	398.00	1652.00	425.00	4
43	1652.00	425.00	1666.00	425.00	4
44	1666.00	425.00	1770.00	460.00	4
45	1770.00	460.00	1787.00	460.00	4
46	1787.00	460.00	1952.00	514.00	4
47	1952.00	514.00	1980.00	515.00	4
48	1980.00	515.00	2044.00	524.00	4
49	2044.00	524.00	2081.00	530.00	4
50	2081.00	530.00	2141.00	540.00	4
51	2141.00	540.00	2235.00	540.00	4
52	2235.00	540.00	2422.00	484.00	4
53	2422.00	484.00	2443.00	484.00	4
54	2443.00	484.00	2482.00	474.00	4
55	214.00	321.00	297.00	270.00	6
56	297.00	270.00	380.00	249.00	6
57	380.00	249.00	400.00	249.00	6
58	400.00	249.00	509.00	270.00	6
59	509.00	270.00	600.00	282.00	6
60	600.00	282.00	736.00	289.00	6
61	198.00	331.00	199.00	327.00	2
62	199.00	327.00	211.00	321.00	2
63	109.00	320.00	134.00	312.00	1
64	134.00	312.00	140.00	312.00	1
65	140.00	312.00	211.00	321.00	1
66	211.00	321.00	297.00	266.00	1
67	297.00	266.00	380.00	245.00	1
68	380.00	245.00	400.00	245.00	1
69	400.00	245.00	509.00	266.00	1
70	509.00	266.00	600.00	278.00	1
71	600.00	278.00	736.00	285.00	1
72	736.00	285.00	764.00	276.00	1
73	764.00	276.00	775.00	276.00	1
74	775.00	276.00	791.00	276.00	1
75	791.00	276.00	840.00	266.00	1
76	840.00	266.00	918.00	263.00	1
77	918.00	263.00	1046.00	269.00	1
78	1046.00	269.00	1111.00	296.00	1
79	1111.00	296.00	1136.00	296.00	1
80	1136.00	296.00	1278.00	355.00	1
81	1278.00	355.00	1310.00	355.00	1
82	1310.00	355.00	1331.00	362.00	1
83	1331.00	362.00	1346.00	362.00	1
84	1346.00	362.00	1347.00	366.00	1
85	1352.00	366.00	1375.00	351.00	2
86	1375.00	351.00	1438.00	330.00	1
87	1438.00	330.00	1735.00	340.00	3
88	1735.00	340.00	1925.00	370.00	3
89	1925.00	370.00	2062.00	400.00	3

90	2062.00	400.00	2482.00	400.00	3
91	1278.00	355.00	1375.00	351.00	1
92	1438.00	330.00	1475.00	320.00	1
93	1475.00	320.00	1600.00	290.00	1
94	1600.00	290.00	1870.00	248.00	1
95	1870.00	248.00	1910.00	248.00	1
96	1910.00	248.00	1962.00	270.00	1
97	1962.00	270.00	2482.00	374.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 10 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	238.00
2	500.00	240.00
3	900.00	250.00
4	1100.00	260.00
5	1300.00	310.00
6	1438.00	330.00
7	1735.00	340.00
8	1925.00	370.00
9	2062.00	400.00
10	2482.00	400.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 100.00 ft.
and X = 250.00 ft.

Each Surface Terminates Between X = 500.00 ft.
and X =1200.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -30.0
And 0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	242.37	342.09
2	282.37	342.01
3	322.34	343.67
4	362.19	347.06
5	401.87	352.19
6	441.27	359.03
7	480.35	367.59
8	519.01	377.84
9	557.20	389.76
10	594.82	403.33
11	631.83	418.52
12	668.13	435.31
13	703.67	453.67
14	714.94	460.12

Circle Center At X = 264.6 ; Y = 1258.2 and Radius, 916.3

*** 2.679 ***

Individual data on the 14 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	40.0	14118.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	40.0	39870.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	39.9	60552.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	39.7	76046.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	39.4	86301.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	39.1	91337.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	38.7	91235.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	38.2	86145.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	37.6	76281.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	37.0	61919.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	36.3	43396.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	35.5	21104.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	10.3	1504.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.9	13.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	183.90	327.64
2	223.90	327.58
3	263.86	329.40
4	303.68	333.12
5	343.29	338.71
6	382.59	346.16
7	421.49	355.47
8	459.91	366.60
9	497.77	379.53
10	534.96	394.24
11	571.42	410.69
12	607.07	428.84
13	620.88	436.72

Circle Center At X = 205.2 ; Y = 1173.7 and Radius, 846.3

*** 2.682 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	227.12	338.28
2	267.11	337.65
3	307.10	338.88
4	346.98	341.97
5	386.67	346.91
6	426.09	353.70
7	465.15	362.32

8	503.77	372.74
9	541.86	384.95
10	579.34	398.92
11	616.13	414.62
12	652.15	432.02
13	687.32	451.07
14	693.71	454.93

Circle Center At X = 260.9 ; Y = 1194.8 and Radius, 857.2

*** 2.689 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	242.37	342.09
2	282.37	342.05
3	322.26	345.09
4	361.79	351.19
5	400.73	360.32
6	438.86	372.42
7	475.94	387.42
8	511.75	405.24
9	523.84	412.46

Circle Center At X = 262.9 ; Y = 860.5 and Radius, 518.9

*** 2.690 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	232.20	339.55
2	272.20	338.94
3	312.15	340.86
4	351.91	345.30
5	391.30	352.24
6	430.17	361.67
7	468.37	373.53
8	505.75	387.78
9	542.15	404.37
10	577.42	423.23
11	584.55	427.64

Circle Center At X = 261.9 ; Y = 971.2 and Radius, 632.3

*** 2.695 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	214.41	335.10
2	254.40	334.50
3	294.35	336.59
4	334.06	341.36
5	373.37	348.80
6	412.08	358.86
7	450.03	371.50
8	487.04	386.67
9	522.95	404.29
10	547.22	418.30

Circle Center At X = 243.6 ; Y = 925.5 and Radius, 591.2

*** 2.696 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	171.19	324.62
2	211.19	324.56
3	251.14	326.57
4	290.93	330.64
5	330.46	336.75
6	369.62	344.90
7	408.31	355.05
8	446.43	367.18
9	483.87	381.27
10	520.53	397.26
11	556.32	415.13
12	573.60	424.90

Circle Center At X = 192.6 ; Y = 1096.3 and Radius, 772.0

*** 2.697 ***

Failure Surface Specified By 15 Coordinate Points

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

1	168.64	324.01
2	208.64	323.52
3	248.63	324.63
4	288.53	327.34
5	328.30	331.65
6	367.86	337.55
7	407.16	345.03
8	446.12	354.07
9	484.69	364.67
10	522.81	376.81
11	560.41	390.46
12	597.43	405.61
13	633.81	422.23
14	669.50	440.29
15	697.43	455.86

Circle Center At X = 200.9 ; Y = 1322.0 and Radius, 998.5

*** 2.697 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	234.75	340.19
2	274.73	339.15
3	314.71	340.37
4	354.56	343.84
5	394.15	349.55
6	433.36	357.47
7	472.06	367.59
8	510.13	379.87
9	547.44	394.28
10	583.89	410.76
11	619.35	429.27
12	639.79	441.45

Circle Center At X = 273.3 ; Y = 1046.6 and Radius, 707.5

*** 2.699 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	183.90	327.64
2	223.88	326.33
3	263.88	326.76
4	303.82	328.91
5	343.63	332.80

6	383.23	338.40
7	422.56	345.72
8	461.53	354.74
9	500.07	365.43
10	538.12	377.79
11	575.59	391.78
12	612.42	407.38
13	648.54	424.57
14	683.88	443.30
15	711.09	459.27

Circle Center At X = 234.1 ; Y = 1249.1 and Radius, 922.8

*** 2.700 ***

SECTION 204

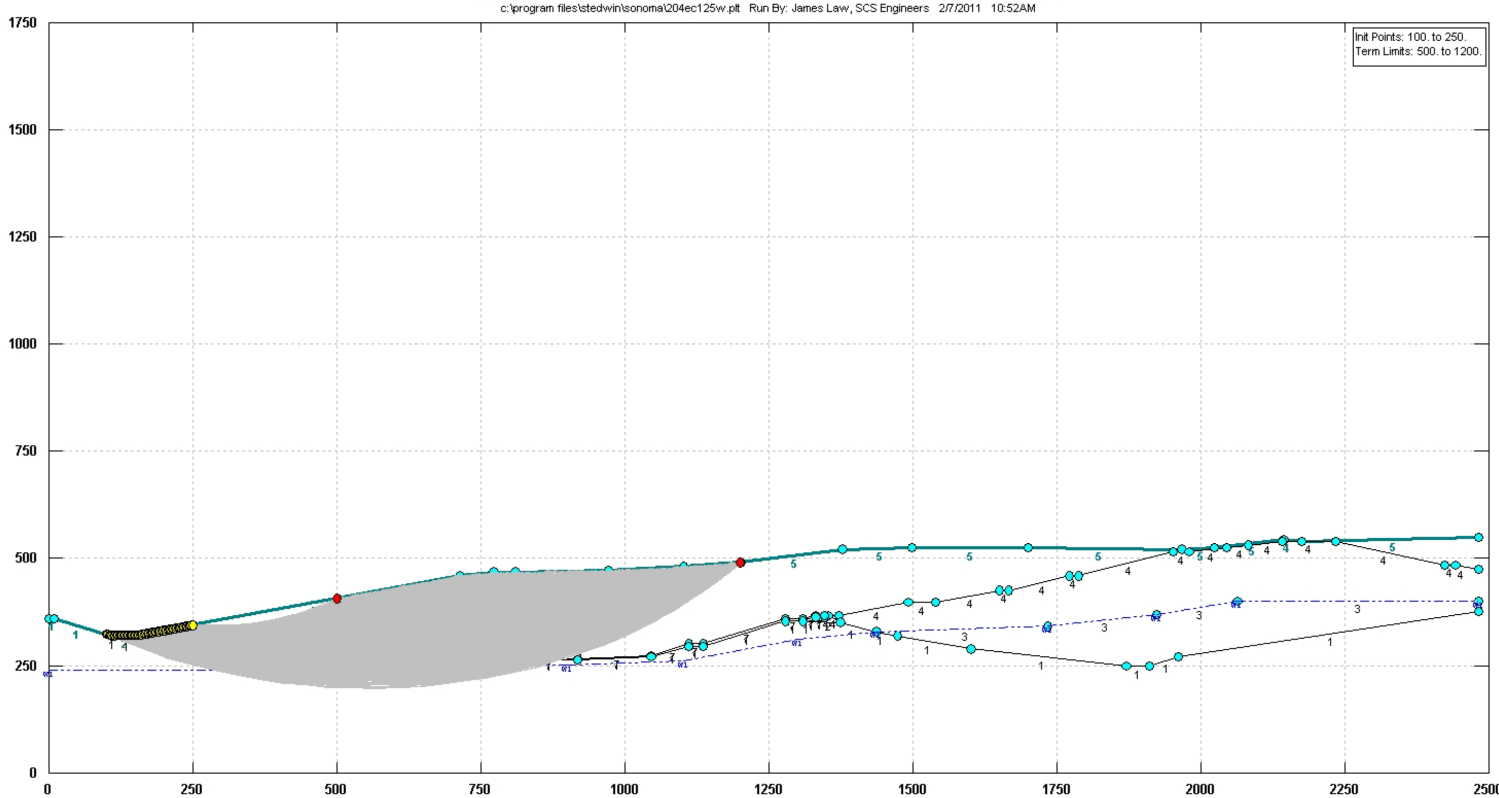
Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 204, Global, circle, seismic=0.36g, liquid

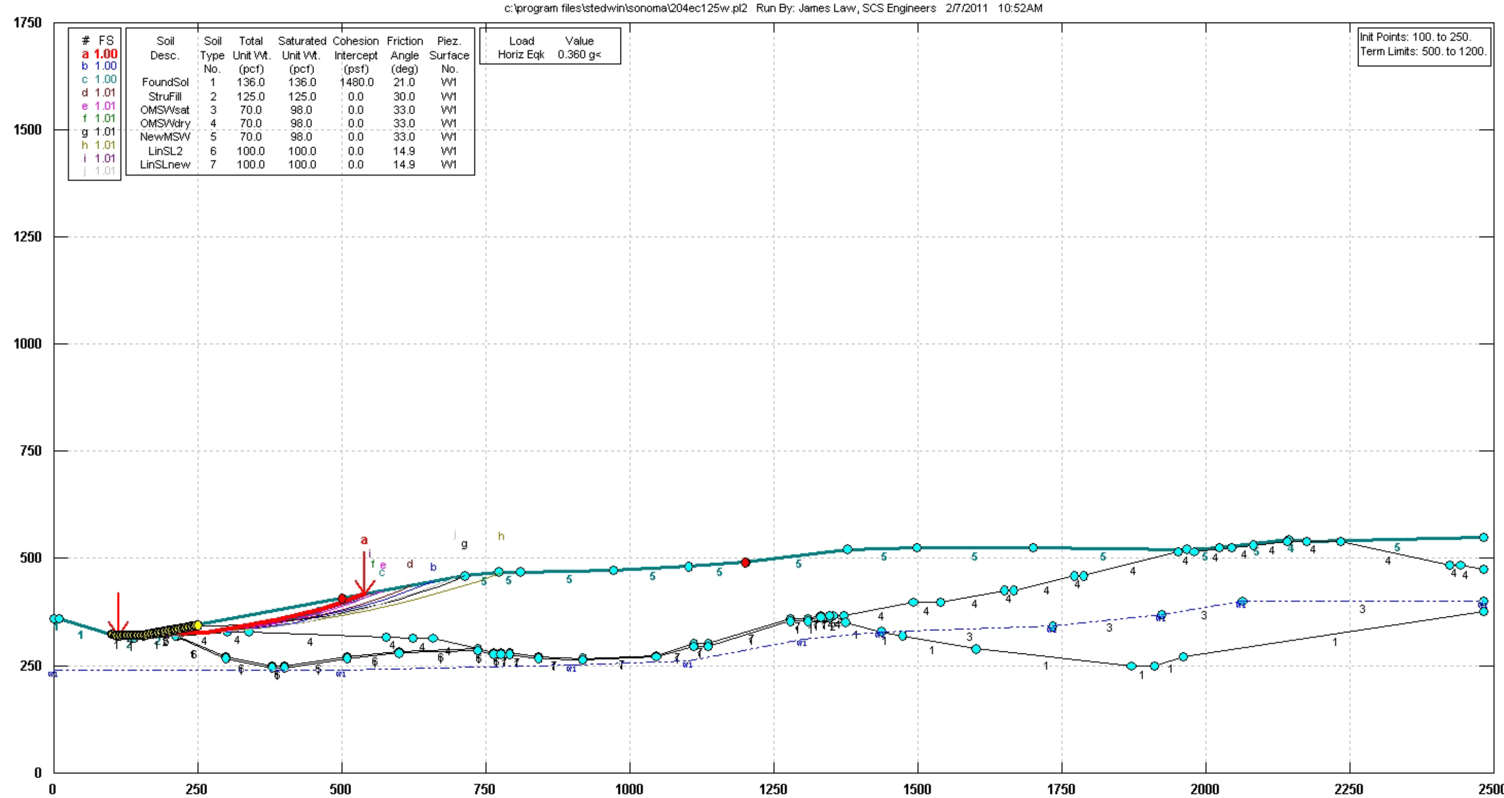
c:\program files\stedwin\sonoma\204ec125w.plt Run By: James Law, SCS Engineers 2/7/2011 10:52AM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 204, Global, circle, seismic=0.36g, liquid

c:\program files\stedwin\sonoma\204ec125w.pl2 Run By: James Law, SCS Engineers 2/7/2011 10:52AM



PCSTABL5M3 FSmin=1.00

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date: 2/7/2011
Time of Run: 10:52AM
Run By: James Law, SCS Engineers
Input Data Filename: C:204ec125w.in
Output Filename: C:204ec125w.OUT
Unit: ENGLISH
Plotted Output Filename: C:204ec125w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 204,
Global, circle, seismic=0.36g, liquid

BOUNDARY COORDINATES

18 Top Boundaries
97 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	360.00	10.00	360.00	1
2	10.00	360.00	109.00	320.00	1
3	109.00	320.00	156.00	321.00	2
4	156.00	321.00	198.00	331.00	2
5	198.00	331.00	714.00	460.00	5
6	714.00	460.00	774.00	468.00	5
7	774.00	468.00	811.00	469.00	5
8	811.00	469.00	970.00	472.00	5
9	970.00	472.00	1100.00	480.00	5
10	1100.00	480.00	1200.00	490.00	5
11	1200.00	490.00	1376.00	520.00	5
12	1376.00	520.00	1500.00	525.00	5
13	1500.00	525.00	1700.00	525.00	5
14	1700.00	525.00	1968.00	521.00	5
15	1968.00	521.00	2022.00	523.00	5
16	2022.00	523.00	2144.00	542.00	5
17	2144.00	542.00	2174.00	541.00	4
18	2174.00	541.00	2482.00	550.00	5
19	198.00	331.00	214.00	321.00	6
20	214.00	321.00	300.00	328.00	4
21	300.00	328.00	338.00	328.00	4
22	338.00	328.00	578.00	318.00	4
23	578.00	318.00	624.00	312.00	4
24	624.00	312.00	658.00	314.00	4
25	658.00	314.00	736.00	289.00	4
26	736.00	289.00	764.00	280.00	6

27	764.00	280.00	775.00	280.00	6
28	775.00	280.00	791.00	280.00	7
29	791.00	280.00	840.00	270.00	7
30	840.00	270.00	918.00	267.00	7
31	918.00	267.00	1046.00	273.00	7
32	1046.00	273.00	1111.00	300.00	7
33	1111.00	300.00	1136.00	300.00	7
34	1136.00	300.00	1278.00	359.00	7
35	1278.00	359.00	1310.00	359.00	7
36	1310.00	359.00	1331.00	366.00	7
37	1331.00	366.00	1347.00	366.00	7
38	1347.00	366.00	1352.00	366.00	4
39	1352.00	366.00	1371.00	366.00	4
40	1371.00	366.00	1493.00	398.00	4
41	1493.00	398.00	1540.00	398.00	4
42	1540.00	398.00	1652.00	425.00	4
43	1652.00	425.00	1666.00	425.00	4
44	1666.00	425.00	1770.00	460.00	4
45	1770.00	460.00	1787.00	460.00	4
46	1787.00	460.00	1952.00	514.00	4
47	1952.00	514.00	1980.00	515.00	4
48	1980.00	515.00	2044.00	524.00	4
49	2044.00	524.00	2081.00	530.00	4
50	2081.00	530.00	2141.00	540.00	4
51	2141.00	540.00	2235.00	540.00	4
52	2235.00	540.00	2422.00	484.00	4
53	2422.00	484.00	2443.00	484.00	4
54	2443.00	484.00	2482.00	474.00	4
55	214.00	321.00	297.00	270.00	6
56	297.00	270.00	380.00	249.00	6
57	380.00	249.00	400.00	249.00	6
58	400.00	249.00	509.00	270.00	6
59	509.00	270.00	600.00	282.00	6
60	600.00	282.00	736.00	289.00	6
61	198.00	331.00	199.00	327.00	2
62	199.00	327.00	211.00	321.00	2
63	109.00	320.00	134.00	312.00	1
64	134.00	312.00	140.00	312.00	1
65	140.00	312.00	211.00	321.00	1
66	211.00	321.00	297.00	266.00	1
67	297.00	266.00	380.00	245.00	1
68	380.00	245.00	400.00	245.00	1
69	400.00	245.00	509.00	266.00	1
70	509.00	266.00	600.00	278.00	1
71	600.00	278.00	736.00	285.00	1
72	736.00	285.00	764.00	276.00	1
73	764.00	276.00	775.00	276.00	1
74	775.00	276.00	791.00	276.00	1
75	791.00	276.00	840.00	266.00	1
76	840.00	266.00	918.00	263.00	1
77	918.00	263.00	1046.00	269.00	1
78	1046.00	269.00	1111.00	296.00	1
79	1111.00	296.00	1136.00	296.00	1
80	1136.00	296.00	1278.00	355.00	1
81	1278.00	355.00	1310.00	355.00	1
82	1310.00	355.00	1331.00	362.00	1
83	1331.00	362.00	1346.00	362.00	1
84	1346.00	362.00	1347.00	366.00	1
85	1352.00	366.00	1375.00	351.00	2
86	1375.00	351.00	1438.00	330.00	1
87	1438.00	330.00	1735.00	340.00	3
88	1735.00	340.00	1925.00	370.00	3
89	1925.00	370.00	2062.00	400.00	3

90	2062.00	400.00	2482.00	400.00	3
91	1278.00	355.00	1375.00	351.00	1
92	1438.00	330.00	1475.00	320.00	1
93	1475.00	320.00	1600.00	290.00	1
94	1600.00	290.00	1870.00	248.00	1
95	1870.00	248.00	1910.00	248.00	1
96	1910.00	248.00	1962.00	270.00	1
97	1962.00	270.00	2482.00	374.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 10 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	238.00
2	500.00	240.00
3	900.00	250.00
4	1100.00	260.00
5	1300.00	310.00
6	1438.00	330.00
7	1735.00	340.00
8	1925.00	370.00
9	2062.00	400.00
10	2482.00	400.00

A Horizontal Earthquake Loading Coefficient
Of0.360 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure =   0.0 (psf)

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced Along The Ground Surface Between X = 100.00 ft.
and X = 250.00 ft.

Each Surface Terminates Between   X = 500.00 ft.
and   X =1200.00 ft.

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

40.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -30.0 And   0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.17	320.02
2	150.17	319.98
3	190.13	321.69
4	229.98	325.16
5	269.64	330.37
6	309.04	337.31
7	348.09	345.97
8	386.72	356.35
9	424.86	368.40
10	462.43	382.12
11	499.37	397.47
12	535.60	414.43
13	539.15	416.29

Circle Center At X = 131.2 ; Y = 1231.2 and Radius, 911.4

*** 0.995 ***

Individual data on the 17 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	40.0	2236.3	0.0	0.0	0.0	0.0	805.1	0.0	0.0
2	5.8	606.1	0.0	0.0	0.0	0.0	218.2	0.0	0.0
3	34.1	17499.0	0.0	0.0	0.0	0.0	6299.6	0.0	0.0
4	7.9	7894.7	0.0	0.0	0.0	0.0	2842.1	0.0	0.0
5	1.0	1021.8	0.0	0.0	0.0	0.0	367.9	0.0	0.0
6	7.7	6729.2	0.0	0.0	0.0	0.0	2422.5	0.0	0.0
7	3.4	2567.2	0.0	0.0	0.0	0.0	924.2	0.0	0.0
8	19.9	16995.6	0.0	0.0	0.0	0.0	6118.4	0.0	0.0
9	39.7	44952.1	0.0	0.0	0.0	0.0	16182.8	0.0	0.0
10	39.4	55142.9	0.0	0.0	0.0	0.0	19851.4	0.0	0.0
11	39.1	60132.2	0.0	0.0	0.0	0.0	21647.6	0.0	0.0
12	38.6	60008.6	0.0	0.0	0.0	0.0	21603.1	0.0	0.0
13	38.1	54928.0	0.0	0.0	0.0	0.0	19774.1	0.0	0.0
14	37.6	45112.0	0.0	0.0	0.0	0.0	16240.3	0.0	0.0
15	36.9	30845.7	0.0	0.0	0.0	0.0	11104.4	0.0	0.0
16	36.2	12475.6	0.0	0.0	0.0	0.0	4491.2	0.0	0.0
17	3.6	120.4	0.0	0.0	0.0	0.0	43.3	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	140.68	320.67
2	180.68	320.47
3	220.66	321.81
4	260.55	324.69
5	300.31	329.11
6	339.86	335.06
7	379.16	342.53
8	418.13	351.52
9	456.74	362.00
10	494.90	373.97
11	532.58	387.40
12	569.71	402.28
13	606.24	418.58
14	642.11	436.28
15	661.78	446.95

Circle Center At X = 166.0 ; Y = 1356.0 and Radius, 1035.7

*** 1.003 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	133.05	320.51
2	173.05	320.18
3	213.02	321.70
4	252.88	325.06
5	292.54	330.25
6	331.92	337.27
7	370.94	346.09
8	409.50	356.71
9	447.54	369.09
10	484.96	383.21
11	521.69	399.05
12	557.66	416.56
13	572.40	424.60

Circle Center At X = 160.2 ; Y = 1187.2 and Radius, 867.1

*** 1.003 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	183.90	327.64
2	223.90	327.58
3	263.86	329.40
4	303.68	333.12
5	343.29	338.71
6	382.59	346.16
7	421.49	355.47
8	459.91	366.60
9	497.77	379.53
10	534.96	394.24
11	571.42	410.69
12	607.07	428.84
13	620.88	436.72

Circle Center At X = 205.2 ; Y = 1173.7 and Radius, 846.3

*** 1.005 ***

1

Failure Surface Specified By 12 Coordinate Points

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

1	171.19	324.62
2	211.19	324.56
3	251.14	326.57
4	290.93	330.64
5	330.46	336.75
6	369.62	344.90
7	408.31	355.05
8	446.43	367.18
9	483.87	381.27
10	520.53	397.26
11	556.32	415.13
12	573.60	424.90

Circle Center At X = 192.6 ; Y = 1096.3 and Radius, 772.0

*** 1.005 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	112.71	320.08
2	152.70	319.21
3	192.69	320.20
4	232.59	323.05
5	272.31	327.77
6	311.77	334.33
7	350.88	342.72
8	389.55	352.92
9	427.71	364.92
10	465.27	378.69
11	502.14	394.19
12	538.26	411.39
13	554.66	420.17

Circle Center At X = 151.4 ; Y = 1177.0 and Radius, 857.8

*** 1.006 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	242.37	342.09
2	282.37	342.01
3	322.34	343.67
4	362.19	347.06
5	401.87	352.19
6	441.27	359.03

7	480.35	367.59
8	519.01	377.84
9	557.20	389.76
10	594.82	403.33
11	631.83	418.52
12	668.13	435.31
13	703.67	453.67
14	714.94	460.12

Circle Center At X = 264.6 ; Y = 1258.2 and Radius, 916.3

*** 1.006 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	112.71	320.08
2	152.71	319.99
3	192.70	321.00
4	232.64	323.10
5	272.52	326.28
6	312.29	330.56
7	351.93	335.91
8	391.41	342.34
9	430.70	349.85
10	469.77	358.43
11	508.59	368.07
12	547.13	378.76
13	585.37	390.50
14	623.27	403.28
15	660.81	417.09
16	697.96	431.92
17	734.70	447.76
18	770.98	464.59
19	778.07	468.11

Circle Center At X = 135.8 ; Y = 1786.5 and Radius, 1466.6

*** 1.007 ***

1

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	148.31	320.84
2	188.31	320.65
3	228.26	322.52
4	268.07	326.45
5	307.62	332.43

6	346.81	340.43
7	385.54	350.44
8	423.70	362.43
9	461.19	376.37
10	497.91	392.23
11	533.77	409.95
12	549.88	418.97

Circle Center At X = 172.3 ; Y = 1093.5 and Radius, 773.1

*** 1.007 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	168.64	324.01
2	208.64	323.52
3	248.63	324.63
4	288.53	327.34
5	328.30	331.65
6	367.86	337.55
7	407.16	345.03
8	446.12	354.07
9	484.69	364.67
10	522.81	376.81
11	560.41	390.46
12	597.43	405.61
13	633.81	422.23
14	669.50	440.29
15	697.43	455.86

Circle Center At X = 200.9 ; Y = 1322.0 and Radius, 998.5

*** 1.007 ***

SECTION 204

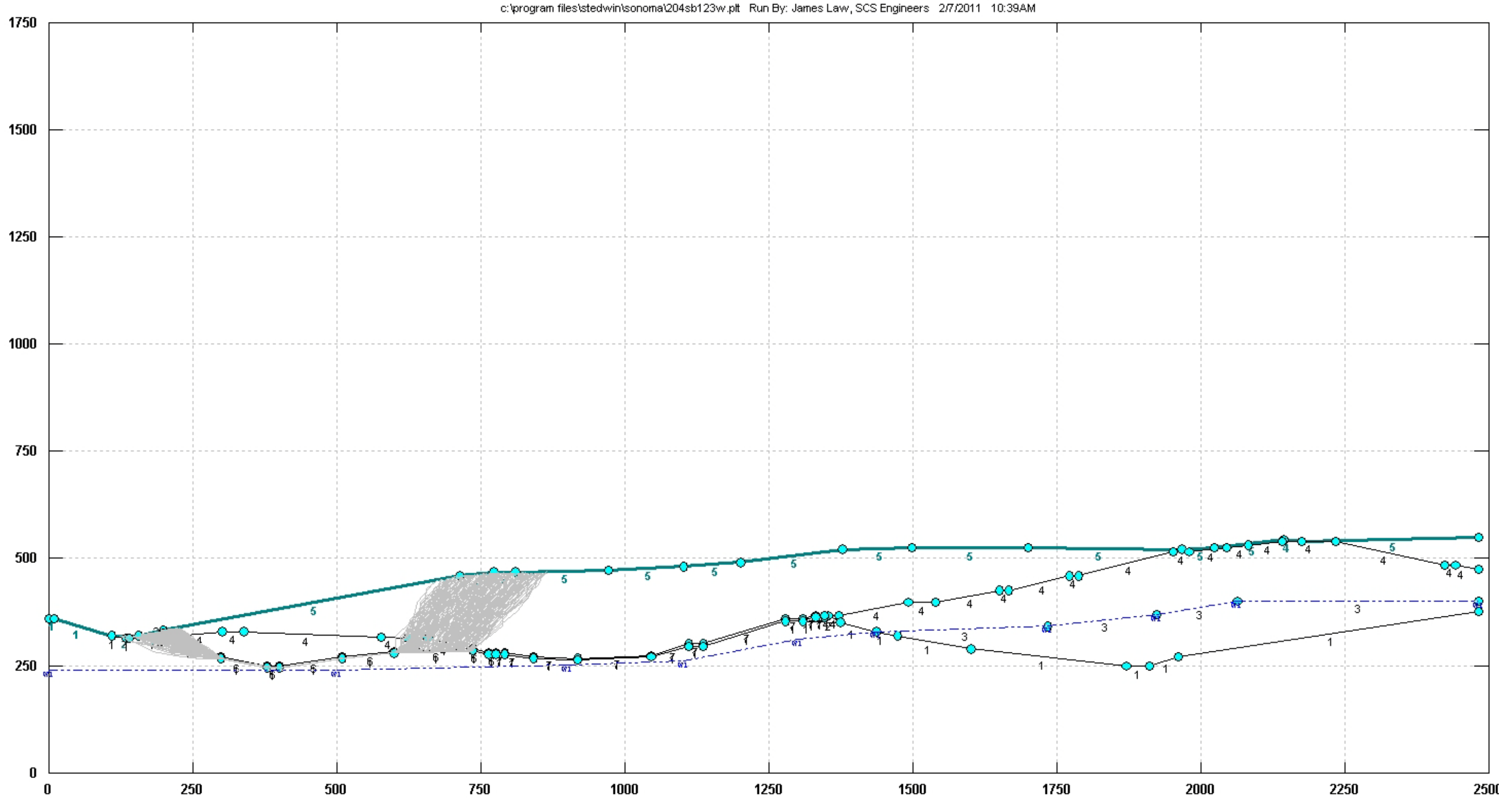
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 204, Global, block, static, liquid

c:\program files\stedwin\sonoma\204sb123w.plt Run By: James Law, SCS Engineers 2/7/2011 10:39AM



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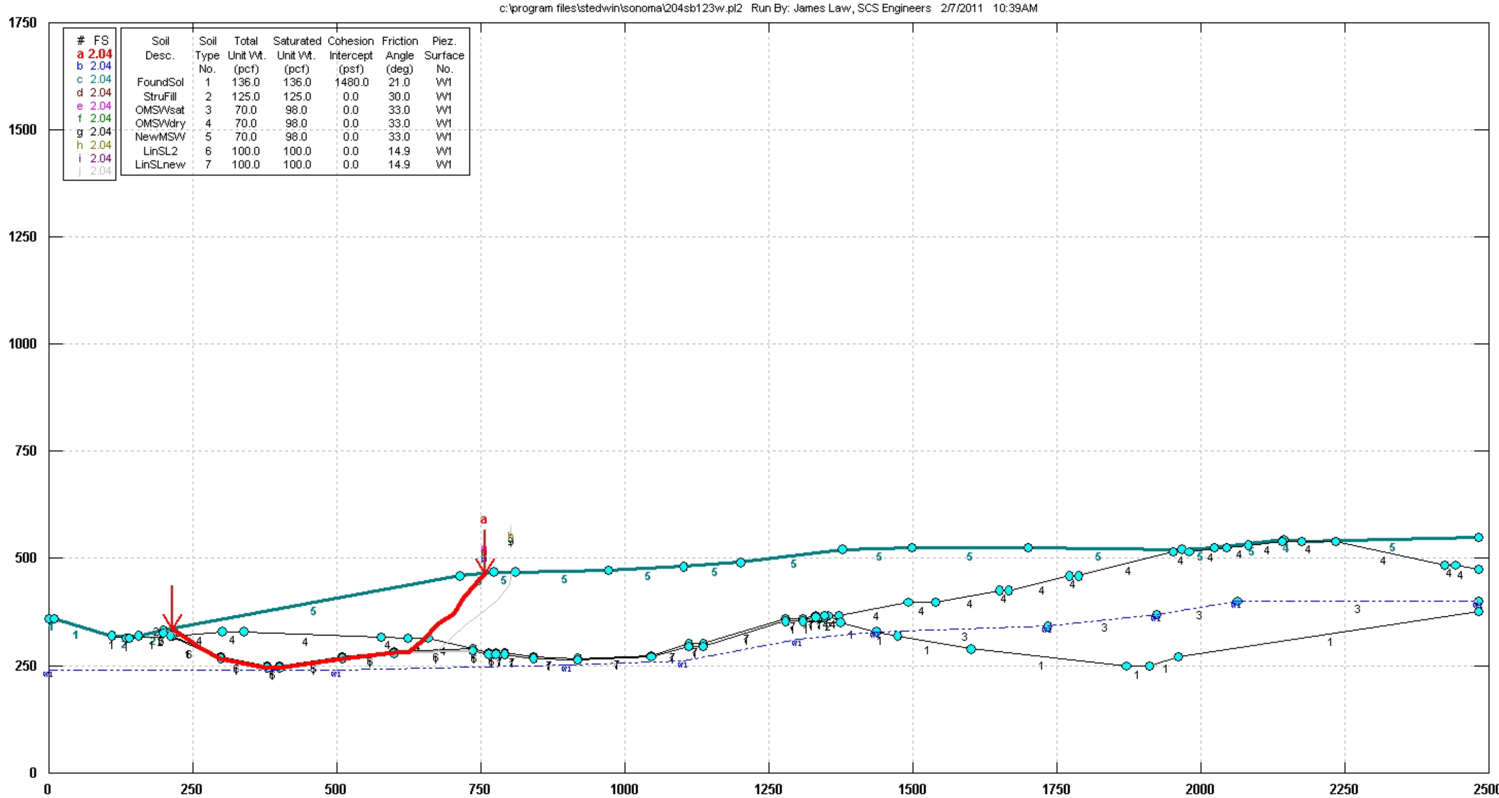
Sonoma Cty Central Disposal, Sect 204, Global, block, static, liquid

c:\program files\stedwin\sonoma\204sb123w.pl2 Run By: James Law, SCS Engineers 2/7/2011 10:39AM



PCSTABL5M3 FSmin=2.04

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/7/2011
Time of Run:	10:39AM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:204sb123w.in
Output Filename:	C:204sb123w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:204sb123w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 204,
Global, block, static, liquid

BOUNDARY COORDINATES

18 Top Boundaries
97 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	360.00	10.00	360.00	1
2	10.00	360.00	109.00	320.00	1
3	109.00	320.00	156.00	321.00	2
4	156.00	321.00	198.00	331.00	2
5	198.00	331.00	714.00	460.00	5
6	714.00	460.00	774.00	468.00	5
7	774.00	468.00	811.00	469.00	5
8	811.00	469.00	970.00	472.00	5
9	970.00	472.00	1100.00	480.00	5
10	1100.00	480.00	1200.00	490.00	5
11	1200.00	490.00	1376.00	520.00	5
12	1376.00	520.00	1500.00	525.00	5
13	1500.00	525.00	1700.00	525.00	5
14	1700.00	525.00	1968.00	521.00	5
15	1968.00	521.00	2022.00	523.00	5
16	2022.00	523.00	2144.00	542.00	5
17	2144.00	542.00	2174.00	541.00	4
18	2174.00	541.00	2482.00	550.00	5
19	198.00	331.00	214.00	321.00	6
20	214.00	321.00	300.00	328.00	4
21	300.00	328.00	338.00	328.00	4
22	338.00	328.00	578.00	318.00	4
23	578.00	318.00	624.00	312.00	4
24	624.00	312.00	658.00	314.00	4
25	658.00	314.00	736.00	289.00	4
26	736.00	289.00	764.00	280.00	6

27	764.00	280.00	775.00	280.00	6
28	775.00	280.00	791.00	280.00	7
29	791.00	280.00	840.00	270.00	7
30	840.00	270.00	918.00	267.00	7
31	918.00	267.00	1046.00	273.00	7
32	1046.00	273.00	1111.00	300.00	7
33	1111.00	300.00	1136.00	300.00	7
34	1136.00	300.00	1278.00	359.00	7
35	1278.00	359.00	1310.00	359.00	7
36	1310.00	359.00	1331.00	366.00	7
37	1331.00	366.00	1347.00	366.00	7
38	1347.00	366.00	1352.00	366.00	4
39	1352.00	366.00	1371.00	366.00	4
40	1371.00	366.00	1493.00	398.00	4
41	1493.00	398.00	1540.00	398.00	4
42	1540.00	398.00	1652.00	425.00	4
43	1652.00	425.00	1666.00	425.00	4
44	1666.00	425.00	1770.00	460.00	4
45	1770.00	460.00	1787.00	460.00	4
46	1787.00	460.00	1952.00	514.00	4
47	1952.00	514.00	1980.00	515.00	4
48	1980.00	515.00	2044.00	524.00	4
49	2044.00	524.00	2081.00	530.00	4
50	2081.00	530.00	2141.00	540.00	4
51	2141.00	540.00	2235.00	540.00	4
52	2235.00	540.00	2422.00	484.00	4
53	2422.00	484.00	2443.00	484.00	4
54	2443.00	484.00	2482.00	474.00	4
55	214.00	321.00	297.00	270.00	6
56	297.00	270.00	380.00	249.00	6
57	380.00	249.00	400.00	249.00	6
58	400.00	249.00	509.00	270.00	6
59	509.00	270.00	600.00	282.00	6
60	600.00	282.00	736.00	289.00	6
61	198.00	331.00	199.00	327.00	2
62	199.00	327.00	211.00	321.00	2
63	109.00	320.00	134.00	312.00	1
64	134.00	312.00	140.00	312.00	1
65	140.00	312.00	211.00	321.00	1
66	211.00	321.00	297.00	266.00	1
67	297.00	266.00	380.00	245.00	1
68	380.00	245.00	400.00	245.00	1
69	400.00	245.00	509.00	266.00	1
70	509.00	266.00	600.00	278.00	1
71	600.00	278.00	736.00	285.00	1
72	736.00	285.00	764.00	276.00	1
73	764.00	276.00	775.00	276.00	1
74	775.00	276.00	791.00	276.00	1
75	791.00	276.00	840.00	266.00	1
76	840.00	266.00	918.00	263.00	1
77	918.00	263.00	1046.00	269.00	1
78	1046.00	269.00	1111.00	296.00	1
79	1111.00	296.00	1136.00	296.00	1
80	1136.00	296.00	1278.00	355.00	1
81	1278.00	355.00	1310.00	355.00	1
82	1310.00	355.00	1331.00	362.00	1
83	1331.00	362.00	1346.00	362.00	1
84	1346.00	362.00	1347.00	366.00	1
85	1352.00	366.00	1375.00	351.00	2
86	1375.00	351.00	1438.00	330.00	1
87	1438.00	330.00	1735.00	340.00	3
88	1735.00	340.00	1925.00	370.00	3
89	1925.00	370.00	2062.00	400.00	3

90	2062.00	400.00	2482.00	400.00	3
91	1278.00	355.00	1375.00	351.00	1
92	1438.00	330.00	1475.00	320.00	1
93	1475.00	320.00	1600.00	290.00	1
94	1600.00	290.00	1870.00	248.00	1
95	1870.00	248.00	1910.00	248.00	1
96	1910.00	248.00	1962.00	270.00	1
97	1962.00	270.00	2482.00	374.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 10 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	238.00
2	500.00	240.00
3	900.00	250.00
4	1100.00	260.00
5	1300.00	310.00
6	1438.00	330.00
7	1735.00	340.00
8	1925.00	370.00
9	2062.00	400.00
10	2482.00	400.00

1

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

1000 Trial Surfaces Have Been Generated.

6 Boxes Specified For Generation Of Central Block Base

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

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	297.00	267.00	300.00	266.00	0.50
2	377.00	247.00	380.00	246.00	0.50
3	398.00	246.00	400.00	246.00	0.50
4	507.00	267.00	509.00	267.00	0.50
5	598.00	279.00	600.00	279.00	0.50
6	601.00	279.00	736.00	286.00	0.50

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 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	214.86	335.22
2	235.94	316.74
3	264.23	288.45
4	297.91	266.88
5	379.53	246.40
6	398.41	245.84
7	508.22	266.91
8	598.06	279.24
9	624.89	280.24
10	650.91	310.62
11	674.56	342.88
12	702.84	371.17
13	718.50	407.98
14	741.33	440.82
15	757.12	465.75

***   2.035   ***

Individual data on the   28 slices

Slice	Width	Weight	Water Force Top	Water Force Bot	Tie Force Norm	Tie Force Tan	Earthquake Force Hor	Earthquake Force Ver	Surcharge Load

No.	(ft)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
1	14.8	8597.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	6.3	8925.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	23.9	64802.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4.4	17330.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	32.8	171121.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.9	5743.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	2.1	13272.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	38.0	268345.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	41.5	351074.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	0.5	4326.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	18.4	172606.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	1.6	15189.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	108.2	1058646.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.8	7775.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	69.0	709166.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	20.1	213055.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	1.9	20812.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	24.0	262019.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.9	9852.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	2.7	29904.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	23.3	235391.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	2.3	21052.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	21.4	178326.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	28.3	191289.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	11.2	58067.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	4.5	18140.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	22.8	60283.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	15.8	12616.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	214.86	335.22
2	235.94	316.74
3	264.23	288.45
4	297.91	266.88
5	379.53	246.40
6	398.41	245.84
7	508.22	266.91
8	598.06	279.24
9	624.89	280.24
10	650.91	310.62
11	674.56	342.88
12	702.84	371.17
13	718.50	407.98
14	741.33	440.82
15	757.12	465.75

*** 2.035 ***

1

Failure Surface Specified By 15 Coordinate Points

Point X-Surf Y-Surf

No.	(ft)	(ft)
1	214.86	335.22
2	235.94	316.74
3	264.23	288.45
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5	379.53	246.40
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*** 2.035 ***

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Point No.	X-Surf (ft)	Y-Surf (ft)
1	214.86	335.22
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4	297.91	266.88
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8	598.06	279.24
9	624.89	280.24
10	650.91	310.62
11	674.56	342.88
12	702.84	371.17
13	718.50	407.98
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*** 2.035 ***

1

Failure Surface Specified By 15 Coordinate Points

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1	214.86	335.22
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5	379.53	246.40
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9	624.89	280.24
10	650.91	310.62
11	674.56	342.88
12	702.84	371.17
13	718.50	407.98
14	741.33	440.82
15	757.12	465.75

*** 2.035 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	202.56	332.14
2	237.26	315.01
3	265.66	286.85
4	299.95	266.24
5	378.12	246.86
6	398.21	245.89
7	507.04	267.17
8	599.43	278.95
9	672.38	282.65
10	697.24	313.99
11	722.05	345.37
12	750.29	373.70
13	778.25	402.30
14	799.55	436.16
15	802.23	468.76

*** 2.038 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	202.56	332.14
2	237.26	315.01
3	265.66	286.85
4	299.95	266.24
5	378.12	246.86
6	398.21	245.89
7	507.04	267.17
8	599.43	278.95
9	672.38	282.65
10	697.24	313.99

11	722.05	345.37
12	750.29	373.70
13	778.25	402.30
14	799.55	436.16
15	802.23	468.76

*** 2.038 ***

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Point No.	X-Surf (ft)	Y-Surf (ft)
1	202.56	332.14
2	237.26	315.01
3	265.66	286.85
4	299.95	266.24
5	378.12	246.86
6	398.21	245.89
7	507.04	267.17
8	599.43	278.95
9	672.38	282.65
10	697.24	313.99
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12	750.29	373.70
13	778.25	402.30
14	799.55	436.16
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*** 2.038 ***

1

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Point No.	X-Surf (ft)	Y-Surf (ft)
1	202.56	332.14
2	237.26	315.01
3	265.66	286.85
4	299.95	266.24
5	378.12	246.86
6	398.21	245.89
7	507.04	267.17
8	599.43	278.95
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11	722.05	345.37
12	750.29	373.70
13	778.25	402.30
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*** 2.038 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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4	299.95	266.24
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6	398.21	245.89
7	507.04	267.17
8	599.43	278.95
9	672.38	282.65
10	697.24	313.99
11	722.05	345.37
12	750.29	373.70
13	778.25	402.30
14	799.55	436.16
15	802.23	468.76

*** 2.038 ***

SECTION 204

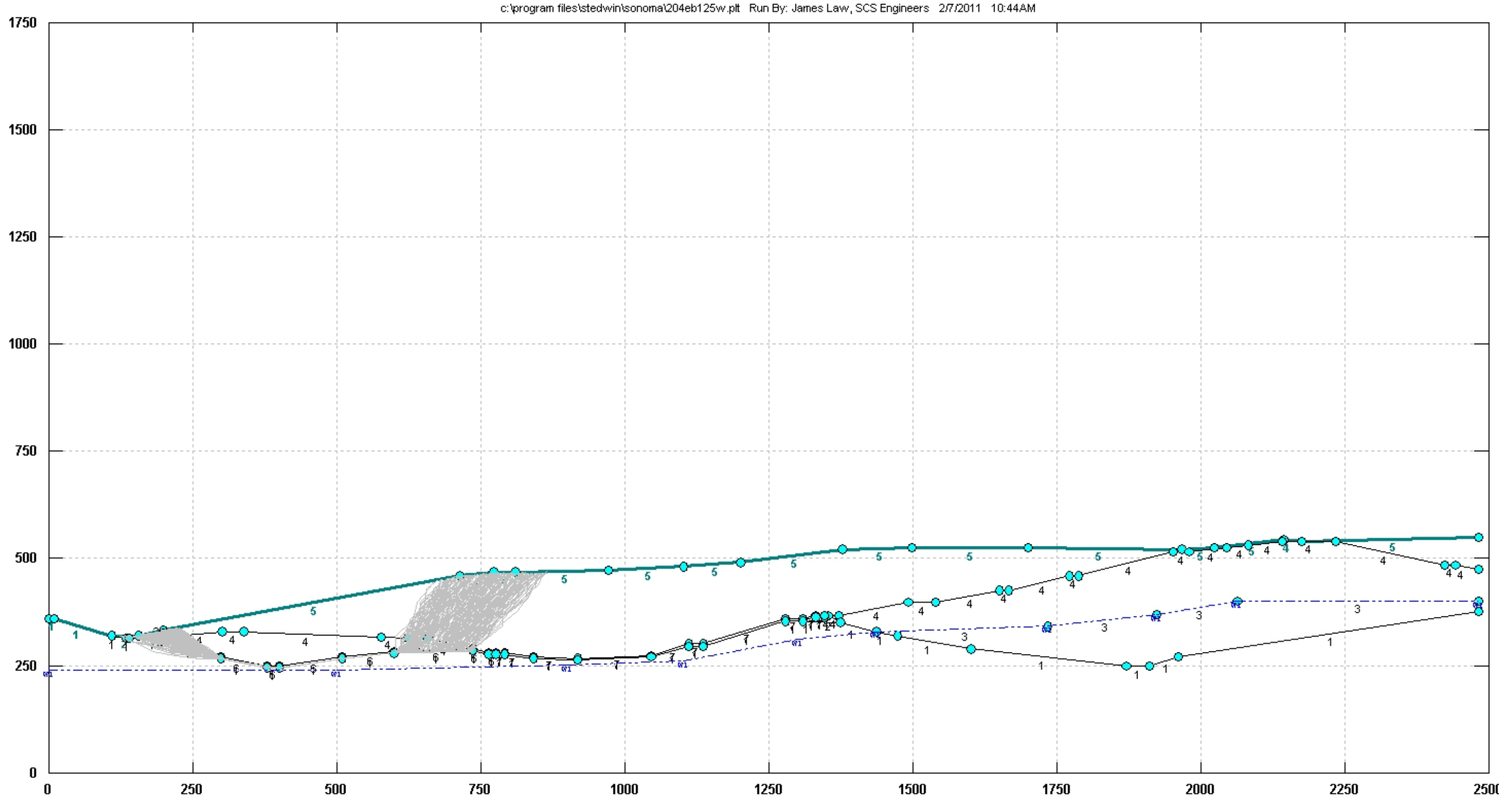
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

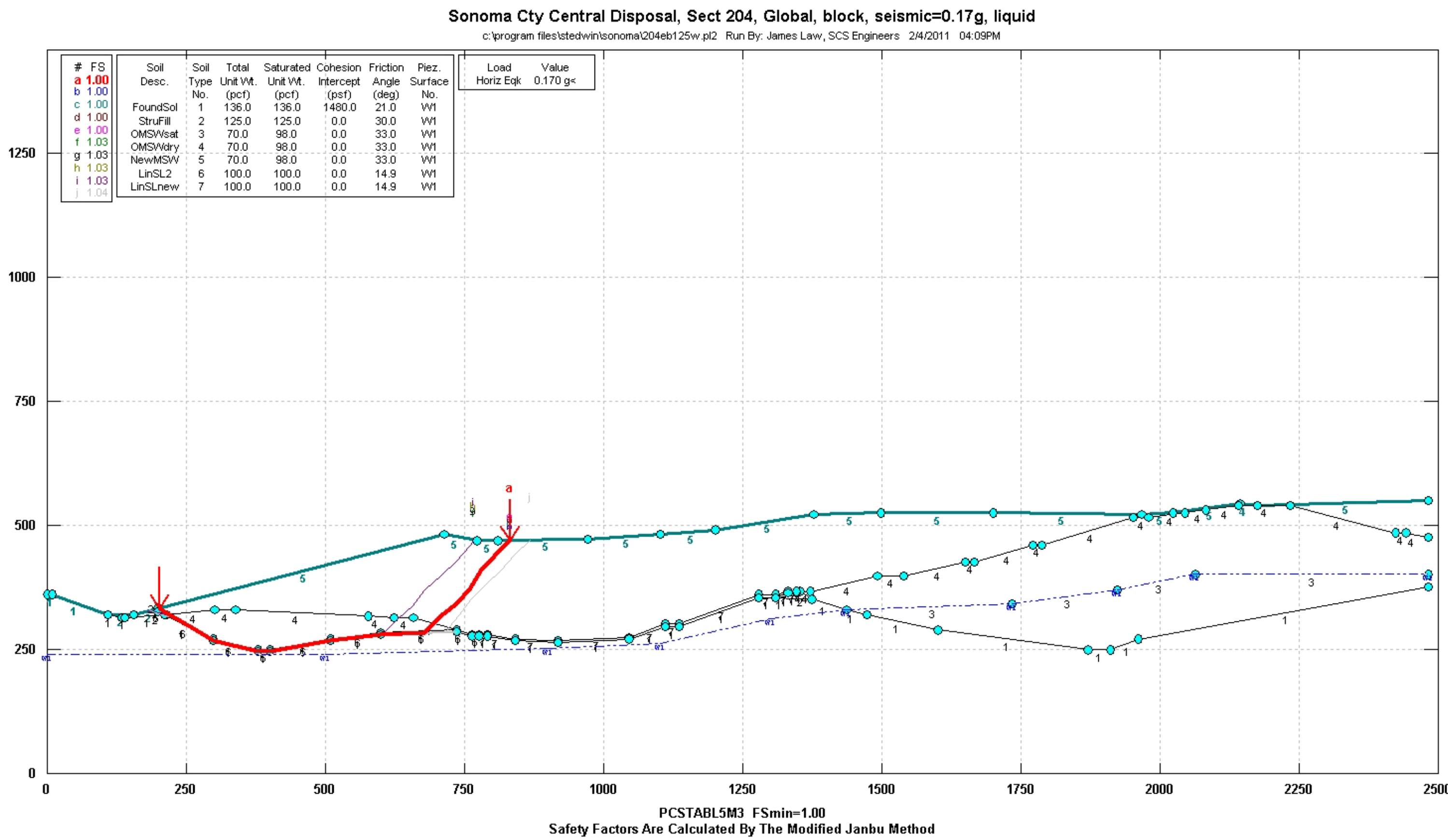
Seismic at k_y

Sonoma Cty Central Disposal, Sect 204, Global, block, seismic=0.21g, liquid

c:\program files\stedwin\sonoma\204eb125w.plt Run By: James Law, SCS Engineers 2/7/2011 10:44AM



SCS ENGINEERS



SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/7/2011
Time of Run:	10:44AM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:204eb125w.in
Output Filename:	C:204eb125w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:204eb125w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 204,
Global, block, seismic=0.21g, liquid

BOUNDARY COORDINATES

18 Top Boundaries
97 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	360.00	10.00	360.00	1
2	10.00	360.00	109.00	320.00	1
3	109.00	320.00	156.00	321.00	2
4	156.00	321.00	198.00	331.00	2
5	198.00	331.00	714.00	460.00	5
6	714.00	460.00	774.00	468.00	5
7	774.00	468.00	811.00	469.00	5
8	811.00	469.00	970.00	472.00	5
9	970.00	472.00	1100.00	480.00	5
10	1100.00	480.00	1200.00	490.00	5
11	1200.00	490.00	1376.00	520.00	5
12	1376.00	520.00	1500.00	525.00	5
13	1500.00	525.00	1700.00	525.00	5
14	1700.00	525.00	1968.00	521.00	5
15	1968.00	521.00	2022.00	523.00	5
16	2022.00	523.00	2144.00	542.00	5
17	2144.00	542.00	2174.00	541.00	4
18	2174.00	541.00	2482.00	550.00	5
19	198.00	331.00	214.00	321.00	6
20	214.00	321.00	300.00	328.00	4
21	300.00	328.00	338.00	328.00	4
22	338.00	328.00	578.00	318.00	4
23	578.00	318.00	624.00	312.00	4
24	624.00	312.00	658.00	314.00	4
25	658.00	314.00	736.00	289.00	4
26	736.00	289.00	764.00	280.00	6

27	764.00	280.00	775.00	280.00	6
28	775.00	280.00	791.00	280.00	7
29	791.00	280.00	840.00	270.00	7
30	840.00	270.00	918.00	267.00	7
31	918.00	267.00	1046.00	273.00	7
32	1046.00	273.00	1111.00	300.00	7
33	1111.00	300.00	1136.00	300.00	7
34	1136.00	300.00	1278.00	359.00	7
35	1278.00	359.00	1310.00	359.00	7
36	1310.00	359.00	1331.00	366.00	7
37	1331.00	366.00	1347.00	366.00	7
38	1347.00	366.00	1352.00	366.00	4
39	1352.00	366.00	1371.00	366.00	4
40	1371.00	366.00	1493.00	398.00	4
41	1493.00	398.00	1540.00	398.00	4
42	1540.00	398.00	1652.00	425.00	4
43	1652.00	425.00	1666.00	425.00	4
44	1666.00	425.00	1770.00	460.00	4
45	1770.00	460.00	1787.00	460.00	4
46	1787.00	460.00	1952.00	514.00	4
47	1952.00	514.00	1980.00	515.00	4
48	1980.00	515.00	2044.00	524.00	4
49	2044.00	524.00	2081.00	530.00	4
50	2081.00	530.00	2141.00	540.00	4
51	2141.00	540.00	2235.00	540.00	4
52	2235.00	540.00	2422.00	484.00	4
53	2422.00	484.00	2443.00	484.00	4
54	2443.00	484.00	2482.00	474.00	4
55	214.00	321.00	297.00	270.00	6
56	297.00	270.00	380.00	249.00	6
57	380.00	249.00	400.00	249.00	6
58	400.00	249.00	509.00	270.00	6
59	509.00	270.00	600.00	282.00	6
60	600.00	282.00	736.00	289.00	6
61	198.00	331.00	199.00	327.00	2
62	199.00	327.00	211.00	321.00	2
63	109.00	320.00	134.00	312.00	1
64	134.00	312.00	140.00	312.00	1
65	140.00	312.00	211.00	321.00	1
66	211.00	321.00	297.00	266.00	1
67	297.00	266.00	380.00	245.00	1
68	380.00	245.00	400.00	245.00	1
69	400.00	245.00	509.00	266.00	1
70	509.00	266.00	600.00	278.00	1
71	600.00	278.00	736.00	285.00	1
72	736.00	285.00	764.00	276.00	1
73	764.00	276.00	775.00	276.00	1
74	775.00	276.00	791.00	276.00	1
75	791.00	276.00	840.00	266.00	1
76	840.00	266.00	918.00	263.00	1
77	918.00	263.00	1046.00	269.00	1
78	1046.00	269.00	1111.00	296.00	1
79	1111.00	296.00	1136.00	296.00	1
80	1136.00	296.00	1278.00	355.00	1
81	1278.00	355.00	1310.00	355.00	1
82	1310.00	355.00	1331.00	362.00	1
83	1331.00	362.00	1346.00	362.00	1
84	1346.00	362.00	1347.00	366.00	1
85	1352.00	366.00	1375.00	351.00	2
86	1375.00	351.00	1438.00	330.00	1
87	1438.00	330.00	1735.00	340.00	3
88	1735.00	340.00	1925.00	370.00	3
89	1925.00	370.00	2062.00	400.00	3

90	2062.00	400.00	2482.00	400.00	3
91	1278.00	355.00	1375.00	351.00	1
92	1438.00	330.00	1475.00	320.00	1
93	1475.00	320.00	1600.00	290.00	1
94	1600.00	290.00	1870.00	248.00	1
95	1870.00	248.00	1910.00	248.00	1
96	1910.00	248.00	1962.00	270.00	1
97	1962.00	270.00	2482.00	374.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 10 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	238.00
2	500.00	240.00
3	900.00	250.00
4	1100.00	260.00
5	1300.00	310.00
6	1438.00	330.00
7	1735.00	340.00
8	1925.00	370.00
9	2062.00	400.00
10	2482.00	400.00

A Horizontal Earthquake Loading Coefficient
Of0.210 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure =   0.0 (psf)

1

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

1000 Trial Surfaces Have Been Generated.

6 Boxes Specified For Generation Of Central Block Base

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

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	297.00	267.00	300.00	266.00	0.50
2	377.00	247.00	380.00	246.00	0.50
3	398.00	246.00	400.00	246.00	0.50
4	507.00	267.00	509.00	267.00	0.50
5	598.00	279.00	600.00	279.00	0.50
6	601.00	279.00	736.00	286.00	0.50

1

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

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

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.61	327.34
2	190.19	319.75
3	226.92	303.89
4	264.02	288.94
5	297.39	266.89
6	379.52	246.11
7	398.50	246.10
8	508.16	266.91
9	599.59	279.17
10	683.69	283.34
11	711.52	312.07
12	739.68	340.48
13	759.86	375.01
14	786.57	404.79
15	810.02	437.20
16	824.96	469.26

*** 0.983 ***

Individual data on the 36 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.6	4452.7	0.0	0.0	0.0	0.0	935.1	0.0	0.0
2	2.5	3174.1	0.0	0.0	0.0	0.0	666.6	0.0	0.0
3	5.3	8627.1	0.0	0.0	0.0	0.0	1811.7	0.0	0.0
4	1.0	1839.7	0.0	0.0	0.0	0.0	386.3	0.0	0.0
5	12.0	25168.1	0.0	0.0	0.0	0.0	5285.3	0.0	0.0
6	3.0	7281.7	0.0	0.0	0.0	0.0	1529.2	0.0	0.0
7	12.9	34921.1	0.0	0.0	0.0	0.0	7333.4	0.0	0.0
8	29.3	98948.3	0.0	0.0	0.0	0.0	20779.1	0.0	0.0
9	7.8	31173.5	0.0	0.0	0.0	0.0	6546.4	0.0	0.0
10	33.0	171936.4	0.0	0.0	0.0	0.0	36106.7	0.0	0.0
11	0.4	2468.3	0.0	0.0	0.0	0.0	518.4	0.0	0.0
12	2.6	16596.9	0.0	0.0	0.0	0.0	3485.4	0.0	0.0
13	38.0	268969.5	0.0	0.0	0.0	0.0	56483.6	0.0	0.0
14	41.5	352054.9	0.0	0.0	0.0	0.0	73931.5	0.0	0.0
15	0.5	4394.1	0.0	0.0	0.0	0.0	922.8	0.0	0.0
16	18.5	173479.5	0.0	0.0	0.0	0.0	36430.7	0.0	0.0
17	1.5	14293.5	0.0	0.0	0.0	0.0	3001.6	0.0	0.0
18	108.2	1056597.4	0.0	0.0	0.0	0.0	*******	0.0	0.0
19	0.8	8438.9	0.0	0.0	0.0	0.0	1772.2	0.0	0.0
20	69.0	709854.5	0.0	0.0	0.0	0.0	*******	0.0	0.0
21	21.6	229930.8	0.0	0.0	0.0	0.0	48285.5	0.0	0.0
22	0.4	4454.6	0.0	0.0	0.0	0.0	935.5	0.0	0.0
23	24.0	261957.0	0.0	0.0	0.0	0.0	55011.0	0.0	0.0
24	34.0	384993.1	0.0	0.0	0.0	0.0	80848.6	0.0	0.0
25	25.7	301645.7	0.0	0.0	0.0	0.0	63345.6	0.0	0.0
26	3.0	35668.3	0.0	0.0	0.0	0.0	7490.3	0.0	0.0
27	13.6	153137.9	0.0	0.0	0.0	0.0	32159.0	0.0	0.0
28	11.3	119516.4	0.0	0.0	0.0	0.0	25098.4	0.0	0.0
29	2.5	25440.7	0.0	0.0	0.0	0.0	5342.5	0.0	0.0
30	25.7	241198.3	0.0	0.0	0.0	0.0	50651.6	0.0	0.0
31	20.2	151207.9	0.0	0.0	0.0	0.0	31753.7	0.0	0.0
32	14.1	83290.3	0.0	0.0	0.0	0.0	17491.0	0.0	0.0
33	12.6	61919.0	0.0	0.0	0.0	0.0	13003.0	0.0	0.0
34	23.5	78237.6	0.0	0.0	0.0	0.0	16429.9	0.0	0.0
35	1.0	2113.1	0.0	0.0	0.0	0.0	443.8	0.0	0.0
36	14.0	14508.4	0.0	0.0	0.0	0.0	3046.8	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.61	327.34
2	190.19	319.75
3	226.92	303.89
4	264.02	288.94
5	297.39	266.89
6	379.52	246.11
7	398.50	246.10
8	508.16	266.91

9	599.59	279.17
10	683.69	283.34
11	711.52	312.07
12	739.68	340.48
13	759.86	375.01
14	786.57	404.79
15	810.02	437.20
16	824.96	469.26

*** 0.983 ***

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Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.61	327.34
2	190.19	319.75
3	226.92	303.89
4	264.02	288.94
5	297.39	266.89
6	379.52	246.11
7	398.50	246.10
8	508.16	266.91
9	599.59	279.17
10	683.69	283.34
11	711.52	312.07
12	739.68	340.48
13	759.86	375.01
14	786.57	404.79
15	810.02	437.20
16	824.96	469.26

*** 0.983 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.61	327.34
2	190.19	319.75
3	226.92	303.89
4	264.02	288.94
5	297.39	266.89
6	379.52	246.11
7	398.50	246.10
8	508.16	266.91
9	599.59	279.17
10	683.69	283.34
11	711.52	312.07
12	739.68	340.48

13	759.86	375.01
14	786.57	404.79
15	810.02	437.20
16	824.96	469.26

*** 0.983 ***

1

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.61	327.34
2	190.19	319.75
3	226.92	303.89
4	264.02	288.94
5	297.39	266.89
6	379.52	246.11
7	398.50	246.10
8	508.16	266.91
9	599.59	279.17
10	683.69	283.34
11	711.52	312.07
12	739.68	340.48
13	759.86	375.01
14	786.57	404.79
15	810.02	437.20
16	824.96	469.26

*** 0.983 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	334.28
2	232.85	313.90
3	264.64	289.62
4	297.53	266.86
5	378.93	246.58
6	399.34	245.97
7	508.69	267.14
8	599.04	278.98
9	706.59	284.57
10	731.64	315.76
11	757.88	345.95
12	786.14	374.25
13	794.35	413.40
14	813.30	448.63
15	821.29	469.19

*** 1.005 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	334.28
2	232.85	313.90
3	264.64	289.62
4	297.53	266.86
5	378.93	246.58
6	399.34	245.97
7	508.69	267.14
8	599.04	278.98
9	706.59	284.57
10	731.64	315.76
11	757.88	345.95
12	786.14	374.25
13	794.35	413.40
14	813.30	448.63
15	821.29	469.19

*** 1.005 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	334.28
2	232.85	313.90
3	264.64	289.62
4	297.53	266.86
5	378.93	246.58
6	399.34	245.97
7	508.69	267.14
8	599.04	278.98
9	706.59	284.57
10	731.64	315.76
11	757.88	345.95
12	786.14	374.25
13	794.35	413.40
14	813.30	448.63
15	821.29	469.19

*** 1.005 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	334.28
2	232.85	313.90
3	264.64	289.62
4	297.53	266.86
5	378.93	246.58
6	399.34	245.97
7	508.69	267.14
8	599.04	278.98
9	706.59	284.57
10	731.64	315.76
11	757.88	345.95
12	786.14	374.25
13	794.35	413.40
14	813.30	448.63
15	821.29	469.19

*** 1.005 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	211.11	334.28
2	232.85	313.90
3	264.64	289.62
4	297.53	266.86
5	378.93	246.58
6	399.34	245.97
7	508.69	267.14
8	599.04	278.98
9	706.59	284.57
10	731.64	315.76
11	757.88	345.95
12	786.14	374.25
13	794.35	413.40
14	813.30	448.63
15	821.29	469.19

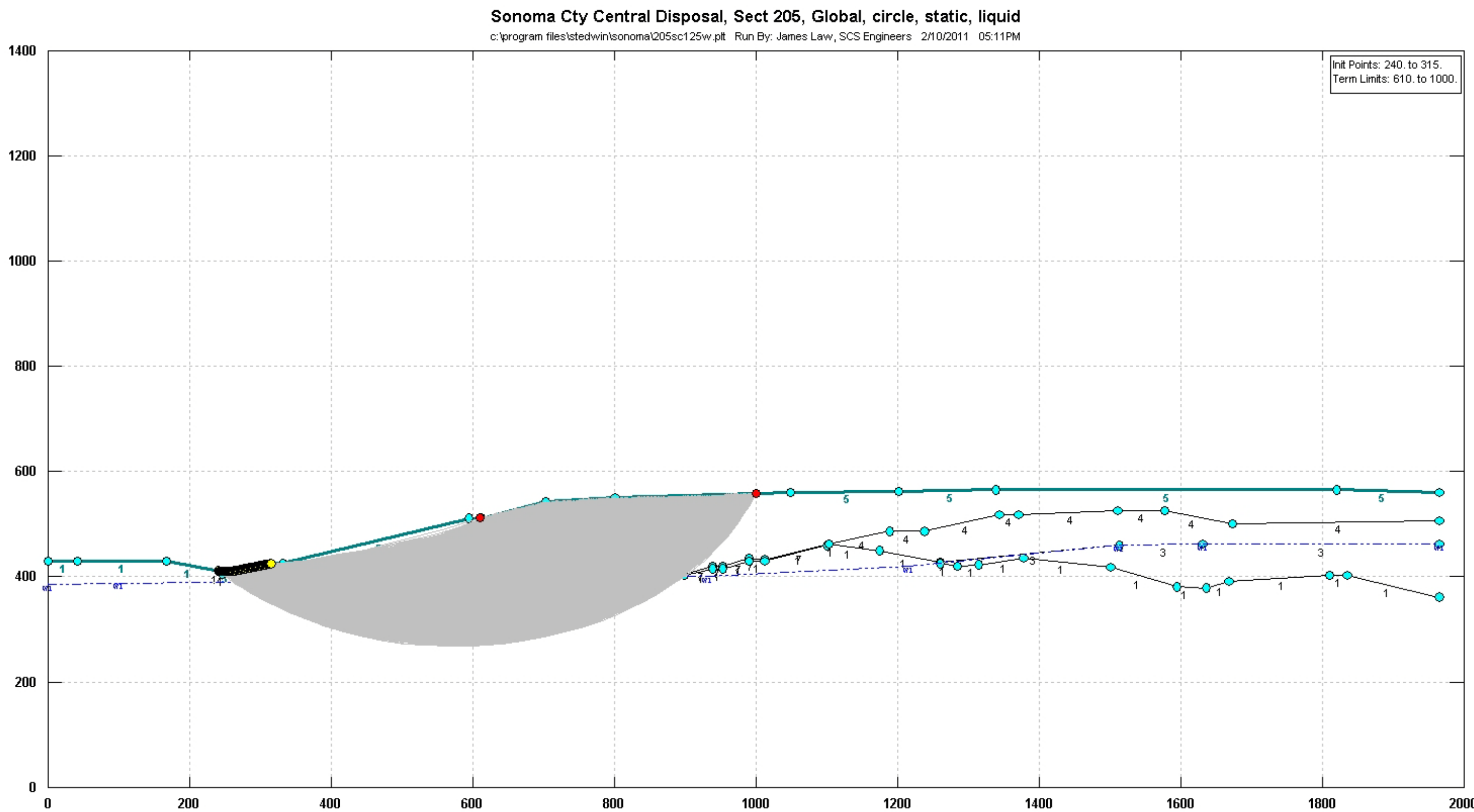
*** 1.005 ***

SECTION 205

Circular Failure Surface

Interface friction angle at 14.9 degrees

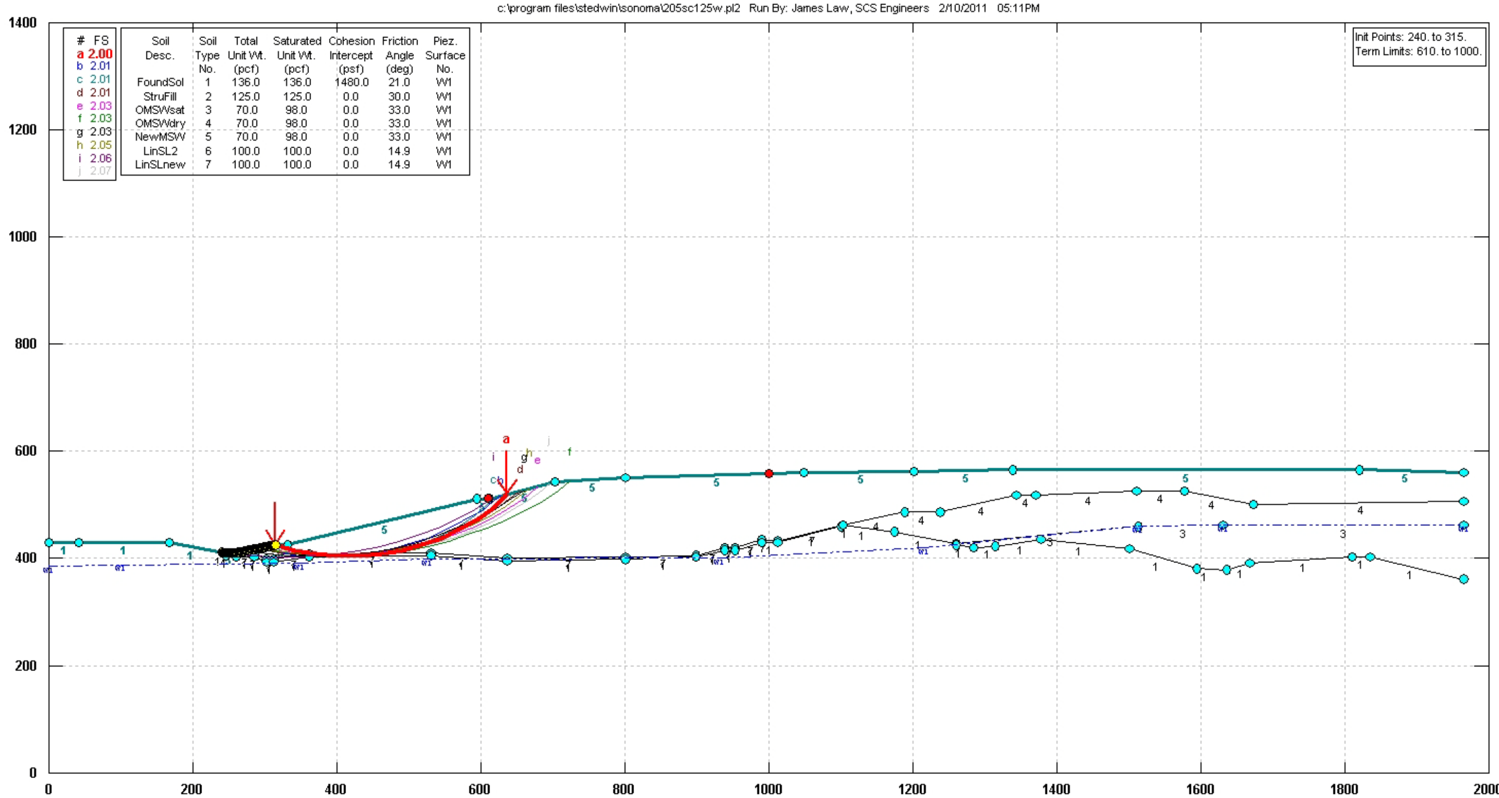
Static



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 205, Global, circle, static, liquid

c:\program files\stedwin\sonoma\205sc125w.pl2 Run By: James Law, SCS Engineers 2/10/2011 05:11PM



PCSTABL5M3 FSmin=2.00

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date: 2/10/2011
Time of Run: 05:11PM
Run By: James Law, SCS Engineers
Input Data Filename: C:205sc125w.in
Output Filename: C:205sc125w.OUT
Unit: ENGLISH
Plotted Output Filename: C:205sc125w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 205,
Global, circle, static, liquid

BOUNDARY COORDINATES

15 Top Boundaries
68 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	430.00	42.00	430.00	1
2	42.00	430.00	167.00	429.00	1
3	167.00	429.00	244.00	410.00	1
4	244.00	410.00	259.00	410.00	5
5	259.00	410.00	315.00	425.00	5
6	315.00	425.00	331.00	425.00	5
7	331.00	425.00	595.00	512.00	5
8	595.00	512.00	611.00	512.00	5
9	611.00	512.00	703.00	543.00	5
10	703.00	543.00	800.00	550.00	5
11	800.00	550.00	1050.00	560.00	5
12	1050.00	560.00	1200.00	563.00	5
13	1200.00	563.00	1339.00	565.00	5
14	1339.00	565.00	1820.00	565.00	5
15	1820.00	565.00	1965.00	561.00	5
16	244.00	410.00	260.00	407.00	7
17	260.00	407.00	284.00	407.00	7
18	284.00	407.00	303.00	397.00	7
19	303.00	397.00	312.00	397.00	7
20	312.00	397.00	360.00	408.00	7
21	360.00	408.00	531.00	409.00	7
22	531.00	409.00	635.00	400.00	7
23	635.00	400.00	800.00	402.00	7
24	800.00	402.00	900.00	406.00	7
25	900.00	406.00	938.00	419.00	7
26	938.00	419.00	952.00	419.00	7

27	952.00	419.00	991.00	435.00	7
28	991.00	435.00	1011.00	433.00	7
29	1011.00	433.00	1102.00	463.00	7
30	1102.00	463.00	1189.00	487.00	4
31	1189.00	487.00	1237.00	487.00	4
32	1237.00	487.00	1343.00	518.00	4
33	1343.00	518.00	1371.00	518.00	4
34	1371.00	518.00	1510.00	526.00	4
35	1510.00	526.00	1576.00	526.00	4
36	1576.00	526.00	1672.00	502.00	4
37	1672.00	502.00	1965.00	505.00	4
38	244.00	410.00	245.00	406.00	1
39	245.00	406.00	260.00	403.00	1
40	260.00	403.00	284.00	403.00	1
41	284.00	403.00	303.00	393.00	1
42	303.00	393.00	312.00	393.00	1
43	312.00	393.00	360.00	404.00	1
44	360.00	404.00	531.00	405.00	1
45	531.00	405.00	635.00	396.00	1
46	635.00	396.00	800.00	398.00	1
47	800.00	398.00	900.00	402.00	1
48	900.00	402.00	938.00	415.00	1
49	938.00	415.00	952.00	415.00	1
50	952.00	415.00	991.00	431.00	1
51	991.00	431.00	1011.00	429.00	1
52	1011.00	429.00	1101.00	459.00	1
53	1101.00	459.00	1102.00	463.00	1
54	1102.00	463.00	1175.00	450.00	1
55	1175.00	450.00	1261.00	428.00	1
56	1261.00	428.00	1513.00	460.00	3
57	1513.00	460.00	1630.00	463.00	3
58	1630.00	463.00	1965.00	463.00	3
59	1261.00	426.00	1285.00	421.00	1
60	1285.00	421.00	1315.00	422.00	1
61	1315.00	422.00	1377.00	434.00	1
62	1377.00	434.00	1500.00	418.00	1
63	1500.00	418.00	1595.00	380.00	1
64	1595.00	380.00	1636.00	379.00	1
65	1636.00	379.00	1668.00	390.00	1
66	1668.00	390.00	1810.00	404.00	1
67	1810.00	404.00	1834.00	404.00	1
68	1834.00	404.00	1965.00	361.00	1

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ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	386.00
2	100.00	388.00
3	350.00	390.00
4	525.00	397.00
5	930.00	400.00
6	1215.00	420.00
7	1513.00	460.00
8	1630.00	463.00
9	1965.00	463.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced Along The Ground Surface Between X = 240.00 ft.
and X = 315.00 ft.

Each Surface Terminates Between X = 610.00 ft.
and X =1000.00 ft.

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

30.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	313.73	424.66
2	342.07	414.83
3	371.33	408.21
4	401.15	404.89
5	431.15	404.92
6	460.96	408.28
7	490.21	414.94
8	518.54	424.81
9	545.59	437.78
10	571.04	453.67
11	594.55	472.30
12	615.84	493.44
13	634.65	516.81
14	637.21	520.83

Circle Center At X = 415.9 ; Y = 673.0 and Radius, 268.6

*** 2.001 ***

Individual data on the 19 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.3	34.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	16.0	3983.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	11.1	7809.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	29.3	44962.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1.2	2626.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	28.6	75306.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	30.0	104209.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	29.8	119231.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	1.4	5902.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	27.8	119092.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	28.3	123465.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	27.1	113561.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	25.4	96499.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	23.5	74048.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.5	1243.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	16.0	35065.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	4.8	7384.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	18.8	15375.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	2.6	282.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	290.85	418.53
2	319.91	411.09
3	349.54	406.42

4	379.49	404.54
5	409.47	405.48
6	439.24	409.23
7	468.52	415.75
8	497.06	424.99
9	524.61	436.87
10	550.92	451.28
11	575.77	468.09
12	598.93	487.16
13	620.19	508.32
14	628.03	517.74

Circle Center At X = 384.5 ; Y = 722.9 and Radius, 318.5

*** 2.006 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	315.00	425.00
2	343.11	414.51
3	372.29	407.55
4	402.10	404.22
5	432.10	404.57
6	461.83	408.61
7	490.84	416.26
8	518.68	427.41
9	544.96	441.90
10	569.25	459.50
11	591.20	479.95
12	610.48	502.94
13	617.84	514.30

Circle Center At X = 414.2 ; Y = 647.9 and Radius, 244.0

*** 2.008 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	289.58	418.19
2	318.74	411.16
3	348.40	406.63
4	378.33	404.61
5	408.32	405.12
6	438.17	408.17
7	467.65	413.72
8	496.56	421.75
9	524.68	432.18
10	551.83	444.96
11	577.80	459.98
12	602.41	477.14

13	625.48	496.31
14	646.85	517.37
15	654.93	526.80

Circle Center At X = 387.2 ; Y = 759.5 and Radius, 355.0

*** 2.009 ***

1

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	297.20	420.23
2	326.30	412.92
3	355.89	408.01
4	385.79	405.53
5	415.79	405.50
6	445.69	407.93
7	475.30	412.78
8	504.40	420.05
9	532.82	429.66
10	560.36	441.57
11	586.83	455.68
12	612.06	471.91
13	635.88	490.15
14	658.13	510.27
15	678.66	532.14
16	681.55	535.77

Circle Center At X = 401.1 ; Y = 771.6 and Radius, 366.4

*** 2.028 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	289.58	418.19
2	318.90	411.86
3	348.58	407.49
4	378.49	405.10
5	408.48	404.71
6	438.44	406.32
7	468.22	409.92
8	497.70	415.49
9	526.74	423.01
10	555.22	432.45
11	583.01	443.76
12	609.98	456.89
13	636.02	471.80
14	661.00	488.40
15	684.83	506.62
16	707.40	526.39
17	725.61	544.63

Circle Center At X = 399.3 ; Y = 855.2 and Radius, 450.6

*** 2.030 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	275.59	414.44
2	305.07	408.86
3	334.88	405.45
4	364.85	404.23
5	394.83	405.21
6	424.67	408.38
7	454.19	413.72
8	483.24	421.21
9	511.66	430.80
10	539.31	442.45
11	566.03	456.09
12	591.68	471.64
13	616.13	489.04
14	639.23	508.17
15	660.65	528.73

Circle Center At X = 366.5 ; Y = 814.0 and Radius, 409.8

*** 2.032 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	295.93	419.89
2	325.06	412.70
3	354.68	407.97
4	384.60	405.75
5	414.60	406.04
6	444.47	408.85
7	473.99	414.15
8	502.97	421.91
9	531.20	432.08
10	558.47	444.58
11	584.60	459.32
12	609.40	476.20
13	632.69	495.11
14	654.32	515.90
15	667.68	531.10

Circle Center At X = 396.1 ; Y = 762.8 and Radius, 357.3

*** 2.048 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	251.44	410.00
2	281.10	405.46
3	311.00	403.01
4	340.99	402.65
5	370.94	404.40
6	400.70	408.24
7	430.11	414.15
8	459.03	422.10
9	487.33	432.06
10	514.86	443.97
11	541.50	457.79
12	567.09	473.43
13	591.54	490.83
14	614.70	509.89
15	620.19	515.10

Circle Center At X = 331.1 ; Y = 830.9 and Radius, 428.4

*** 2.061 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	302.29	421.60
2	331.35	414.14
3	360.91	409.05
4	390.79	406.36
5	420.79	406.09
6	450.71	408.24
7	480.36	412.80
8	509.55	419.73
9	538.09	429.00
10	565.78	440.53
11	592.45	454.26
12	617.93	470.10
13	642.05	487.94
14	664.65	507.67
15	685.59	529.16
16	694.76	540.22

Circle Center At X = 409.1 ; Y = 776.7 and Radius, 370.8

*** 2.071 ***

SECTION 205

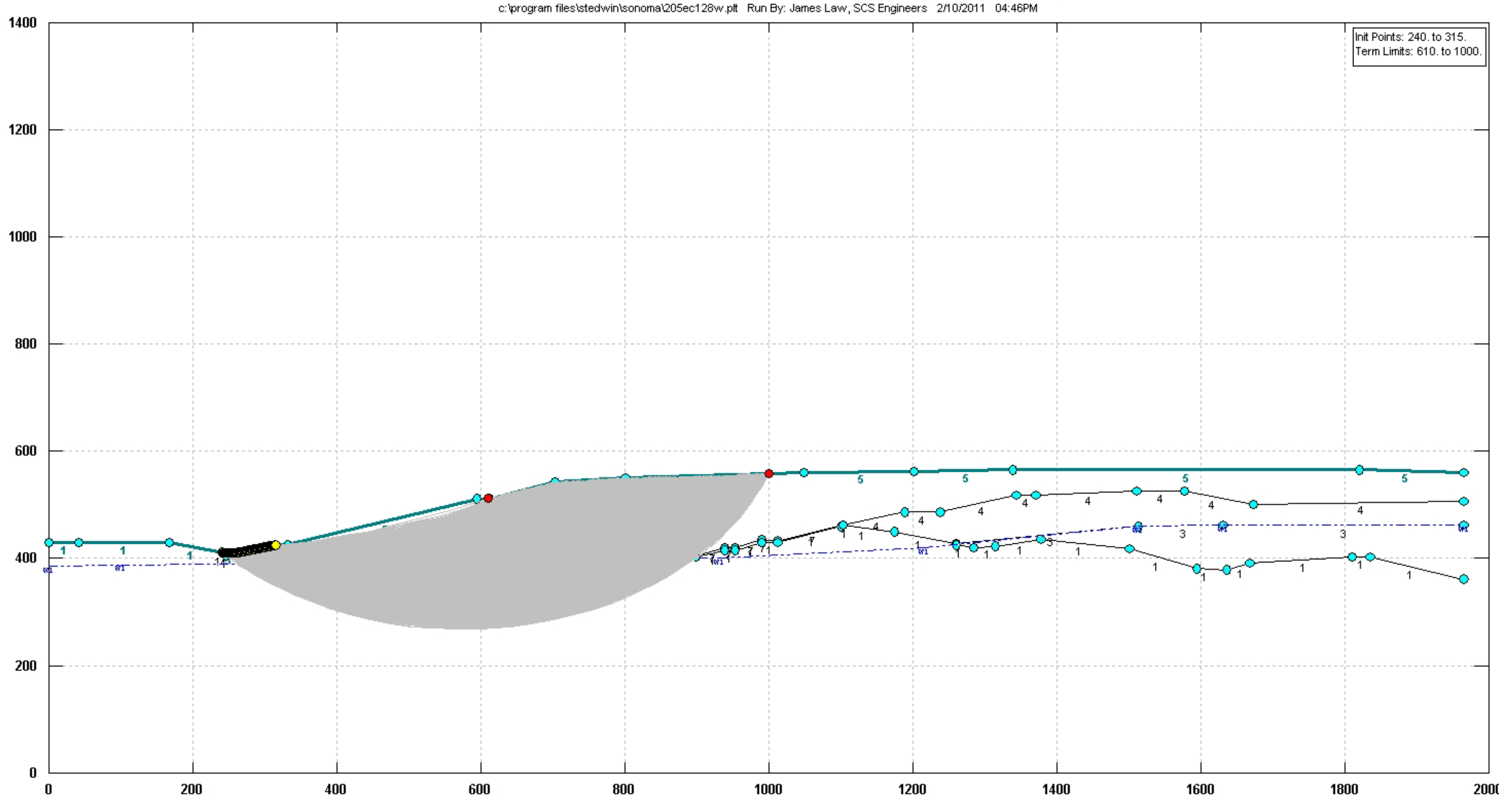
Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 205, Global, circle, seismic=0.26g, liquid

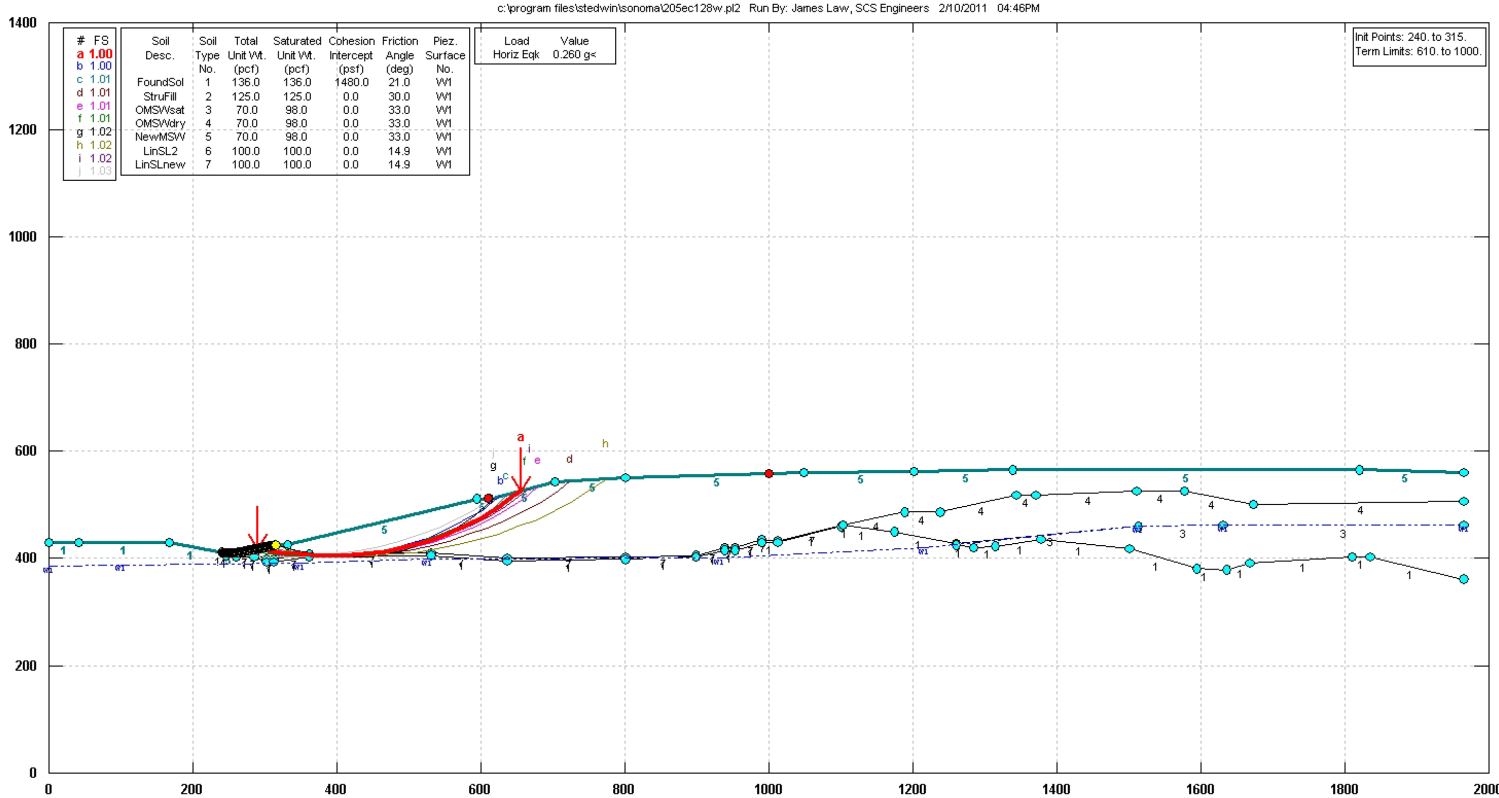
c:\program files\stedwin\sonoma\205ec128w.plt Run By: James Law, SCS Engineers 2/10/2011 04:46PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 205, Global, circle, seismic=0.26g, liquid

c:\program files\stedwin\sonoma\205ec128w.pl2 Run By: James Law, SCS Engineers 2/10/2011 04:46PM



PCSTABL5M3 FSmin=1.00

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

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

Run Date:	2/10/2011
Time of Run:	04:46PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:205ec128w.in
Output Filename:	C:205ec128w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:205ec128w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 205,
Global, circle, seismic=0.26g, liquid

BOUNDARY COORDINATES

15 Top Boundaries
68 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	430.00	42.00	430.00	1
2	42.00	430.00	167.00	429.00	1
3	167.00	429.00	244.00	410.00	1
4	244.00	410.00	259.00	410.00	5
5	259.00	410.00	315.00	425.00	5
6	315.00	425.00	331.00	425.00	5
7	331.00	425.00	595.00	512.00	5
8	595.00	512.00	611.00	512.00	5
9	611.00	512.00	703.00	543.00	5
10	703.00	543.00	800.00	550.00	5
11	800.00	550.00	1050.00	560.00	5
12	1050.00	560.00	1200.00	563.00	5
13	1200.00	563.00	1339.00	565.00	5
14	1339.00	565.00	1820.00	565.00	5
15	1820.00	565.00	1965.00	561.00	5
16	244.00	410.00	260.00	407.00	7
17	260.00	407.00	284.00	407.00	7
18	284.00	407.00	303.00	397.00	7
19	303.00	397.00	312.00	397.00	7
20	312.00	397.00	360.00	408.00	7
21	360.00	408.00	531.00	409.00	7
22	531.00	409.00	635.00	400.00	7
23	635.00	400.00	800.00	402.00	7
24	800.00	402.00	900.00	406.00	7
25	900.00	406.00	938.00	419.00	7
26	938.00	419.00	952.00	419.00	7

27	952.00	419.00	991.00	435.00	7
28	991.00	435.00	1011.00	433.00	7
29	1011.00	433.00	1102.00	463.00	7
30	1102.00	463.00	1189.00	487.00	4
31	1189.00	487.00	1237.00	487.00	4
32	1237.00	487.00	1343.00	518.00	4
33	1343.00	518.00	1371.00	518.00	4
34	1371.00	518.00	1510.00	526.00	4
35	1510.00	526.00	1576.00	526.00	4
36	1576.00	526.00	1672.00	502.00	4
37	1672.00	502.00	1965.00	505.00	4
38	244.00	410.00	245.00	406.00	1
39	245.00	406.00	260.00	403.00	1
40	260.00	403.00	284.00	403.00	1
41	284.00	403.00	303.00	393.00	1
42	303.00	393.00	312.00	393.00	1
43	312.00	393.00	360.00	404.00	1
44	360.00	404.00	531.00	405.00	1
45	531.00	405.00	635.00	396.00	1
46	635.00	396.00	800.00	398.00	1
47	800.00	398.00	900.00	402.00	1
48	900.00	402.00	938.00	415.00	1
49	938.00	415.00	952.00	415.00	1
50	952.00	415.00	991.00	431.00	1
51	991.00	431.00	1011.00	429.00	1
52	1011.00	429.00	1101.00	459.00	1
53	1101.00	459.00	1102.00	463.00	1
54	1102.00	463.00	1175.00	450.00	1
55	1175.00	450.00	1261.00	428.00	1
56	1261.00	428.00	1513.00	460.00	3
57	1513.00	460.00	1630.00	463.00	3
58	1630.00	463.00	1965.00	463.00	3
59	1261.00	426.00	1285.00	421.00	1
60	1285.00	421.00	1315.00	422.00	1
61	1315.00	422.00	1377.00	434.00	1
62	1377.00	434.00	1500.00	418.00	1
63	1500.00	418.00	1595.00	380.00	1
64	1595.00	380.00	1636.00	379.00	1
65	1636.00	379.00	1668.00	390.00	1
66	1668.00	390.00	1810.00	404.00	1
67	1810.00	404.00	1834.00	404.00	1
68	1834.00	404.00	1965.00	361.00	1

1

ISOTROPIC SOIL PARAMETERS

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Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	0.00	0.0	1

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Unit Weight of Water = 62.40

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7	1513.00	460.00
8	1630.00	463.00
9	1965.00	463.00

A Horizontal Earthquake Loading Coefficient
Of0.260 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
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10	551.83	444.96
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*** 1.000 ***

Individual data on the 21 slices

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1	25.4	11509.3	0.0	0.0	0.0	0.0	2992.4	0.0	0.0
2	3.7	3506.2	0.0	0.0	0.0	0.0	911.6	0.0	0.0
3	12.3	12676.7	0.0	0.0	0.0	0.0	3295.9	0.0	0.0
4	17.4	24245.6	0.0	0.0	0.0	0.0	6303.9	0.0	0.0
5	4.3	7569.6	0.0	0.0	0.0	0.0	1968.1	0.0	0.0
6	7.3	14116.8	0.0	0.0	0.0	0.0	3670.4	0.0	0.0
7	18.3	43063.5	0.0	0.0	0.0	0.0	11196.5	0.0	0.0
8	30.0	88400.7	0.0	0.0	0.0	0.0	22984.2	0.0	0.0
9	29.8	103397.2	0.0	0.0	0.0	0.0	26883.3	0.0	0.0
10	1.6	5779.5	0.0	0.0	0.0	0.0	1502.7	0.0	0.0
11	27.9	106137.2	0.0	0.0	0.0	0.0	27595.7	0.0	0.0
12	28.9	115458.3	0.0	0.0	0.0	0.0	30019.2	0.0	0.0
13	28.1	112669.2	0.0	0.0	0.0	0.0	29294.0	0.0	0.0
14	27.1	103991.0	0.0	0.0	0.0	0.0	27037.7	0.0	0.0
15	26.0	90135.3	0.0	0.0	0.0	0.0	23435.2	0.0	0.0
16	17.2	52007.6	0.0	0.0	0.0	0.0	13522.0	0.0	0.0
17	7.4	19412.3	0.0	0.0	0.0	0.0	5047.2	0.0	0.0
18	8.6	18824.2	0.0	0.0	0.0	0.0	4894.3	0.0	0.0

19	14.5	24468.1	0.0	0.0	0.0	0.0	6361.7	0.0	0.0
20	21.4	20403.5	0.0	0.0	0.0	0.0	5304.9	0.0	0.0
21	8.1	1899.0	0.0	0.0	0.0	0.0	493.7	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	290.85	418.53
2	319.91	411.09
3	349.54	406.42
4	379.49	404.54
5	409.47	405.48
6	439.24	409.23
7	468.52	415.75
8	497.06	424.99
9	524.61	436.87
10	550.92	451.28
11	575.77	468.09
12	598.93	487.16
13	620.19	508.32
14	628.03	517.74

Circle Center At X = 384.5 ; Y = 722.9 and Radius, 318.5

*** 1.004 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	313.73	424.66
2	342.07	414.83
3	371.33	408.21
4	401.15	404.89
5	431.15	404.92
6	460.96	408.28
7	490.21	414.94
8	518.54	424.81
9	545.59	437.78
10	571.04	453.67
11	594.55	472.30
12	615.84	493.44
13	634.65	516.81
14	637.21	520.83

Circle Center At X = 415.9 ; Y = 673.0 and Radius, 268.6

*** 1.005 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	289.58	418.19
2	318.90	411.86
3	348.58	407.49
4	378.49	405.10
5	408.48	404.71
6	438.44	406.32
7	468.22	409.92
8	497.70	415.49
9	526.74	423.01
10	555.22	432.45
11	583.01	443.76
12	609.98	456.89
13	636.02	471.80
14	661.00	488.40
15	684.83	506.62
16	707.40	526.39
17	725.61	544.63

Circle Center At X = 399.3 ; Y = 855.2 and Radius, 450.6

*** 1.006 ***

1

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	297.20	420.23
2	326.30	412.92
3	355.89	408.01
4	385.79	405.53
5	415.79	405.50
6	445.69	407.93
7	475.30	412.78
8	504.40	420.05
9	532.82	429.66
10	560.36	441.57
11	586.83	455.68
12	612.06	471.91
13	635.88	490.15
14	658.13	510.27
15	678.66	532.14
16	681.55	535.77

Circle Center At X = 401.1 ; Y = 771.6 and Radius, 366.4

*** 1.011 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	275.59	414.44
2	305.07	408.86
3	334.88	405.45
4	364.85	404.23
5	394.83	405.21
6	424.67	408.38
7	454.19	413.72
8	483.24	421.21
9	511.66	430.80
10	539.31	442.45
11	566.03	456.09
12	591.68	471.64
13	616.13	489.04
14	639.23	508.17
15	660.65	528.73

Circle Center At X = 366.5 ; Y = 814.0 and Radius, 409.8

*** 1.011 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	315.00	425.00
2	343.11	414.51
3	372.29	407.55
4	402.10	404.22
5	432.10	404.57
6	461.83	408.61
7	490.84	416.26
8	518.68	427.41
9	544.96	441.90
10	569.25	459.50
11	591.20	479.95
12	610.48	502.94
13	617.84	514.30

Circle Center At X = 414.2 ; Y = 647.9 and Radius, 244.0

*** 1.016 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	301.02	421.25
2	330.21	414.33
3	359.77	409.22
4	389.59	405.92
5	419.55	404.47
6	449.55	404.86
7	479.47	407.08
8	509.19	411.15
9	538.61	417.02
10	567.61	424.70
11	596.09	434.14
12	623.93	445.31
13	651.03	458.17
14	677.30	472.67
15	702.62	488.76
16	726.91	506.37
17	750.07	525.43
18	772.01	545.89
19	774.15	548.13

Circle Center At X = 428.2 ; Y = 892.7 and Radius, 488.3

*** 1.017 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	295.93	419.89
2	325.06	412.70
3	354.68	407.97
4	384.60	405.75
5	414.60	406.04
6	444.47	408.85
7	473.99	414.15
8	502.97	421.91
9	531.20	432.08
10	558.47	444.58
11	584.60	459.32
12	609.40	476.20
13	632.69	495.11
14	654.32	515.90
15	667.68	531.10

Circle Center At X = 396.1 ; Y = 762.8 and Radius, 357.3

*** 1.023 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	251.44	410.00
2	281.10	405.46
3	311.00	403.01
4	340.99	402.65
5	370.94	404.40
6	400.70	408.24
7	430.11	414.15
8	459.03	422.10
9	487.33	432.06
10	514.86	443.97
11	541.50	457.79
12	567.09	473.43
13	591.54	490.83
14	614.70	509.89
15	620.19	515.10

Circle Center At X = 331.1 ; Y = 830.9 and Radius, 428.4

*** 1.027 ***

SECTION 205

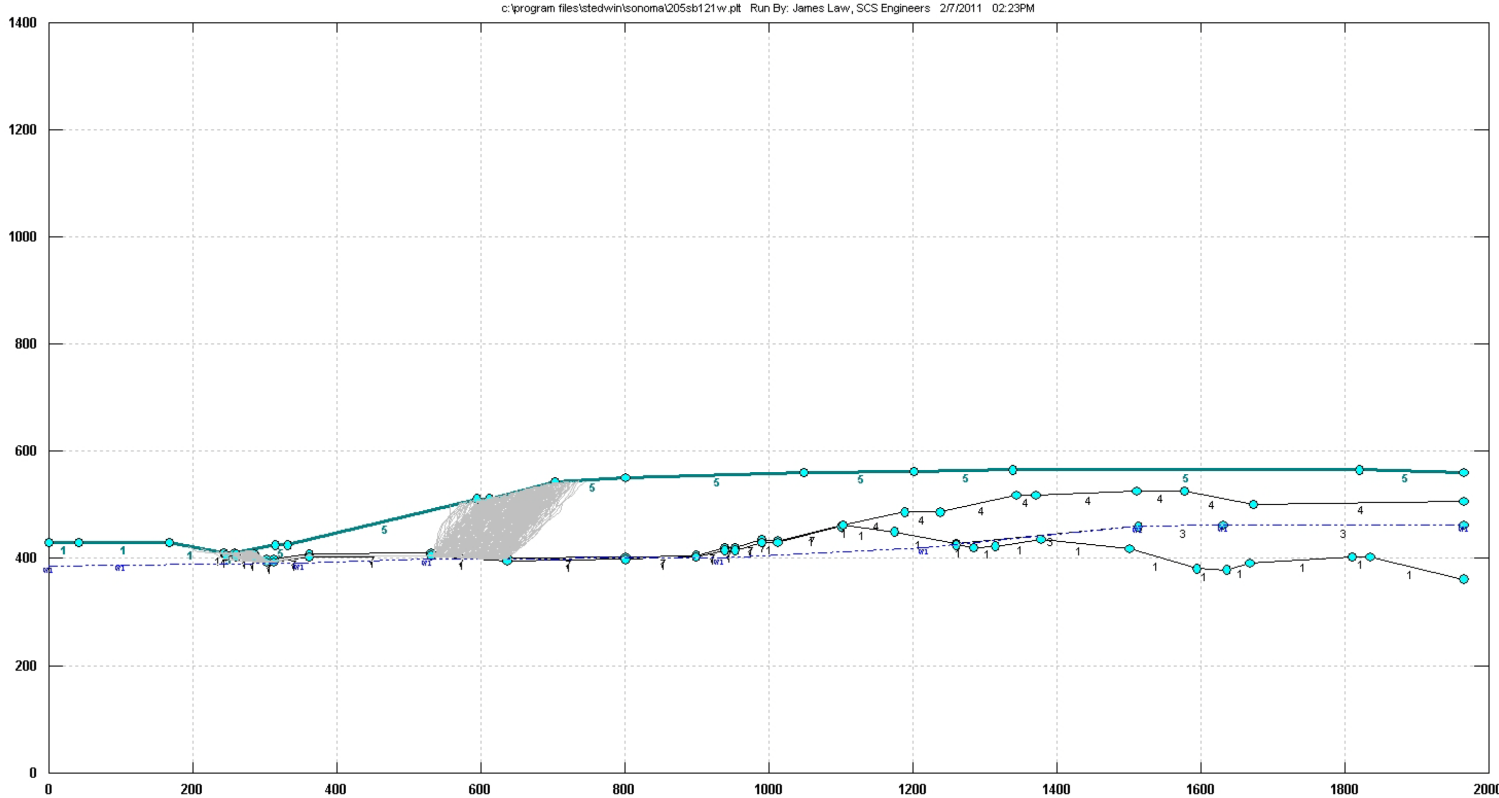
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 205, Global, block, static, liquid

c:\program files\stedwin\sonoma\205sb121w.plt Run By: James Law, SCS Engineers 2/7/2011 02:23PM



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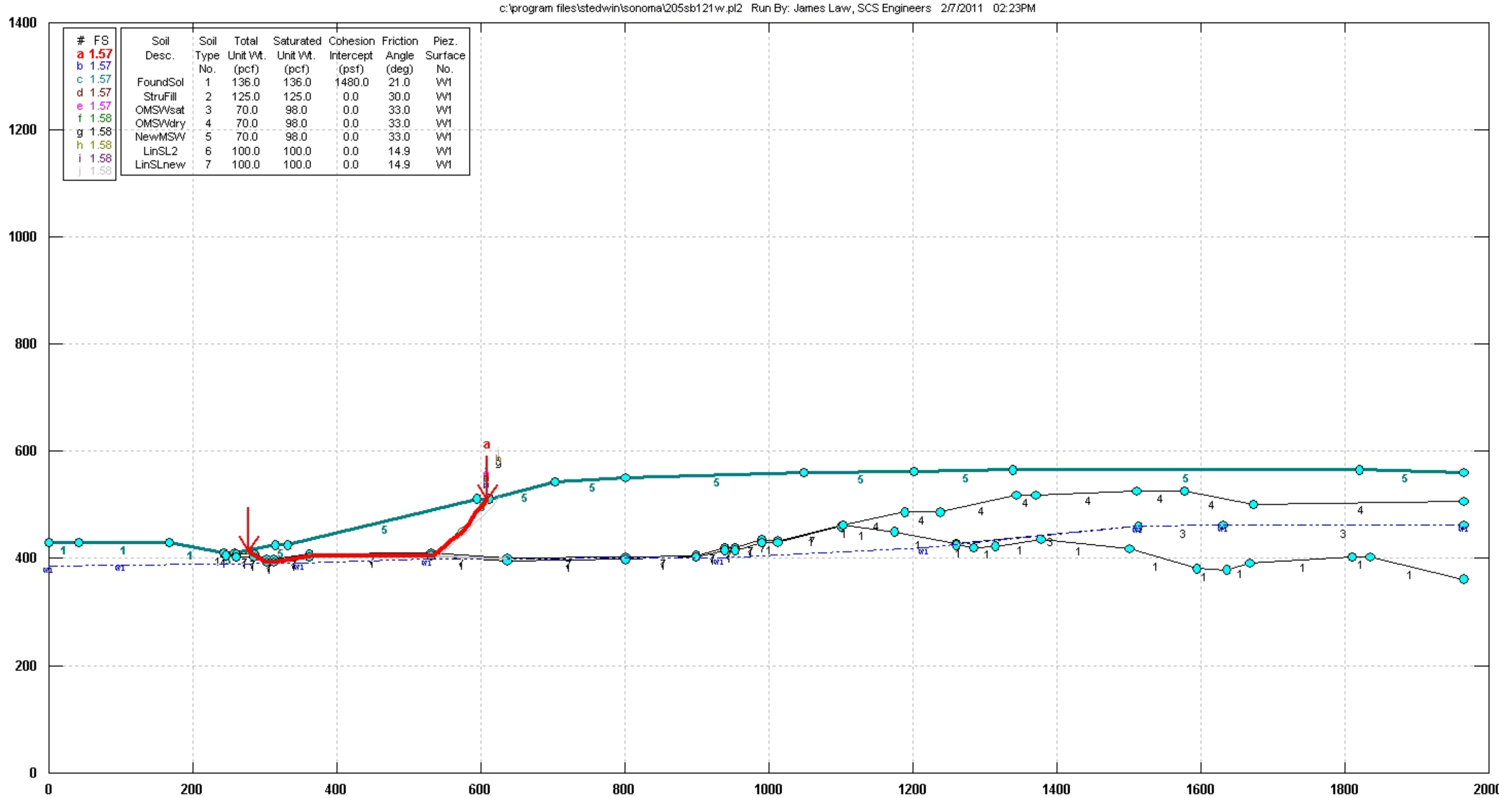
Sonoma Cty Central Disposal, Sect 205, Global, block, static, liquid

c:\program files\stedwin\sonoma\205sb121w.pl2 Run By: James Law, SCS Engineers 2/7/2011 02:23PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
FoundSol	1	136.0	136.0	1480.0	21.0	W1
StruFill	2	125.0	125.0	0.0	30.0	W1
OMSWsat	3	70.0	98.0	0.0	33.0	W1
OMSWdry	4	70.0	98.0	0.0	33.0	W1
NewMSW	5	70.0	98.0	0.0	33.0	W1
LinSL2	6	100.0	100.0	0.0	14.9	W1
LinSLnew	7	100.0	100.0	0.0	14.9	W1

PCSTABL5M3 FSmin=1.57

Safety Factors Are Calculated By The Modified Janbu Method

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** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/7/2011
Time of Run:	02:23PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:205sb121w.in
Output Filename:	C:205sb121w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:205sb121w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 205,
Global, block, static, liquid

BOUNDARY COORDINATES

15 Top   Boundaries
68 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	430.00	42.00	430.00	1
2	42.00	430.00	167.00	429.00	1
3	167.00	429.00	244.00	410.00	1
4	244.00	410.00	259.00	410.00	5
5	259.00	410.00	315.00	425.00	5
6	315.00	425.00	331.00	425.00	5
7	331.00	425.00	595.00	512.00	5
8	595.00	512.00	611.00	512.00	5
9	611.00	512.00	703.00	543.00	5
10	703.00	543.00	800.00	550.00	5
11	800.00	550.00	1050.00	560.00	5
12	1050.00	560.00	1200.00	563.00	5
13	1200.00	563.00	1339.00	565.00	5
14	1339.00	565.00	1820.00	565.00	5
15	1820.00	565.00	1965.00	561.00	5
16	244.00	410.00	260.00	407.00	7
17	260.00	407.00	284.00	407.00	7
18	284.00	407.00	303.00	397.00	7
19	303.00	397.00	312.00	397.00	7
20	312.00	397.00	360.00	408.00	7
21	360.00	408.00	531.00	409.00	7
22	531.00	409.00	635.00	400.00	7
23	635.00	400.00	800.00	402.00	7
24	800.00	402.00	900.00	406.00	7
25	900.00	406.00	938.00	419.00	7
26	938.00	419.00	952.00	419.00	7

27	952.00	419.00	991.00	435.00	7
28	991.00	435.00	1011.00	433.00	7
29	1011.00	433.00	1102.00	463.00	7
30	1102.00	463.00	1189.00	487.00	4
31	1189.00	487.00	1237.00	487.00	4
32	1237.00	487.00	1343.00	518.00	4
33	1343.00	518.00	1371.00	518.00	4
34	1371.00	518.00	1510.00	526.00	4
35	1510.00	526.00	1576.00	526.00	4
36	1576.00	526.00	1672.00	502.00	4
37	1672.00	502.00	1965.00	505.00	4
38	244.00	410.00	245.00	406.00	1
39	245.00	406.00	260.00	403.00	1
40	260.00	403.00	284.00	403.00	1
41	284.00	403.00	303.00	393.00	1
42	303.00	393.00	312.00	393.00	1
43	312.00	393.00	360.00	404.00	1
44	360.00	404.00	531.00	405.00	1
45	531.00	405.00	635.00	396.00	1
46	635.00	396.00	800.00	398.00	1
47	800.00	398.00	900.00	402.00	1
48	900.00	402.00	938.00	415.00	1
49	938.00	415.00	952.00	415.00	1
50	952.00	415.00	991.00	431.00	1
51	991.00	431.00	1011.00	429.00	1
52	1011.00	429.00	1101.00	459.00	1
53	1101.00	459.00	1102.00	463.00	1
54	1102.00	463.00	1175.00	450.00	1
55	1175.00	450.00	1261.00	428.00	1
56	1261.00	428.00	1513.00	460.00	3
57	1513.00	460.00	1630.00	463.00	3
58	1630.00	463.00	1965.00	463.00	3
59	1261.00	426.00	1285.00	421.00	1
60	1285.00	421.00	1315.00	422.00	1
61	1315.00	422.00	1377.00	434.00	1
62	1377.00	434.00	1500.00	418.00	1
63	1500.00	418.00	1595.00	380.00	1
64	1595.00	380.00	1636.00	379.00	1
65	1636.00	379.00	1668.00	390.00	1
66	1668.00	390.00	1810.00	404.00	1
67	1810.00	404.00	1834.00	404.00	1
68	1834.00	404.00	1965.00	361.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	386.00
2	100.00	388.00
3	350.00	390.00
4	525.00	397.00
5	930.00	400.00
6	1215.00	420.00
7	1513.00	460.00
8	1630.00	463.00
9	1965.00	463.00

1

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

1000 Trial Surfaces Have Been Generated.

5 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	303.00	394.00	305.00	394.00	0.50
2	310.00	394.00	312.00	394.00	0.50
3	360.00	405.00	363.00	405.00	0.50
4	528.00	406.00	531.00	406.00	0.50
5	532.00	406.00	635.00	397.00	0.50

1

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

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

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	278.28	415.16
2	287.40	406.24
3	303.21	394.00
4	310.76	394.07
5	362.56	405.14
6	530.23	406.10
7	533.98	405.60
8	546.63	421.09
9	560.76	435.24
10	574.77	449.51
11	583.73	467.39
12	593.05	485.09
13	603.90	501.89
14	609.32	512.00

*** 1.567 ***

Individual data on the 22 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.1	3628.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	4.1	3928.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	11.5	17850.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.2	434.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	7.5	15893.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1.2	2692.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	3.0	6528.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	16.0	33068.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	29.0	60187.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	2.6	5630.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	167.7	688310.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.8	4652.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	3.0	18133.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	2.4	14427.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	10.2	57079.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	14.1	69444.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	14.0	59486.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	9.0	30333.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	9.3	21900.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	2.0	3425.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	8.9	10588.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	5.4	1919.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	278.28	415.16
2	287.40	406.24

3	303.21	394.00
4	310.76	394.07
5	362.56	405.14
6	530.23	406.10
7	533.98	405.60
8	546.63	421.09
9	560.76	435.24
10	574.77	449.51
11	583.73	467.39
12	593.05	485.09
13	603.90	501.89
14	609.32	512.00

*** 1.567 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	278.28	415.16
2	287.40	406.24
3	303.21	394.00
4	310.76	394.07
5	362.56	405.14
6	530.23	406.10
7	533.98	405.60
8	546.63	421.09
9	560.76	435.24
10	574.77	449.51
11	583.73	467.39
12	593.05	485.09
13	603.90	501.89
14	609.32	512.00

*** 1.567 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	278.28	415.16
2	287.40	406.24
3	303.21	394.00
4	310.76	394.07
5	362.56	405.14
6	530.23	406.10
7	533.98	405.60
8	546.63	421.09
9	560.76	435.24
10	574.77	449.51

11	583.73	467.39
12	593.05	485.09
13	603.90	501.89
14	609.32	512.00

*** 1.567 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	278.28	415.16
2	287.40	406.24
3	303.21	394.00
4	310.76	394.07
5	362.56	405.14
6	530.23	406.10
7	533.98	405.60
8	546.63	421.09
9	560.76	435.24
10	574.77	449.51
11	583.73	467.39
12	593.05	485.09
13	603.90	501.89
14	609.32	512.00

*** 1.567 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	269.26	412.75
2	285.77	401.86
3	304.06	393.77
4	311.92	393.95
5	362.25	405.13
6	529.09	405.86
7	533.83	405.89
8	547.89	420.11
9	561.07	435.15
10	569.26	453.40
11	583.38	467.56
12	591.27	485.94
13	601.00	503.41
14	609.47	512.00

*** 1.581 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	279.31	415.44
2	288.47	407.49
3	303.06	393.81
4	310.83	393.94
5	360.85	404.88
6	528.29	406.17
7	540.47	405.51
8	554.25	420.00
9	568.29	434.25
10	579.66	450.70
11	590.96	467.20
12	603.90	482.45
13	616.96	497.60
14	625.21	515.82
15	626.59	517.25

*** 1.583 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	279.31	415.44
2	288.47	407.49
3	303.06	393.81
4	310.83	393.94
5	360.85	404.88
6	528.29	406.17
7	540.47	405.51
8	554.25	420.00
9	568.29	434.25
10	579.66	450.70
11	590.96	467.20
12	603.90	482.45
13	616.96	497.60
14	625.21	515.82
15	626.59	517.25

*** 1.583 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	279.31	415.44
2	288.47	407.49
3	303.06	393.81
4	310.83	393.94
5	360.85	404.88
6	528.29	406.17
7	540.47	405.51
8	554.25	420.00
9	568.29	434.25
10	579.66	450.70
11	590.96	467.20
12	603.90	482.45
13	616.96	497.60
14	625.21	515.82
15	626.59	517.25

*** 1.583 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	279.31	415.44
2	288.47	407.49
3	303.06	393.81
4	310.83	393.94
5	360.85	404.88
6	528.29	406.17
7	540.47	405.51
8	554.25	420.00
9	568.29	434.25
10	579.66	450.70
11	590.96	467.20
12	603.90	482.45
13	616.96	497.60
14	625.21	515.82
15	626.59	517.25

*** 1.583 ***

SECTION 205

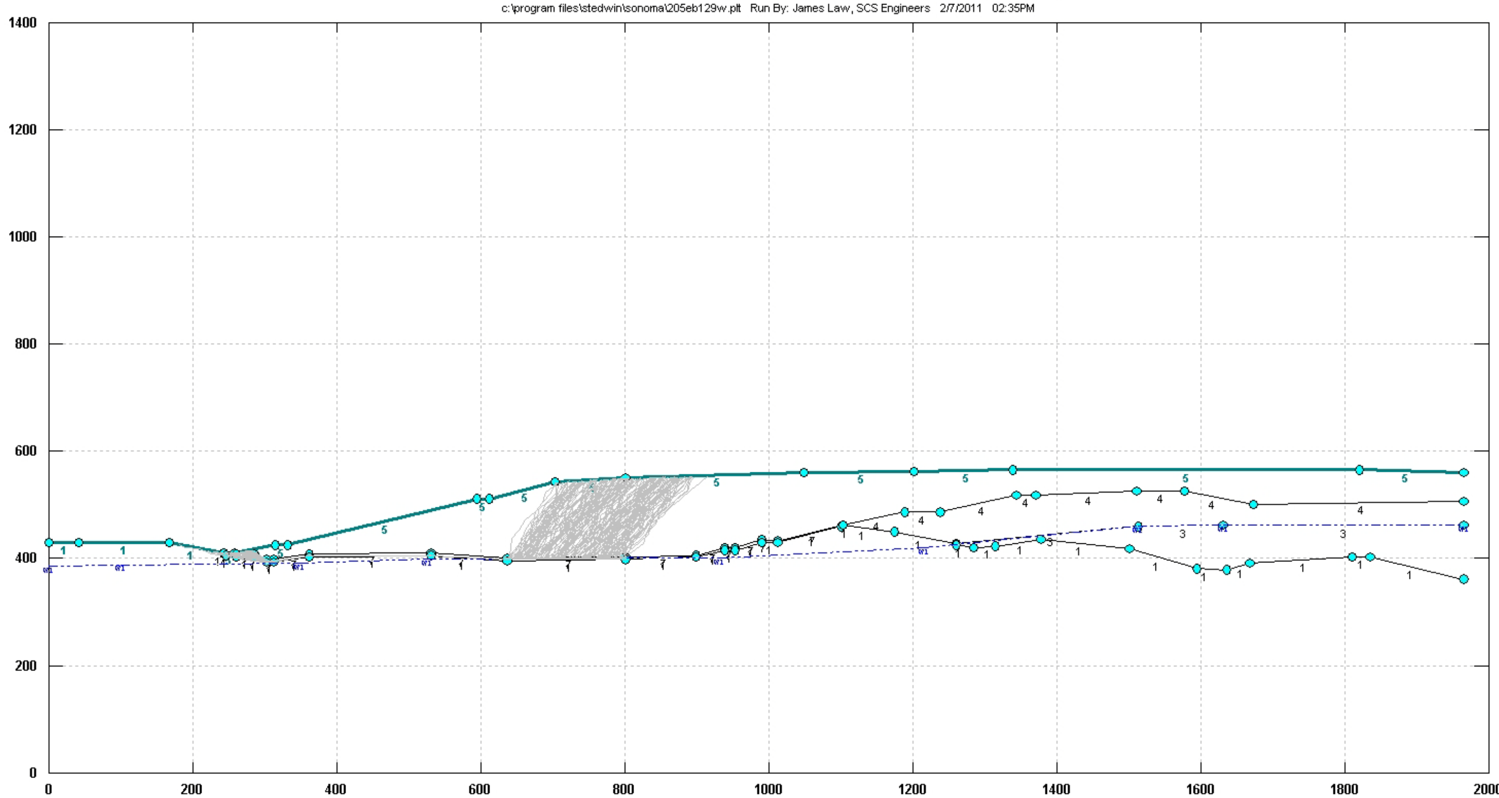
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 205, Global, block, seismic=0.15g, liquid

c:\program files\stedwin\sonoma\205eb129w.plt Run By: James Law, SCS Engineers 2/7/2011 02:35PM



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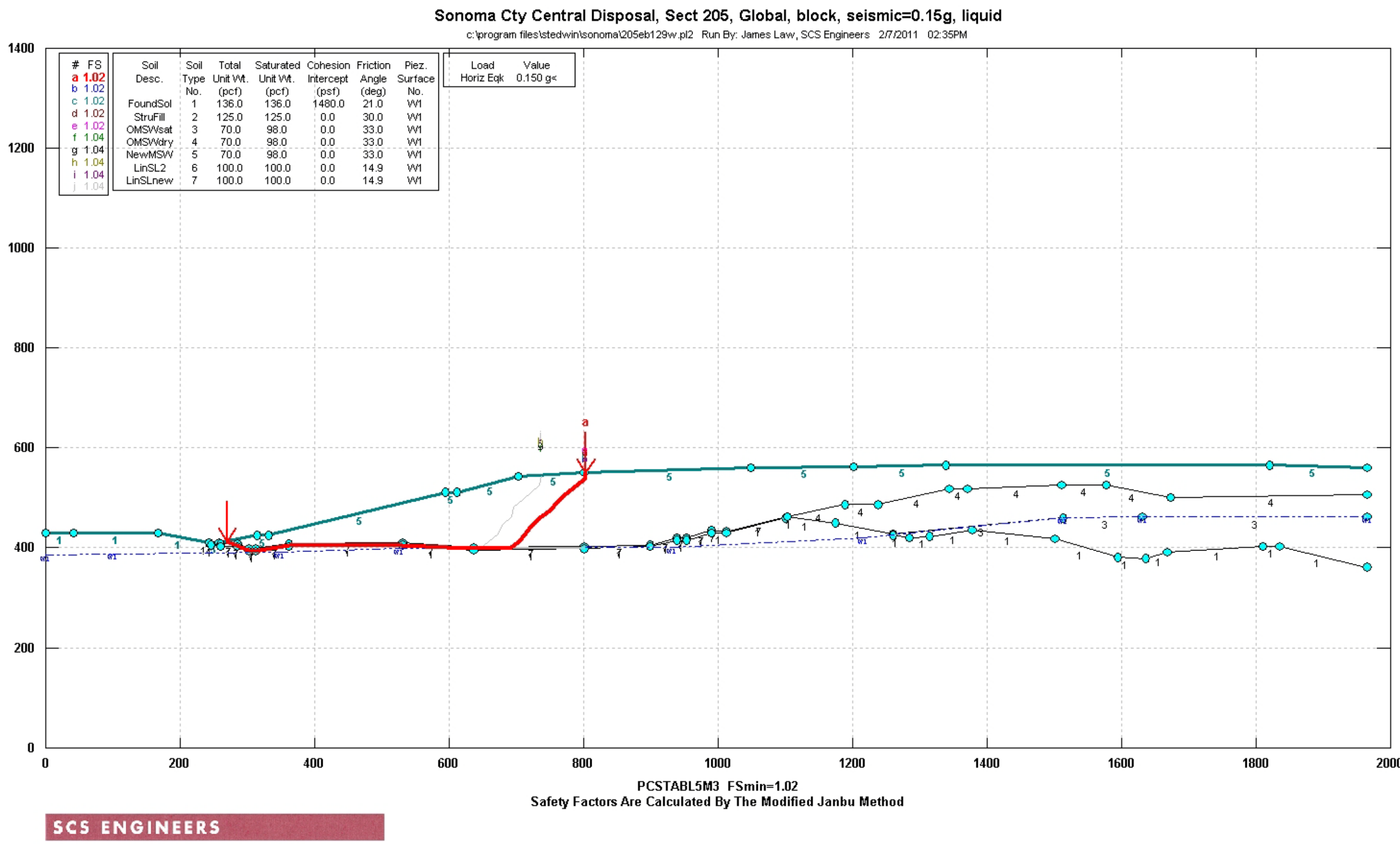

Sonoma Cty Central Disposal, Sect 205, Global, block, seismic=0.15g, liquid
c:\program files\stedwin\sonoma\205eb129w.pl2 Run By: James Law, SCS Engineers 2/7/2011 02:35PM
FS
a 1.02
b 1.02
c 1.02
d 1.02
e 1.02
f 1.04
g 1.04
h 1.04
i 1.04
j 1.04
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No.
FoundSol 1 136.0 136.0 1480.0 21.0 W1
StruFill 2 125.0 125.0 0.0 30.0 W1
OMSWsat 3 70.0 98.0 0.0 33.0 W1
OMSWdry 4 70.0 98.0 0.0 33.0 W1
NewMSW 5 70.0 98.0 0.0 33.0 W1
LinSL2 6 100.0 100.0 0.0 14.9 W1
LinSLnew 7 100.0 100.0 0.0 14.9 W1
Load Value
Horiz Eqk 0.150 g<
PCSTABL5M3 FSmin=1.02
Safety Factors Are Calculated By The Modified Janbu Method
SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/7/2011
Time of Run:	02:35PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:205eb129w.in
Output Filename:	C:205eb129w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:205eb129w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 205,
Global, block, seismic=0.15g, liquid

BOUNDARY COORDINATES

15 Top Boundaries
68 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	430.00	42.00	430.00	1
2	42.00	430.00	167.00	429.00	1
3	167.00	429.00	244.00	410.00	1
4	244.00	410.00	259.00	410.00	5
5	259.00	410.00	315.00	425.00	5
6	315.00	425.00	331.00	425.00	5
7	331.00	425.00	595.00	512.00	5
8	595.00	512.00	611.00	512.00	5
9	611.00	512.00	703.00	543.00	5
10	703.00	543.00	800.00	550.00	5
11	800.00	550.00	1050.00	560.00	5
12	1050.00	560.00	1200.00	563.00	5
13	1200.00	563.00	1339.00	565.00	5
14	1339.00	565.00	1820.00	565.00	5
15	1820.00	565.00	1965.00	561.00	5
16	244.00	410.00	260.00	407.00	7
17	260.00	407.00	284.00	407.00	7
18	284.00	407.00	303.00	397.00	7
19	303.00	397.00	312.00	397.00	7
20	312.00	397.00	360.00	408.00	7
21	360.00	408.00	531.00	409.00	7
22	531.00	409.00	635.00	400.00	7
23	635.00	400.00	800.00	402.00	7
24	800.00	402.00	900.00	406.00	7
25	900.00	406.00	938.00	419.00	7
26	938.00	419.00	952.00	419.00	7

27	952.00	419.00	991.00	435.00	7
28	991.00	435.00	1011.00	433.00	7
29	1011.00	433.00	1102.00	463.00	7
30	1102.00	463.00	1189.00	487.00	4
31	1189.00	487.00	1237.00	487.00	4
32	1237.00	487.00	1343.00	518.00	4
33	1343.00	518.00	1371.00	518.00	4
34	1371.00	518.00	1510.00	526.00	4
35	1510.00	526.00	1576.00	526.00	4
36	1576.00	526.00	1672.00	502.00	4
37	1672.00	502.00	1965.00	505.00	4
38	244.00	410.00	245.00	406.00	1
39	245.00	406.00	260.00	403.00	1
40	260.00	403.00	284.00	403.00	1
41	284.00	403.00	303.00	393.00	1
42	303.00	393.00	312.00	393.00	1
43	312.00	393.00	360.00	404.00	1
44	360.00	404.00	531.00	405.00	1
45	531.00	405.00	635.00	396.00	1
46	635.00	396.00	800.00	398.00	1
47	800.00	398.00	900.00	402.00	1
48	900.00	402.00	938.00	415.00	1
49	938.00	415.00	952.00	415.00	1
50	952.00	415.00	991.00	431.00	1
51	991.00	431.00	1011.00	429.00	1
52	1011.00	429.00	1101.00	459.00	1
53	1101.00	459.00	1102.00	463.00	1
54	1102.00	463.00	1175.00	450.00	1
55	1175.00	450.00	1261.00	428.00	1
56	1261.00	428.00	1513.00	460.00	3
57	1513.00	460.00	1630.00	463.00	3
58	1630.00	463.00	1965.00	463.00	3
59	1261.00	426.00	1285.00	421.00	1
60	1285.00	421.00	1315.00	422.00	1
61	1315.00	422.00	1377.00	434.00	1
62	1377.00	434.00	1500.00	418.00	1
63	1500.00	418.00	1595.00	380.00	1
64	1595.00	380.00	1636.00	379.00	1
65	1636.00	379.00	1668.00	390.00	1
66	1668.00	390.00	1810.00	404.00	1
67	1810.00	404.00	1834.00	404.00	1
68	1834.00	404.00	1965.00	361.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	386.00
2	100.00	388.00
3	350.00	390.00
4	525.00	397.00
5	930.00	400.00
6	1215.00	420.00
7	1513.00	460.00
8	1630.00	463.00
9	1965.00	463.00

A Horizontal Earthquake Loading Coefficient
Of0.150 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

1

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

1000 Trial Surfaces Have Been Generated.

6 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 20.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	303.00	394.00	305.00	394.00	0.50
2	310.00	394.00	312.00	394.00	0.50
3	360.00	405.00	363.00	405.00	0.50
4	528.00	406.00	531.00	406.00	0.50
5	632.00	397.00	635.00	397.00	0.50
6	636.00	397.00	800.00	399.00	0.50

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 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.26	413.28
2	286.52	401.73
3	304.87	393.76
4	310.28	393.85
5	360.42	404.77
6	530.70	405.84
7	632.43	397.21
8	690.56	397.61
9	704.31	412.14
10	714.02	429.62
11	724.60	446.59
12	737.92	461.52
13	751.55	476.15
14	762.22	493.07
15	774.15	509.12
16	787.70	523.83
17	801.54	538.26
18	802.40	550.10

*** 1.017 ***

Individual data on the 33 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.3	2471.4	0.0	0.0	0.0	0.0	370.7	0.0	0.0
2	4.4	3577.4	0.0	0.0	0.0	0.0	536.6	0.0	0.0
3	2.5	2809.0	0.0	0.0	0.0	0.0	421.3	0.0	0.0
4	16.5	26293.2	0.0	0.0	0.0	0.0	3944.0	0.0	0.0
5	1.9	3798.0	0.0	0.0	0.0	0.0	569.7	0.0	0.0
6	5.4	11585.9	0.0	0.0	0.0	0.0	1737.9	0.0	0.0
7	1.7	3759.8	0.0	0.0	0.0	0.0	564.0	0.0	0.0
8	3.0	6562.1	0.0	0.0	0.0	0.0	984.3	0.0	0.0
9	16.0	33180.4	0.0	0.0	0.0	0.0	4977.1	0.0	0.0
10	29.0	60105.7	0.0	0.0	0.0	0.0	9015.9	0.0	0.0
11	0.4	912.7	0.0	0.0	0.0	0.0	136.9	0.0	0.0
12	170.3	701081.3	0.0	0.0	0.0	0.0	*******	0.0	0.0
13	0.3	1812.7	0.0	0.0	0.0	0.0	271.9	0.0	0.0
14	64.0	446642.8	0.0	0.0	0.0	0.0	66996.4	0.0	0.0
15	16.0	127236.0	0.0	0.0	0.0	0.0	19085.4	0.0	0.0
16	15.1	124237.5	0.0	0.0	0.0	0.0	18635.6	0.0	0.0

17	6.3	53914.2	0.0	115.1	0.0	0.0	8087.1	0.0	0.0
18	2.6	22288.3	0.0	93.6	0.0	0.0	3343.2	0.0	0.0
19	55.6	518366.4	0.0	2076.5	0.0	0.0	77755.0	0.0	0.0
20	0.6	5826.2	0.0	16.3	0.0	0.0	873.9	0.0	0.0
21	2.3	23060.5	0.0	0.0	0.0	0.0	3459.1	0.0	0.0
22	9.5	90274.5	0.0	0.0	0.0	0.0	13541.2	0.0	0.0
23	1.3	12075.7	0.0	0.0	0.0	0.0	1811.4	0.0	0.0
24	9.7	83278.3	0.0	0.0	0.0	0.0	12491.8	0.0	0.0
25	10.6	78607.5	0.0	0.0	0.0	0.0	11791.1	0.0	0.0
26	13.3	84810.2	0.0	0.0	0.0	0.0	12721.5	0.0	0.0
27	13.6	73616.0	0.0	0.0	0.0	0.0	11042.4	0.0	0.0
28	10.7	46532.6	0.0	0.0	0.0	0.0	6979.9	0.0	0.0
29	11.9	38913.0	0.0	0.0	0.0	0.0	5836.9	0.0	0.0
30	13.5	30485.1	0.0	0.0	0.0	0.0	4572.8	0.0	0.0
31	12.3	16631.6	0.0	0.0	0.0	0.0	2494.7	0.0	0.0
32	1.5	1359.6	0.0	0.0	0.0	0.0	203.9	0.0	0.0
33	0.9	352.3	0.0	0.0	0.0	0.0	52.8	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.26	413.28
2	286.52	401.73
3	304.87	393.76
4	310.28	393.85
5	360.42	404.77
6	530.70	405.84
7	632.43	397.21
8	690.56	397.61
9	704.31	412.14
10	714.02	429.62
11	724.60	446.59
12	737.92	461.52
13	751.55	476.15
14	762.22	493.07
15	774.15	509.12
16	787.70	523.83
17	801.54	538.26
18	802.40	550.10

*** 1.017 ***

1

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.26	413.28
2	286.52	401.73
3	304.87	393.76
4	310.28	393.85
5	360.42	404.77
6	530.70	405.84
7	632.43	397.21

8	690.56	397.61
9	704.31	412.14
10	714.02	429.62
11	724.60	446.59
12	737.92	461.52
13	751.55	476.15
14	762.22	493.07
15	774.15	509.12
16	787.70	523.83
17	801.54	538.26
18	802.40	550.10

*** 1.017 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.26	413.28
2	286.52	401.73
3	304.87	393.76
4	310.28	393.85
5	360.42	404.77
6	530.70	405.84
7	632.43	397.21
8	690.56	397.61
9	704.31	412.14
10	714.02	429.62
11	724.60	446.59
12	737.92	461.52
13	751.55	476.15
14	762.22	493.07
15	774.15	509.12
16	787.70	523.83
17	801.54	538.26
18	802.40	550.10

*** 1.017 ***

1

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.26	413.28
2	286.52	401.73
3	304.87	393.76
4	310.28	393.85
5	360.42	404.77
6	530.70	405.84
7	632.43	397.21

8	690.56	397.61
9	704.31	412.14
10	714.02	429.62
11	724.60	446.59
12	737.92	461.52
13	751.55	476.15
14	762.22	493.07
15	774.15	509.12
16	787.70	523.83
17	801.54	538.26
18	802.40	550.10

*** 1.017 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.19	413.53
2	287.39	404.78
3	304.31	394.12
4	310.41	394.23
5	360.76	405.01
6	530.67	406.05
7	634.89	396.85
8	646.24	396.90
9	657.76	413.25
10	671.89	427.40
11	679.45	445.92
12	691.99	461.50
13	696.12	481.07
14	709.11	496.27
15	722.55	511.09
16	735.39	526.42
17	735.94	545.38

*** 1.035 ***

1

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.19	413.53
2	287.39	404.78
3	304.31	394.12
4	310.41	394.23
5	360.76	405.01
6	530.67	406.05
7	634.89	396.85
8	646.24	396.90

9	657.76	413.25
10	671.89	427.40
11	679.45	445.92
12	691.99	461.50
13	696.12	481.07
14	709.11	496.27
15	722.55	511.09
16	735.39	526.42
17	735.94	545.38

*** 1.035 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.19	413.53
2	287.39	404.78
3	304.31	394.12
4	310.41	394.23
5	360.76	405.01
6	530.67	406.05
7	634.89	396.85
8	646.24	396.90
9	657.76	413.25
10	671.89	427.40
11	679.45	445.92
12	691.99	461.50
13	696.12	481.07
14	709.11	496.27
15	722.55	511.09
16	735.39	526.42
17	735.94	545.38

*** 1.035 ***

1

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.19	413.53
2	287.39	404.78
3	304.31	394.12
4	310.41	394.23
5	360.76	405.01
6	530.67	406.05
7	634.89	396.85
8	646.24	396.90
9	657.76	413.25
10	671.89	427.40

11	679.45	445.92
12	691.99	461.50
13	696.12	481.07
14	709.11	496.27
15	722.55	511.09
16	735.39	526.42
17	735.94	545.38

*** 1.035 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.19	413.53
2	287.39	404.78
3	304.31	394.12
4	310.41	394.23
5	360.76	405.01
6	530.67	406.05
7	634.89	396.85
8	646.24	396.90
9	657.76	413.25
10	671.89	427.40
11	679.45	445.92
12	691.99	461.50
13	696.12	481.07
14	709.11	496.27
15	722.55	511.09
16	735.39	526.42
17	735.94	545.38

*** 1.035 ***

SECTION 206

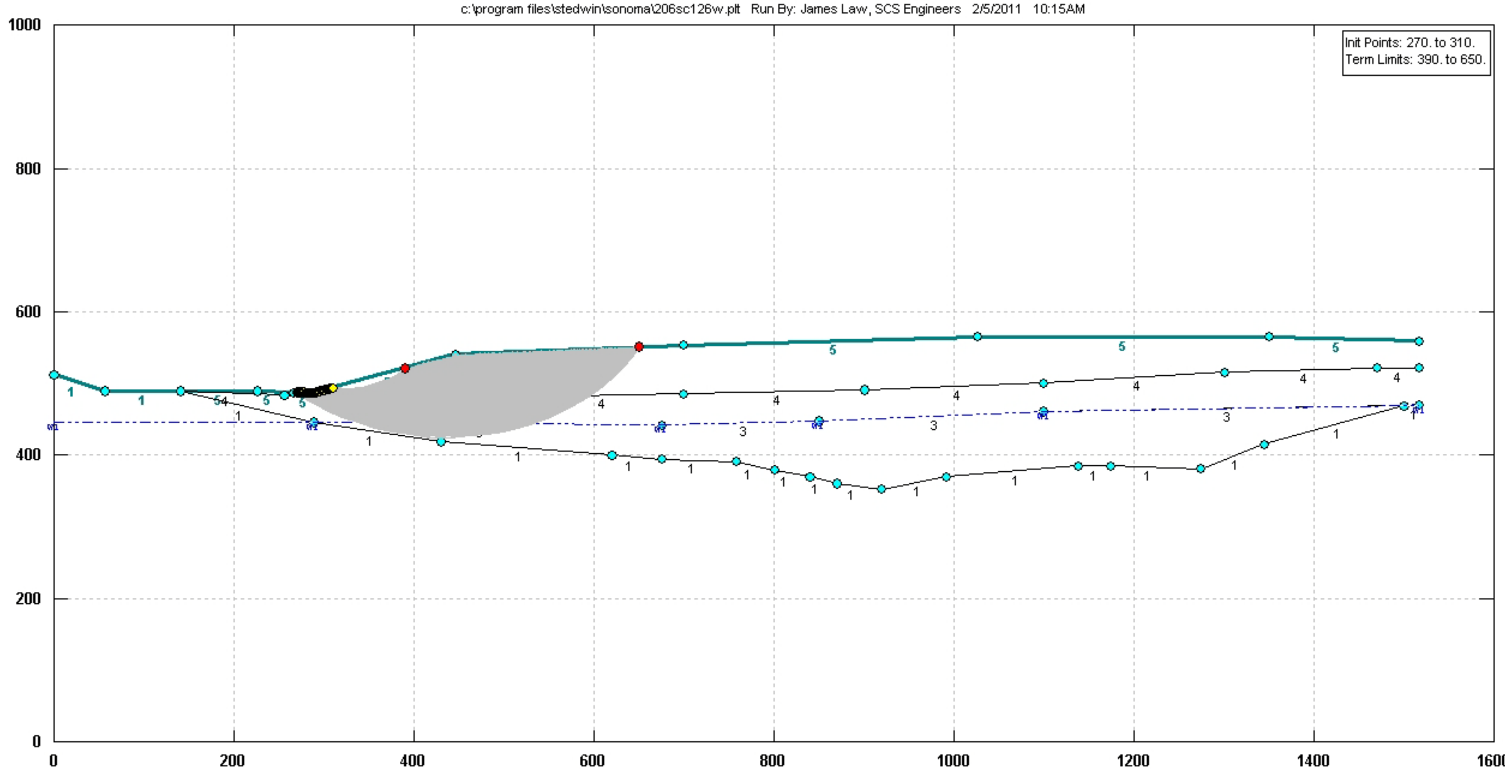
Circular Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 206, Global, circle, static, liquid

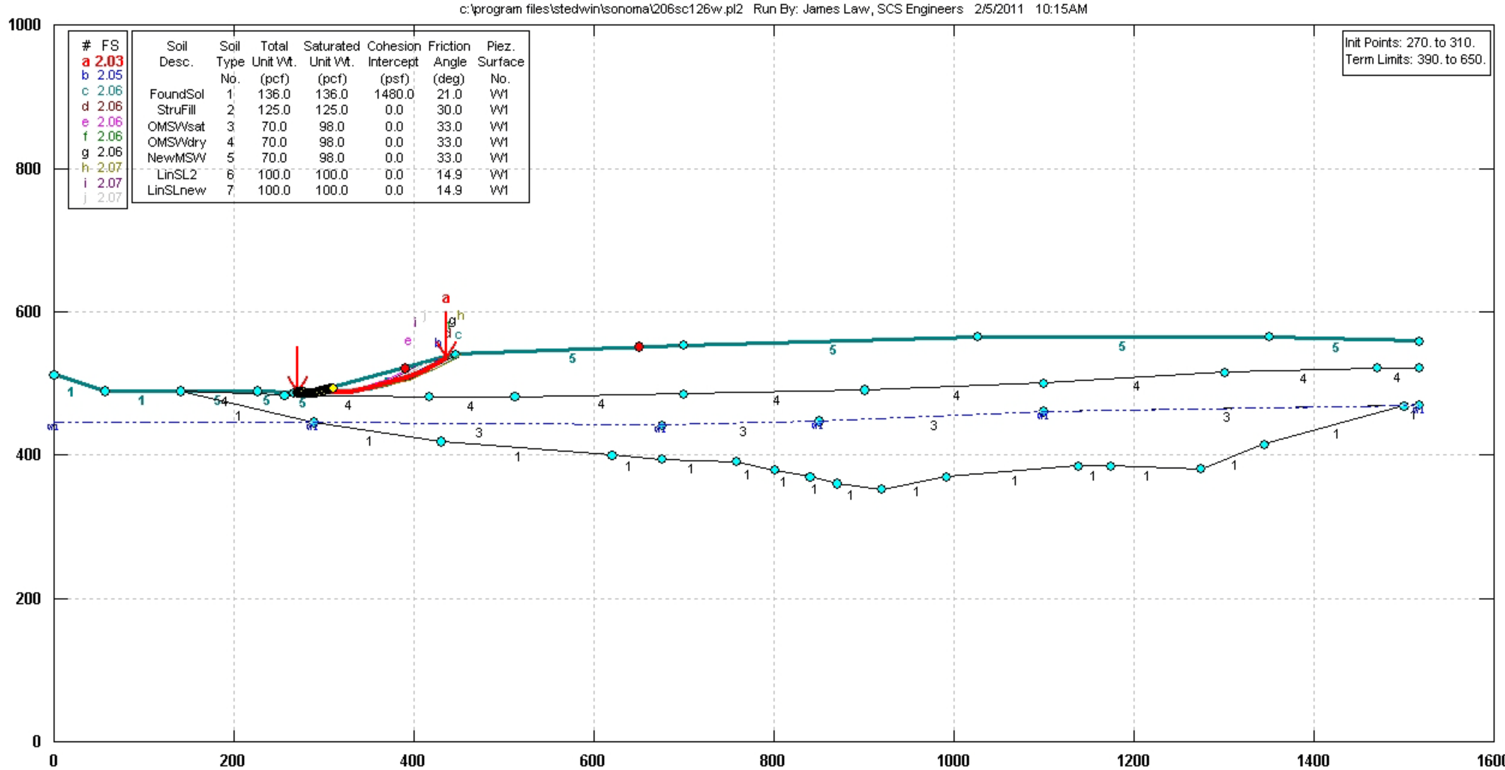
c:\program files\stedwin\sonoma\206sc126w.plt Run By: James Law, SCS Engineers 2/5/2011 10:15AM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 206, Global, circle, static, liquid

c:\program files\stedwin\sonoma\206sc126w.pl2 Run By: James Law, SCS Engineers 2/5/2011 10:15AM



PCSTABL5M3 FSmin=2.03

Safety Factors Are Calculated By The Modified Bishop Method

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/5/2011
Time of Run:	10:15AM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:206sc126w.in
Output Filename:	C:206sc126w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:206sc126w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 206,
Global, circle, static, liquid

BOUNDARY COORDINATES

10 Top Boundaries
39 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	512.00	56.00	490.00	1
2	56.00	490.00	141.00	489.00	1
3	141.00	489.00	226.00	490.00	5
4	226.00	490.00	266.00	488.00	5
5	266.00	488.00	289.00	487.00	5
6	289.00	487.00	446.00	540.00	5
7	446.00	540.00	700.00	554.00	5
8	700.00	554.00	1025.00	565.00	5
9	1025.00	565.00	1350.00	565.00	5
10	1350.00	565.00	1517.00	560.00	5
11	141.00	489.00	256.00	484.00	4
12	256.00	484.00	418.00	482.00	4
13	418.00	482.00	512.00	482.00	4
14	512.00	482.00	700.00	486.00	4
15	700.00	486.00	900.00	491.00	4
16	900.00	491.00	1100.00	500.00	4
17	1100.00	500.00	1300.00	515.00	4
18	1300.00	515.00	1470.00	522.00	4
19	1470.00	522.00	1517.00	522.00	4
20	141.00	489.00	288.00	446.00	1
21	288.00	446.00	675.00	442.00	3
22	675.00	442.00	850.00	447.00	3
23	850.00	447.00	1100.00	460.00	3
24	1100.00	460.00	1500.00	468.00	3
25	1500.00	468.00	1517.00	471.00	1
26	288.00	446.00	430.00	420.00	1

27	430.00	420.00	620.00	400.00	1
28	620.00	400.00	675.00	394.00	1
29	675.00	394.00	759.00	391.00	1
30	759.00	391.00	800.00	380.00	1
31	800.00	380.00	840.00	370.00	1
32	840.00	370.00	870.00	360.00	1
33	870.00	360.00	920.00	353.00	1
34	920.00	353.00	992.00	370.00	1
35	992.00	370.00	1138.00	385.00	1
36	1138.00	385.00	1174.00	385.00	1
37	1174.00	385.00	1275.00	381.00	1
38	1275.00	381.00	1345.00	415.00	1
39	1345.00	415.00	1500.00	468.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 6 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	446.00
2	288.00	446.00
3	675.00	442.00
4	850.00	447.00
5	1100.00	460.00
6	1517.00	468.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 270.00 ft.
and X = 310.00 ft.

Each Surface Terminates Between X = 390.00 ft.
and X = 650.00 ft.

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

20.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -40.0
And 0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.03	487.74
2	292.01	486.79
3	312.00	487.56
4	331.84	490.05
5	351.40	494.24
6	370.52	500.10
7	389.07	507.58
8	406.90	516.63
9	423.89	527.19
10	436.91	536.93

Circle Center At X = 293.1 ; Y = 717.9 and Radius, 231.1

*** 2.031 ***

Individual data on the 10 slices

Water Water Tie Tie Earthquake

Slice No.	Width (ft)	Weight (lbs)	Force Top (lbs)	Force Bot (lbs)	Force Norm (lbs)	Force Tan (lbs)	Force Hor (lbs)	Ver (lbs)	Surcharge Load (lbs)
1	17.0	42.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.0	137.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	20.0	5902.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	19.8	12934.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	19.6	17277.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	19.1	18908.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	18.5	17932.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	17.8	14585.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	17.0	9222.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	13.0	2436.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	292.37	488.14
2	312.37	488.10
3	332.27	490.11
4	351.86	494.17
5	370.92	500.22
6	389.26	508.21
7	406.67	518.04
8	422.98	529.61
9	427.83	533.87

Circle Center At X = 302.8 ; Y = 681.7 and Radius, 193.9

*** 2.053 ***

1

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.36	487.77
2	291.31	486.39
3	311.31	486.65
4	331.22	488.52
5	350.91	492.01
6	370.26	497.08
7	389.13	503.72
8	407.40	511.86
9	424.94	521.46
10	441.65	532.45
11	451.72	540.32

Circle Center At X = 298.2 ; Y = 732.3 and Radius, 246.0

*** 2.059 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	299.83	490.66
2	319.83	490.42
3	339.75	492.25
4	359.37	496.11
5	378.49	501.97
6	396.91	509.77
7	414.43	519.42
8	430.86	530.82
9	438.68	537.53

Circle Center At X = 312.1 ; Y = 684.5 and Radius, 194.2

*** 2.060 ***

1

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.10	487.56
2	296.06	486.27
3	316.02	487.61
4	335.62	491.57
5	354.53	498.07
6	372.43	507.01
7	388.99	518.22
8	393.59	522.31

Circle Center At X = 296.0 ; Y = 636.4 and Radius, 150.1

*** 2.062 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	270.00	487.83
2	289.93	486.17
3	309.93	486.33
4	329.83	488.31
5	349.47	492.10
6	368.68	497.65
7	387.31	504.93

8	405.20	513.88
9	422.20	524.42
10	438.17	536.46
11	439.75	537.89

Circle Center At X = 298.2 ; Y = 705.6 and Radius, 219.5

*** 2.063 ***

1

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	281.53	487.32
2	301.50	486.26
3	321.48	487.07
4	341.30	489.72
5	360.80	494.21
6	379.78	500.48
7	398.11	508.50
8	415.61	518.18
9	432.13	529.45
10	444.08	539.35

Circle Center At X = 303.0 ; Y = 700.3 and Radius, 214.0

*** 2.064 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.10	487.56
2	296.06	486.34
3	316.06	486.77
4	335.95	488.86
5	355.60	492.58
6	374.88	497.91
7	393.65	504.82
8	411.78	513.26
9	429.15	523.17
10	445.65	534.48
11	452.89	540.38

Circle Center At X = 300.8 ; Y = 728.0 and Radius, 241.7

*** 2.066 ***

1

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	274.75	487.62
2	294.69	486.10
3	314.67	487.05
4	334.37	490.45
5	353.51	496.25
6	371.79	504.37
7	388.94	514.67
8	402.53	525.33

Circle Center At X = 297.0 ; Y = 647.5 and Radius, 161.4

*** 2.069 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	305.26	492.49
2	325.25	492.36
3	345.09	494.92
4	364.40	500.13
5	382.83	507.89
6	400.05	518.07
7	414.24	529.28

Circle Center At X = 316.2 ; Y = 640.3 and Radius, 148.2

*** 2.070 ***

SECTION 206

Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 206, Global, circle, seismic=0.29g, liquid

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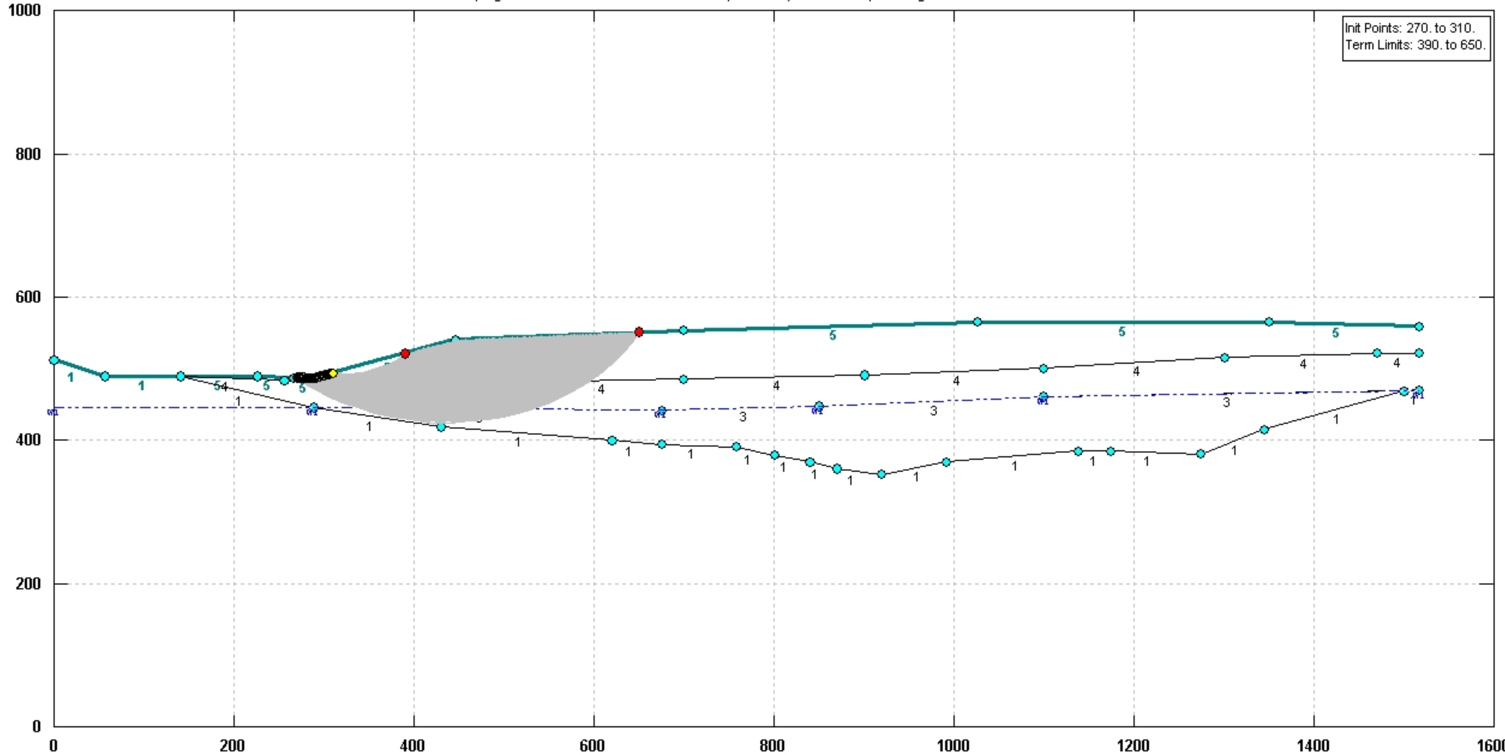

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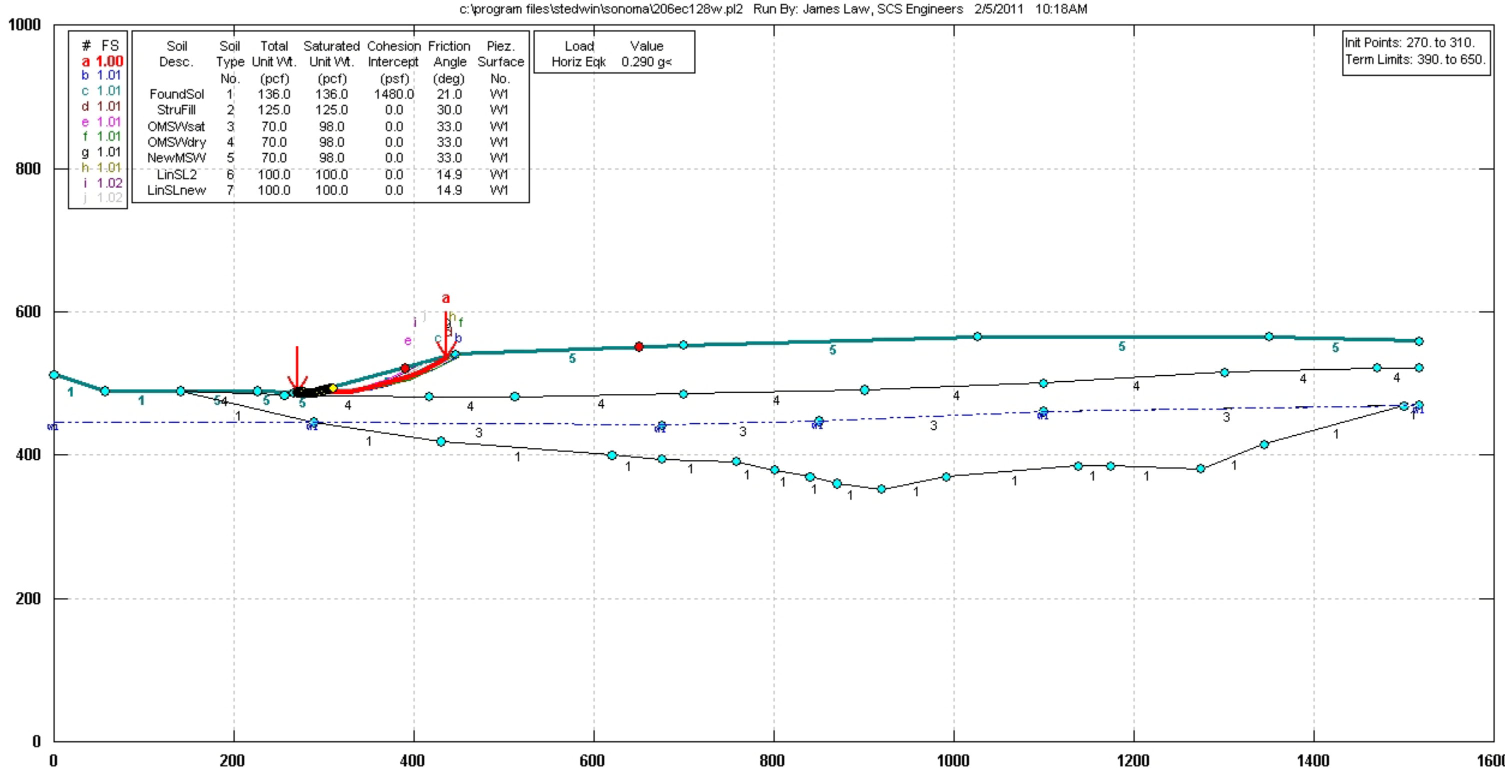
Sonoma Cty Central Disposal, Sect 206, Global, circle, seismic=0.29g, liquid

c:\program files\stedwin\sonoma\206ec128w.pl2 Run By: James Law, SCS Engineers 2/5/2011 10:18AM



PCSTABL5M3 FSmin=1.00

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/5/2011
Time of Run:	10:18AM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:206ec128w.in
Output Filename:	C:206ec128w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:206ec128w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 206,
Global, circle, seismic=0.29g, liquid

BOUNDARY COORDINATES

10 Top Boundaries
39 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	512.00	56.00	490.00	1
2	56.00	490.00	141.00	489.00	1
3	141.00	489.00	226.00	490.00	5
4	226.00	490.00	266.00	488.00	5
5	266.00	488.00	289.00	487.00	5
6	289.00	487.00	446.00	540.00	5
7	446.00	540.00	700.00	554.00	5
8	700.00	554.00	1025.00	565.00	5
9	1025.00	565.00	1350.00	565.00	5
10	1350.00	565.00	1517.00	560.00	5
11	141.00	489.00	256.00	484.00	4
12	256.00	484.00	418.00	482.00	4
13	418.00	482.00	512.00	482.00	4
14	512.00	482.00	700.00	486.00	4
15	700.00	486.00	900.00	491.00	4
16	900.00	491.00	1100.00	500.00	4
17	1100.00	500.00	1300.00	515.00	4
18	1300.00	515.00	1470.00	522.00	4
19	1470.00	522.00	1517.00	522.00	4
20	141.00	489.00	288.00	446.00	1
21	288.00	446.00	675.00	442.00	3
22	675.00	442.00	850.00	447.00	3
23	850.00	447.00	1100.00	460.00	3
24	1100.00	460.00	1500.00	468.00	3
25	1500.00	468.00	1517.00	471.00	1
26	288.00	446.00	430.00	420.00	1

27	430.00	420.00	620.00	400.00	1
28	620.00	400.00	675.00	394.00	1
29	675.00	394.00	759.00	391.00	1
30	759.00	391.00	800.00	380.00	1
31	800.00	380.00	840.00	370.00	1
32	840.00	370.00	870.00	360.00	1
33	870.00	360.00	920.00	353.00	1
34	920.00	353.00	992.00	370.00	1
35	992.00	370.00	1138.00	385.00	1
36	1138.00	385.00	1174.00	385.00	1
37	1174.00	385.00	1275.00	381.00	1
38	1275.00	381.00	1345.00	415.00	1
39	1345.00	415.00	1500.00	468.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 6 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	446.00
2	288.00	446.00
3	675.00	442.00
4	850.00	447.00
5	1100.00	460.00
6	1517.00	468.00

A Horizontal Earthquake Loading Coefficient
Of0.290 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure =   0.0 (psf)

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced Along The Ground Surface Between X = 270.00 ft.
and X = 310.00 ft.

Each Surface Terminates Between   X = 390.00 ft.
and   X = 650.00 ft.

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

20.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -40.0 And   0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.03	487.74
2	292.01	486.79
3	312.00	487.56
4	331.84	490.05
5	351.40	494.24
6	370.52	500.10
7	389.07	507.58
8	406.90	516.63
9	423.89	527.19
10	436.91	536.93

Circle Center At X = 293.1 ; Y = 717.9 and Radius, 231.1

*** 0.996 ***

Individual data on the 10 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	17.0	42.4	0.0	0.0	0.0	0.0	12.3	0.0	0.0
2	3.0	137.4	0.0	0.0	0.0	0.0	39.8	0.0	0.0
3	20.0	5902.4	0.0	0.0	0.0	0.0	1711.7	0.0	0.0
4	19.8	12934.1	0.0	0.0	0.0	0.0	3750.9	0.0	0.0
5	19.6	17277.9	0.0	0.0	0.0	0.0	5010.6	0.0	0.0
6	19.1	18908.1	0.0	0.0	0.0	0.0	5483.3	0.0	0.0
7	18.5	17932.0	0.0	0.0	0.0	0.0	5200.3	0.0	0.0
8	17.8	14585.1	0.0	0.0	0.0	0.0	4229.7	0.0	0.0
9	17.0	9222.7	0.0	0.0	0.0	0.0	2674.6	0.0	0.0
10	13.0	2436.0	0.0	0.0	0.0	0.0	706.4	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	271.36	487.77
2	291.31	486.39
3	311.31	486.65
4	331.22	488.52
5	350.91	492.01
6	370.26	497.08
7	389.13	503.72
8	407.40	511.86
9	424.94	521.46
10	441.65	532.45
11	451.72	540.32

Circle Center At X = 298.2 ; Y = 732.3 and Radius, 246.0

*** 1.008 ***

1

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	292.37	488.14
2	312.37	488.10
3	332.27	490.11
4	351.86	494.17
5	370.92	500.22
6	389.26	508.21

7	406.67	518.04
8	422.98	529.61
9	427.83	533.87

Circle Center At X = 302.8 ; Y = 681.7 and Radius, 193.9

*** 1.008 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	270.00	487.83
2	289.93	486.17
3	309.93	486.33
4	329.83	488.31
5	349.47	492.10
6	368.68	497.65
7	387.31	504.93
8	405.20	513.88
9	422.20	524.42
10	438.17	536.46
11	439.75	537.89

Circle Center At X = 298.2 ; Y = 705.6 and Radius, 219.5

*** 1.011 ***

1

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.10	487.56
2	296.06	486.27
3	316.02	487.61
4	335.62	491.57
5	354.53	498.07
6	372.43	507.01
7	388.99	518.22
8	393.59	522.31

Circle Center At X = 296.0 ; Y = 636.4 and Radius, 150.1

*** 1.011 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.10	487.56
2	296.06	486.34
3	316.06	486.77
4	335.95	488.86
5	355.60	492.58
6	374.88	497.91
7	393.65	504.82
8	411.78	513.26
9	429.15	523.17
10	445.65	534.48
11	452.89	540.38

Circle Center At X = 300.8 ; Y = 728.0 and Radius, 241.7

*** 1.012 ***

1

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	299.83	490.66
2	319.83	490.42
3	339.75	492.25
4	359.37	496.11
5	378.49	501.97
6	396.91	509.77
7	414.43	519.42
8	430.86	530.82
9	438.68	537.53

Circle Center At X = 312.1 ; Y = 684.5 and Radius, 194.2

*** 1.012 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	281.53	487.32
2	301.50	486.26
3	321.48	487.07
4	341.30	489.72
5	360.80	494.21
6	379.78	500.48
7	398.11	508.50

8	415.61	518.18
9	432.13	529.45
10	444.08	539.35

Circle Center At X = 303.0 ; Y = 700.3 and Radius, 214.0

*** 1.014 ***

1

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	274.75	487.62
2	294.69	486.10
3	314.67	487.05
4	334.37	490.45
5	353.51	496.25
6	371.79	504.37
7	388.94	514.67
8	402.53	525.33

Circle Center At X = 297.0 ; Y = 647.5 and Radius, 161.4

*** 1.015 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	305.26	492.49
2	325.25	492.36
3	345.09	494.92
4	364.40	500.13
5	382.83	507.89
6	400.05	518.07
7	414.24	529.28

Circle Center At X = 316.2 ; Y = 640.3 and Radius, 148.2

*** 1.017 ***

SECTION 207

Circular Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 207, Global, circle, static, liquid

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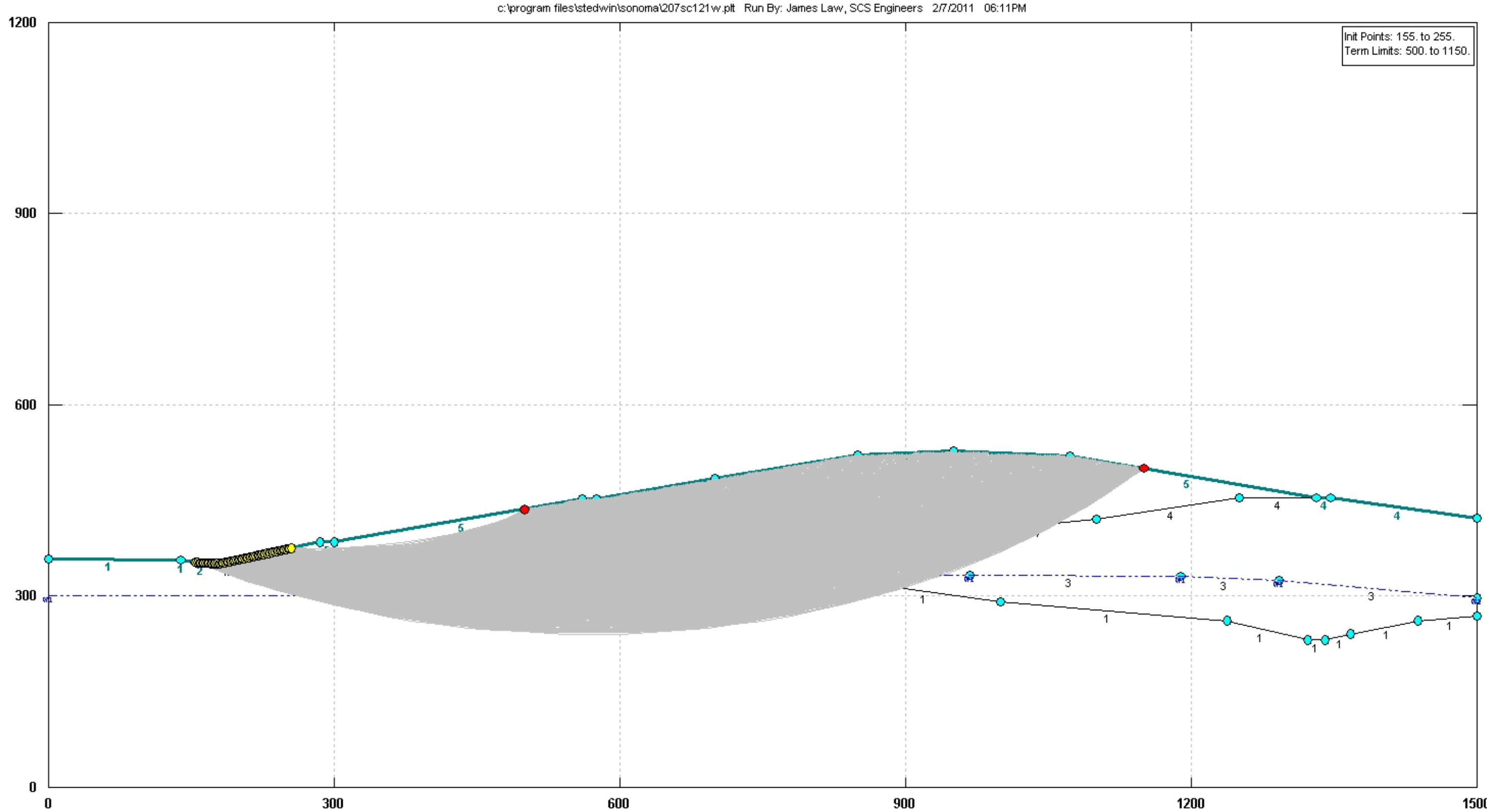

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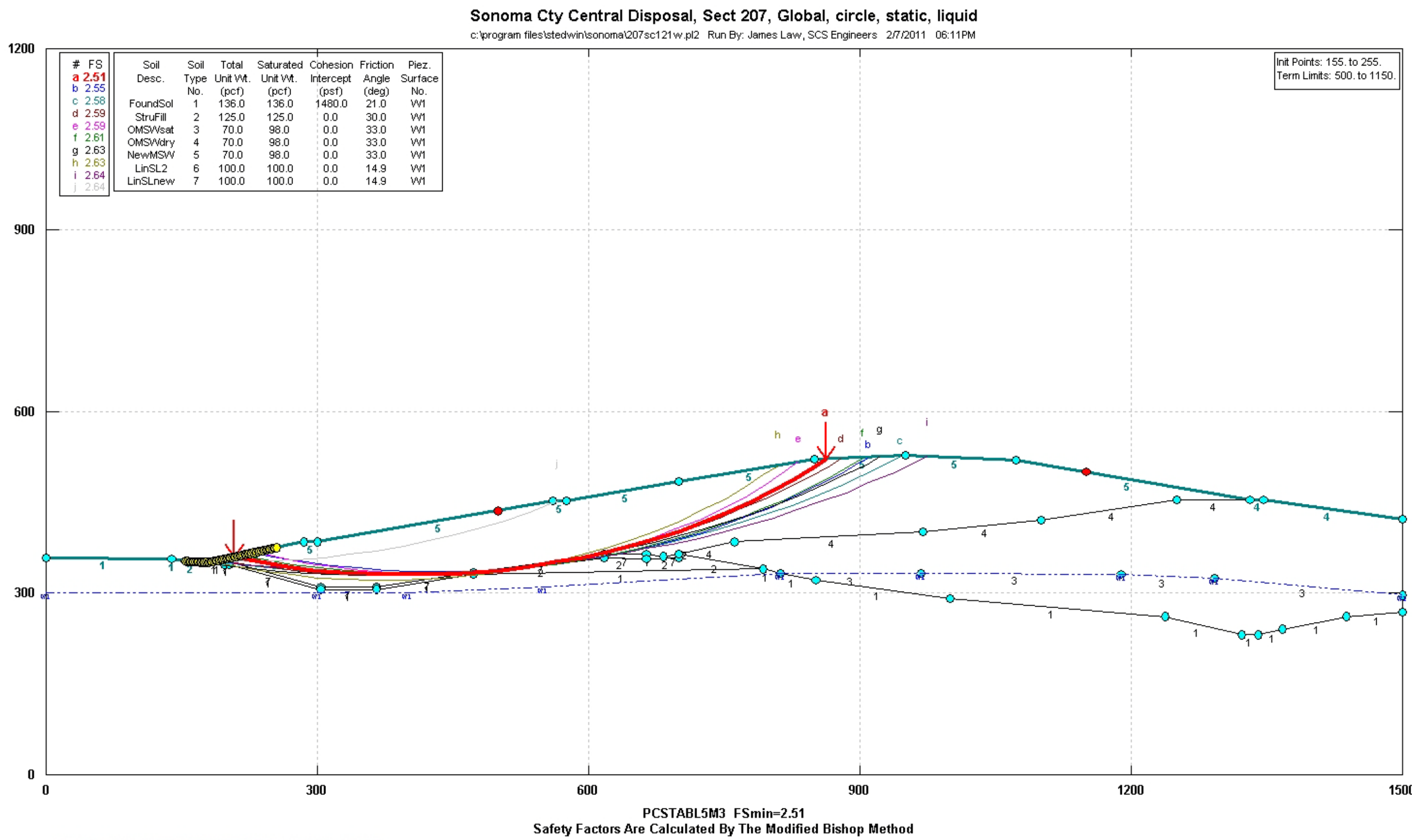


SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date: 2/7/2011
Time of Run: 06:11PM
Run By: James Law, SCS Engineers
Input Data Filename: C:207sc121w.in
Output Filename: C:207sc121w.OUT
Unit: ENGLISH
Plotted Output Filename: C:207sc121w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 207,
Global, circle, static, liquid

BOUNDARY COORDINATES

14 Top Boundaries
52 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	359.00	139.00	356.00	1
2	139.00	356.00	154.00	352.00	1
3	154.00	352.00	179.00	350.00	2
4	179.00	350.00	285.00	384.00	5
5	285.00	384.00	300.00	384.00	5
6	300.00	384.00	560.00	451.00	5
7	560.00	451.00	575.00	451.00	5
8	575.00	451.00	700.00	483.00	5
9	700.00	483.00	849.00	521.00	5
10	849.00	521.00	950.00	526.00	5
11	950.00	526.00	1072.00	520.00	5
12	1072.00	520.00	1332.00	454.00	5
13	1332.00	454.00	1346.00	454.00	4
14	1346.00	454.00	1500.00	422.00	4
15	179.00	350.00	195.00	350.00	1
16	195.00	350.00	203.00	350.00	7
17	203.00	350.00	304.00	310.00	7
18	304.00	310.00	366.00	310.00	7
19	366.00	310.00	473.00	334.00	7
20	473.00	334.00	616.00	363.00	7
21	616.00	363.00	664.00	363.00	7
22	664.00	363.00	683.00	360.00	7
23	683.00	360.00	700.00	363.00	7
24	700.00	363.00	761.00	384.00	4
25	761.00	384.00	970.00	402.00	4
26	970.00	402.00	1101.00	420.00	4

27	1101.00	420.00	1250.00	454.00	4
28	1250.00	454.00	1332.00	454.00	4
29	195.00	350.00	196.00	346.00	1
30	196.00	346.00	203.00	346.00	1
31	203.00	346.00	304.00	306.00	1
32	304.00	306.00	366.00	306.00	1
33	366.00	306.00	473.00	330.00	1
34	473.00	330.00	616.00	358.00	2
35	616.00	358.00	663.00	356.00	2
36	663.00	356.00	699.00	359.00	2
37	699.00	359.00	700.00	363.00	2
38	700.00	363.00	794.00	339.00	2
39	473.00	330.00	794.00	339.00	1
40	794.00	339.00	812.00	332.00	1
41	812.00	332.00	968.00	332.00	3
42	968.00	332.00	1188.00	330.00	3
43	1188.00	330.00	1292.00	325.00	3
44	1292.00	325.00	1500.00	296.00	3
45	812.00	332.00	852.00	320.00	1
46	852.00	320.00	1000.00	290.00	1
47	1000.00	290.00	1238.00	260.00	1
48	1238.00	260.00	1322.00	230.00	1
49	1322.00	230.00	1340.00	230.00	1
50	1340.00	230.00	1366.00	240.00	1
51	1366.00	240.00	1438.00	260.00	1
52	1438.00	260.00	1500.00	269.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	300.00

2	300.00	300.00
3	400.00	300.00
4	550.00	310.00
5	812.00	332.00
6	968.00	332.00
7	1188.00	330.00
8	1292.00	325.00
9	1500.00	296.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 155.00 ft.
and X = 255.00 ft.

Each Surface Terminates Between X = 500.00 ft.
and X =1150.00 ft.

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

30.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation. The Angle Has Been Restricted Between The Angles Of -30.0 And 0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	207.54	359.16
2	236.37	350.86
3	265.56	343.90
4	295.03	338.30
5	324.73	334.06
6	354.59	331.20
7	384.55	329.71

8	414.55	329.61
9	444.52	330.90
10	474.41	333.57
11	504.13	337.61
12	533.64	343.02
13	562.87	349.78
14	591.75	357.89
15	620.23	367.32
16	648.25	378.05
17	675.74	390.06
18	702.64	403.33
19	728.91	417.83
20	754.48	433.52
21	779.29	450.38
22	803.31	468.36
23	826.46	487.43
24	848.72	507.55
25	862.98	521.69

Circle Center At X = 401.7 ; Y = 979.6 and Radius, 650.2

*** 2.514 ***

Individual data on the 33 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	28.8	17702.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	29.2	52503.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	19.4	52850.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	10.0	31409.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	5.0	16032.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	24.7	88898.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	29.9	128750.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	30.0	149909.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	30.0	167977.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	30.0	182792.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	24.3	157362.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	4.1	27530.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	1.4	9403.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	29.7	203758.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	29.5	209401.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	26.4	189645.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	2.9	20605.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	12.1	85228.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	16.8	114892.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	1.5	10450.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	26.9	181601.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	28.0	183321.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	27.5	171671.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	24.3	142415.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	2.6	14917.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	26.3	140546.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	25.6	121632.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	24.8	100950.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	24.0	78866.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

30	23.2	55776.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	22.3	32094.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.3	261.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	14.0	6447.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	227.88	365.68
2	256.77	357.59
3	285.98	350.74
4	315.45	345.14
5	345.14	340.82
6	374.98	337.77
7	404.93	335.99
8	434.93	335.51
9	464.92	336.30
10	494.84	338.38
11	524.65	341.74
12	554.29	346.37
13	583.71	352.27
14	612.84	359.42
15	641.65	367.81
16	670.06	377.43
17	698.04	388.25
18	725.53	400.26
19	752.49	413.44
20	778.85	427.76
21	804.57	443.19
22	829.61	459.71
23	853.93	477.29
24	877.46	495.89
25	900.18	515.49
26	909.22	523.98

Circle Center At X = 431.3 ; Y = 1035.6 and Radius, 700.1

*** 2.549 ***

1

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	187.20	352.63
2	216.55	346.39
3	246.09	341.15
4	275.78	336.90
5	305.61	333.65
6	335.52	331.41
7	365.50	330.17
8	395.50	329.94
9	425.49	330.72
10	455.43	332.52

11	485.30	335.31
12	515.06	339.11
13	544.67	343.91
14	574.11	349.70
15	603.33	356.48
16	632.31	364.24
17	661.01	372.97
18	689.41	382.66
19	717.46	393.30
20	745.13	404.88
21	772.40	417.38
22	799.24	430.79
23	825.61	445.10
24	851.48	460.28
25	876.83	476.33
26	901.62	493.22
27	925.83	510.94
28	944.69	525.74

Circle Center At X = 387.2 ; Y = 1221.2 and Radius, 891.3

*** 2.584 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	192.29	354.26
2	221.40	347.03
3	250.79	341.00
4	280.40	336.18
5	310.18	332.57
6	340.09	330.18
7	370.07	329.02
8	400.07	329.08
9	430.04	330.38
10	459.93	332.89
11	489.70	336.63
12	519.29	341.58
13	548.65	347.74
14	577.73	355.09
15	606.49	363.63
16	634.88	373.33
17	662.85	384.19
18	690.35	396.18
19	717.33	409.29
20	743.76	423.49
21	769.58	438.76
22	794.76	455.07
23	819.25	472.40
24	843.00	490.72
25	866.00	509.99
26	879.76	522.52

Circle Center At X = 383.5 ; Y = 1061.6 and Radius, 732.8

*** 2.585 ***

1

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	232.97	367.31
2	261.29	357.42
3	290.12	349.12
4	319.36	342.43
5	348.93	337.37
6	378.74	333.96
7	408.69	332.21
8	438.69	332.12
9	468.65	333.70
10	498.47	336.93
11	528.07	341.82
12	557.36	348.33
13	586.23	356.46
14	614.61	366.18
15	642.41	377.46
16	669.54	390.27
17	695.92	404.55
18	721.47	420.28
19	746.11	437.40
20	769.75	455.86
21	792.34	475.61
22	813.80	496.57
23	832.26	516.73

Circle Center At X = 425.3 ; Y = 872.7 and Radius, 540.8

*** 2.592 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	214.32	361.33
2	243.27	353.45
3	272.52	346.79
4	302.02	341.36
5	331.73	337.17
6	361.59	334.23
7	391.54	332.55
8	421.54	332.12
9	451.52	332.95
10	481.45	335.04
11	511.26	338.38
12	540.91	342.97
13	570.34	348.79

14	599.50	355.85
15	628.34	364.12
16	656.80	373.60
17	684.84	384.26
18	712.41	396.08
19	739.47	409.05
20	765.95	423.15
21	791.82	438.34
22	817.03	454.60
23	841.53	471.91
24	865.29	490.22
25	888.26	509.52
26	903.78	523.71

Circle Center At X = 416.7 ; Y = 1047.0 and Radius, 714.9

*** 2.605 ***

1

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	170.25	350.70
2	199.62	344.55
3	229.17	339.40
4	258.88	335.25
5	288.72	332.11
6	318.64	329.97
7	348.62	328.85
8	378.62	328.74
9	408.61	329.64
10	438.55	331.56
11	468.40	334.49
12	498.14	338.42
13	527.74	343.36
14	557.14	349.29
15	586.33	356.22
16	615.27	364.12
17	643.93	373.00
18	672.27	382.84
19	700.26	393.64
20	727.87	405.37
21	755.07	418.03
22	781.82	431.60
23	808.10	446.07
24	833.88	461.42
25	859.12	477.62
26	883.81	494.68
27	907.90	512.55
28	923.12	524.67

Circle Center At X = 366.8 ; Y = 1216.0 and Radius, 887.3

*** 2.629 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	183.81	351.54
2	212.49	342.72
3	241.57	335.35
4	270.98	329.45
5	300.66	325.04
6	330.51	322.13
7	360.48	320.73
8	390.48	320.85
9	420.44	322.47
10	450.27	325.60
11	479.91	330.23
12	509.28	336.34
13	538.31	343.93
14	566.91	352.97
15	595.03	363.44
16	622.58	375.31
17	649.50	388.56
18	675.71	403.14
19	701.16	419.03
20	725.78	436.18
21	749.50	454.55
22	772.26	474.09
23	794.01	494.75
24	809.39	510.90

Circle Center At X = 373.2 ; Y = 915.5 and Radius, 594.9

*** 2.633 ***

1

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.90	353.18
2	218.39	347.66
3	248.03	343.04
4	277.80	339.30
5	307.66	336.47
6	337.60	334.53
7	367.58	333.49
8	397.58	333.35
9	427.57	334.11
10	457.52	335.77
11	487.42	338.33
12	517.22	341.79
13	546.90	346.14
14	576.44	351.38

15	605.81	357.50
16	634.98	364.50
17	663.93	372.38
18	692.62	381.12
19	721.05	390.72
20	749.17	401.16
21	776.96	412.45
22	804.41	424.57
23	831.48	437.50
24	858.14	451.25
25	884.39	465.78
26	910.18	481.10
27	935.51	497.18
28	960.33	514.02
29	975.19	524.76

Circle Center At X = 387.2 ; Y = 1332.4 and Radius, 999.1

*** 2.638 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	187.20	352.63
2	217.20	352.07
3	247.19	352.86
4	277.11	354.98
5	306.91	358.43
6	336.53	363.20
7	365.91	369.30
8	394.98	376.69
9	423.69	385.38
10	451.99	395.34
11	479.82	406.55
12	507.12	418.99
13	533.83	432.64
14	559.92	447.47
15	565.53	451.00

Circle Center At X = 214.7 ; Y = 1024.5 and Radius, 672.4

*** 2.639 ***

SECTION 207

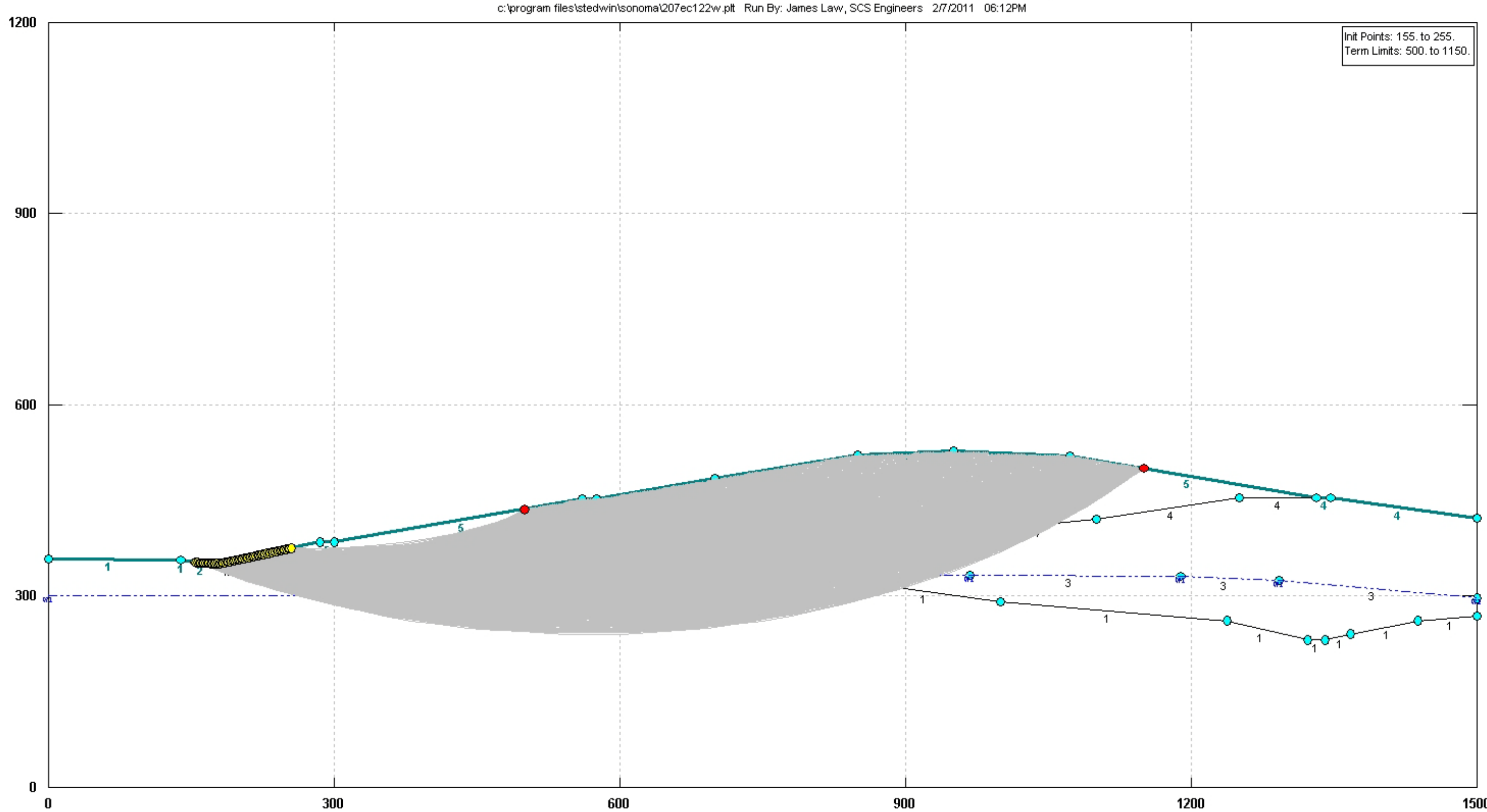
Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 207, Global, circle, seismic=0.33g, liquid

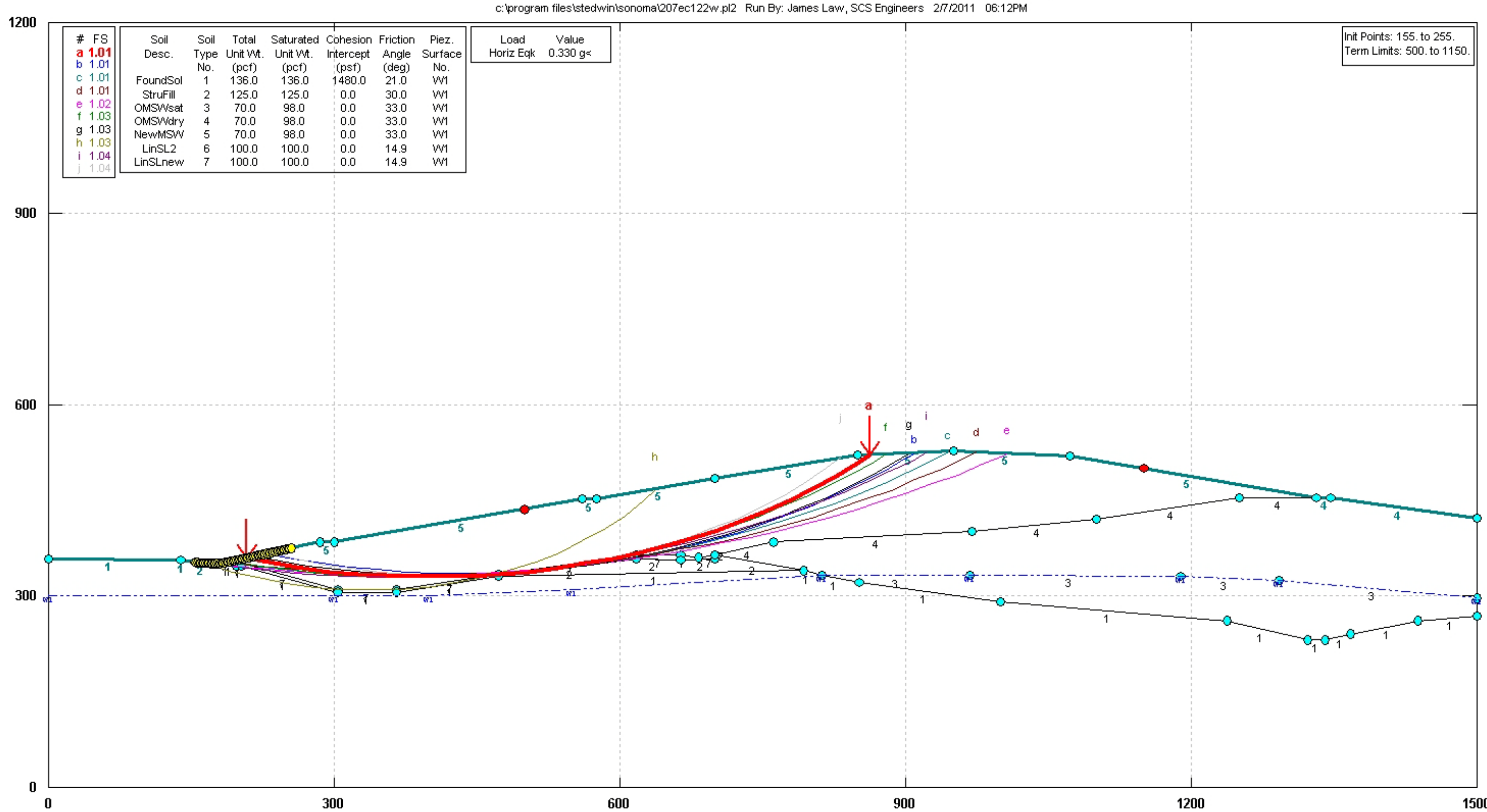
c:\program files\stedwin\sonoma\207ec122w.plt   Run By: James Law, SCS Engineers   2/7/2011   06:12PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 207, Global, circle, seismic=0.33g, liquid

c:\program files\stedwin\sonoma\207ec122w.pl2 Run By: James Law, SCS Engineers 2/7/2011 06:12PM



PCSTABL5M3 FSmin=1.01

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/7/2011
Time of Run:	06:12PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:207ec122w.in
Output Filename:	C:207ec122w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:207ec122w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 207,
Global, circle, seismic=0.33g, liquid

BOUNDARY COORDINATES

14 Top   Boundaries
52 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	359.00	139.00	356.00	1
2	139.00	356.00	154.00	352.00	1
3	154.00	352.00	179.00	350.00	2
4	179.00	350.00	285.00	384.00	5
5	285.00	384.00	300.00	384.00	5
6	300.00	384.00	560.00	451.00	5
7	560.00	451.00	575.00	451.00	5
8	575.00	451.00	700.00	483.00	5
9	700.00	483.00	849.00	521.00	5
10	849.00	521.00	950.00	526.00	5
11	950.00	526.00	1072.00	520.00	5
12	1072.00	520.00	1332.00	454.00	5
13	1332.00	454.00	1346.00	454.00	4
14	1346.00	454.00	1500.00	422.00	4
15	179.00	350.00	195.00	350.00	1
16	195.00	350.00	203.00	350.00	7
17	203.00	350.00	304.00	310.00	7
18	304.00	310.00	366.00	310.00	7
19	366.00	310.00	473.00	334.00	7
20	473.00	334.00	616.00	363.00	7
21	616.00	363.00	664.00	363.00	7
22	664.00	363.00	683.00	360.00	7
23	683.00	360.00	700.00	363.00	7
24	700.00	363.00	761.00	384.00	4
25	761.00	384.00	970.00	402.00	4
26	970.00	402.00	1101.00	420.00	4

27	1101.00	420.00	1250.00	454.00	4
28	1250.00	454.00	1332.00	454.00	4
29	195.00	350.00	196.00	346.00	1
30	196.00	346.00	203.00	346.00	1
31	203.00	346.00	304.00	306.00	1
32	304.00	306.00	366.00	306.00	1
33	366.00	306.00	473.00	330.00	1
34	473.00	330.00	616.00	358.00	2
35	616.00	358.00	663.00	356.00	2
36	663.00	356.00	699.00	359.00	2
37	699.00	359.00	700.00	363.00	2
38	700.00	363.00	794.00	339.00	2
39	473.00	330.00	794.00	339.00	1
40	794.00	339.00	812.00	332.00	1
41	812.00	332.00	968.00	332.00	3
42	968.00	332.00	1188.00	330.00	3
43	1188.00	330.00	1292.00	325.00	3
44	1292.00	325.00	1500.00	296.00	3
45	812.00	332.00	852.00	320.00	1
46	852.00	320.00	1000.00	290.00	1
47	1000.00	290.00	1238.00	260.00	1
48	1238.00	260.00	1322.00	230.00	1
49	1322.00	230.00	1340.00	230.00	1
50	1340.00	230.00	1366.00	240.00	1
51	1366.00	240.00	1438.00	260.00	1
52	1438.00	260.00	1500.00	269.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	300.00

2	300.00	300.00
3	400.00	300.00
4	550.00	310.00
5	812.00	332.00
6	968.00	332.00
7	1188.00	330.00
8	1292.00	325.00
9	1500.00	296.00

A Horizontal Earthquake Loading Coefficient
Of0.330 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure =   0.0 (psf)

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 155.00 ft.
and X = 255.00 ft.

Each Surface Terminates Between   X = 500.00 ft.
and   X =1150.00 ft.

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

30.00 ft. Line Segments Define Each Trial Failure Surface.

Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -30.0
And   0.0 deg.

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 Bishop Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	207.54	359.16
2	236.37	350.86
3	265.56	343.90
4	295.03	338.30
5	324.73	334.06
6	354.59	331.20
7	384.55	329.71
8	414.55	329.61
9	444.52	330.90
10	474.41	333.57
11	504.13	337.61
12	533.64	343.02
13	562.87	349.78
14	591.75	357.89
15	620.23	367.32
16	648.25	378.05
17	675.74	390.06
18	702.64	403.33
19	728.91	417.83
20	754.48	433.52
21	779.29	450.38
22	803.31	468.36
23	826.46	487.43
24	848.72	507.55
25	862.98	521.69

Circle Center At X = 401.7 ; Y = 979.6 and Radius, 650.2

*** 1.005 ***

Individual data on the 33 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	28.8	17702.2	0.0	0.0	0.0	0.0	5841.7	0.0	0.0
2	29.2	52503.2	0.0	0.0	0.0	0.0	17326.0	0.0	0.0
3	19.4	52850.5	0.0	0.0	0.0	0.0	17440.7	0.0	0.0
4	10.0	31409.0	0.0	0.0	0.0	0.0	10365.0	0.0	0.0
5	5.0	16032.2	0.0	0.0	0.0	0.0	5290.6	0.0	0.0
6	24.7	88898.4	0.0	0.0	0.0	0.0	29336.5	0.0	0.0
7	29.9	128750.6	0.0	0.0	0.0	0.0	42487.7	0.0	0.0
8	30.0	149909.1	0.0	0.0	0.0	0.0	49470.0	0.0	0.0
9	30.0	167977.6	0.0	0.0	0.0	0.0	55432.6	0.0	0.0
10	30.0	182792.6	0.0	0.0	0.0	0.0	60321.6	0.0	0.0
11	24.3	157362.9	0.0	0.0	0.0	0.0	51929.8	0.0	0.0
12	4.1	27530.2	0.0	0.0	0.0	0.0	9085.0	0.0	0.0
13	1.4	9403.8	0.0	0.0	0.0	0.0	3103.3	0.0	0.0
14	29.7	203758.5	0.0	0.0	0.0	0.0	67240.3	0.0	0.0
15	29.5	209401.8	0.0	0.0	0.0	0.0	69102.6	0.0	0.0
16	26.4	189645.2	0.0	0.0	0.0	0.0	62582.9	0.0	0.0
17	2.9	20605.1	0.0	0.0	0.0	0.0	6799.7	0.0	0.0
18	12.1	85228.1	0.0	0.0	0.0	0.0	28125.3	0.0	0.0
19	16.8	114892.0	0.0	0.0	0.0	0.0	37914.4	0.0	0.0

20	1.5	10450.3	0.0	0.0	0.0	0.0	3448.6	0.0	0.0
21	26.9	181601.9	0.0	0.0	0.0	0.0	59928.6	0.0	0.0
22	28.0	183321.7	0.0	0.0	0.0	0.0	60496.2	0.0	0.0
23	27.5	171671.8	0.0	0.0	0.0	0.0	56651.7	0.0	0.0
24	24.3	142415.1	0.0	0.0	0.0	0.0	46997.0	0.0	0.0
25	2.6	14917.2	0.0	0.0	0.0	0.0	4922.7	0.0	0.0
26	26.3	140546.2	0.0	0.0	0.0	0.0	46380.3	0.0	0.0
27	25.6	121632.6	0.0	0.0	0.0	0.0	40138.7	0.0	0.0
28	24.8	100950.0	0.0	0.0	0.0	0.0	33313.5	0.0	0.0
29	24.0	78866.5	0.0	0.0	0.0	0.0	26026.0	0.0	0.0
30	23.2	55776.6	0.0	0.0	0.0	0.0	18406.3	0.0	0.0
31	22.3	32094.9	0.0	0.0	0.0	0.0	10591.3	0.0	0.0
32	0.3	261.5	0.0	0.0	0.0	0.0	86.3	0.0	0.0
33	14.0	6447.8	0.0	0.0	0.0	0.0	2127.8	0.0	0.0

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	227.88	365.68
2	256.77	357.59
3	285.98	350.74
4	315.45	345.14
5	345.14	340.82
6	374.98	337.77
7	404.93	335.99
8	434.93	335.51
9	464.92	336.30
10	494.84	338.38
11	524.65	341.74
12	554.29	346.37
13	583.71	352.27
14	612.84	359.42
15	641.65	367.81
16	670.06	377.43
17	698.04	388.25
18	725.53	400.26
19	752.49	413.44
20	778.85	427.76
21	804.57	443.19
22	829.61	459.71
23	853.93	477.29
24	877.46	495.89
25	900.18	515.49
26	909.22	523.98

Circle Center At X = 431.3 ; Y = 1035.6 and Radius, 700.1

*** 1.006 ***

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Failure Surface Specified By 28 Coordinate Points

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

1	187.20	352.63
2	216.55	346.39
3	246.09	341.15
4	275.78	336.90
5	305.61	333.65
6	335.52	331.41
7	365.50	330.17
8	395.50	329.94
9	425.49	330.72
10	455.43	332.52
11	485.30	335.31
12	515.06	339.11
13	544.67	343.91
14	574.11	349.70
15	603.33	356.48
16	632.31	364.24
17	661.01	372.97
18	689.41	382.66
19	717.46	393.30
20	745.13	404.88
21	772.40	417.38
22	799.24	430.79
23	825.61	445.10
24	851.48	460.28
25	876.83	476.33
26	901.62	493.22
27	925.83	510.94
28	944.69	525.74

Circle Center At X = 387.2 ; Y = 1221.2 and Radius, 891.3

*** 1.008 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.90	353.18
2	218.39	347.66
3	248.03	343.04
4	277.80	339.30
5	307.66	336.47
6	337.60	334.53
7	367.58	333.49
8	397.58	333.35
9	427.57	334.11
10	457.52	335.77
11	487.42	338.33
12	517.22	341.79
13	546.90	346.14
14	576.44	351.38
15	605.81	357.50
16	634.98	364.50
17	663.93	372.38
18	692.62	381.12
19	721.05	390.72
20	749.17	401.16

21	776.96	412.45
22	804.41	424.57
23	831.48	437.50
24	858.14	451.25
25	884.39	465.78
26	910.18	481.10
27	935.51	497.18
28	960.33	514.02
29	975.19	524.76

Circle Center At X = 387.2 ; Y = 1332.4 and Radius, 999.1

*** 1.013 ***

1

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	173.64	350.43
2	203.25	345.55
3	232.96	341.45
4	262.78	338.13
5	292.67	335.59
6	322.62	333.84
7	352.61	332.87
8	382.60	332.69
9	412.60	333.29
10	442.57	334.68
11	472.49	336.85
12	502.34	339.81
13	532.11	343.54
14	561.77	348.06
15	591.30	353.35
16	620.68	359.41
17	649.89	366.24
18	678.91	373.83
19	707.73	382.18
20	736.31	391.28
21	764.65	401.13
22	792.72	411.71
23	820.51	423.03
24	847.98	435.07
25	875.13	447.83
26	901.94	461.30
27	928.39	475.46
28	954.46	490.31
29	980.13	505.83
30	1005.38	522.03
31	1007.09	523.19

Circle Center At X = 374.6 ; Y = 1477.9 and Radius, 1145.2

*** 1.022 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	192.29	354.26
2	221.40	347.03
3	250.79	341.00
4	280.40	336.18
5	310.18	332.57
6	340.09	330.18
7	370.07	329.02
8	400.07	329.08
9	430.04	330.38
10	459.93	332.89
11	489.70	336.63
12	519.29	341.58
13	548.65	347.74
14	577.73	355.09
15	606.49	363.63
16	634.88	373.33
17	662.85	384.19
18	690.35	396.18
19	717.33	409.29
20	743.76	423.49
21	769.58	438.76
22	794.76	455.07
23	819.25	472.40
24	843.00	490.72
25	866.00	509.99
26	879.76	522.52

Circle Center At X = 383.5 ; Y = 1061.6 and Radius, 732.8

*** 1.030 ***

1

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	214.32	361.33
2	243.27	353.45
3	272.52	346.79
4	302.02	341.36
5	331.73	337.17
6	361.59	334.23
7	391.54	332.55
8	421.54	332.12
9	451.52	332.95
10	481.45	335.04
11	511.26	338.38
12	540.91	342.97
13	570.34	348.79
14	599.50	355.85
15	628.34	364.12

16	656.80	373.60
17	684.84	384.26
18	712.41	396.08
19	739.47	409.05
20	765.95	423.15
21	791.82	438.34
22	817.03	454.60
23	841.53	471.91
24	865.29	490.22
25	888.26	509.52
26	903.78	523.71

Circle Center At X = 416.7 ; Y = 1047.0 and Radius, 714.9

*** 1.031 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	165.17	351.11
2	192.23	338.16
3	220.27	327.47
4	249.08	319.12
5	278.48	313.15
6	308.27	309.60
7	338.25	308.50
8	368.22	309.87
9	397.97	313.67
10	427.32	319.91
11	456.06	328.52
12	483.99	339.45
13	510.94	352.64
14	536.72	367.98
15	561.15	385.39
16	584.08	404.73
17	605.35	425.89
18	624.82	448.71
19	638.10	467.15

Circle Center At X = 336.6 ; Y = 674.8 and Radius, 366.3

*** 1.034 ***

1

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	170.25	350.70
2	199.62	344.55
3	229.17	339.40
4	258.88	335.25
5	288.72	332.11
6	318.64	329.97

7	348.62	328.85
8	378.62	328.74
9	408.61	329.64
10	438.55	331.56
11	468.40	334.49
12	498.14	338.42
13	527.74	343.36
14	557.14	349.29
15	586.33	356.22
16	615.27	364.12
17	643.93	373.00
18	672.27	382.84
19	700.26	393.64
20	727.87	405.37
21	755.07	418.03
22	781.82	431.60
23	808.10	446.07
24	833.88	461.42
25	859.12	477.62
26	883.81	494.68
27	907.90	512.55
28	923.12	524.67

Circle Center At X = 366.8 ; Y = 1216.0 and Radius, 887.3

*** 1.036 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	232.97	367.31
2	261.29	357.42
3	290.12	349.12
4	319.36	342.43
5	348.93	337.37
6	378.74	333.96
7	408.69	332.21
8	438.69	332.12
9	468.65	333.70
10	498.47	336.93
11	528.07	341.82
12	557.36	348.33
13	586.23	356.46
14	614.61	366.18
15	642.41	377.46
16	669.54	390.27
17	695.92	404.55
18	721.47	420.28
19	746.11	437.40
20	769.75	455.86
21	792.34	475.61
22	813.80	496.57
23	832.26	516.73

Circle Center At X = 425.3 ; Y = 872.7 and Radius, 540.8

*** 1.039 ***

SECTION 207

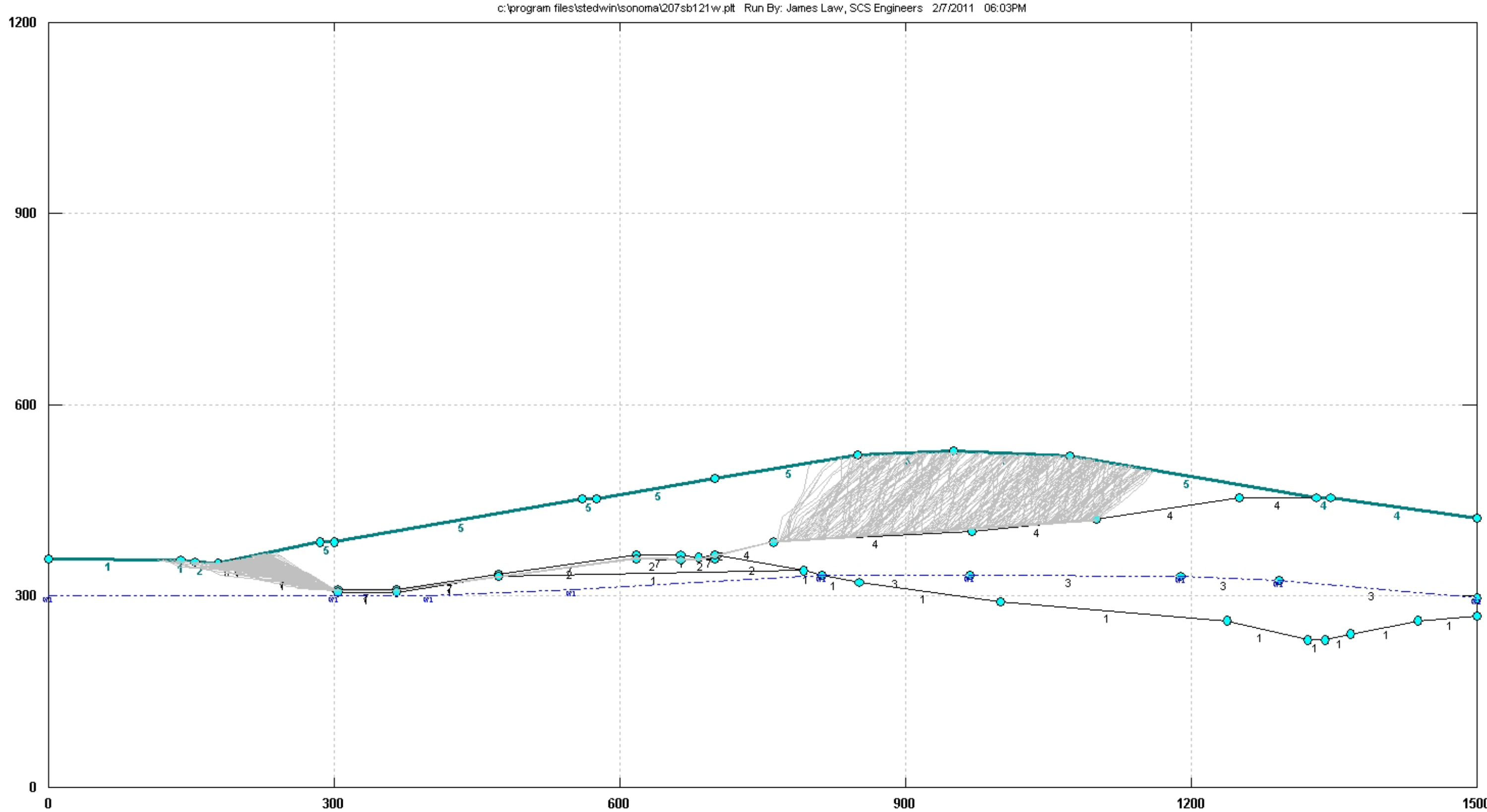
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 207, Global, block, static, liquid

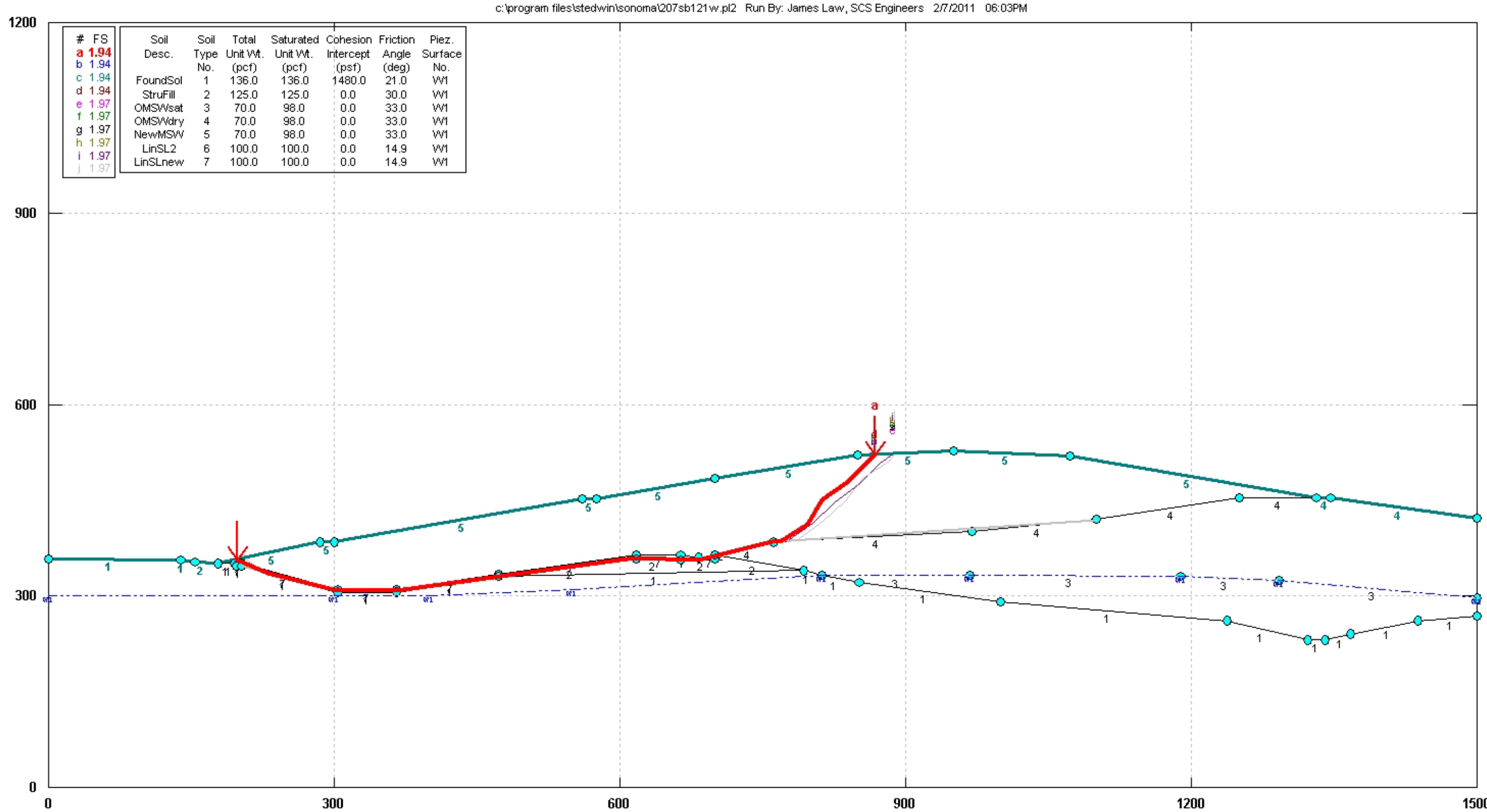
c:\program files\stedwin\sonoma\207sb121w.plt Run By: James Law, SCS Engineers 2/7/2011 06:03PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 207, Global, block, static, liquid

c:\program files\stedwin\sonoma\207sb121w.pl2 Run By: James Law, SCS Engineers 2/7/2011 06:03PM



PCSTABL5M3 FSmin=1.94

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

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

Run Date:	2/7/2011
Time of Run:	06:03PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:207sb121w.in
Output Filename:	C:207sb121w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:207sb121w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 207,
Global, block, static, liquid

BOUNDARY COORDINATES

14 Top   Boundaries
52 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	359.00	139.00	356.00	1
2	139.00	356.00	154.00	352.00	1
3	154.00	352.00	179.00	350.00	2
4	179.00	350.00	285.00	384.00	5
5	285.00	384.00	300.00	384.00	5
6	300.00	384.00	560.00	451.00	5
7	560.00	451.00	575.00	451.00	5
8	575.00	451.00	700.00	483.00	5
9	700.00	483.00	849.00	521.00	5
10	849.00	521.00	950.00	526.00	5
11	950.00	526.00	1072.00	520.00	5
12	1072.00	520.00	1332.00	454.00	5
13	1332.00	454.00	1346.00	454.00	4
14	1346.00	454.00	1500.00	422.00	4
15	179.00	350.00	195.00	350.00	1
16	195.00	350.00	203.00	350.00	7
17	203.00	350.00	304.00	310.00	7
18	304.00	310.00	366.00	310.00	7
19	366.00	310.00	473.00	334.00	7
20	473.00	334.00	616.00	363.00	7
21	616.00	363.00	664.00	363.00	7
22	664.00	363.00	683.00	360.00	7
23	683.00	360.00	700.00	363.00	7
24	700.00	363.00	761.00	384.00	4
25	761.00	384.00	970.00	402.00	4
26	970.00	402.00	1101.00	420.00	4

27	1101.00	420.00	1250.00	454.00	4
28	1250.00	454.00	1332.00	454.00	4
29	195.00	350.00	196.00	346.00	1
30	196.00	346.00	203.00	346.00	1
31	203.00	346.00	304.00	306.00	1
32	304.00	306.00	366.00	306.00	1
33	366.00	306.00	473.00	330.00	1
34	473.00	330.00	616.00	358.00	2
35	616.00	358.00	663.00	356.00	2
36	663.00	356.00	699.00	359.00	2
37	699.00	359.00	700.00	363.00	2
38	700.00	363.00	794.00	339.00	2
39	473.00	330.00	794.00	339.00	1
40	794.00	339.00	812.00	332.00	1
41	812.00	332.00	968.00	332.00	3
42	968.00	332.00	1188.00	330.00	3
43	1188.00	330.00	1292.00	325.00	3
44	1292.00	325.00	1500.00	296.00	3
45	812.00	332.00	852.00	320.00	1
46	852.00	320.00	1000.00	290.00	1
47	1000.00	290.00	1238.00	260.00	1
48	1238.00	260.00	1322.00	230.00	1
49	1322.00	230.00	1340.00	230.00	1
50	1340.00	230.00	1366.00	240.00	1
51	1366.00	240.00	1438.00	260.00	1
52	1438.00	260.00	1500.00	269.00	1

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ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	300.00

2	300.00	300.00
3	400.00	300.00
4	550.00	310.00
5	812.00	332.00
6	968.00	332.00
7	1188.00	330.00
8	1292.00	325.00
9	1500.00	296.00

1

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

1000 Trial Surfaces Have Been Generated.

7 Boxes Specified For Generation Of Central Block Base

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

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	203.00	347.00	303.00	307.00	0.50
2	304.00	307.00	306.00	307.00	0.50
3	364.00	307.00	366.00	307.00	0.50
4	615.00	359.00	616.00	359.00	0.50
5	682.00	357.00	684.00	357.00	0.50
6	760.00	384.00	762.00	384.00	0.50
7	763.00	384.00	1101.00	419.00	0.00

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 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.67	356.31
2	230.24	335.98
3	304.41	307.01
4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48

11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.940 ***

Individual data on the 36 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	18.5	11587.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	13.0	22700.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	54.8	196483.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	15.0	77259.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	4.0	21779.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.4	2258.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	60.7	369835.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.9	6141.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	82.7	562366.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	24.3	170374.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	2.3	16117.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	32.8	233629.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	52.0	377565.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	15.0	108679.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	40.6	292499.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.4	2788.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	48.0	373618.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	13.7	114953.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	5.3	45533.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.1	621.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	2.4	20210.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	14.6	123592.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	183.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.1	1115.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	34.8	288710.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	25.3	205209.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.2	1853.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.5	3937.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	8.6	69299.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.1	509.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	28.2	207919.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	14.0	76613.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	27.7	97268.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	9.5	21991.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	12.4	15703.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	7.1	2175.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.67	356.31
2	230.24	335.98
3	304.41	307.01

4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48
11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.940 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.67	356.31
2	230.24	335.98
3	304.41	307.01
4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48
11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.940 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.67	356.31
2	230.24	335.98
3	304.41	307.01
4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48
11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.940 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.967 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.967 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.967 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.967 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64

3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.967 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	206.60	358.85
2	229.19	336.32
3	304.14	306.91
4	364.47	307.03
5	615.22	359.19
6	682.50	356.82
7	760.59	384.21
8	785.84	386.36
9	813.13	415.61
10	837.02	447.69
11	854.87	483.48
12	882.19	512.70
13	889.37	523.00

*** 1.974 ***

SECTION 207

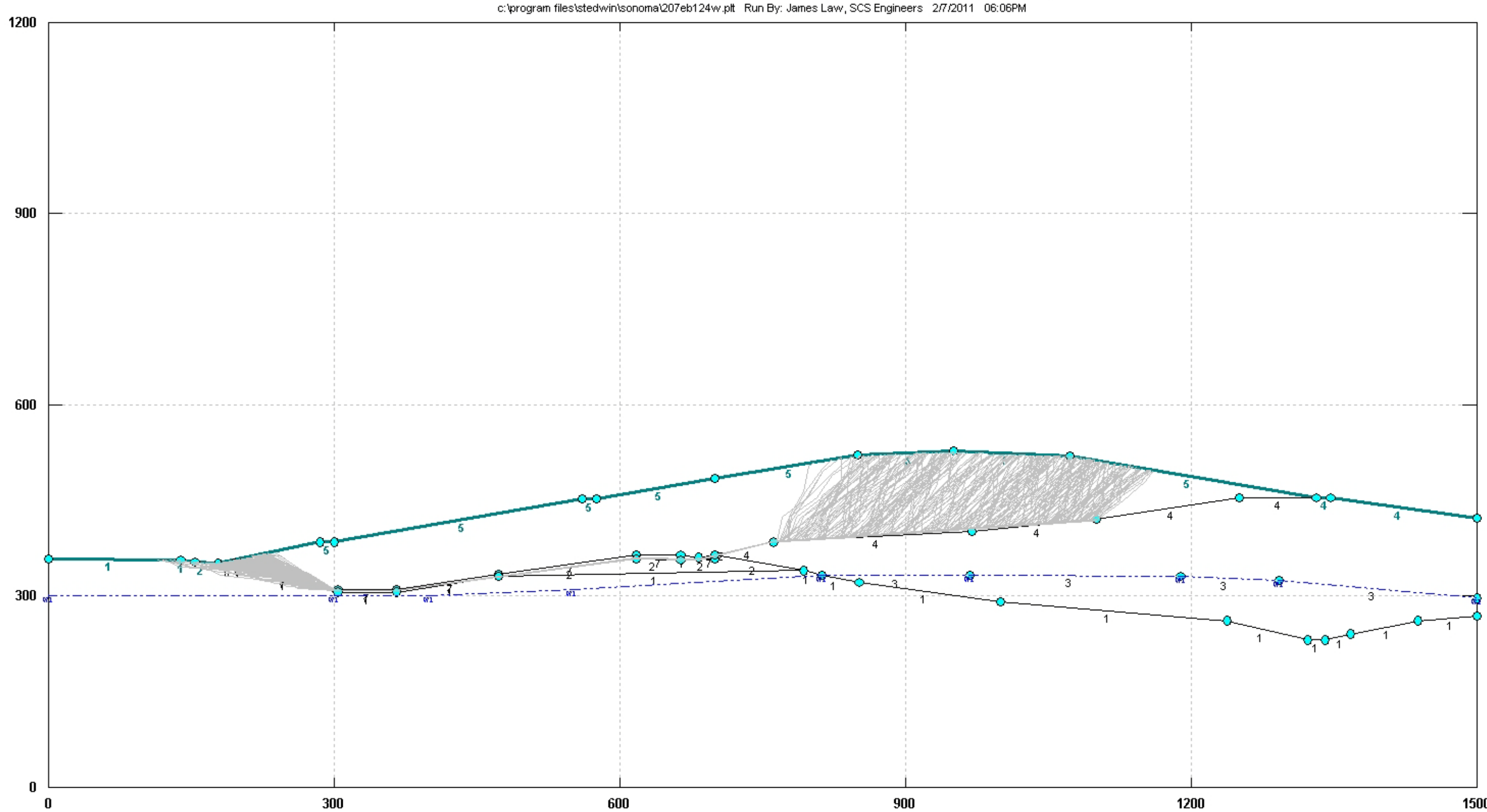
Block-Type Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 207, Global, block, seismic=0.18g, liquid

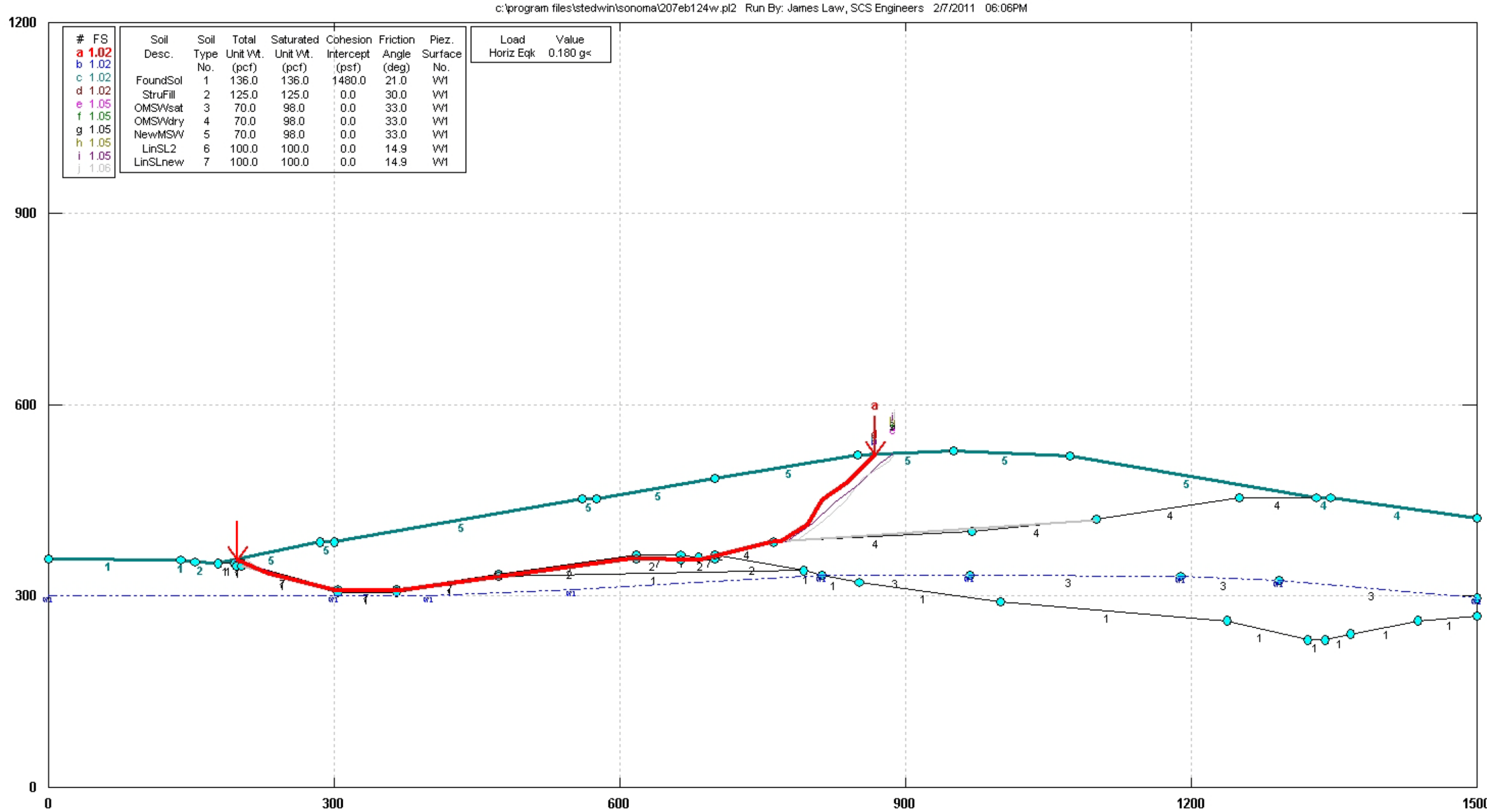
c:\program files\stedwin\sonoma\207eb124w.plt Run By: James Law, SCS Engineers 2/7/2011 06:06PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 207, Global, block, seismic=0.18g, liquid

c:\program files\stedwin\sonoma\207eb124w.pl2 Run By: James Law, SCS Engineers 2/7/2011 06:06PM



PCSTABL5M3 FSmin=1.02

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/7/2011
Time of Run:	06:06PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:207eb124w.in
Output Filename:	C:207eb124w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:207eb124w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 207,
Global, block, seismic=0.18g, liquid

BOUNDARY COORDINATES

14 Top Boundaries
52 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	359.00	139.00	356.00	1
2	139.00	356.00	154.00	352.00	1
3	154.00	352.00	179.00	350.00	2
4	179.00	350.00	285.00	384.00	5
5	285.00	384.00	300.00	384.00	5
6	300.00	384.00	560.00	451.00	5
7	560.00	451.00	575.00	451.00	5
8	575.00	451.00	700.00	483.00	5
9	700.00	483.00	849.00	521.00	5
10	849.00	521.00	950.00	526.00	5
11	950.00	526.00	1072.00	520.00	5
12	1072.00	520.00	1332.00	454.00	5
13	1332.00	454.00	1346.00	454.00	4
14	1346.00	454.00	1500.00	422.00	4
15	179.00	350.00	195.00	350.00	1
16	195.00	350.00	203.00	350.00	7
17	203.00	350.00	304.00	310.00	7
18	304.00	310.00	366.00	310.00	7
19	366.00	310.00	473.00	334.00	7
20	473.00	334.00	616.00	363.00	7
21	616.00	363.00	664.00	363.00	7
22	664.00	363.00	683.00	360.00	7
23	683.00	360.00	700.00	363.00	7
24	700.00	363.00	761.00	384.00	4
25	761.00	384.00	970.00	402.00	4
26	970.00	402.00	1101.00	420.00	4

27	1101.00	420.00	1250.00	454.00	4
28	1250.00	454.00	1332.00	454.00	4
29	195.00	350.00	196.00	346.00	1
30	196.00	346.00	203.00	346.00	1
31	203.00	346.00	304.00	306.00	1
32	304.00	306.00	366.00	306.00	1
33	366.00	306.00	473.00	330.00	1
34	473.00	330.00	616.00	358.00	2
35	616.00	358.00	663.00	356.00	2
36	663.00	356.00	699.00	359.00	2
37	699.00	359.00	700.00	363.00	2
38	700.00	363.00	794.00	339.00	2
39	473.00	330.00	794.00	339.00	1
40	794.00	339.00	812.00	332.00	1
41	812.00	332.00	968.00	332.00	3
42	968.00	332.00	1188.00	330.00	3
43	1188.00	330.00	1292.00	325.00	3
44	1292.00	325.00	1500.00	296.00	3
45	812.00	332.00	852.00	320.00	1
46	852.00	320.00	1000.00	290.00	1
47	1000.00	290.00	1238.00	260.00	1
48	1238.00	260.00	1322.00	230.00	1
49	1322.00	230.00	1340.00	230.00	1
50	1340.00	230.00	1366.00	240.00	1
51	1366.00	240.00	1438.00	260.00	1
52	1438.00	260.00	1500.00	269.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 9 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	300.00

2	300.00	300.00
3	400.00	300.00
4	550.00	310.00
5	812.00	332.00
6	968.00	332.00
7	1188.00	330.00
8	1292.00	325.00
9	1500.00	296.00

A Horizontal Earthquake Loading Coefficient
Of0.180 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

1

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

1000 Trial Surfaces Have Been Generated.

7 Boxes Specified For Generation Of Central Block Base

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

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	203.00	347.00	303.00	307.00	0.50
2	304.00	307.00	306.00	307.00	0.50
3	364.00	307.00	366.00	307.00	0.50
4	615.00	359.00	616.00	359.00	0.50
5	682.00	357.00	684.00	357.00	0.50
6	760.00	384.00	762.00	384.00	0.50
7	763.00	384.00	1101.00	419.00	0.00

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 13 Coordinate Points

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

1	198.67	356.31
2	230.24	335.98
3	304.41	307.01
4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48
11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.022 ***

Individual data on the 36 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	18.5	11587.4	0.0	0.0	0.0	0.0	2085.7	0.0	0.0
2	13.0	22700.5	0.0	0.0	0.0	0.0	4086.1	0.0	0.0
3	54.8	196483.5	0.0	0.0	0.0	0.0	35367.0	0.0	0.0
4	15.0	77259.7	0.0	0.0	0.0	0.0	13906.7	0.0	0.0
5	4.0	21779.5	0.0	0.0	0.0	0.0	3920.3	0.0	0.0
6	0.4	2258.2	0.0	0.0	0.0	0.0	406.5	0.0	0.0
7	60.7	369835.0	0.0	0.0	0.0	0.0	66570.3	0.0	0.0
8	0.9	6141.1	0.0	0.0	0.0	0.0	1105.4	0.0	0.0
9	82.7	562366.9	0.0	0.0	0.0	0.0	*******	0.0	0.0
10	24.3	170374.5	0.0	0.0	0.0	0.0	30667.4	0.0	0.0
11	2.3	16117.7	0.0	0.0	0.0	0.0	2901.2	0.0	0.0
12	32.8	233629.4	0.0	0.0	0.0	0.0	42053.3	0.0	0.0
13	52.0	377565.7	0.0	0.0	0.0	0.0	67961.8	0.0	0.0
14	15.0	108679.0	0.0	0.0	0.0	0.0	19562.2	0.0	0.0
15	40.6	292499.0	0.0	0.0	0.0	0.0	52649.8	0.0	0.0
16	0.4	2788.1	0.0	0.0	0.0	0.0	501.9	0.0	0.0
17	48.0	373618.5	0.0	0.0	0.0	0.0	67251.3	0.0	0.0
18	13.7	114953.9	0.0	0.0	0.0	0.0	20691.7	0.0	0.0
19	5.3	45533.7	0.0	0.0	0.0	0.0	8196.1	0.0	0.0
20	0.1	621.6	0.0	0.0	0.0	0.0	111.9	0.0	0.0
21	2.4	20210.7	0.0	0.0	0.0	0.0	3637.9	0.0	0.0
22	14.6	123592.1	0.0	0.0	0.0	0.0	22246.6	0.0	0.0
23	0.0	183.7	0.0	0.0	0.0	0.0	33.1	0.0	0.0
24	0.1	1115.6	0.0	0.0	0.0	0.0	200.8	0.0	0.0
25	34.8	288710.8	0.0	0.0	0.0	0.0	51967.9	0.0	0.0
26	25.3	205209.8	0.0	0.0	0.0	0.0	36937.8	0.0	0.0
27	0.2	1853.9	0.0	0.0	0.0	0.0	333.7	0.0	0.0
28	0.5	3937.5	0.0	0.0	0.0	0.0	708.7	0.0	0.0
29	8.6	69299.9	0.0	0.0	0.0	0.0	12474.0	0.0	0.0
30	0.1	509.2	0.0	0.0	0.0	0.0	91.6	0.0	0.0
31	28.2	207919.1	0.0	0.0	0.0	0.0	37425.4	0.0	0.0
32	14.0	76613.7	0.0	0.0	0.0	0.0	13790.5	0.0	0.0
33	27.7	97268.0	0.0	0.0	0.0	0.0	17508.2	0.0	0.0
34	9.5	21991.7	0.0	0.0	0.0	0.0	3958.5	0.0	0.0
35	12.4	15703.4	0.0	0.0	0.0	0.0	2826.6	0.0	0.0
36	7.1	2175.5	0.0	0.0	0.0	0.0	391.6	0.0	0.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.67	356.31
2	230.24	335.98
3	304.41	307.01
4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48
11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.022 ***

1

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.67	356.31
2	230.24	335.98
3	304.41	307.01
4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48
11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.022 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.67	356.31
2	230.24	335.98
3	304.41	307.01

4	365.07	307.20
5	615.62	359.18
6	683.07	357.05
7	760.28	383.81
8	769.58	384.68
9	797.81	413.02
10	811.84	450.48
11	839.55	479.33
12	861.45	512.80
13	868.50	521.97

*** 1.022 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.046 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49

13	873.87	509.01
14	886.00	522.83

*** 1.046 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.046 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.046 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	194.87	355.09
2	211.49	348.64
3	246.72	329.69
4	305.58	307.01
5	364.93	307.14
6	615.68	358.99
7	682.82	356.85
8	760.74	383.90
9	773.79	385.12
10	801.95	413.52
11	824.23	446.75
12	852.05	475.49
13	873.87	509.01
14	886.00	522.83

*** 1.046 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	206.60	358.85
2	229.19	336.32
3	304.14	306.91
4	364.47	307.03
5	615.22	359.19
6	682.50	356.82
7	760.59	384.21
8	785.84	386.36
9	813.13	415.61
10	837.02	447.69
11	854.87	483.48
12	882.19	512.70
13	889.37	523.00

*** 1.056 ***

EXCAVATION SLOPE STABILITY ANALYSIS

PCSTABL5M Graphs & Printouts

SECTION 208

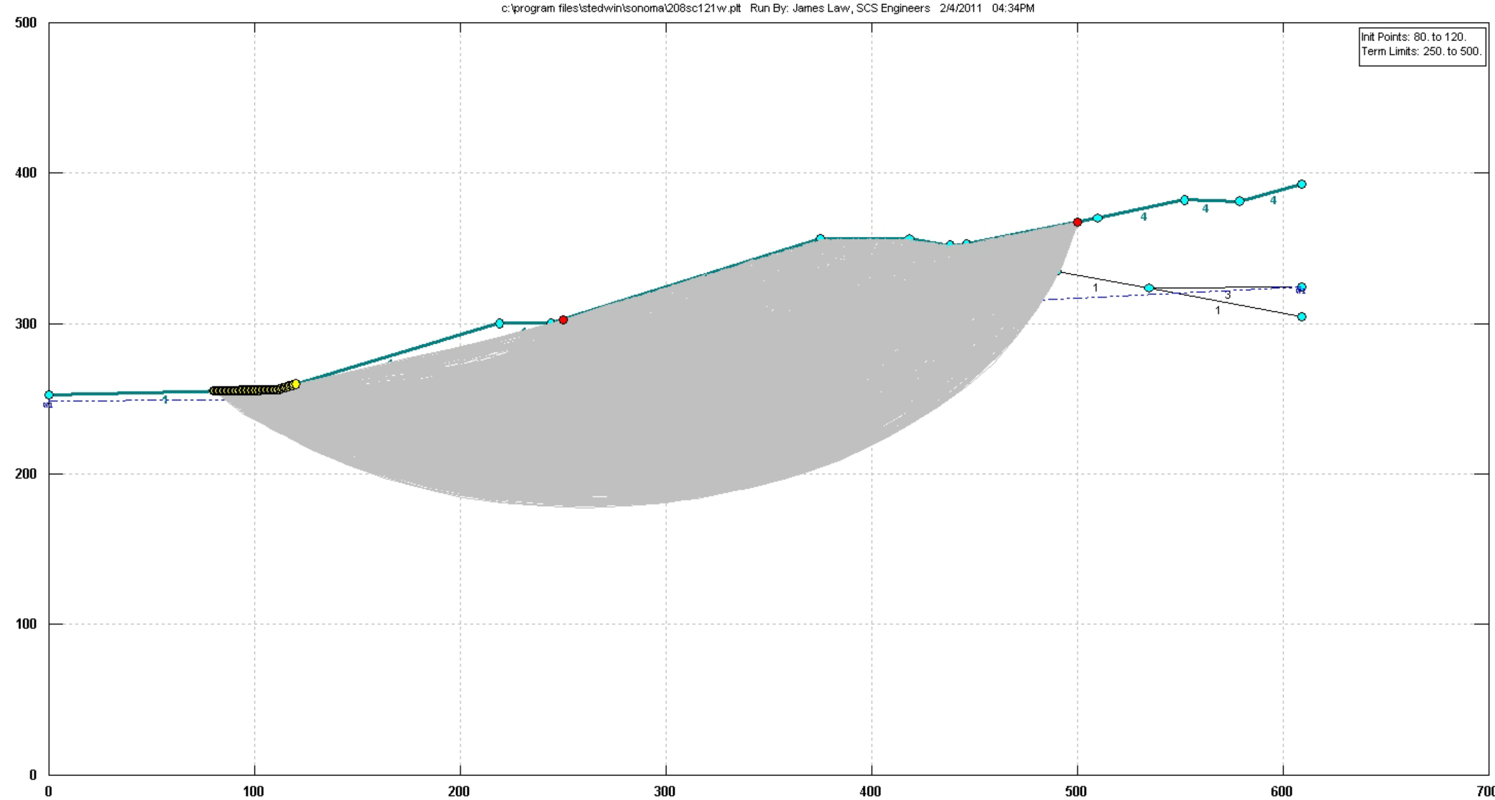
Circular Failure Surface

Interface friction angle at 14.9 degrees

Static

Sonoma Cty Central Disposal, Sect 208, Excavation Slope, circle, static

c:\program files\stedwin\sonoma\208sc121w.plt Run By: James Law, SCS Engineers 2/4/2011 04:34PM



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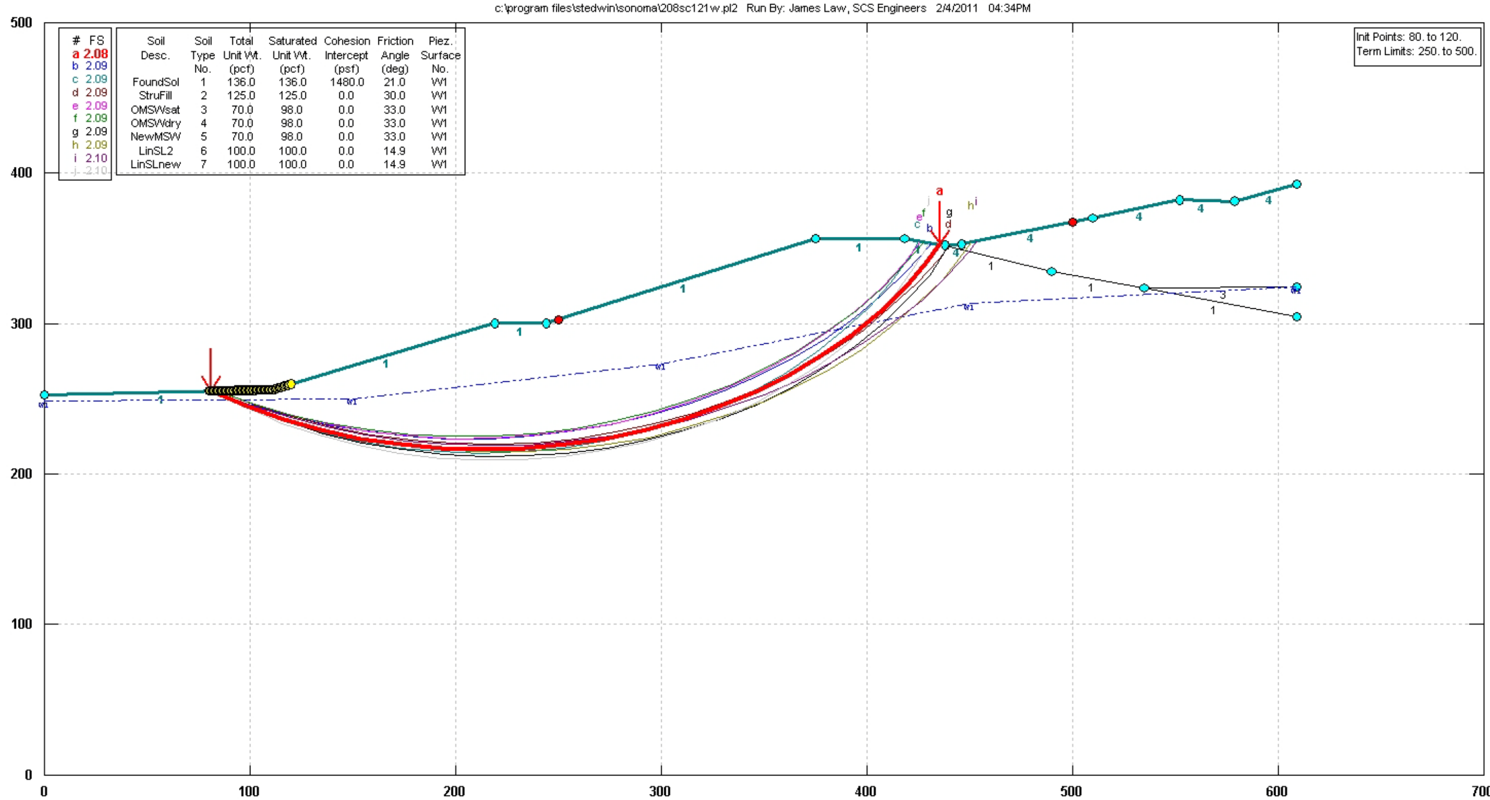
Sonoma Cty Central Disposal, Sect 208, Excavation Slope, circle, static

c:\program files\stedwin\sonoma\208sc121w.pl2 Run By: James Law, SCS Engineers 2/4/2011 04:34PM



PCSTABL5M3 FSmin=2.08
Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/4/2011
Time of Run:	04:34PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:208sc121w.in
Output Filename:	C:208sc121w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:208sc121w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 208,
Excavation Slope, circle, static

BOUNDARY COORDINATES

11 Top Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	253.00	111.00	256.00	1
2	111.00	256.00	219.00	300.00	1
3	219.00	300.00	244.00	300.00	1
4	244.00	300.00	375.00	356.00	1
5	375.00	356.00	418.00	356.00	1
6	418.00	356.00	438.00	352.00	1
7	438.00	352.00	446.00	353.00	4
8	446.00	353.00	510.00	370.00	4
9	510.00	370.00	552.00	382.00	4
10	552.00	382.00	579.00	381.00	4
11	579.00	381.00	609.00	392.00	4
12	438.00	352.00	490.00	335.00	1
13	490.00	335.00	535.00	323.00	1
14	535.00	323.00	609.00	324.00	3
15	535.00	323.00	609.00	304.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 5 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	248.00
2	150.00	250.00
3	300.00	273.00
4	450.00	313.00
5	609.00	324.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced Along The Ground Surface Between X = 80.00 ft.
and X = 120.00 ft.

Each Surface Terminates Between X = 250.00 ft.
and X = 500.00 ft.

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

20.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.68	255.18
2	97.98	245.14
3	116.03	236.53
4	134.71	229.40
5	153.91	223.79
6	173.50	219.75
7	193.35	217.29
8	213.33	216.44
9	233.31	217.20
10	253.17	219.57
11	272.78	223.53
12	292.00	229.05
13	310.72	236.10
14	328.80	244.64
15	346.14	254.60
16	362.63	265.93
17	378.15	278.54
18	392.60	292.37
19	405.90	307.31
20	417.95	323.27
21	428.67	340.15
22	435.22	352.56

Circle Center At X = 213.8 ; Y = 464.5 and Radius, 248.1

*** 2.079 ***

Individual data on the 30 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.3	4367.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	7.0	7990.0	0.0	1053.5	0.0	0.0	0.0	0.0	0.0
3	13.0	24421.9	0.0	6624.7	0.0	0.0	0.0	0.0	0.0
4	5.0	13192.1	0.0	4095.9	0.0	0.0	0.0	0.0	0.0
5	18.7	73417.7	0.0	20851.2	0.0	0.0	0.0	0.0	0.0
6	15.3	86517.2	0.0	22592.1	0.0	0.0	0.0	0.0	0.0
7	3.9	25697.1	0.0	6517.4	0.0	0.0	0.0	0.0	0.0
8	19.6	148386.2	0.0	37421.3	0.0	0.0	0.0	0.0	0.0
9	19.8	180824.8	0.0	45159.0	0.0	0.0	0.0	0.0	0.0
10	20.0	208574.9	0.0	50963.6	0.0	0.0	0.0	0.0	0.0
11	5.7	63482.2	0.0	15263.6	0.0	0.0	0.0	0.0	0.0
12	14.3	161700.9	0.0	39533.9	0.0	0.0	0.0	0.0	0.0
13	10.7	119407.5	0.0	30372.8	0.0	0.0	0.0	0.0	0.0
14	9.2	103460.1	0.0	26263.0	0.0	0.0	0.0	0.0	0.0
15	19.6	230786.7	0.0	56466.6	0.0	0.0	0.0	0.0	0.0

16	19.2	235591.8	0.0	54290.9	0.0	0.0	0.0	0.0	0.0
17	8.0	99741.2	0.0	22057.6	0.0	0.0	0.0	0.0	0.0
18	10.7	134276.9	0.0	27868.4	0.0	0.0	0.0	0.0	0.0
19	18.1	226344.2	0.0	45725.5	0.0	0.0	0.0	0.0	0.0
20	17.3	213063.0	0.0	40266.1	0.0	0.0	0.0	0.0	0.0
21	16.5	194868.9	0.0	32865.0	0.0	0.0	0.0	0.0	0.0
22	12.4	138635.0	0.0	19615.7	0.0	0.0	0.0	0.0	0.0
23	3.1	33712.0	0.0	3954.5	0.0	0.0	0.0	0.0	0.0
24	14.5	138671.9	0.0	12441.9	0.0	0.0	0.0	0.0	0.0
25	6.2	50829.9	0.0	1502.3	0.0	0.0	0.0	0.0	0.0
26	7.1	50715.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	12.0	66711.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.1	240.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	10.7	33638.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	6.5	6102.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.36	255.20
2	99.26	246.29
3	117.80	238.78
4	136.86	232.73
5	156.33	228.15
6	176.10	225.09
7	196.04	223.56
8	216.04	223.56
9	235.98	225.10
10	255.74	228.18
11	275.21	232.76
12	294.27	238.82
13	312.80	246.34
14	330.70	255.25
15	347.87	265.52
16	364.19	277.08
17	379.58	289.86
18	393.93	303.78
19	407.18	318.77
20	419.23	334.73
21	430.02	351.57
22	431.00	353.40

Circle Center At X = 206.0 ; Y = 483.1 and Radius, 259.7

*** 2.085 ***

1

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.68	255.18
2	97.58	244.48
3	115.33	235.28

4	133.82	227.65
5	152.90	221.65
6	172.42	217.31
7	192.25	214.68
8	212.23	213.77
9	232.21	214.59
10	252.05	217.14
11	271.59	221.39
12	290.70	227.31
13	309.22	234.86
14	327.01	243.98
15	343.96	254.61
16	359.92	266.66
17	374.78	280.04
18	388.43	294.66
19	400.76	310.41
20	411.69	327.16
21	421.13	344.79
22	425.31	354.54

Circle Center At X = 212.7 ; Y = 444.7 and Radius, 231.0

*** 2.085 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	84.75	255.29
2	102.39	245.88
3	120.71	237.86
4	139.60	231.28
5	158.94	226.18
6	178.62	222.60
7	198.51	220.55
8	218.51	220.04
9	238.48	221.09
10	258.31	223.68
11	277.88	227.80
12	297.08	233.41
13	315.78	240.50
14	333.87	249.02
15	351.26	258.91
16	367.82	270.11
17	383.47	282.57
18	398.11	296.20
19	411.65	310.92
20	424.01	326.64
21	435.11	343.28
22	440.16	352.27

Circle Center At X = 215.0 ; Y = 477.8 and Radius, 257.8

*** 2.088 ***

1

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	84.07	255.27
2	101.92	246.25
3	120.43	238.68
4	139.48	232.60
5	158.96	228.06
6	178.74	225.08
7	198.69	223.69
8	218.69	223.89
9	238.61	225.68
10	258.32	229.05
11	277.71	233.98
12	296.64	240.43
13	314.99	248.37
14	332.66	257.75
15	349.52	268.50
16	365.47	280.56
17	380.42	293.86
18	394.26	308.30
19	406.90	323.79
20	418.27	340.24
21	426.43	354.31

Circle Center At X = 206.2 ; Y = 474.7 and Radius, 251.1

*** 2.088 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.39	255.25
2	101.38	246.52
3	120.00	239.21
4	139.13	233.37
5	158.65	229.04
6	178.46	226.24
7	198.42	224.99
8	218.41	225.29
9	238.33	227.14
10	258.04	230.54
11	277.42	235.46
12	296.37	241.88
13	314.75	249.75
14	332.47	259.02
15	349.42	269.64
16	365.49	281.55
17	380.58	294.67
18	394.61	308.93

19	407.49	324.23
20	419.13	340.49
21	427.38	354.12

Circle Center At X = 204.5 ; Y = 481.9 and Radius, 257.0

*** 2.090 ***

1

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.71	255.24
2	99.55	244.44
3	117.23	235.08
4	135.62	227.22
5	154.59	220.91
6	174.03	216.19
7	193.79	213.10
8	213.74	211.65
9	233.73	211.86
10	253.65	213.73
11	273.34	217.24
12	292.67	222.37
13	311.51	229.08
14	329.73	237.33
15	347.20	247.06
16	363.81	258.21
17	379.43	270.69
18	393.97	284.42
19	407.32	299.31
20	419.40	315.26
21	430.11	332.15
22	439.38	349.87
23	440.41	352.30

Circle Center At X = 221.2 ; Y = 452.8 and Radius, 241.2

*** 2.092 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.71	255.24
2	99.95	245.10
3	117.92	236.32
4	136.52	228.97
5	155.64	223.08
6	175.15	218.68

7	194.94	215.82
8	214.90	214.49
9	234.90	214.72
10	254.82	216.49
11	274.54	219.80
12	293.95	224.63
13	312.92	230.95
14	331.35	238.72
15	349.12	247.90
16	366.13	258.42
17	382.27	270.24
18	397.45	283.26
19	411.57	297.42
20	424.55	312.64
21	436.31	328.81
22	446.79	345.85
23	451.15	354.37

Circle Center At X = 222.0 ; Y = 472.3 and Radius, 257.9

*** 2.094 ***

1

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.03	255.22
2	99.71	245.85
3	118.02	237.82
4	136.88	231.14
5	156.17	225.88
6	175.80	222.04
7	195.66	219.66
8	215.63	218.74
9	235.63	219.29
10	255.52	221.31
11	275.22	224.78
12	294.61	229.70
13	313.58	236.02
14	332.04	243.72
15	349.88	252.76
16	367.01	263.08
17	383.34	274.64
18	398.77	287.36
19	413.22	301.18
20	426.62	316.03
21	438.90	331.82
22	449.98	348.47
23	453.69	355.04

Circle Center At X = 218.1 ; Y = 490.8 and Radius, 272.0

*** 2.095 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.03	255.22
2	98.48	243.84
3	115.87	233.96
4	134.06	225.65
5	152.91	218.97
6	172.28	213.97
7	192.01	210.71
8	211.95	209.19
9	231.95	209.43
10	251.85	211.44
11	271.50	215.19
12	290.74	220.66
13	309.42	227.79
14	327.40	236.55
15	344.54	246.86
16	360.71	258.63
17	375.77	271.79
18	389.62	286.22
19	402.14	301.81
20	413.25	318.44
21	422.84	335.99
22	430.49	353.50

Circle Center At X = 219.2 ; Y = 435.9 and Radius, 226.8

*** 2.098 ***

SECTION 208

Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 208, Excavation Slope, circle, seismic=0.31g

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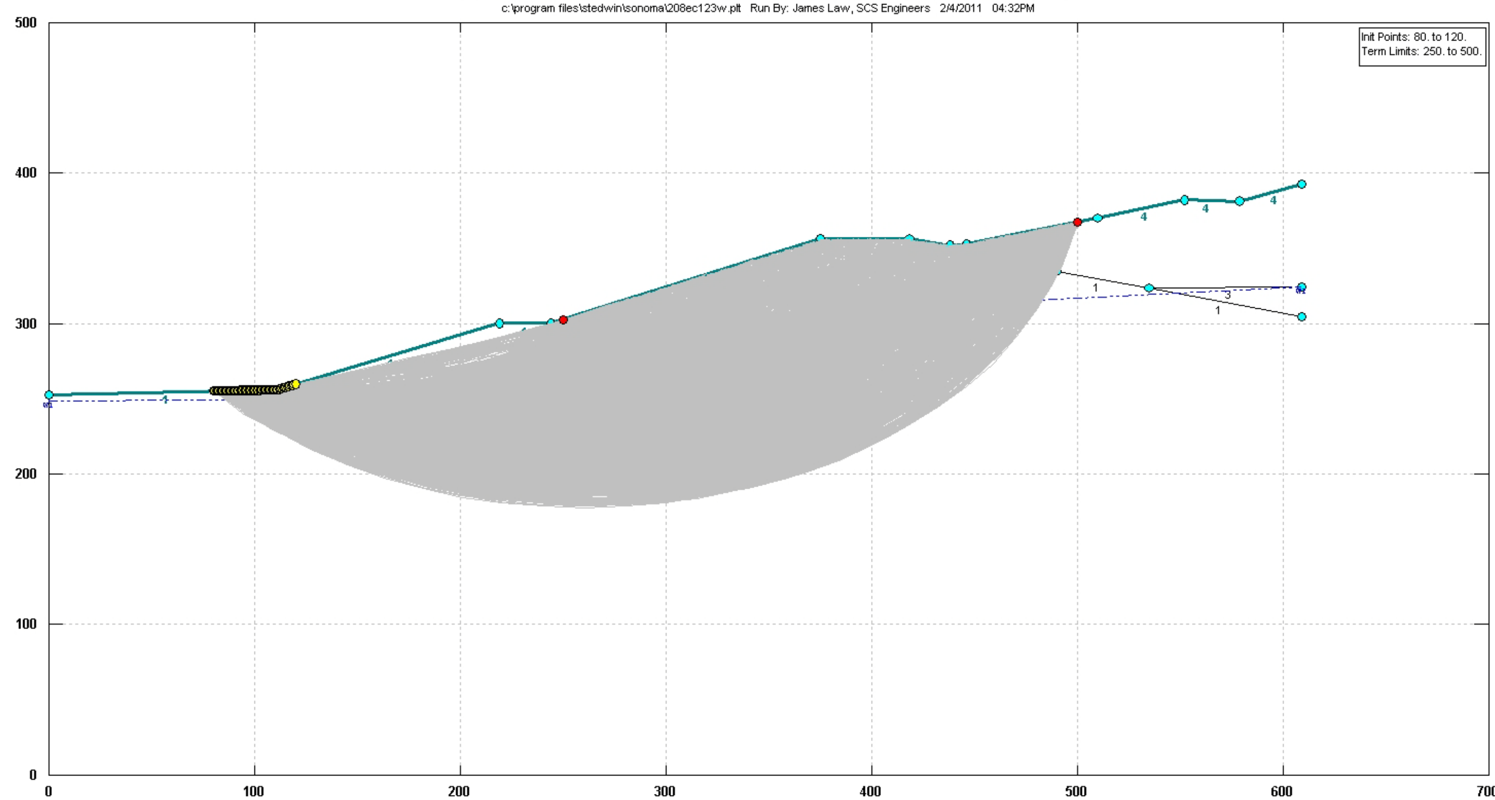
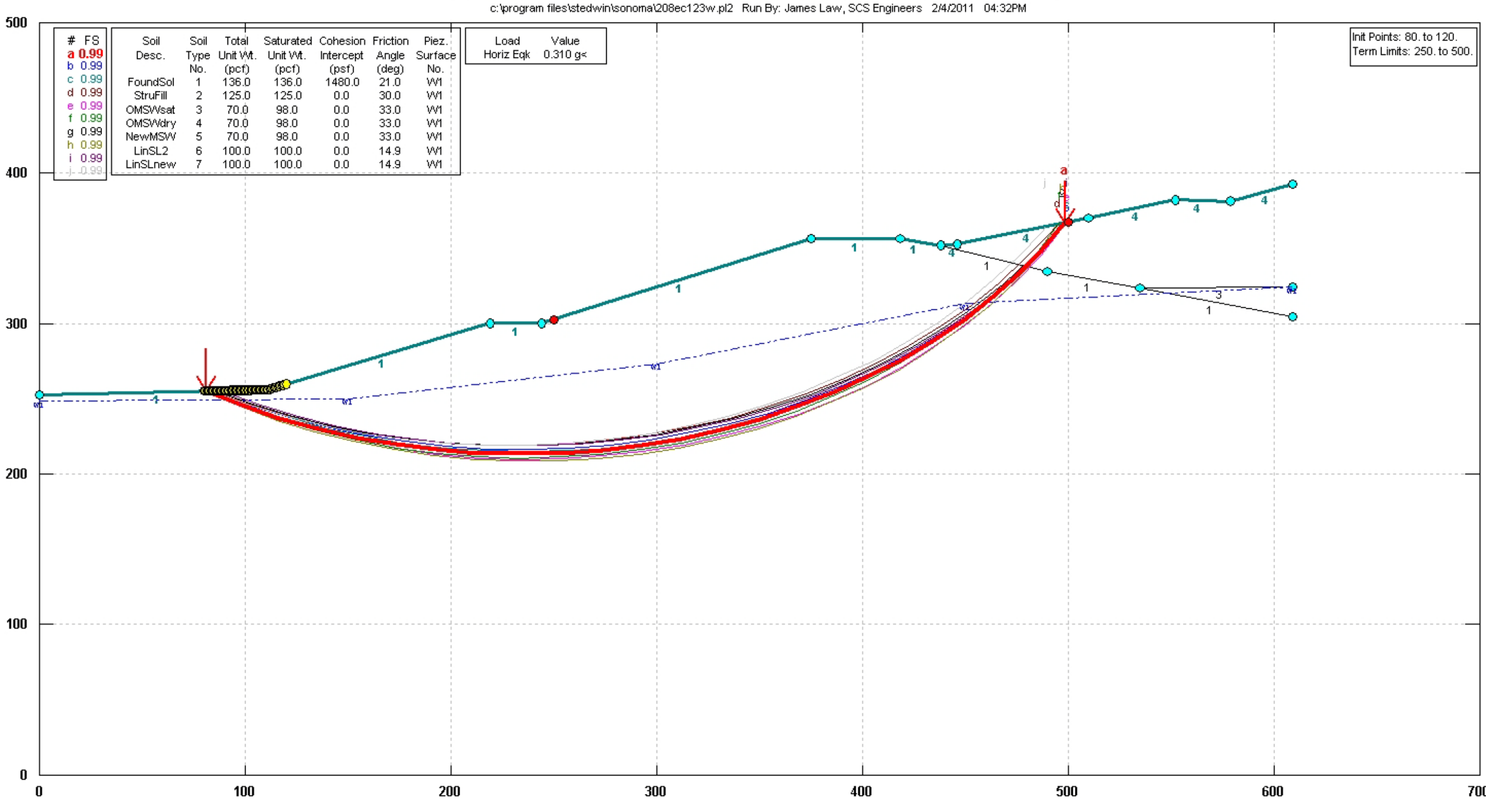


SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 208, Excavation Slope, circle, seismic=0.31g

c:\program files\stedwin\sonoma\208ec123w.pl2 Run By: James Law, SCS Engineers 2/4/2011 04:32PM



PCSTABL5M3 FSmin=0.99

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/4/2011
Time of Run:	04:32PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:208ec123w.in
Output Filename:	C:208ec123w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:208ec123w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 208,
Excavation Slope, circle, seismic=0.31g

BOUNDARY COORDINATES

11 Top   Boundaries
15 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	253.00	111.00	256.00	1
2	111.00	256.00	219.00	300.00	1
3	219.00	300.00	244.00	300.00	1
4	244.00	300.00	375.00	356.00	1
5	375.00	356.00	418.00	356.00	1
6	418.00	356.00	438.00	352.00	1
7	438.00	352.00	446.00	353.00	4
8	446.00	353.00	510.00	370.00	4
9	510.00	370.00	552.00	382.00	4
10	552.00	382.00	579.00	381.00	4
11	579.00	381.00	609.00	392.00	4
12	438.00	352.00	490.00	335.00	1
13	490.00	335.00	535.00	323.00	1
14	535.00	323.00	609.00	324.00	3
15	535.00	323.00	609.00	304.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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 5 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	248.00
2	150.00	250.00
3	300.00	273.00
4	450.00	313.00
5	609.00	324.00

A Horizontal Earthquake Loading Coefficient
Of0.310 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 80.00 ft.
and X = 120.00 ft.

Each Surface Terminates Between X = 250.00 ft.
and X = 500.00 ft.

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

20.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.68	255.18
2	98.26	245.64
3	116.43	237.28
4	135.11	230.13
5	154.21	224.23
6	173.67	219.59
7	193.39	216.25
8	213.28	214.20
9	233.27	213.47
10	253.26	214.05
11	273.17	215.95
12	292.91	219.15
13	312.40	223.65
14	331.55	229.41
15	350.28	236.42
16	368.51	244.65
17	386.16	254.05
18	403.16	264.60
19	419.42	276.24
20	434.88	288.93
21	449.48	302.60
22	463.14	317.21
23	475.82	332.68
24	487.45	348.95
25	497.98	365.95
26	498.52	366.95

Circle Center At X = 234.4 ; Y = 517.5 and Radius, 304.0

*** 0.988 ***

Individual data on the 38 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	11.0	4671.6	0.0	0.0	0.0	0.0	1448.2	0.0	0.0

2	6.6	7297.3	0.0	858.5	0.0	0.0	2262.2	0.0	0.0
3	12.7	22729.4	0.0	5849.3	0.0	0.0	7046.1	0.0	0.0
4	5.4	13708.2	0.0	4094.4	0.0	0.0	4249.5	0.0	0.0
5	18.7	71910.6	0.0	19927.2	0.0	0.0	22292.3	0.0	0.0
6	14.9	83097.5	0.0	21465.9	0.0	0.0	25760.2	0.0	0.0
7	4.2	27431.6	0.0	6921.8	0.0	0.0	8503.8	0.0	0.0
8	19.5	147266.2	0.0	37290.0	0.0	0.0	45652.5	0.0	0.0
9	19.7	181357.7	0.0	45919.5	0.0	0.0	56220.9	0.0	0.0
10	19.9	212116.3	0.0	52991.6	0.0	0.0	65756.1	0.0	0.0
11	5.7	65894.2	0.0	16250.5	0.0	0.0	20427.2	0.0	0.0
12	14.3	167409.9	0.0	42225.0	0.0	0.0	51897.1	0.0	0.0
13	10.7	126056.5	0.0	33086.9	0.0	0.0	39077.5	0.0	0.0
14	9.3	110903.5	0.0	29260.8	0.0	0.0	34380.1	0.0	0.0
15	19.9	252392.8	0.0	64591.3	0.0	0.0	78241.8	0.0	0.0
16	19.7	266176.8	0.0	65196.7	0.0	0.0	82514.8	0.0	0.0
17	7.1	98760.1	0.0	23549.1	0.0	0.0	30615.6	0.0	0.0
18	12.4	176032.0	0.0	40259.8	0.0	0.0	54569.9	0.0	0.0
19	19.2	278188.0	0.0	63144.2	0.0	0.0	86238.3	0.0	0.0
20	18.7	276438.3	0.0	61532.0	0.0	0.0	85695.9	0.0	0.0
21	18.2	269736.8	0.0	58285.9	0.0	0.0	83618.4	0.0	0.0
22	6.5	95486.0	0.0	20292.2	0.0	0.0	29600.7	0.0	0.0
23	11.2	159287.5	0.0	33127.6	0.0	0.0	49379.1	0.0	0.0
24	17.0	223415.6	0.0	46954.8	0.0	0.0	69258.8	0.0	0.0
25	14.8	173792.8	0.0	35874.8	0.0	0.0	53875.8	0.0	0.0
26	1.4	15458.8	0.0	3044.1	0.0	0.0	4792.2	0.0	0.0
27	15.5	150536.7	0.0	29346.8	0.0	0.0	46666.4	0.0	0.0
28	3.1	26267.1	0.0	4898.1	0.0	0.0	8142.8	0.0	0.0
29	8.0	60956.4	0.0	10099.0	0.0	0.0	18896.5	0.0	0.0
30	3.5	23748.0	0.0	3282.9	0.0	0.0	7361.9	0.0	0.0
31	0.5	3440.5	0.0	464.9	0.0	0.0	1066.6	0.0	0.0
32	9.8	57065.8	0.0	4412.0	0.0	0.0	17690.4	0.0	0.0
33	3.3	15903.3	0.0	0.0	0.0	0.0	4930.0	0.0	0.0
34	12.7	44456.4	0.0	0.0	0.0	0.0	13781.5	0.0	0.0
35	4.0	8255.7	0.0	0.0	0.0	0.0	2559.3	0.0	0.0
36	7.6	10299.5	0.0	0.0	0.0	0.0	3192.9	0.0	0.0
37	10.5	5871.9	0.0	0.0	0.0	0.0	1820.3	0.0	0.0
38	0.5	16.1	0.0	0.0	0.0	0.0	5.0	0.0	0.0

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	84.07	255.27
2	101.85	246.12
3	120.19	238.13
4	139.00	231.35
5	158.22	225.80
6	177.75	221.51
7	197.52	218.50
8	217.45	216.77
9	237.44	216.33
10	257.42	217.19
11	277.31	219.34
12	297.01	222.77
13	316.45	227.48
14	335.54	233.43
15	354.21	240.61
16	372.38	248.98
17	389.96	258.51
18	406.89	269.15
19	423.10	280.88

20	438.51	293.62
21	453.06	307.34
22	466.70	321.97
23	479.35	337.46
24	490.98	353.73
25	499.33	367.17

Circle Center At X = 234.2 ; Y = 525.0 and Radius, 308.7

*** 0.990 ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	84.75	255.29
2	102.38	245.86
3	120.60	237.61
4	139.33	230.59
5	158.48	224.81
6	177.96	220.31
7	197.71	217.11
8	217.62	215.21
9	237.61	214.63
10	257.59	215.38
11	277.49	217.44
12	297.20	220.80
13	316.65	225.46
14	335.75	231.40
15	354.42	238.58
16	372.57	246.98
17	390.13	256.55
18	407.02	267.26
19	423.16	279.07
20	438.49	291.91
21	452.94	305.74
22	466.45	320.49
23	478.95	336.10
24	490.40	352.50
25	499.25	367.14

Circle Center At X = 236.4 ; Y = 517.6 and Radius, 303.0

*** 0.991 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	83.39	255.25

2	101.37	246.50
3	119.88	238.92
4	138.83	232.52
5	158.15	227.35
6	177.76	223.42
7	197.58	220.74
8	217.53	219.33
9	237.53	219.20
10	257.50	220.34
11	277.35	222.75
12	297.01	226.42
13	316.40	231.33
14	335.43	237.47
15	354.04	244.81
16	372.14	253.32
17	389.66	262.96
18	406.53	273.71
19	422.68	285.50
20	438.05	298.30
21	452.57	312.05
22	466.19	326.70
23	478.85	342.18
24	490.49	358.44
25	495.25	366.08

Circle Center At X = 229.6 ; Y = 532.9 and Radius, 313.8

*** 0.991 ***

1

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.03	255.22
2	99.29	245.11
3	117.20	236.21
4	135.67	228.54
5	154.62	222.14
6	173.96	217.05
7	193.60	213.28
8	213.46	210.85
9	233.43	209.78
10	253.43	210.08
11	273.36	211.72
12	293.13	214.72
13	312.66	219.06
14	331.84	224.71
15	350.60	231.66
16	368.84	239.86
17	386.48	249.28
18	403.44	259.89
19	419.64	271.61
20	435.00	284.42
21	449.46	298.23
22	462.95	313.00
23	475.40	328.65

24	486.76	345.11
25	496.98	362.31
26	499.45	367.20

Circle Center At X = 239.1 ; Y = 503.6 and Radius, 293.9

*** 0.991 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.36	255.20
2	98.68	245.20
3	116.64	236.40
4	135.16	228.84
5	154.15	222.57
6	173.52	217.60
7	193.18	213.96
8	213.05	211.68
9	233.03	210.75
10	253.03	211.18
11	272.95	212.97
12	292.70	216.12
13	312.19	220.60
14	331.33	226.40
15	350.03	233.50
16	368.20	241.85
17	385.77	251.41
18	402.64	262.15
19	418.74	274.02
20	433.99	286.96
21	448.33	300.90
22	461.68	315.79
23	473.99	331.55
24	485.20	348.11
25	495.25	365.40
26	495.64	366.19

Circle Center At X = 236.7 ; Y = 504.1 and Radius, 293.4

*** 0.991 ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	85.42	255.31
2	103.38	246.50
3	121.86	238.85

4	140.79	232.40
5	160.10	227.18
6	179.70	223.20
7	199.51	220.47
8	219.46	219.03
9	239.46	218.85
10	259.43	219.96
11	279.28	222.34
12	298.95	225.99
13	318.34	230.88
14	337.38	237.00
15	355.99	244.33
16	374.09	252.83
17	391.62	262.47
18	408.49	273.21
19	424.64	285.01
20	440.00	297.82
21	454.51	311.58
22	468.12	326.24
23	480.76	341.74
24	492.38	358.01
25	497.83	366.77

Circle Center At X = 232.1 ; Y = 531.6 and Radius, 312.8

*** 0.991 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	80.68	255.18
2	97.82	244.88
3	115.64	235.79
4	134.03	227.94
5	152.92	221.37
6	172.22	216.12
7	191.83	212.20
8	211.67	209.64
9	231.63	208.45
10	251.63	208.64
11	271.57	210.20
12	291.36	213.12
13	310.89	217.39
14	330.09	223.00
15	348.86	229.92
16	367.11	238.10
17	384.75	247.52
18	401.70	258.14
19	417.89	269.89
20	433.23	282.72
21	447.65	296.58
22	461.08	311.39
23	473.47	327.10
24	484.74	343.61
25	494.86	360.87
26	497.79	366.76

Circle Center At X = 238.9 ; Y = 499.1 and Radius, 290.7

***   0.992   ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	88.14	255.38
2	106.06	246.51
3	124.52	238.81
4	143.44	232.32
5	162.73	227.06
6	182.33	223.05
7	202.14	220.32
8	222.09	218.86
9	242.09	218.69
10	262.05	219.81
11	281.91	222.22
12	301.57	225.90
13	320.95	230.83
14	339.97	237.01
15	358.56	244.40
16	376.63	252.97
17	394.11	262.68
18	410.93	273.50
19	427.02	285.39
20	442.31	298.28
21	456.73	312.13
22	470.24	326.88
23	482.76	342.47
24	494.26	358.84
25	499.35	367.17

Circle Center At X = 234.7 ; Y = 529.0 and Radius, 310.4

***   0.993   ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	82.71	255.24
2	100.67	246.43
3	119.16	238.80
4	138.10	232.39
5	157.42	227.22
6	177.04	223.31
7	196.86	220.68

8	216.82	219.34
9	236.82	219.29
10	256.78	220.54
11	276.62	223.08
12	296.25	226.90
13	315.59	231.98
14	334.57	238.31
15	353.09	245.85
16	371.09	254.57
17	388.48	264.44
18	405.20	275.42
19	421.17	287.46
20	436.33	300.50
21	450.62	314.50
22	463.96	329.40
23	476.31	345.13
24	487.62	361.62
25	489.34	364.51

Circle Center At X = 227.5 ; Y = 527.8 and Radius, 308.7

*** 0.993 ***

SECTION 209

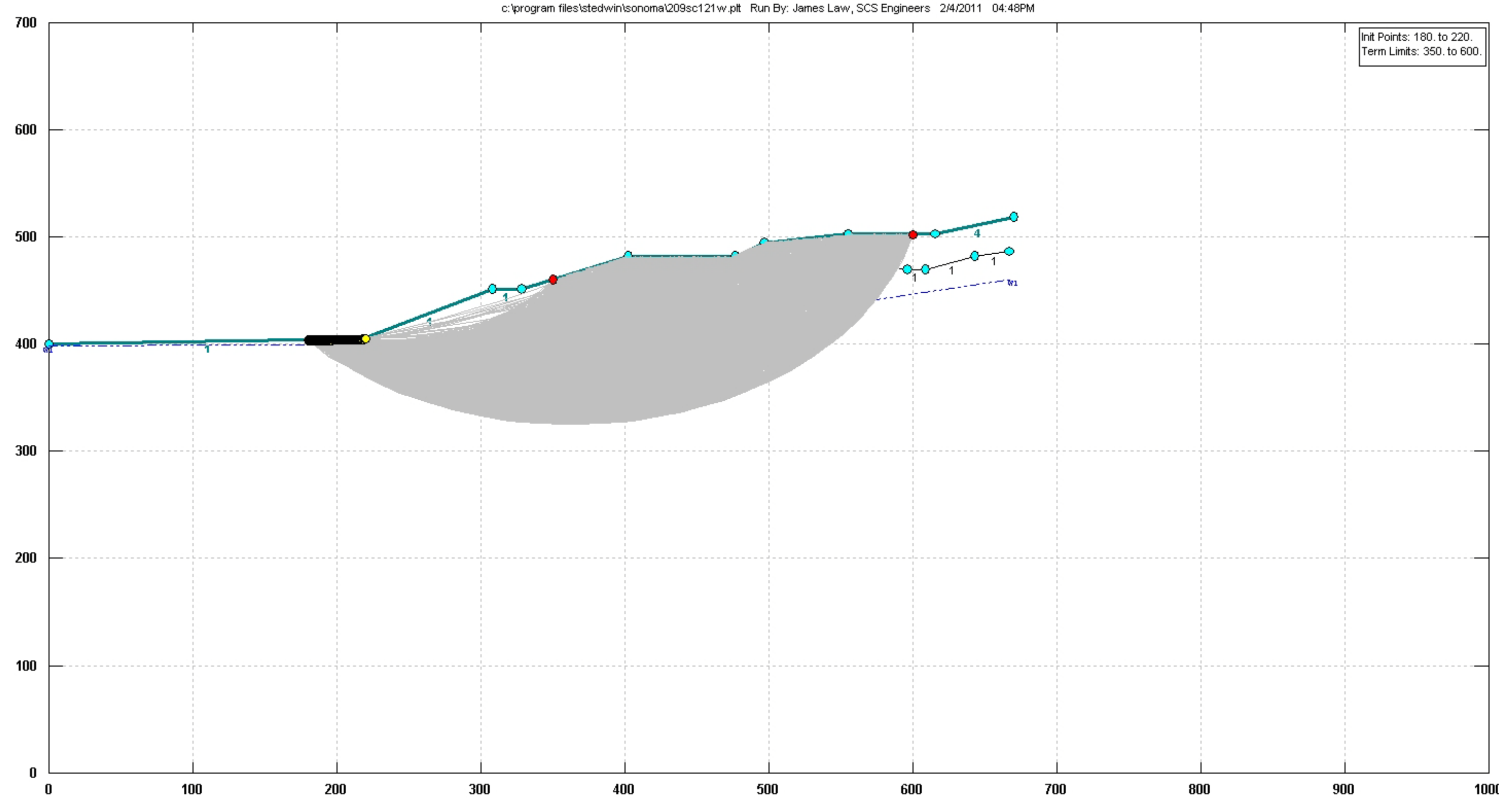
Circular Failure Surface

Interface friction angle at 14.9 degrees

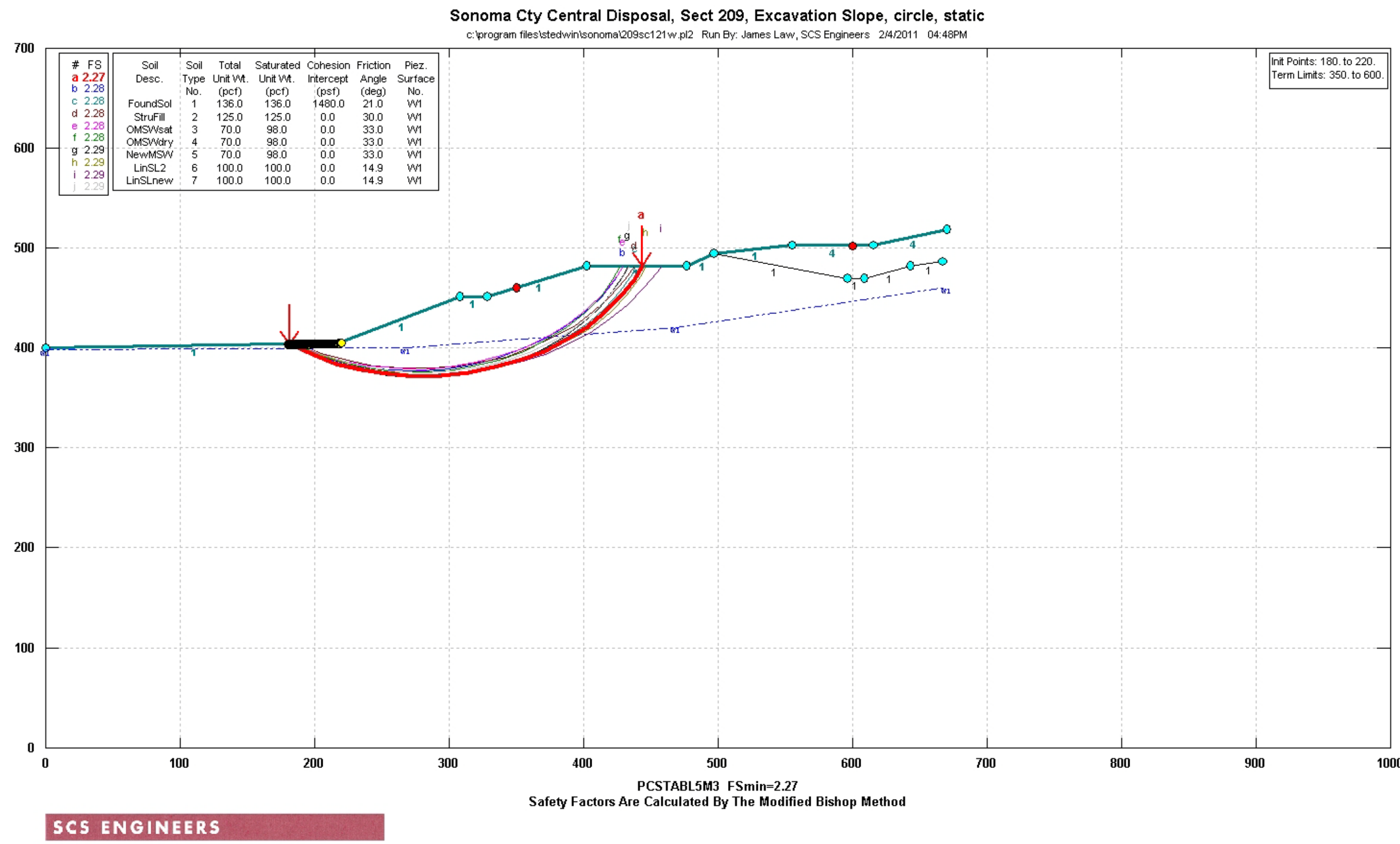
Static

Sonoma Cty Central Disposal, Sect 209, Excavation Slope, circle, static

c:\program files\stedwin\sonoma\209sc121w.plt   Run By: James Law, SCS Engineers   2/4/2011   04:48PM



SCS ENGINEERS



Sonoma Cty Central Disposal, Sect 209, Excavation Slope, circle, static
c:\program files\stedwin\sonoma\209sc121w.pl2 Run By: James Law, SCS Engineers 2/4/2011 04:48PM
FS
a 2.27
b 2.28
c 2.28
d 2.28
e 2.28
f 2.28
g 2.29
h 2.29
i 2.29
j 2.29
Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Piez. Surface No.
FoundSol 1 136.0 136.0 1480.0 21.0 W1
StruFill 2 125.0 125.0 0.0 30.0 W1
OMSWsat 3 70.0 98.0 0.0 33.0 W1
OMSWdry 4 70.0 98.0 0.0 33.0 W1
NewMSW 5 70.0 98.0 0.0 33.0 W1
LinSL2 6 100.0 100.0 0.0 14.9 W1
LinSLnew 7 100.0 100.0 0.0 14.9 W1
Init Points: 180. to 220.
Term Limits: 350. to 600.
0
100
200
300
400
500
600
700
800
900
1000
PCSTABL5M3 FSmin=2.27
Safety Factors Are Calculated By The Modified Bishop Method
SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

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

Run Date: 2/4/2011
Time of Run: 04:48PM
Run By: James Law, SCS Engineers
Input Data Filename: C:209sc121w.in
Output Filename: C:209sc121w.OUT
Unit: ENGLISH
Plotted Output Filename: C:209sc121w.PLT

PROBLEM DESCRIPTION Sonoma Cty Central Disposal, Sect 209,
Excavation Slope, circle, static

BOUNDARY COORDINATES

9 Top Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	400.00	218.00	404.00	1
2	218.00	404.00	308.00	451.00	1
3	308.00	451.00	328.00	451.00	1
4	328.00	451.00	402.00	482.00	1
5	402.00	482.00	476.00	482.00	1
6	476.00	482.00	497.00	495.00	1
7	497.00	495.00	555.00	502.00	1
8	555.00	502.00	615.00	502.00	4
9	615.00	502.00	670.00	518.00	4
10	497.00	495.00	596.00	469.00	1
11	596.00	469.00	608.00	469.00	1
12	608.00	469.00	643.00	482.00	1
13	643.00	482.00	667.00	487.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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	398.00
2	268.00	400.00
3	468.00	420.00
4	670.00	460.00

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced Along The Ground Surface Between X = 180.00 ft.
and X = 220.00 ft.

Each Surface Terminates Between X = 350.00 ft.
and X = 600.00 ft.

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

20.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	180.68	403.32
2	197.72	392.85
3	215.85	384.40
4	234.82	378.07
5	254.39	373.94
6	274.30	372.06
7	294.30	372.47
8	314.12	375.14
9	333.50	380.06
10	352.20	387.16
11	369.98	396.33
12	386.59	407.47
13	401.82	420.43
14	415.48	435.04
15	427.38	451.11
16	437.38	468.43
17	443.27	482.00

Circle Center At X = 280.8 ; Y = 547.3 and Radius, 175.4

*** 2.274 ***

Individual data on the 23 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.4	1752.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	10.7	10735.1	0.0	2583.6	0.0	0.0	0.0	0.0	0.0
3	18.1	37386.4	0.0	13620.9	0.0	0.0	0.0	0.0	0.0
4	2.1	5826.1	0.0	2201.6	0.0	0.0	0.0	0.0	0.0
5	16.8	62948.2	0.0	20817.2	0.0	0.0	0.0	0.0	0.0
6	19.6	111483.2	0.0	29727.4	0.0	0.0	0.0	0.0	0.0
7	13.6	98575.0	0.0	22732.0	0.0	0.0	0.0	0.0	0.0
8	6.3	50913.0	0.0	10988.4	0.0	0.0	0.0	0.0	0.0
9	20.0	180459.0	0.0	36466.2	0.0	0.0	0.0	0.0	0.0
10	13.7	137946.3	0.0	25687.3	0.0	0.0	0.0	0.0	0.0
11	6.1	63464.9	0.0	11337.7	0.0	0.0	0.0	0.0	0.0
12	13.9	139881.5	0.0	25254.1	0.0	0.0	0.0	0.0	0.0
13	5.5	54491.7	0.0	9489.2	0.0	0.0	0.0	0.0	0.0
14	18.7	187215.4	0.0	29650.7	0.0	0.0	0.0	0.0	0.0
15	17.8	176714.3	0.0	21813.5	0.0	0.0	0.0	0.0	0.0
16	16.6	158495.0	0.0	11333.6	0.0	0.0	0.0	0.0	0.0
17	5.8	53099.6	0.0	1045.0	0.0	0.0	0.0	0.0	0.0
18	9.4	81114.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.2	1511.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	13.5	99290.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	11.9	63030.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	10.0	30229.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	5.9	5433.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	180.68	403.32
2	198.21	393.70
3	216.75	386.19
4	236.03	380.88
5	255.80	377.86
6	275.79	377.16
7	295.73	378.79
8	315.33	382.72
9	334.35	388.92
10	352.52	397.28
11	369.59	407.70
12	385.33	420.04
13	399.53	434.12
14	412.00	449.76
15	422.56	466.75
16	429.73	482.00

Circle Center At X = 271.8 ; Y = 548.5 and Radius, 171.4

*** 2.277 ***

1

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	183.39	403.36
2	200.45	392.92
3	218.61	384.55
4	237.63	378.37
5	257.25	374.46
6	277.18	372.88
7	297.17	373.64
8	316.93	376.75
9	336.18	382.15
10	354.67	389.78
11	372.14	399.52
12	388.34	411.24
13	403.06	424.78
14	416.09	439.96
15	427.25	456.55
16	436.39	474.34
17	439.24	482.00

Circle Center At X = 280.7 ; Y = 543.1 and Radius, 170.2

*** 2.277 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	187.46	403.44
2	205.25	394.31
3	223.96	387.24
4	243.35	382.33
5	263.17	379.64
6	283.16	379.20
7	303.08	381.01
8	322.67	385.06
9	341.67	391.30
10	359.85	399.63
11	376.97	409.97
12	392.82	422.17
13	407.19	436.08
14	419.90	451.52
15	430.79	468.29
16	437.63	482.00

Circle Center At X = 277.0 ; Y = 555.8 and Radius, 176.8

*** 2.280 ***

1

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.75	403.39
2	202.43	394.04
3	221.08	386.82
4	240.45	381.84
5	260.27	379.17
6	280.27	378.83
7	300.17	380.84
8	319.69	385.16
9	338.58	391.74
10	356.56	400.49
11	373.40	411.28
12	388.86	423.97
13	402.72	438.39
14	414.80	454.33
15	424.93	471.57
16	429.51	482.00

Circle Center At X = 273.1 ; Y = 548.7 and Radius, 170.1

*** 2.281 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.07	403.38
2	201.32	393.25
3	219.68	385.32
4	238.87	379.70
5	258.61	376.48
6	278.59	375.70
7	298.52	377.38
8	318.10	381.50
9	337.02	387.98
10	355.00	396.74
11	371.77	407.63
12	387.08	420.50
13	400.69	435.15
14	412.41	451.36
15	422.04	468.89
16	427.27	482.00

Circle Center At X = 274.8 ; Y = 538.0 and Radius, 162.4

*** 2.284 ***

1

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	181.36	403.33
2	198.01	392.25
3	215.90	383.32
4	234.76	376.66
5	254.30	372.38
6	274.21	370.54
7	294.20	371.18
8	313.96	374.28
9	333.19	379.79
10	351.58	387.64
11	368.87	397.69
12	384.78	409.81
13	399.08	423.79
14	411.54	439.44
15	421.98	456.50
16	430.23	474.72
17	432.49	482.00

Circle Center At X = 279.1 ; Y = 532.2 and Radius, 161.7

*** 2.285 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	185.42	403.40
2	202.53	393.03
3	220.70	384.68
4	239.71	378.46
5	259.30	374.44
6	279.22	372.68
7	299.22	373.21
8	319.02	376.01
9	338.37	381.05
10	357.03	388.26
11	374.74	397.55
12	391.27	408.80
13	406.42	421.87
14	419.98	436.57
15	431.77	452.72
16	441.64	470.12
17	446.70	482.00

Circle Center At X = 284.6 ; Y = 547.8 and Radius, 175.2

*** 2.285 ***

1

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	180.00	403.30
2	197.36	393.37
3	215.66	385.29
4	234.69	379.15
5	254.26	375.02
6	274.15	372.93
7	294.15	372.91
8	314.04	374.97
9	333.62	379.08
10	352.66	385.19
11	370.97	393.24
12	388.34	403.15
13	404.60	414.80
14	419.56	428.07
15	433.07	442.82
16	444.97	458.89
17	455.15	476.11
18	457.85	482.00

Circle Center At X = 284.2 ; Y = 565.1 and Radius, 192.5

*** 2.286 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.14	403.45
2	205.35	393.28
3	223.68	385.27
4	242.84	379.53
5	262.56	376.17
6	282.53	375.21
7	302.48	376.69
8	322.10	380.57
9	341.10	386.81
10	359.21	395.30
11	376.16	405.92
12	391.69	418.52
13	405.58	432.91
14	417.63	448.87
15	427.65	466.18
16	434.40	482.00

Circle Center At X = 280.3 ; Y = 539.7 and Radius, 164.5

*** 2.286 ***

SECTION 209

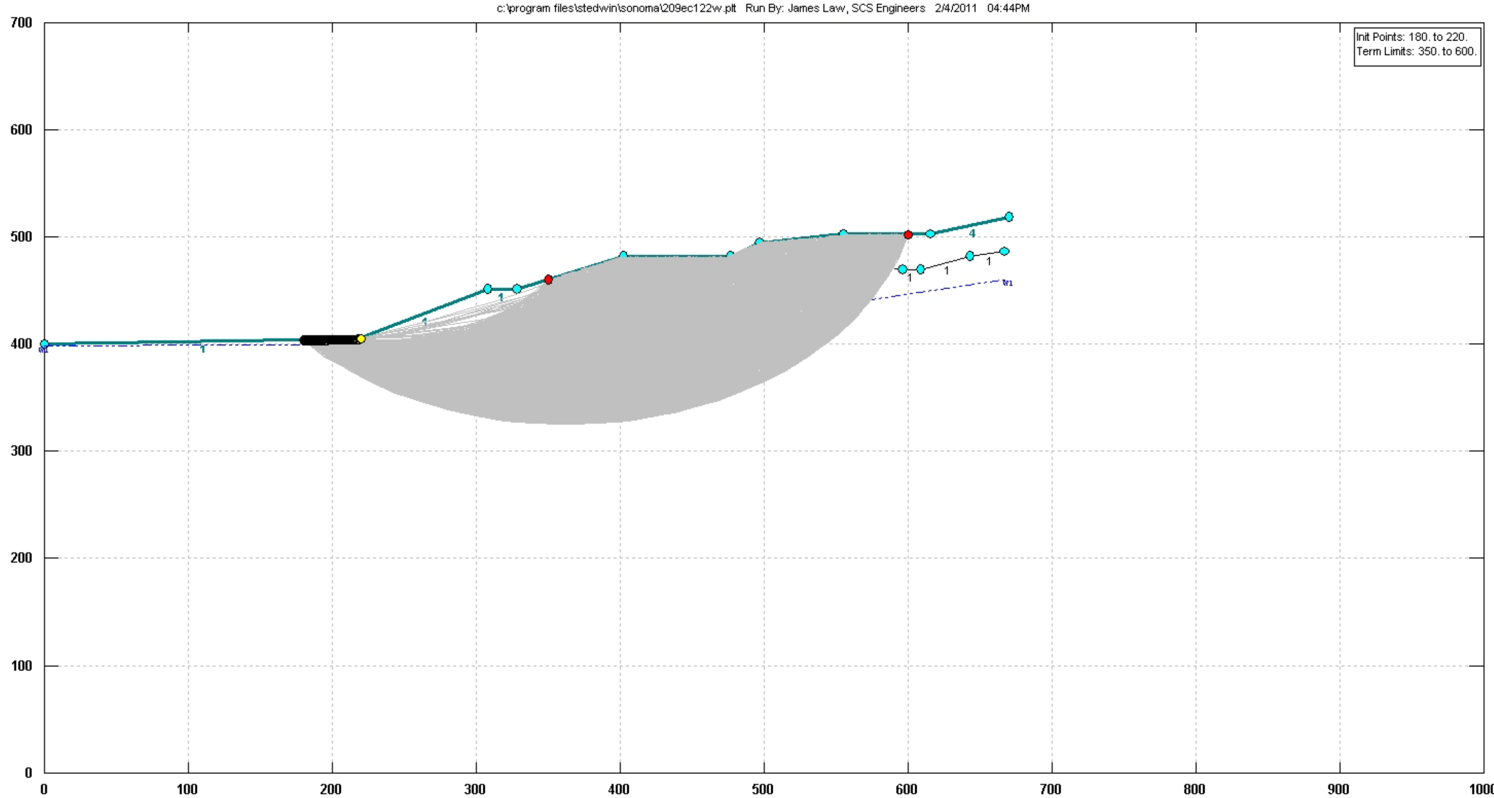
Circular Failure Surface

Interface friction angle at 14.9 degrees

Seismic at k_y

Sonoma Cty Central Disposal, Sect 209, Excavation Slope, circle, seismic=0.34g

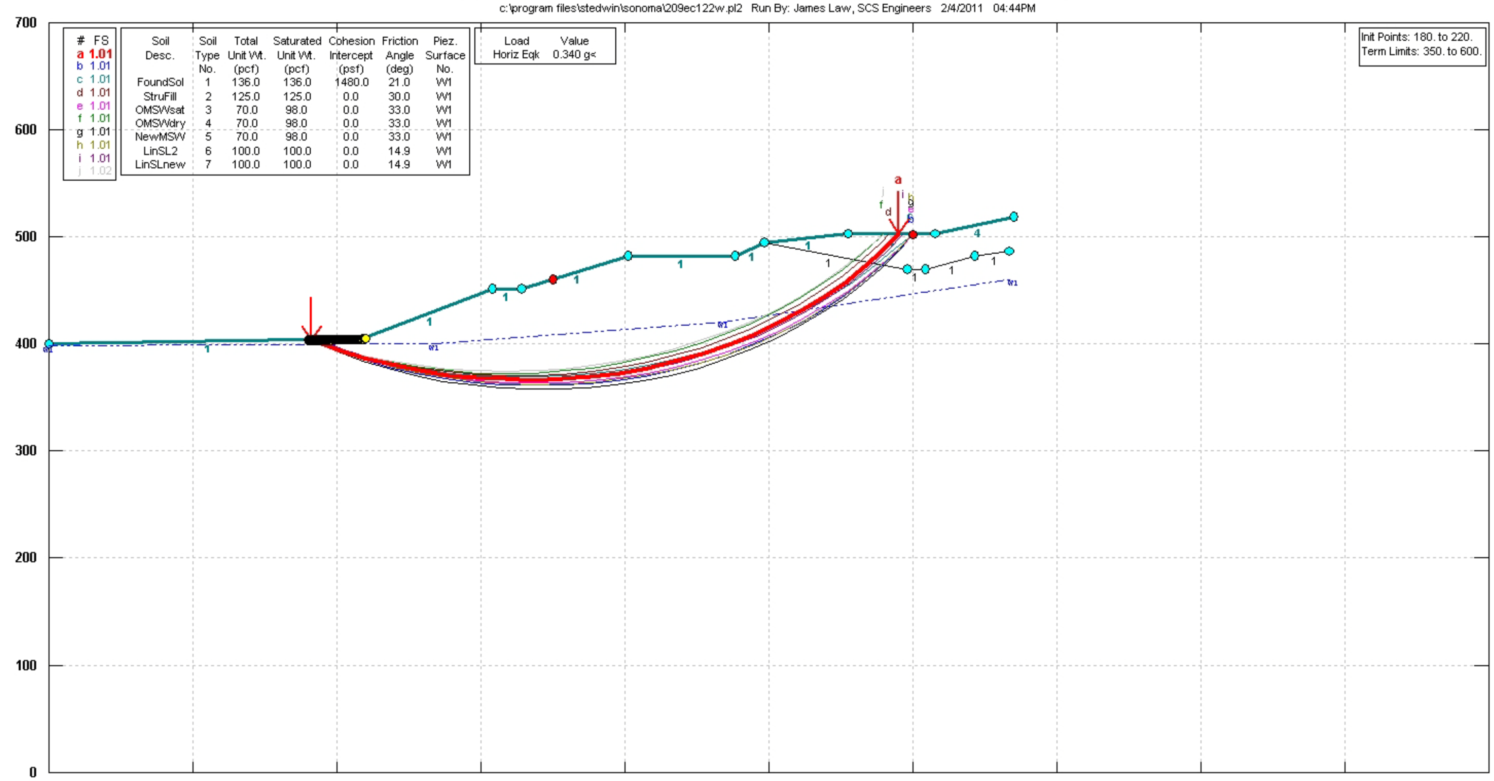
c:\program files\stedwin\sonoma\209ec122w.plt Run By: James Law, SCS Engineers 2/4/2011 04:44PM



SCS ENGINEERS

Sonoma Cty Central Disposal, Sect 209, Excavation Slope, circle, seismic=0.34g

c:\program files\stedwin\sonoma\209ec122w.pl2 Run By: James Law, SCS Engineers 2/4/2011 04:44PM



PCSTABL5M3 FSmin=1.01
Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M3 **

by Purdue University 1985
rev. for SCS Engineers HVA 2008

1

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

Run Date:	2/4/2011
Time of Run:	04:44PM
Run By:	James Law, SCS Engineers
Input Data Filename:	C:209ec122w.in
Output Filename:	C:209ec122w.OUT
Unit:	ENGLISH
Plotted Output Filename:	C:209ec122w.PLT

PROBLEM DESCRIPTION   Sonoma Cty Central Disposal, Sect 209,
Excavation Slope, circle, seismic=0.34g

BOUNDARY COORDINATES

9 Top   Boundaries
13 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	400.00	218.00	404.00	1
2	218.00	404.00	308.00	451.00	1
3	308.00	451.00	328.00	451.00	1
4	328.00	451.00	402.00	482.00	1
5	402.00	482.00	476.00	482.00	1
6	476.00	482.00	497.00	495.00	1
7	497.00	495.00	555.00	502.00	1
8	555.00	502.00	615.00	502.00	4
9	615.00	502.00	670.00	518.00	4
10	497.00	495.00	596.00	469.00	1
11	596.00	469.00	608.00	469.00	1
12	608.00	469.00	643.00	482.00	1
13	643.00	482.00	667.00	487.00	1

1

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	136.0	136.0	1480.0	21.0	0.00	0.0	1
2	125.0	125.0	0.0	30.0	0.00	0.0	1
3	70.0	98.0	0.0	33.0	0.00	0.0	1
4	70.0	98.0	0.0	33.0	0.00	0.0	1
5	70.0	98.0	0.0	33.0	0.00	0.0	1
6	100.0	100.0	0.0	14.9	0.00	0.0	1
7	100.0	100.0	0.0	14.9	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	398.00
2	268.00	400.00
3	468.00	420.00
4	670.00	460.00

A Horizontal Earthquake Loading Coefficient
Of0.340 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned

Cavitation Pressure = 0.0 (psf)

1

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

2400 Trial Surfaces Have Been Generated.

40 Surfaces Initiate From Each Of 60 Points Equally Spaced
Along The Ground Surface Between X = 180.00 ft.
and X = 220.00 ft.

Each Surface Terminates Between X = 350.00 ft.
and X = 600.00 ft.

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

20.00 ft. Line Segments Define Each Trial Failure Surface.

1

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

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.71	403.35
2	200.63	394.48
3	219.08	386.75
4	237.99	380.22
5	257.27	374.90
6	276.84	370.81
7	296.64	367.98
8	316.58	366.41
9	336.58	366.11
10	356.55	367.08
11	376.43	369.31
12	396.12	372.80
13	415.55	377.54
14	434.64	383.50
15	453.32	390.66
16	471.50	398.99
17	489.12	408.46
18	506.09	419.03
19	522.37	430.66
20	537.87	443.30
21	552.54	456.89
22	566.31	471.39
23	579.14	486.74
24	590.33	502.00

Circle Center At X = 331.3 ; Y = 680.8 and Radius, 314.7

*** 1.010 ***

Individual data on the 35 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.9	2198.6	0.0	0.0	0.0	0.0	747.5	0.0	0.0
2	10.0	9020.8	0.0	1746.5	0.0	0.0	3067.1	0.0	0.0
3	17.4	30701.3	0.0	10244.0	0.0	0.0	10438.4	0.0	0.0
4	1.1	2549.9	0.0	927.3	0.0	0.0	867.0	0.0	0.0
5	18.9	66877.2	0.0	20240.3	0.0	0.0	22738.2	0.0	0.0
6	19.3	109892.2	0.0	27815.4	0.0	0.0	37363.3	0.0	0.0
7	10.7	78147.1	0.0	17914.2	0.0	0.0	26570.0	0.0	0.0
8	8.8	72987.2	0.0	16102.4	0.0	0.0	24815.6	0.0	0.0
9	19.8	189831.8	0.0	40331.6	0.0	0.0	64542.8	0.0	0.0
10	11.4	124352.3	0.0	25396.6	0.0	0.0	42279.8	0.0	0.0

11	8.6	98314.7	0.0	20137.5	0.0	0.0	33427.0	0.0	0.0
12	11.4	131513.9	0.0	27732.9	0.0	0.0	44714.7	0.0	0.0
13	8.6	101055.4	0.0	21443.8	0.0	0.0	34358.8	0.0	0.0
14	20.0	250453.9	0.0	51244.7	0.0	0.0	85154.3	0.0	0.0
15	19.9	267409.1	0.0	51729.7	0.0	0.0	90919.1	0.0	0.0
16	19.7	279484.9	0.0	50629.7	0.0	0.0	95024.9	0.0	0.0
17	5.9	85740.8	0.0	14871.7	0.0	0.0	29151.9	0.0	0.0
18	13.6	195582.6	0.0	33077.6	0.0	0.0	66498.1	0.0	0.0
19	19.1	263481.2	0.0	43699.3	0.0	0.0	89583.6	0.0	0.0
20	18.7	241062.8	0.0	37896.8	0.0	0.0	81961.4	0.0	0.0
21	14.7	175664.0	0.0	25310.8	0.0	0.0	59725.8	0.0	0.0
22	3.5	39886.6	0.0	5221.2	0.0	0.0	13561.5	0.0	0.0
23	4.5	50065.1	0.0	6549.0	0.0	0.0	17022.1	0.0	0.0
24	13.1	144693.0	0.0	16358.2	0.0	0.0	49195.6	0.0	0.0
25	7.9	87545.7	0.0	7985.4	0.0	0.0	29765.5	0.0	0.0
26	9.1	98134.6	0.0	6846.8	0.0	0.0	33365.8	0.0	0.0
27	16.3	159863.2	0.0	5274.2	0.0	0.0	54353.5	0.0	0.0
28	0.2	1563.5	0.0	0.7	0.0	0.0	531.6	0.0	0.0
29	15.3	129189.6	0.0	0.0	0.0	0.0	43924.5	0.0	0.0
30	14.7	101187.8	0.0	0.0	0.0	0.0	34403.8	0.0	0.0
31	2.5	14619.0	0.0	0.0	0.0	0.0	4970.5	0.0	0.0
32	11.3	38546.4	0.0	0.0	0.0	0.0	13105.8	0.0	0.0
33	3.7	8023.0	0.0	0.0	0.0	0.0	2727.8	0.0	0.0
34	9.1	13231.2	0.0	0.0	0.0	0.0	4498.6	0.0	0.0
35	11.2	5978.8	0.0	0.0	0.0	0.0	2032.8	0.0	0.0

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.03	403.34
2	199.61	393.79
3	217.76	385.39
4	236.41	378.18
5	255.49	372.18
6	274.92	367.41
7	294.61	363.91
8	314.48	361.67
9	334.46	360.72
10	354.46	361.05
11	374.39	362.67
12	394.18	365.56
13	413.74	369.72
14	433.00	375.13
15	451.86	381.77
16	470.27	389.60
17	488.13	398.60
18	505.38	408.72
19	521.94	419.94
20	537.74	432.19
21	552.73	445.44
22	566.83	459.62
23	580.00	474.67
24	592.17	490.54
25	599.83	502.00

Circle Center At X = 339.3 ; Y = 671.8 and Radius, 311.2

*** 1.010 ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.71	403.35
2	200.91	395.06
3	219.58	387.87
4	238.64	381.81
5	258.02	376.89
6	277.66	373.13
7	297.50	370.55
8	317.45	369.15
9	337.45	368.95
10	357.42	369.93
11	377.30	372.11
12	397.02	375.46
13	416.50	379.98
14	435.68	385.66
15	454.49	392.46
16	472.86	400.37
17	490.72	409.37
18	508.02	419.41
19	524.69	430.46
20	540.67	442.48
21	555.90	455.44
22	570.34	469.28
23	583.93	483.95
24	596.62	499.41
25	598.50	502.00

Circle Center At X = 330.9 ; Y = 704.6 and Radius, 335.8

*** 1.010 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.03	403.34
2	200.21	395.00
3	218.87	387.81
4	237.95	381.79
5	257.36	376.98
6	277.04	373.39
7	296.90	371.03
8	316.87	369.92
9	336.87	370.06
10	356.82	371.44
11	376.64	374.06
12	396.27	377.92
13	415.61	382.99
14	434.61	389.27
15	453.17	396.71
16	471.23	405.30
17	488.72	414.99

18	505.58	425.76
19	521.72	437.56
20	537.10	450.35
21	551.66	464.07
22	565.32	478.67
23	578.06	494.09
24	583.79	502.00

Circle Center At X = 324.7 ; Y = 689.9 and Radius, 320.1

*** 1.011 ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.07	403.38
2	201.82	394.16
3	220.11	386.08
4	238.88	379.18
5	258.06	373.48
6	277.55	369.01
7	297.29	365.79
8	317.19	363.82
9	337.18	363.12
10	357.17	363.69
11	377.09	365.52
12	396.85	368.62
13	416.37	372.96
14	435.58	378.53
15	454.39	385.31
16	472.74	393.26
17	490.55	402.37
18	507.75	412.58
19	524.26	423.87
20	540.02	436.17
21	554.97	449.46
22	569.05	463.66
23	582.20	478.73
24	594.37	494.60
25	599.33	502.00

Circle Center At X = 338.2 ; Y = 678.4 and Radius, 315.3

*** 1.011 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.03	403.34
2	200.38	395.37
3	219.18	388.55
4	238.37	382.91

5	257.87	378.46
6	277.60	375.23
7	297.50	373.22
8	317.49	372.44
9	337.48	372.90
10	357.41	374.60
11	377.19	377.52
12	396.76	381.67
13	416.03	387.01
14	434.94	393.53
15	453.41	401.21
16	471.36	410.02
17	488.74	419.91
18	505.48	430.87
19	521.50	442.83
20	536.76	455.77
21	551.18	469.62
22	564.73	484.34
23	577.33	499.86
24	578.86	502.00

Circle Center At X = 320.0 ; Y = 695.8 and Radius, 323.3

*** 1.013 ***

1

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	182.03	403.34
2	199.32	393.28
3	217.24	384.39
4	235.70	376.70
5	254.63	370.26
6	273.95	365.08
7	293.57	361.20
8	313.40	358.62
9	333.37	357.37
10	353.37	357.44
11	373.32	358.83
12	393.13	361.55
13	412.72	365.57
14	432.01	370.88
15	450.89	377.45
16	469.30	385.27
17	487.16	394.28
18	504.37	404.46
19	520.88	415.76
20	536.59	428.13
21	551.46	441.51
22	565.40	455.85
23	578.37	471.07
24	590.29	487.13
25	599.88	502.00

Circle Center At X = 342.3 ; Y = 658.9 and Radius, 301.7

*** 1.013 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.75	403.39
2	202.35	393.90
3	220.53	385.56
4	239.21	378.42
5	258.32	372.50
6	277.76	367.83
7	297.47	364.42
8	317.36	362.30
9	337.34	361.47
10	357.33	361.92
11	377.26	363.68
12	397.03	366.71
13	416.56	371.02
14	435.77	376.58
15	454.58	383.37
16	472.91	391.36
17	490.69	400.52
18	507.84	410.81
19	524.29	422.19
20	539.97	434.61
21	554.81	448.01
22	568.76	462.35
23	581.75	477.55
24	593.73	493.57
25	599.22	502.00

Circle Center At X = 340.2 ; Y = 670.7 and Radius, 309.2

*** 1.013 ***

1

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	186.78	403.43
2	204.67	394.49
3	223.10	386.71
4	241.98	380.13
5	261.25	374.76
6	280.82	370.64
7	300.61	367.77
8	320.55	366.17
9	340.55	365.84
10	360.52	366.79
11	380.40	369.02
12	400.09	372.51
13	419.52	377.24
14	438.61	383.21
15	457.28	390.39

16	475.46	398.74
17	493.06	408.23
18	510.02	418.83
19	526.27	430.48
20	541.75	443.15
21	556.38	456.79
22	570.12	471.32
23	582.90	486.71
24	594.03	502.00

Circle Center At X = 335.6 ; Y = 679.0 and Radius, 313.2

*** 1.014 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	181.36	403.33
2	199.84	395.68
3	218.74	389.16
4	238.01	383.79
5	257.56	379.58
6	277.33	376.56
7	297.25	374.73
8	317.24	374.11
9	337.23	374.69
10	357.15	376.47
11	376.93	379.44
12	396.49	383.60
13	415.77	388.93
14	434.69	395.41
15	453.19	403.02
16	471.19	411.72
17	488.65	421.49
18	505.48	432.29
19	521.63	444.09
20	537.04	456.83
21	551.66	470.48
22	565.43	484.99
23	578.30	500.30
24	579.57	502.00

Circle Center At X = 317.6 ; Y = 706.3 and Radius, 332.2

*** 1.015 ***

ATTACHMENT B-2

PERMANENT DISPLACEMENT ANALYSIS USING BRAY'S METHOD

ATTACHMENT B-2
SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 202

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/19/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **circular failure surface in waste mass** to the final sideslope at selected sideslope section, Section 202.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 202 in LF1 area, the max. waste height from the circular failure surface to the final sideslope of the landfill is 40 feet and was used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.31 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\,(EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

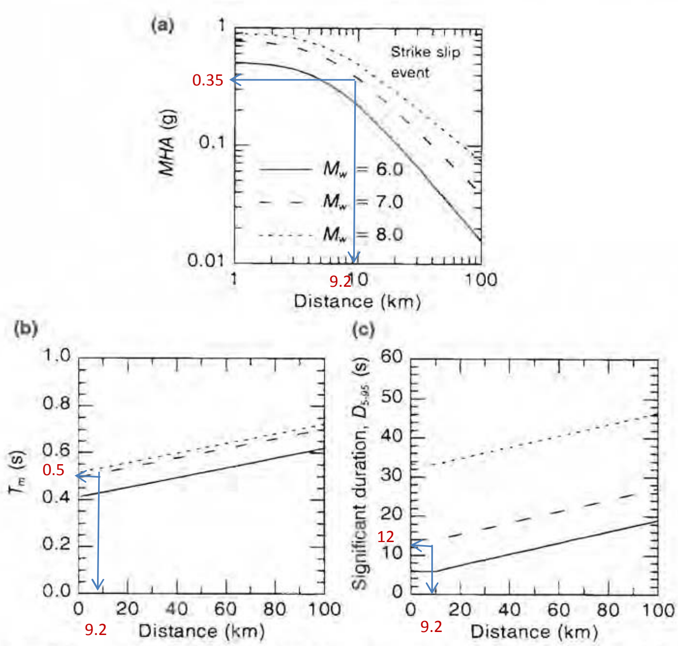


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, *MHA* for strike-slip faults (for reverse faults, use 1.3 × *MHA* for $M_w \geq 6.4$ and 1.64 × *MHA* for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock} :

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\ (EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **40** ft. = 12 m (use average value)

From Figure 3, V_s = **195** m/s (use average profile line)

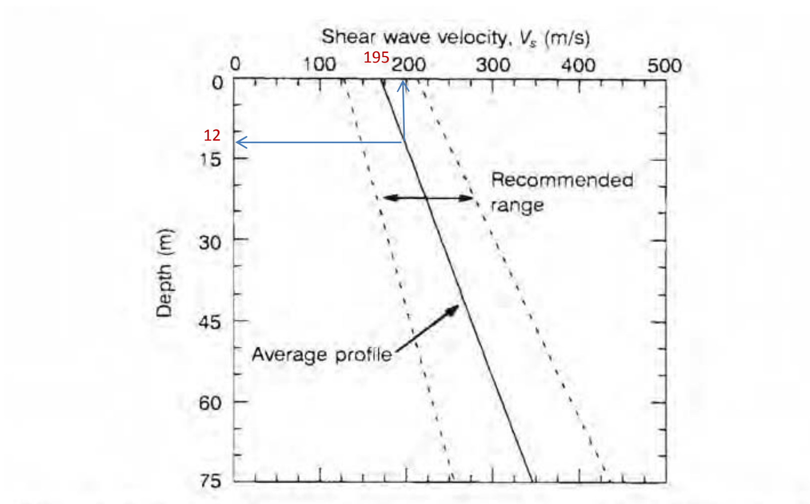


Figure 3. Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\ (waste)} = 4H/V_s$ = 0.25 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\ (Waste)}$ / $T_{m\ (EQ)}$:

$T_{s\ (waste)} / T_{m\ (EQ)}$ = 0.50

5. To estimate the maximum horizontal equivalent acceleration for base sliding

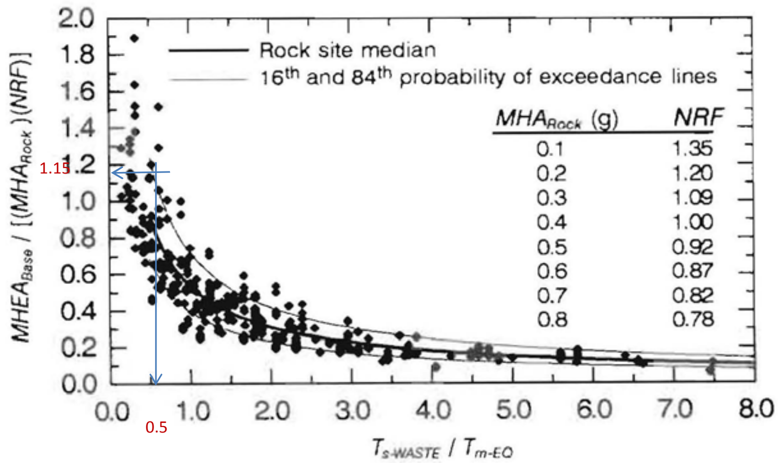


Figure 6. **Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).**

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.30	**1.09**
0.35	1.05
0.40	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\ (waste)} / T_{m\ (EQ)}$ = 0.50

$MHEA_{base} / \{(MHA_{rock})(NRF)\}$ = **1.15** (use upper bound line)

$MHEA_{base}$ = 0.42 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.31**

$k_{max} = MHEA_{base}/g$ = 0.42 (from Step 5)

k_y / k_{max} = 0.74

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

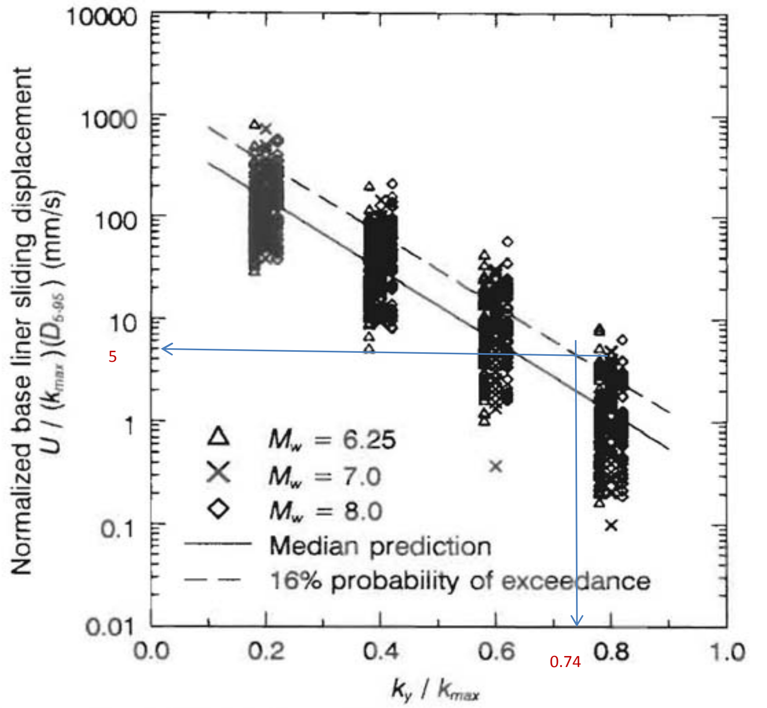


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, U / {(k_{max})(D_{5-95})}

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At ky / kmax = 0.74 (from Step 6)

U / {(k_{max})(D_{5-95})} = **5.0** mm/s (use upper bound line)

k_{max} = 0.42 (from Step 5)

D_{5-95} = 12 s (from Step 1)

Seismic slope permanent displacement, U = **25.2** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the base of LF2 Canyon area is estimated to be equal to **25.2 mm, or less than 1.0 inches.**

ATTACHMENT B - 2
SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 203

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/21/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **block-type failure surface at base liner** to the final sideslope at selected sideslope section, Section 203.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 203 in LF2, the waste height from the base to the final sideslope of the landfill ranges from 88 to 162 feet. The average value of 125 feet is to be used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.11 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\ (EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

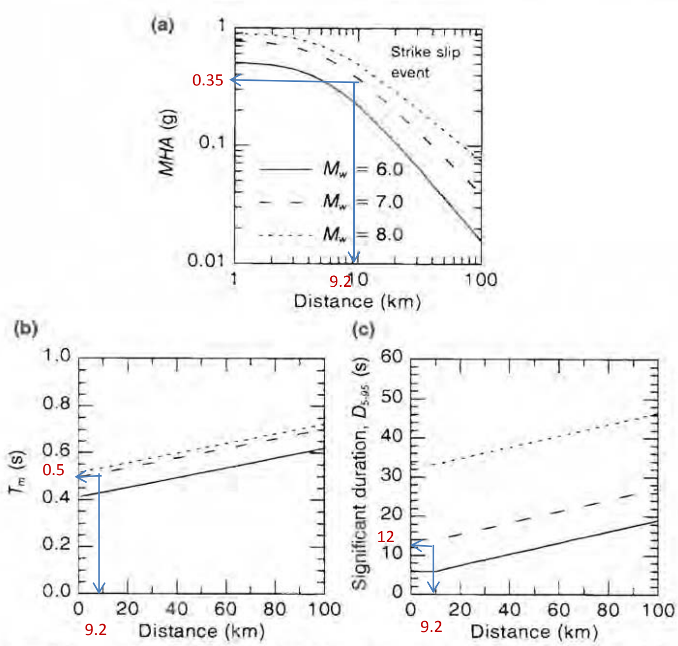


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, *MHA* for strike-slip faults (for reverse faults, use 1.3 × *MHA* for $M_w \geq 6.4$ and 1.64 × *MHA* for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock}:

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHArock = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = **9.2** km,

From Figure 2b, $T_{m\,(EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **125** ft. = 38 m (use average value)

From Figure 3, V_s = **262** m/s (use average profile line)

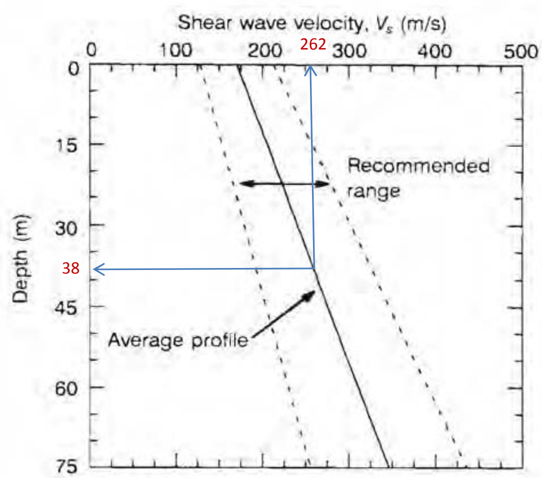


Figure 3. Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\,(waste)} = 4H/V_s$ = 0.58 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\,(Waste)} / T_{m\,(EQ)}$:

$T_{s\,(waste)} / T_{m\,(EQ)}$ = 1.16

5. To estimate the maximum horizontal equivalent acceleration for base sliding

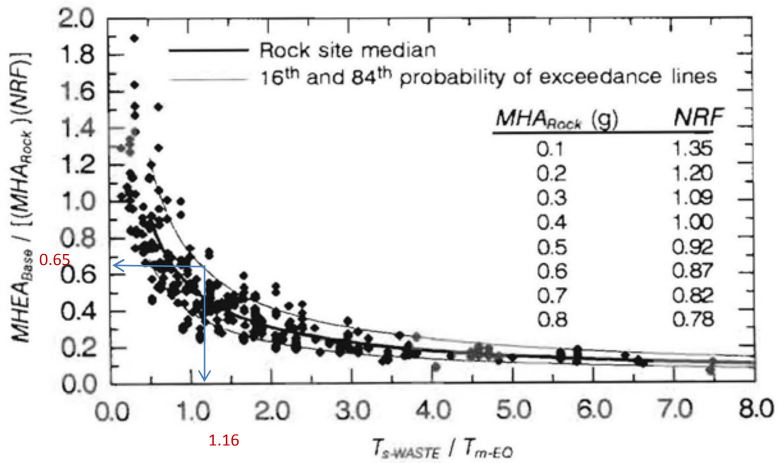


Figure 6. Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)		NRF
0.3		**1.09**
0.35		1.05
0.4		**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\ (waste)}$ / $T_{m\ (EQ)}$ = 1.16

$MHEA_{base}$ / {(MHA_{rock})(NRF)} = **0.65** (use upper bound line)

$MHEA_{base}$ = 0.24 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.11**

k_{max} = $MHEA_{base}$/g = 0.24 (from Step 5)

k_y / k_{max} = 0.46

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

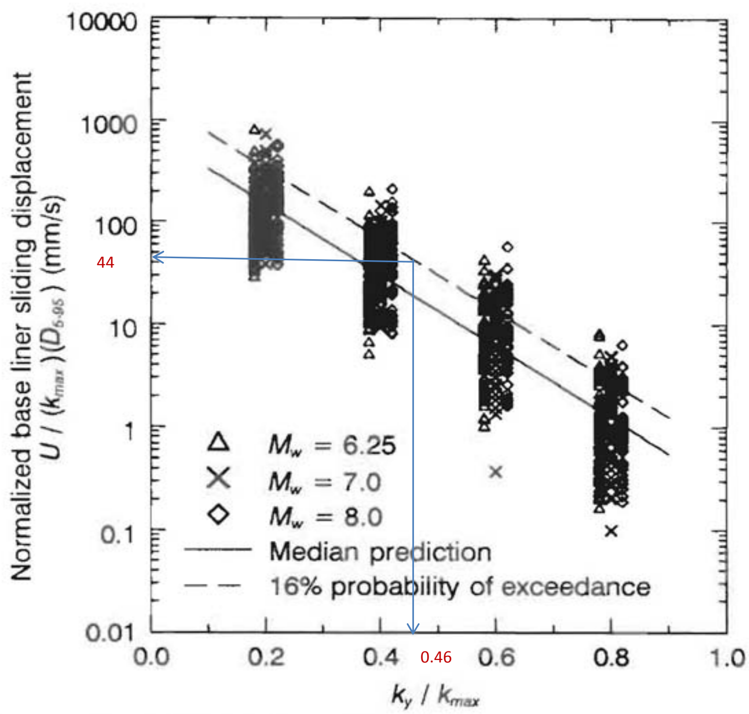


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, U / {(k_{max})($D_{5\text{-}95}$)}

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At k_y / k_{max} = 0.46 (from Step 6)

U / {(k_{max})($D_{5\text{-}95}$)} = **44** mm/s (use upper bound line)

k_{max} = 0.24 (from Step 5)

$D_{5\text{-}95}$ = 12 s (from Step 1)

Seismic slope permanent displacement, U = **125.5** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the base of LF2 Canyon area is estimated to be equal to **125.5 mm, or less than 4.9 inches.**

ATTACHMENT B-2
SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 204

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/21/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **circular failure surface in waste mass** to the final sideskope at selected sideslope section, Section 204.

Reference: 1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given: 1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 204 in LF2 canyon area, the max. waste height from the circular failure surface to the final sideslope of the landfill is 42 feet and was used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.36 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\ (EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

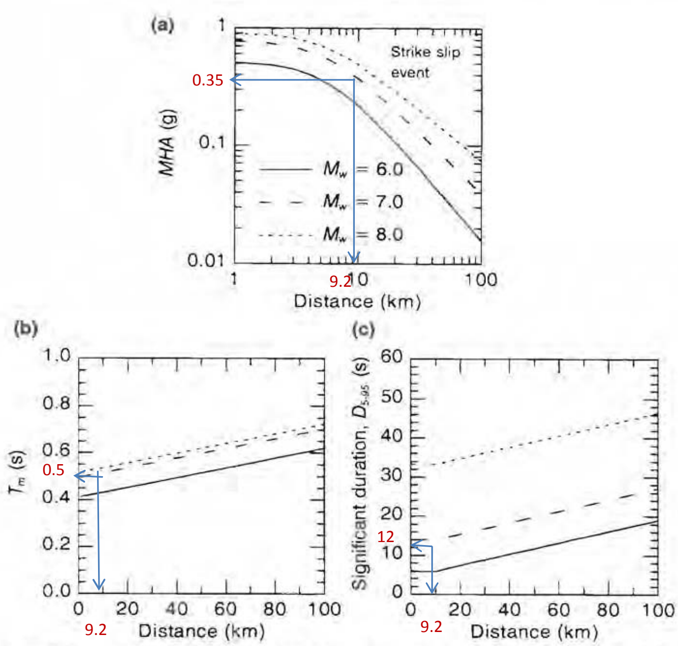


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, *MHA* for strike-slip faults (for reverse faults, use 1.3 × *MHA* for $M_w \geq 6.4$ and 1.64 × *MHA* for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock} :

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\,(EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **42** ft. = 13 m (use average value)

From Figure 3, V_s = **200** m/s (use average profile line)

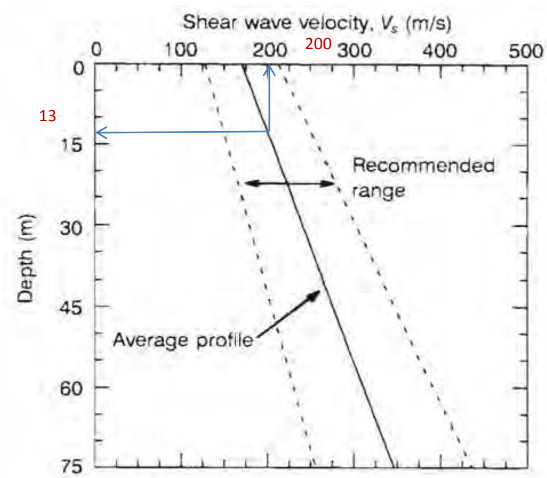


Figure 3. Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\,(waste)} = 4H/V_s$ = 0.26 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\,(Waste)}$ / $T_{m\,(EQ)}$:

$T_{s\,(waste)} / T_{m\,(EQ)}$ = 0.51

5. To estimate the maximum horizontal equivalent acceleration for base sliding

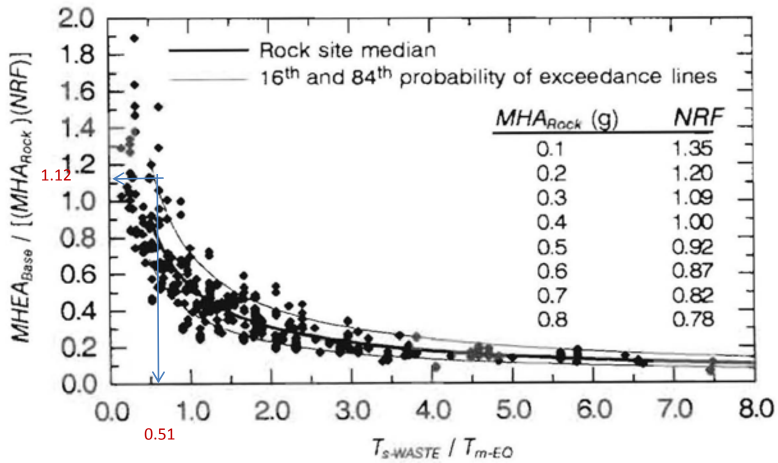


Figure 6. Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.30	**1.09**
0.35	1.05
0.40	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\ (waste)}$ / $T_{m\ (EQ)}$ = 0.51

$MHEA_{base}$ / {(MHA_{rock})(NRF)} = **1.12** (use upper bound line)

$MHEA_{base}$ = 0.41 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = 0.36

k_{max} = $MHEA_{base}$/g = 0.41 (from Step 5)

k_y / k_{max} = 0.88

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

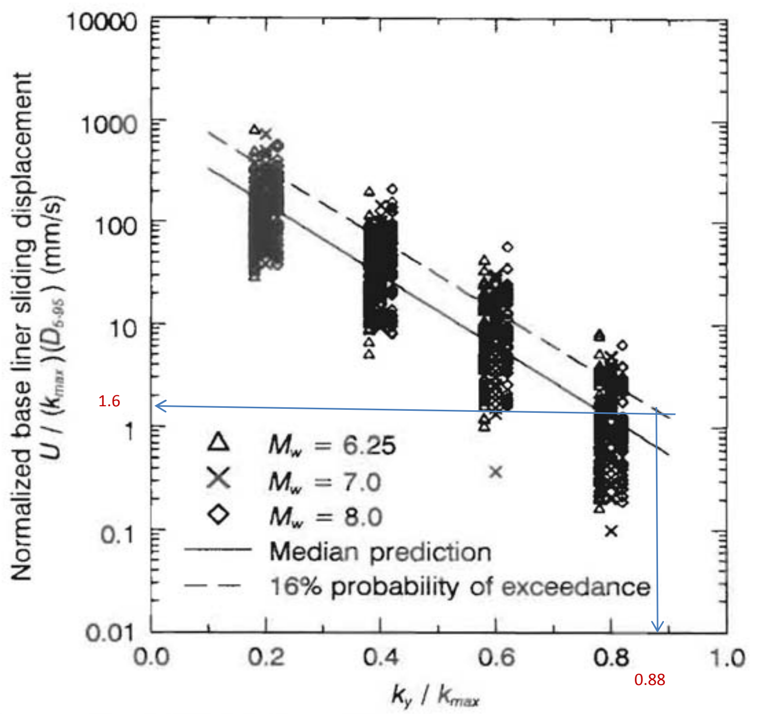


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, $U / \{(k_{max})(D_{5\text{-}95})\}$

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At k_y / k_{max} = 0.88 (from Step 6)

$U / \{(k_{max})(D_{5\text{-}95})\}$ = **1.6** mm/s (use upper bound line)

k_{max} = 0.41 (from Step 5)

$D_{5\text{-}95}$ = 12 s (from Step 1)

Seismic slope permanent displacement, U = **7.9** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the circular surface in LF2 Canyon area is estimated to be equal to **7.9 mm, or less than 0.31 inches.**

ATTACHMENT B-2
SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 204

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/21/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **block-type failure surface at base liner** to the final sideslope at selected sideslope section, Section 204.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 204 in LF2 canyon area, the waste height from the base to the final sideslope of the landfill ranges from 44 to 127 feet. The average value of 86 feet is to be used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.20 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\,(EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

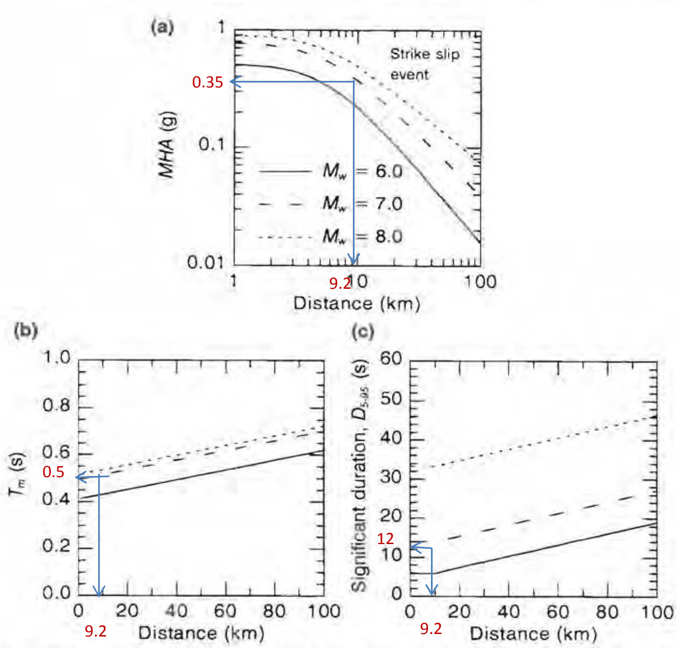


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, *MHA* for strike-slip faults (for reverse faults, use 1.3 × *MHA* for $M_w \geq 6.4$ and 1.64 × *MHA* for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock}:

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\,(EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **146** ft. = 45 m (use average value)

From Figure 3, V_s = **273** m/s (use average profile line)

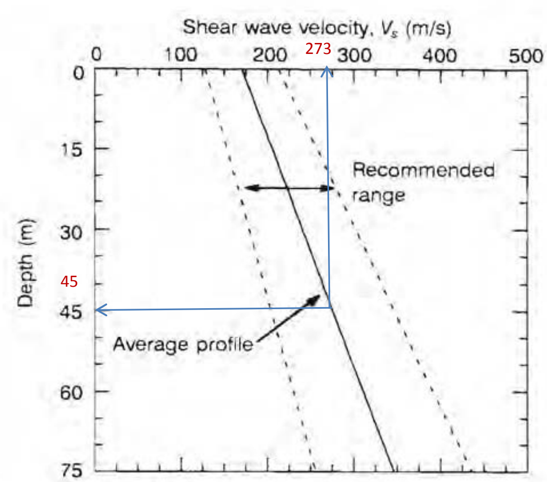


Figure 3. Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\,(waste)} = 4H/V_s$ = 0.65 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\,(Waste)} / T_{m\,(EQ)}$:

$T_{s\,(waste)} / T_{m\,(EQ)}$ = 1.30

5. To estimate the maximum horizontal equivalent acceleration for base sliding

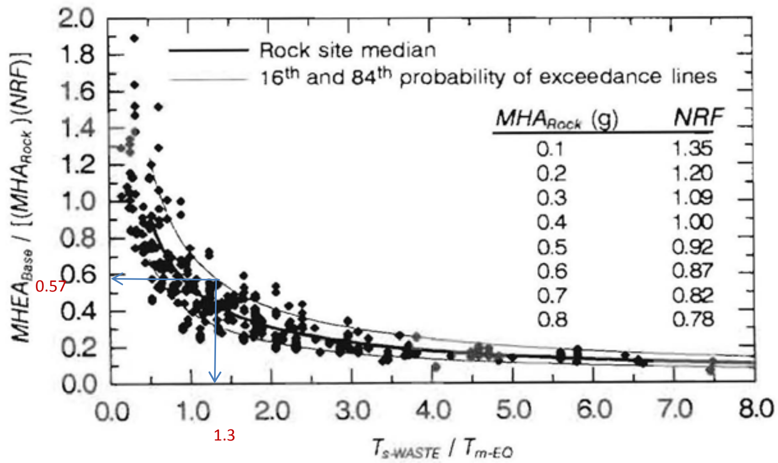


Figure 6. Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.30	**1.09**
0.35	1.05
0.40	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\ (waste)} / T_{m\ (EQ)}$ = 1.30

$MHEA_{base} / \{(MHA_{rock})(NRF)\}$ = **0.57** (use upper bound line)

$MHEA_{base}$ = 0.21 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.20**

$k_{max} = MHEA_{base}/g$ = 0.21 (from Step 5)

k_y / k_{max} = 0.96

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

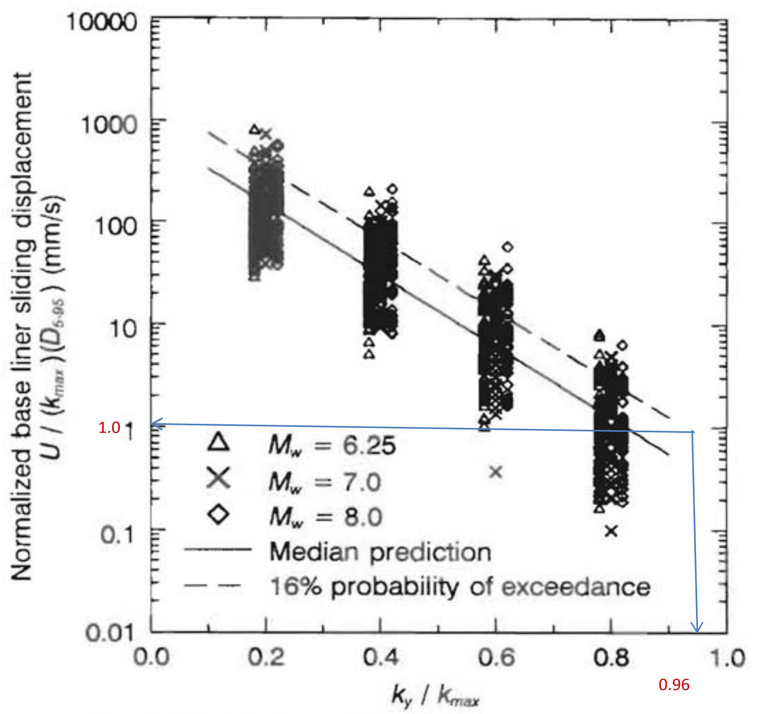


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, $U / \{(k_{max})(D_{5\text{-}95})\}$

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At k_y / k_{max} = 0.96 (from Step 6)

$U / \{(k_{max})(D_{5\text{-}95})\}$ = **1.0** mm/s (use upper bound line)

k_{max} = 0.21 (from Step 5)

$D_{5\text{-}95}$ = 12 s (from Step 1)

Seismic slope permanent displacement, U = **2.5** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the base of LF2 Canyon area is estimated to be equal to **2.5 mm, or less than 0.10 inches.**

ATTACHMENT B-2
SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 205

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/21/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **circular failure surface in waste mass** to the final sideslope at selected sideslope section, Section 205.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 205 in LF1 area, the max. waste height from the circular failure surface to the final sideslope of the landfill is 80 feet and was used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.26 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\ (EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

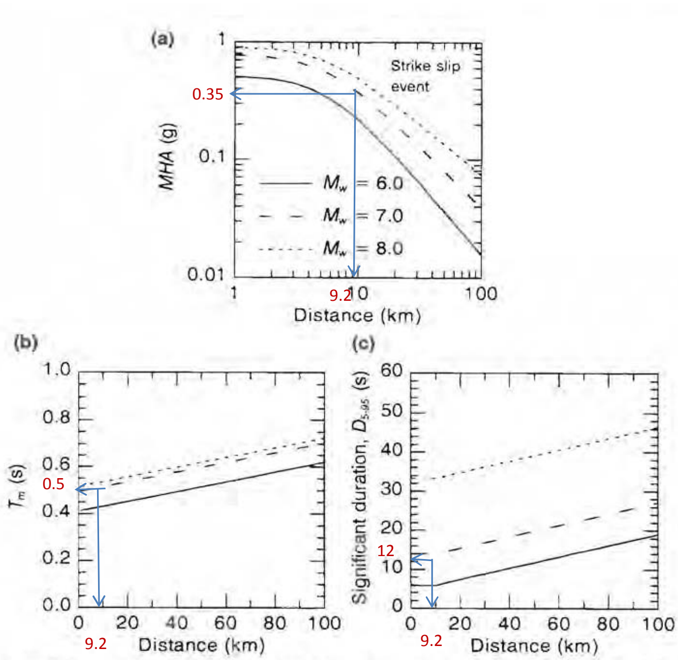


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, MHA for strike-slip faults (for reverse faults, use $1.3 \times MHA$ for $M_w \geq 6.4$ and $1.64 \times MHA$ for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock}:

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\,(EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **80** ft. = 24 m (use average value)

From Figure 3, V_s = **225** m/s (use average profile line)

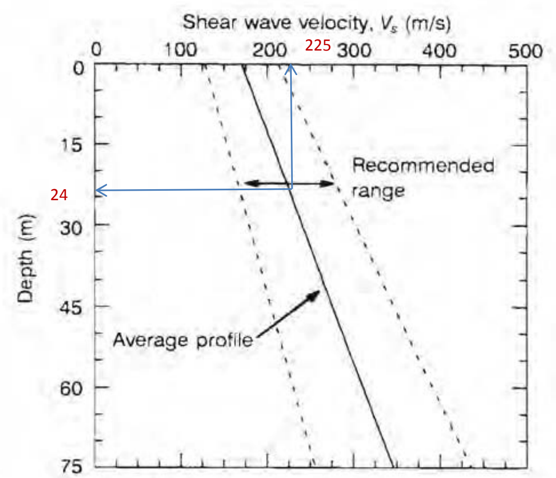


Figure 3. Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\,(waste)} = 4H/V_s$ = 0.43 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\,(Waste)} / T_{m\,(EQ)}$:

$T_{s\,(waste)} / T_{m\,(EQ)}$ = 0.87

5. To estimate the maximum horizontal equivalent acceleration for base sliding

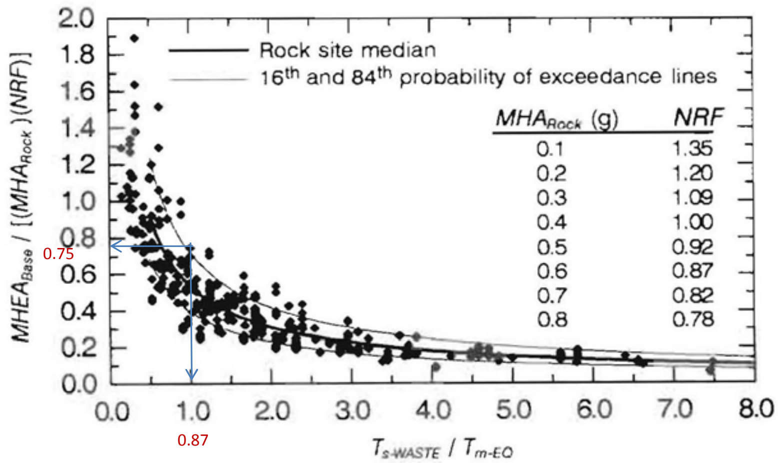


Figure 6. Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.30	**1.09**
0.35	1.05
0.40	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\ (waste)}$ / $T_{m\ (EQ)}$ = 0.87

$MHEA_{base}$ / {(MHA_{rock})(NRF)} = **0.75** (use upper bound line)

$MHEA_{base}$ = 0.27 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.26**

k_{max} = $MHEA_{base}$/g = 0.27 (from Step 5)

k_y / k_{max} = 0.95

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

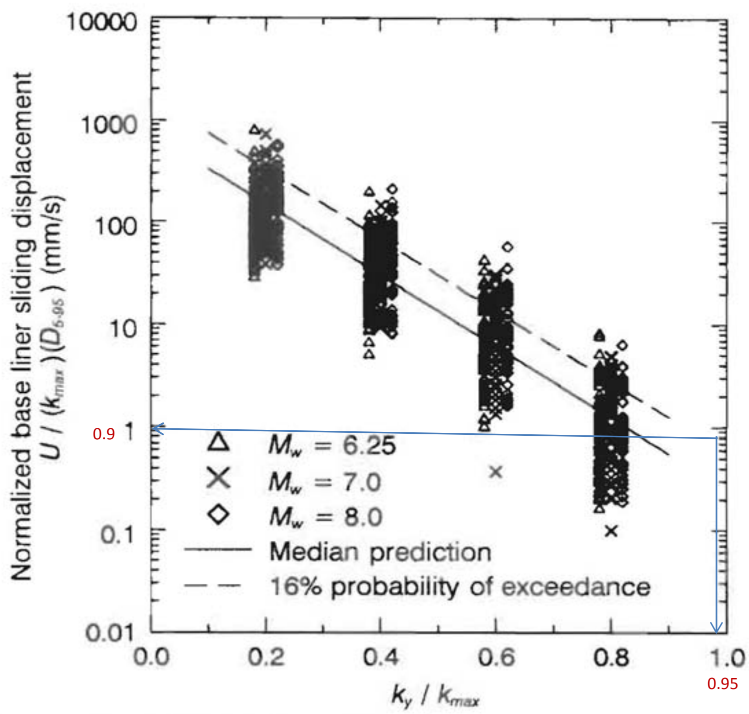


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, U / {(k_{max})($D_{5\text{-}95}$)}

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At k_y / k_{max} = 0.95 (from Step 6)

U / {(k_{max})($D_{5\text{-}95}$)} = **0.9** mm/s (use upper bound line)

k_{max} = 0.27 (from Step 5)

$D_{5\text{-}95}$ = 12 s (from Step 1)

Seismic slope permanent displacement, U = **3.0** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the circular failure surface in LF1 area is estimated to be equal to **3.0 mm, or less than 0.12 inches.**

ATTACHMENT B - 2
SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 205

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/21/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **block-type failure surface at base liner** to the final sideslope at selected sideslope section, Section 205.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 205 in REA/LF1, the waste height from the base to the final sideslope of the landfill ranges from 35 to 156 feet. The average value of 96 feet is to be used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.15 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\,(EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

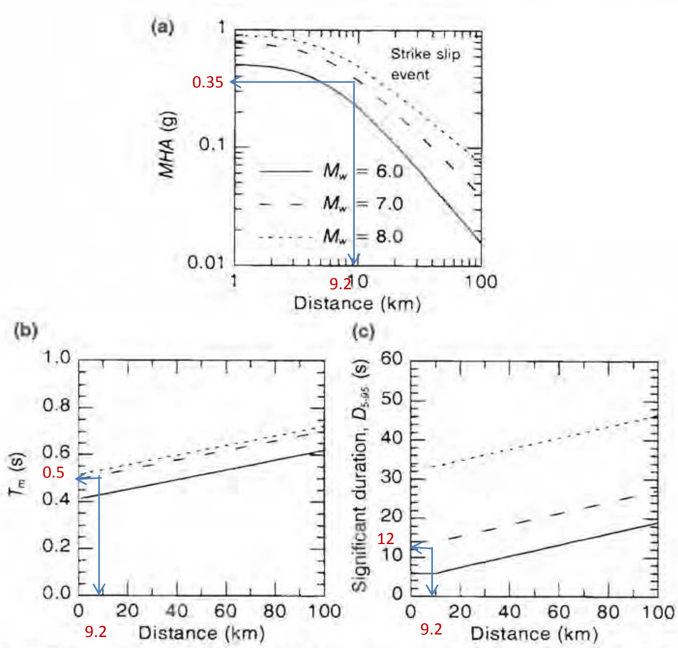


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, *MHA* for strike-slip faults (for reverse faults, use $1.3 \times MHA$ for $M_w \geq 6.4$ and $1.64 \times MHA$ for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock}:

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\,(EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **96** ft. = 29 m (use average value)

From Figure 3, V_s = **237** m/s (use average profile line)

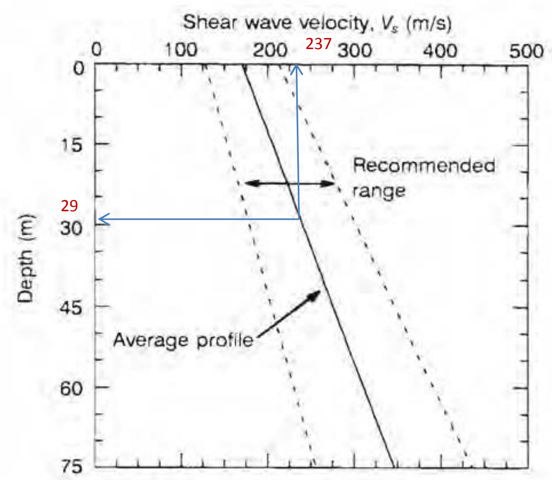


Figure 3. **Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).**

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\,(waste)} = 4H/V_s$ = 0.49 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\,(Waste)} / T_{m\,(EQ)}$:

$T_{s\,(waste)} / T_{m\,(EQ)}$ = 0.99

5. To estimate the maximum horizontal equivalent acceleration for base sliding

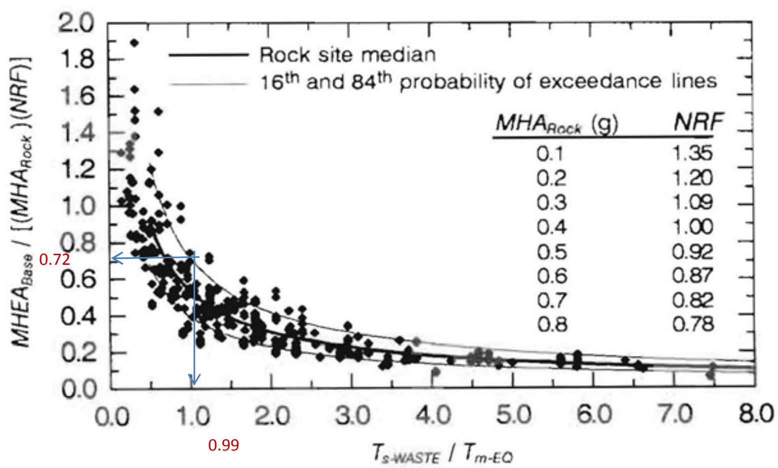


Figure 6. Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.30	**1.09**
0.35	1.05
0.40	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\ (waste)}$ / $T_{m\ (EQ)}$ = 0.99

$MHEA_{base}$ / {(MHA_{rock})(NRF)} = **0.72** (use upper bound line)

$MHEA_{base}$ = 0.26 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.15**

k_{max} = $MHEA_{base}$/g = 0.26 (from Step 5)

k_y / k_{max} = 0.57

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

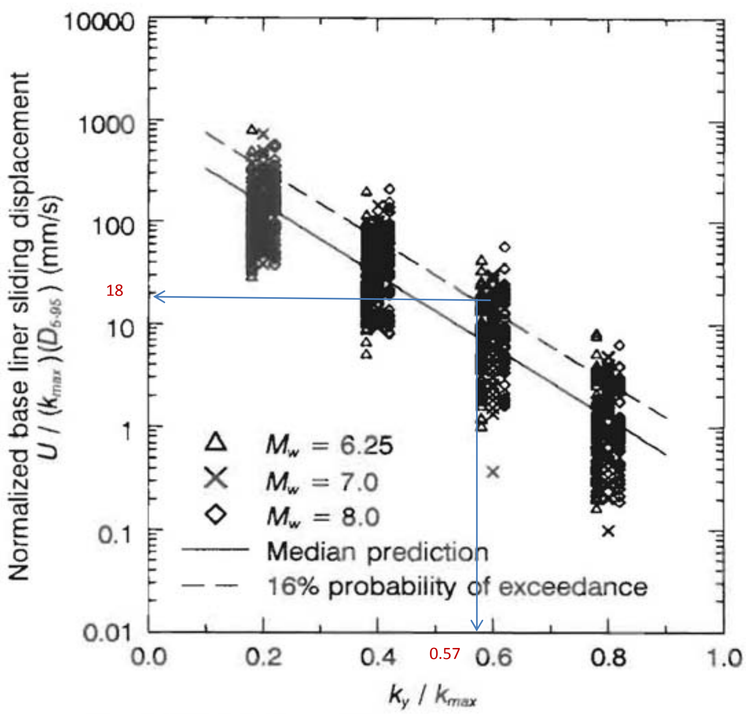


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, U / {(k_{max})($D_{5\text{-}95}$)}

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At k_y / k_{max} = 0.57 (from Step 6)

U / {(k_{max})($D_{5\text{-}95}$)} = **18** mm/s (use upper bound line)

k_{max} = 0.26 (from Step 5)

$D_{5\text{-}95}$ = 12 s (from Step 1)

Seismic slope permanent displacement, U = **56.9** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the base of REA/LF1 area is estimated to be equal to **56.9 mm, or less than 2.2 inches.**

ATTACHMENT B-2

SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS

AT SECTION 206

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/21/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **circular failure surface in waste mass** to the final sideslope at selected sideslope section, Section 206.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 206 in LF1 area, the max. waste height from the circular failure surface to the final sideslope of the landfill is 25 feet and was used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.29 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\ (EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

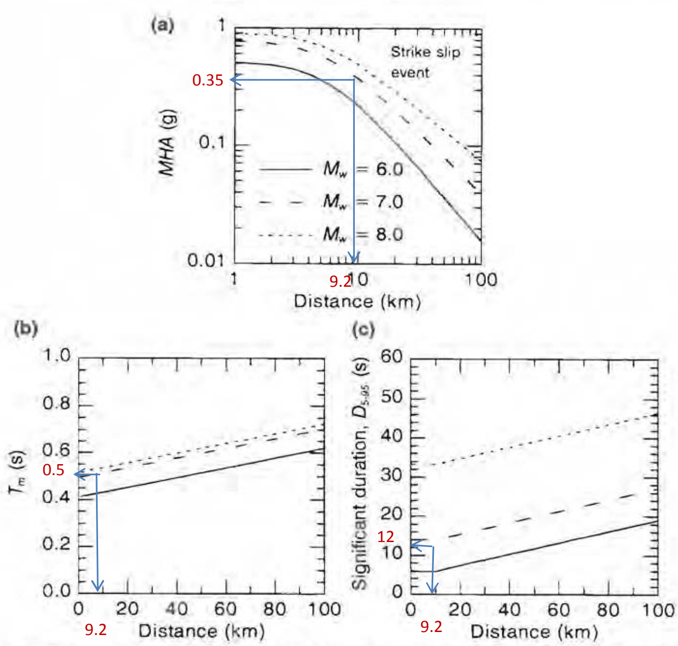


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, *MHA* for strike-slip faults (for reverse faults, use $1.3 \times MHA$ for $M_w \geq 6.4$ and $1.64 \times MHA$ for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock}:

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\ (EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **35** ft. = 11 m (use average value)

From Figure 3, V_s = **200** m/s (use average profile line)

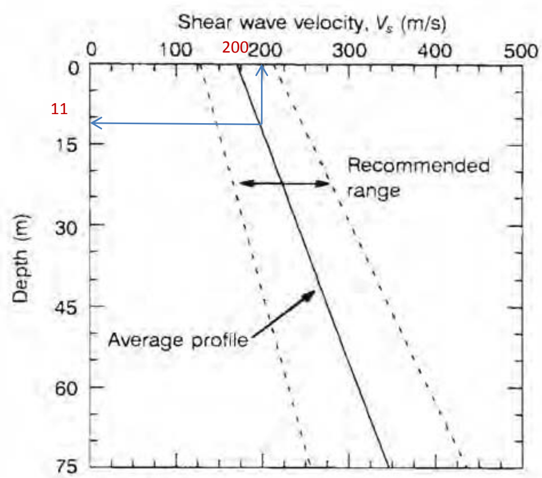


Figure 3. Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\ (waste)} = 4H/V_s$ = 0.21 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\ (Waste)} / T_{m\ (EQ)}$:

$T_{s\ (waste)} / T_{m\ (EQ)}$ = 0.43

5. To estimate the maximum horizontal equivalent acceleration for base sliding

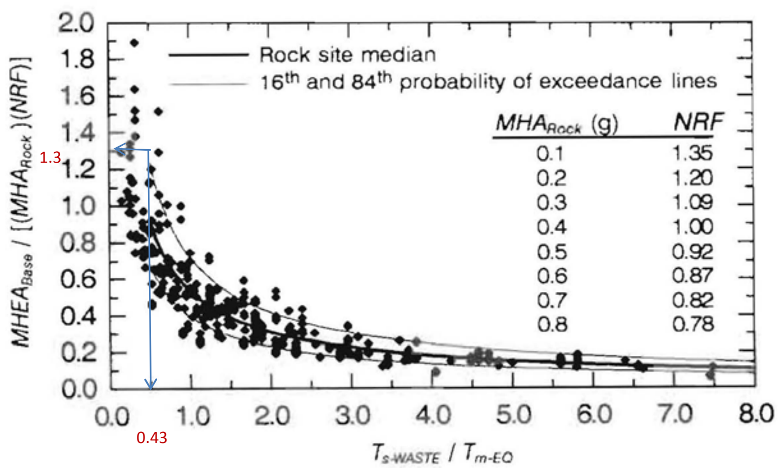


Figure 6. Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.30	**1.09**
0.35	1.05
0.40	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\ (waste)} / T_{m\ (EQ)}$ = 0.43

$MHEA_{base} / \{(MHA_{rock})(NRF)\}$ = **1.30** (use upper bound line)

$MHEA_{base}$ = 0.48 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.29**

$k_{max} = MHEA_{base}/g$ = **0.48** (from Step 5)

k_y / k_{max} = **0.61**

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

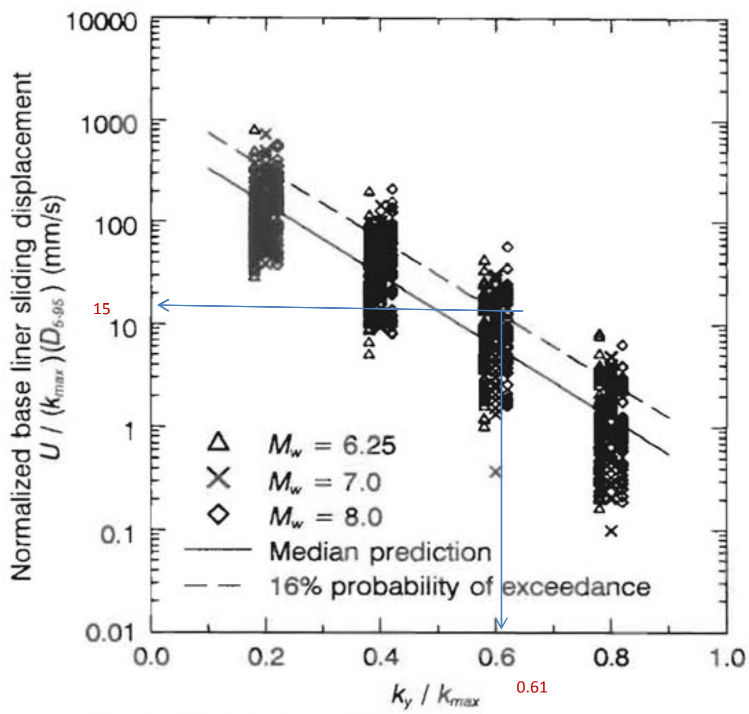


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, $U / \{(k_{max})(D_{5\text{-}95})\}$

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At k_y / k_{max} = 0.61 (from Step 6)

$U / \{(k_{max})(D_{5\text{-}95})\}$ = **15.0** mm/s (use upper bound line)

k_{max} = 0.48 (from Step 5)

$D_{5\text{-}95}$ = 12 s (from Step 1)

Seismic slope permanent displacement, U = **85.6** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the circular failure surface in LF1 area is estimated to be equal to **85.6 mm, or less than 3.4 inches.**

ATTACHMENT B-2
SEISMIC SLOPE PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 207

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/10/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AAM	Date: 2/10/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from the **block-type failure surface at base liner** to the final sideslope at selected sideslope section, Section 207.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 207 in LF2 canyon area, the waste height from the base to the final sideslope of the landfill ranges from 44 to 127 feet. The average value of 86 feet is to be used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.18 is obtained from the pseudo-static slope stability analysis as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\,(EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

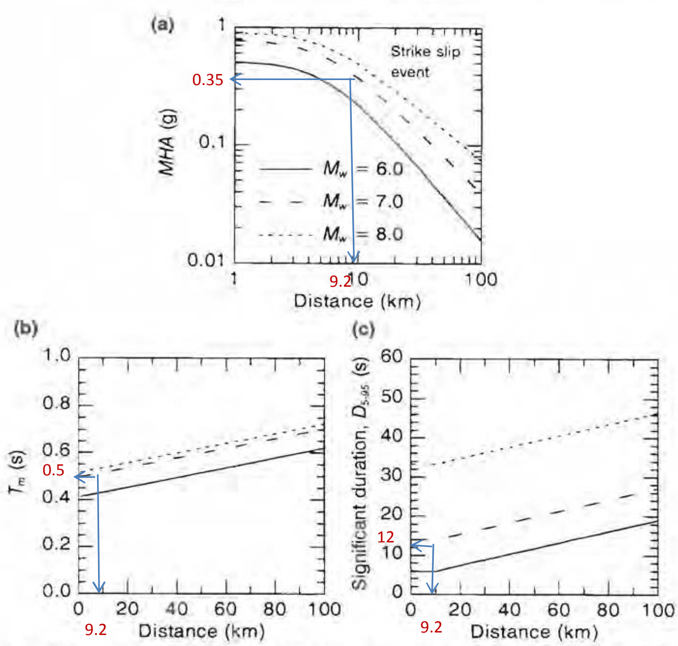


Figure 2. Simplified characterization of earthquake rock motions: (a) intensity, MHA for strike-slip faults (for reverse faults, use $1.3 \times MHA$ for $M_w \geq 6.4$ and $1.64 \times MHA$ for $M_w = 6.0$, with linear interpolation for $6.0 < M_w < 6.4$) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).

Maximum Horizontal Acceleration, MHA_{rock}:

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\ (EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **86** ft. = 26 m (use average value)

From Figure 3, V_s = **226** m/s (use average profile line)

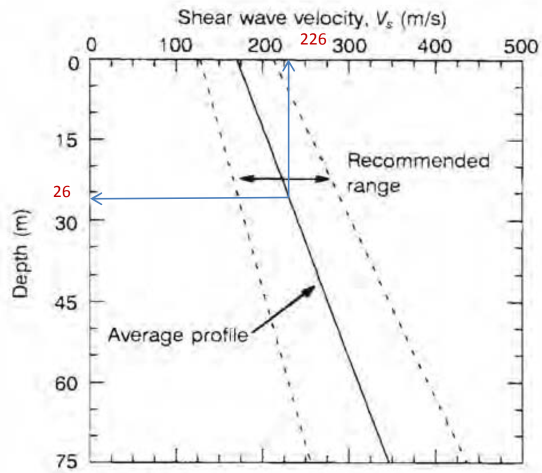


Figure 3. Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\ (waste)} = 4H/V_s$ = 0.46 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\ (Waste)} / T_{m\ (EQ)}$:

$T_{s\ (waste)} / T_{m\ (EQ)}$ = 0.93

5. To estimate the maximum horizontal equivalent acceleration for base sliding

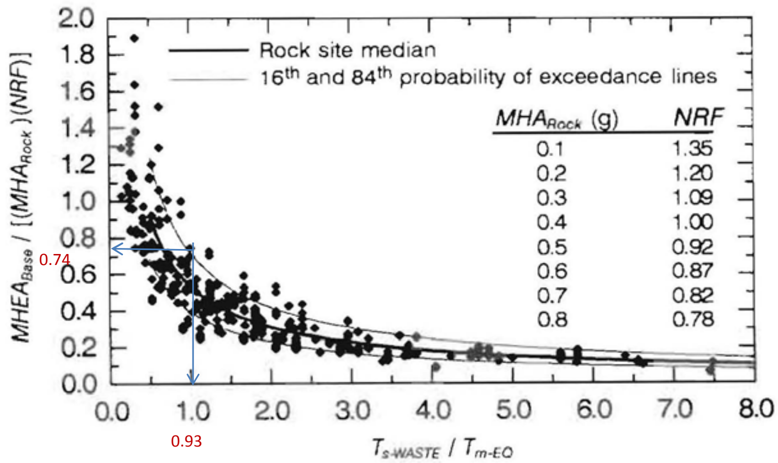


Figure 6. Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.30	**1.09**
0.35	1.05
0.40	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for base sliding, $MHEA_{base}$:

From Figure 6 and at $T_{s\,(waste)}$ / $T_{m\,(EQ)}$ = 0.93

$MHEA_{base}$ / {(MHA_{rock})(NRF)} = **0.74** (use upper bound line)

$MHEA_{base}$ = 0.27 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.18**

k_{max} = $MHEA_{base}$/g = 0.27 **(from Step 5)**

k_y / k_{max} = 0.67

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

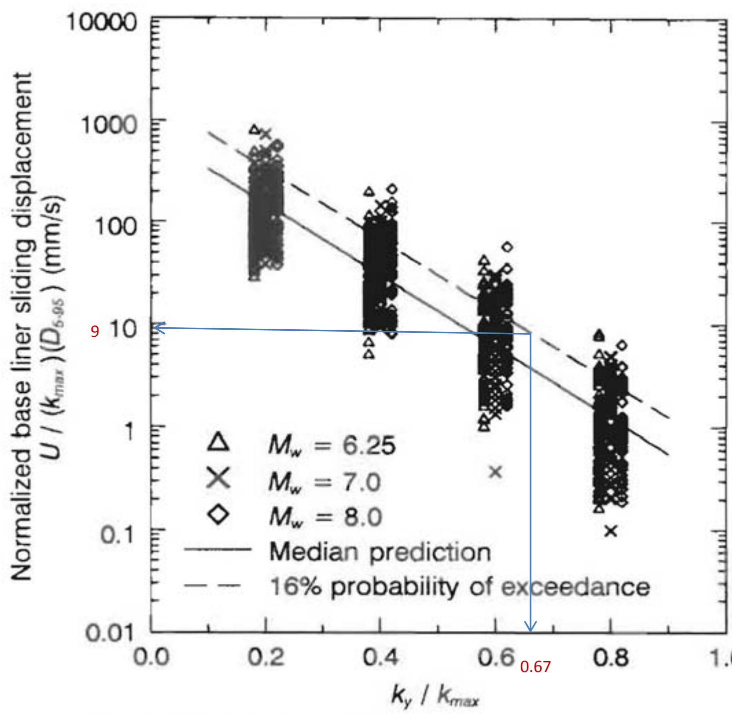


Figure 11. Normalized base liner sliding displacements (from Bray and Rathje 1998).

Normalized base liner sliding displacement, U / {(k_{max})($D_{5\text{-}95}$)}

From Figure 11 and extrapolating the median line to calculated k_y/k_{max} value,

At k_y / k_{max} = 0.67 (from Step 6)

U / {(k_{max})($D_{5\text{-}95}$)} = **9** mm/s (use median line)

k_{max} = 0.27 (from Step 5)

$D_{5\text{-}95}$ = 12 s (from Step 1)

Seismic slope permanent displacement, U = **29.2** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic slope permanent displacement at the base of LF2 Canyon area is estimated to be equal to **29.2 mm, or less than 1.2 inches.**

ATTACHMENT C

FINAL COVER (VENEER) SLOPE STABILITY

Using Design Slope Length

(50’ Vertical Height Between Benches)

ATTACHMENT C-1

FINAL COVER SLOPE STABILITY

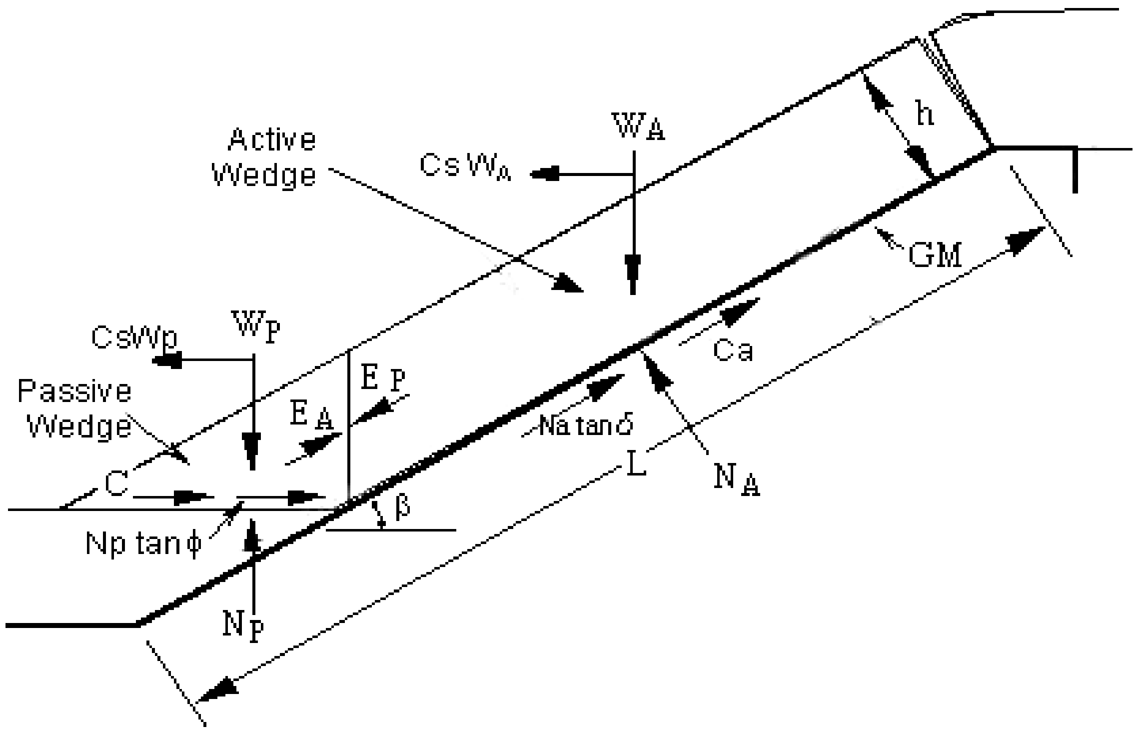
USING KOERNER & SOONG'S EQUATIONS

COVER STABILITY CALCULATION (STATIC)

Project: Sonoma County Central Disposal Site Final Cover
Location: Sonoma County, CA
Prepared by: SCS ENGINEERS
Date: February 1, 2011

Calc'd by:	HJL	Date:	2/9/2011
Chk'd by:	JJM/AM	Date:	2/10/2011

Consideration: To determine the factor of safety (FS) under static condition using analysis as described by Koerner and Soong (1998) referenced below.



Ref.: R.M. Koerner, and T-Y.Soong, 1998. "Analysis and Design of Veneer Cover Soils". Proceeding of 6th International Conference on Geosynthetics, Vol. 1, pp. 1-23, Atlanta, Georgia, USA.

Parameters:

L	=	length of slope meausured along the geomembrane
β	=	soil slope angle beneath the geomembrane
FS	=	factor of safety against instability
W_A	=	total weight of the active wedge
W_P	=	total weight of the passive wedge
N_A	=	effective force normal to the failure plane of the active wedge
h	=	thickness of the cover soil
γ	=	unit weight of the cover soil
φ	=	cover soil friction angle
δ	=	interface friction angle between cover soil and geomembrane
C_a	=	adhesive force between cover soil of the active wedge and the geomembrane
c_a	=	adhesion between cover soil of the active wedge and the geomembrane
C	=	cohesive force along the failure plane of the passive wedge
c	=	cohesion of the cover soil

COVER STABILITY CALCULATION (STATIC)

Calculate Factor of Safety (FS):

$$FS = \frac{-b + (b^2 - 4ac)^{1/2}}{2a}$$, where

$$a = (C_S W_A + N_A \sin\beta)(\cos\beta) + C_S W_P(\cos\beta)$$

$$b = -[(C_S W_A + N_A \sin\beta)\sin\beta(\tan\phi) + (N_A \tan\delta + C_a)(\cos^2\beta) + (C + W_P \tan\phi)\cos\beta]$$

$$c = (N_A \tan\delta + C_a)\cos\beta\sin\beta\tan\phi$$, where

$$W_A = \gamma h^2 [(L/h) - (1/\sin\beta) - (\tan\beta/2)]$$

$$N_A = W_A(\cos\beta)$$

$$W_P = \gamma h^2 / \sin 2\beta$$

$$C_a = c_a(L-(h/\sin\beta))$$

$$C = (ch)/(\sin\beta)$$

γ =	18.85	kN/m^3			
h =	457.20	mm	=	0.46	m
L =	48.20	m			
β =	18.40	°	=	0.32	rad
C_s =	0.00	g			
ϕ =	28.00	°	=	0.49	rad
δ =	19.80	°	=	0.35	rad
c =	0.00	kN/m^2			
c_a =	1.48	kN/m^2			

W_A =	402.26	kN
N_A =	381.69	kN
W_P =	6.58	kN
C_a =	69.19	kN
C =	0.00	kN
a =	114.32	
b =	-209.56	
c =	32.90	
FS =	**1.66**	

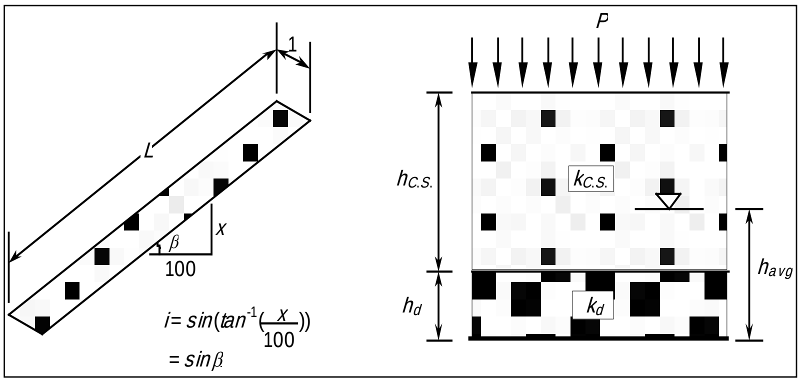
Summary:

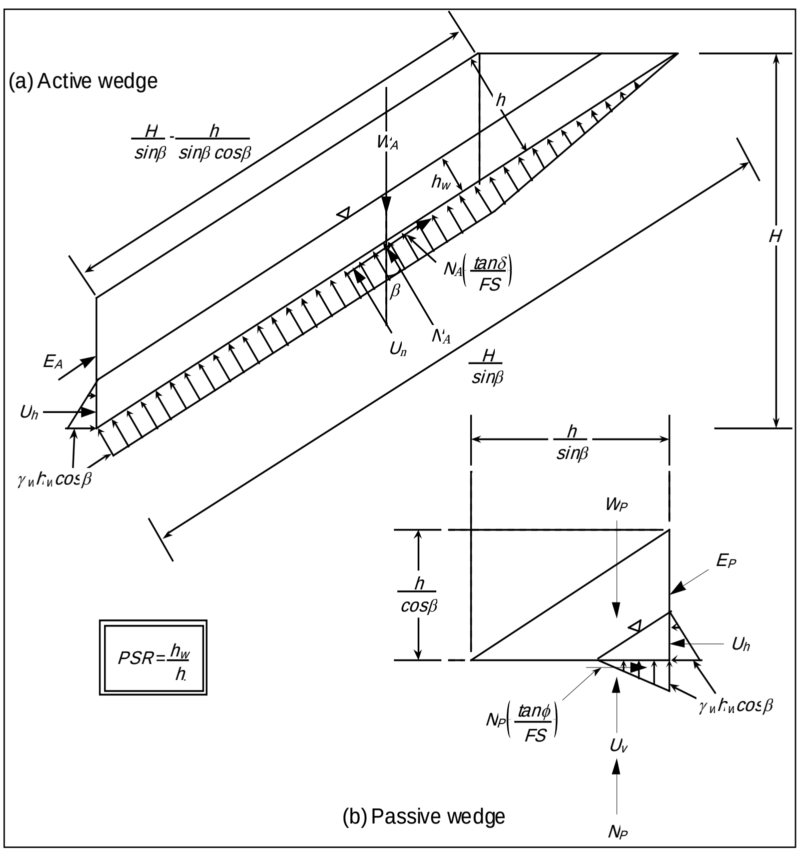
At the minimum interface friction angle of 19.8 degrees and 31 psf adhesion for all soil-geosynthetic and geosynthetic-geosynthetic interfaces and under static condition and no seepage force applied, the factor of safety is calculated as 1.66, indicating the final cover system is stable under the slope conditions analysis (slope length between benches = 150' horiz.; adhesion = tested residual value of 31 psf).

COVER STABILITY (STATIC) CALCULATION WITH SEEPAGE FORCES

Project: Sonoma County Central Disposal Site Final Cover Calc'd by: HJL Date: 2/9/2011
Location: Sonoma County, CA Chk'd by: JJM/AM Date: 2/10/2011
Prepared by: SCS ENGINEERS
Date: February 1, 2011

Consideration: To evaluate the stability of the cover system with seepage forces applied using the method described by Koerner and Soong (1998) referenced below.





Ref.: R.M. Koerner, and T-Y.Soong, 1998. "Analysis and Design of Veneer Cover Soils". Proceeding of 6th International Conference on Geosynthetics, Vol. 1, pp. 1-23, Atlanta, Georgia, USA.

COVER STABILITY (STATIC) CALCULATION WITH SEEPAGE FORCES

Parameters:

DLC	=	drainage layer capacity
$FLUX_{allow}$	=	allowable flow rate of the drainage layer per unit width of slope
k_d	=	permeability of drainage soil or geosynthetic
h_d	=	thickness of the drainage soil or geosynthetic
i	=	sin β = slope gradient
$FLUX_{req'd}$	=	actual flow rate per unit width of slope
PERC	=	the rate of percolation
P	=	probable maximum (hourly) precipitation (24-hr 100-year storm event)
RC	=	runoff coefficient
L	=	length of drainage slope
k_{cs}	=	permeability of cover soil
β	=	slope angle
w	=	1.0 m = unit width of drainage slope
PSR	=	parallel submergence ratio
h_{avg}	=	average head buildup above the geomembrane
h_{cs}	=	thickness of cover soil
FS	=	factor of safety against instability
W_A	=	total weight of the active wedge
W_P	=	total weight of the passive wedge
U_h	=	resultant of the pore pressures acting on the interwedge surfaces
U_n	=	resultant of the pore pressures acting perpendicular to the slope
U_v	=	resultant of the vertical pore pressures acting on the passive wedge
N_A	=	effective force normal to the failure plane of the active wedge
h	=	thickness of the cover soil
H	=	vertical height of the slope measured from the toe
h_w	=	(PSR)(h) = height of the free water surface measured from the geomembrane
γ_{dry}	=	dry unit weight of the cover soil
$\gamma_{sat'd}$	=	saturated unit weight of the cover soil
γ_w	=	unit weight of water
ϕ	=	cover soil friction angle
δ	=	interface friction angle between cover soil and geomembrane

COVER STABILITY (STATIC) CALCULATION WITH SEEPAGE FORCES

Calculate Drainage Layer Capacity (DLC):

$PERC = P(1-RC)$, for $P(1-RC) \leq k_{cs}$
$PERC = k_{cs}$, for $P(1-RC) > k_{cs}$

k_{CS} =	5.50E-05	cm/s	=	1.98E+00	mm/hr
P =	7.36	mm/hr			
RC =	0.40				

P(1-RC) = 4.42 mm/hr

PERC = 1.98 mm/hr

$$FLUX_{req'd} = \frac{PERC}{1000} \times L(\cos\beta) \times w$$

L =	48.20	m			
β =	18.40	°	=	0.32	rad

$L(\cos\beta)$ = 45.74 m

$FLUX_{req'd}$ = 0.091 m^3/hr

$$FLUX_{allow} = k_d \times i \times h_d$$

k_d =	3.00E+00	cm/s	=	3.00E-02	m/s
h_d =	6.35	mm	=	0.01	m
i =	0.32				

$FLUX_{allow}$ = 0.22 m^3/hr

$$DLC = \frac{FLUX_{allow}}{FLUX_{req'd}}$$

DLC = 2.39

Notes:
1) If only one soil layer above geomembrane, treat it as a drainage layer.
2) DLC needs to be greater than one to avoid saturation of the drainage layer.

COVER STABILITY (STATIC) CALCULATION WITH SEEPAGE FORCES

Calculate Parallel Submergence Ratio (PSR):

$$h_{avg} = \frac{FLUX_{req'd}/3600}{k_d \times i}, \text{ for DLC} \geq 1.0$$

$$h_{avg} = \frac{[FLUX_{req'd}/(3600 \times i)] - [h_d \times (k_d - k_{cs})]}{k_{cs}}, \text{ for DLC} < 1.0$$

h_{avg} for DLC $\geq$ 1.0 = 0.00 m
h_{avg} for DLC < 1.0 = -201.46 m

h_{avg} = 0.00 m

$$PSR = \frac{h_{avg}}{h_{cs} + h_d}$$
if PSR $\geq$ 1, set PSR = 1

h_{CS} = 457.20 mm = 0.46 m

PSR = 0.01

PSR = 0.01

Calculate Factor of Safety (FS):

$$W_A = \frac{\gamma_{dry}(h - h_w)[2H\cos\beta - (h + h_w)] + \gamma_{sat'd}(h_w)(2H\cos\beta - h_w)}{\sin 2\beta}$$

γ_{dry} = 18.06 kN/m^3
$\gamma_{sat'd}$ = 19.63 kN/m^3

$h = h_d + h_{cs}$ = 463.55 mm = 0.46 m
h_w = 2.66 mm = 0.00 m
$H = L \times \sin\beta$ = 15.21 m

W_A = 397.24 kN

$$U_h = \frac{\gamma_w (h_w)^2}{2}$$

γ_w = 9.81 kN/m^3

U_h = 0.00 kN

$$U_n = \frac{\gamma_w(h_w)(\cos\beta)(2H\cos\beta - h_w)}{\sin 2\beta}$$

U_n = 1.19 kN

COVER STABILITY (STATIC) CALCULATION WITH SEEPAGE FORCES

$N_A = W_A(\cos\beta) + U_h(\sin\beta) - U_n$

$N_A =$ 375.74 kN

$W_P = \dfrac{\gamma_{dry}(h^2 - h_w^2) + \gamma_{sat'd}(h_w)^2}{\sin 2\beta}$

$W_P =$ 6.48 kN

$U_V = U_h(\cot\beta)$

$U_V =$ 0.00 kN

$FS = \dfrac{-b + (b^2 - 4ac)^{1/2}}{2a}$

$a = W_A(\sin\beta)(\cos\beta) - U_h(\cos^2\beta) + U_h$

a = 118.98

$b = -W_A(\sin^2\beta)(\tan\phi) + U_h(\sin\beta)(\cos\beta)(\tan\phi) - N_A(\cos\beta)(\tan\delta) - (W_P - U_V)(\tan\phi)$

$\phi =$ 28.00 ° = 0.49 rad
$\delta =$ 19.80 ° = 0.35 rad

b = -152.85

$c = N_A(\sin\beta)(\tan\delta)(\tan\phi)$

c = 22.70

FS = 1.11

Summary:

DLC	2.39
PSR	0.01
FS	1.11

At the critical interface friction angle of 19.8 degrees for all the critical geosynthetic-geosynthetic interfaces, the static factor of safety under seepage forces is calculated as 1.11, indicating that there is adequate shear strength available to prevent the cover system from sliding. Therefore the cover system is stable under the static slope conditions analyzed (max. slope length at 158', or 48.2m between benches).

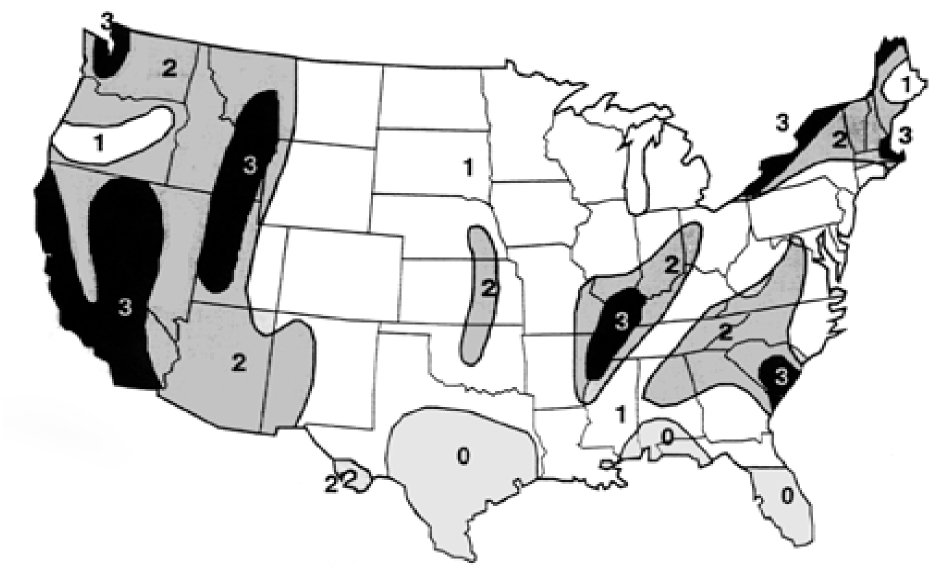
The resulting drainage layer capacity (DLC) of greater than 1.0, indicating the saturation of the cover soil above the liner would not occur. Therefore the anticipated flow capacity within the drainage layer (3cm/sec and 0.25-inch thick geocomposite) with 158-foot between benches is sufficient to handle a 100-year 24-hour storm event (6.95 inches).

COVER STABILITY CALCULATION (SEISMIC)

Project: Sonoma County Central Disposal Site Final Cover Calc'd by: HJL Date: 2/9/2011
Location: Sonoma County, CA Chk'd by: JJM/AM Date: 2/10/2011
Prepared by: SCS ENGINEERS
Date: February 1, 2011

Consideration: To determine the yield acceleration (k_y) equal to a factor of safety (FS) of 1.0 for a geosynthetic lines slope using a pseudo-static analysis as described by Koerner and Soong (1998) referenced below.

Seismic Coefficient: Subtitle "D" of the U.S. EPA regulations requires a seismic analysis if the site has experienced a 0.1g horizontal acceleration, or more, in the past 250 years. The map below shows the seismic coefficients for various zones in the USA.



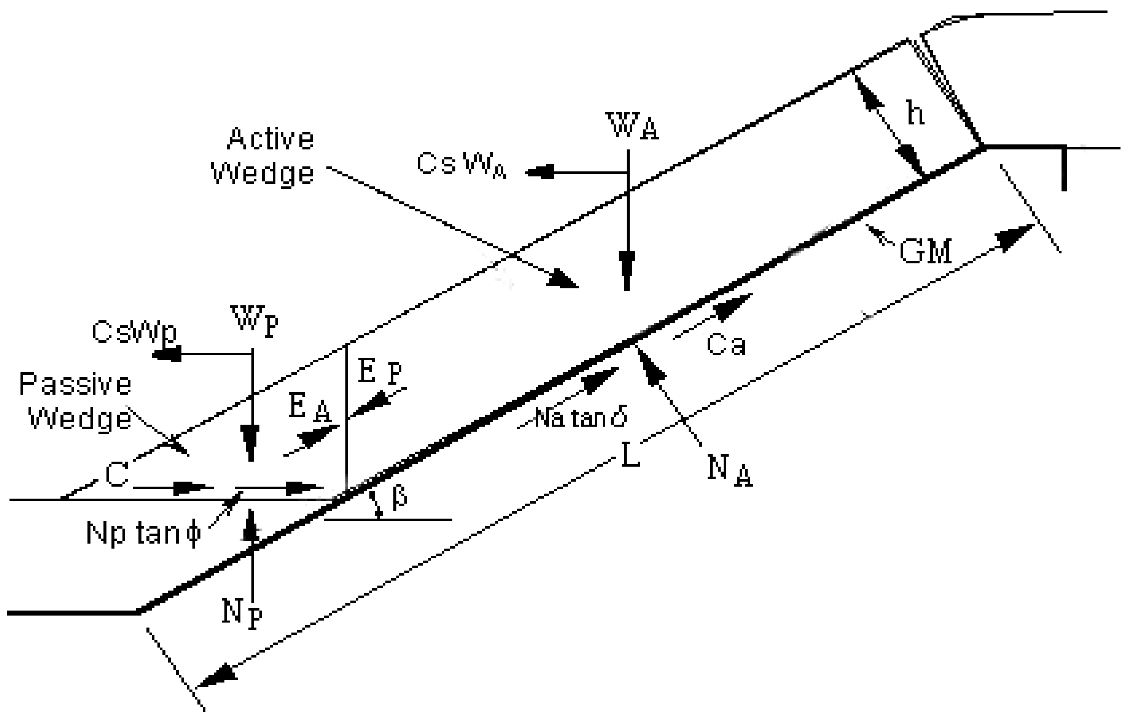
Legend:

Zone 0: No damage
Zone 1: Minor damage; corresponds to intensities V and VI on the modified Mercalli intensity scale
Zone 2: Moderage damage; corresponds to intensity VII on the modified Mercalli intensity scale
Zone 3: Major damage; corresponds to intensity VIII or higher on the modified Mercalli intensity scale

Seismic coefficients corresponding to each zone:

Zone	Remark	Modified Mercalli Scale	Average Seismic Coefficient (C_s)
0	No damage	-	0
1	Minor damage	V and VI	0.03 to 0.07
2	Moderate damage	VII	0.13
3	Major damage	VIII or higher	0.27

COVER STABILITY CALCULATION (SEISMIC)



Ref.: R.M. Koerner, and T-Y.Soong, 1998. "Analysis and Design of Veneer Cover Soils". Proceeding of 6th International Conference on Geosynthetics, Vol. 1, pp. 1-23, Atlanta, Georgia, USA.

Parameters:

L	=	length of slope meausured along the geomembrane
β	=	soil slope angle beneath the geomembrane
FS	=	factor of safety against instability
W_A	=	total weight of the active wedge
W_P	=	total weight of the passive wedge
N_A	=	effective force normal to the failure plane of the active wedge
h	=	thickness of the cover soil
γ	=	unit weight of the cover soil
ϕ	=	cover soil friction angle
δ	=	interface friction angle between cover soil and geomembrane
C_a	=	adhesive force between cover soil of the active wedge and the geomembrane
c_a	=	adhesion between cover soil of the active wedge and the geomembrane
C	=	cohesive force along the failure plane of the passive wedge
c	=	cohesion of the cover soil

COVER STABILITY CALCULATION (SEISMIC)

Calculate Factor of Safety (FS):

$$FS = \frac{-b + (b^2 - 4ac)^{1/2}}{2a}$$, where

$$a = (C_S W_A + N_A \sin\beta)(\cos\beta) + C_S W_P(\cos\beta)$$

$$b = -[(C_S W_A + N_A \sin\beta)\sin\beta(\tan\phi) + (N_A \tan\delta + C_a)(\cos^2\beta) + (C + W_P \tan\phi)\cos\beta]$$

$$c = (N_A \tan\delta + C_a)\cos\beta\sin\beta\tan\phi$$, where

$$W_A = \gamma h^2 [(L/h) - (1/\sin\beta) - (\tan\beta/2)]$$

$$N_A = W_A(\cos\beta)$$

$$W_P = \gamma h^2 / \sin 2\beta$$

$$C_a = c_a(L-(h/\sin\beta))$$

$$C = (ch)/(\sin\beta)$$

γ =	18.85	kN/m^3			
h =	457.20	mm	=	0.46	m
L =	48.20	m			
β =	18.40	°	=	0.32	rad
C_s =	0.115	g			
ϕ =	28.00	°	=	0.49	rad
δ =	19.80	°	=	0.35	rad
c =	0.00	kN/m^2			
c_a =	0.74	kN/m^2			

W_A =	402.26	kN
N_A =	381.69	kN
W_P =	6.58	kN
C_a =	34.60	kN
C =	0.00	kN
a =	158.93	
b =	-186.18	
c =	27.39	
FS =	**1.00**	

Summary:

At the interface friction angle of 19.8 degrees and 15.5 psf adhesion for the critical geosynthetic-geosynthetic interfaces and at a factor of safety of 1.0, the calculated k_y is equal to 0.115g, indicating that the cover system is stable under the slope conditions analyzed (longest slope length = 150' horiz. between benches). Only half of the tested adhesion value (residual) was used in the analysis. The tested value of 19.8 degrees interface friction angle is the same for both peak and residual shear strength value.

ATTACHMENT C-2

FINAL COVER PERMANENT DISPLACEMENT ANALYSIS

USING BRAY'S METHOD

FINAL COVER SEISMIC PERMANENT DISPLACEMENT ANALYSIS
AT SECTION 203

Project:	**Sonoma County Central Disposal Site**	Calc'd by: HJL	Date: 2/19/2011
Location:	**Petaluma, Sonoma County, CA**	Chk'd by: JJM / AM	Date: 2/21/2011
Project No.:	**01210155.00 T1**		

Objective: To estimate the seismic final cover slope permanent displacement using methods described by Bray et al (1998) by using: (1) a yield acceleration coefficient (FS = 1) determined from the pseudo-static slope stability analysis; (2) a near-field earthquake event (with a known distance from the epicenter to the project site); and (3) an average waste height measured from **block-type failure surface at base liner** to the final sideslope at selected critical slope section, Section 203.

Reference:

1. "Simplified Seismic Design Procedure for Geosynthetic-Lined, Solid-Waste Landfills," by J.D. Bray, E.M. Rathje, A.J. Augello and S.M. Merry, 1998, Geosynthetics International, Vol. 5, Nos. 1-2.

2. "Final Closure and Postclosure Maintenance Plans, Central Disposal Site, Sonoma County, CA," by Geosyntec Consultants, July 29, 2008.

3. "80% Draft Design Report Rock Extraction Area Landfill, Central Disposal Site," Sonoma County, CA," by Geosyntec Consultants, October 14, 2004.

4.. "Technical Memorandum: Sonoma County Central Landfill Rock Extraction Area and Landfill 2 Seismic and Geologic Conditions," by Rick Mitchell/RMC Geoscience, dated January 21, 2011.

Given:

1. From Table 1 Mitchell (2011), the near-field earthquake resulting from a strike-slip fault (Healdsburg-Rodgers Creek) has a magnitude = 6.75 (on Richter Scale) and an epicenter of 9.2 km from the project site.

2. From Section 203 in LF2, the waste height from the base to the final sideslope of the landfill ranges from 88 to 162 feet. The average value of 125 feet is to be used in the analysis.

3. The yield acceleration coefficient (k_y) = 0.115 is obtained from the pseudo-static slope stability analysis using Koerner and Soong (1998) equations as presented in this report.

Calculation: **1. To estimate MHA_{rock}, $T_{m\ (EQ)}$, $D_{5\text{-}95}$ using Bray 1998 procedure, Figure 2**

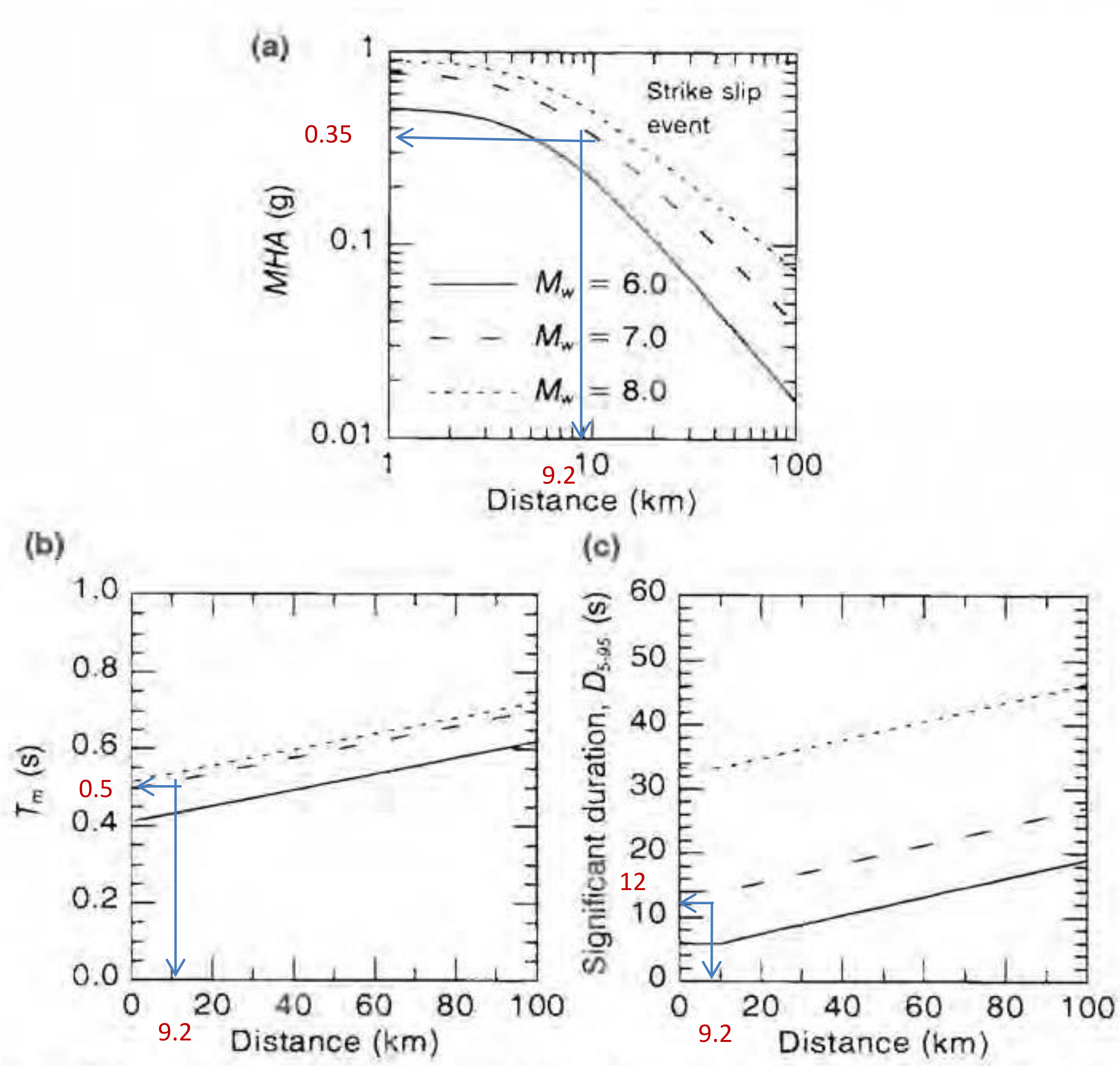


Figure 2. **Simplified characterization of earthquake rock motions: (a) intensity, *MHA* for strike-slip faults (for reverse faults, use 1.3 × *MHA* for M_w ≥ 6.4 and 1.64 × *MHA* for M_w = 6.0, with linear interpolation for 6.0 < M_w < 6.4) (Abrahamson and Silva 1997); (b) frequency content, T_m (Rathje et al. 1998); (c) duration, $D_{5\text{-}95}$ (Abrahamson and Silva 1996).**

Maximum Horizontal Acceleration, MHA_{rock} :

Earthquake magnitude (near-field) = **6.75** at a distance = **9.2** km

From Figure 2a, MHA_{rock} = **0.35** g, for Strike-slip fault

Mean Period, T_m and Significant Duration, $D_{5\text{-}95}$:

At a distance = 9.2 km,

From Figure 2b, $T_{m\ (EQ)}$ = **0.5** s

From Figure 2c, $D_{5\text{-}95}$ = **12** s

2. To estimate Average Waste Shear Wave Velocity, V_s, Figure 3

Average Waste Shear Wave Velocity, V_s:

At an average waste depth, H = **125** ft. = 38 m (use average value)

From Figure 3, V_s = **262** m/s (use average profile line)

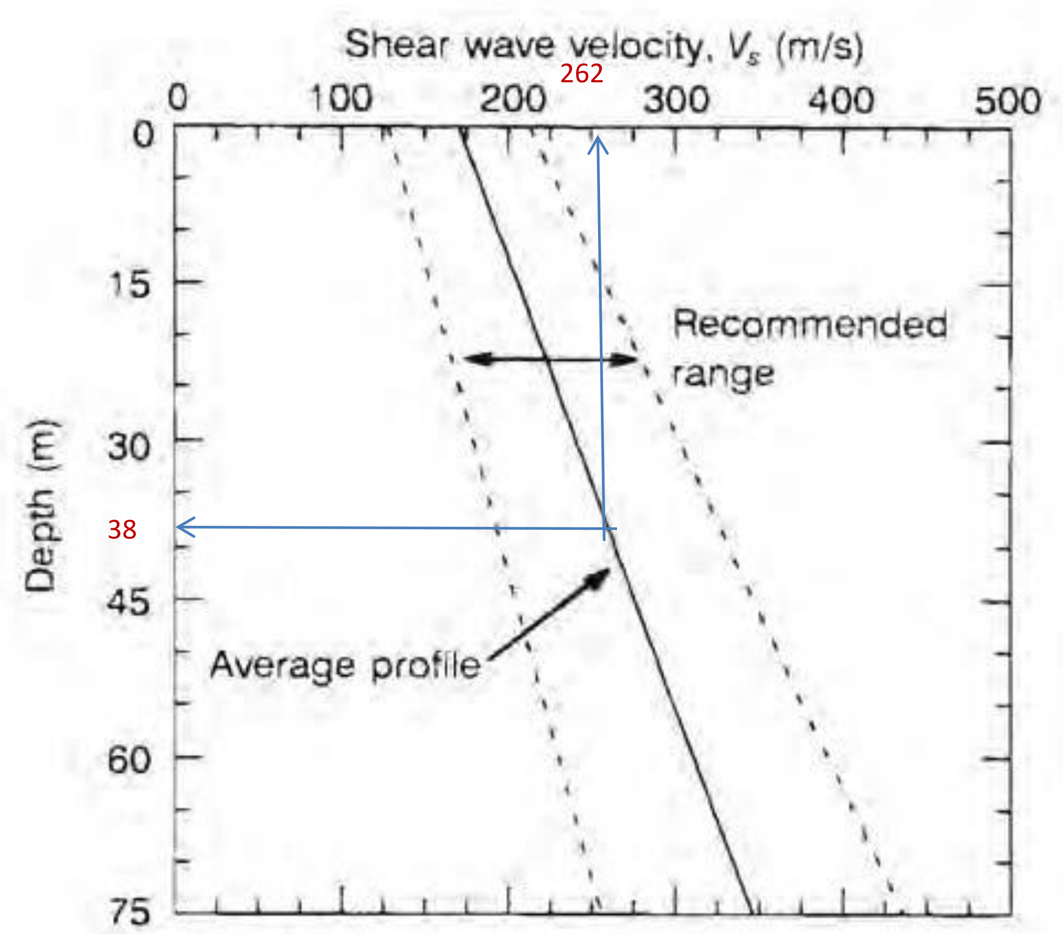


Figure 3. **Shear wave velocity profiles for municipal solid-waste (after Kavazanjian et al. 1996).**

3. To Calculate the initial fundamental Period, T_s:

Initial Fundamental Period, T_s:

$T_{s\ (waste)} = 4H/V_s$ = 0.58 s

4. To calculate the normalized fundamental period of waste fill, $T_{s\ (Waste)}$ / $T_{m\ (EQ)}$:

$T_{s\ (waste)} / T_{m\ (EQ)}$ = 1.16

5. To estimate the maximum horizontal equivalent acceleration for base sliding

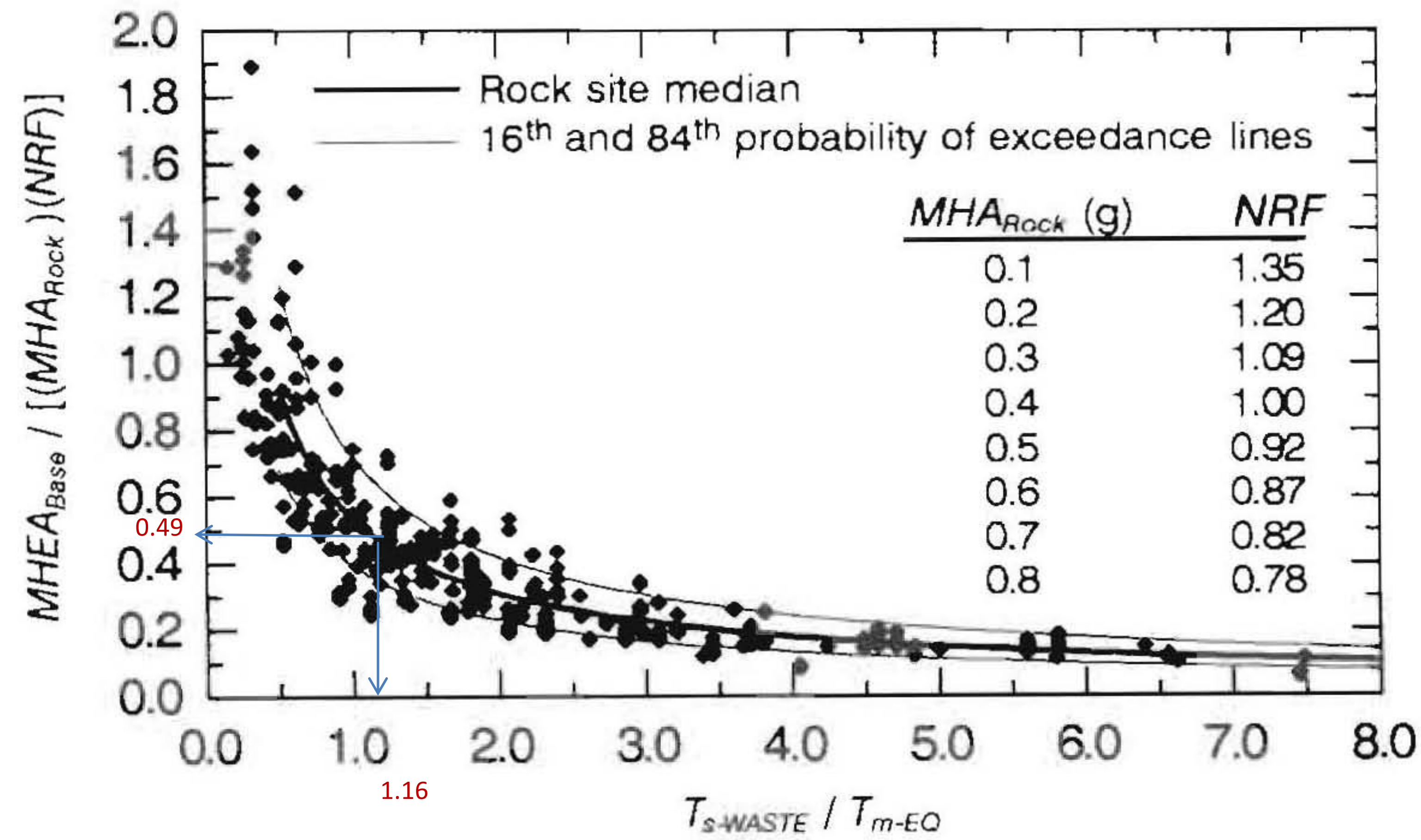


Figure 6. **Normalized maximum horizontal equivalent acceleration for base sliding versus normalized fundamental period of waste fill (adapted from Bray and Rathje 1998).**

Non-Linear Response Factor, NRF:

At MHA_{rock} = 0.35 g, (from Step 1)

From Figure 6, and interpolating

MHA_{rock} (g)	NRF
0.3	**1.09**
0.35	1.05
0.4	**1.00**

Calculated NRF = 1.05

Maximum Horizontal Equivalent Acceleration for cover liner sliding, $MHEA_{top}$:

From Figure 6 and at $T_{s\ (waste)}$ / $T_{m\ (EQ)}$ = 1.16

$MHEA_{base}$ / {(MHA_{rock})(NRF)} = **0.49** (use median line)

$MHEA_{base}$ = 0.18 g

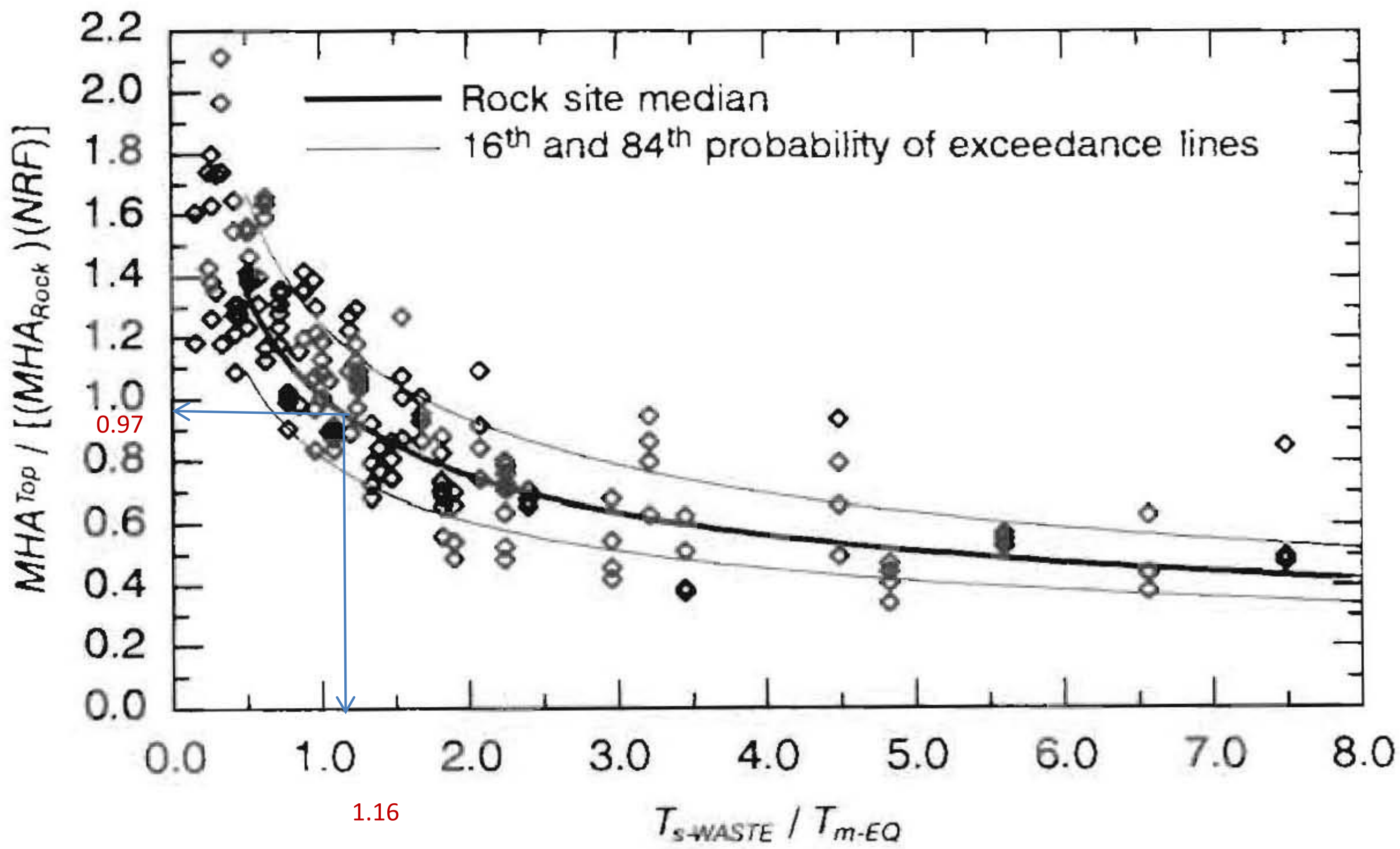


Figure 8. Normalized maximum horizontal acceleration at the top versus the normalized fundamental period of the waste fill (from Bray and Rathje 1998).

From Figure 8 and at $T_{s\,(waste)} / T_{m\,(EQ)}$ = 1.16

$MHEA_{top} / \{(MHA_{rock})(NRF)\}$ = **0.97** (use median line)

$MHEA_{top}$ = 0.35 g

6. To calculate the ratio of k_y over k_{max} (or MHEA/g)

From pseudo-static slope stability analysis, k_y = **0.115** (Using Koerner and Soong equations (1998))

$k_{max} = MHEA_{top}/g$ = 0.35 (from Step 5)

k_y / k_{max} = 0.32

7. To estimate seismic slope permanent displacement at base of landfill, U (mm)

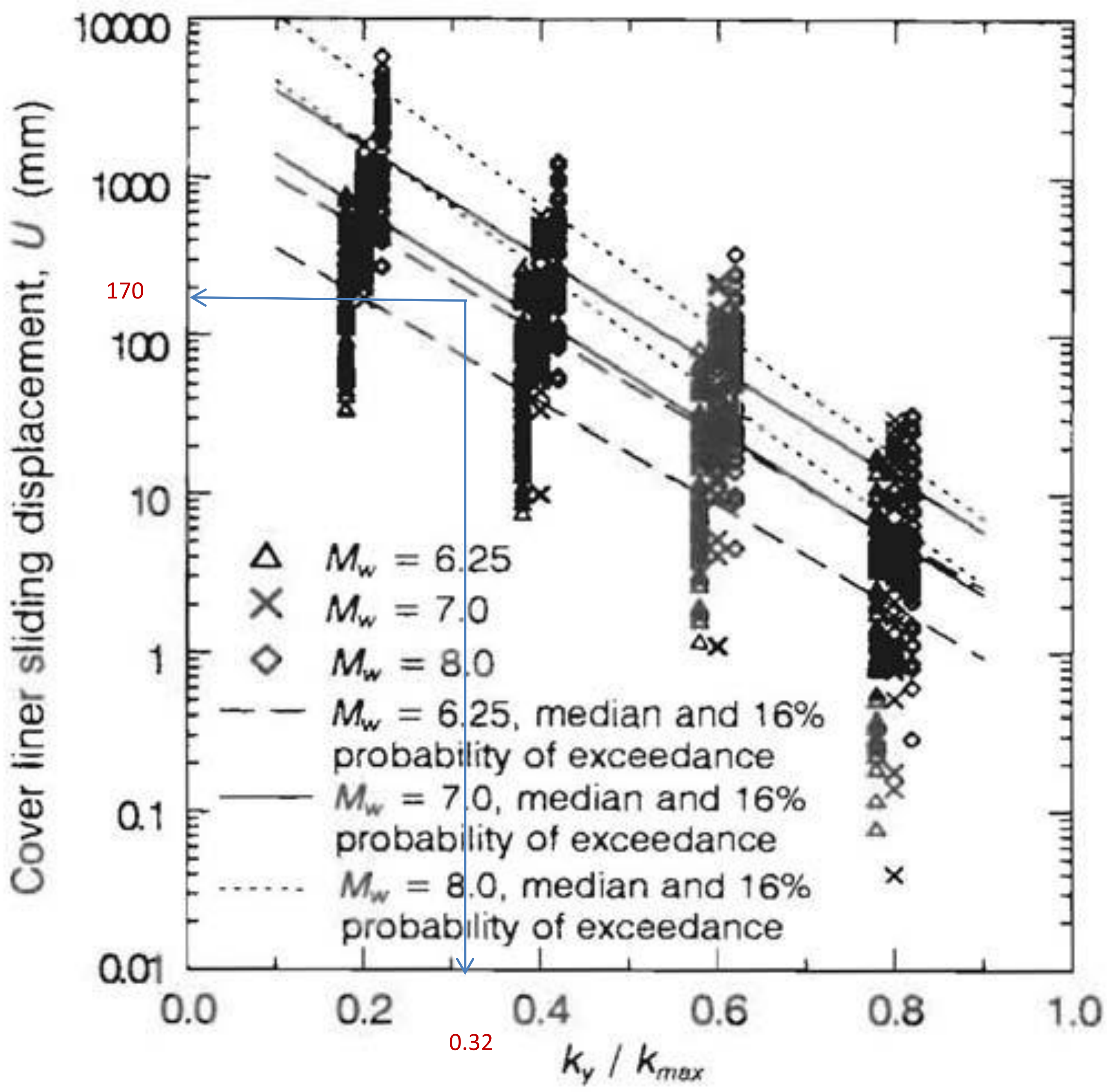


Figure 12. Cover liner sliding displacements.

Cover liner sliding displacement, U (mm) at M_w = 6.75

From Figure 12 and interpolating between 6.25 and 7.0 median lines to estimate U value,

At ky / kmax = 0.32 (from Step 6)

U = **170** mm (interpolated between median lines)

Seismic Cover Liner Sliding Displacement, U = **170** mm

Summary:

Using the Bray et al (1998) simplified seismic slope displacement procedure, the seismic cover liner sliding displacement at the top of the landfill at Section 203 is estimated to be equal to **170.0 mm, or less than 6.7 inches.**