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208 Southern States Rd | Mauk, GA 31058 Taylor County Landfill

March 23, 2017

Honorable Randall F. Nelson, Chairman
Taylor County Board of Commissioners
7 Ivy Street
Butler, Georgia 31006

Subject: **WI - Taylor County Landfill**
CCR Management Plan

Dear Commissioner Nelson:

The Rules of Georgia Department of Natural Resources, Environmental Protection Division for Solid Waste Management, 391-3-4-.07 (5) state in part that *"The owner or operator shall notify the local governing authorities of any city and county in which the landfill is located upon the submittal of the CCR Management Plan to EPD."*

The Taylor County Landfill is located within Taylor County, so in accordance with this requirement, we are providing notice that we have submitted a CCR Management Plan to EPD for their review and approval.

Sincerely,

Roy Walton
General Manager

Cc: Jeff Browne, P.E.

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208 Southern States Rd | Mauk, GA 31058 Taylor County Landfill

March 23, 2017

Honorable Walter Turner, Mayor
City of Reynolds
P.O. Box 386
Reynolds, Georgia 31076-0386

Subject: **WI - Taylor County Landfill**
CCR Management Plan

Dear Mayor Turner:

The Rules of Georgia Department of Natural Resources, Environmental Protection Division (EPD) for Solid Waste Management, 391-3-4-.07 (5) state in part that *"The owner or operator shall notify the local governing authorities of any city and county in which the landfill is located upon the submittal of the CCR Management Plan to EPD."* Furthermore, EPD has prepared a guidance document for CCR Management which states, *"The owner or operator shall notify the local governing authorities of the county,* ***and any city within the county****, in which the landfill is located upon initial submittal of a CCR Management Plan to EPD."*

The Taylor County Landfill is located within Taylor County, and the City of Reynolds is also in Taylor County, so in accordance with this requirement, we are providing notice that we have submitted a CCR Management Plan to EPD for their review and approval.

Sincerely,

Roy Walton
General Manager

Cc: Jeff Browne, P.E.

WASTE INDUSTRIES www.wasteindustries.com
208 Southern States Rd | Mauk, GA 31058 Taylor County Landfill

March 23, 2017

Honorable William B. Whitley, Mayor
City of Butler
P.O. Box 476
Butler, Georgia 31006

Subject: **WI - Taylor County Landfill**
CCR Management Plan

Dear Mayor Whitley:

The Rules of Georgia Department of Natural Resources, Environmental Protection Division (EPD) for Solid Waste Management, 391-3-4-.07 (5) state in part that *"The owner or operator shall notify the local governing authorities of any city and county in which the landfill is located upon the submittal of the CCR Management Plan to EPD."* Furthermore, EPD has prepared a guidance document for CCR Management which states, *"The owner or operator shall notify the local governing authorities of the county, **and any city within the county**, in which the landfill is located upon initial submittal of a CCR Management Plan to EPD."*

The Taylor County Landfill is located within Taylor County, and the City of Butler is also in Taylor County, so in accordance with this requirement, we are providing notice that we have submitted a CCR Management Plan to EPD for their review and approval.

Sincerely,

Roy Walton
General Manager

Cc: Jeff Browne, P.E.

Report – Design Consistency

Waste Industries – Taylor County MSW Landfill
Mauk, Georgia

Prepared For:
WI Taylor County Disposal, LLC
Mauk, Georgia

S+G Project No. WITaylor 17-1

GEORGIA REGISTERED ★ No. PE030208 PROFESSIONAL ★ ENGINEER JOHN M. GARDNER

5/9/17

John M. Gardner, P.E.
Sr. Project Manager

May 9, 2017

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14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

Waste Industries Taylor County Landfill – MSW Cells 1 through 14 (Constructed Cell areas as of May 2017)

The following presents information required by the Georgia Department of Natural Resources, Environmental Protection Division (GA EPD)[1] in fulfillment of requirements established by the GA EPD for facilities that have received Coal Combustion Residuals (CCR). More specifically, the following addresses those requirements related to Design Consistency, Items 4a through 4e for existing MSW Cells 1 through 14 at the subject site.

4. Design Consistency

a) A demonstration that the design grades of the landfill are stable (i.e., for short operations and long-term static and seismic conditions).

This demonstration [that the design grades of the landfill are stable (i.e., for short operations and long-term static and seismic conditions)] addresses the currently constructed Cells 1 through 14 and is presented as a comparative analysis between the previous slope stability "input" design/analysis assumptions and those same parameters and assumptions for cells that have received CCR subsequent to the previous analyses. Prior to certification of any new disposal areas for Cells 15 through 25, an updated Report on Design Consistency, and an updated CCR Management Plan will be submitted to Georgia EPD for review and approval.

GA DNR issued the "original" Solid Waste Handling Permit (No. 133-003D(SL)) for the Taylor County Landfill site to Southern States Landfill, Inc. on February 10, 1989.

The first major redesign[2] of the originally permitted/designed Taylor County Landfill was performed by Hodges, Harbin, Newberry & Tribble, Inc., (HHNT), Macon Georgia. Regarding stability of the site's design grades, the application included a slope stability analysis (dated November 1995) in a letter report titled, "*Seismic and Slope Stability Analysis; Southern States Landfill; Taylor County, Georgia*. The report was prepared by Gregory N. Richardson, Ph.D., P.E. of G.N. Richardson & Associates, Inc. (GNRA).

The analysis performed at that time by GNRA (a copy is on file with Georgia EPD in the previously approved design documents supporting the D&O Plan submittals) consisted of 1.) evaluating the site's location relative to faults active in the past 11,000 years (Holocene Epoch); and 2.) analyzing the site for seismic conditions if it is within a seismic impact zone. The analysis findings were as follows:

1. The Taylor County site satisfies 40CFR Part 258; Section 258.13 in that it is not within 200 feet of an active fault; and,

[1] Document titled, "Guidance Document for Coal Combustion Residuals (CCR) Management Plans", dated December 22, 2016.
[2] GA EPD issued a Major Modification to Permit No. 133-003D(SL) on February 20, 2002, for a vertical expansion, to Allied Waste Industries, Inc. (dba Southern States Environmental Services). At that time, the facility consisted of 25 waste cells.

2. The Taylor County Landfill satisfies criteria in 40 CFR 258 with regard to liquefaction and seismic stability.

The current, approved Design & Operation (D&O) Plans[3] associated with the Waste Industries Taylor County Landfill Vertical Expansion No. 2 (formerly referred to as the Southern States Landfill) were prepared by HHNT. Regarding stability of the site's design grades, the application included Design Calculations (dated September 2003) and more specifically a report titled, "*Report of Geotechnical Analysis; Demonstration of Closure Cap and Base Liner Stability; Vertical Expansion of Existing MSW Landfill; Southern States Landfill – Allied Waste, Inc.; Taylor County, Georgia; BLE Project No. J99-1007-13*", dated September 5, 2000. The report was prepared by Gary L. Weekly, P.E. and Daniel B. Bunnell, P.E. of Bunnell-Lammons Engineering, Inc. (BLE).

The BLE report (a copy is on file with Georgia EPD in the previously approved design documents supporting the D&O Plan submittals) addressed a number of design components including the landfill cap, the landfill base liner, and the overall slope stability of the (then) proposed facility. Based on BLE's analysis as presented in the report, the following results were summarized:

	Minimum Factor of Safety
Cap Stability:	
• Static Infinite Slope (wet)	1.5
• Static Infinite Slope (dry)	2.0
• Cover Soil Interface	1.5
• Shear of Geocomposite	1.5
Base Liner Stability:	1.5
Slope Stability:	
Failure Through waste:	
• Static, Circular	2.3
• Static, Block	2.4
Failure Through Fill Embankment:	
• Static, Circular	2.0
• Static, Block	2.0
Side Slope Berm Stability:	
• Static, Block	1.5

BLE conclusions as reported at the time were as follows:

> *"The resulting factors of safety were computed to equal or exceed 1.5 for static loading conditions. The site is not in a seismic impact zone. The results of the specific analyses are summarized in the attached table [above] and specific analyses are also attached.*

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[3] D&O Plans - Revision dated January 2004 - approved by the State of Georgia, Environmental Protection Division, dated July 30, 2004. This major modification vertically increased the site's waste capacity (depth) by lowering the base liner grades within Cells 12 through 25.

In conclusion, the above analyses indicate that the landfill configuration will be stable and provide appropriate factors of safety."

Site Operation Sequence/Chronology

To address which areas of the currently constructed landfill have received CCR, a review of site operations was conducted. The Waste Industries Taylor County Landfill reportedly began receiving MSW waste in 1989 and currently has 14 cells constructed and operating, as follows:

Cell 1:	Opened in 1989
Cell 2:	Opened in 1989
Cell 3:	Opened in October 1992
Cell 4:	Opened in June 1994
Cell 8:	Opened in January 1996
Cell 9:	Opened in June 1996
Cell 5:	Opened in January 1997
Cell 7:	Opened in May 1998
Cell 6:	Opened in September 1999
Cell 10:	Opened in December 2003
Cell 11:	Opened in December 2003
Cell 12:	Opened in August 2004
Cell 13:	Opened in January 2007
Cell 14:	Opened in July 2014

In July 2003, GA EPD approved a Minor Permit Modification to allow waste solidification. Waste solidification is allowed inside the lined cell area in accordance with the D&O plans. This included solidification of CCR and related wastes. Solidification of the CCR consisted of mixing it with on-site leachate within the lined cell areas. The mixture was then subsequently placed as alternate daily cover or simply disposed within the lined areas of the site[4].

It is noted that portions of Cells 2, 3, 4, and 5 (covering about 18 acres) were capped in 2000. Similarly, portions of Cells 4, 5, 7, 8, and 9 (about 15 acres) were capped in 2005.

CCR Disposal

The landfill reportedly began accepting CCR in 2008 which at the time consisted of periodic receipt of "event" CCR waste streams whereby the CCR was not routinely received, but was received from time to time. From 2014 to late 2016, CCR was received on a more routine basis at a rate of approximately 25 percent of the site's tonnage during that period. The majority of the CCR received at the site during this

[4] It is noted that the CCR/leachate mixture exhibits a pozzolanic reaction that significantly increases the stiffness and overall "strength" of the mixture, although this "strengthening" has not been quantified.

period was sourced from Jacksonville Electric Authority (JEA)[5]. Most of the CCR material was used for solidification agent and used on interior slopes as alternate daily cover. Any CCR material disposed directly at the active working face was blended in with MSW waste during the day's regular disposal activities. Large, isolated "blocks" of CCR were not disposed during typical daily operations. The disposal practices were intended to not create layers of compacted coal ash.

Given the site's operating sequence summarized above, and considering that the site did not begin accepting CCR until 2008, several observations are made with respect to this demonstration:

1. In 2008, based on the reported total tons of waste disposed (through 8/1/13) and assuming about 500,000 CY of airspace consumption per year, the average waste thickness over the cells constructed at that time (Cells 1 through 13) was about 75 feet.

2. Based on the capping history of the site, there was no CCR placed in Cells 5 or 9 (they were entirely capped prior to 2008) and only the uppermost portions of Cells 2, 3, 4, 7, and 8 contain any CCR (again based on the chronology of the previous capping relative to the initial receipt of CCR).

3. When the site began receiving CCR in 2008, the most recently constructed cell (Cell 13) had already been in operation for about 1 year.

4. Between 2008 and about 2014, the CCR waste stream was negligible, totaling less than approximately 100,000 Tons (or cubic yards, CY assuming 1 in-place CY weighs about 1 ton). At the beginning of this period (2008), the site contained about 16.4 MCY of in-place, non-CCR MSW waste. Consequently, the CCR received within that time frame was less than 1% of the overall waste stream.

5. Over the 3-year period between 2014 and current (May, 2017), the facility received a total of about 453,000 tons. As of 1/1/17, the total site capacity consumed was approximately 20.57 MCY. The total volume of CCR received since 2008 is about 0.5 MCY, or about 2.4% of the total site volume.

6. CCR material disposed during this time was blended with non-CCR MSW waste at the working face, and not disposed in isolated blocks of CCR.

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[5] The ash from JEA contains both CCR from coal combustion and residuals from burning petroleum coke. The percentages used in the process by JEA may be less than that which classifies it as CCR. [per 40 CFR 257.50 (f)] However, for purposes of this design consistency analysis, it is treated as CCR.

Comparative Analysis – 2008 to Current (May 2017)

BLE's more recent analysis included a number of assumptions which are itemized below.

Waste Properties

Unit Weight:	75 PCF
Cohesion:	0 PSF
Angle of Internal Friction:	30 Degrees

GNRA's analysis assumed slightly different waste properties: Unit Weight of 65 PCF; Angle of Internal Friction of 20 Degrees and Cohesion of 200 PSF. From a stability (i.e. shear strength) standpoint, these properties are similar, although the BLE assumptions are slightly more conservative (given the length of the surface along which the critical failure planes were located in the GNRA analysis).

Assuming that CCR comprises only about 25% of a portion of the waste placed since 2014 and overall is less than 2.5% of the total in-place waste, these assumed values are, in our opinion, reasonable to represent the CCR-MSW mixture that exists within the currently-constructed cells.

Although the facility received MSW, CCR and CCR as solidification agent during the life of Cells 1 through 14, since the CCR waste or solidified CCR waste was blended with the MSW during disposal operations, the entire waste mass is relatively homogeneous. This blending and the fact that the CCR was not disposed in isolated blocks, the addition of CCR material since 2008 does not impact this homogeneity. The influence of the CCR on the previously assumed MSW waste properties is likely negligible.

Since the resultant, calculated Factor of Safety is the most sensitive to these waste properties, it is reasonable to conclude that the original conclusions, as stated above by GNRA and BLE would continue to apply to the cell areas previously constructed and currently being operated.

Analysis – Current (2017) to Final Grades

Due to the higher percentage of CCR waste proposed (i.e. a maximum of 33%), the stability of the landfill was re-evaluated. With respect to future landfill operations (i.e. starting in January 2017) in Cells 1 through 14, the total permitted capacity within these constructed cells is about 23.68 million cubic yards (MCY). As of January 2017, the remaining capacity of these cells (assuming they could be filled to final grades over the entire Cell 1 through 14 footprint) is about 3,115,000 CY. Under the proposed maximum CCR acceptance rate of 33% of the remaining capacity of these constructed cells (or about 1,040,000 CY), the total quantity of CCR disposed in these cells since CCR began being accepted at the site would comprise only about 6.7% of the total constructed capacity (1.59 MCY/23.68 MCY).

Again, most of the CCR material will be used for solidification agent and used on interior slopes as alternate daily cover. Any CCR material disposed directly at the active working face will be blended in with MSW waste during the day's regular disposal activities.

Since large isolated "blocks" of CCR will not be disposed during typical daily operations, CCR disposal will not restrict proper operations at the working face. The disposal practices are intended to not create layers of compacted coal ash, and therefore prevent the increased occurrence of leachate outbreaks due to reduced infiltration rates. In addition, since CCR or solidified CCR as ADC will be used on interior slopes, and leachate breakouts that do occur will be contained within the lined area.

For this analysis, the acceptable factors of safety for the landfill were assumed to be:

Table 1. Required Factors of Safety

Condition	Minimum Factor of Safety
Final Slope, Static Conditions	1.5
Final Slope, Seismic Loading	1.0
Interim Slope (Static)	1.3

Deep-seated failure surfaces were evaluated using the computer program **Slide** (v. 6.0), developed by Roc Science (Toronto, Ontario). Both block (translational along liner) and circular (rotational within waste mass) failure surfaces were analyzed. The factor of safety was determined using Spencer's Method, which satisfies force and moment equilibrium. Analyses through the subgrade were omitted for this response, as previously approved analyses are not significantly impacted by the increased percentage of CCR.

Based on inspection of the proposed waste grading plan for Cells 1 through 14, three (3) potential areas of stability concern were selected (**Figures 1A through 1D**). Two of the selected sections have little or no waste that will potentially contain the proposed 3:1 MSW to CCR ratio. Section C (an interim section) was selected for the analysis because it is most representative of the various MSW-CCR mixtures potentially at the site.

Assuming future disposal practices will similarly not include isolated blocks or create "layer cake" sections, and the blending of CCR, MSW and solidified CCR will maintain the site's waste homogeneity. Material properties of the materials used in the stability analysis are summarized below. Where available, the material properties were selected to be consistent with values used in previous analyses at the site.

Table 2. Material Properties

Material/Zone	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (phi)
In-situ Soil	118	0	118
Soil Liner (CCL)	120	0	24
Geosynthetics	60	0	14
"Pre-2014 Waste"	70	500	30
"Pre-2017 Waste"	70	250	28
"Post-2017 Waste"	75	0	25

Three different waste "types" are represented in the material properties:

- The "Pre-2014 Waste" properties reflect typical MSW values. Although some CCR was disposed between 2008 and 2014 (about 100,000 Tons), this was considered negligible for this analysis, based on the blending methods used at that time. The assumed shear strength envelope (cohesion and friction angle values) was based on EPA guidance and summarized strength properties for MSW waste by Kavazanjian et. al[6]. and Eid et. al[7]. The data was collected from published laboratory and field tests on MSW wastes and from values back figured from steep landfill slopes. Kavazanjian et. al. recommend a bilinear strength envelope for MSW materials as shown on **Figure 2**. This envelope represents a lower bound to the MSW strength data collected in that study. Also shown on **Figure 2** is the strength envelope recommended by Eid et. al. The shear strength envelope assumed for this evaluation ranges between the Kavazanjian and Eid values.

- The "Pre-2017 Waste" properties are selected to represent waste placed with MSW-CCR comingled at less than about 3% CCR (i.e., representative of waste disposed between 2014 and 2017). The minimal percentage of CCR in the waste mass is not expected to have significant impact on the unit weight or strength of the material; however, both the cohesion and friction angle are assumed to be lower than the Pre-2014 Waste properties.

- The "Post-2017 Waste" properties are selected to represent typical unit weights observed in CCR-only facilities, with minimal strength values reported for CCR material. The friction angle and cohesion values selected represent reported low-end values for fly ash materials, and therefore represent conservative properties for the analyses. The unit weight selected for the Post-2017 Waste is approximately one ton per cubic yard, which is representative of observed values for CCR materials at sites that do not comingle CCR and MSW. Again, this is considered conservative for purposes of this analysis.

Additionally, in response to EPD's expressed concerns regarding placing denser waste above less dense waste, a sensitivity analysis was performed varying the assumed unit weight of the "Post-2017" waste. Based on the sensitivity analysis, the unit weight of CCR would need to be greater than 135 pounds per cubic foot (pcf) (i.e., 1.8 tons per cubic yard) to cause the factor of safety to drop to an unacceptable value. Based on the range of typical CCR wastes, it is unlikely that the CCR would be this dense.

The peak ground acceleration at the project site was obtained from 2014 USGS information[8] (tabulated projected ground acceleration -- 2% probability of being exceeded in 50 years). This indicates that a peak ground acceleration (PGA) of 0.058 g

[6] Kavazanjian, E., Jr., Matasovic, N., Poran, C.J., and G.R. Schmertman (1995), "Evaluation of Municipal Solid Waste Properties for Seismic Analysis," Geoenvironment 2000, ASCE Geotechnical Special Publication #46, V2.
[7] Eid, H.T., Stark, T.D., Evans, W.D., and Sherry, P.E. (2000), AMunicipal Solid Waste Slope Failure. I: Waste and Foundation Soil Properties,@ *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, Vol. 126, No. 5, pp. 397-407
[8] Petersen, M.D., Moschetti, M.P., Powers, P.M., Mueller, C.S., Haller, K.M., Frankel, A.D., Zeng, Yuehua, Rezaeian, Sanaz, Harmsen, S.C., Boyd, O.S., Field, Ned, Chen, Rui, Rukstales, K.S., Luco, Nico, Wheeler, R.L., Williams, R.A., and Olsen, A.H., 2014, Documentation for the 2014 update of the United States national seismic hazard maps: U.S. Geological Survey Open-File Report 2014–1091, 243 p., http://dx.doi.org/10.3133/ofr20141091.

can be assigned to the site based on the site longitude (-84.38 degrees) and latitude (32.45 degrees).

The results of the stability analyses are summarized below, with the results attached in **Appendix A.**

Table 3. Summary of Results

Condition Analyzed	Factor of Safety	Comment
Circular, Static (shallow)	1.63	acceptable
Circular, Seismic (shallow)	1.38	acceptable
Circular, Static (deep)	1.72	acceptable
Circular, Seismic (deep)	1.45	acceptable
Block, Static	1.50	acceptable
Block, Seismic	1.15	acceptable

Note that the circular analyses were performed for shallow and deep failure arcs. The software indicated that the lowest factor of safety for the circular failure was a very shallow, surficial (i.e., less than 20 feet) failure arc that does not appear to be truly representative of an expected failure mode. A deeper arc was established by requiring the failure to extend within the waste mass, which was assumed to be more representative of a failure of concern and more likely. There was minimal difference in the results.

It is worth noting that the section analyzed is an interim section, and a factor of safety of 1.3 is acceptable for static conditions along the interim section. Based on the sensitivity analysis described previously, the unit weight of the MSW-CCR blend would have to exceed 135 PCF to cause the factor of safety to drop below 1.3, which is unlikely.

Based on these additional analyses, the stability of Cells 1 through 14 is not compromised by increasing the ratio of CCR materials in the MSW landfill to a maximum of 33%.

b) A demonstration that the liner system is designed to account for chemical exposure to CCR-generated leachate.

With the exception of Cells 5, 6 and 7, all currently operated cells have been constructed with a composite liner consisting of the following: 24 inches of compacted clay liner (CCL) comprised of on-site soils required to have a tested, in-place hydraulic conductivity of not more than 1 x 10^{-5} cm/sec and subsequently overlain by a "reinforced" Geosynthetic Clay Liner (GCL) which is then overlain by a 60-mil HDPE Geomembrane.

Based on this general configuration, the most susceptible components of the liner system to degradation from exposure to CCR leachate are the GCL and overlying HDPE Geomembrane. Each of these is evaluated separately below. The impact of site leachate (from MSW leachate and CCR-generated leachate) on the CCL is not included in this analysis.

GCL Evaluation

Leachates are capable of containing certain cations and anions that could potentially impact the GCL's that were used in Cells 1 through 4, and 8 through 14 at the site. These analytes include: Calcium; Magnesium; Potassium; Sodium; Chlorides; and Sulfates.

As reported by GSE[9] the following leachate parameters ("key constituents of concern") have the highest potential to impact (reduce) the hydraulic conductivity performance of the GCL's. The range of analytes summarized below were obtained from site-specific leachate samples obtained from CCR monofill samples (Flue Gas Desulfurization Residue (FGD), Flyash, and Bottom ash):

Analytes	Calcium	Magnesium	Potassium	Sodium	Chlorides	Sulfates
Highest Value (ppm)	740	530	410	2,200	1,200	7,600
Lowest Value (ppm)	480	6	14	78	250	1,600

The following summarizes analytical leachate data obtained from Taylor County landfill leachate, as obtained from the site MSW Cells 1 through 14) in April/May 2007 (prior to CCR acceptance/disposal at the Taylor County Landfill site:

Analytes	Calcium	Magnesium	Potassium	Sodium	Chlorides	Sulfates
Value (mg/l)	-	-	-	-	1,730 – 1,870	Non - Detect

Additionally, the following summarizes more recent laboratory data from Taylor County landfill leachate analyses, with respect to these parameters as obtained from the site in 2016 and 2017 (about eight years after CCR began being received at the site):

Analytes	Calcium	Magnesium	Potassium	Sodium	Chlorides	Sulfates
2016 Value (mg/l)	62.9	34.8	491	1,490	1,300	81
2017 Value (mg/l)	28.5	24	456	1,580	Not tested	Not tested

As shown, the leachates obtained from the CCR monofill sites exhibit generally higher levels of nearly all of the analytes (with the exception of Potassium and Chlorides). Additionally, it is noted that the Taylor County landfill leachate quality prior to receipt of CCR in 2008 compared with more recent sampling in 2016-17 (about 8 years following the initial receipt of CCR) is largely unchanged, albeit based on only limited number of parameters.

[9] "*Report on Geosynthetic Clay Liner (GCL) Compatibility with Three Site Specific Leachates*", dated September 2012.

Finally, analytical testing (i.e. TCLP analysis) in 2012 of the CCR received from JEA, which constitutes about 90% of the CCR received and disposed at the Taylor County Landfill indicates Sulfates ranged between 12,900 ppm and 13,600 ppm. Results from sampling in 2014 (a copy is on file with Georgia EPD in the previously approved minor modification for CCR solidification) indicates Sulfates range between 15,600 ppm and 16,400 ppm. In comparing this site-specific CCR data to the current Taylor County Landfill leachate quality data, it is noted that Sulfates are either absent or substantially lower in the leachate (i.e. more than 2 magnitudes lower) and consequently CCR does not appear to be having a significant influence on the site's leachate quality.

- Historical Taylor County CCR Disposal - Based on a comparison of the (limited) data representative of CCR monofills and Taylor County's leachate, it is seen that the influence of the CCR on the overall leachate quality is negligible, and in fact, not observed. This would be expected when considering that the overall proportion of CCR that has been co-disposed with MSW at the Taylor County Landfill is only about 2.5% of the total waste currently in-place at the site (as of January 2017).

- Future Taylor County CCR Disposal - With respect to future landfill operations (i.e. starting in January 2017) in Cells 1 through 14 disposing of up to 33% CCR waste, the total permitted capacity within these constructed cells is about 23.68 million cubic yards (MCY). As of January 2017, the remaining capacity of these cells (assuming they could be filled to final grades over the entire Cell 1 through 14 footprint) is about 3,115,000 CY. Under the proposed maximum CCR acceptance rate of 33% of the remaining capacity of these constructed cells (or about 1,040,000 CY), the total quantity of CCR disposed in these cells since CCR began being accepted at the site would comprise only about 6.7% of the total constructed capacity (1.59 MCY/23.68 MCY). Again, at this relatively low total percentage of the waste, the leachate quality is not expected to be impacted by CCR-generated leachate. Consequently, the potential impact on the GCL's previously installed is similarly expected to be negligible.

Based on this evaluation, it is our judgement that the leachate quality at the site as influenced by past and future CCR disposal at the rates shown will have no potential impact on the performance of the GCL's previously installed in Cells 1 through 4 and 8 through 14 at the site.

<u>HDPE Evaluation</u>

High Density Polyethylene (HDPE) used in the manufacture of geomembrane liners, including those previously installed at the subject site in Cells 1 through 14 is commonly known to be generally chemically inert in that its physical properties that are relied upon for containment are unaffected (i.e. non-reactant) by chemicals. More specifically, HDPE's relevant properties (i.e. those impacting containment performance) have been shown to be substantially unaffected by acidic/basic conditions, petroleum hydrocarbons, solvents, salts, and metals. Although some solvents (including trichloroethylene and benzene) have been shown to cause some swelling in HDPE geomembranes, the concentration that causes swelling is reportedly much higher than is seen in typical MSW or CCR leachates, as well as in the Taylor County leachate, as summarized below.

CCR leachate quality can also vary widely and this analysis does not provide source-specific CCR leachate quality data. However, in general, CCR leachate can generally be characterized as having somewhat elevated levels of metals, sodium, and sulfate. It is noted that HDPE is not reactive with these characteristic CCR constituents. Regarding relevant properties, solvent (i.e. benzene) levels in CCR leachate are not reported in the literature but are expected to be relatively low. Although pH can vary widely from below 5 to greater than 10, CCR is not typically reported by being particularly acidic or basic.

Based on leachate quality analyses from the Taylor County site in 2017 (which is comprised predominantly MSW leachate containing only about 2.5% CCR-generated leachate), trichloroethylene was not detected and benzene levels were reported as not exceeding about 7 µg/l. The pH (field) of Taylor County landfill leachate (as sampled most recently in January 2017) was reported at 7.6. In summary, the Taylor County MSW landfill leachate quality is not impacted by past CCR disposal.

- ❖ Historical Taylor County CCR Disposal – As demonstrated above with respect to GCL's, the influence of the CCR on the overall leachate quality is not observed and therefore the impact of (predominantly) MSW leachate on the HDPE liners is not expected.

- ❖ Future CCR Disposal - Under the proposed maximum CCR acceptance rate of 33% of the remaining capacity of the constructed cells and CCR content at about 6.7%, the leachate quality is not expected to be impacted by CCR-generated leachate and therefore the impact of (predominantly) MSW leachate on the HDPE liners is not expected.

Based on this evaluation, it is our judgement that the leachate quality at the site will have no potential impact on the performance of the HDPE geomembrane liners previously installed in Cells 1 through 4 and 8 through 14 at the site.

c) The cell floor grading and construction plans shall account for settlement caused by the weight of the CCR or the comingled waste. Cell floor subsidence and leachate collection pipe crushing shall be evaluated, and a demonstration of adequate post-settlement cell floor grades, leachate pipe grades, and resistance to crushing shall be provided in the design calculations.

Similar to the stability demonstration presented above (Item 4.a.), the following demonstration addresses the currently constructed Cells 1 through 14 and is presented as a comparative analysis between the previous (HHNT and BLE) "input" parameters and design/analysis assumptions with those same parameters and assumptions for those cell areas that have received CCR subsequent to the previous HHNT and BLE analyses.

Leachate collection pipe crushing was previously evaluated by HHNT in their report titled, "*Design Calculations for Vertical Expansion No. 2, Southern States Landfill, Charing Georgia*", dated September 22, 2003 and included as part of the GAEPD-approved permit application (a copy is on file with Georgia EPD in the previously approved design documents supporting the D&O Plan submittal).

Cell floor subsidence and a demonstration of adequate post-settlement cell floor grades and leachate pipe grades was previously evaluated by BLE in their report titled, "*Report of Geotechnical Analysis; Demonstration of Closure Cap and Base Liner Stability; Vertical Expansion of Existing MSW Landfill; Southern States Landfill – Allied Waste, Inc.; Taylor County, Georgia; BLE Project No. J99-1007-13*", dated September 5, 2000 (a copy is on file with Georgia EPD in the previously approved design documents supporting the D&O Plan submittal).

Comparative Analysis

HHNT's and BLE's analyses included a number of assumptions which are itemized below with a comparison with current site data and S+G's evaluation, by inspection, of these same assumptions with considering that the site accepted CCR between 2008 and 2016.

Waste Properties

Unit Weight:	65 Pounds per Cubic Foot (PCF)
Height of Waste:	330 feet (maximum)

These load assumptions (height of waste and unit weight of waste/cover) are the most critical "input" parameter when evaluating loading and resultant strains and settlements. The subsurface conditions (with respect to consolidation characteristics) would be unchanged from the original analyses. As reported in the previous analyses, HHNT estimated that the Factor of Safety against leachate pipe crushing was about 2.2 and BLE estimated maximum subgrade settlements of about 13 inches.

Based on historical data collected to-date including the total volume of in-place waste/cover and total tons received at the facility, the current in-place waste/cover density (*including* CCR waste disposed between 2008 and 2016) is about 0.8 Tons per Cubic Yard (TCY), or about 60 PCF. The maximum height of the landfill that resulted in the design case for loading (330 feet) has not changed and represents the currently approved design.

Consequently by inspection, it is reasonable to assume that with an actual waste/cover density value that is lower than was assumed in the original analyses by HHNT and BLE (results as used in the design by HHNT and BLE), these analyses are not only still valid, but are also somewhat conservative.

Again, since the CCR waste or solidified CCR waste was blended with the MSW during disposal operations, the entire waste mass is relatively homogeneous. Based on this blending and the fact that the CCR was not disposed in isolated "blocks", the addition of CCR material since 2008 does not impact this homogeneity. Future disposal practices will not include isolated blocks or create "layer cake" sections, and the blending of CCR, MSW and solidified CCR will maintain the previous homogeneity.

d) **The Leachate Collection and Removal System (LCRS) shall continue to maintain its functionality and limit the head of leachate on the liner system to a maximum of 30 centimeters. Drainage nets, filter fabrics, and other features of the LCRS must be demonstrated to be compatible with CCR. Pipes must be able to support the weight of the CCR without damage.**

The existing leachate collection system is incised within the protective cover and generally consists of the following:

- 8-inch DIA. perforated HDPE piping;
- The piping is surrounded with GA DOT #57 stone and some (optional) geotextile fabric (weight >/= 6 oz/sy);
- A zone of "transition filter media" is placed between the #57 stone and the protective cover material.

Per the approved D&O Plans, leachate is removed from the cells either through gravity penetrations of the liner system (Cells 1through 4, 8, and 9) or sideslope risers/sumps/pumps (Cells 5 through 7 and 11through 25; Cell 10 is piped into Cell 11) into a combined gravity/forcemain piping system that conveys leachate to the on-site leachate storage tanks. In this regard, the leachate collection system uses a combination of liner penetration assemblies and leachate sumps to remove leachate from the lined areas.

Although there has been some evidence of potential clogging of geotextiles within the leachate collection and removal systems (LCRS), the small contribution of CCR to the site (about 2.5% of the volume placed within the upper portions of the landfill, away from the LCRS and about 6.7% for the remainder of the cells' capacity) in our opinion will not result in impacts to the LCRS.

Comparative Analysis

LCRS Pipe Crushing

As discussed above in response to Item 4.c., the existing waste-plus-cover soil unit weight (co-mingled MSW and CCR) is less than the unit weight that was assumed in the analysis of the LCRS system, and therefore the added weight due to the CCR is acceptable.

LCRS Flow Capacity

The pumping station design in the currently approved D&O Plans, based on HELP model analyses is about 27 gpm (or about 38,641 gpd).

Based on actual leachate generation estimates the site currently produces about 50,000 gallons per day.

Based on these values, it is reasonable to conclude that the LCRS is functioning as designed, and has had no impact due to receipt/disposal of CCR. Again, the impact on the LCRS system would be expected to be low due to:

1. The co-mingling of the CCR with MSW;
2. The solidification of the CCR which would tend to demobilize the finer fraction of the CCR that could cause some clogging;
3. The vertical distance between the LCRS and the disposed CCR; and,
4. The relatively small quantity of CCR accepted and disposed at the site (about 2.5%).

e) The landfill gas collection system design shall account for comingling of MSW and CCR waste.

The Taylor County Landfill facility was required to install a landfill gas (LFG) collection and control system (GCCS) in 1999. In general, this system includes a series of vertical extraction wells that are connected to buried collection piping that conveys the LFG from the well field to a blower/flare station. The GCCS is operated under Title V Permit No. 4953-269-0014-V-02-0.

A minor modification to the solid waste permit for the Landfill Gas To Energy (LFGTE) system was approved by GAEPD on June 18, 2003. The Taylor County LFGTE Power Station (formerly owned/operated by Bio Energy (Georgia) LLC and now operated by EDI) is located at the Taylor County Landfill in the southwest corner of the facility. The power station operates under Title V Permit No. 4911-269-0016-V-02-0. The LFGTE system transfers LFG that is collected in the GCCS to a landfill gas-fueled power generation station consisting of up to eight internal combustion engines (and the flare, as necessary).

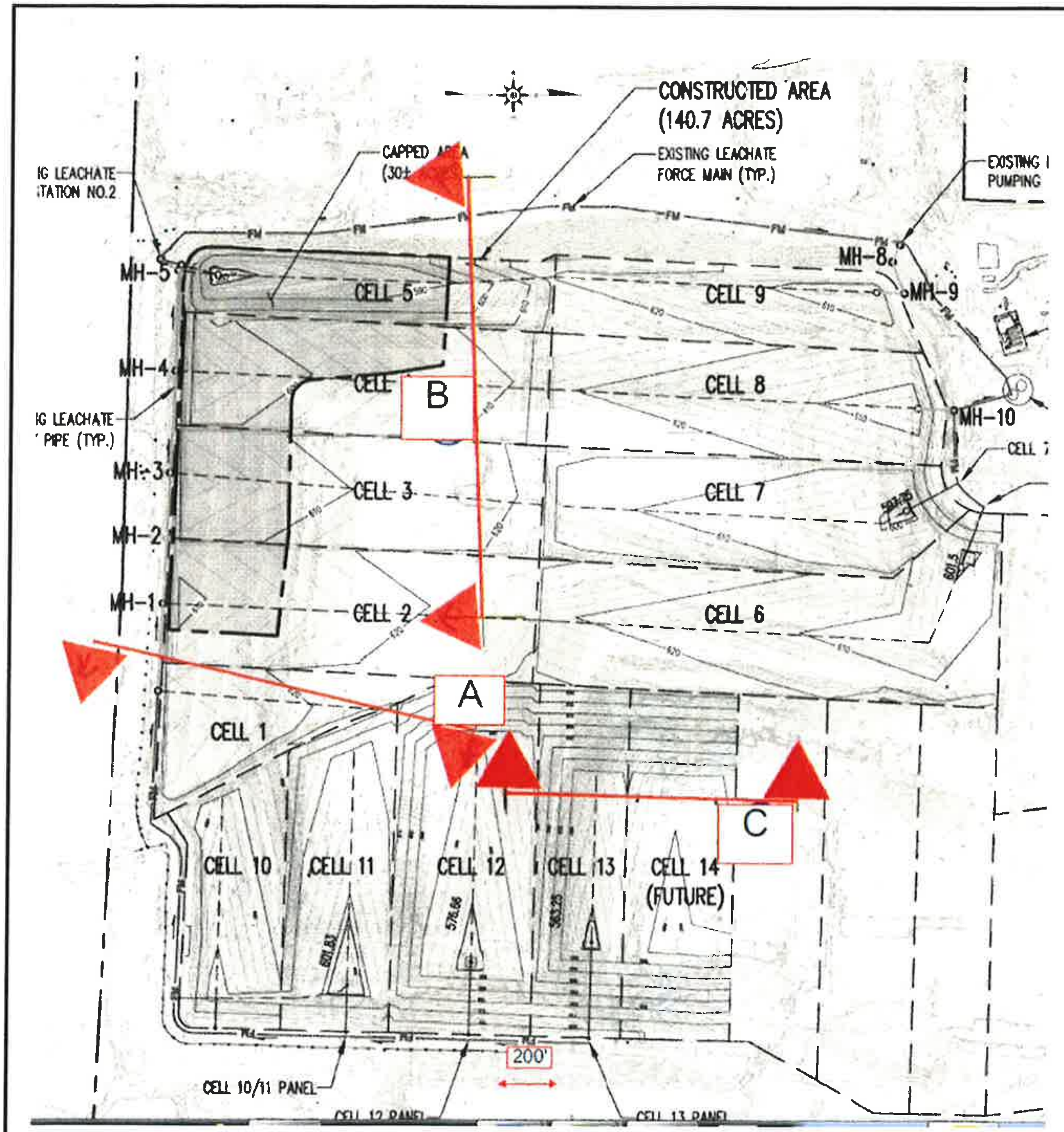
Similar to the comparative analysis performed for the site LCRS system, the site currently generates about 2,200 scfm of landfill gas from about 120 LFG wells. At this time, it is estimated that the GCCS is functioning adequately to both prevent surface emissions in excess of the permitted quantity and also to provide sufficient LFG to the on-site LFGTE plant, which includes penalties for not meeting lower threshold LFG quantities.

Based on this review, it is reasonable to assume that the GCCS is experiencing little or no impact due to CCR disposed at the Taylor County Landfill site. Expansion of the system for the remainder of the (vertical) capacity of Cells 1 through 14 no impacts are anticipated.

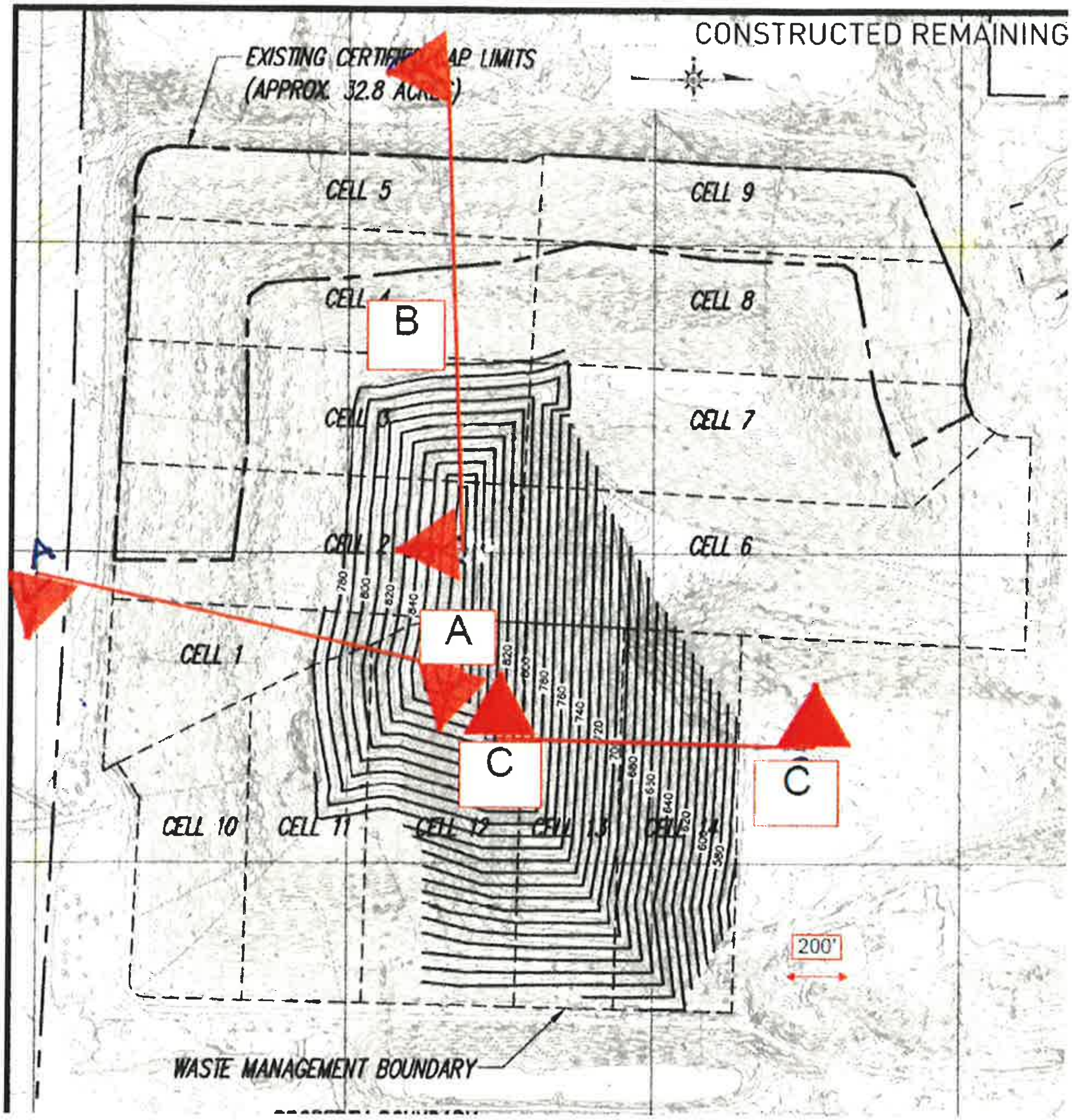
APPENDIX A

Slope Stability Calculations

Design Consistency
Waste Industries – Taylor County MSW Landfill
Mauk, Georgia

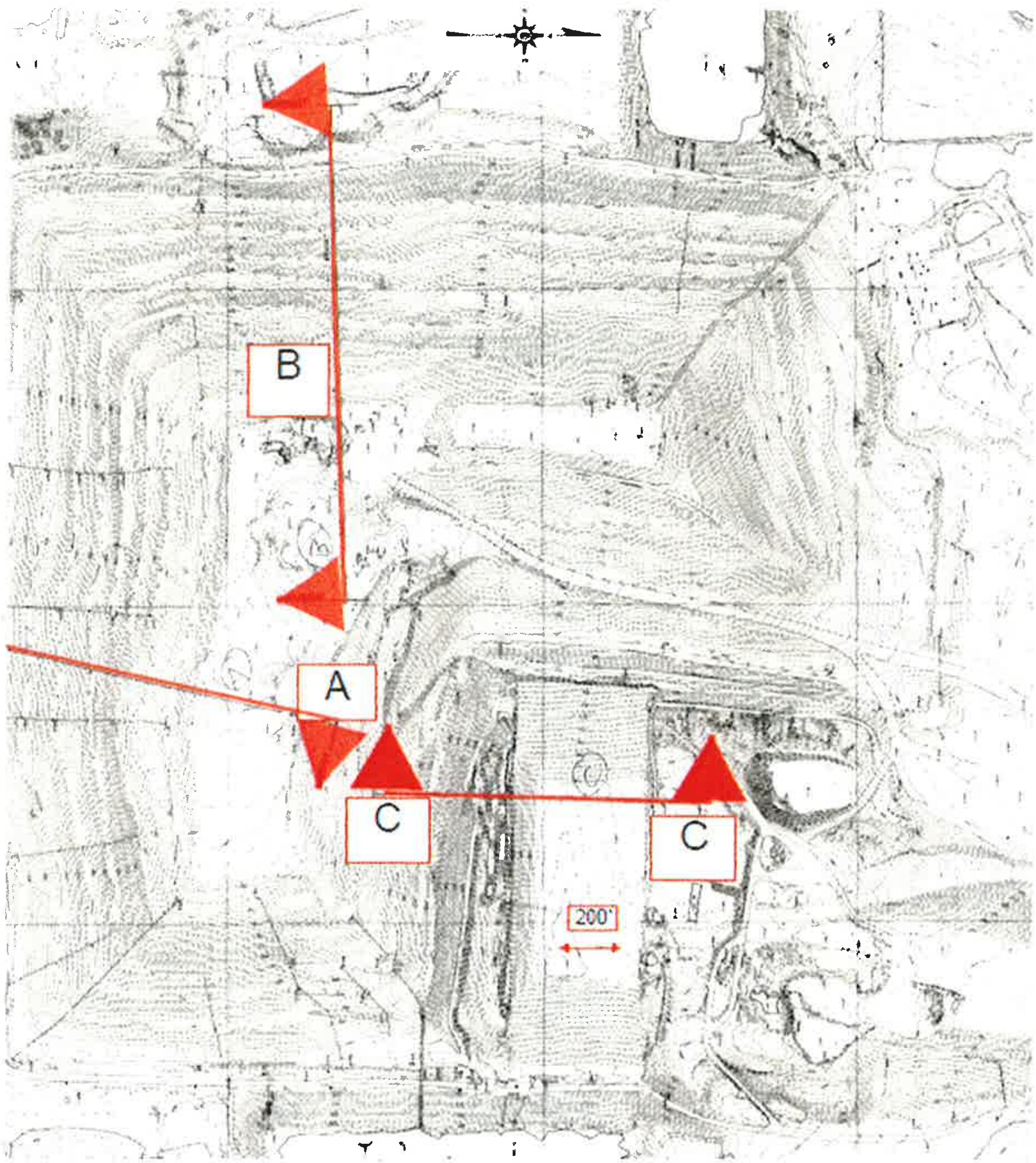


TAYLOR COUNTY MSW LANDFILL BASE GRADES	SMITH+GARDNER				
SCALE: AS SHOWN	DRAWN BY: OTHERS	CHECKED BY: GGM	DATE: MAY 2017	PROJECT NO. WITAYLOR-17-1	FIGURE NO. 1A



TAYLOR COUNTY MSW LANDFILL FINAL COVER GRADES	SMITH+GARDNER

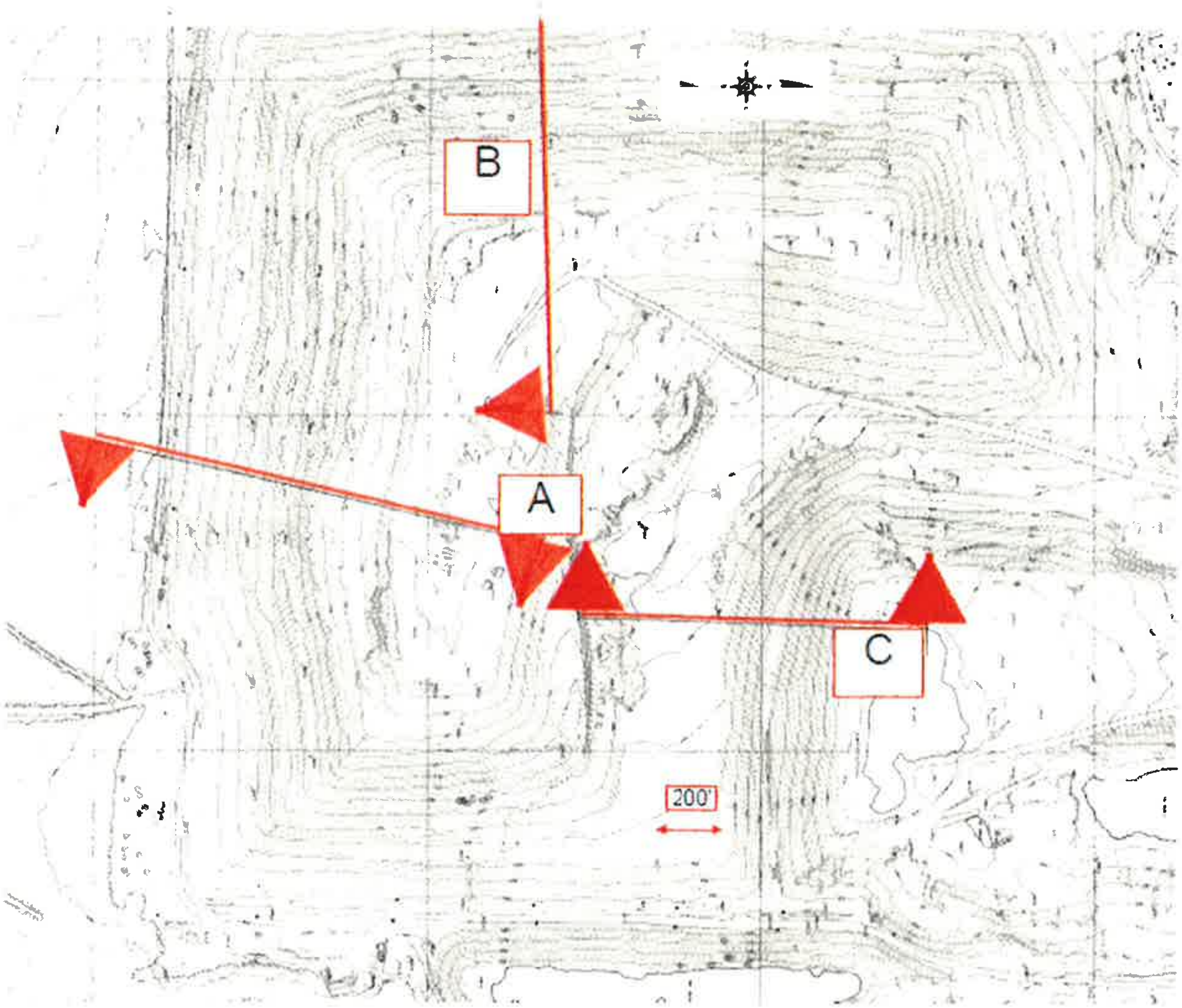
SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.
AS SHOWN	OTHERS	GGM	MAY 2017	WITAYLOR-17-1	1B



TAYLOR COUNTY MSW LANDFILL
MARCH 2014 TOPOGRAPHY

SMITH+GARDNER

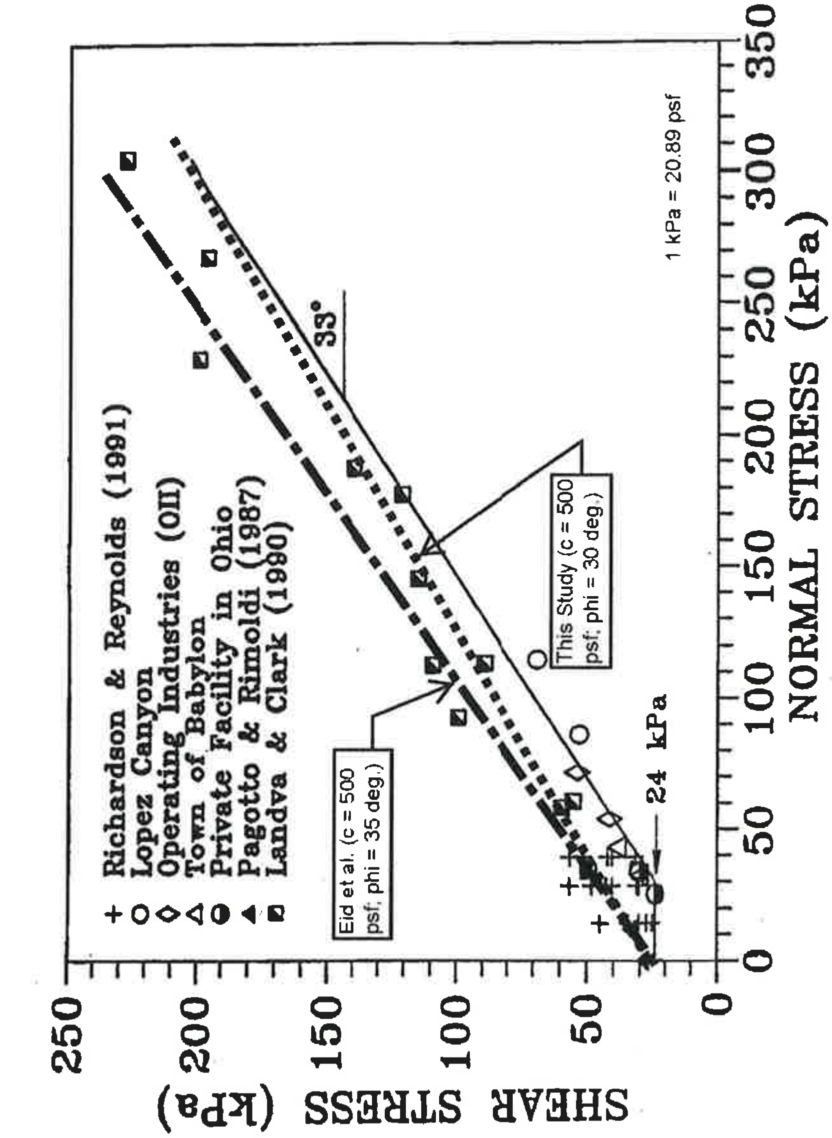
SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.
AS SHOWN	OTHERS	GGM	MAY 2017	WITAYLOR-17-1	1C



TAYLOR COUNTY MSW LANDFILL
JANUARY 2014 TOPOGRAPHY

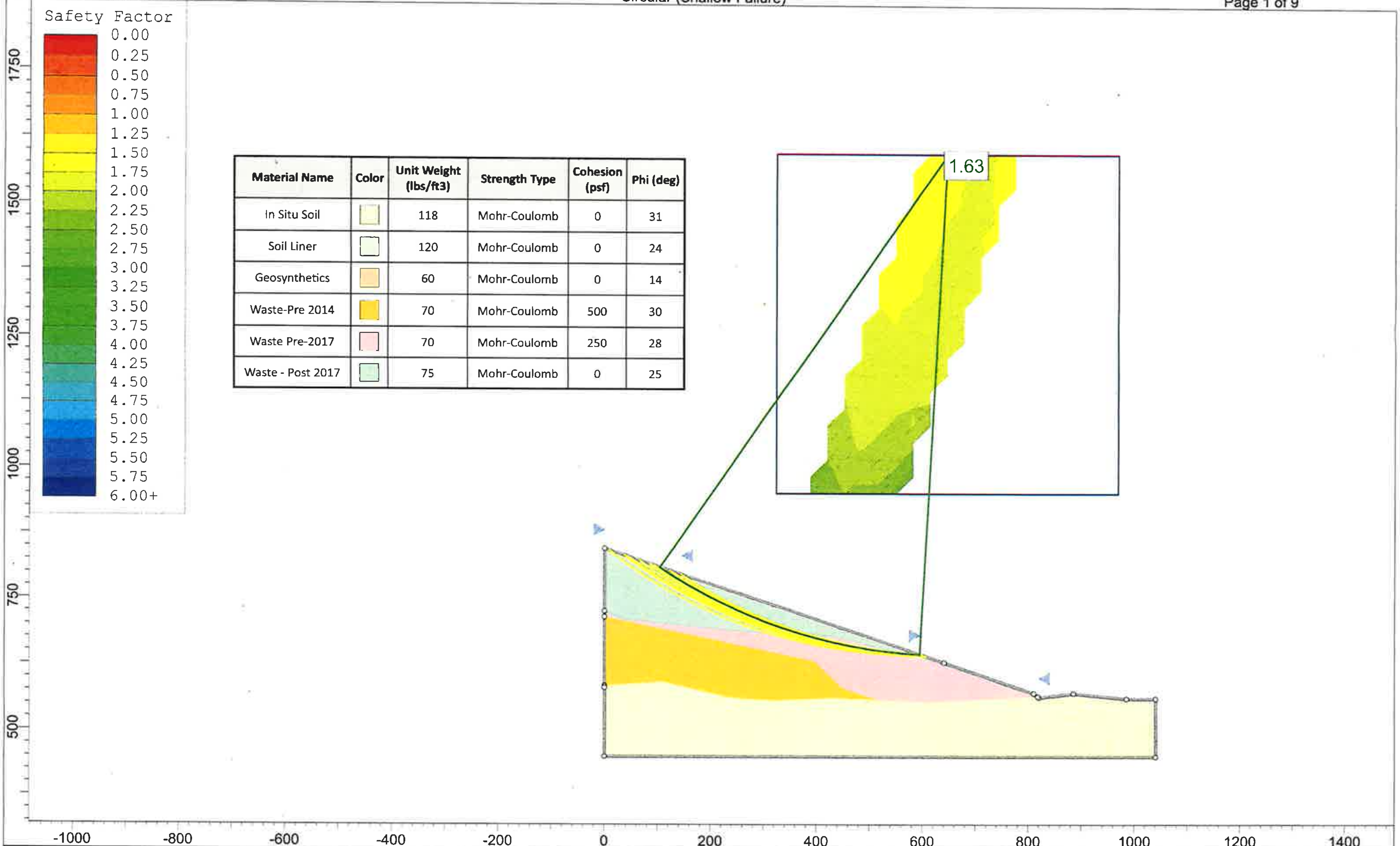
SMITH GARDNER

SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.
AS SHOWN	OTHERS	GGM	MAY 2017	WITAYLOR-17-1	1D



MSW Shear Stregth

SHEAR STRENGTH OF MUNICIPAL SOLID WASTE			SMITH+GARDNER		
SCALE: NOT TO SCALE	DRAWN BY: OTHERS	CHECKED BY: GGM	DATE: MAY 2017	PROJECT NO. WITAYLOR-17-1	FIGURE NO. 2



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
In Situ Soil		118	Mohr-Coulomb	0	31
Soil Liner		120	Mohr-Coulomb	0	24
Geosynthetics		60	Mohr-Coulomb	0	14
Waste-Pre 2014		70	Mohr-Coulomb	500	30
Waste Pre-2017		70	Mohr-Coulomb	250	28
Waste - Post 2017		75	Mohr-Coulomb	0	25

SMITH+GARDNER

Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	Spenser's Method - Circular (shallow failure)
Drawn By	Greg Mills
Scale	1:3000
Section	Taylor County Landfill Section C
Date	May 2017
File Name	Section C Circular.slim

SLIDEINTERPRET 6.015

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: Section C Circular.slim
Slide Modeler Version: 6.015
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Spenser's Method - Circular (shallow failure)
Date Created: 5/4/2017, 10:10:30 PM
Comments:

Taylor County Landfill Section C

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 35
Tolerance: 0.005
Maximum number of iterations: 100
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Section C Circular.slim

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 20

Material Properties

Property	In Situ Soil	Soil Liner	Geosynthetics	Waste-Pre 2014	Waste Pre-2017	Waste - Post 2017
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	118	120	60	70	70	75
Cohesion [psf]	0	0	0	500	250	0
Friction Angle [deg]	31	24	14	30	28	25
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Probabilistic Analysis Input

General Settings

Sensitivity Analysis: On
Probabilistic Analysis: Off

Variables

Material	Property	Distribution	Mean	Min	Max

Waste - Post 2017	Phi	Normal	25	15	65

Global Minimums

Method: spencer

FS: 1.634650
Center: 645.951, 1596.486
Radius: 954.565
Left Slip Surface Endpoint: 104.350, 810.444
Right Slip Surface Endpoint: 594.921, 643.286
Resisting Moment=4.56671e+008 lb-ft
Driving Moment=2.7937e+008 lb-ft
Resisting Horizontal Force=453347 lb
Driving Horizontal Force=277336 lb

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1491
Number of Invalid Surfaces: 3360

Error Codes:

Error Code -101 reported for 16 surfaces
Error Code -1000 reported for 3344 surfaces

Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.63465

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	13.8081	2398.67	Waste - Post 2017	0	25	37.5704	61.4145	131.704	0	131.704

Section C Circular.slim

2	13.8081	7017.18	Waste - Post 2017	0	25	111.177	181.736	389.733	0	389.733
3	13.8081	11284	Waste - Post 2017	0	25	180.797	295.54	633.786	0	633.786
4	13.8081	15210.5	Waste - Post 2017	0	25	246.409	402.792	863.787	0	863.787
5	13.8081	18807.1	Waste - Post 2017	0	25	307.989	503.454	1079.66	0	1079.66
6	13.8081	22083.7	Waste - Post 2017	0	25	365.516	597.49	1281.32	0	1281.32
7	13.8081	25049.2	Waste - Post 2017	0	25	418.964	684.859	1468.68	0	1468.68
8	13.8081	27712	Waste - Post 2017	0	25	468.308	765.519	1641.66	0	1641.66
9	13.8081	30079.7	Waste - Post 2017	0	25	513.52	839.425	1800.15	0	1800.15
10	13.8081	32159.6	Waste - Post 2017	0	25	554.571	906.53	1944.06	0	1944.06
11	13.8081	33958.2	Waste - Post 2017	0	25	591.432	966.784	2073.28	0	2073.28
12	13.8081	35482	Waste - Post 2017	0	25	624.066	1020.13	2187.68	0	2187.68
13	13.8081	36736.6	Waste - Post 2017	0	25	652.445	1066.52	2287.16	0	2287.16
14	13.8081	37727.4	Waste - Post 2017	0	25	676.524	1105.88	2371.57	0	2371.57
15	13.8081	38459.5	Waste - Post 2017	0	25	696.265	1138.15	2440.77	0	2440.77
16	13.8081	38937.5	Waste - Post 2017	0	25	711.626	1163.26	2494.62	0	2494.62
17	13.8081	39165.9	Waste - Post 2017	0	25	722.564	1181.14	2532.96	0	2532.96
18	13.8081	39148.6	Waste - Post 2017	0	25	729.025	1191.7	2555.61	0	2555.61
19	13.8081	38889.5	Waste - Post 2017	0	25	730.958	1194.86	2562.4	0	2562.4
20	13.8081	38392.1	Waste - Post 2017	0	25	728.315	1190.54	2553.12	0	2553.12
21	14.7651	40113.3	Waste Pre-2017	250	28	975.603	1594.77	2529.14	0	2529.14
22	14.7651	38761.3	Waste Pre-2017	250	28	957.11	1564.54	2472.3	0	2472.3
23	14.7651	37148.1	Waste Pre-2017	250	28	932.658	1524.57	2397.11	0	2397.11
24	14.7651	35276.9	Waste Pre-2017	250	28	902.126	1474.66	2303.25	0	2303.25

Section C Circular.slim

25	14.7651	33262.2	Waste Pre-2017	250	28	867.794	1418.54	2197.71	0	2197.71
26	14.7651	31120	Waste Pre-2017	250	28	829.902	1356.6	2081.21	0	2081.21
27	14.7651	28728	Waste Pre-2017	250	28	785.697	1284.34	1945.3	0	1945.3
28	14.7651	26088.3	Waste Pre-2017	250	28	735.034	1201.52	1789.55	0	1789.55
29	14.7651	23202.9	Waste Pre-2017	250	28	677.783	1107.94	1613.54	0	1613.54
30	14.7651	20073.5	Waste Pre-2017	250	28	613.789	1003.33	1416.81	0	1416.81
31	14.7651	16701.9	Waste Pre-2017	250	28	542.896	887.445	1198.86	0	1198.86
32	12.9983	11651.2	Waste - Post 2017	0	25	263.786	431.198	924.708	0	924.708
33	12.9983	8533.99	Waste - Post 2017	0	25	194.898	318.59	683.219	0	683.219
34	12.9983	5242.16	Waste - Post 2017	0	25	120.77	197.416	423.36	0	423.36
35	12.9983	1776.34	Waste - Post 2017	0	25	42.2624	69.0843	148.152	0	148.152

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.63465

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	104.35	810.444	0	0	0
2	118.158	801.106	711.144	231.527	18.0337
3	131.966	792.114	2680.94	872.833	18.0337
4	145.774	783.456	5672.62	1846.83	18.0337
5	159.582	775.122	9470.69	3083.37	18.0337
6	173.39	767.1	13879.4	4518.71	18.0337
7	187.198	759.384	18721.3	6095.08	18.0337
8	201.006	751.963	23836.1	7760.33	18.0337
9	214.815	744.831	29079.8	9467.51	18.0337
10	228.623	737.981	34323.4	11174.6	18.0336
11	242.431	731.405	39452.3	12844.5	18.0337
12	256.239	725.097	44365.6	14444.1	18.0337
13	270.047	719.052	48975.6	15945	18.0337
14	283.855	713.264	53206.9	17322.5	18.0336

15	297.663	707.729	56996.2	18556.3	18.0337
16	311.471	702.44	60292.1	19629.3	18.0337
17	325.279	697.395	63054.2	20528.5	18.0336
18	339.088	692.589	65253.2	21244.5	18.0337
19	352.896	688.019	66870.6	21771	18.0336
20	366.704	683.68	67898.5	22105.7	18.0337
21	380.512	679.569	68339.4	22249.2	18.0337
22	395.277	675.423	64424.9	20974.8	18.0337
23	410.042	671.531	59919	19507.8	18.0337
24	424.807	667.891	54879.7	17867.2	18.0337
25	439.572	664.498	49377.9	16076	18.0337
26	454.337	661.351	43485.5	14157.6	18.0337
27	469.102	658.446	37280.1	12137.3	18.0337
28	483.867	655.783	30864.3	10048.5	18.0337
29	498.632	653.358	24354.4	7929.06	18.0337
30	513.398	651.169	17880.7	5821.4	18.0336
31	528.163	649.216	11587.8	3772.63	18.0337
32	542.928	647.497	5635.48	1834.74	18.0337
33	555.926	646.176	3429.41	1116.51	18.0336
34	568.924	645.034	1676.89	545.943	18.0336
35	581.923	644.071	515.251	167.75	18.0337
36	594.921	643.286	0	0	0

List Of Coordinates

External Boundary

X	Y
1040	450
1040	560
985	560
885	570
820	562
817.65	563.88
810	570
640.839	627.64
0	846
0	725
0	714
0	584
0	582

0	580
0	450

Material Boundary

X	Y
0	582
110	590
238	560
320	555
432	560
605	551
820	562

Material Boundary

X	Y
0	580
110	588
238	558
320	553
432	558
605	549
820	560

Material Boundary

X	Y
0	584
110	592
238	562
320	557
432	562
519.373	557.455
605	553
817.65	563.88

Material Boundary

X	Y
820	560
820	562

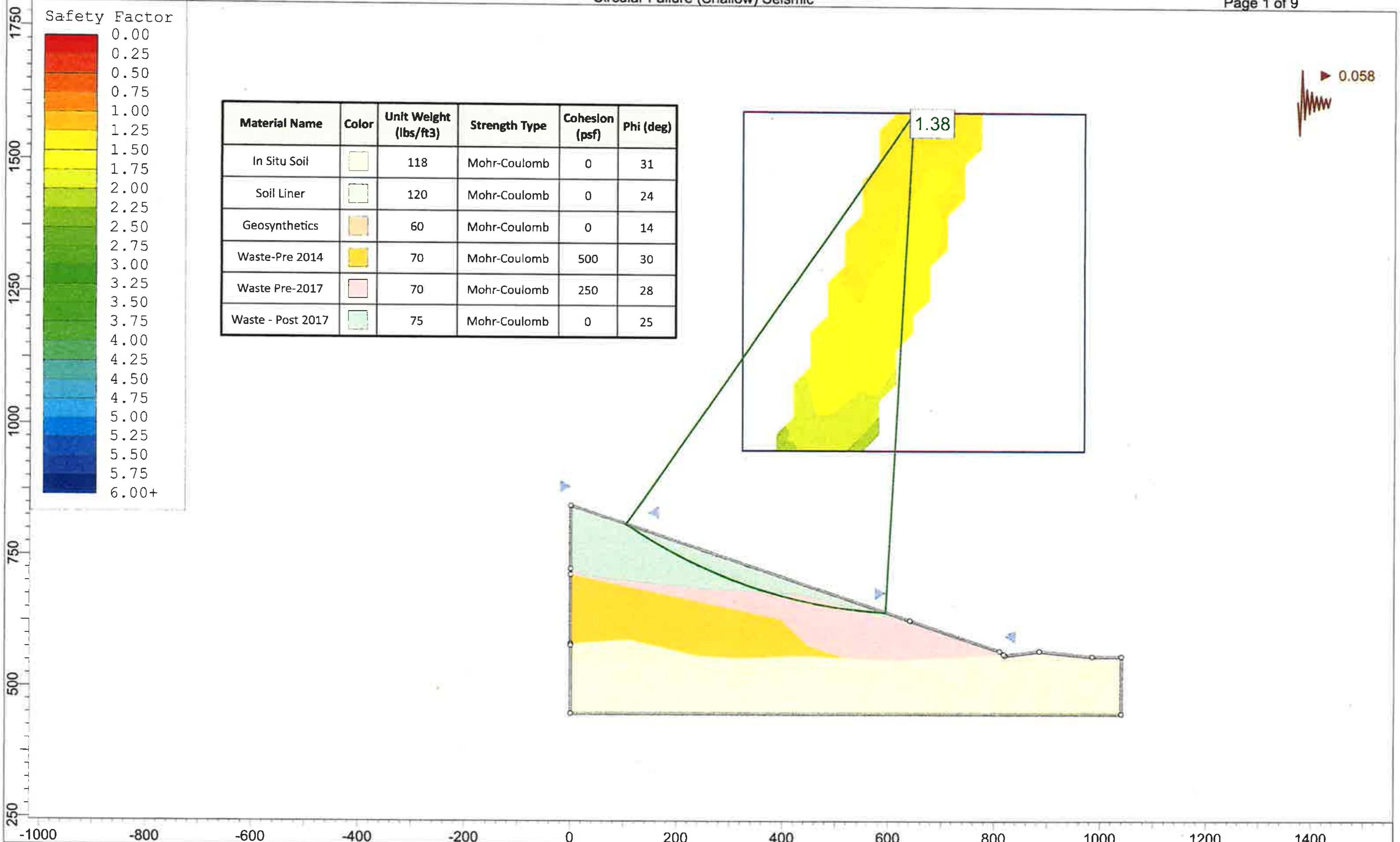
Section C Circular.slim

Material Boundary

X	Y
0	725
30	710
240	688
440	676
570	640
625	630
640.839	627.64

Material Boundary

X	Y
0	714
398	630
450	580
510	560
519.373	557.455



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
In Situ Soil		118	Mohr-Coulomb	0	31
Soil Liner		120	Mohr-Coulomb	0	24
Geosynthetics		60	Mohr-Coulomb	0	14
Waste-Pre 2014		70	Mohr-Coulomb	500	30
Waste Pre-2017		70	Mohr-Coulomb	250	28
Waste - Post 2017		75	Mohr-Coulomb	0	25

SMITH+GARDNER

Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	Spencer's Method - Circular (Shallow Failure) - SEISMIC
Drawn By	Greg Mills
Scale	1:3000
Section	Taylor County Landfill Section C
Date	May 2017
File Name	Section C Circular Siesmic.slim

SLIDEINTERPRET 6.015

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: Section C Circular Siesmic.slim
Slide Modeler Version: 6.015
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Spenser's Method - Circular (Deeper failure in Waste) -SEISMIC
Date Created: 5/4/2017, 10:10:30 PM
Comments:

Taylor County Landfill Section C

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 35
Tolerance: 0.005
Maximum number of iterations: 100
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Section C Circular Siesmic.slim

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 20

Loading

Seismic Load Coefficient (Horizontal): 0.058

Material Properties

Property	In Situ Soil	Soil Liner	Geosynthetics	Waste-Pre 2014	Waste Pre-2017	Waste - Post 2017
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	118	120	60	70	70	75
Cohesion [psf]	0	0	0	500	250	0
Friction Angle [deg]	31	24	14	30	28	25
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Probabilistic Analysis Input

General Settings

Sensitivity Analysis: On
Probabilistic Analysis: Off

Section C Circular Siesmic.slim

Variables

Material	Property	Distribution	Mean	Min	Max
Waste - Post 2017	Phi	Normal	25	15	65

Global Minimums

Method: spencer

FS: 1.378520
Center: 645.951, 1596.486
Radius: 954.565
Left Slip Surface Endpoint: 104.350, 810.444
Right Slip Surface Endpoint: 594.921, 643.286
Resisting Moment=4.50515e+008 lb-ft
Driving Moment=3.2681e+008 lb-ft
Resisting Horizontal Force=446983 lb
Driving Horizontal Force=324248 lb

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1491
Number of Invalid Surfaces: 3360

Error Codes:

Error Code -101 reported for 16 surfaces
Error Code -1000 reported for 3344 surfaces

Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.37852

	Base	Base	Effective

Section C Circular Siesmic.slim

Slice Number	Width [ft]	Weight [lbs]	Base Material	Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Strength [psf]	Normal Stress [psf]	Pressure [psf]	Normal Stress [psf]
1	13.8081	2398.67	Waste - Post 2017	0	25	42.2021	58.1765	124.76	0	124.76
2	13.8081	7017.18	Waste - Post 2017	0	25	125.113	172.471	369.865	0	369.865
3	13.8081	11284	Waste - Post 2017	0	25	203.834	280.989	602.583	0	602.583
4	13.8081	15210.5	Waste - Post 2017	0	25	278.315	383.663	822.766	0	822.766
5	13.8081	18807.1	Waste - Post 2017	0	25	348.507	480.424	1030.28	0	1030.28
6	13.8081	22083.7	Waste - Post 2017	0	25	414.359	571.202	1224.95	0	1224.95
7	13.8081	25049.2	Waste - Post 2017	0	25	475.818	655.925	1406.64	0	1406.64
8	13.8081	27712	Waste - Post 2017	0	25	532.832	734.519	1575.18	0	1575.18
9	13.8081	30079.7	Waste - Post 2017	0	25	585.343	806.907	1730.42	0	1730.42
10	13.8081	32159.6	Waste - Post 2017	0	25	633.294	873.009	1872.17	0	1872.17
11	13.8081	33958.2	Waste - Post 2017	0	25	676.626	932.742	2000.27	0	2000.27
12	13.8081	35482	Waste - Post 2017	0	25	715.274	986.02	2114.53	0	2114.53
13	13.8081	36736.6	Waste - Post 2017	0	25	749.173	1032.75	2214.74	0	2214.74
14	13.8081	37727.4	Waste - Post 2017	0	25	778.255	1072.84	2300.72	0	2300.72
15	13.8081	38459.5	Waste - Post 2017	0	25	802.448	1106.19	2372.24	0	2372.24
16	13.8081	38937.5	Waste - Post 2017	0	25	821.678	1132.7	2429.08	0	2429.08
17	13.8081	39165.9	Waste - Post 2017	0	25	835.86	1152.25	2471.01	0	2471.01
18	13.8081	39148.6	Waste - Post 2017	0	25	844.913	1164.73	2497.78	0	2497.78
19	13.8081	38889.5	Waste - Post 2017	0	25	848.751	1170.02	2509.12	0	2509.12
20	13.8081	38392.1	Waste - Post 2017	0	25	847.278	1167.99	2504.77	0	2504.77
21	14.7651	40113.3	Waste Pre-2017	250	28	1148.58	1583.34	2507.66	0	2507.66
			Waste							

Section C Circular Siesmic.slim

			Pre-2017							
23	14.7651	37148.1	Waste Pre-2017	250	28	1102.91	1520.39	2389.26	0	2389.26
24	14.7651	35276.9	Waste Pre-2017	250	28	1069.29	1474.04	2302.08	0	2302.08
25	14.7651	33262.2	Waste Pre-2017	250	28	1031.04	1421.31	2202.91	0	2202.91
26	14.7651	31120	Waste Pre-2017	250	28	988.415	1362.55	2092.4	0	2092.4
27	14.7651	28728	Waste Pre-2017	250	28	938.122	1293.22	1962.02	0	1962.02
28	14.7651	26088.3	Waste Pre-2017	250	28	879.95	1213.03	1811.19	0	1811.19
29	14.7651	23202.9	Waste Pre-2017	250	28	813.668	1121.66	1639.35	0	1639.35
30	14.7651	20073.5	Waste Pre-2017	250	28	739.037	1018.78	1445.86	0	1445.86
31	14.7651	16701.9	Waste Pre-2017	250	28	655.804	904.039	1230.07	0	1230.07
32	12.9983	11651.2	Waste - Post 2017	0	25	314.752	433.892	930.487	0	930.487
33	12.9983	8533.99	Waste - Post 2017	0	25	233.021	321.224	688.867	0	688.867
34	12.9983	5242.16	Waste - Post 2017	0	25	144.686	199.452	427.726	0	427.726
35	12.9983	1776.34	Waste - Post 2017	0	25	50.1111	69.0791	148.141	0	148.141

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.37852

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	104.35	810.444	0	0	0
2	118.158	801.106	721.275	284.578	21.5316
3	131.966	792.114	2726.39	1075.69	21.5316
4	145.774	783.456	5783.33	2281.8	21.5316
5	159.582	775.122	9679.83	3819.16	21.5316
6	173.39	767.1	14222.1	5611.29	21.5316
7	187.198	759.384	19233.4	7588.51	21.5316
8	201.006	751.963	24553.5	9687.51	21.5316
9	214.815	744.831	30036.9	11851	21.5316

Section C Circular Siesmic.slim

10	228.623	737.981	35552.9	14027.3	21.5316
11	242.431	731.405	40984.3	16170.3	21.5316
12	256.239	725.097	46227.2	18238.9	21.5317
13	270.047	719.052	51190.3	20197	21.5316
14	283.855	713.264	55794.1	22013.4	21.5316
15	297.663	707.729	59971.1	23661.5	21.5316
16	311.471	702.44	63665.3	25119	21.5316
17	325.279	697.395	66831.8	26368.3	21.5316
18	339.088	692.589	69436.4	27396	21.5316
19	352.896	688.019	71456	28192.8	21.5316
20	366.704	683.68	72877.9	28753.8	21.5316
21	380.512	679.569	73700.3	29078.3	21.5316
22	395.277	675.423	69463.6	27406.7	21.5316
23	410.042	671.531	64601.2	25488.3	21.5316
24	424.807	667.891	59168.7	23344.9	21.5316
25	439.572	664.498	53235.7	21004	21.5316
26	454.337	661.351	46873.5	18493.9	21.5317
27	469.102	658.446	40160.4	15845.2	21.5316
28	483.867	655.783	33200.3	13099.1	21.5316
29	498.632	653.358	26112.1	10302.5	21.5317
30	513.398	651.169	19030.3	7508.37	21.5316
31	528.163	649.216	12105.6	4776.25	21.5317
32	542.928	647.497	5505.5	2172.18	21.5316
33	555.926	646.176	3319.03	1309.52	21.5317
34	568.924	645.034	1571.42	620	21.5316
35	581.923	644.071	406.559	160.407	21.5316
36	594.921	643.286	0	0	0

List Of Coordinates

External Boundary

X	Y
1040	450
1040	560
985	560
885	570
820	562
817.65	563.88
810	570
640.839	627.64

0	846
0	725
0	714
0	584
0	582
0	580
0	450

Material Boundary

X	Y
0	582
110	590
238	560
320	555
432	560
605	551
820	562

Material Boundary

X	Y
0	580
110	588
238	558
320	553
432	558
605	549
820	560

Material Boundary

X	Y
0	584
110	592
238	562
320	557
432	562
519.373	557.455
605	553
817.65	563.88

Section C Circular Siesmic.slim

Material Boundary

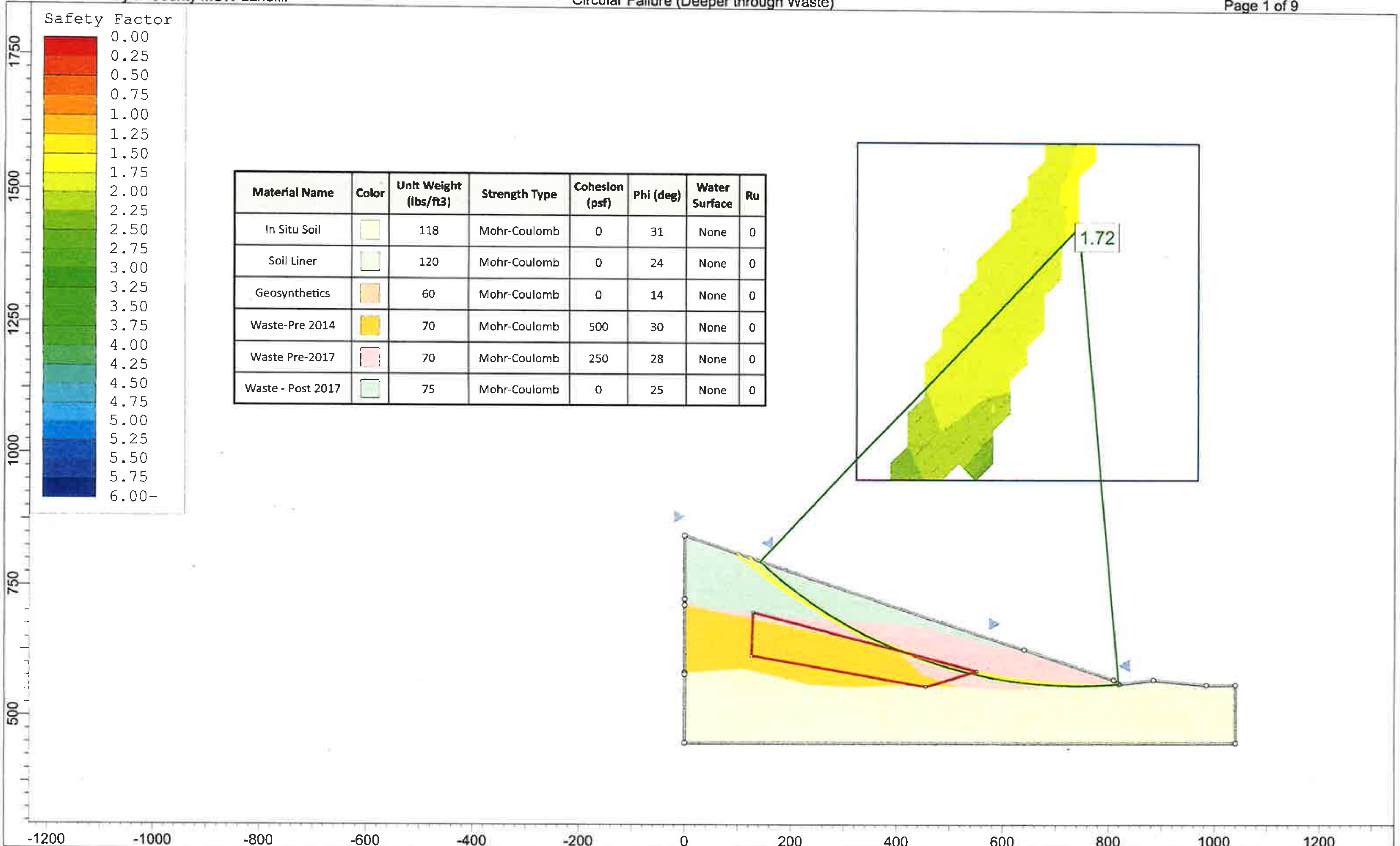
X	Y
820	560
820	562

Material Boundary

X	Y
0	725
30	710
240	688
440	676
570	640
625	630
640.839	627.64

Material Boundary

X	Y
0	714
398	630
450	580
510	560
519.373	557.455



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
In Situ Soil		118	Mohr-Coulomb	0	31	None	0
Soil Liner		120	Mohr-Coulomb	0	24	None	0
Geosynthetics		60	Mohr-Coulomb	0	14	None	0
Waste-Pre 2014		70	Mohr-Coulomb	500	30	None	0
Waste Pre-2017		70	Mohr-Coulomb	250	28	None	0
Waste - Post 2017		75	Mohr-Coulomb	0	25	None	0

SMITH+GARDNER

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Spenser's Method - Circular (Deeper failure in Waste)		
Drawn By	Greg Mills	*Scale* 1:3000	*Section* Taylor County Landfill Section C
Date	May 2017	*File Name*	Section C Circular.slim

SLIDEINTERPRET 6.015

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: Section C Circular.slim
Slide Modeler Version: 6.015
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Spenser's Method - Circular (Deeper failure in Waste)
Date Created: 5/4/2017, 10:10:30 PM
Comments:

Taylor County Landfill Section C

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 35
Tolerance: 0.005
Maximum number of iterations: 100
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Section C Circular.slim

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 20

Material Properties

Property	In Situ Soil	Soil Liner	Geosynthetics	Waste-Pre 2014	Waste Pre-2017	Waste - Post 2017
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	118	120	60	70	70	75
Cohesion [psf]	0	0	0	500	250	0
Friction Angle [deg]	31	24	14	30	28	25
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Probabilistic Analysis Input

General Settings

Sensitivity Analysis: On
Probabilistic Analysis: Off

Variables

Material	Property	Distribution	Mean	Min	Max
Waste - Post 2017	Phi	Normal	25	15	65

Global Minimums

Method: spencer

Section C Circular.slim

FS: 1.722000
Center: 742.741, 1435.169
Radius: 875.883
Left Slip Surface Endpoint: 142.253, 797.529
Right Slip Surface Endpoint: 819.212, 562.631
Resisting Moment=1.2844e+009 lb-ft
Driving Moment=7.45873e+008 lb-ft
Resisting Horizontal Force=1.37579e+006 lb
Driving Horizontal Force=798949 lb

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1290
Number of Invalid Surfaces: 3561

Error Codes:

Error Code -101 reported for 8 surfaces
Error Code -1000 reported for 3553 surfaces

Error Codes

The following errors were encountered during the computation:

-101 = Only one (or zero) surface / slope intersections.
-1000 = No valid slip surfaces are generated at a grid center. Unable to draw a surface.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.722

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	18.5538	7413.27	Waste - Post 2017	0	25	74.2491	127.857	274.19	0	274.19
2	18.5538	21584.1	Waste - Post 2017	0	25	220.622	379.911	814.721	0	814.721
3	18.5538	34489.6	Waste - Post 2017	0	25	359.449	618.972	1327.39	0	1327.39
4	18.5538	46215.3	Waste - Post 2017	0	25	490.708	845	1812.11	0	1812.11
5	18.5538	56835.2	Waste - Post 2017	0	25	614.379	1057.96	2268.81	0	2268.81
6	18.5538	66413.6	Waste - Post 2017	0	25	730.447	1257.83	2697.43	0	2697.43

Section C Circular.slim

7	18.5538	75007	Waste - Post 2017	0	25	838.891	1444.57	3097.89	0	3097.89
8	18.5538	82665	Waste - Post 2017	0	25	939.686	1618.14	3470.12	0	3470.12
9	21.4475	103305	Waste Pre-2017	250	28	1305.49	2248.05	3757.78	0	3757.78
10	21.4475	109876	Waste Pre-2017	250	28	1404.68	2418.86	4079.04	0	4079.04
11	21.4475	115279	Waste Pre-2017	250	28	1492.81	2570.62	4364.43	0	4364.43
12	21.4475	119564	Waste Pre-2017	250	28	1569.76	2703.13	4613.66	0	4613.66
13	21.4475	122776	Waste Pre-2017	250	28	1635.42	2816.19	4826.28	0	4826.28
14	19.5192	113671	Waste Pre-2017	250	28	1687.72	2906.25	4995.7	0	4995.7
15	19.5192	114720	Waste Pre-2017	250	28	1727.46	2974.68	5124.39	0	5124.39
16	19.5192	115184	Waste Pre-2017	250	28	1759.53	3029.91	5228.25	0	5228.25
17	19.5192	115196	Waste Pre-2017	250	28	1785.49	3074.62	5312.35	0	5312.35
18	19.5192	114516	Waste Pre-2017	250	28	1801.65	3102.44	5364.69	0	5364.69
19	19.5192	113156	Waste Pre-2017	250	28	1807.74	3112.93	5384.38	0	5384.38
20	19.5192	111130	Waste Pre-2017	250	28	1803.57	3105.74	5370.86	0	5370.86
21	19.5192	108448	Waste Pre-2017	250	28	1788.9	3080.48	5323.36	0	5323.36
22	19.5192	105121	Waste Pre-2017	250	28	1763.44	3036.64	5240.9	0	5240.9
23	19.5192	101041	Waste Pre-2017	250	28	1725.12	2970.66	5116.84	0	5116.84
24	19.5192	96276.1	Waste Pre-2017	250	28	1674.48	2883.46	4952.81	0	4952.81
25	19.5192	90888.7	Waste Pre-2017	250	28	1612.04	2775.93	4750.58	0	4750.58
26	19.5192	84900.1	Waste Pre-2017	250	28	1537.67	2647.86	4509.71	0	4509.71
27	19.5192	78565.1	Waste Pre-2017	250	28	1455.09	2505.67	4242.31	0	4242.31
28	19.5192	71664.1	Waste Pre-2017	250	28	1360.33	2342.49	3935.4	0	3935.4
29	19.5192	64164	Waste Pre-2017	250	28	1252.3	2156.46	3585.53	0	3585.53
30	19.5192	56067.3	Waste Pre-2017	250	28	1130.48	1946.69	3191	0	3191

Section C Circular.slim

31	17.8927	43692	Geosynthetics	0	14	370.644	638.249	2559.88	0	2559.88
32	17.8927	35784.6	Geosynthetics	0	14	306.702	528.14	2118.26	0	2118.26
33	17.8927	27484.6	Geosynthetics	0	14	238.022	409.874	1643.92	0	1643.92
34	17.8927	18791.2	Geosynthetics	0	14	164.454	283.189	1135.81	0	1135.81
35	17.8927	8349.95	Geosynthetics	0	14	77.7573	133.898	537.034	0	537.034

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.722

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	142.253	797.529	0	0	0
2	160.807	780.552	3279.33	1097.76	18.508
3	179.36	764.517	12255.7	4102.59	18.5079
4	197.914	749.359	25717.2	8608.87	18.508
5	216.468	735.02	42609.8	14263.7	18.5081
6	235.022	721.452	62012.7	20758.8	18.508
7	253.576	708.61	83120.6	27824.7	18.508
8	272.13	696.457	105228	35225.1	18.508
9	290.683	684.959	127717	42753.4	18.508
10	312.131	672.446	146780	49134.7	18.508
11	333.578	660.729	164492	55063.9	18.508
12	355.026	649.772	180344	60370.2	18.508
13	376.474	639.544	193916	64913.6	18.508
14	397.921	630.017	204874	68581.8	18.508
15	417.44	621.934	212357	71086.6	18.508
16	436.96	614.396	217320	72747.9	18.508
17	456.479	607.386	219676	73536.6	18.508
18	475.998	600.891	219377	73436.6	18.508
19	495.517	594.9	216402	72440.9	18.508
20	515.037	589.402	210774	70556.7	18.508
21	534.556	584.387	202557	67806.2	18.508
22	554.075	579.847	191861	64225.6	18.508
23	573.594	575.774	178838	59866.2	18.508
24	593.114	572.161	163700	54798.6	18.508
25	612.633	569.003	146703	49109.1	18.5081
26	632.152	566.296	128148	42897.8	18.5081
27	651.671	564.033	108381	36280.6	18.508
28	671.191	562.213	87741.9	29371.7	18.508
29	690.71	560.833	66661.9	22315.1	18.508
30	710.229	559.89	45636.2	15276.8	18.5081
31	729.748	559.382	25221.6	8442.94	18.508

Section C Circular.slim

32	747.641	559.3	18811.3	6297.08	18.508
33	765.534	559.583	12732.5	4262.2	18.508
34	783.426	560.232	7413.34	2481.62	18.508
35	801.319	561.247	3321.72	1111.95	18.508
36	819.212	562.631	0	0	0

List Of Coordinates

Focus Search Window

X	Y
126.245	615.357
455.619	556.771
551.985	585.955
128.869	699.642

External Boundary

X	Y
1040	450
1040	560
985	560
885	570
820	562
817.65	563.88
810	570
640.839	627.64
0	846
0	725
0	714
0	584
0	582
0	580
0	450

Material Boundary

X	Y
0	582
110	590
238	560
320	555
432	560

Section C Circular.slim

605	551
820	562

Material Boundary

X	Y
0	580
110	588
238	558
320	553
432	558
605	549
820	560

Material Boundary

X	Y
0	584
110	592
238	562
320	557
432	562
519.373	557.455
605	553
817.65	563.88

Material Boundary

X	Y
820	560
820	562

Material Boundary

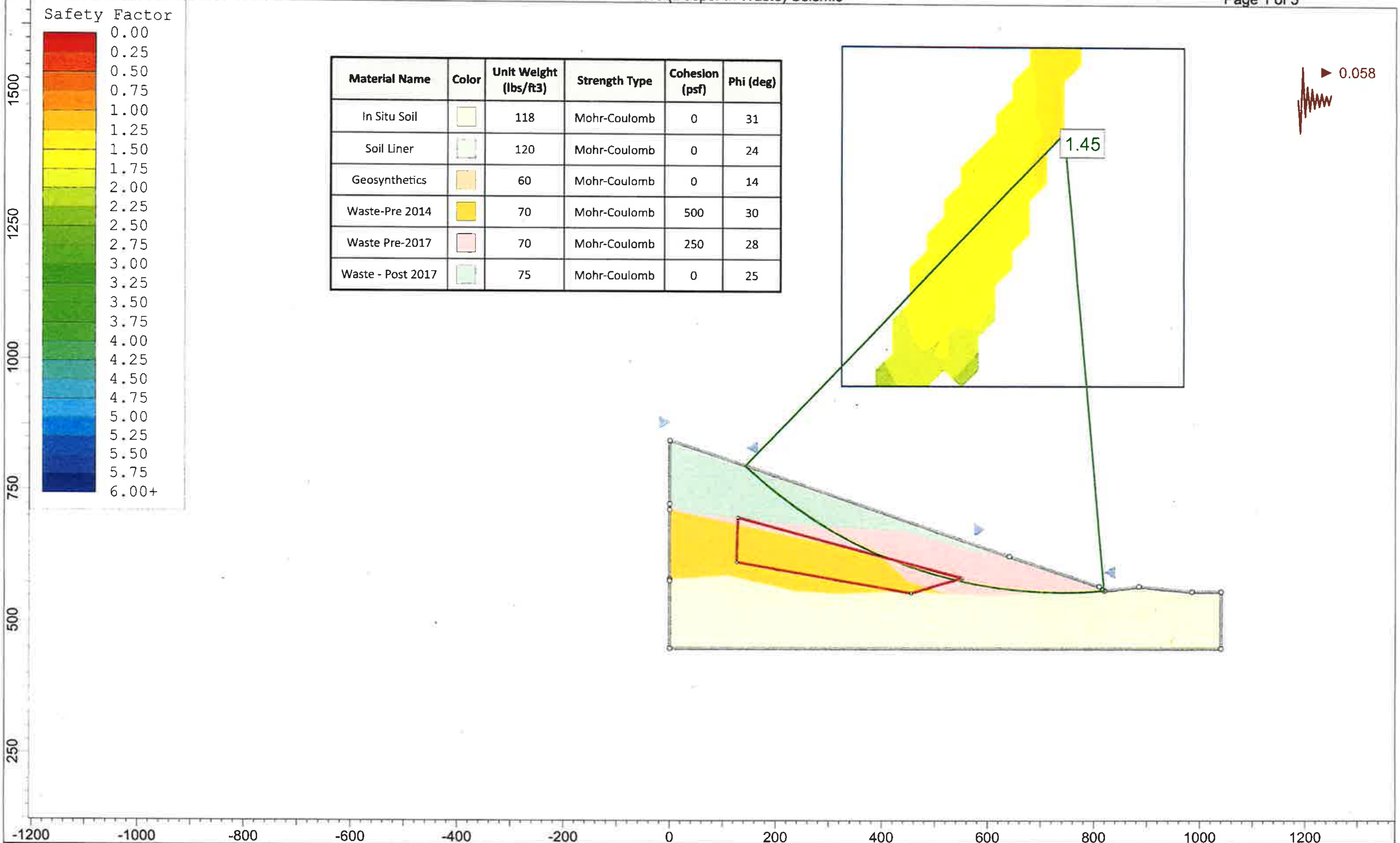
X	Y
0	725
30	710
240	688
440	676
570	640
625	630
640.839	627.64

Section C Circular.slim

Material Boundary

X	Y
0	714
398	630
450	580
510	560
519.373	557.455

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
In Situ Soil		118	Mohr-Coulomb	0	31
Soil Liner		120	Mohr-Coulomb	0	24
Geosynthetics		60	Mohr-Coulomb	0	14
Waste-Pre 2014		70	Mohr-Coulomb	500	30
Waste Pre-2017		70	Mohr-Coulomb	250	28
Waste - Post 2017		75	Mohr-Coulomb	0	25



SMITH+GARDNER

Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	Spenser's Method - Circular (Deeper failure in Waste) SEISMIC
Drawn By	Greg Mills
Scale	1:3000
Section	Taylor County Landfill Section C
Date	May 2017
File Name	Section C Circular Siesmic.slim

SLIDEINTERPRET 6.015

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: Section C Circular Siesmic.slim
Last saved with Slide version: 6.015
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Spenser's Method - Circular (Deeper failure in Waste) -SEISMIC
Date Created: 5/4/2017, 10:10:30 PM
Comments:

Taylor County Landfill Section C

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 35
Tolerance: 0.005
Maximum number of iterations: 100
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Circular
Search Method: Grid Search
Radius Increment: 10
Composite Surfaces: Disabled
Reverse Curvature: Create Tension Crack
Minimum Elevation: Not Defined
Minimum Depth: 20

Loading

Seismic Load Coefficient (Horizontal): 0.058

Material Properties

Property	In Situ Soil	Soil Liner	Geosynthetics	Waste-Pre 2014	Waste Pre-2017	Waste - Post 2017
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	118	120	60	70	70	75
Cohesion [psf]	0	0	0	500	250	0
Friction Angle [deg]	31	24	14	30	28	25
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Probabilistic Analysis Input

General Settings

Sensitivity Analysis: On
Probabilistic Analysis: Off

Variables

Material	Property	Distribution	Mean	Min	Max
Waste - Post 2017	Phi	Normal	25	15	65

List Of Coordinates

External Boundary

X	Y

1040	450
1040	560
985	560
885	570
820	562
817.65	563.88
810	570
640.839	627.64
0	846
0	725
0	714
0	584
0	582
0	580
0	450

Material Boundary

X	Y
0	582
110	590
238	560
320	555
432	560
605	551
820	562

Material Boundary

X	Y
0	580
110	588
238	558
320	553
432	558
605	549
820	560

Material Boundary

X	Y
0	584
110	592
238	562
320	557
432	562

519.373	557.455
605	553
817.65	563.88

Material Boundary

X	Y
820	560
820	562

Material Boundary

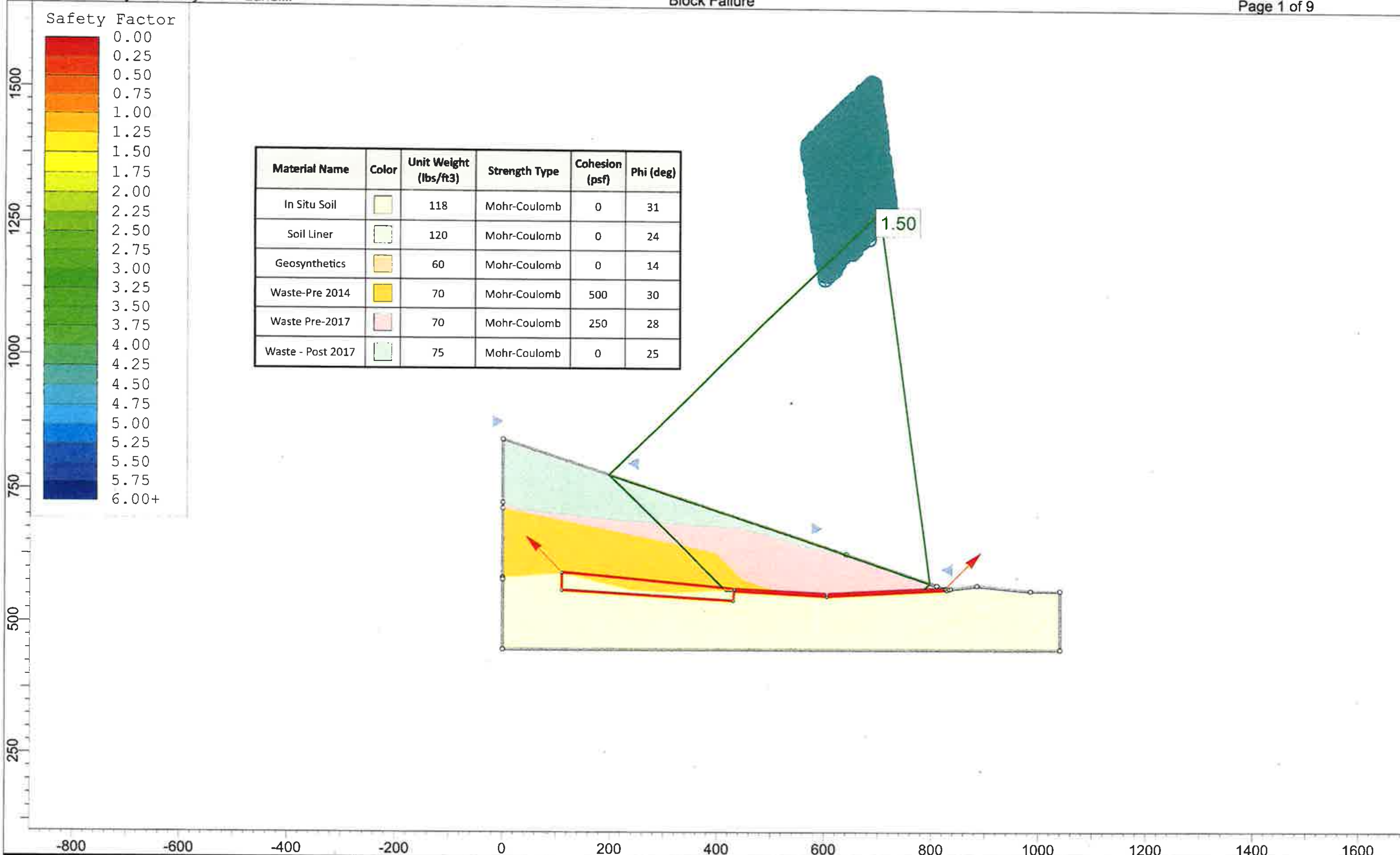
X	Y
0	725
30	710
240	688
440	676
570	640
625	630
640.839	627.64

Material Boundary

X	Y
0	714
398	630
450	580
510	560
519.373	557.455

Focus Search Window

X	Y
126.245	615.357
455.619	556.771
551.985	585.955
128.869	699.642



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
In Situ Soil		118	Mohr-Coulomb	0	31
Soil Liner		120	Mohr-Coulomb	0	24
Geosynthetics		60	Mohr-Coulomb	0	14
Waste-Pre 2014		70	Mohr-Coulomb	500	30
Waste Pre-2017		70	Mohr-Coulomb	250	28
Waste - Post 2017		75	Mohr-Coulomb	0	25

SMITH+GARDNER

Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	Spencer's Method - Block Failure
Drawn By	Greg Mills
Scale	1:3000
Section	Taylor County Landfill Section C
Date	May 2017
File Name	Section C Block.slim

SLIDEINTERPRET 6.015

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: Section C Block.slim
Slide Modeler Version: 6.015
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Spenser's Method - Circular (Deeper failure in Waste) -SEISMIC
Date Created: 5/4/2017, 10:10:30 PM
Comments:

Taylor County Landfill Section C

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 35
Tolerance: 0.005
Maximum number of iterations: 100
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Section C Block.slim

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Property	In Situ Soil	Soil Liner	Geosynthetics	Waste-Pre 2014	Waste Pre-2017	Waste - Post 2017
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	118	120	60	70	70	75
Cohesion [psf]	0	0	0	500	250	0
Friction Angle [deg]	31	24	14	30	28	25
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Probabilistic Analysis Input

General Settings

Sensitivity Analysis: On
Probabilistic Analysis: Off

Variables

Material	Property	Distribution	Mean	Min	Max
Geosynthetics	Phi	Normal	14	6	34
Waste Pre-2017	Cohesion	Normal	250	100	500
Waste Pre-2017	Phi	Normal	28	25	30

Section C Block.slim

Global Minimums

Method: spencer

FS: 1.499020
Axis Location: 701.695, 1276.318
Left Slip Surface Endpoint: 197.437, 778.725
Right Slip Surface Endpoint: 797.215, 574.356
Resisting Moment=9.06051e+008 lb-ft
Driving Moment=6.04429e+008 lb-ft
Resisting Horizontal Force=1.07487e+006 lb
Driving Horizontal Force=717050 lb

Global Minimum Coordinates

Method: spencer

X	Y
197.437	778.725
415.245	560.917
597.934	551.521
782.942	560.084
797.215	574.356

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4911
Number of Invalid Surfaces: 89

Error Codes:

Error Code -108 reported for 1 surface
Error Code -111 reported for 88 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge

Slice Data

Section C Block.slim

Global Minimum Query (spencer) - Safety Factor: 1.49902

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	18.7599	8700.55	Waste - Post 2017	0	25	95.2702	142.812	306.262	0	306.262
2	18.7599	26101.6	Waste - Post 2017	0	25	285.811	428.437	918.786	0	918.786
3	18.7599	43502.7	Waste - Post 2017	0	25	476.352	714.061	1531.31	0	1531.31
4	18.7599	60903.8	Waste - Post 2017	0	25	666.893	999.686	2143.84	0	2143.84
5	18.7599	78304.9	Waste - Post 2017	0	25	857.434	1285.31	2756.36	0	2756.36
6	20.5292	104640	Waste Pre-2017	250	28	1309.68	1963.23	3222.11	0	3222.11
7	20.5292	123498	Waste Pre-2017	250	28	1520.53	2279.3	3816.56	0	3816.56
8	20.6574	143303	Waste-Pre 2014	500	30	1980.73	2969.15	4276.68	0	4276.68
9	20.6574	162397	Waste-Pre 2014	500	30	2207.94	3309.74	4866.6	0	4866.6
10	20.6574	181491	Waste-Pre 2014	500	30	2435.15	3650.34	5456.56	0	5456.56
11	20.6574	200585	Waste-Pre 2014	500	30	2662.36	3990.93	6046.48	0	6046.48
12	0.320455	3261.49	Geosynthetics	0	14	1199	1797.33	7208.72	0	7208.72
13	18.2689	182263	Geosynthetics	0	14	1702.39	2551.91	10235.2	0	10235.2
14	18.2689	174977	Geosynthetics	0	14	1634.33	2449.9	9826.04	0	9826.04
15	18.2689	168090	Geosynthetics	0	14	1570.01	2353.48	9439.34	0	9439.34
16	18.2689	161227	Geosynthetics	0	14	1505.91	2257.39	9053.89	0	9053.89
17	18.2689	154364	Geosynthetics	0	14	1441.8	2161.29	8668.44	0	8668.44
18	18.2689	147500	Geosynthetics	0	14	1377.69	2065.19	8283.05	0	8283.05
19	18.2689	140637	Geosynthetics	0	14	1313.58	1969.09	7897.6	0	7897.6
20	18.2689	133773	Geosynthetics	0	14	1249.48	1873	7512.15	0	7512.15
21	18.2689	126887	Geosynthetics	0	14	1185.17	1776.59	7125.5	0	7125.5
22	18.2689	119883	Geosynthetics	0	14	1119.74	1678.51	6732.13	0	6732.13
23	17.6851	108388	Geosynthetics	0	14	1096.43	1643.57	6591.99	0	6591.99
24	17.6851	99669.9	Geosynthetics	0	14	1008.24	1511.37	6061.78	0	6061.78
25	17.6851	90937.2	Geosynthetics	0	14	919.901	1378.95	5530.68	0	5530.68
26	17.6851	82420.6	Geosynthetics	0	14	833.751	1249.81	5012.71	0	5012.71
27	17.6851	73931.2	Geosynthetics	0	14	747.875	1121.08	4496.39	0	4496.39
28	17.6851	65441.7	Geosynthetics	0	14	661.995	992.344	3980.08	0	3980.08
29	17.6851	56952.3	Geosynthetics	0	14	576.118	863.612	3463.76	0	3463.76
30	20.4042	55251.9	Soil Liner	0	24	908.594	1362	3059.09	0	3059.09

Section C Block.slim

31	20.4042	44132.6	Soil Liner	0	24	725.741	1087.9	2443.46	0	2443.46
32	20.4042	33013.4	Soil Liner	0	24	542.89	813.803	1827.83	0	1827.83
33	0.469723	616.438	Soil Liner	0	24	1187.9	1780.68	3999.48	0	3999.48
34	1.70941	2063.39	Geosynthetics	0	14	407.69	611.135	2451.13	0	2451.13
35	12.0933	6862.78	Waste Pre-2017	250	28	1275.41	1911.86	3125.51	0	3125.51

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.49902

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	197.437	778.725	0	0	0
2	216.197	759.965	3953.51	1161.81	16.3764
3	234.957	741.205	15814.1	4647.22	16.3762
4	253.717	722.446	35581.6	10456.2	16.3762
5	272.477	703.686	63256.2	18588.9	16.3763
6	291.237	684.926	98837.9	29045.1	16.3763
7	311.766	664.397	138029	40562	16.3763
8	332.295	643.867	185083	54389.7	16.3763
9	352.952	623.21	232405	68296.1	16.3763
10	373.61	602.553	287208	84400.7	16.3763
11	394.267	581.895	349491	102704	16.3763
12	414.925	561.238	419255	123205	16.3763
13	415.245	560.917	421180	123771	16.3763
14	433.514	559.978	399615	117434	16.3764
15	451.783	559.038	378913	111350	16.3763
16	470.052	558.098	359026	105506	16.3763
17	488.321	557.159	339950	99900	16.3763
18	506.589	556.219	321687	94533	16.3763
19	524.858	555.279	304236	89404.7	16.3763
20	543.127	554.34	287596	84514.9	16.3763
21	561.396	553.4	271769	79863.9	16.3763
22	579.665	552.46	256757	75452.2	16.3763
23	597.934	551.521	242573	71284	16.3763
24	615.619	552.339	217736	63985.3	16.3763
25	633.304	553.158	194897	57273.5	16.3762
26	650.989	553.976	174058	51149.9	16.3763
27	668.674	554.795	155172	45599.7	16.3762
28	686.359	555.614	138230	40621.2	16.3763
29	704.045	556.432	123234	36214.4	16.3763
30	721.73	557.251	110184	32379.3	16.3763

Section C Block.slim

31	742.134	558.195	88707.2	26068.1	16.3763
32	762.538	559.14	71552.8	21026.9	16.3762
33	782.942	560.084	58720.4	17255.9	16.3762
34	783.412	560.554	56282.3	16539.5	16.3763
35	785.122	562.263	51393.6	15102.8	16.3762
36	797.215	574.356	0	0	0

List Of Coordinates

Block Search Window

X	Y
605	549
605	553
432	562
432	558

Block Search Window

X	Y
826.359	564.384
605	553
605	549
828.708	560.504

Block Search Window

X	Y
430.218	540.508
432	562
110	592
110	559.372

External Boundary

X	Y
1040	450
1040	560
985	560
885	570
835.19	563.689
830.234	563.061
826.359	564.384

Section C Block.slim

810	570
640.839	627.64
0	846
0	725
0	714
0	584
0	582
0	580
0	450

Material Boundary

X	Y
0	582
110	590
238	560
320	555
432	560
605	551
830.234	563.061

Material Boundary

X	Y
0	580
110	588
238	558
320	553
432	558
605	549
830.234	560.47

Material Boundary

X	Y
0	584
110	592
238	562
320	557
432	562
519.373	557.455
605	553
826.359	564.384

Section C Block.slim

Material Boundary

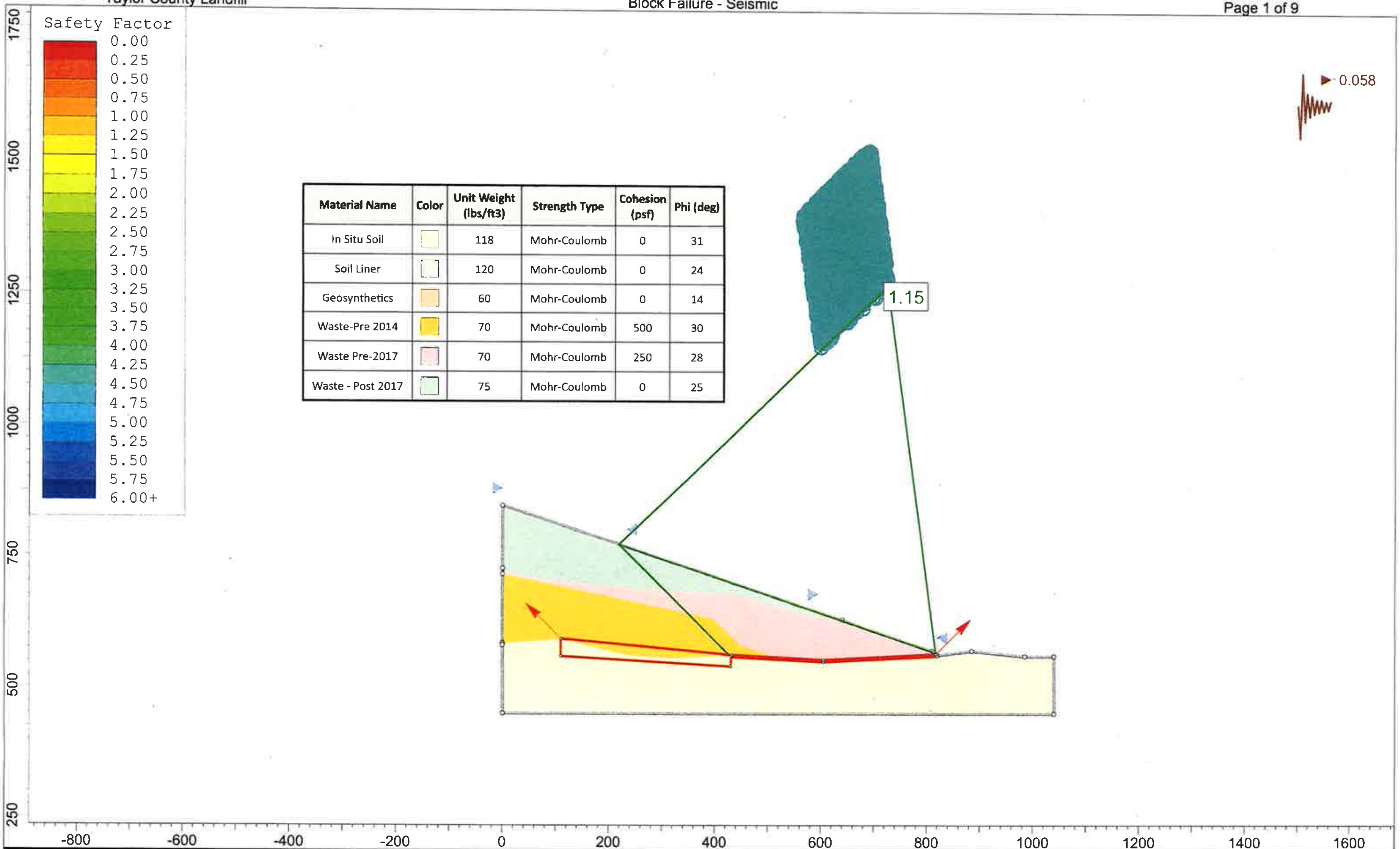
X	Y
830.234	560.47
830.234	563.061

Material Boundary

X	Y
0	725
30	710
240	688
440	676
570	640
625	630
640.839	627.64

Material Boundary

X	Y
0	714
398	630
450	580
510	560
519.373	557.455



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
In Situ Soil		118	Mohr-Coulomb	0	31
Soil Liner		120	Mohr-Coulomb	0	24
Geosynthetics		60	Mohr-Coulomb	0	14
Waste-Pre 2014		70	Mohr-Coulomb	500	30
Waste Pre-2017		70	Mohr-Coulomb	250	28
Waste - Post 2017		75	Mohr-Coulomb	0	25

SMITH+GARDNER

Project	SLIDE - An Interactive Slope Stability Program
Analysis Description	Spencer's Method - Block Failure - SEISMIC
Drawn By	Greg Mills
Scale	1:3000
Section	Taylor County Landfill Section C
Date	May 2017
File Name	Section C Block Siesmic.slim

SLIDEINTERPRET 6.015

Slide Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

File Name: Section C Block Siesmic.slim
Slide Modeler Version: 6.015
Project Title: SLIDE - An Interactive Slope Stability Program
Analysis: Spenser's Method - Circular (Deeper failure in Waste) -SEISMIC
Date Created: 5/4/2017, 10:10:30 PM
Comments:

Taylor County Landfill Section C

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Failure Direction: Left to Right
Data Output: Standard
Maximum Material Properties: 20
Maximum Support Properties: 20

Analysis Options

Analysis Methods Used

Spencer

Number of slices: 35
Tolerance: 0.005
Maximum number of iterations: 100
Initial trial value of FS: 1
Steffensen Iteration: Yes

Groundwater Analysis

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight: 62.4 lbs/ft3
Advanced Groundwater Method: None

Random Numbers

Section C Block Siesmic.slim

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Loading

Seismic Load Coefficient (Horizontal): 0.058

Material Properties

Property	In Situ Soil	Soil Liner	Geosynthetics	Waste-Pre 2014	Waste Pre-2017	Waste - Post 2017
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	118	120	60	70	70	75
Cohesion [psf]	0	0	0	500	250	0
Friction Angle [deg]	31	24	14	30	28	25
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Probabilistic Analysis Input

General Settings

Sensitivity Analysis: On
Probabilistic Analysis: Off

Variables

Material	Property	Distribution	Mean	Min	Max

Section C Block Siesmic.slim

Waste - Post 2017	Phi	Normal	25	15	65

Global Minimums

Method: spencer

FS: 1.147540
Axis Location: 725.443, 1266.072
Left Slip Surface Endpoint: 219.026, 771.369
Right Slip Surface Endpoint: 817.355, 564.116
Resisting Moment=7.66724e+008 lb-ft
Driving Moment=6.68143e+008 lb-ft
Resisting Horizontal Force=925010 lb
Driving Horizontal Force=806077 lb

Global Minimum Coordinates

Method: spencer

X	Y
219.026	771.369
428.668	561.726
599.35	551.815
817.001	563.762
817.355	564.116

Valid / Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 4802
Number of Invalid Surfaces: 198

Error Codes:

Error Code -108 reported for 9 surfaces
Error Code -111 reported for 189 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge

Section C Block Siesmic.slim

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.14754

Slice Number	Width [ft]	Weight [lbs]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]
1	17.4703	7545.53	Waste - Post 2017	0	25	102.914	118.098	253.262	0	253.262
2	17.4703	22636.6	Waste - Post 2017	0	25	308.742	354.294	759.787	0	759.787
3	17.4703	37727.6	Waste - Post 2017	0	25	514.57	590.49	1266.31	0	1266.31
4	17.4703	52818.7	Waste - Post 2017	0	25	720.398	826.686	1772.83	0	1772.83
5	17.4703	67909.8	Waste - Post 2017	0	25	926.225	1062.88	2279.36	0	2279.36
6	21.9787	105734	Waste Pre-2017	250	28	1463.33	1679.23	2687.99	0	2687.99
7	21.9787	127349	Waste Pre-2017	250	28	1724.98	1979.48	3252.66	0	3252.66
8	15.6667	103971	Waste-Pre 2014	500	30	2253.02	2585.43	3612.07	0	3612.07
9	15.6667	114953	Waste-Pre 2014	500	30	2452.72	2814.6	4009	0	4009
10	15.6667	125936	Waste-Pre 2014	500	30	2652.43	3043.77	4405.93	0	4405.93
11	15.6667	136918	Waste-Pre 2014	500	30	2852.13	3272.93	4802.87	0	4802.87
12	15.6667	147900	Waste-Pre 2014	500	30	3051.83	3502.1	5199.78	0	5199.78
13	17.0681	163964	Geosynthetics	0	14	2158.66	2477.15	9935.32	0	9935.32
14	17.0681	158014	Geosynthetics	0	14	2080.33	2387.26	9574.78	0	9574.78
15	17.0681	152139	Geosynthetics	0	14	2002.98	2298.5	9218.81	0	9218.81
16	17.0681	146264	Geosynthetics	0	14	1925.63	2209.74	8862.78	0	8862.78
17	17.0681	140389	Geosynthetics	0	14	1848.29	2120.99	8506.81	0	8506.81
18	17.0681	134514	Geosynthetics	0	14	1770.94	2032.23	8150.84	0	8150.84
19	17.0681	128639	Geosynthetics	0	14	1693.6	1943.47	7794.81	0	7794.81
20	17.0681	122764	Geosynthetics	0	14	1616.25	1854.71	7438.84	0	7438.84
21	17.0681	116853	Geosynthetics	0	14	1538.43	1765.41	7080.65	0	7080.65
22	17.0681	110845	Geosynthetics	0	14	1459.33	1674.64	6716.6	0	6716.6
23	18.1376	110005	Geosynthetics	0	14	1478.46	1696.59	6804.66	0	6804.66
24	18.1376	100652	Geosynthetics	0	14	1352.76	1552.35	6226.13	0	6226.13
25	18.1376	91323.2	Geosynthetics	0	14	1227.38	1408.47	5649.08	0	5649.08
26	18.1376	82211.8	Geosynthetics	0	14	1104.92	1267.94	5085.45	0	5085.45
27	18.1376	73113.4	Geosynthetics	0	14	982.641	1127.62	4522.64	0	4522.64

Section C Block Siesmic.slim

28	18.1376	64015	Geosynthetics	0	14	860.36	987.297	3959.83	0	3959.83
29	18.1376	54916.7	Geosynthetics	0	14	738.078	846.974	3397.02	0	3397.02
30	18.1376	45818.3	Geosynthetics	0	14	615.796	706.651	2834.22	0	2834.22
31	18.1376	36719.9	Geosynthetics	0	14	493.514	566.327	2271.41	0	2271.41
32	18.1376	27621.5	Geosynthetics	0	14	371.232	426.004	1708.61	0	1708.61
33	18.1376	18523.2	Geosynthetics	0	14	248.951	285.681	1145.8	0	1145.8
34	18.1376	8636.97	Geosynthetics	0	14	116.08	133.207	534.264	0	534.264
35	0.353879	7.8521	Waste Pre-2017	250	28	1417.21	1626.31	2588.45	0	2588.45

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.14754

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	219.026	771.369	0	0	0
2	236.496	753.899	3067.42	1354.82	23.8301
3	253.966	736.428	12269.7	5419.28	23.8301
4	271.437	718.958	27606.8	12193.4	23.8301
5	288.907	701.488	49078.7	21677.1	23.8301
6	306.377	684.017	76685.5	33870.5	23.8301
7	328.356	662.039	109791	48492.5	23.8301
8	350.335	640.06	150820	66614.5	23.8302
9	366.001	624.393	178205	78709.5	23.8301
10	381.668	608.727	209321	92453.1	23.8301
11	397.335	593.06	244170	107845	23.8301
12	413.002	577.393	282751	124886	23.8302
13	428.668	561.726	325065	143575	23.8301
14	445.737	560.735	307642	135879	23.83
15	462.805	559.744	290851	128463	23.8301
16	479.873	558.753	274685	121323	23.8301
17	496.941	557.762	259143	114458	23.83
18	514.009	556.771	244225	107870	23.8302
19	531.077	555.78	229932	101556	23.83
20	548.145	554.788	216263	95519	23.8301
21	565.214	553.797	203218	89757.4	23.8301
22	582.282	552.806	190801	84273.1	23.8301
23	599.35	551.815	179022	79070.8	23.8302
24	617.487	552.811	151859	67073.4	23.8302
25	635.625	553.806	127006	56096	23.8301
26	653.763	554.802	104456	46136	23.83
27	671.9	555.798	84155.3	37169.8	23.8301

Section C Block Siesmic.slim

28	690.038	556.793	66101.6	29195.8	23.8301
29	708.175	557.789	50294.6	22214.2	23.8302
30	726.313	558.784	36734.2	16224.8	23.8301
31	744.451	559.78	25420.5	11227.7	23.83
32	762.588	560.775	16353.4	7222.97	23.8301
33	780.726	561.771	9532.88	4210.49	23.8301
34	798.863	562.767	4959.02	2190.3	23.8301
35	817.001	563.762	2826.32	1248.33	23.8301
36	817.355	564.116	0	0	0

List Of Coordinates

Block Search Window

X	Y
605	549
605	553
432	562
432	558

Block Search Window

X	Y
817.65	563.88
605	553
605	549
820	560

Block Search Window

X	Y
430.218	540.508
432	562
110	592
110	559.372

External Boundary

X	Y
1040	450
1040	560
985	560
885	570

Section C Block Siesmic.slim

820	562
817.65	563.88
810	570
640.839	627.64
0	846
0	725
0	714
0	584
0	582
0	580
0	450

Material Boundary

X	Y
0	582
110	590
238	560
320	555
432	560
605	551
820	562

Material Boundary

X	Y
0	580
110	588
238	558
320	553
432	558
605	549
820	560

Material Boundary

X	Y
0	584
110	592
238	562
320	557
432	562
519.373	557.455
605	553

Section C Block Siesmic.slim

817.65	563.88

Material Boundary

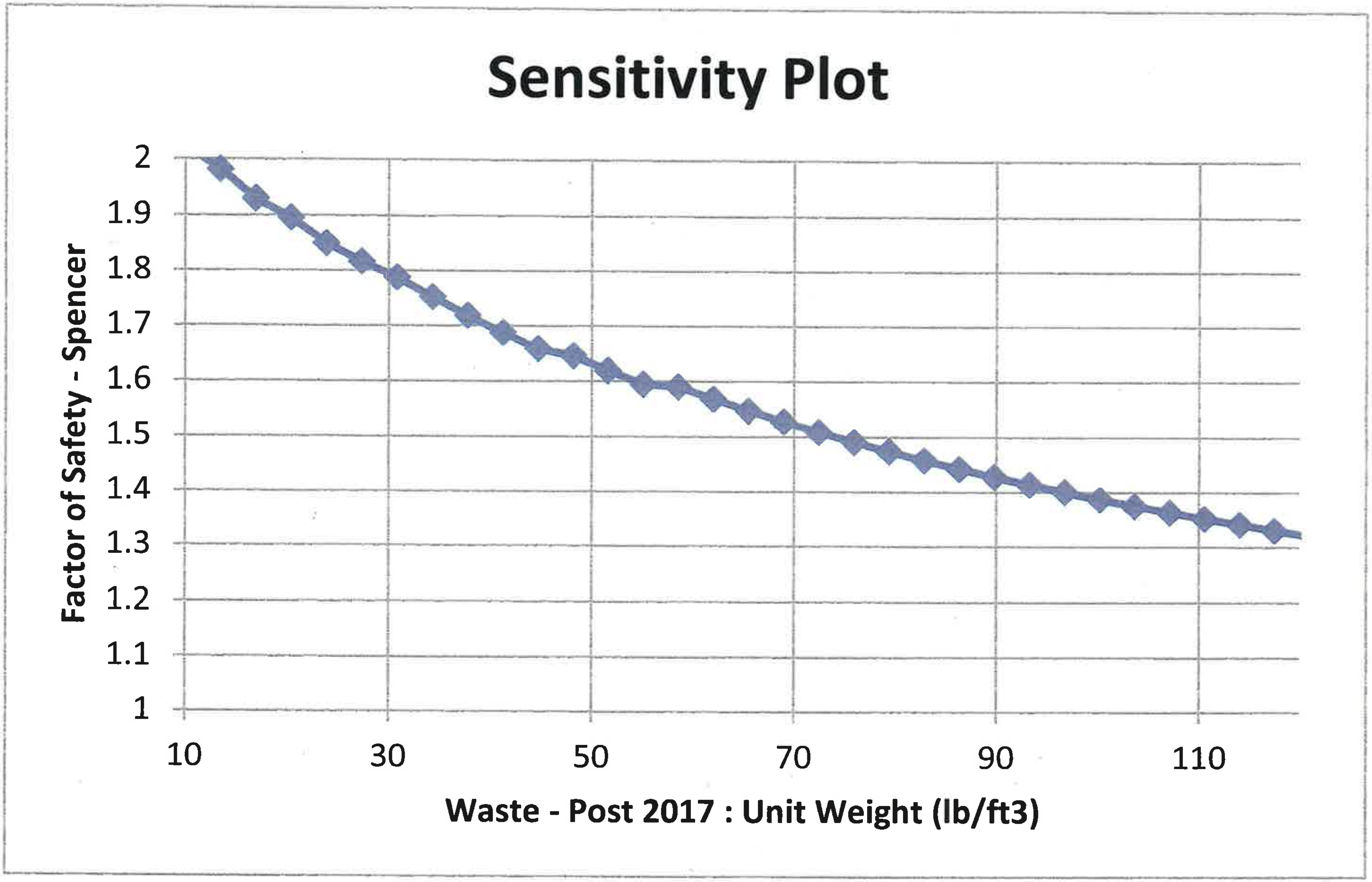
X	Y
820	560
820	562

Material Boundary

X	Y
0	725
30	710
240	688
440	676
570	640
625	630
640.839	627.64

Material Boundary

X	Y
0	714
398	630
450	580
510	560
519.373	557.455


Sensitivity Plot
Factor of Safety - Spencer
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
10
30
50
70
90
110
Waste - Post 2017 : Unit Weight (lb/ft3)