Appendix J – Geotechnical Analysis

APTIM

J.1 – Summary of Geotechnical Design Parameters

Client:	Zion Landfill, Inc.
Project:	Zion Landfill – Site 2 North Expansion
Project #:	631020105
Calculated By: ORC	Date: 05/2022
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TITLE: SUMMARY OF GEOTECHNICAL PARAMETERS

Problem Statement

Summarize the geotechnical parameters for the various landfill and in-situ materials present at the Zion Landfill.

Background

The material strengths of the geologic units described in the following text are derived from laboratory testing that has been conducted using on-site material. The geotechnical properties of the constructed earthen layers (e.g. recompacted soil liner, granular soil layer) are based on site-specific laboratory testing and properties of similar materials. The geotechnical properties of waste are based on published data. Test results of laboratory data used to support this summary are summarized in the attached tables. Laboratory test results are included in **Appendix I.**

As geosynthetics are manufactured products, they can be designed and/or selected to meet strength requirements. The geosynthetic interface shear strengths are calculated values based on the Zion Landfill configuration that have been determined to be appropriate, as further described in **Appendix J.2**.

Given

- ❑ Hydrogeologic and Design Drawings contained in this Application.
- ❑ **Section 2.2** Hydrogeologic Investigation, in this Application.
- ❑ Boring Logs contained in this Application.
- ❑ Laboratory Test Results contained in this Application (please refer to the **Appendix I**).
- ❑ Bray, Jonathan D., Zekkos, Dimitrios, Kavazanjian, Edward Jr., Athanasopopoulos, George A., and Riemer, Michael F., Shear Strength of Municipal Solid Waste, Journal of Geotechnical and Geoenvironmental Engineering, June, 2009 (please refer to attached pages).
- ❑ Geotechdata.info, Angle of friction, http://geotechdata.info/parameter/cohesion (as of December 15, 2013) (please see attached pages).
- ❑ Geotechdata.info, Cohesion, http://geotechdata.info/parameter/cohesion (as of December 15, 2013) (please see attached pages).
- ❑ Coduto, Donald P., Geotechnical Engineering, Principles and Practices (please refer to attached pages).
- ❑ Vilar, O.M., and Carvalho, M.F., Shear Strength and Consolidation Properties of Municipal Solid Waste, International Workshop "Hydro-Physico-Mechanics of Landfill" Grenoble 1 University, France, 21-22 March 2005 (please refer to attached pages).
- ❑ Babu, G.L. Sivakumar, Reddy, Krishna R., Chouksey, Sandeep K., Constitutive Model for Municipal Solid Waste Incorporating Mechanical Creep and Biodegradation-Induced Compression, 2009.

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- Kavasanjian, Edward, The Impact of Degradation on MSW Shear Strength, Conference Proceeding Paper from the GeoCongress 2008: Geotechnics of Waste Management and Remediation (GSP177), MSW Shear Strength (please refer to attached pages).
- *Compression Indices for Full-Scale Landfills*, July 8, 2008, completed by C.Bareither (please refer to attached pages).
- USGS National Seismic Hazard Mapping Project found on the internet/online at *http://earthquake.usgs.gov/hazards/* (please see attached pages).
- Computer model SLIDE

Assumptions

Layer Configuration

The Horizontal and Vertical Expansion areas will include the various components detailed in **Table J.1-1** (system layers are listed from top to bottom).

Table J.1-1
Zion Landfill – Site 2 North Expansion
Layer Configuration Overview

Component	Horizontal Expansion	Existing Landfill / Vertical Expansion
Final Cover System	• 3-foot protective soil cover (6-inch vegetative soil layer and 2.5-foot protective soil layer) • 6-oz/yd^2 double-sided geocomposite drainage layer • 40-mil textured LLDPE geomembrane • 2-foot compacted low permeable soil layer soil layer ($k \leq 1\times10^{-5}$ cm/sec)	• 3-foot protective soil cover (6-inch vegetative soil layer and 2.5-foot protective soil layer) • 6-oz/yd^2 double-sided geocomposite drainage layer • 40-mil textured LLDPE geomembrane • 2-foot compacted low permeable soil layer ($k \leq 5\times10^{-7}$ cm/sec)
Waste	• A maximum waste column height of approximately 198 feet occurs in the proposed horizontal expansion area of the landfill beneath the final landform elevation of approximately 896 feet MSL.	• A maximum waste column height of approximately 206 feet occurs in the proposed vertical expansion area of the landfill beneath the final landform elevation of approximately 896 feet MSL.
Leachate Collection System (LCS) / Liner System[1]	• 8-oz/yd^2 non-woven geotextile filter • 1-foot granular drainage layer ($d < 1.0$ inches, $k \geq 1\times10^{-1}$ cm/sec) • 12-oz/yd^2 non-woven geotextile cushion • 60-mil HDPE textured geomembrane • 5-foot low permeable earth liner ($k \leq 1\times10^{-7}$ cm/sec)	Cell 6: • 6-oz/yd^2 non-woven geotextile filter on floor • 1-foot granular drainage layer ($d < 0.187$-inch, $k \geq 1\times10^{-2}$ cm/sec) • 60-mil HDPE geomembrane (textured on sideslopes, smooth on floor) • 5-foot low permeable earth liner ($k \leq 1\times10^{-7}$ cm/sec) Cells 7 and 9: • 6-oz/yd^2 nonwoven geotextile filter • 1-foot granular drainage layer ($D < 1.0$-inch, $k \geq 1\times10^{-1}$ cm/sec) • 12-oz/yd^2 nonwoven geotextile cushion • 60-mil HDPE textured geomembrane • 5-foot low permeable earth liner ($k \leq 1\times10^{-7}$ cm/sec)

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LCS Pipe Trench / Liner System	• 8-oz/yd^2 non-woven geotextile filter • 24-inch coarse aggregate (D ≤ 1.5-inches) • 12-oz/yd^2 non-woven geotextile cushion • 60-mil HDPE textured geomembrane • 5-foot low permeable earth liner	Cell 6: • 6-oz/yd^2 non-woven geotextile filter • 6-inches intermediate aggregate (D < 0.5-inches) • 1.5-feet coarse aggregate (D ≤ 1.5-inches) • 12-oz/yd^2 non-woven geotextile • 60-mil HDPE smooth geomembrane • 5-foot low permeable earth liner (k ≤ 1×10^{-7} cm/sec) Cells 7 and 9: • 6-oz/yd^2 non-woven geotextile filter • 2-feet coarse aggregate (D ≤ 1.5-inches) • 12-oz/yd^2 non-woven geotextile cushion • 60-mil HDPE textured geomembrane • 5-foot low permeable earth liner (k ≤ 1×10^{-7} cm/sec)
In-Situ Underlying Geologic Units	• Wadsworth Formation • Shallow Drift Aquifer (combination sands, silts, and clays)	• Wadsworth Formation • Shallow Drift Aquifer (combination sands, silts, and clays)

Notes:

1. The “Leachate Collection System (LCS)/Liner System” and “LCS Pipe Trench/Liner System” identified for the existing landfill/vertical expansion area reflects the constructed landfill configuration. Constructed landfill configurations do not necessarily match what was previously permitted.

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Summary of Geologic Unit and Constructed Layer Properties

A summary of the material unit weights and shear strength values for all landfill layers and geologic units is presented in the table below. These values are used in the geotechnical calculations presented in **Appendices J.2** through **J.5**. All values are considered conservative, and are derived from laboratory test data, field test data, and test data for similar materials at other landfill project sites. Laboratory testing results are summarized in the attached tables. Supporting test reports are provided in **Appendix I**.

Table J.1-2
Zion Landfill – Site 2 North Expansion
Summary of Material Unit Weights and Shear Strength

Layer Description	Dry Unit Weight "γ_{dry}" (pcf)	Total Unit Weight "γ_{total}" (pcf)	Saturated Unit Weight "$\gamma_{saturated}$" (pcf)	Shear Strength Short-Term Conditions[1]		Shear Strength Long-Term Conditions[2]	
				Cohesion c (psf)	Friction Angle φ' (degrees)	Cohesion c' (psf)	Friction Angle φ' (degrees)
In Situ / Foundation Soils Beneath Landfill & Outside Landfill Footprint							
Wadsworth Till	118.4	136.6	137.8	1,465	11.8	1,000	14.3
Shallow Drift Aquifer[3]	104.8	123.3	129.8	-	-	-	-
Landfill Layers:							
Final Cover Soils[4]	106.7	121.5	130.3	1,465	11.8	0	34.3
Waste Fill[5]	75.0	75.0	75.0	0	33	0	30
LCS Granular Drainage Layer[6]	125.0	126.0	130.0	0	30	0	30
Low Permeable Earth Liner[4]	112.6	128.2	134.1	1,465	11.8	0	34.3

Notes:

1. Shear strength values for short-term conditions of the Wadsworth Till, Final Cover Soils, Low Permeable Earth Liner are derived from the unconsolidated-undrained triaxial shear strength Mohr circles (see attached figures). It is assumed these conditions occur during initial landfill cell development and interim waste fill heights / active landfill cell phase. A summary of the test results are presented in the attached Tables and the complete laboratory test results are provided in **Appendix I**. The Mohr circles are also provided in the attached pages.
2. Shear strength values for long-term conditions of the Final Cover Soils and Low Permeable Earth Liner are conservatively derived from the Mohr circles of the effective stress, consolidated-undrained triaxial shear strength tests. The long-term shear strength value assumed for the Wadsworth Till is derived from the Mohr circles of the total stress, consolidated-undrained triaxial shear strength tests. A summary of the test results are presented in the attached Tables and the complete laboratory test results are provided in **Appendix I**. The Mohr circles are also provided in the attached pages.
3. The Shallow Drift Aquifer, Lower Till, Basal Drift, and Bedrock units are significantly lower than the proposed landfill base and therefore were not considered in the geotechnical analyses.
4. The unit weights of the Final Cover Soils and the Low Permeable Earth Liner are derived from the results of Standard Proctor tests performed on the Wadsworth Till soils. It was assumed that the Final Cover Soils and Earth Liner Soils will be compacted to 90% and 95% of the Standard Proctor test results, respectively, and therefore the unit weights of the Final Cover Soils and Low Permeable Earth Liner are based on these corresponding values. A summary of the Standard Proctor test results are presented on Table 3 in the attached pages. The complete Standard Proctor laboratory test reports are provided in **Appendix I**. Modified Proctor testing was not analyzed for hydraulic conductivity testing or shear strength evaluations. In the event that Modified Proctors are intended to be used during construction, shear strength values should be evaluated prior to use to ensure that the strength parameters fall within the acceptable ranges identified within this Appendix. While direct comparisons cannot be made, 90% and 95% of the Standard Proctor (for the Final Cover Soil and Low Permeable Earth Liner, respectively) generally produce similar compactive efforts as 85% and 90% of the Modified Proctors, respectively. It should be noted that the unit weights of the Final Cover Soil and Low Permeable Earth Liner in the Site 2 North Expansion are as conservative as or more conservative than the values used for the Zion Site 2 East Expansion completed in 2011 by Weaver Boos Consultants, Inc.
5. The unit weight of the waste fill is based on an average value reported in published technical literature (see attached pages). The shear strength values of the waste fill are based on bilinear shear strength envelopes results for MSW waste in conventional landfills described in Eid et. al (2000). It should be noted that the unit weights and shear strength values of the Waste for the Site 2 North Expansion are as conservative as or more conservative than the values used for the Zion Site 2 East Expansion completed in 2011 by Weaver Boos Consultants, Inc.
6. The unit weights of the LCS Granular Drainage Layer are based on the unit weights of similar materials used at other landfills. It should be noted that the unit weights and shear strength values of the LCS granular drainage layer for the Site 2 North Expansion are as conservative as or more conservative than the values used for the Zion Site 2 East Expansion completed in 2011 by Weaver Boos Consultants, Inc.

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Summary of Consolidation Parameters

The consolidation parameters presented in the following table were used to calculate the primary and secondary settlement of the waste mass and compressible soil layers (i.e., final cover, low permeable earth liner, and Wadsworth Till foundation soil) due to compression at the landfill.

- Waste Fill. The consolidation parameters for the waste fill are based on average data reported in published technical literature (see attached pages).
- Constructed Earthen Layers and Wadsworth Till Foundation. The consolidation parameters for the landfill soil layers (i.e., final cover, and low permeable earth liner) and the Wadsworth Till are derived from the results of consolidation tests performed on representative samples of the on-site Wadsworth Till soils. The overconsolidation ratio (OCR) calculated for the samples tested ranged from approximately 0.82 to 1.52. The average OCR value was determined to be 1.25. Sample B-02-18 had a calculated OCR value of 0.82 and was therefore assumed to be disturbed and not included in the calculated average values reported in Table 6 (see attached pages). The on-site Wadsworth Till soils were determined to be normally consolidated. Note the settlement calculations assume normally consolidated soil conditions. A summary of the consolidation test data including pre-consolidation stresses, existing overburden stresses, OCRs, and sample locations/depths are reported on Table 9 in the attached pages. Additionally, the complete consolidation test reports are provided in **Appendix I**.

Table J.1-3
Zion Landfill – Site 2 North Expansion
Summary of Consolidation Parameters

Layer Description	Compression Index C_c (C'_c)	Void Ratio e_o	Recompression Index C_r	Secondary Compression Index C_α (C'_α)
Waste Fill	- (0.172)	0.650	--	0.084 (0.051)
Final Cover Low Permeable Earth Liner Wadsworth Till	0.08 -	0.432	0.021	0.0032 -

Seismic Impact Zone

A seismic impact zone is defined as an area with a 10% or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull, will exceed 0.10g in 250 years. Maximum horizontal acceleration is defined as the maximum expected horizontal acceleration depicted on a seismic hazard map, with a 90% or greater probability that the acceleration will not be exceeded in 250 years. From the United State Geologic Survey (USGS) Earthquake Hazards Program - National Seismic Hazard Mapping website, the seismic coefficient for the landfill site area was determined to be 0.0461g (please refer to attached pages).

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Water Surface Assumed in Geotechnical Stability Calculations

A liquid level representing a 1-foot leachate level was assumed to be at the top of the LCS drainage layer along the entire landfill base. The groundwater elevation was conservatively assumed to be 5-feet below the existing ground surface outside of the landfill waste boundary.

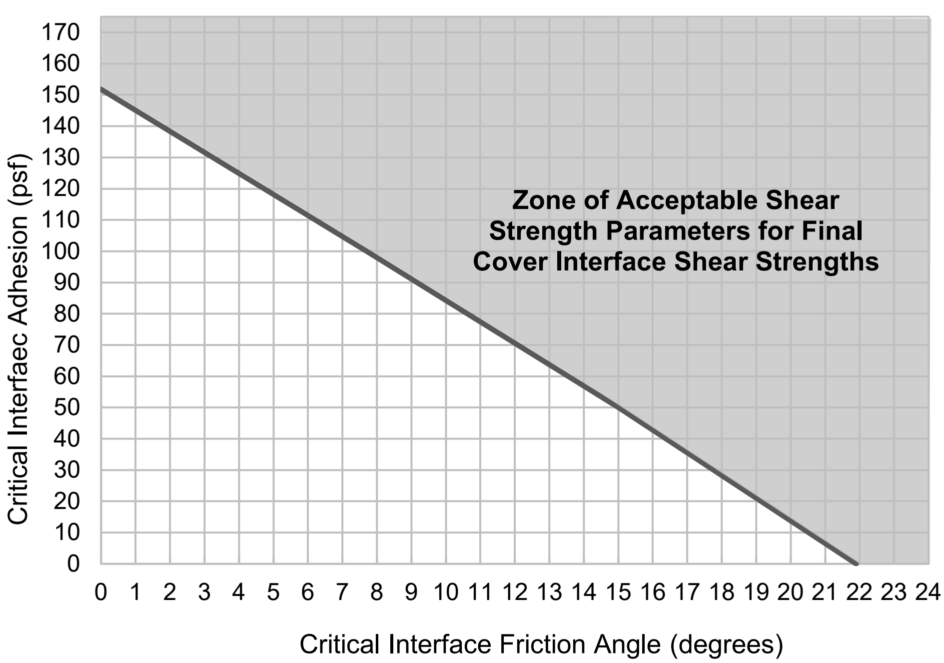
Summary of Geosynthetic Material Interfaces

Geosynthetics are used in both the existing and proposed designs to provide engineered barriers (geomembranes), drainage medium (geocomposites), and filtration and cushioning (geotextiles). Calculations have been completed as part of this appendix to identify the range of acceptable shear strength values that must be met to ensure minimum acceptable safety factors of 1.5 for static conditions and 1.3 for seismic conditions during all phases of the landfill life (during construction, closure, and post closure).

Calculation J.2-A identifies the lowest peak shear strength that produces acceptable factors of safety for any potential interface within the final cover. The most critical failure surface will be located between one of the following interfaces:

- Low permeable soil layer vs. textured geomembrane;
- Textured geomembrane vs. geocomposite; or
- Geocomposite vs. protective soil cover layer.

Acceptable values for these interfaces are shown below. It is noted that all interfaces will be required to meet the minimum interface peak shear strength values determined in this calculation. Interface friction test results for previous final cover construction events is attached demonstrating existing construction achieves the required acceptable values.



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Calculation J.2-B through J.2-E identifies the lowest peak shear strength that produces acceptable factors of safety for any potential interface within the liner and leachate collection system through all stages of operations, including prior to waste placement, during operations, and after closure. The interfaces that are considered include the following:

- Geotextile to granular drainage layer;
- Geotextile to geomembrane; or
- Geomembrane to low permeable earth liner.

Acceptable peak shear strength values for these interfaces are shown in the following chart in the gray shaded area. It is noted that all interfaces will be required to meet the minimum interface peak shear strength values determined in geotechnical evaluations. Interface friction test results for previous liner construction events is attached demonstrating existing construction achieves the required acceptable values.

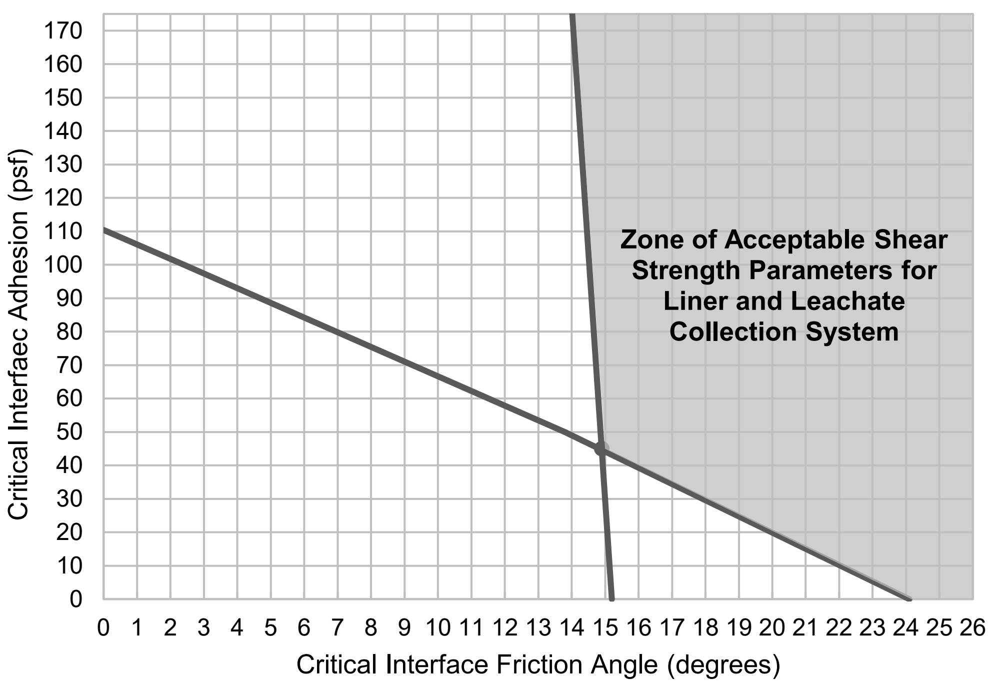

TABLE 1
ZION LANDFILL SITE 2 NORTH EXPANSION
SUMMARY OF GEOTECHNICAL LABORATORY TEST RESULTS FOR WADSWORTH TILL

Boring No.	Sample No.	Depth BGS (feet)	USCS Soil Class.	Soil	Grain Size Analysis: ASTM C136 & ASTM D1140				Atterberg Limits: ASTM D4318			Properties Below Taken from Hydraulic Conductivity Test Data (ASTM D5084) or Specific Gravity Test Data (ASTM D854)								Hydr. Cond. "k" (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	PL	LL	PI	Specific Gravity "G_s"	Void Ratio "e"	Porosity "n"	Saturation "S" (%)	Moisture Content "w" (%)	Dry Unit Weight "γ_{dry}" (pcf)	Total Unit Weight "γ_{total}" (pcf)	Sat. Unit Weight "γ_{sat}" (pcf)	
B-01-18	ST-35	68.0 - 70.0'	CL	Grey CLAY	-	-	-	-	-	-	-	2.750	0.42	0.30	98.0	15.0	120.7	138.9	139.3	2.38E-08
B-03-18	ST-34	66.0 - 68.0'	CL	Dark Grey Silty CLAY	-	-	-	-	-	-	-	2.750	0.38	0.28	92.0	12.7	124.3	140.2	141.5	4.77E-08
B-05-18	ST-37	72.0 - 74.0'	CL	Brown-Grey CLAY	-	-	-	-	-	-	-	2.750	0.67	0.40	99.0	24.3	102.6	127.5	127.8	4.85E-08
B-10-18	ST-30	58.0 - 60.0'	CL-ML	Grey Silty CLAY with thin layers of dry SILT	-	-	-	-	-	-	-	2.750	0.45	0.31	87.0	14.3	118.1	135.0	137.6	9.84E-08
B-11-18	ST-29	56.0 - 58.0'	CL	Grey CLAY	-	-	-	-	-	-	-	2.750	0.46	0.31	100.0	16.6	117.9	137.5	137.4	3.63E-08
B-14-18	ST-33	64.0 - 66.0'	CL	Grey Silty CLAY	-	-	-	-	-	-	-	2.750	0.35	0.26	84.0	10.8	126.9	140.6	143.2	3.65E-08
B-01-18	SS-23	44.0 - 46.0'	CL	Grey Lean CLAY with Sand	2.2	19.1	51.8	26.9	11	26	15	-	-	-	-	-	-	-	-	-
B-01-18	SS-27	52.0 - 54.0'	CL	Light Grey Lean CLAY	0.8	5.5	52.9	40.8	12	34	22	-	-	-	-	-	-	-	-	-
B-02-18	SS-30	58.0 - 60.0'	CL	Light Brown Lean CLAY	0.2	7.7	55.9	36.2	12	30	18	-	-	-	-	-	-	-	-	-
B-02-18	SS-33	64.0 - 66.0'	CL	Grey Silty Lean CLAY with Sand	1.3	18.1	58.5	22.1	10	21	11	-	-	-	-	-	-	-	-	-
B-03-18	SS-29	56.0 - 58.0'	CL	Grey Lean CLAY	1.7	7.7	55.6	35.0	15	30	15	-	-	-	-	-	-	-	-	-
B-03-18	SS-32	62.0 - 64.0'	CL	Grey Silty Lean CLAY	0.9	6.4	52.2	40.5	15	32	17	-	-	-	-	-	-	-	-	-
B-04-18	SS-20	38.0 - 40.0'	CL	Greay Sandy Lean CLAY	9.4	27.4	51.2	12.0	11	19	8	-	-	-	-	-	-	-	-	-
B-04-18	SS-23	44.0 - 46.0'	CL	Light Grey Lean CLAY with Sand	2.9	19.8	48.0	29.3	11	29	18	-	-	-	-	-	-	-	-	-
B-05-18	SS-31	60.0 - 62.0'	CL	Light Grey Lean CLAY	0.0	12.3	52.9	34.8	13	28	15	-	-	-	-	-	-	-	-	-
B-06-18	SS-31	60.0 - 62.0'	CL	Grey Lean CLAY	1.1	11.2	52.3	35.4	12	33	21	-	-	-	-	-	-	-	-	-
B-07-18	SS-15	28.0 - 30.0'	CL	Light Brown Lean CLAY	0.9	12.5	64.7	21.9	14	23	9	-	-	-	-	-	-	-	-	-
B-07-18	SS-24	46.0 - 48.0'	CL	Grey Lean CLAY with Sand	1.4	18.0	56.8	23.8	13	27	14	-	-	-	-	-	-	-	-	-
B-08-18	SS-30	58.0 - 60.0'	CL	Brown, Grey Lean CLAY with Sand	0.6	19.1	53.2	27.1	13	28	15	-	-	-	-	-	-	-	-	-
B-09-18	SS-22	42.0 - 44.0'	CL-ML	Grey Silty CLAY with Sand	1.0	27.4	62.0	9.6	14	18	4	-	-	-	-	-	-	-	-	-
B-09-18	SS-28	54.0 - 56.0'	CL	Grey Lean CLAY with SAND	2.0	17.2	52.1	28.7	14	27	13	-	-	-	-	-	-	-	-	-
B-10-18	SS-23	44.0 - 46.0'	CL	Brown-Grey Lean CLAY with Sand	2.6	17.6	49.7	30.1	14	26	12	-	-	-	-	-	-	-	-	-
B-10-18	SS-28	54.0 - 56.0'	CL	Grey Lean CLAY with SAND	3.2	16.6	49.7	30.5	14	28	14	-	-	-	-	-	-	-	-	-
B-11-18	SS-22	42.0 - 44.0'	CL-ML	Grey Sandy Silty CLAY	3.1	36.2	49.4	11.3	12	17	5	-	-	-	-	-	-	-	-	-
B-11-18	SS-28	54.0 - 56.0'	CL	Grey Lean CLAY with Sand	0.9	19.2	50.4	29.5	14	27	13	-	-	-	-	-	-	-	-	-
B-12-18	SS-27	52.0 - 54.0'	CL	Grey Lean CLAY with Sand	4.4	18.1	49.2	28.3	13	25	12	-	-	-	-	-	-	-	-	-
B-12-18	SS-32	62.0 - 64.0'	CL	Grey Lean CLAY with Sand	3.6	17.4	55.7	23.3	12	25	13	-	-	-	-	-	-	-	-	-
B-13-18	SS-17	32.0 - 34.0'	CL-ML	Grey Silty CLAY	0.0	1.5	79.5	19.0	15	22	7	-	-	-	-	-	-	-	-	-
B-13-18	SS-26	50.0 - 52.0'	CL	Grey Lean CLAY with Sand	5.5	17.8	50.8	25.9	14	26	12	-	-	-	-	-	-	-	-	-
B-14-18	SS-26	50.0 - 52.0'	CL	Grey Lean CLAY	0.0	0.4	49.7	49.9	18	40	22	-	-	-	-	-	-	-	-	-
B-14-18	SS-31	60.0 - 62.0'	CL-ML	Brownish Grey Sandy Silty CLAY	0.6	41.6	43.8	14.0	12	18	6	-	-	-	-	-	-	-	-	-
B-15-18	SS-24	46.0 - 48.0'	CL	Greay Sandy Lean CLAY	6.0	25.2	42.9	25.9	14	28	14	-	-	-	-	-	-	-	-	-
B-15-18	SS-29	56.0 - 58.0'	CL	Grey Lean CLAY	0.0	1.5	54.9	43.6	15	32	17	-	-	-	-	-	-	-	-	-
				Minimum:	0.0	0.4	42.9	9.6	10.0	17.0	4.0	2.750	0.35	0.26	84.0	10.8	102.6	127.5	127.8	2.38E-08
				Maximum:	9.4	41.6	79.5	49.9	18.0	40.0	22.0	2.750	0.67	0.40	100.0	24.3	126.9	140.6	143.2	9.84E-08
				Average:	2.1	16.4	53.5	28.0	13.2	26.6	13.4	2.750	0.46	0.31	93.3	15.6	118.4	136.6	137.8	4.85E-08

Note:

1) Values in cells shaded in gray were calculated using the soil density relationships below.

Soil Density Relationships:

$\gamma_{dry} = [(G_s \times \gamma_w] / (1+e)$

$\gamma_{total} = [(G_s + Se) \times \gamma_w] / (1+e)$

$\gamma_{total} = \gamma_d \times (1 + (w\% / 100))$

$\gamma_{sat} = [(G_s + e) \times \gamma_w] / (1+e)$

$S\% = (w \times G_s) / e$

n = e / (1+e)

e = n / (1-n)

APTIM

TABLE 2
ZION LANDFILL SITE 2 NORTH EXPANSION
SUMMARY OF GEOTECHNICAL LABORATORY TEST RESULTS FOR SHALLOW DRIFT AQUIFER

Boring No.	Sample No.	Depth BGS (feet)	USCS Soil Class.	Soil	Grain Size Analysis: ASTM C136 & ASTM D1140				Properties Below Taken from Hydraulic Conductivity Test Data (ASTM D5084) or Specific Gravity Test Data (ASTM D854)							
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Specific Gravity "G_s"	Void Ratio "e"	Porosity "n"	Saturation "S" (%)	Moisture Content "w" (%)	Dry Unit Weight "γ_{dry}" (pcf)	Total Unit Weight "γ_{total}" (pcf)	Sat. Unit Weight "γ_{sat}" (pcf)
B-05-18	SS-59	116.0 - 118.0'	SM	Grey Silty SAND	0.0	77.6	20.6	1.8	2.789	0.76	0.43	63.0	17.1	99.0	116.0	125.9
B-06-18	SS-53	104.0 - 106.0'	SM	Grey Silty SAND	4.4	82.7	12.3	0.6	2.814	0.53	0.35	75.0	14.2	114.5	130.8	136.2
B-08-18	SS-61	120.0 - 122.0'	SM	Grey Silty SAND	0.0	81.7	16.3	2.0	2.790	0.73	0.42	84.0	22.0	100.8	123.0	127.2
				Minimum:	0.0	77.6	12.3	0.6	2.789	0.53	0.35	63.0	14.2	99.0	116.0	125.9
				Maximum:	4.4	82.7	20.6	2.0	2.814	0.76	0.43	84.0	22.0	114.5	130.8	136.2
				Average:	1.5	80.7	16.4	1.5	2.798	0.67	0.40	74.0	17.8	104.8	123.3	129.8

<u>Soil Density Relationships:</u>

$\gamma_{dry} = [(G_s \times \gamma_w] / (1+e)$

$\gamma_{total} = [(G_s + Se) \times \gamma_w] / (1+e)$

$\gamma_{total} = \gamma_d \times (1 + (w\% / 100))$

$\gamma_{sat} = [(G_s + e) \times \gamma_w] / (1+e)$

$S\% = (w \times G_s) / e$

$n = e / (1+e)$

$e = n / (1-n)$

TABLE 3
ZION LANDFILL SITE 2 NORTH EXPANSION
SUMMARY OF SOIL PROPERTIES AND STANDARD PROCTOR TEST DATA - WADSWORTH FORMATION

Boring Location	Depth BGS (feet)	USCS Soil Class.	Standard Proctor Test Results (ASTM D698)		95% of Standard Proctor			90% of Standard Proctor		
			$\gamma_{dry-max}$ (pcf)	MC_{opt} (%)	γ_{dry} (pcf)	γ_{total} (pcf)	$\gamma_{saturated}$ (pcf)	γ_{dry} (pcf)	γ_{total} (pcf)	$\gamma_{saturated}$ (pcf)
B-01-18 Brown and Grey CLAY	6.0 - 79.0'	CL	118.1	14.5	112.2	128.5	133.8	106.3	121.7	130.0
B-05-18 Grey CLAY	16.0 - 115.5'	CL	119	13.2	113.1	128.0	134.3	107.1	121.2	130.6
		MINIMUM:	118.1	13.2	112.2	128.0	133.8	106.3	121.2	130.0
		MAXIMUM:	119	14.5	113.1	128.5	134.3	107.1	121.7	130.6
		AVERAGE:	118.6	13.9	112.6	128.2	134.1	106.7	121.5	130.3

Notes:

1) Values in cells shaded in gray were calculated using the soil density relationships below.

Soil Density Relationships:

$\gamma_{total} = \gamma_d \times (1 + (w\% / 100))$

$\gamma_{sat} = [(G_s + e) \times \gamma_w] / (1+e)$

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TABLE 4
ZION LANDFILL SITE 2 NORTH EXPANSION
SUMMARY OF REMOLDED PERMEABILITY TEST RESULTS FOR REMOLDED WADSWORTH TILL SAMPLES

Boring No.	Depth BGS (feet)	Description	Hydraulic Conductivity Test Data (ASTM D5084)								
			Specific Gravity "G_s"	Void Ratio "e"	Porosity "n"	Saturation "S" (%)	Moisture Content "w" (%)	Dry Unit Weight "γ_{dry}" (pcf)	Total Unit Weight "γ_{total}" (pcf)	Sat. Unit Weight "γ_{sat}" (pcf)	Hydr. Cond. "k" (cm/sec)
B-01-18	6'- 79'	Opt+ 0%	2.750	0.49	0.33	78	14.0	114.9	131.0	135.5	2.13E-07
		Opt+ 2%	2.750	0.50	0.33	88	16.0	114.4	132.8	135.2	3.05E-08
		Opt+ 4%	2.750	0.51	0.34	99	18.2	113.9	134.7	134.9	1.95E-08
B-05-18	16'-115.5'	Opt+ 0%	2.750	0.50	0.33	71	12.9	114.6	129.3	135.3	1.73E-07
		Opt+ 2%	2.750	0.47	0.32	87	15.0	116.5	134.0	136.6	3.53E-08
		Opt+ 4%	2.750	0.49	0.33	97	17.4	115.0	135.0	135.6	1.54E-08
		MINIMUM:	**2.750**	**0.47**	**0.32**	**71**	**12.9**	**113.9**	**129.3**	**134.9**	**1.54E-08**
		MAXIMUM:	**2.750**	**0.51**	**0.34**	**99**	**18.2**	**116.5**	**135.0**	**136.6**	**2.13E-07**
		AVERAGE:	**2.750**	**0.49**	**0.33**	**87**	**15.6**	**114.9**	**132.8**	**135.5**	**4.78E-08**

Note:

1) Values in cells shaded in gray were calculated using the soil density relationships below.

Soil Density Relationships:

$\gamma_{dry} = [(G_s \times \gamma_w] / (1+e)$

$\gamma_{total} = [(G_s + Se) \times \gamma_w] / (1+e)$

$\gamma_{total} = \gamma_d \times (1 + (w\% / 100))$

$\gamma_{sat} = [(G_s + e) \times \gamma_w] / (1+e)$

$S\% = (w \times G_s) / e$

$n = e / (1+e)$

$e = n / (1-n)$

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TABLE 5
ZION LANDFILL SITE 2 NORTH EXPANSION
SUMMARY OF TRIAXIAL SHEAR STRENGTH TEST DATA - WADSWORTH FORMATION

Boring Location	Sample No.	Depth (Feet MSL)	Soil	Mohr Circles				Total (Undrained) Shear Strength		Effective (Drained) Shear Strength	
				Failure Stress	1	2	3	Cohesion (C)	Friction Angle (ϕ)	Cohesion (C')	Friction Angle (ϕ')
Consolidated Undrained - Triaxial Shear Strength: ASTM D2850											
B-01-18	ST-31	60.0 - 62.0'	Brown-Grey CLAY	σ_1:	4,752 psf	8,496 psf	14,976 psf	752 psf	24.9 deg	508 psf	33.2 deg
				σ_3:	864 psf	2,016 psf	3,888 psf				
B-12-18	ST-34	66.0 - 68.0'	Grey Silty CLAY	σ_1:	9,173 psf	11,750 psf	12,845 psf	2,740 psf	12.1 deg	48 psf	37.2 deg
				σ_3:	2,218 psf	2,851 psf	3,125 psf				
B-13-18	ST-29	56.0-58.0'	Grey Silty CLAY	σ_1:	6,106 psf	9,202 psf	9,821 psf	1,974 psf	11.1 deg	726 psf	29.5 deg
				σ_3:	1,253 psf	2,174 psf	2,578 psf				
							MINIMUM:	**752 psf**	**11.1 deg**	**48 psf**	**29.5 deg**
							MAXIMUM:	**2,740 psf**	**24.9 deg**	**726 psf**	**37.2 deg**
							AVERAGE:	**1,822 psf**	**16.0 deg**	**427 psf**	**33.3 deg**
Unconsolidated Undrained - Triaxial Shear Strength: ASTM D4767											
B-06-18	ST-38	74.0 - 76.0'	Brown-Grey CLAY	σ_1:	8,640 psf	12,816 psf	21,168 psf	1,519 psf	20.7 deg		
				σ_3:	2,016 psf	4,032 psf	8,064 psf				
B-07-18	ST-29	56.0 - 58.0'	Brown-Grey Silty CLAY	σ_1:	7,344 psf	10,368 psf	15,120 psf	2,481 psf	6.0 deg		
				σ_3:	2,016 psf	3,312 psf	8,064 psf				
B-15-18	ST-30	58.0 - 60.0'	Brown-Grey CLAY	σ_1:	8,064 psf	10,656 psf	15,840 psf	2,344 psf	7.8 deg		
				σ_3:	2,016 psf	4,032 psf	8,064 psf				
							MINIMUM:	**1,519 psf**	**6.0 deg**		
							MAXIMUM:	**2,481 psf**	**20.7 deg**		
							AVERAGE:	**2,115 psf**	**11.5 deg**		

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TABLE 6
ZION LANDFILL SITE 2 NORTH EXPANSION
SUMMARY OF 2018 CONSOLIDATION PARAMETERS

Geoligc Unit	Specific Gravity G_s	Dry Unit Weight[1] γ_{dry} (pcf)	Moisture Content %	Saturation (%)	Total Unit Weight[1] γ_{total} (pcf)	Saturated Unit Weight[1] γ_{sat} (pcf)	Pre-Consolidation Stress σ'_{pc} (psf)	Existing Effective Overburden Stress σ'_{vo} (psf)	OCR	Void Ratio (e_o)	Compression Index (C_c)	Recompression Index (C_r)	Secondary Compression Index (C_α)
Clay: B-02-18, ST-29 (56.0 - 58.0' bgs)	2.750	124.0	13.3	94.8	140.5	141.2	5,600	6,870	0.82	0.385	0.09	0.009	0.0036
Clay: B-04-18, ST-27 (52.0 - 54.0' bgs)	2.750	115.5	16.8	95.1	134.9	135.9	8,400	5,528	1.52	0.486	0.09	0.015	0.0036
Clay B-09-18, ST-31 (60.0 - 62.0' bgs)	2.750	124.6	13.2	95.7	141.0	141.6	7,000	7,097	0.99	0.378	0.07	0.027	0.0028
Averages:	**2.750**	**120.1**	**15.0**	**95.4**	**138.0**	**138.8**	**7,700**	**6313**	**1.25**	**0.432**	**0.08**	**0.021**	**0.0032**

Notes:

1. B-02-18 was assumed to be disturbed and was not inlcuded in the averages values reported in the table.
2. Consolidation tests were performed on representative soil samples taken at the borings/sample locations noted above.
3. The pre-consolidation stresses reported above were derived from the consolidation test data plots provided the attached pages.
4. The existing overburden stresses were calculated using the unit weight and the sample depth intervals reported above.

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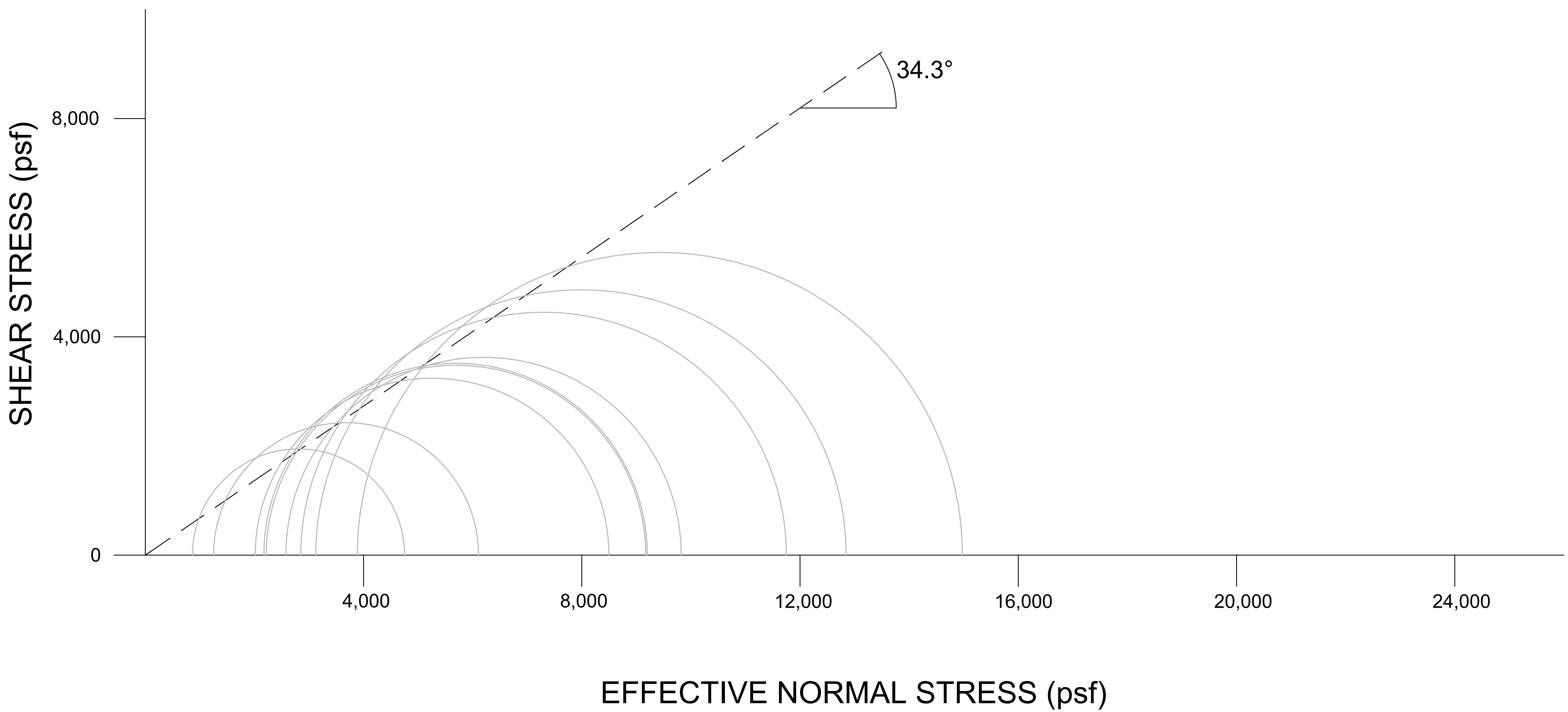
Mohr Circle Plots

EFFECTIVE STRESS CONSOLIDATED-UNDRAINED (CU) TRIAXIAL TEST RESULTS



REV. NO.	DATE	DESCRIPTION

APTIM

APTIM Environmental & Infrastructure, LLC

ZION LANDFILL - SITE 2 NORTH EXPANSION
MOHR CIRCLES

EFFECTIVE SHEAR STRENGTH RESULTS
CU TRIAXIAL SHEAR STRENGTH TESTS

DRAWN BY:	ORC	APPROVED BY:	DAM	PROJ. NO.:	631020105	DATE:	FEBRUARY 2020

TOTAL STRESS CONSOLIDATED-UNDRAINED (CU) TRIAXIAL TEST RESULTS

REV. NO.	DATE	DESCRIPTION

APTIM

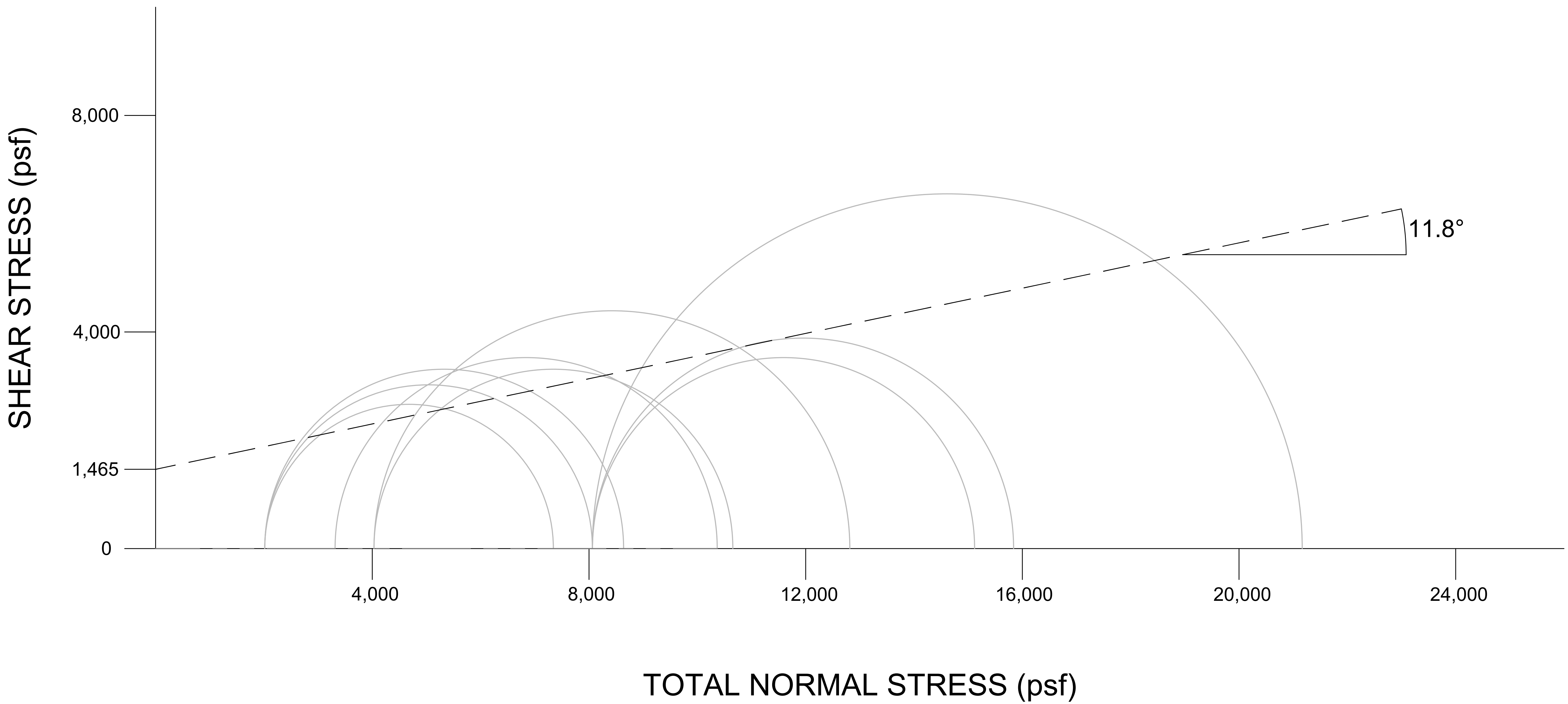
APTIM Environmental & Infrastructure, LLC

ZION LANDFILL - SITE 2 NORTH EXPANSION
MOHR CIRCLES

TOTAL SHEAR STRENGTH RESULTS
CU TRIAXIAL SHEAR STRENGTH TESTS

DRAWN BY: ORC	APPROVED BY: DAM	PROJ. NO.: 631020105	DATE: FEBRUARY 2020

UNCONSOLIDATED-UNDRAINED (UU) TRIAXIAL TEST RESULTS



REV. NO.	DATE	DESCRIPTION

APTIM

APTIM Environmental & Infrastructure, LLC

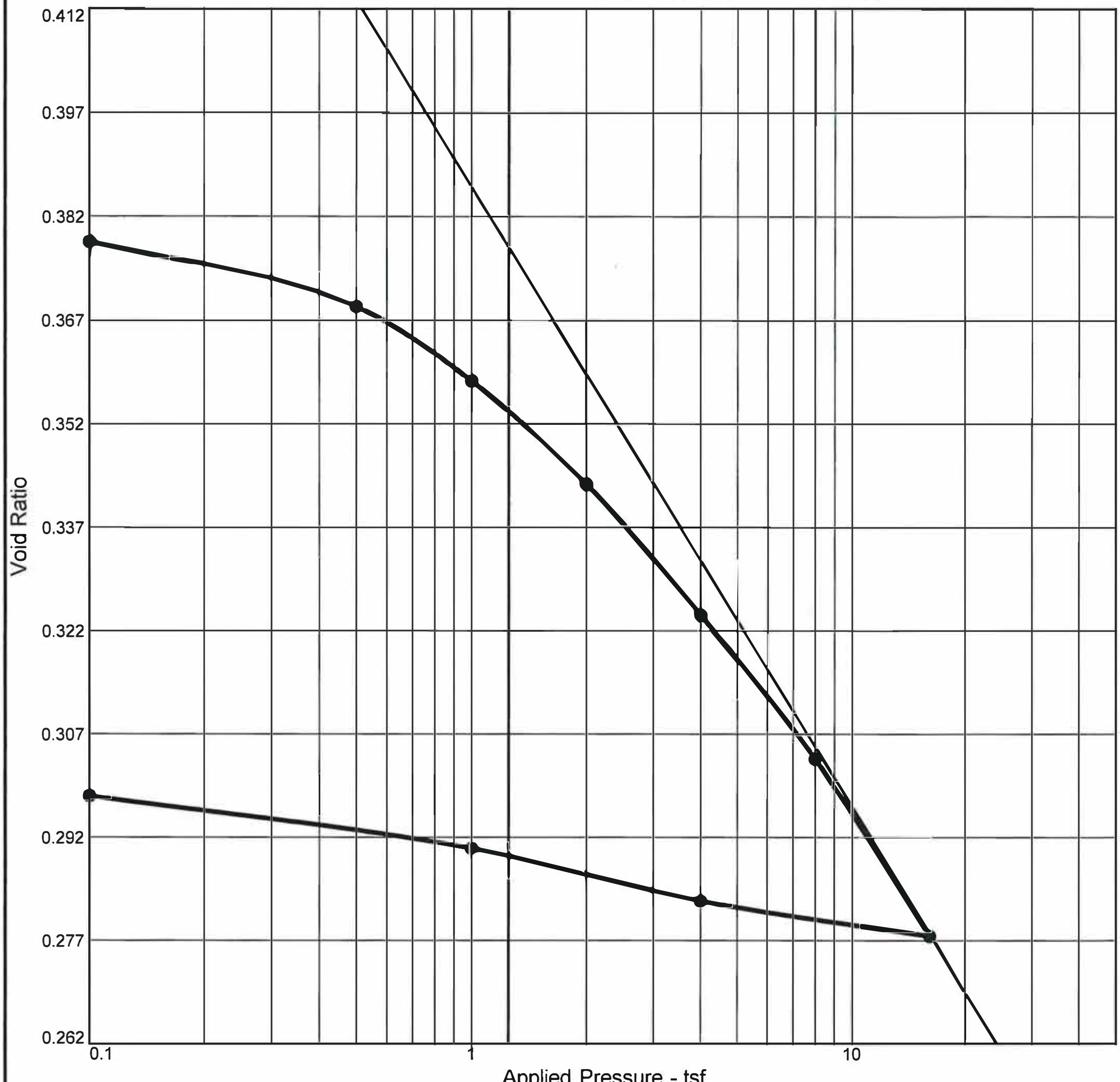
ZION LANDFILL - SITE 2 NORTH EXPANSION
MOHR CIRCLES

TOTAL SHEAR STRENGTH RESULTS
UU TRIAXIAL SHEAR STRENGTH TESTS

DRAWN BY: ORC	APPROVED BY: DAM	PROJ. NO.: 631020105	DATE: FEBRUARY 2020

Consolidation Test Data Plots

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
94.8 %	13.3 %	124.0			2.75		2.8	0.09		0.385

MATERIAL DESCRIPTION	USCS	AASHTO
Brown-Grey Silty CLAY		

Project No. 28287 **Client:** APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-2 **Depth:** 56.0- 58.0' **Sample Number:** ST-29

Midland Standard Engineering & Testing

South Elgin, IL

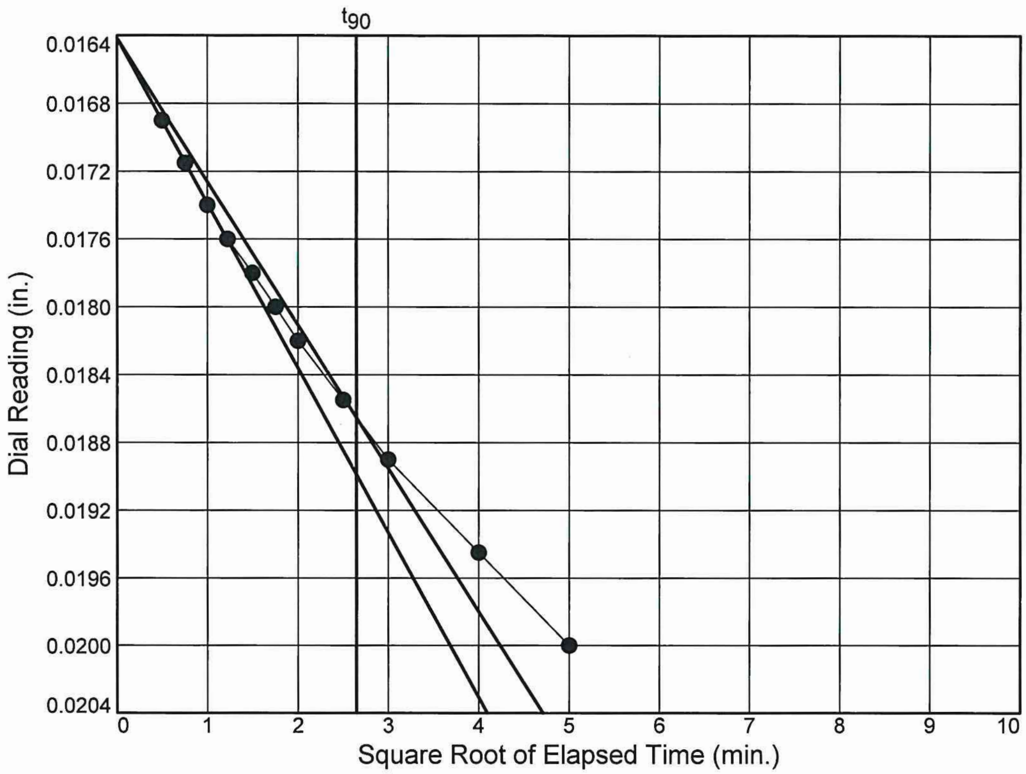
Remarks:

Figure

Dial Reading vs. Time

Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-2 Depth: 56.0- 58.0' Sample Number: ST-29



Load No.= 1

Load= 0.10 tsf

D_0 = 0.0164

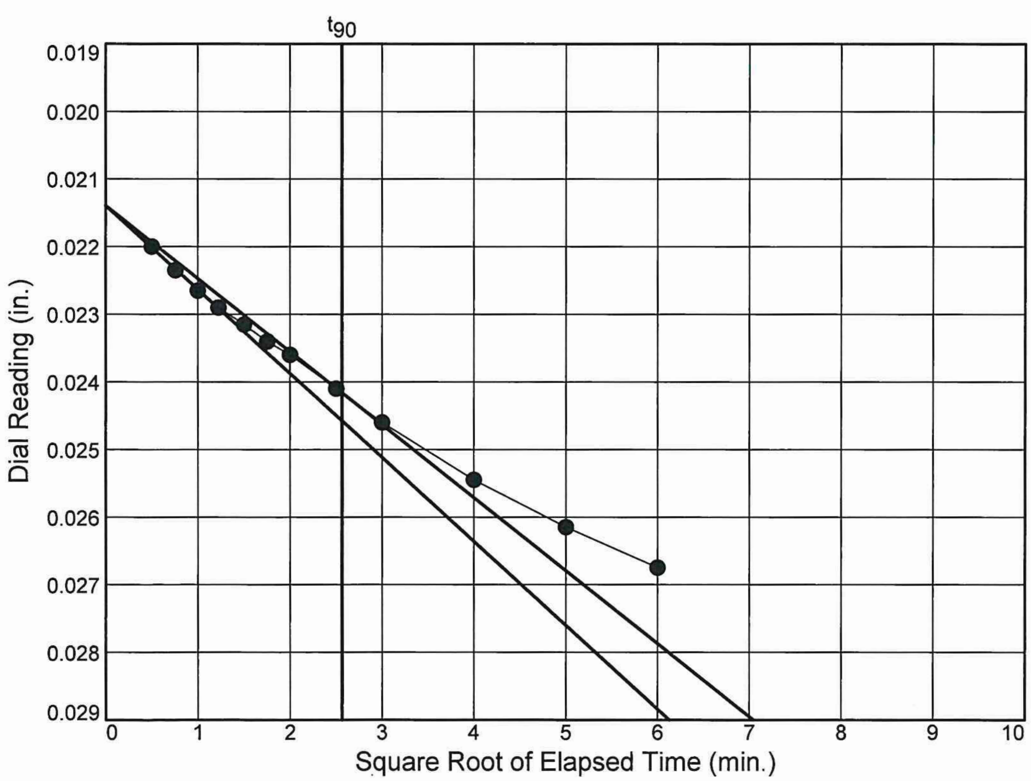
D_{90} = 0.0187

D_{100} = 0.0189

T_{90} = 6.99 min.

C_v @ T_{90}

0.302 $ft.^2$/day



Load No.= 2

Load= 0.50 tsf

D_0 = 0.0214

D_{90} = 0.0242

D_{100} = 0.0245

T_{90} = 6.57 min.

C_v @ T_{90}

0.318 $ft.^2$/day

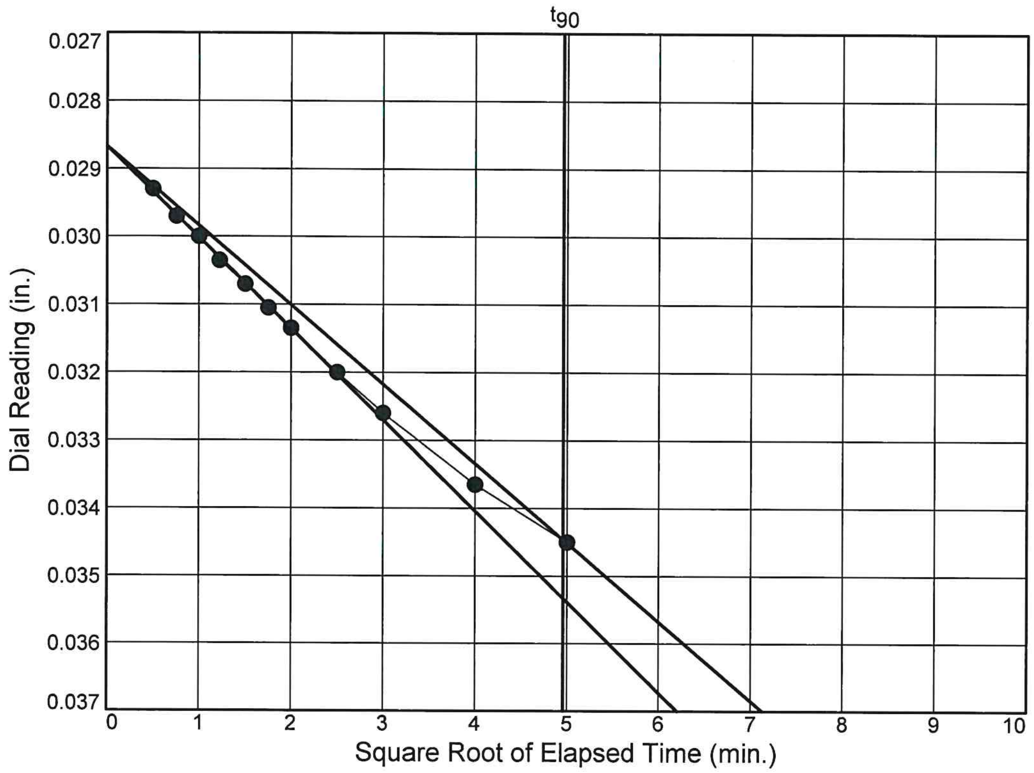
Figure

Midland Standard Engineering & Testing

Dial Reading vs. Time

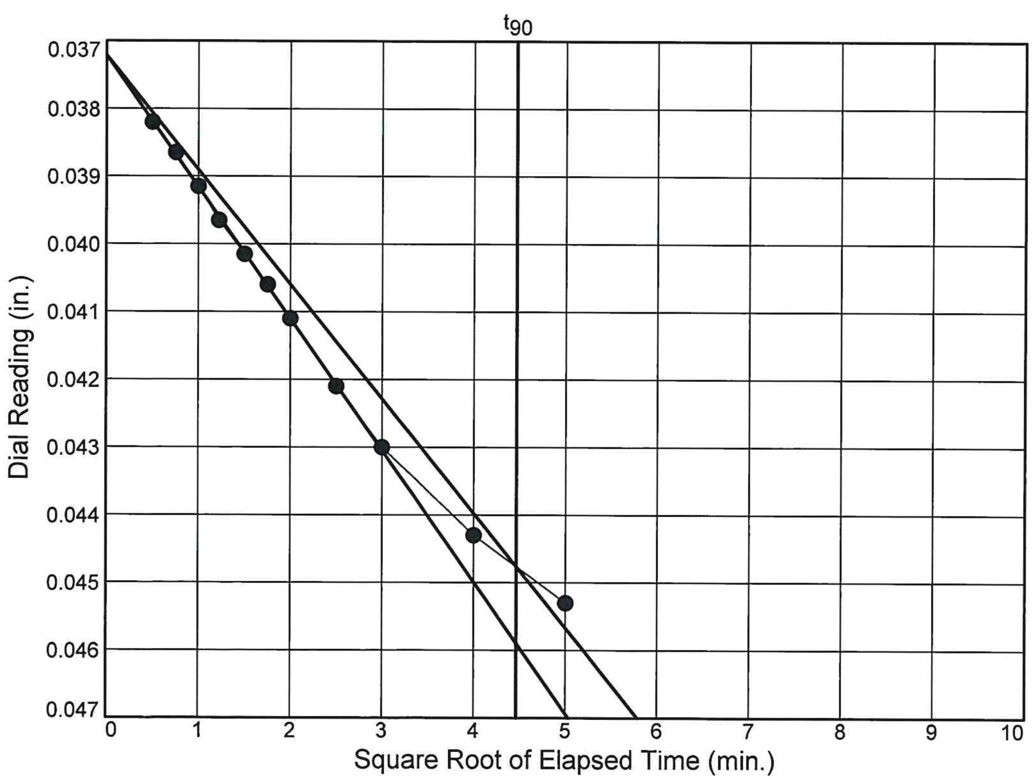
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-2 Depth: 56.0- 58.0' Sample Number: ST-29



Load No.= 3
Load= 1.00 tsf
D_0 = 0.0287
D_{90} = 0.0345
D_{100} = 0.0351
T_{90} = 24.61 min.

C_v @ T_{90}
0.084 $ft.^2$/day



Load No.= 4
Load= 2.00 tsf
D_0 = 0.0372
D_{90} = 0.0448
D_{100} = 0.0456
T_{90} = 19.95 min.

C_v @ T_{90}
0.101 $ft.^2$/day

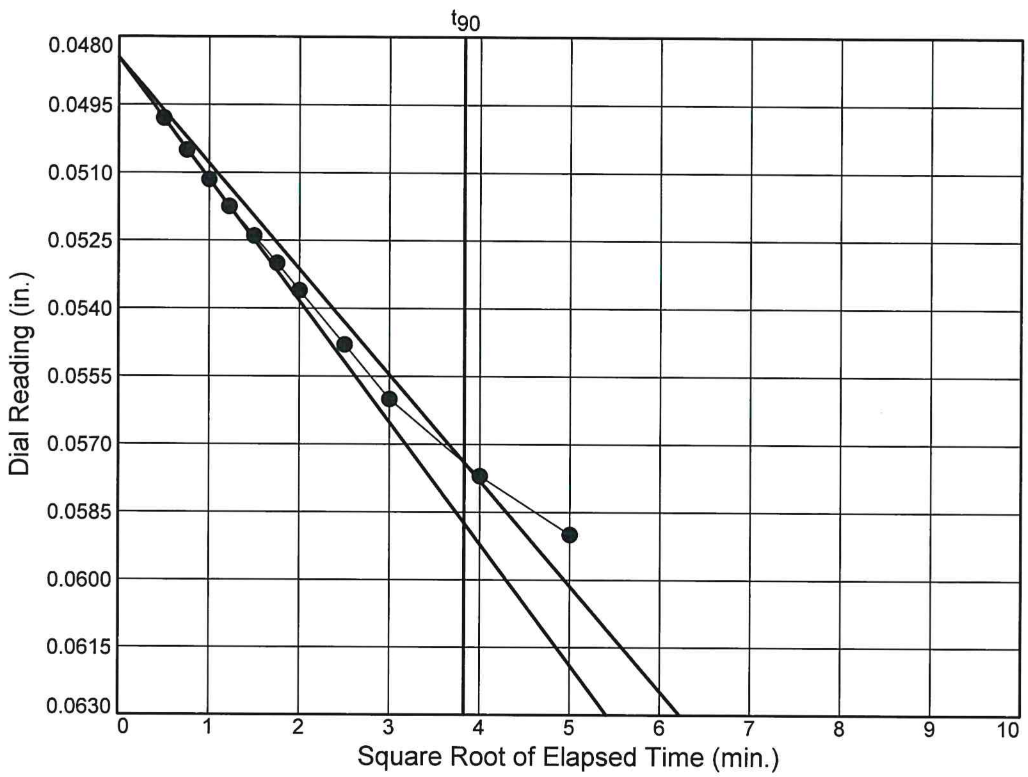
Figure

Midland Standard Engineering & Testing

Dial Reading vs. Time

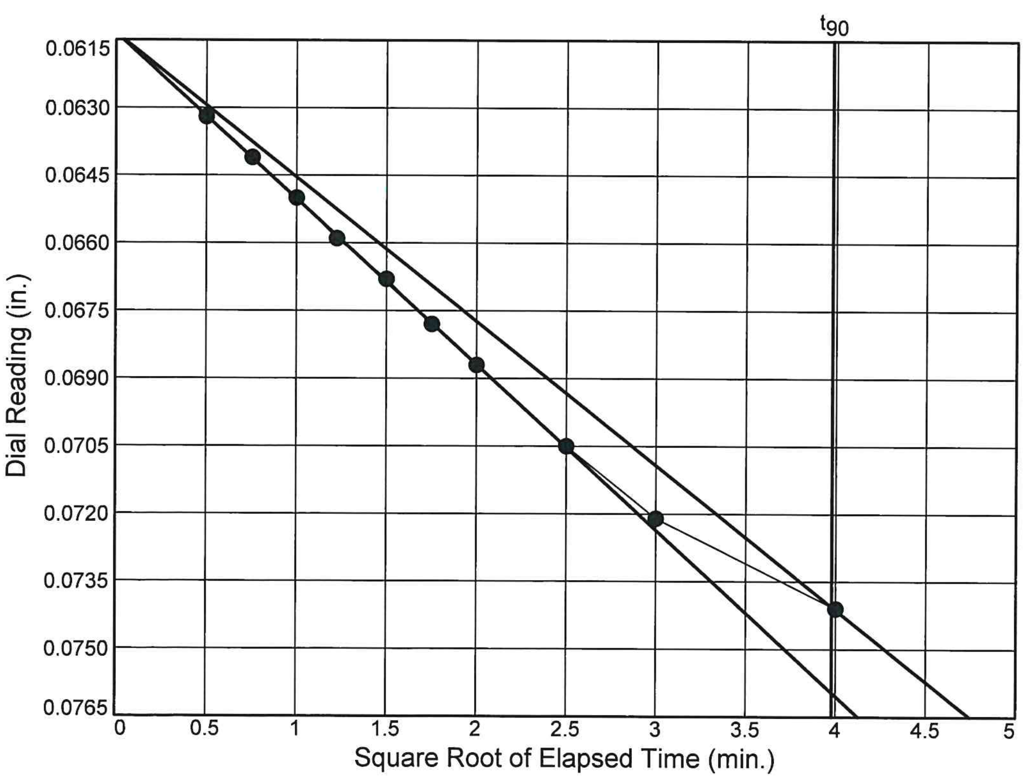
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-2 Depth: 56.0- 58.0' Sample Number: ST-29



Load No.= 5
Load=4.00 tsf
D_0 = 0.0485
D_{90} = 0.0574
D_{100} = 0.0584
T_{90} = 14.66 min.

C_v @ T_{90}
0.134 ft.^{2}/day



Load No.= 6
Load=8.00 tsf
D_0 = 0.0613
D_{90} = 0.0741
D_{100} = 0.0755
T_{90} = 15.84 min.

C_v @ T_{90}
0.120 ft.^{2}/day

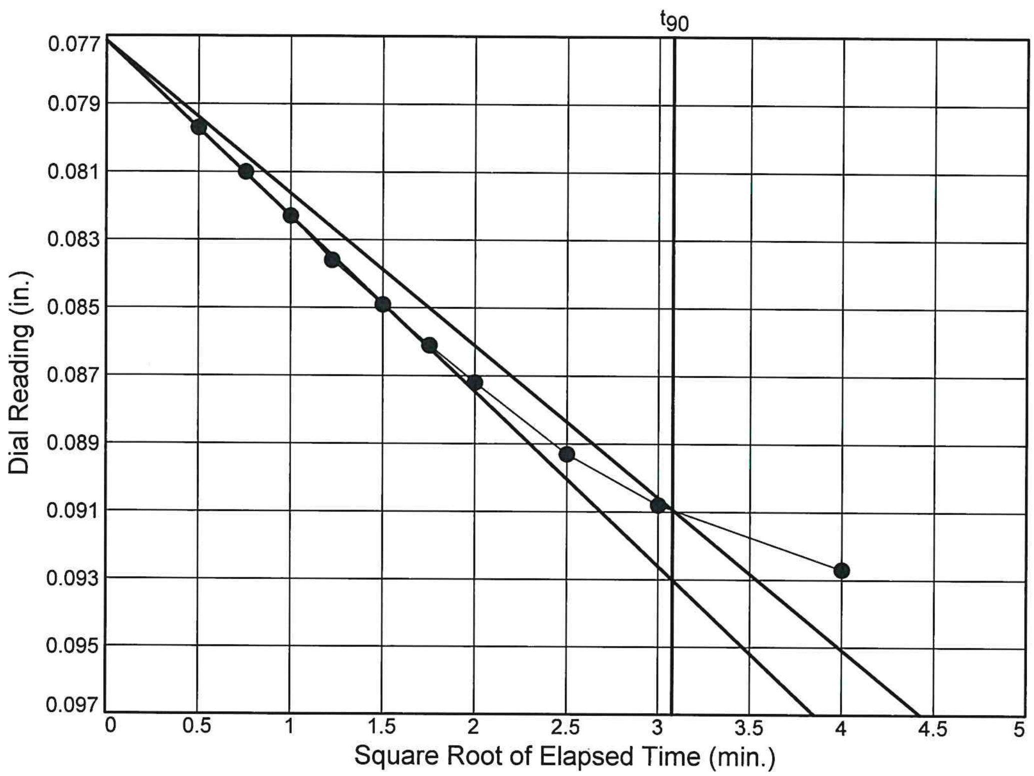
Figure

Midland Standard Engineering & Testing

Dial Reading vs. Time

Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-2 Depth: 56.0- 58.0' Sample Number: ST-29



Load No.= 7

Load= 16.00 tsf

D_0 = 0.0771

D_{90} = 0.0909

D_{100} = 0.0925

T_{90} = 9.47 min.

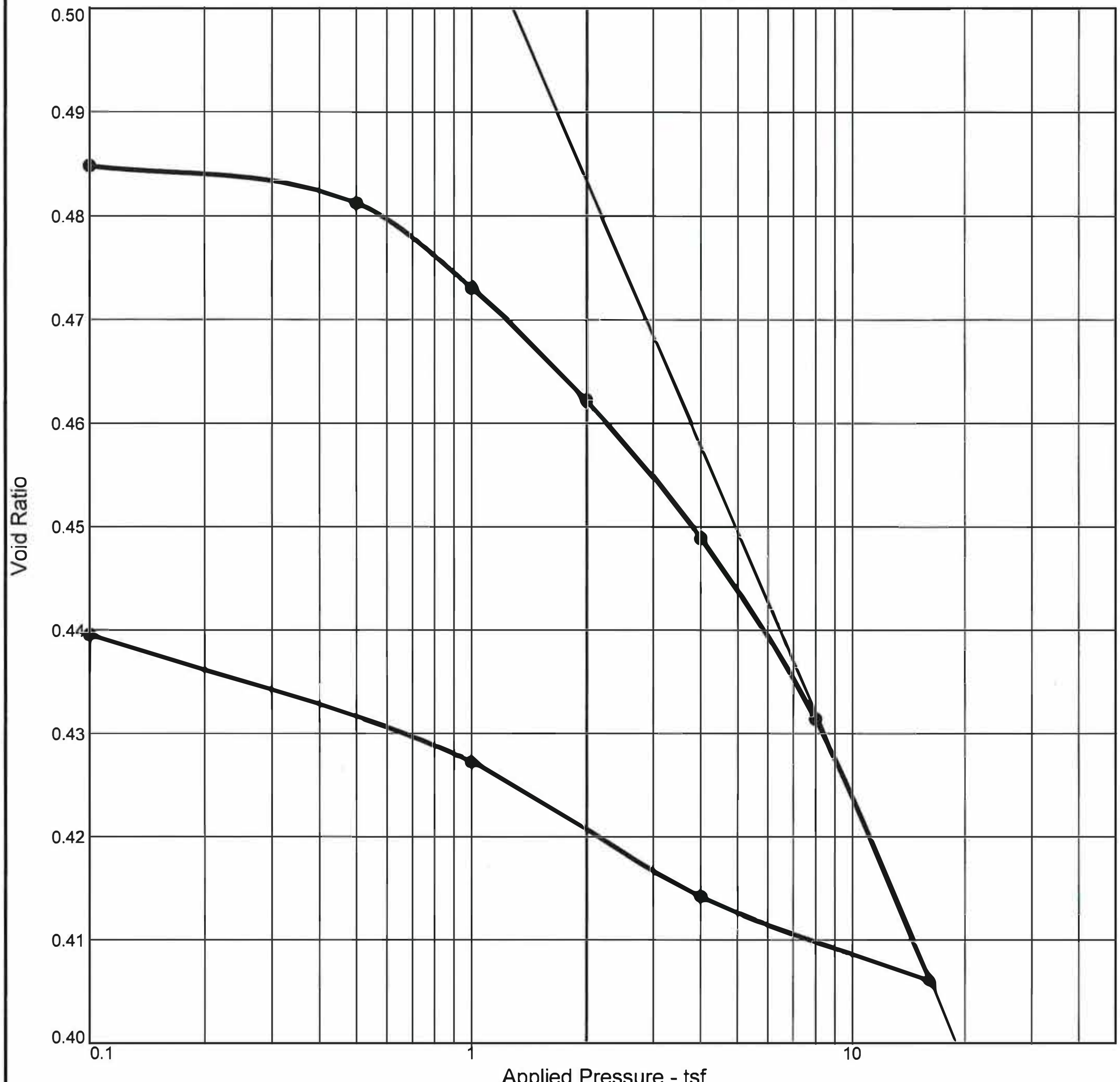
C_v @ T_{90}

0.194 $ft.^2$/day

Figure

Midland Standard Engineering & Testing

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
95.1 %	16.8 %	115.5			2.75		4.2	0.09		0.486

MATERIAL DESCRIPTION	USCS	AASHTO
Brown-grey CLAY		

Project No. 28287 **Client:** APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-4 **Depth:** 52.0- 54.0' **Sample Number:** ST-27

Midland Standard Engineering & Testing

South Elgin, IL

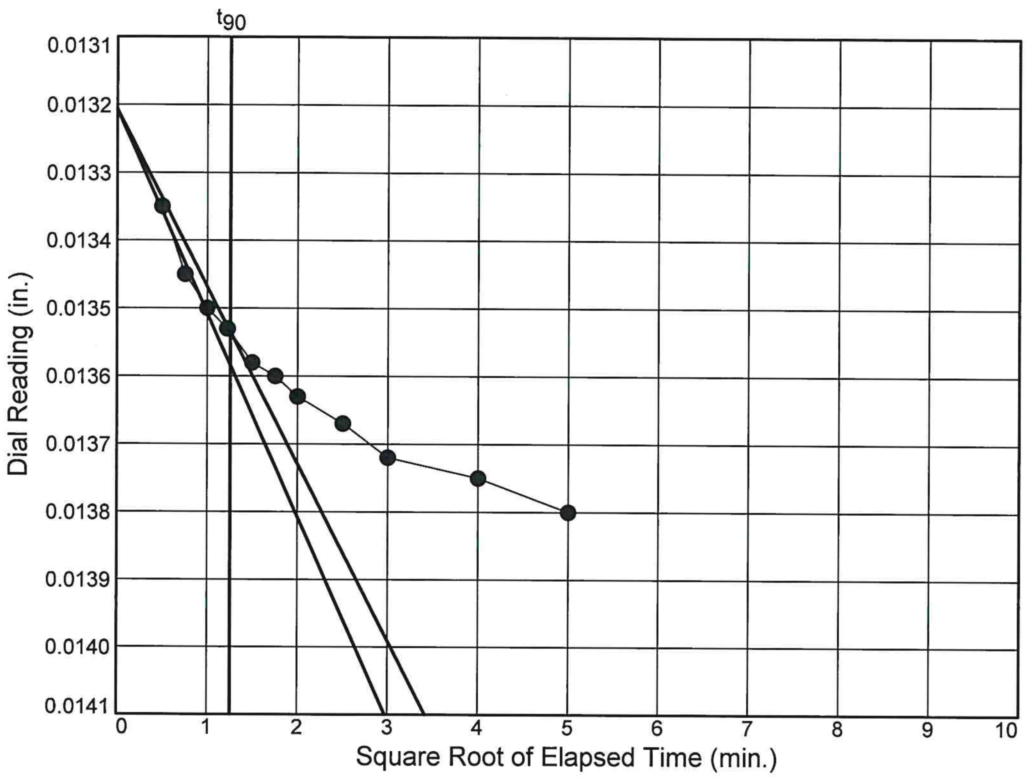
Remarks:

Figure

Dial Reading vs. Time

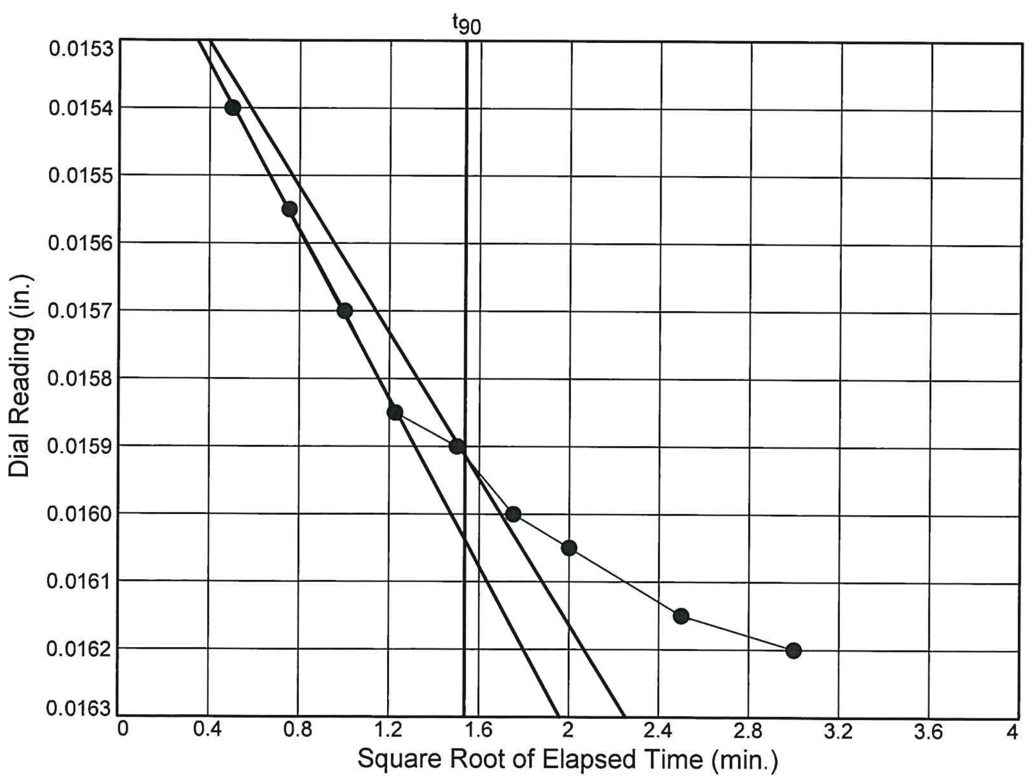
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-4 Depth: 52.0- 54.0' Sample Number: ST-27



Load No.= 1
Load=0.10 tsf
D_0 = 0.0132
D_{90} = 0.0135
D_{100} = 0.0136
T_{90} = 1.58 min.

C_v @ T_{90}
1.348 ft.^{2}/day



Load No.= 2
Load=0.50 tsf
D_0 = 0.0151
D_{90} = 0.0159
D_{100} = 0.0160
T_{90} = 2.36 min.

C_v @ T_{90}
0.899 ft.^{2}/day

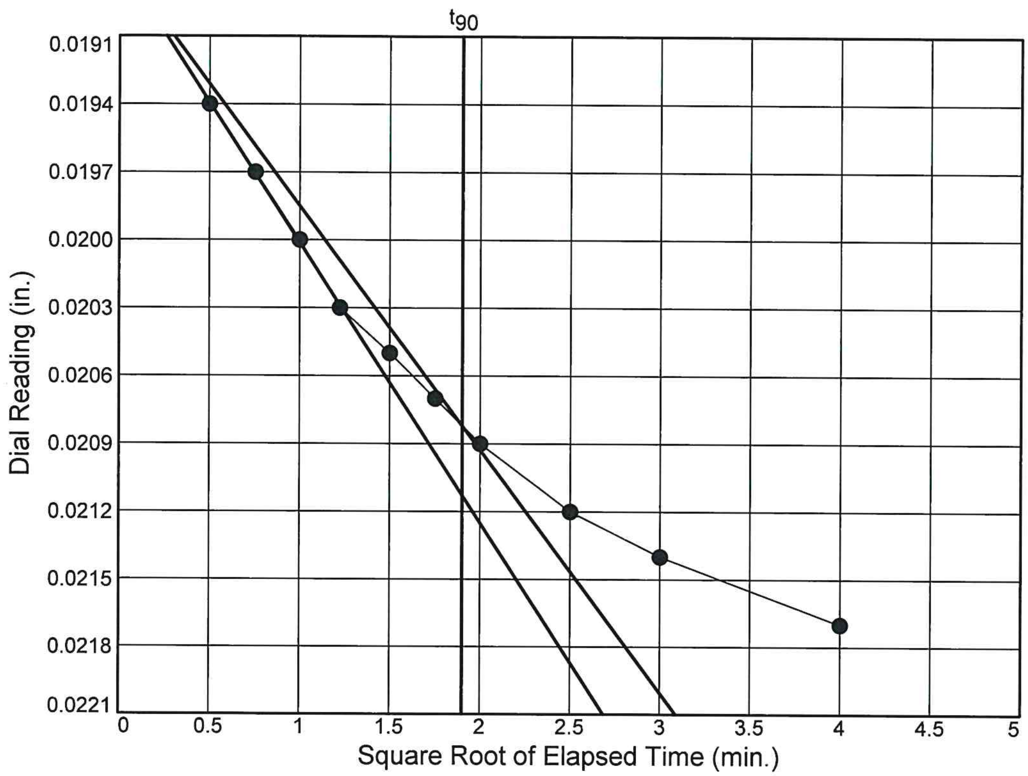
Figure

Midland Standard Engineering & Testing

Dial Reading vs. Time

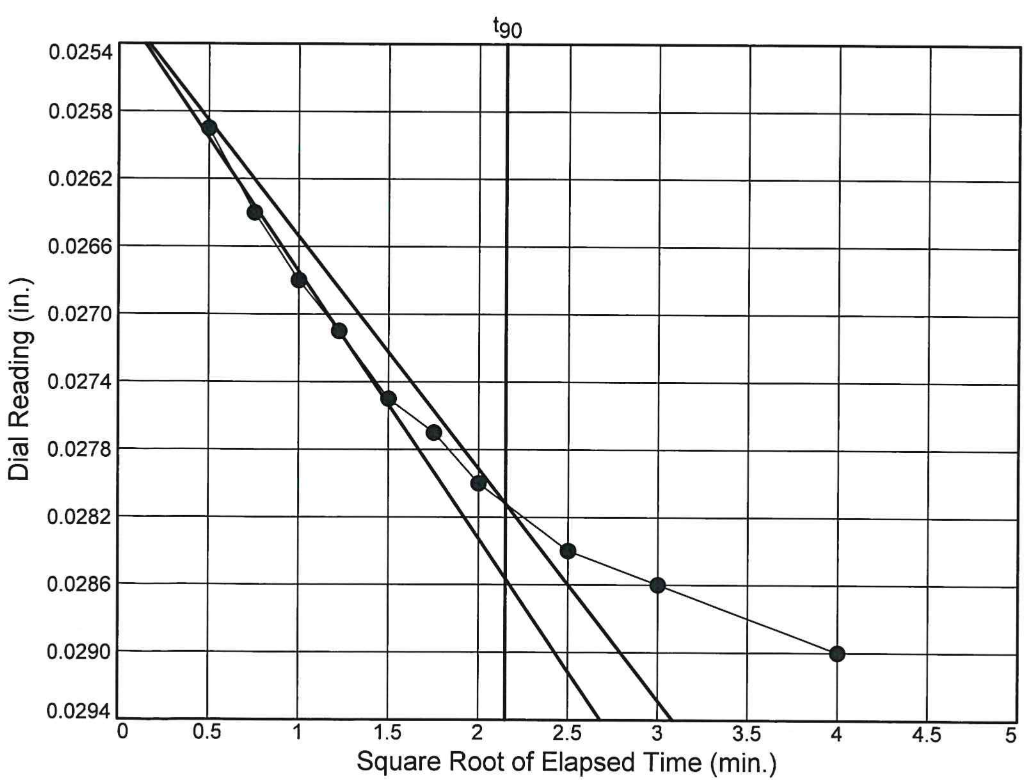
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-4 Depth: 52.0- 54.0' Sample Number: ST-27



Load No.= 3
Load= 1.00 tsf
D_0 = 0.0188
D_{90} = 0.0208
D_{100} = 0.0210
T_{90} = 3.62 min.

C_v @ T_{90}
0.582 ft.^{2}/day



Load No.= 4
Load= 2.00 tsf
D_0 = 0.0252
D_{90} = 0.0281
D_{100} = 0.0284
T_{90} = 4.63 min.

C_v @ T_{90}
0.449 ft.^{2}/day

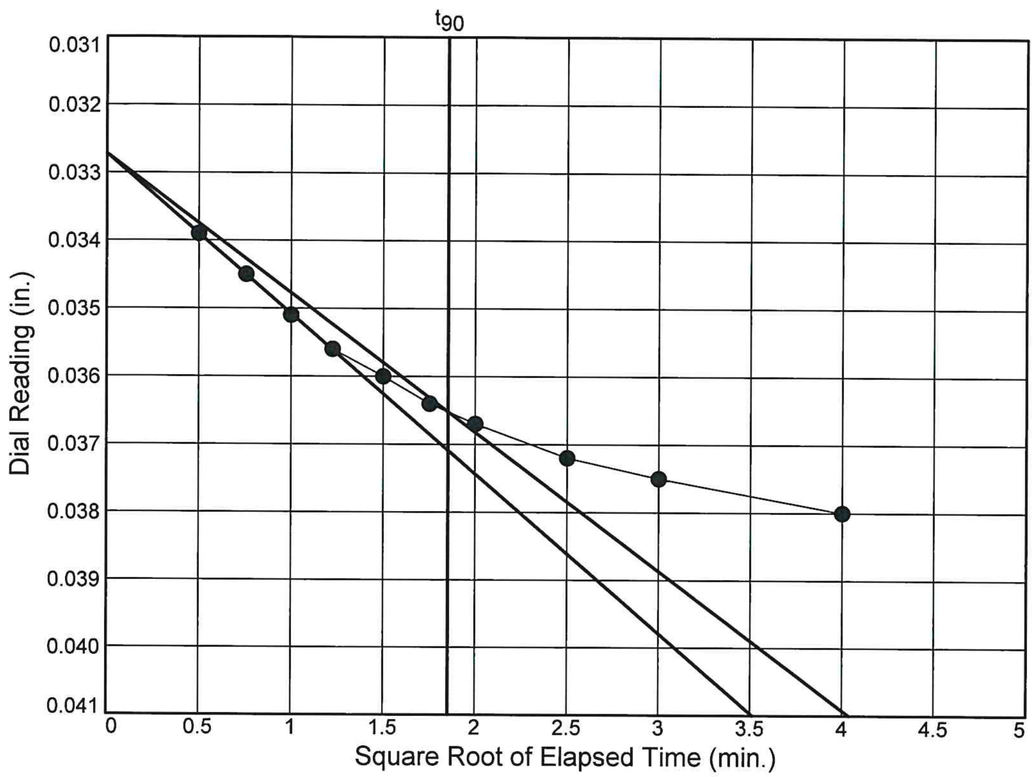
Figure

Midland Standard Engineering & Testing

Dial Reading vs. Time

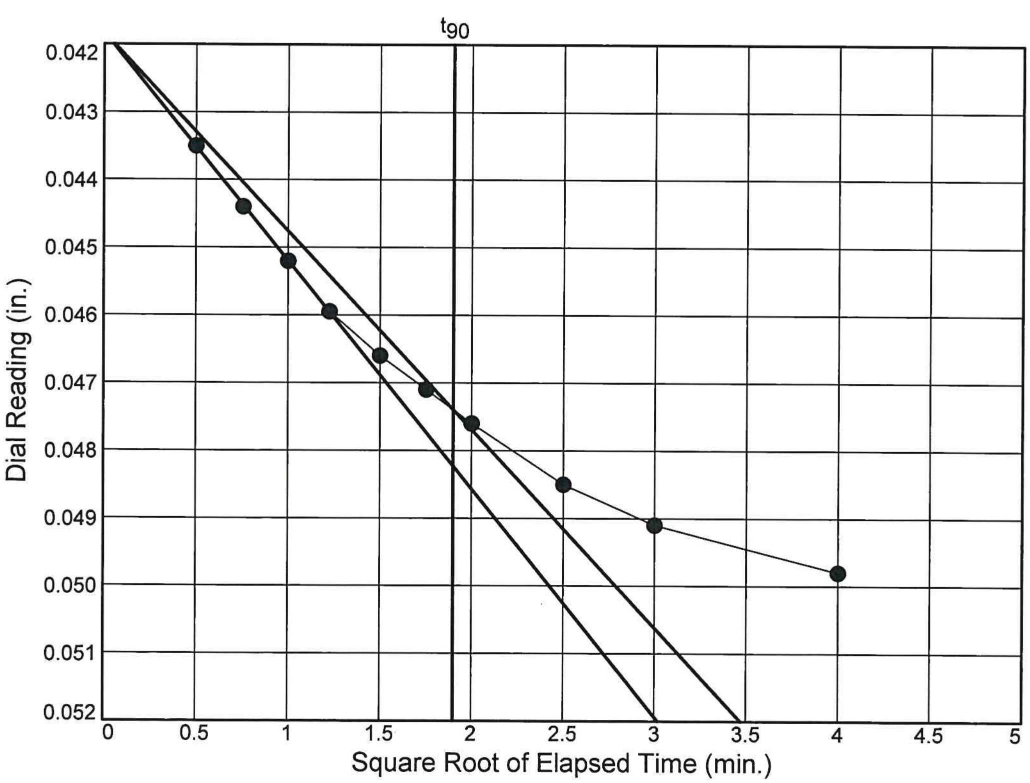
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-4 Depth: 52.0- 54.0' Sample Number: ST-27



Load No.= 5
Load=4.00 tsf
D_0 = 0.0327
D_{90} = 0.0365
D_{100} = 0.0369
T_{90} = 3.44 min.

C_v @ T_{90}
0.594 ft.^{2}/day



Load No.= 6
Load=8.00 tsf
D_0 = 0.0418
D_{90} = 0.0474
D_{100} = 0.0480
T_{90} = 3.61 min.

C_v @ T_{90}
0.554 ft.^{2}/day

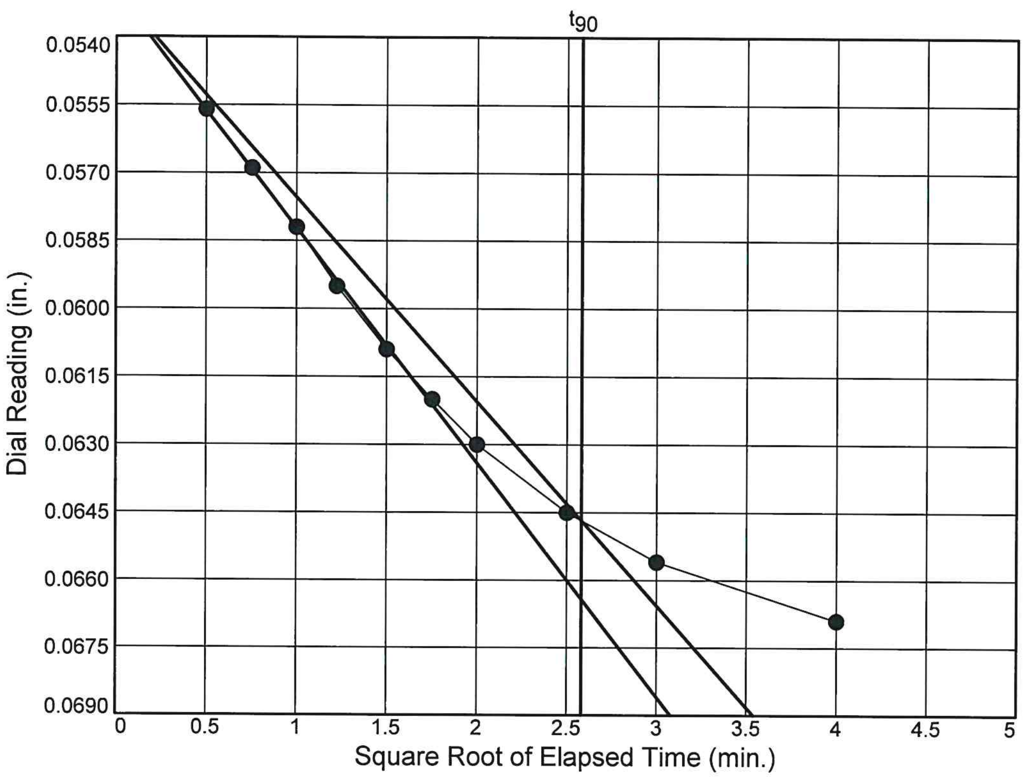
Figure

Midland Standard Engineering & Testing

Dial Reading vs. Time

Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-4 Depth: 52.0- 54.0' Sample Number: ST-27



Load No.= 7

Load= 16.00 tsf

D_0 = 0.0530

D_{90} = 0.0647

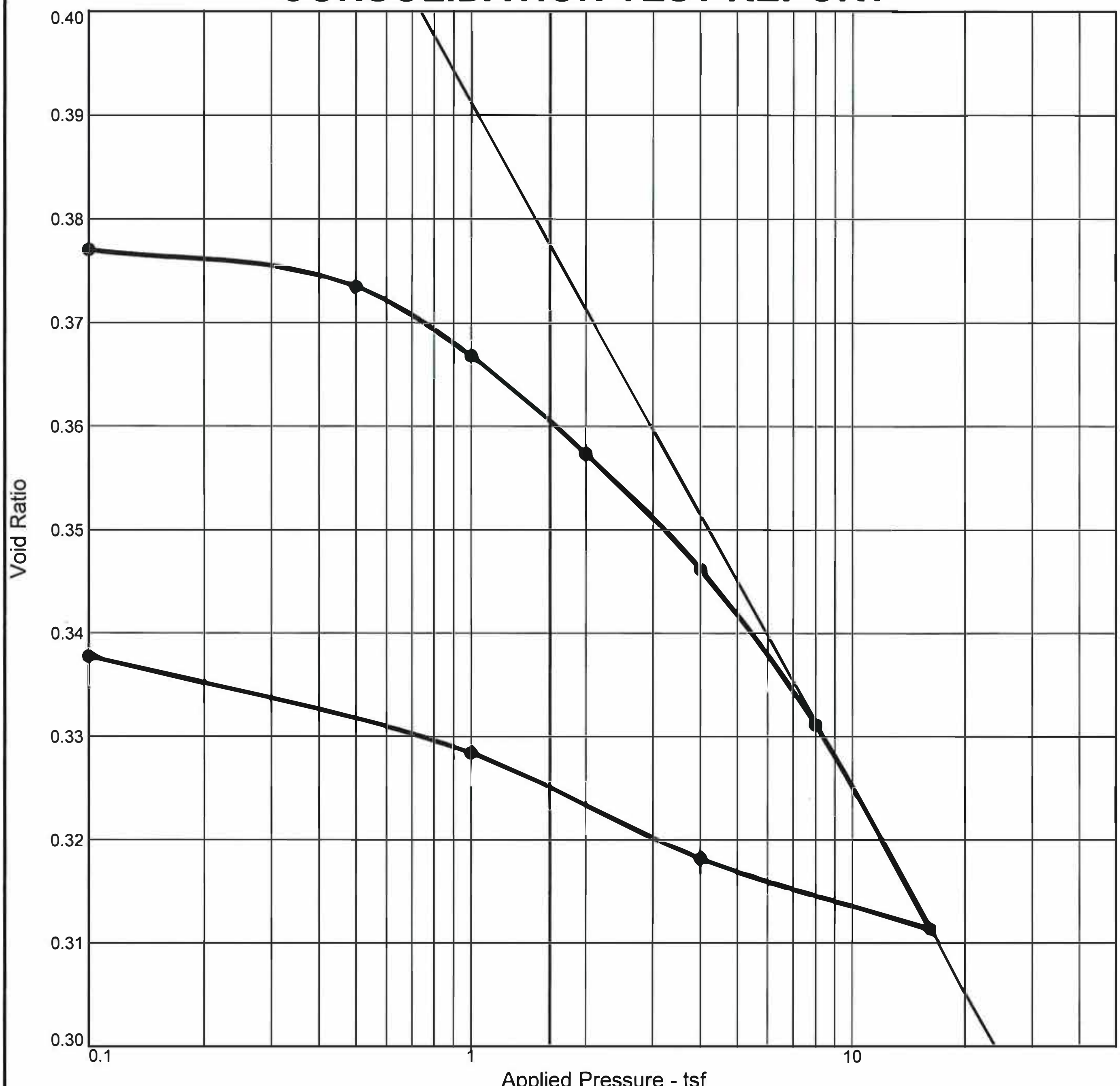
D_{100} = 0.0660

T_{90} = 6.66 min.

C_v @ T_{90}
0.291 ft.^{2}/day

Figure

CONSOLIDATION TEST REPORT



Natural Saturation	Natural Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	C_c	C_r	Initial Void Ratio
95.7 %	13.2 %	124.6			2.75		3.5	0.07		0.378

MATERIAL DESCRIPTION	USCS	AASHTO
Brown-grey Silty CLAY		

Project No. 28287 **Client:** APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-9 **Depth:** 60.0- 62.0' **Sample Number:** ST-31

Midland Standard Engineering & Testing

South Elgin, IL

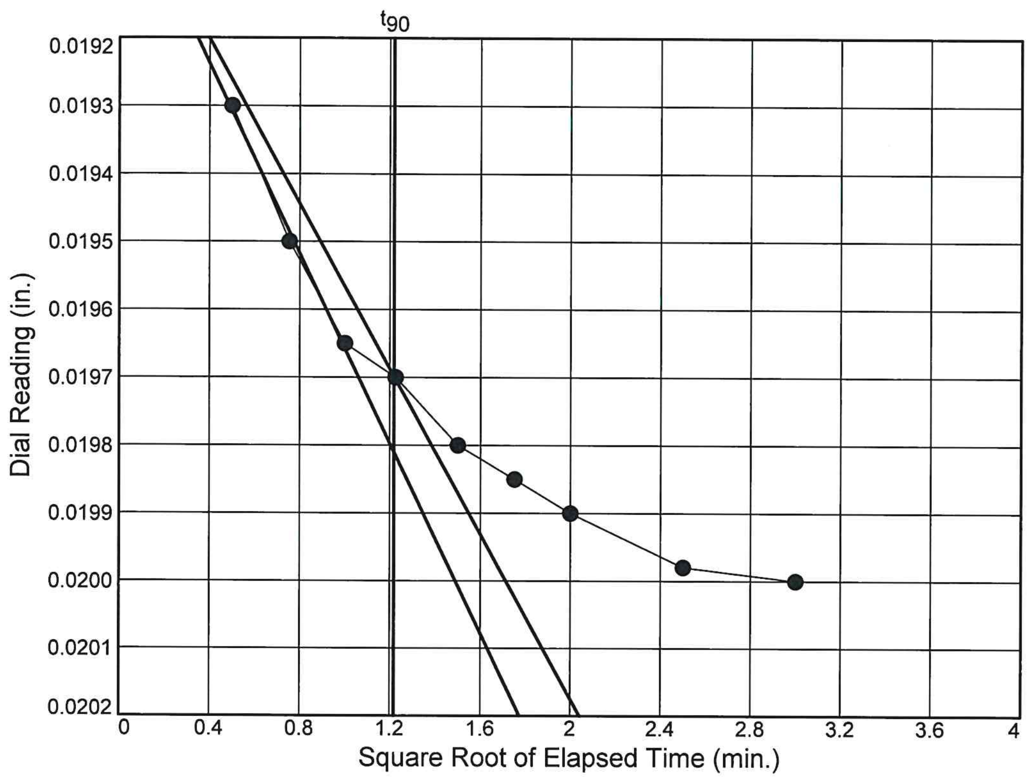
Remarks:

Figure

Dial Reading vs. Time

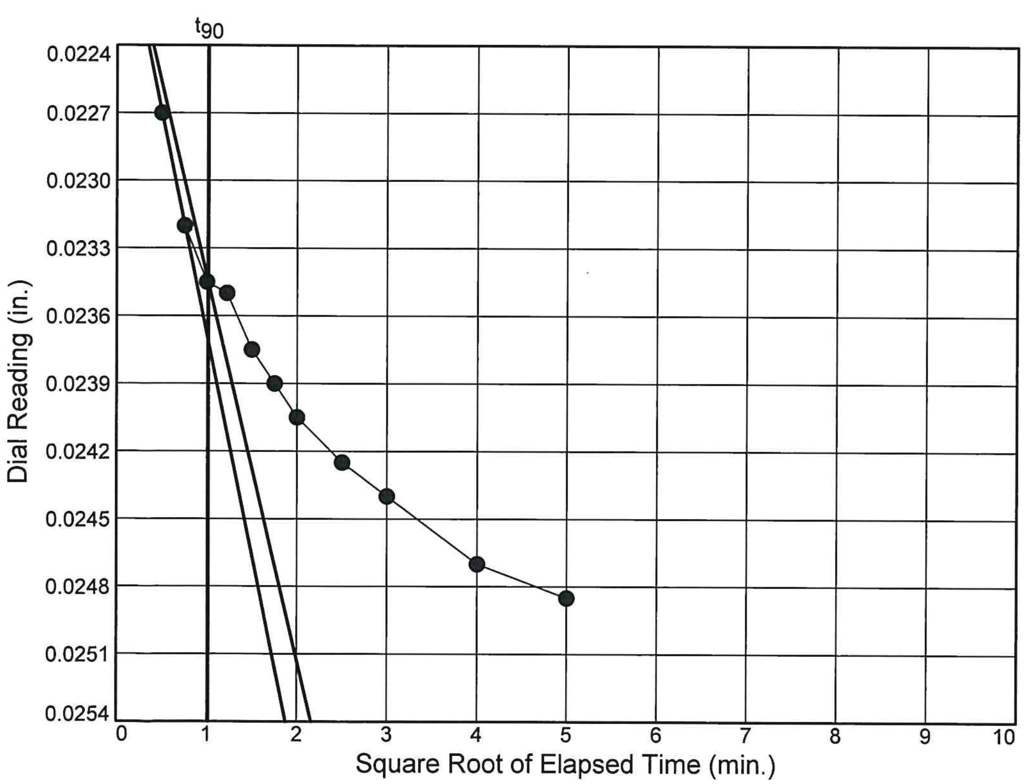
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-9 Depth: 60.0- 62.0' Sample Number: ST-31



Load No.= 2
Load= 0.50 tsf
D_0 = 0.0190
D_{90} = 0.0197
D_{100} = 0.0198
T_{90} = 1.48 min.

C_v @ T_{90}
1.421 ft.^{2}/day



Load No.= 3
Load= 1.00 tsf
D_0 = 0.0217
D_{90} = 0.0235
D_{100} = 0.0236
T_{90} = 1.04 min.

C_v @ T_{90}
2.016 ft.^{2}/day

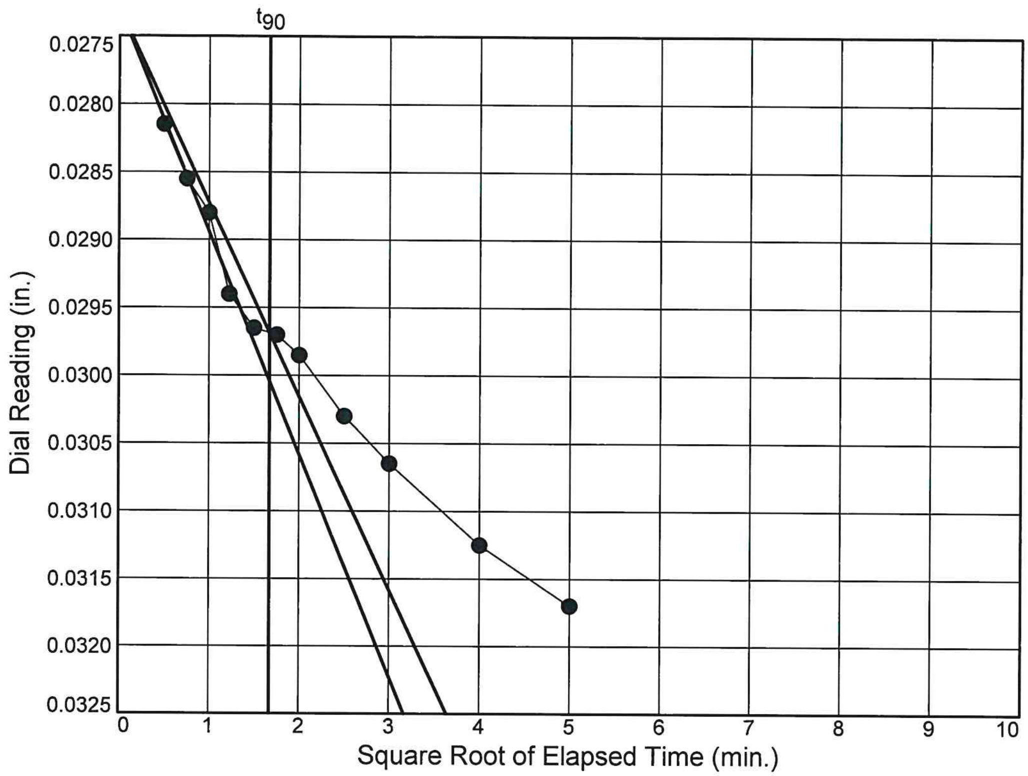
Figure

Midland Standard Engineering & Testing

Dial Reading vs. Time

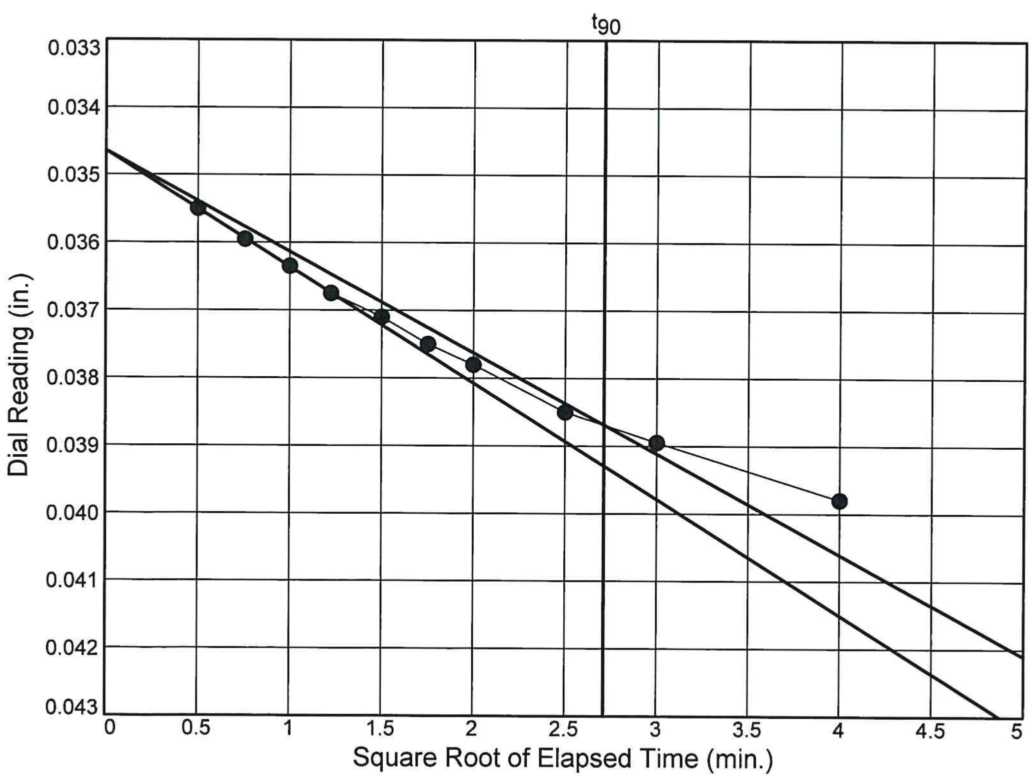
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-9 Depth: 60.0- 62.0' Sample Number: ST-31



Load No.= 4
Load=2.00 tsf
D_0 = 0.0273
D_{90} = 0.0297
D_{100} = 0.0299
T_{90} = 2.79 min.

C_v @ T_{90}
0.740 ft.^{2}/day



Load No.= 5
Load=4.00 tsf
D_0 = 0.0346
D_{90} = 0.0387
D_{100} = 0.0391
T_{90} = 7.35 min.

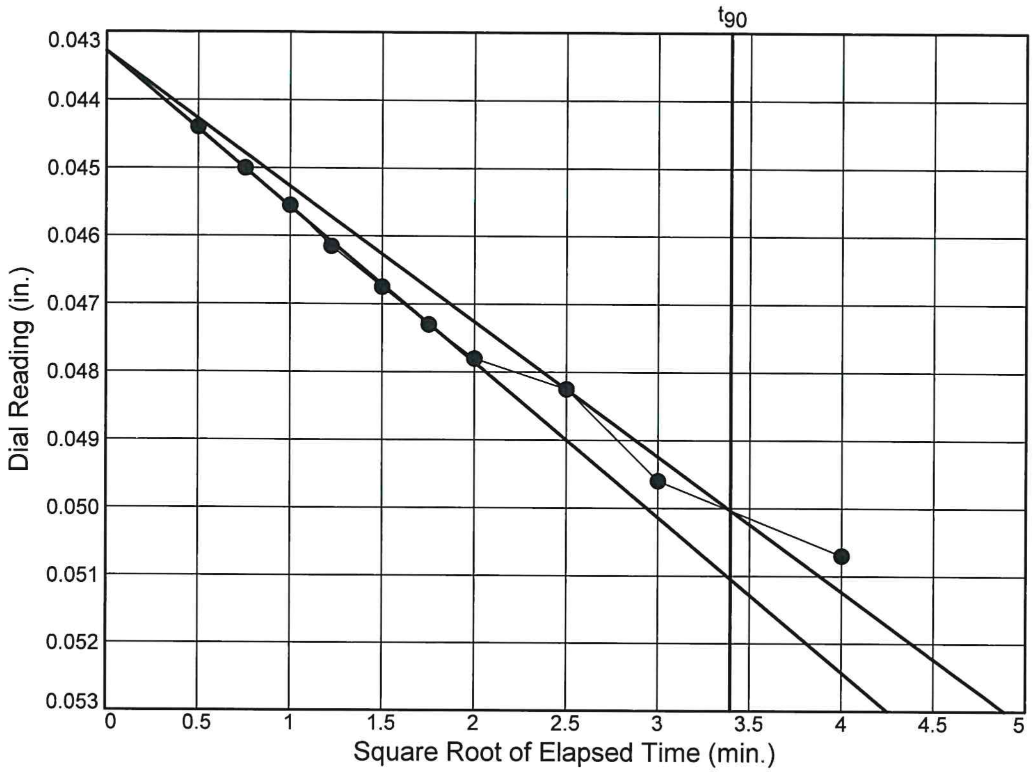
C_v @ T_{90}
0.277 ft.^{2}/day

Figure

Dial Reading vs. Time

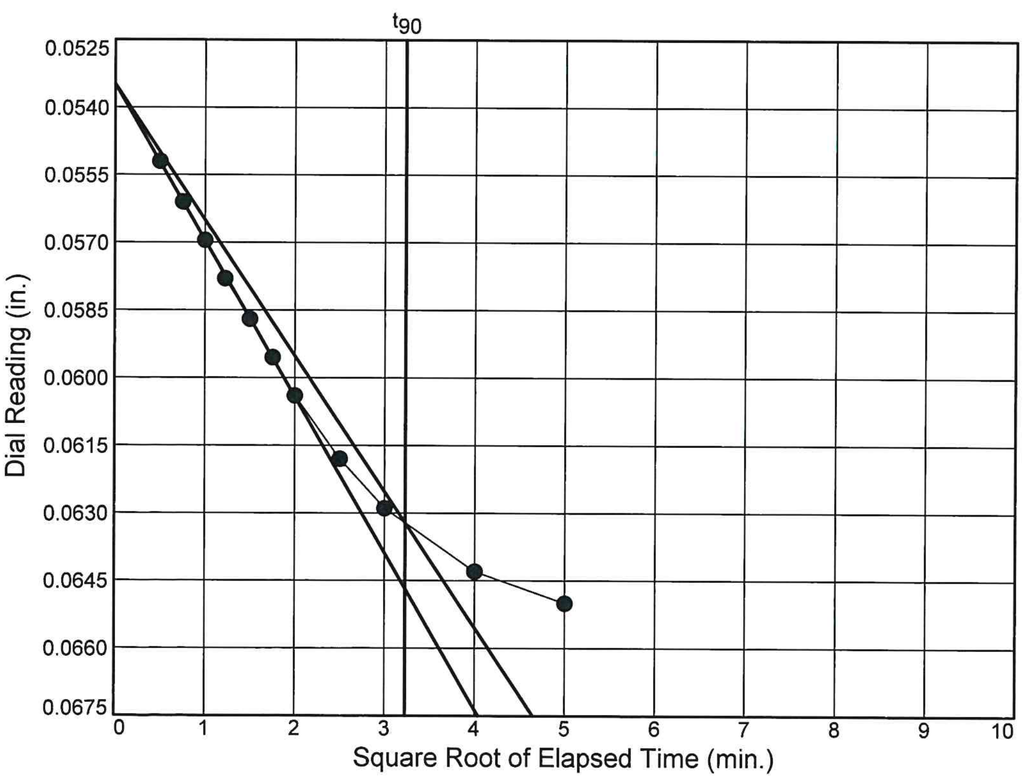
Project No.: 28287
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-9 Depth: 60.0- 62.0' Sample Number: ST-31



Load No.= 6
Load= 8.00 tsf
D_0 = 0.0433
D_{90} = 0.0500
D_{100} = 0.0508
T_{90} = 11.53 min.

C_v @ T_{90}
0.173 ft.^{2}/day



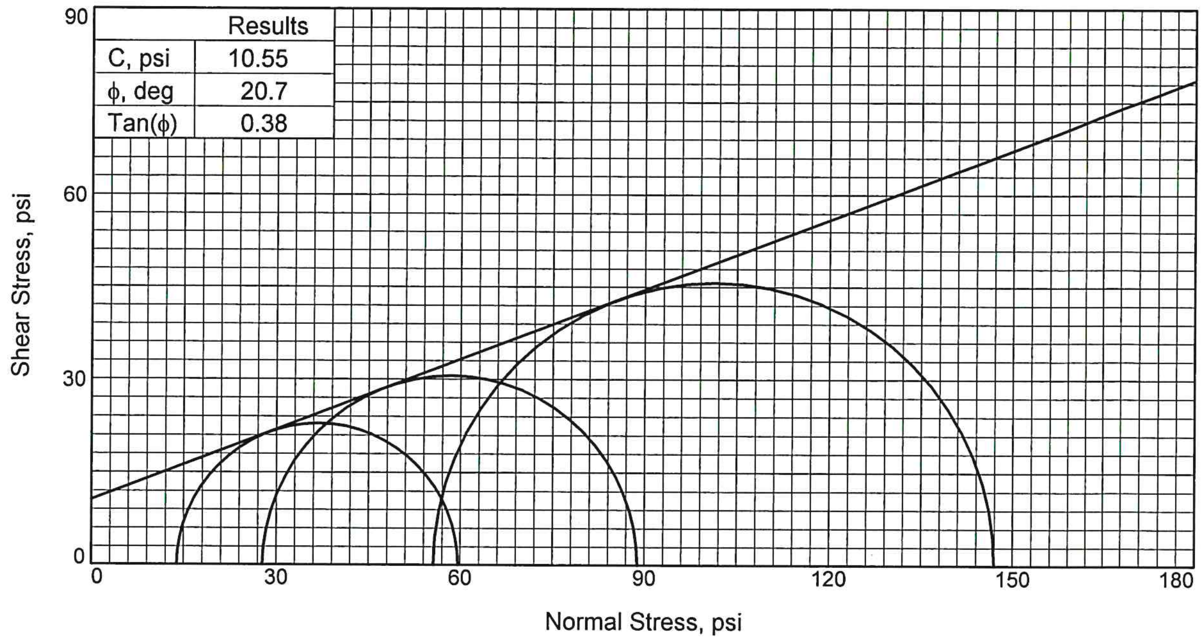
Load No.= 7
Load= 16.00 tsf
D_0 = 0.0535
D_{90} = 0.0632
D_{100} = 0.0643
T_{90} = 10.42 min.

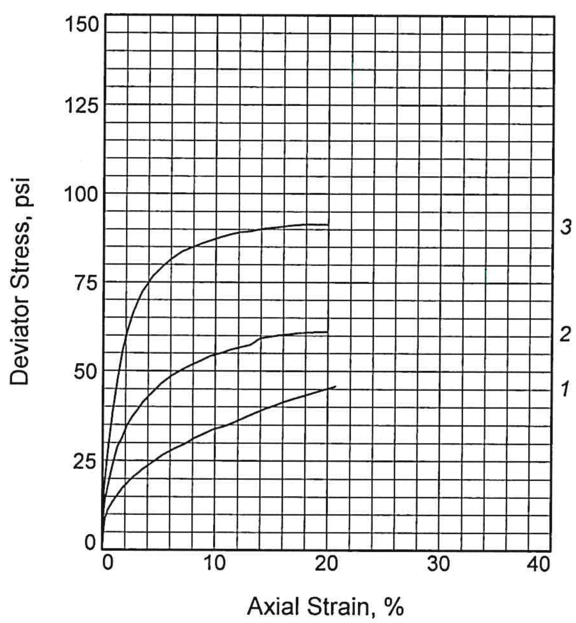
C_v @ T_{90}
0.187 ft.^{2}/day

Figure

Midland Standard Engineering & Testing

Unconsolidated-Undrained Triaxial Test Results





Sample No.		1	2	3
Initial	Water Content, %	21.1	22.9	19.8
	Dry Density, pcf	108.6	106.1	110.2
	Saturation, %	99.6	101.8	97.6
	Void Ratio	0.5814	0.6181	0.5581
	Diameter, in.	2.87	2.86	2.86
	Height, in.	5.56	5.75	5.76
At Test	Water Content, %	21.1	22.5	20.3
	Dry Density, pcf	108.6	106.1	110.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5814	0.6181	0.5581
	Diameter, in.	2.87	2.86	2.86
	Height, in.	5.56	5.75	5.76
Strain rate, in./min.		0.037	0.037	0.037
Back Pressure, psi		68	68	68
Cell Pressure, psi		82	96	123
Fail. Stress, psi		46	61	91
Ult. Stress, psi				
σ_1 Failure, psi		60	89	147
σ_3 Failure, psi		14	28	56

Type of Test:
Unconsolidated Undrained
Sample Type: Shelby Tube
Description: Brown-Grey CLAY

Specific Gravity= 2.75
Remarks:

Figure ________

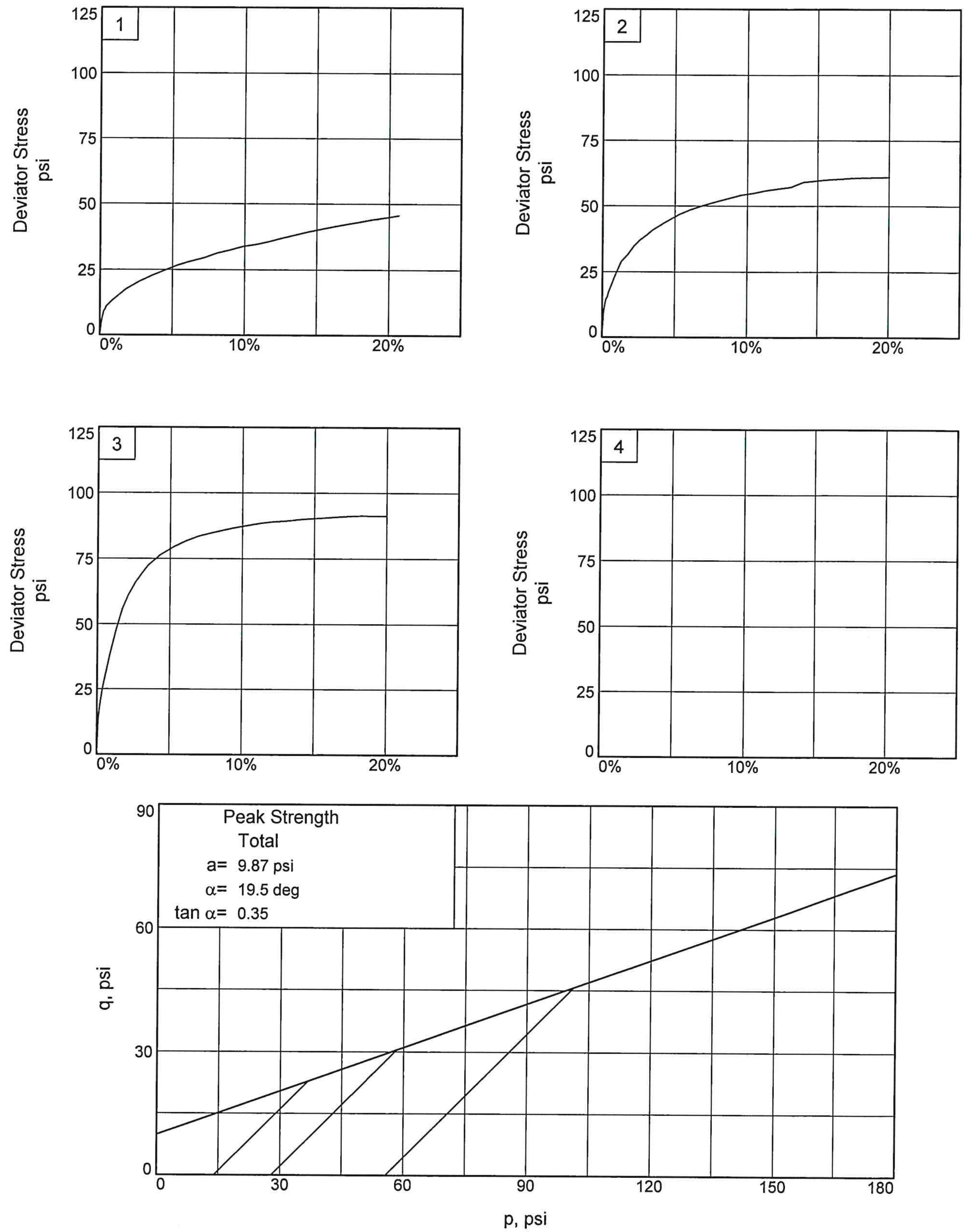
Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-6
Sample Number: ST-38 **Depth:** 74.0- 76.0'
Proj. No.: 28287 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Midland Standard Engineering & Testing
South Elgin, IL

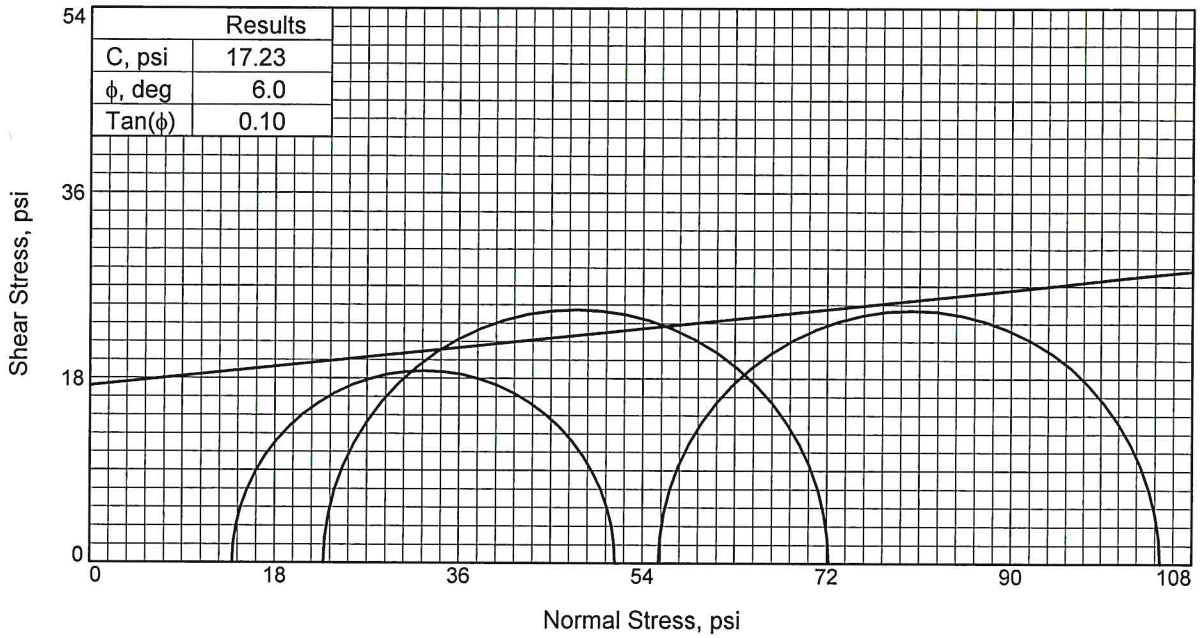
Tested By: JDS **Checked By:** WDP

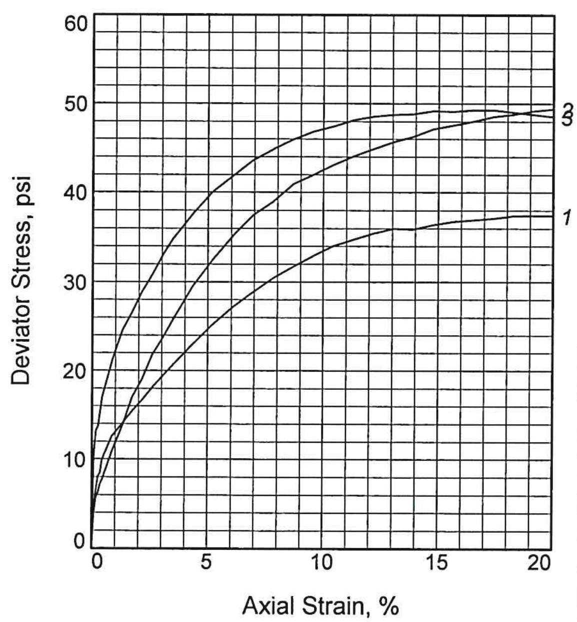


Client: APTIM
Project: Zion Landfill Site 2 Expansion, Aptim #3211
Location: B-6 **Depth:** 74.0- 76.0' **Sample Number:** ST-38
Project No.: 28287 **Figure** ________

Midland Standard Engineering & Testing

Tested By: JDS **Checked By:** WDP





Sample No.		1	2	3
Initial	Water Content, %	15.7	17.3	16.7
	Dry Density, pcf	121.0	117.5	118.3
	Saturation, %	103.1	103.3	101.9
	Void Ratio	0.4188	0.4614	0.4510
	Diameter, in.	2.74	2.85	2.79
	Height, in.	5.75	5.76	5.75
At Test	Water Content, %	0.0	16.8	17.5
	Dry Density, pcf	0.0	117.5	118.3
	Saturation, %	0.0	100.1	106.9
	Void Ratio	N/A	0.4614	0.4510
	Diameter, in.	2.74	2.85	2.79
	Height, in.	5.75	5.76	5.75
Strain rate, in./min.		0.037	0.037	0.037
Back Pressure, psi		52	57	52
Cell Pressure, psi		65	79	107
Fail. Stress, psi		37	49	49
Ult. Stress, psi				
σ_1 Failure, psi		51	72	105
σ_3 Failure, psi		14	23	56

Type of Test:
Unconsolidated Undrained
Sample Type: Shelby Tube
Description: Brown-grey Silty CLAY

Specific Gravity= 2.75
Remarks:

Figure ________

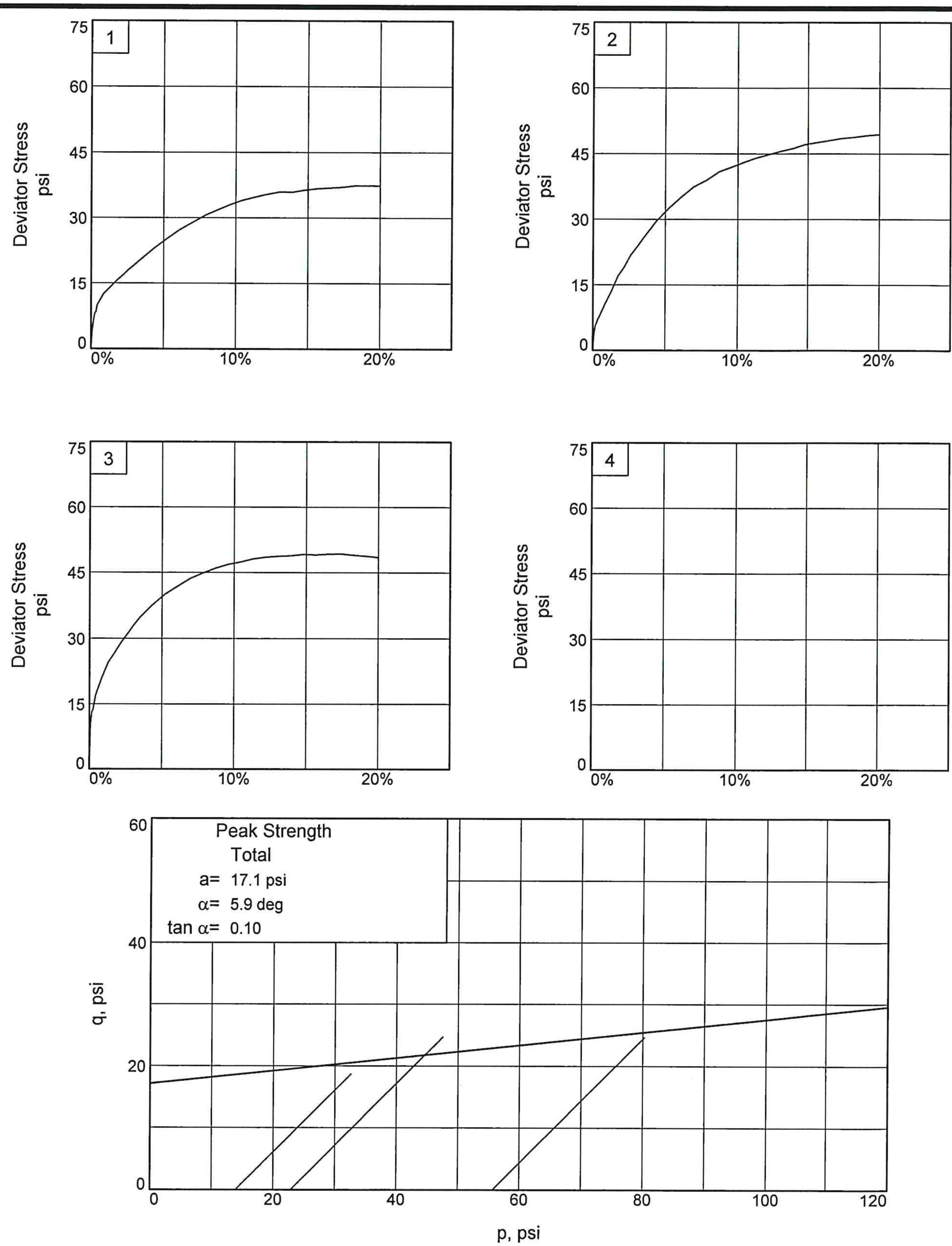
Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-7
Sample Number: ST-29 **Depth:** 56.0- 58.0'
Proj. No.: 28287 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Midland Standard Engineering & Testing
South Elgin, IL

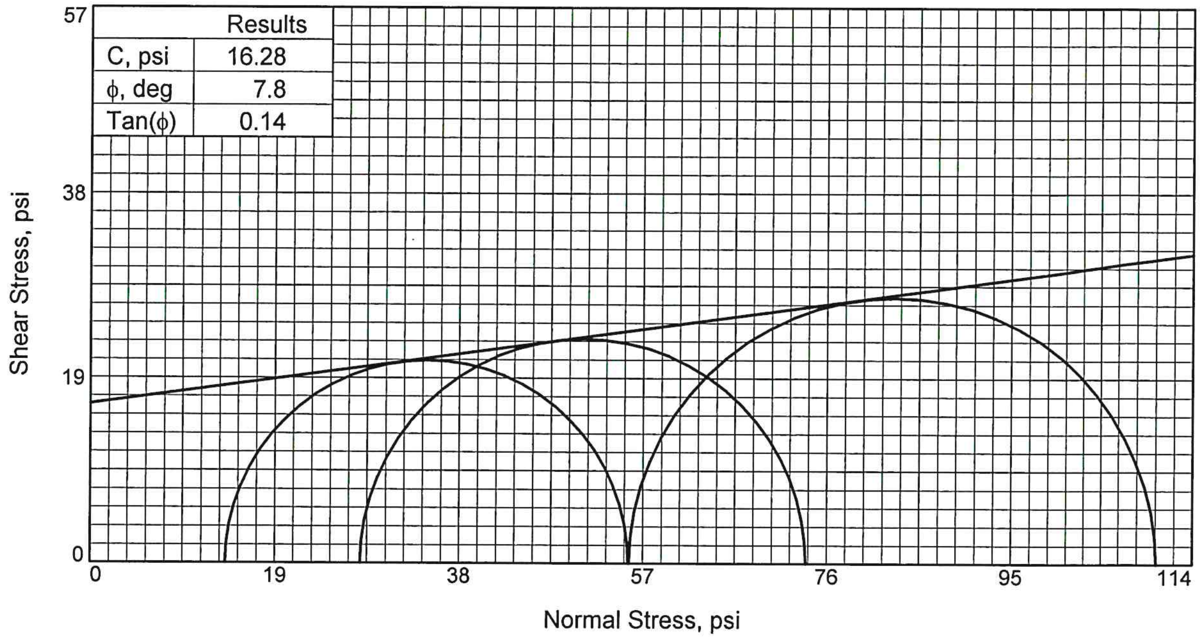
Tested By: JDS **Checked By:** WDP

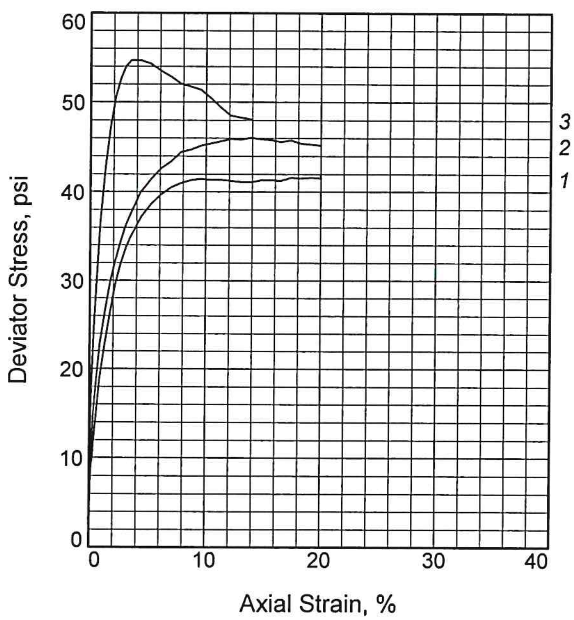


Client: APTIM
Project: Zion Landfill Site 2 Expansion, Aptim #3211
Location: B-7 **Depth:** 56.0- 58.0' **Sample Number:** ST-29
Project No.: 28287 **Figure** ________

Midland Standard Engineering & Testing

Tested By: JDS **Checked By:** WDP





Sample No.		1	2	3
Initial	Water Content, %	20.6	27.5	24.5
	Dry Density, pcf	106.6	97.5	103.3
	Saturation, %	93.0	99.3	101.8
	Void Ratio	0.6101	0.7607	0.6612
	Diameter, in.	2.86	2.86	2.84
	Height, in.	5.75	5.75	5.76
At Test	Water Content, %	23.2	27.0	24.2
	Dry Density, pcf	106.6	97.5	103.3
	Saturation, %	104.4	97.5	100.5
	Void Ratio	0.6101	0.7607	0.6612
	Diameter, in.	2.86	2.86	2.84
	Height, in.	5.75	5.75	5.76
Strain rate, in./min.		0.037	0.037	0.037
Back Pressure, psi		53	53	53
Cell Pressure, psi		67	81	109
Fail. Stress, psi		42	46	55
Ult. Stress, psi				
σ_1 Failure, psi		56	74	110
σ_3 Failure, psi		14	28	56

Type of Test:
Unconsolidated Undrained

Sample Type: Shelby Tube

Description: Brown-grey CLAY

Specific Gravity= 2.750

Remarks:

Figure ________

Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

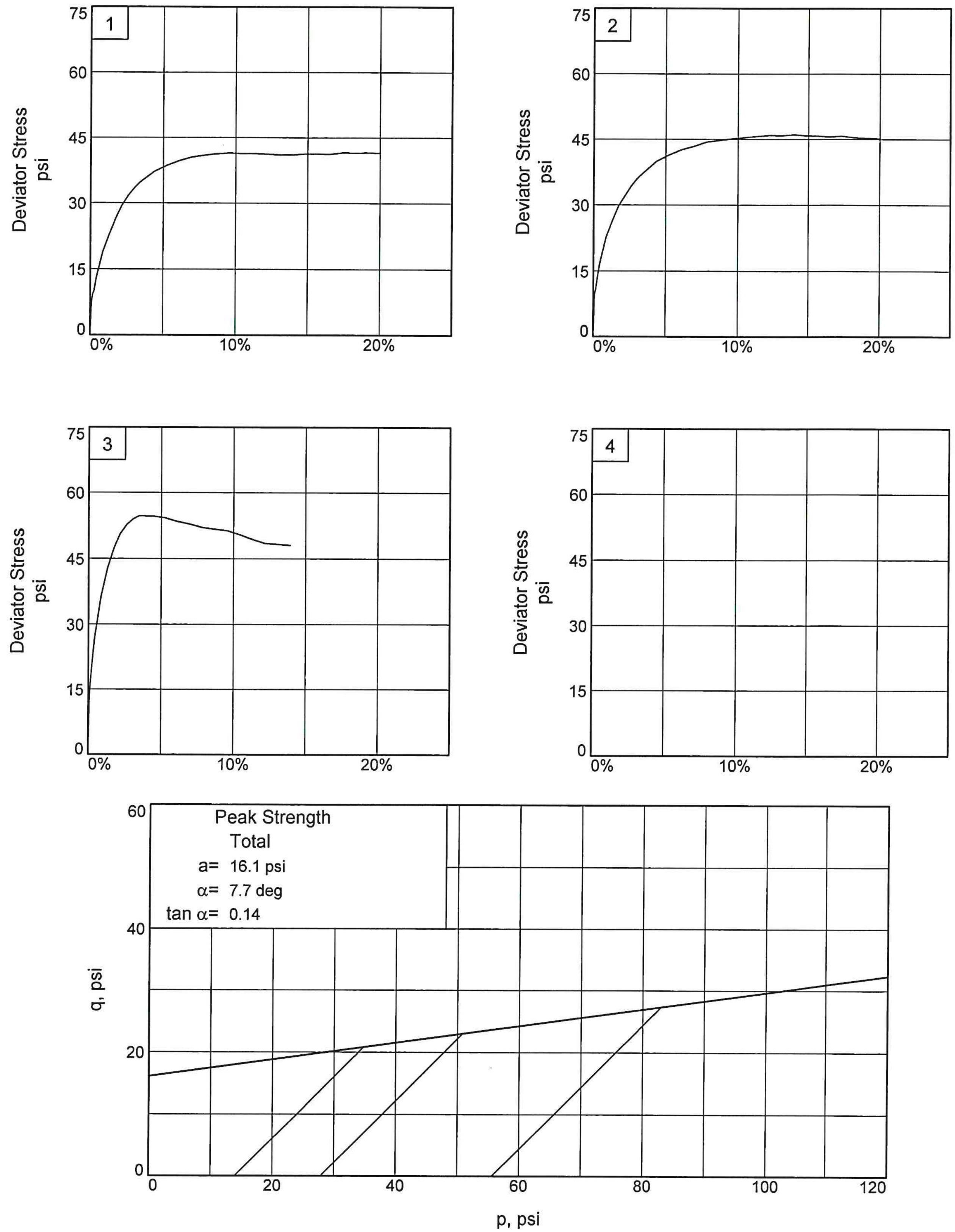
Location: B-15

Sample Number: ST-30 **Depth:** 58.0- 60.0'

Proj. No.: 28287 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Midland Standard Engineering & Testing
South Elgin, IL

Tested By: JDS **Checked By:** WP



Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

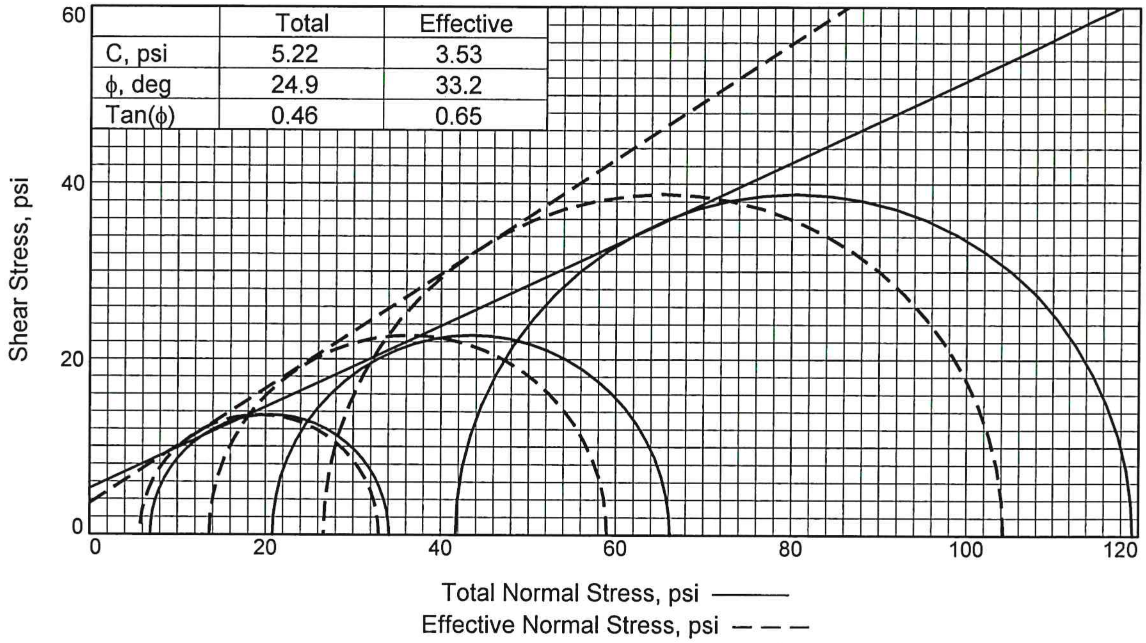
Location: B-15 **Depth:** 58.0- 60.0' **Sample Number:** ST-30

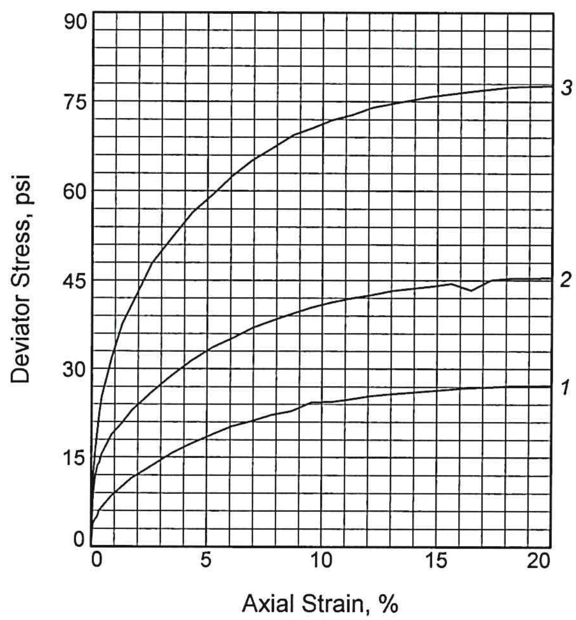
Project No.: 28287 **Figure** ________

Midland Standard Engineering & Testing

Tested By: JDS **Checked By:** WP

Consolidated-Undrained Triaxial Test Results





Sample No.		1	2	3
Initial	Water Content, %	14.3	13.2	14.8
	Dry Density, pcf	121.6	124.2	120.3
	Saturation, %	95.3	94.8	95.2
	Void Ratio	0.4120	0.3818	0.4269
	Diameter, in.	2.84	2.85	2.82
	Height, in.	5.76	5.77	5.76
At Test	Water Content, %	15.0	13.9	15.5
	Dry Density, pcf	121.6	124.2	120.3
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4120	0.3818	0.4269
	Diameter, in.	2.84	2.85	2.82
	Height, in.	5.76	5.77	5.76
Strain rate, in./min.		0.037	0.037	0.037
Back Pressure, psi		55	55	55
Cell Pressure, psi		62	76	97
Fail. Stress, psi		27	45	78
Total Pore Pr., psi		56	62	70
Ult. Stress, psi				
Total Pore Pr., psi				
$\bar{\sigma}_1$ Failure, psi		33	59	104
$\bar{\sigma}_3$ Failure, psi		6	14	27

Type of Test:
CU with Pore Pressures
Sample Type: Shelby Tube
Description: Brown-grey CLAY

Specific Gravity= 2.75
Remarks:

Figure ________

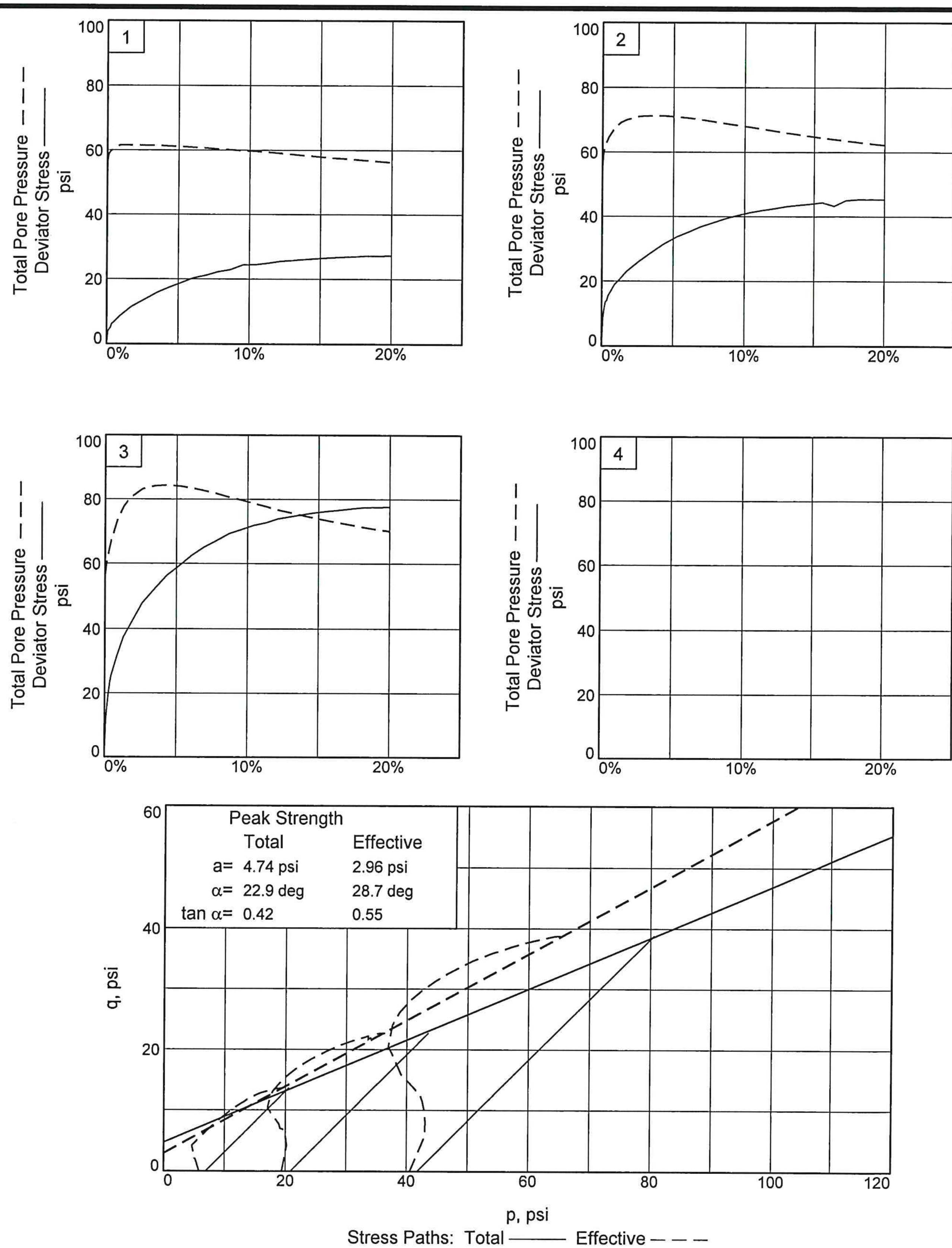
Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-01
Sample Number: ST-31 **Depth:** 60.0- 62.0'
Proj. No.: 28287 **Date Sampled:** 4/1/19

TRIAXIAL SHEAR TEST REPORT
Midland Standard Engineering & Testing
South Elgin, IL

Tested By: JDS **Checked By:** WDP



Client: APTIM

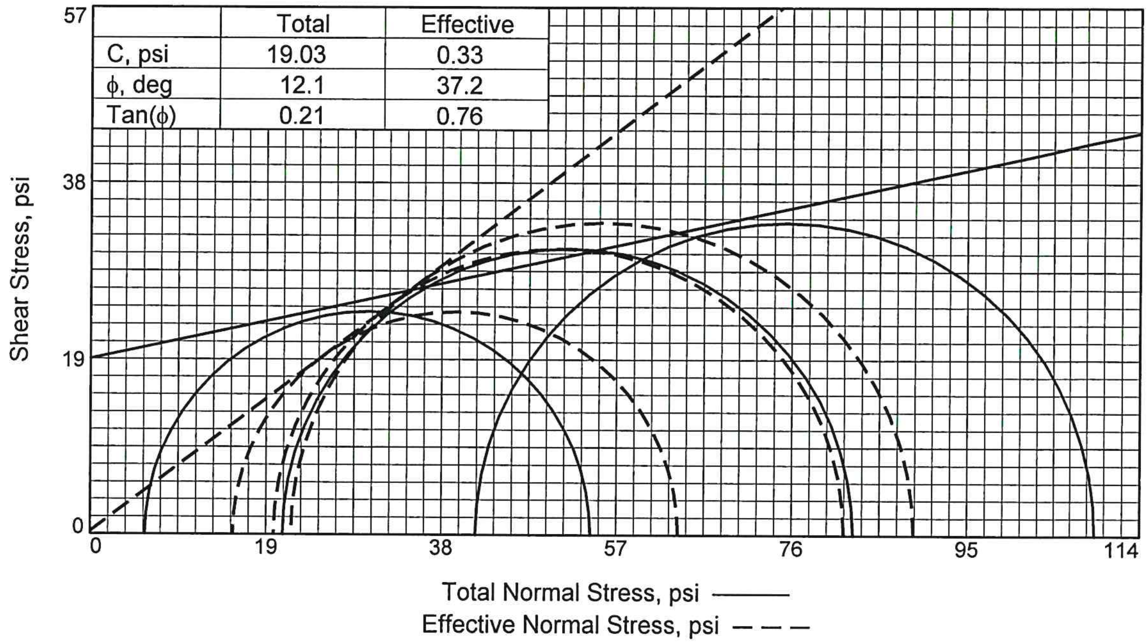
Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-01 **Depth:** 60.0- 62.0' **Sample Number:** ST-31

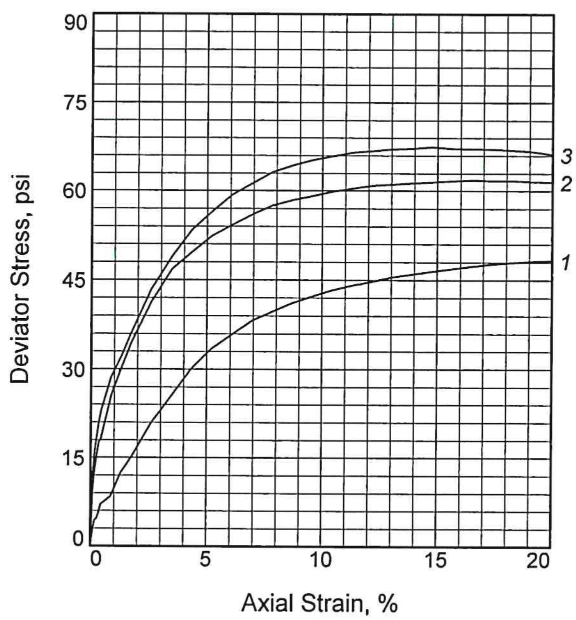
Project No.: 28287 **Figure** ________

Midland Standard Engineering & Testing

Tested By: JDS **Checked By:** WDP



	Total	Effective
C, psi	19.03	0.33
ϕ, deg	12.1	37.2
Tan(ϕ)	0.21	0.76



Sample No.		1	2	3
Initial	Water Content, %	15.9	15.3	16.2
	Dry Density, pcf	117.7	118.1	118.8
	Saturation, %	95.1	92.8	99.9
	Void Ratio	0.4589	0.4533	0.4448
	Diameter, in.	2.87	2.84	2.85
	Height, in.	5.76	5.75	5.76
At Test	Water Content, %	16.7	16.5	16.2
	Dry Density, pcf	117.7	118.1	118.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4589	0.4533	0.4448
	Diameter, in.	2.87	2.84	2.85
	Height, in.	5.76	5.75	5.76
Strain rate, in./min.		0.037	0.037	0.037
Back Pressure, psi		60.5	60.5	60.5
Cell Pressure, psi		66.4	81.3	102.2
Fail. Stress, psi		48.3	61.8	67.5
Total Pore Pr., psi		51.0	61.5	80.5
Ult. Stress, psi				
Total Pore Pr., psi				
$\bar{\sigma}_1$ Failure, psi		63.7	81.6	89.2
$\bar{\sigma}_3$ Failure, psi		15.4	19.8	21.7

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: Grey Silty CLAY

Specific Gravity= 2.750

Remarks:

Figure ________

Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

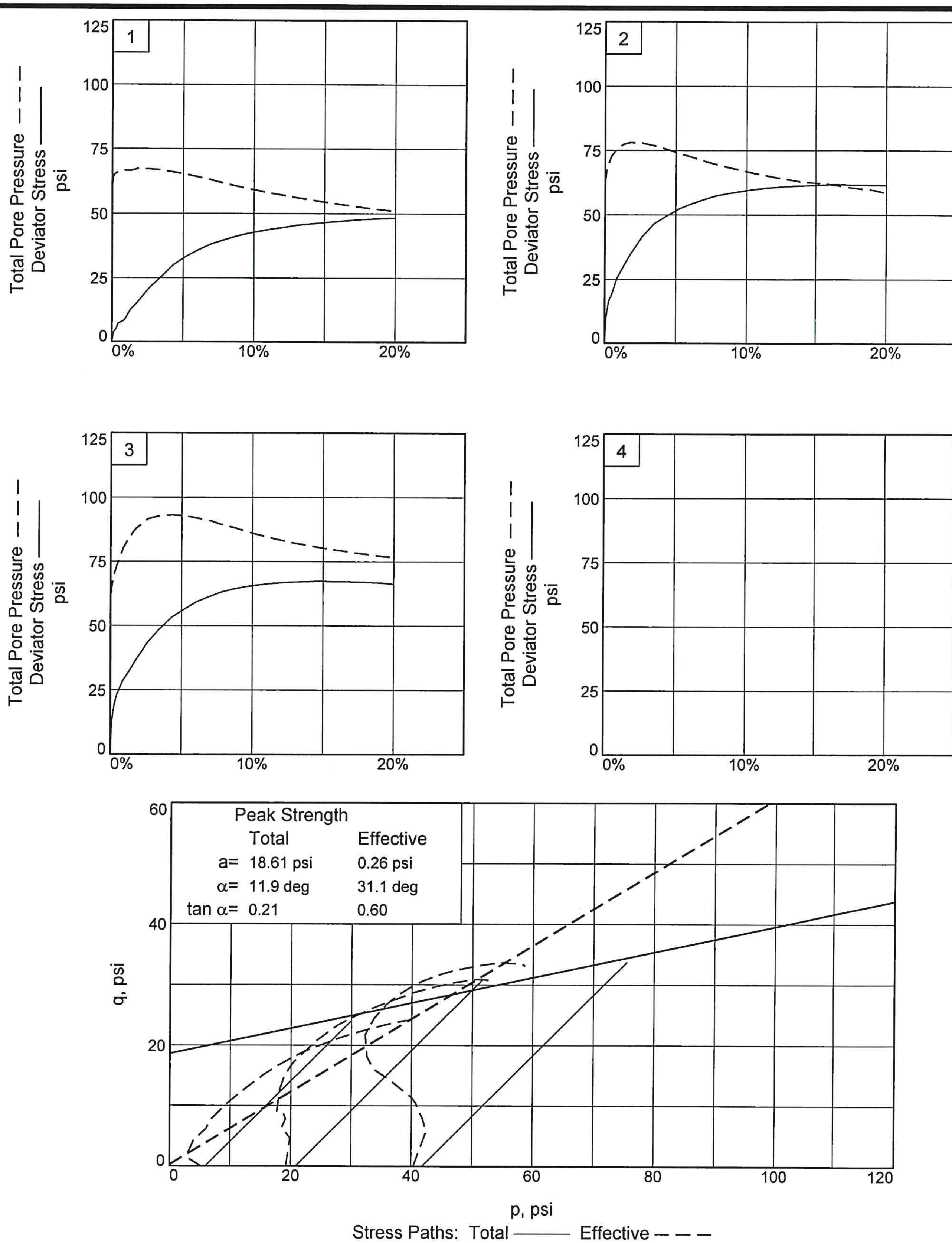
Location: B-12

Sample Number: ST-34 **Depth:** 66.0- 68.0'

Proj. No.: 28287 **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Midland Standard Engineering & Testing
South Elgin, IL

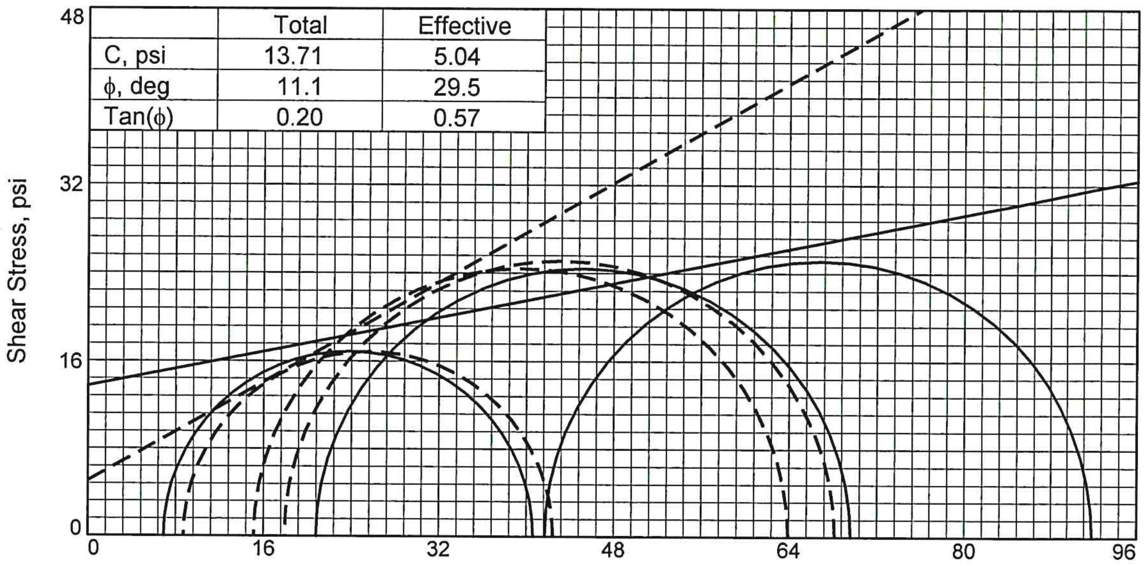
Tested By: JDS **Checked By:** WDP

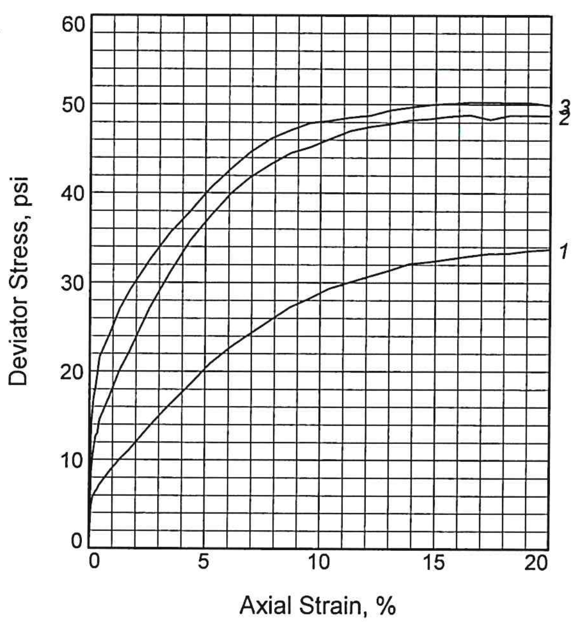


Client: APTIM
Project: Zion Landfill Site 2 Expansion, Aptim #3211
Location: B-12 **Depth:** 66.0- 68.0' **Sample Number:** ST-34
Project No.: 28287 **Figure** ________

Midland Standard Engineering & Testing

Tested By: JDS **Checked By:** WDP





Sample No.		1	2	3
Initial	Water Content, %	13.9	15.7	13.6
	Dry Density, pcf	123.5	120.6	122.3
	Saturation, %	97.8	102.1	92.4
	Void Ratio	0.3906	0.4239	0.4043
	Diameter, in.	2.86	2.90	2.85
	Height, in.	5.77	5.76	5.76
At Test	Water Content, %	14.2	15.4	14.7
	Dry Density, pcf	123.5	120.6	122.3
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3906	0.4239	0.4043
	Diameter, in.	2.86	2.90	2.85
	Height, in.	5.77	5.76	5.76
Strain rate, in./min.		0.037	0.037	0.037
Back Pressure, psi		51.5	51.5	51.5
Cell Pressure, psi		58.4	72.3	93.2
Fail. Stress, psi		33.7	48.8	50.3
Total Pore Pr., psi		49.7	57.2	75.3
Ult. Stress, psi				
Total Pore Pr., psi				
$\bar{\sigma}_1$ Failure, psi		42.4	63.9	68.2
$\bar{\sigma}_3$ Failure, psi		8.7	15.1	17.9

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: Grey Silty CLAY

Specific Gravity= 2.75

Remarks:

Figure ________

Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

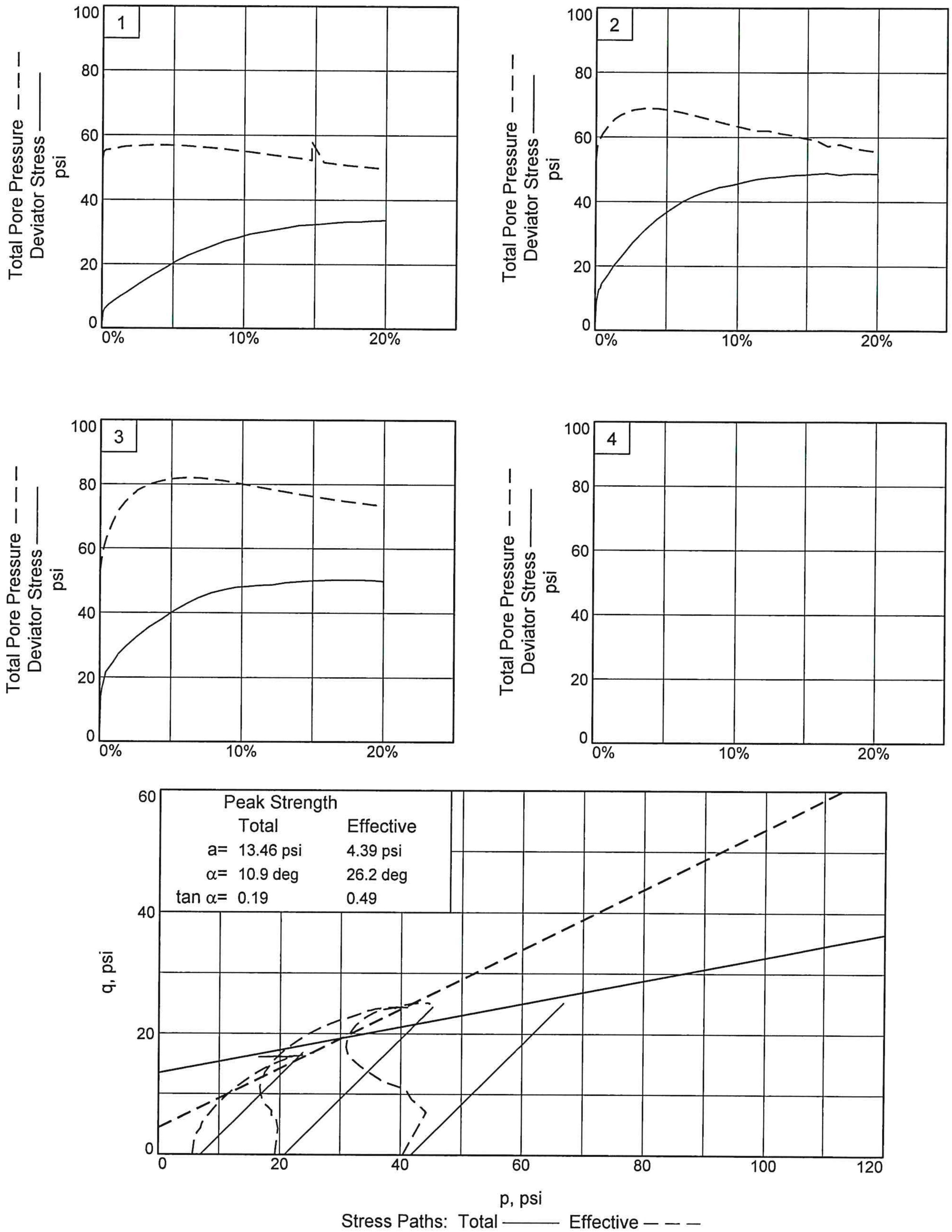
Location: B-13

Sample Number: ST-29 **Depth:** 56.0- 58.0'

Proj. No.: 28287 **Date Sampled:** 4/17/19

TRIAXIAL SHEAR TEST REPORT
Midland Standard Engineering & Testing
South Elgin, IL

Tested By: JDS **Checked By:** WDP



Client: APTIM

Project: Zion Landfill Site 2 Expansion, Aptim #3211

Location: B-13 **Depth:** 56.0- 58.0' **Sample Number:** ST-29

Project No.: 28287 **Figure** ________

Midland Standard Engineering & Testing

Tested By: JDS **Checked By:** WDP

USGS Earthquake Hazards Program - Bedrock Acceleration

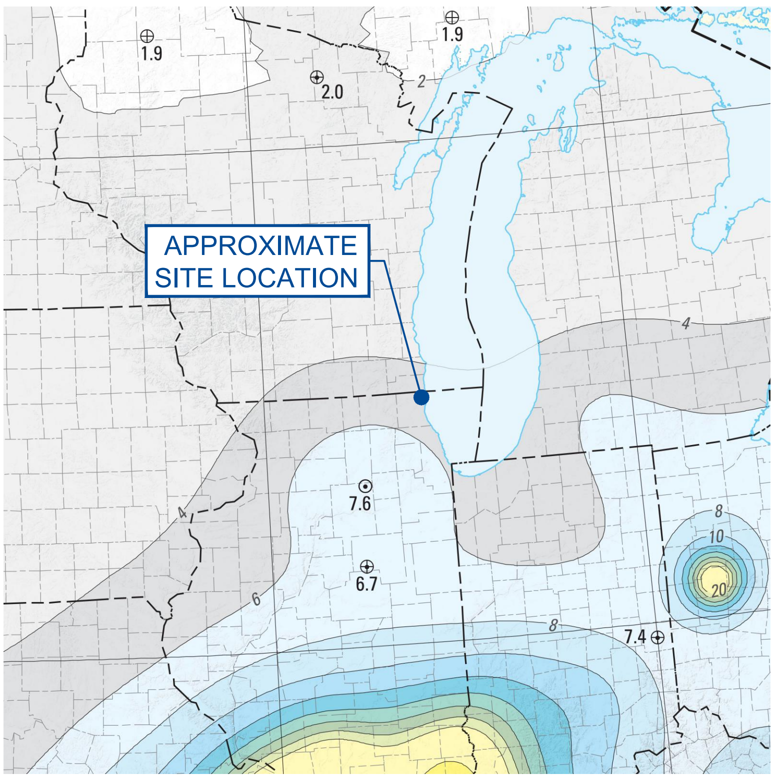
USGS
science for a changing world
Earthquake Hazards Program

LOCATION 42.490 Lat. -87.867 Long.

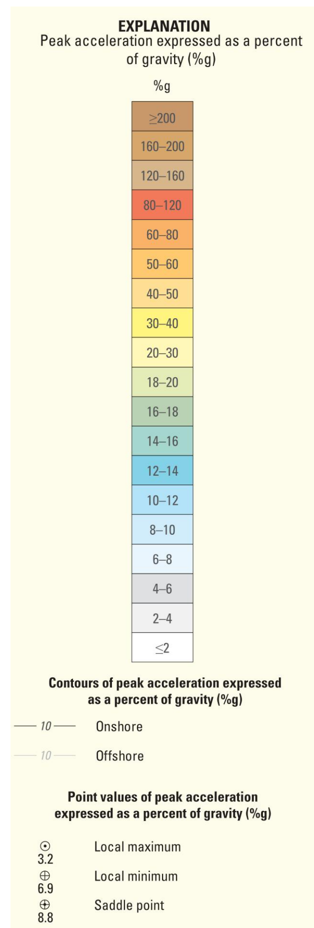
The interpolated probabilistic ground motion values, in %g, at the requested point are:

P.E. %	Exp. Time (years)	Ground Motion (g)
2	50	0.0461

U.S. NATIONAL SEISMIC HAZARD MAPS: Peterson, M.D., et al, 2014



Peak Horizontal Acceleration with 2% Probability of Exceedance in 50 Years



NOTES

1. Information obtained from the United States Geological Survey website.
2. 2% P.E. in 50 years is equivalent to 10% in 250 years.

APTIM Environmental & Infrastructure, LLC

ZION LANDFILL SITE 2 NORTH EXPANSION HYDROGEOLOGIC INVESTIGATION

FIGURE 2.2-15
MAP OF HORIZONTAL ACCELERATION

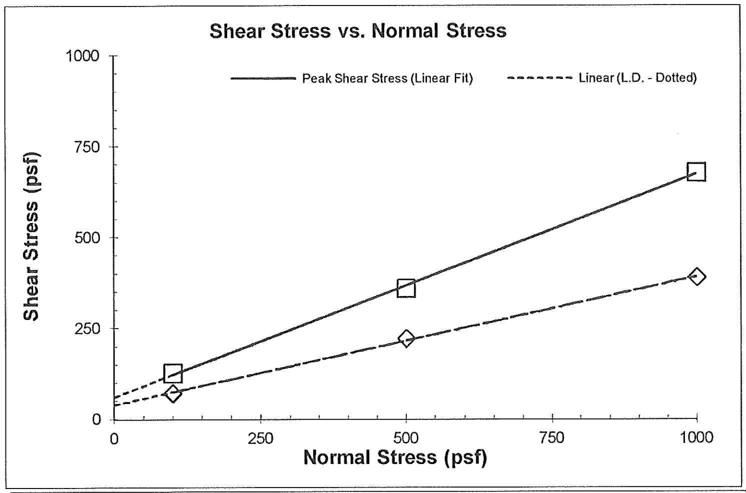
APPROVED BY: TFA	PROJ. NO.: 631020105	DATE: MAY 2022

Interface Friction Test Results -
Previous Final Cover and Liner Construction

Interface Friction Test Report

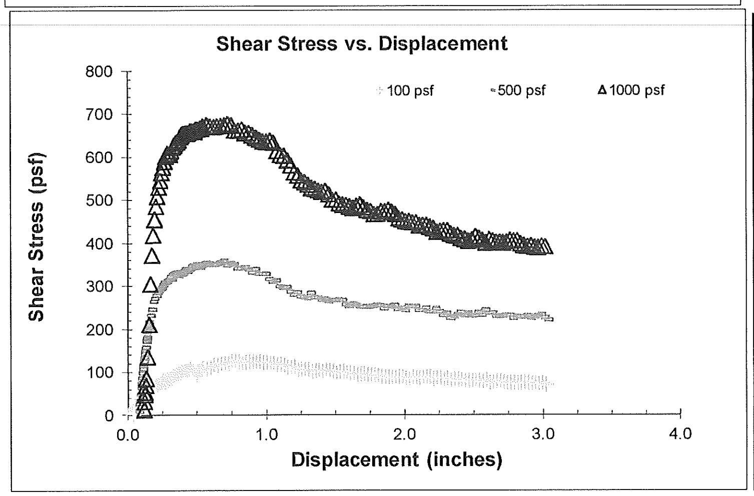
Client:	**Veolia Environmental Services**	TRI Log#: E2365-93-04	John M. Allen, P.E., 10/30/2012
Project:	**Zion Landfill, 2012 Cap**	Test Method: ASTM D 5321	Quality Review/Date
Test Date:	10/30/12-10/30/12		

Tested Interface: GSE Double-sided Geocomposite vs. GSE 40 mil LLDPE Textured Geomembrane



Test Results		
	Peak	**Large Displacement (@ 3.0 in.)**
Friction Angle (degrees):	**31.5**	**19.4**
Y-intercept or Adhesion (psf):	**61**	**40**

Shearing occurred at the interface.



Test Conditions

Upper Box &	GSE double-sided geocomposite
Lower Box	GSE 40 mil LLDPE textured geomembrane
Box Dimensions:	12"x12"x4"
Interface Conditioning:	Interface soaked and loading applied for a minimum of 15 minutes prior to shear.
Test Condition:	Wet
Shearing Rate:	0.2 inches/minute

Test Data

Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	9	13	18
Normal Stress (psf)	100	500	1000
Corrected Peak Shear Stress (psf)	127	360	678
Corrected Large Displacement Shear Stress (psf)	72	222	390
Peak Secant Angle (degrees)	51.9	35.7	34.1
Large Displacement Secant Angle (degrees)	35.8	23.9	21.3
Asperity (mils)	29.4	30.0	29.4

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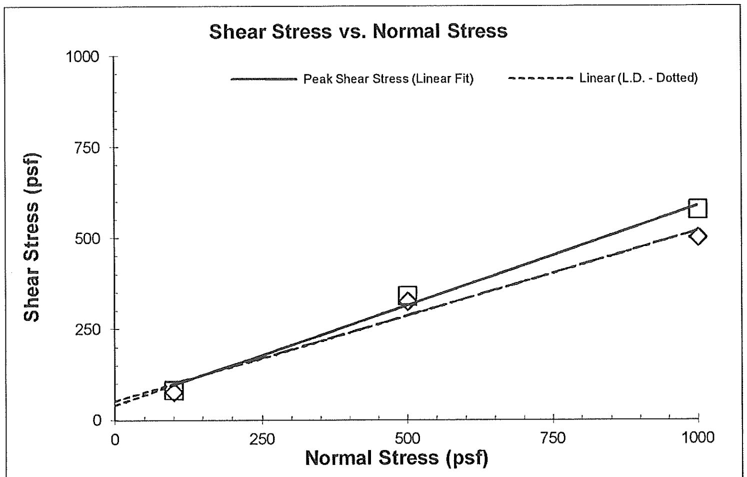
Interface Friction Test Report

Client: **Veolia Environmental Services**
Project: **Zion Landfill, 2012 Cap**
Test Date: 10/30/12-10/31/12

TRI Log#: E2365-93-04
Test Method: ASTM D 5321

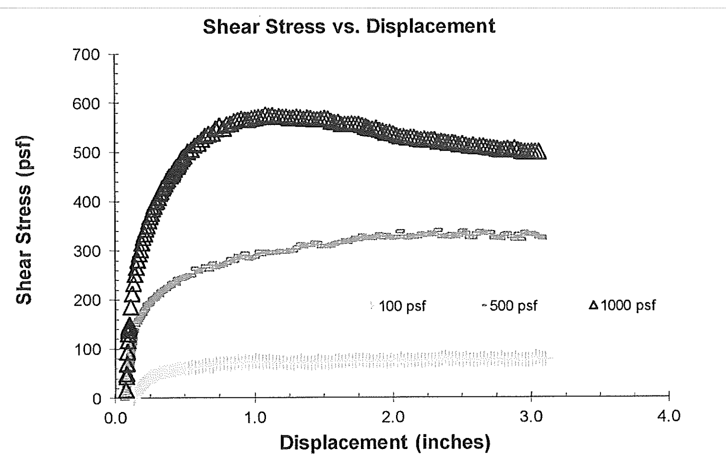
John M. Allen, P.E., 10/31/2012
Quality Review/Date

Tested Interface: Cover Soil vs. GSE Double-sided Geocomposite



Test Results	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	28.7	24.9
Y-intercept or Adhesion (psf):	42	54

Shearing occurred at the interface.



Test Conditions

Upper Box &	Cover Soil tamped in place
Lower Box	GSE double-sided geocomposite
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 16 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data

Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	9	13	18
Normal Stress (psf)	100	500	1000
Corrected Peak Shear Stress (psf)	82	341	577
Corrected Large Displacement Shear Stress (psf)	78	326	501
Peak Secant Angle (degrees)	39.5	34.3	30.0
Large Displacement Secant Angle (degrees)	38.0	33.1	26.6

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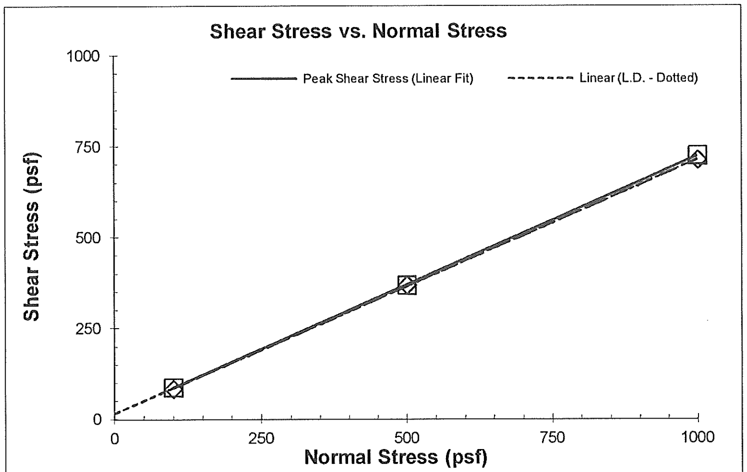
Interface Friction Test Report

Client: **Veolia Environmental Services**
Project: **Zion Landfill, 2012 Cap**
Test Date: 10/31/12-11/01/12

TRI Log#: E2365-93-04
Test Method: ASTM D5321

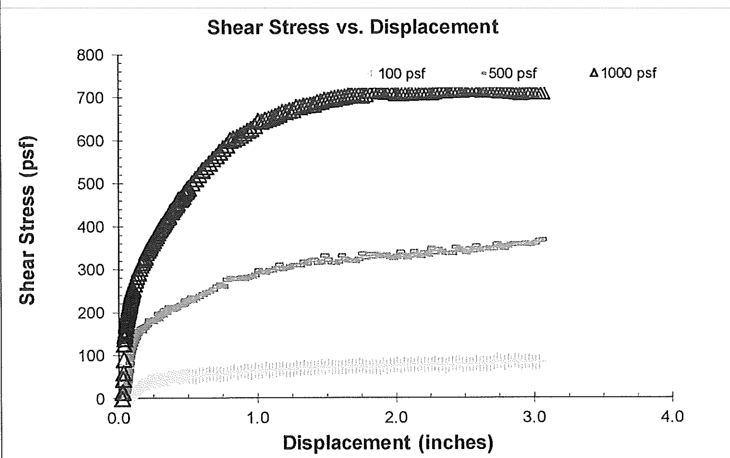
John M. Allen, P.E., 11/01/2012
Quality Review/Date

Tested Interface: Clay Soil vs. GSE 40 mil LLDPE Textured Geomembrane



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	35.3	34.9
Y-intercept or Adhesion (psf):	17	16

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Clay Soil remolded to 131 pcf ato 11.5% moisture content
Lower Box	GSE 40 mil LLDPE textured geomembrane
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 16 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data

Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	9	13	18
Normal Stress (psf)	100	500	1000
Corrected Peak Shear Stress (psf)	88	369	725
Corrected Large Displacement Shear Stress (psf)	84	369	713
Peak Secant Angle (degrees)	41.4	36.4	35.9
Large Displacement Secant Angle (degrees)	40.0	36.4	35.5
Asperity (mils)	23.6	23.6	23.2

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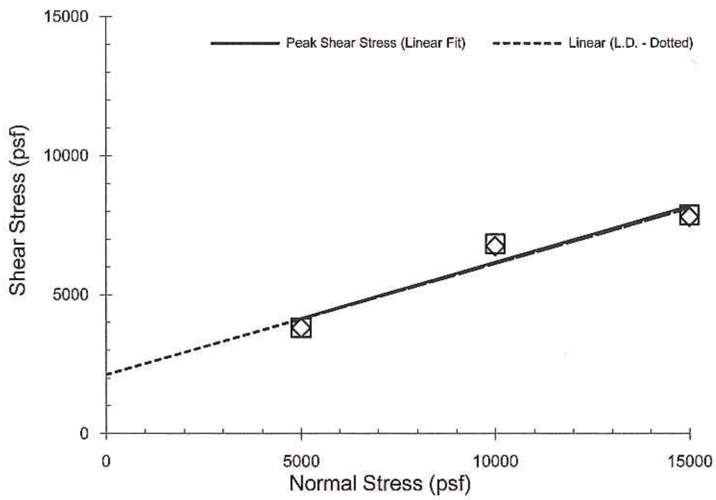
Interface Friction Test Report

Client: Advanced Disposal Services
Project: Zion Landfill, Cell 9
Date: 09-17-2015 to 09-17-2015

TRI Log#: E2388-71-05
Test Method: ASTM D5321

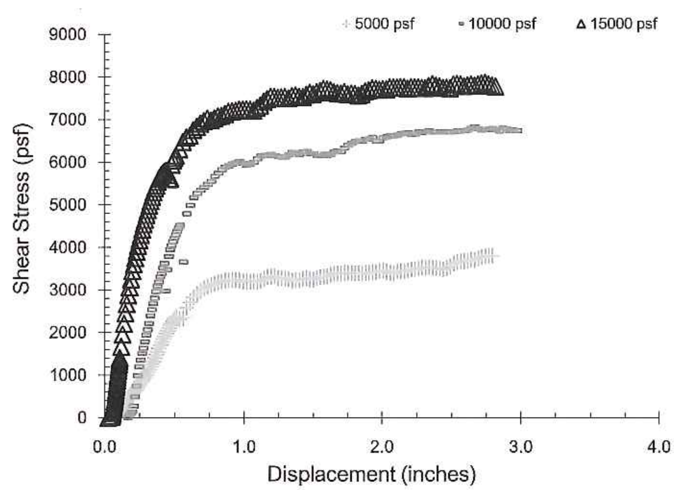
John M. Allen, P.E., 09/17/2015
Quality Review/Date

Tested Interface: Pea Stone vs. Skaps GE160 Non-woven Geotextile (389841.51)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	22.1	21.8
Y-intercept or Adhesion (psf):	2112	2125

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Pea Stone tamped in place
Lower Box	Skaps GE160 non-woven geotextile
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 1 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	56	103	151
Normal Stress (psf)	5000	10000	15000
Corrected Peak Shear Stress (psf)	3809	6826	7865
Corrected Large Displacement Shear Stress (psf)	3809	6744	7802
Peak Secant Angle (degrees)	37.3	34.3	27.7
Large Displacement Secant Angle (degrees)	37.3	34.0	27.5
Asperity (mils)	- -	- -	- -

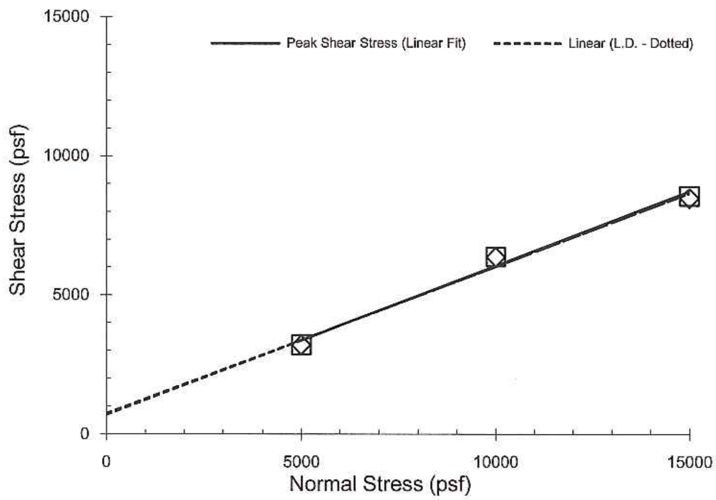
Interface Friction Test Report

Client: **Advanced Disposal Services**
Project: **Zion Landfill, Cell 9**
Date: 09-01-2015 to 09-16-2015

TRI Log#: E2388-71-05
Test Method: ASTM D5321

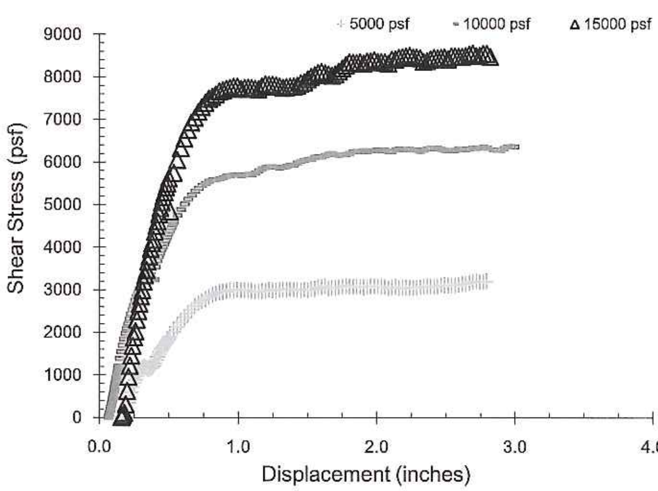
John M. Allen, P.E., 09/16/2015
Quality Review/Date

Tested Interface: Pea Stone vs. Skaps GE112 Non-woven Geotextile (38984.02)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	28.1	27.8
Y-intercept or Adhesion (psf):	698	743

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Pea Stone tamped in place
Lower Box	Skaps GE112 non-woven geotextile
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 1 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data

Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	56	103	151
Normal Stress (psf)	5000	10000	15000
Corrected Peak Shear Stress (psf)	3208	6373	8556
Corrected Large Displacement Shear Stress (psf)	3205	6364	8478
Peak Secant Angle (degrees)	32.7	32.5	29.7
Large Displacement Secant Angle (degrees)	32.7	32.5	29.5
Asperity (mils)	- -	- -	- -

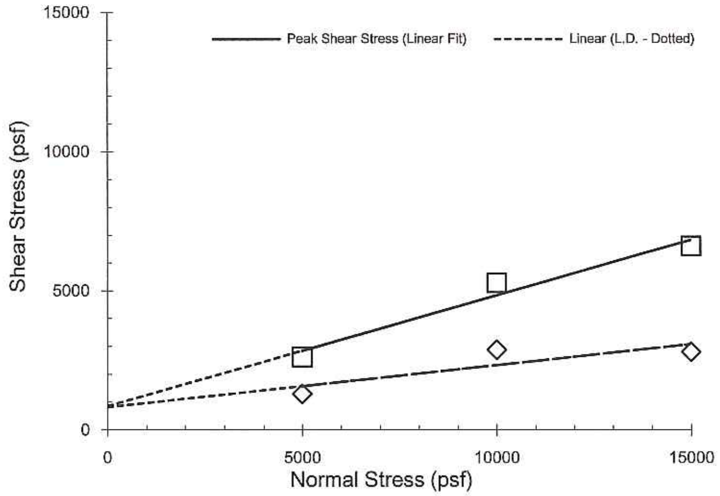
Interface Friction Test Report

Client: **Advanced Disposal Services**
Project: **Zion Landfill, Cell 9**
Date: 08-28-2015 to 09-08-2015

TRI Log#: E2388-71-05
Test Method: ASTM D5321

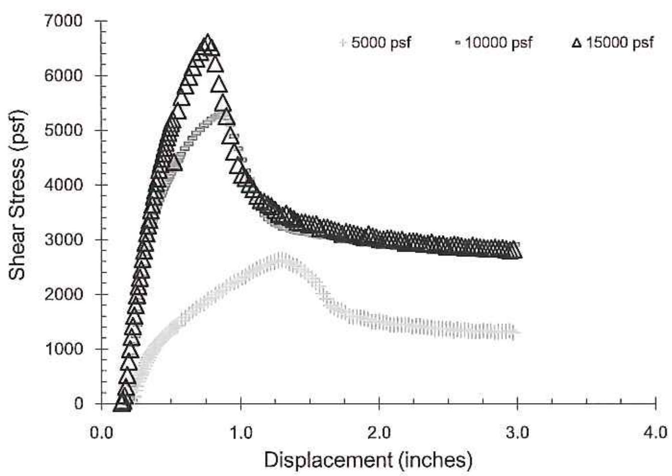
John M. Allen, P.E., 09/08/2015
Quality Review/Date

Tested Interface: Skaps GE112 Non-woven Geotextile (38984.02) vs. Agru 60 mil HDPE Microspike Geomembrane (G15D304051)



Test Results	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	21.7	8.6
Y-intercept or Adhesion (psf):	851	815

Shearing occurred at the interface.



Test Conditions

Upper Box & Skaps GE112 non-woven geotextile

Lower Box Agru 60 mil HDPE Micropsike geomembrane (dull side)

Box Dimensions: 12"x12"x4"

Interface Conditioning: Interface soaked and loading applied for a minimum of 15 minutes prior to shear.

Test Condition: Wet

Shearing Rate: 0.2 inches/minute

Test Data

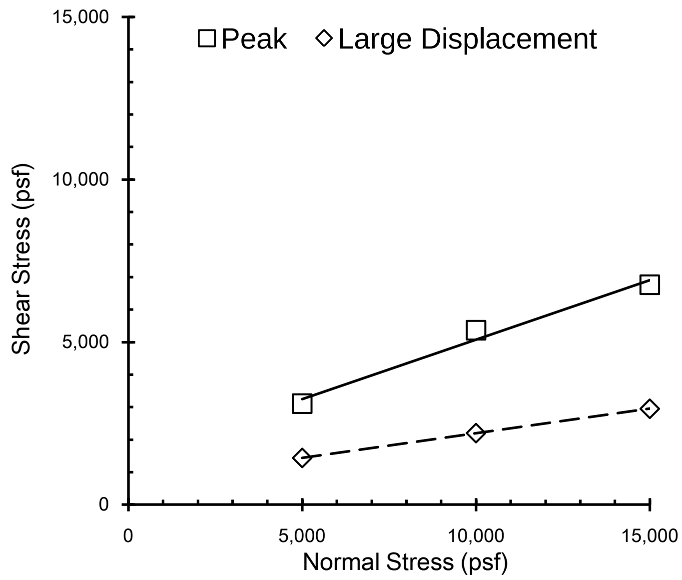
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	56	103	151
Normal Stress (psf)	5000	10000	15000
Corrected Peak Shear Stress (psf)	2621	5284	6607
Corrected Large Displacement Shear Stress (psf)	1294	2879	2805
Peak Secant Angle (degrees)	27.7	27.9	23.8
Large Displacement Secant Angle (degrees)	14.5	16.1	10.6
Asperity (mils)	24.8	24.8	25.0

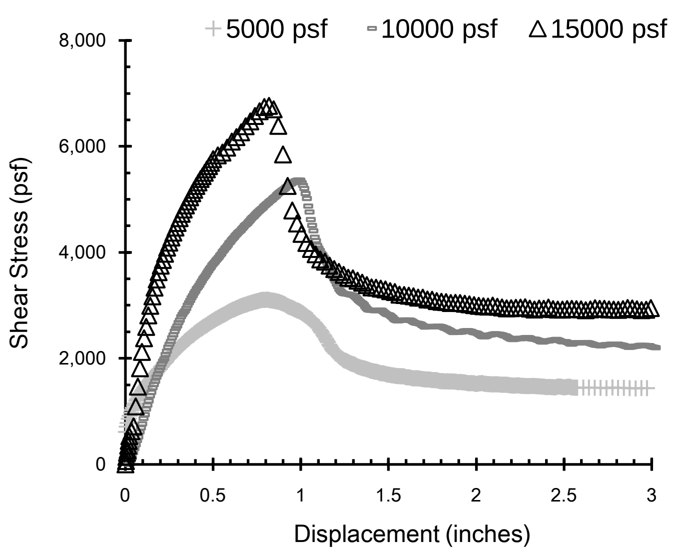
Shear Strength of Geosynthetic-Geosynthetic Interface by Direct Shear (ASTM D5321)

Client: ADS
Project: Zion Landfill

TRI Log #: 45186-4
Richard S. Lacey, P.E. 4/9/2019
Analysis & Quality Review/Date

SKAPS NWGT GE112 (56408.5) vs. Agru 60 mil HDPE MSGM - dull side up





Test Results, Linear Regression			
Mohr-Coulomb Parameters		Peak	Large Displacement
Friction Angle	Degrees	20.1	8.6
Y-intercept or Adhesion	psf	1,421	683
Minimum Secant Angle	Degrees	24.3	11.1

Note - Large Displacement Values Reported for 3.0 inches of Displacement

Test Conditions		
Upper Box	SKAPS NWGT GE112 (56408.5)	
Lower Box	Agru 60 mil HDPE MSGM - dull side up	
Conditioning	Wet - Loading applied and Interface flooded for a minimum of 15 minutes prior to shear.	
Shearing Rate	inches/minute	0.2

Test Notes
Shearing occurred at the interface at all stresses.

Specimen No.		-	1	2	3
Normal Stress		psf	5,000	10,000	15,000
Box Edge Dimension		in	12	12	12
Equivalent Bearing Slide Resist. Correction		psf	56	103	151
Peak	Shear Stress	psf	3,107	5,365	6,764
	Secant Angle	deg.	31.9	28.2	24.3
Large Displacement	Shear Stress	psf	1,437	2,200	2,949
	Secant Angle	deg.	16.0	12.4	11.1
Asperity Height, Avg. of 5 Meas.		mils	26	27	26

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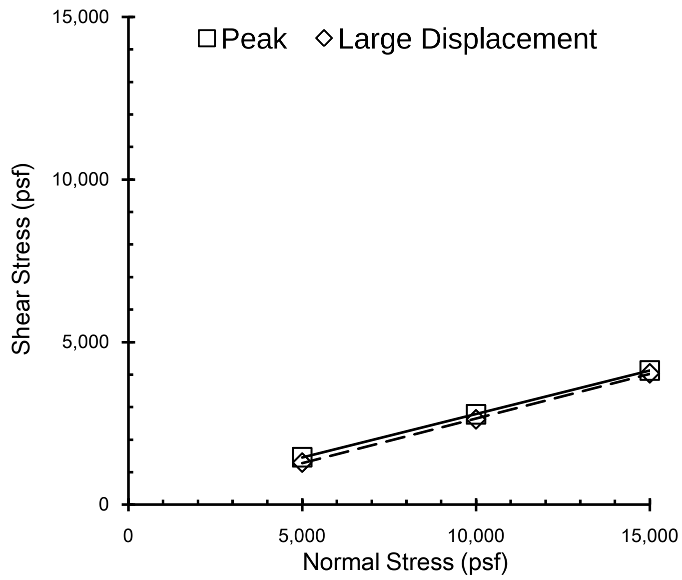
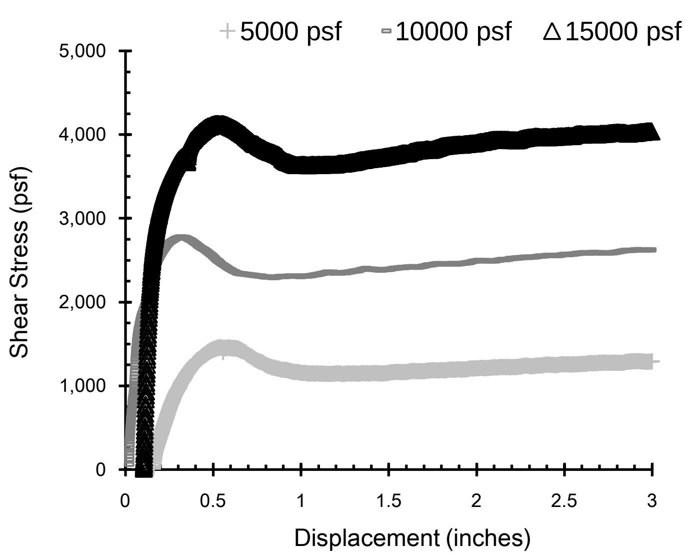
Shear Strength of Soil-Geosynthetic Interface by Direct Shear (ASTM D5321)

Client: ADS
Project: Zion Landfill

TRI Log #: 45186-6
Richard S. Lacey, P.E. 4/15/2019
Analysis & Quality Review/Date

Clay Sample vs.
Agru 60 mil HDPE MSGM - shiny side up





Test Results, Linear Regression			
Mohr-Coulomb Parameters		Peak	Large Displacement
Friction Angle	Degrees	14.9	14.9
Y-intercept or Adhesion	psf	120	0 (Forced)
Minimum Secant Angle	Degrees	15.4	14.5

Note - Large Displacement Values Reported for 3.0 inches of Displacement

Test Conditions		
Upper Box	Clay Sample ω = 15.3 % γ_d = 114.5 pcf	
Lower Box	Agru 60 mil HDPE MSGM - shiny side up	
Conditioning	Wet - Loading applied and Interface flooded for a minimum of 24 hours prior to shear.	
Shearing Rate	inches/minute	0.04

Test Notes
Shearing occurred at the interface at all stresses.

Specimen No.		-	1	2	3
Normal Stress		psf	5,000	10,000	15,000
Box Edge Dimension		in	12	12	12
Equivalent Bearing Slide Resist. Correction		psf	56	103	151
Peak	Shear Stress	psf	1,459	2,778	4,127
	Secant Angle	deg.	16.3	15.5	15.4
Large Displacement	Shear Stress	psf	1,294	2,624	4,039
	Secant Angle	deg.	14.5	14.7	15.1
Asperity Height, Avg. of 5 Meas.		mils	31	32	31

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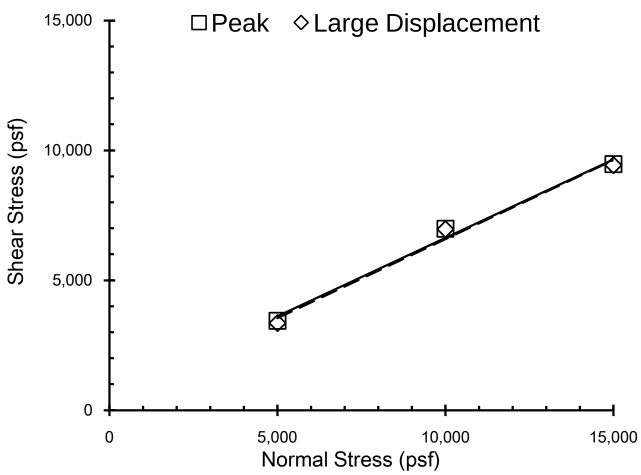
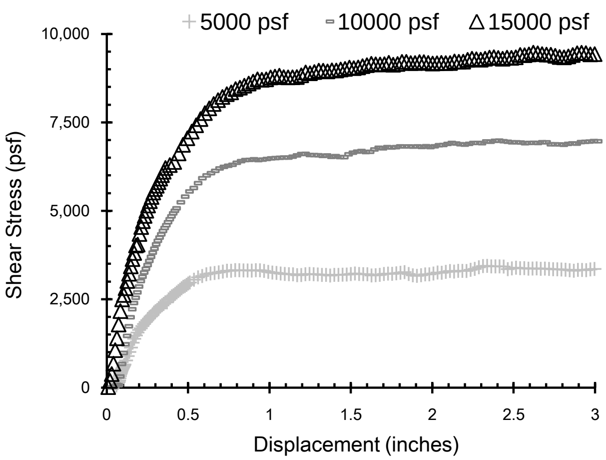
Shear Strength of Soil-Geosynthetic Interface by Direct Shear (ASTM D5321)

Client: ADS
Project: Zion Landfill

TRI Log #: 45186-8
Richard S. Lacey 9/24/2019
Analysis & Quality Review/Date

Drainage Layer vs. SKAPS NWGT GE112 (56408.5)





Test Results, Linear Regression			
Mohr-Coulomb Parameters		Peak	Large Displacement
Friction Angle	Degrees	31.1	31.3
Y-intercept or Adhesion	psf	603	508
Minimum Secant Angle	Degrees	32.3	32.2

Note - Large Displacement Values Reported for 3.0 inches of Displacement

Test Conditions		
Upper Box	Drainage Layer 60% Midwest Agg.-40% Theilen Tamped in place	
Lower Box	SKAPS NWGT GE112 (56408.5)	
Conditioning	Wet - Loading applied and Interface flooded for a minimum of 24 hours prior to shear.	
Shearing Rate	inches/minute	0.04

Test Notes

Shearing occurred at the interface at all stresses.

Specimen No.		-	1	2	3
Normal Stress		psf	5,000	10,000	15,000
Box Edge Dimension		in	12	12	12
Bearing Slide Resistance		lbs	56	103	151
Peak	Shear Stress	psf	3,442	6,984	9,472
	Secant Angle	deg.	34.5	34.9	32.3
Large Displacement	Shear Stress	psf	3,354	6,966	9,431
	Secant Angle	deg.	33.9	34.9	32.2

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Published Technical References

Shear Strength of Municipal Solid Waste

Jonathan D. Bray, F.ASCE[1]; Dimitrios Zekkos, M.ASCE[2]; Edward Kavazanjian Jr., M.ASCE[3]; George A. Athanasopoulos, M.ASCE[4]; and Michael F. Riemer, M.ASCE[5]

Abstract: A comprehensive large-scale laboratory testing program using direct shear (DS), triaxial (TX), and simple shear tests was performed on municipal solid waste (MSW) retrieved from a landfill in the San Francisco Bay area to develop insights about and a framework for interpretation of the shear strength of MSW. Stability analyses of MSW landfills require characterization of the shear strength of MSW. Although MSW is variable and a difficult material to test, its shear strength can be evaluated rationally to develop reasonable estimates. The effects of waste composition, fibrous particle orientation, confining stress, rate of loading, stress path, stress-strain compatibility, and unit weight on the shear strength of MSW were evaluated in the testing program described herein. The results of this testing program indicate that the DS test is appropriate to evaluate the shear strength of MSW along its weakest orientation (i.e., on a plane parallel to the preferred orientation of the larger fibrous particles within MSW). These laboratory results and the results of more than 100 large-scale laboratory tests from other studies indicate that the DS static shear strength of MSW is best characterized by a cohesion of 15 kPa and a friction angle of 36° at normal stress of 1 atm with the friction angle decreasing by 5° for every log cycle increase in normal stress. Other shearing modes that engage the fibrous materials within MSW (e.g., TX) produce higher friction angles. The dynamic shear strength of MSW can be estimated conservatively to be 20% greater than its static strength. These recommendations are based on tests of MSW with a moisture content below its field capacity; therefore, cyclic degradation due to pore pressure generation has not been considered in its development.

DOI: 10.1061/(ASCE)GT.1943-5606.0000063

CE Database subject headings: Dynamic properties; Municipal wastes; Solid wastes; Landfills; Shear strength; Stress strain relations; Laboratory tests.

Introduction

Static and seismic stability analyses of municipal solid waste (MSW) landfills require appropriate characterization of the shear strength of MSW. Landfill stability analyses can be no more reliable than the reliability of the engineer's estimate of the shear strength of the waste. Because modern municipal solid waste (MSW) landfills are built with multilayer liner systems that contain materials and interfaces with varied stress-strain responses, including some that may exhibit postpeak drops in shear strength, the stress-strain response of MSW may also need to be considered to provide mobilized shear strength values that are compatible with the level of deformation anticipated along potential failure surfaces.

There is considerable uncertainty associated with the MSW shear strength values currently employed in practice. Obstacles to evaluating the shear strength of MSW include its heterogeneity and the difficulty in recovering and testing representative waste samples due to the large size of some waste constituents. In this paper, relevant studies of MSW shear strength are briefly reviewed, and then the results from a comprehensive testing program on reconstituted specimens of waste sampled at a landfill in northern California are summarized. These data, which include large-scale direct shear (DS), triaxial (TX), and simple shear (SS) test results as well as large-scale testing data of waste from numerous landfills worldwide and back-analyses of failed landfill slopes in the field, are then interpreted to provide both recommendations for assessing the shear strength of MSW on a project-specific basis and a new generic shear strength characterization for MSW for use in design when project-specific data are not available.

Insights from Previous Studies

A comprehensive discussion of previous studies of the shear strength of MSW is presented in Zekkos (2005). These previous studies of MSW shear strength indicate:

- The Mohr-Coulomb strength criterion is typically used to characterize the shear strength of waste (e.g., Landva and Clark 1990). These characterizations indicate that MSW shear strength is primarily stress dependent (i.e., frictional), particularly at higher confining stresses, but that it also has significant

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Note. This manuscript was submitted on May 28, 2008; approved on October 2, 2008; published online on May 15, 2009. Discussion period open until November 1, 2009; separate discussions must be submitted for individual papers. This paper is part of the ***Journal of Geotechnical and Geoenvironmental Engineering***, Vol. 135, No. 6, June 1, 2009. ©ASCE, ISSN 1090-0241/2009/6-709–722/$25.00.

strength at low confining stresses (i.e., cohesive strength). The shear strength at low confining stress appears to result primarily from the fibrous constituents of the waste.

- The equivalent (secant) friction angle of the MSW Mohr-Coulomb failure envelope appears to decrease as the normal stress increases (Pelkey et al. 2001).
- The shear strength used to characterize MSW may depend on the testing conditions (i.e., stress state, stress path, and strain path), specimen preparation, and the strength criterion used. Typical direct shear test results on both reconstituted specimens and on intact specimens tested in situ at low normal stress suggest a cohesion (c) of between 0 and 50 kPa and a friction angle (ϕ) of between 27 and 41°, with a majority of investigators suggesting $\phi \cong 33°$ (Landva and Clark 1990; Richardson and Reynolds 1991; Houston et al. 1995; Withiam et al. 1995; Kavazanjian et al. 1999; Mazzucato et al. 1999; Pelkey et al. 2001). MSW shear strength interpretation from triaxial tests is complicated by the need to use strain level-based definitions of shear strength due to the lack of a well defined peak strength and a continued increase in mobilized strength at large strains. MSW shear strength in triaxial compression has been defined in the literature as the mobilized shear stress at 5–25% axial strain. Friction angles as high as 45–53° have been reported at high strain levels (Jessberger and Kockel 1995; Grisolia et al. 1995). However, when strength is evaluated at lower strain levels typically considered appropriate for field characterization of shear strength (e.g., 5–10%), triaxial strength values tend to be lower than those from direct shear tests (Vilar and Carvalho 2002) or back-analysis of waste slopes (Kavazanjian et al. 1995; Eid et al. 2000).
- Simple shear tests on MSW are limited. In interpreting this test, an assumption of the orientation of the failure surface or of the value of the horizontal normal stress is required. Assuming the failure plane to be horizontal and interpreting the simple shear test as a direct shear test results in the lowest possible strength estimate, whereas assuming the normal stress on the vertical plane to be the K_o stress or that the normal stress on the vertical plane is the mean normal stress results in a significantly higher strength estimate. Using $K_o = 0.6$, Kavazanjian et al. (1999) estimated a lower bound shear strength envelope of $c = 16$ kPa and $\phi = 33°$ and an upper bound envelope of $c = 30$ kPa and $\phi = 59°$ from simple shear tests on reconstituted MSW. However, using the assumption of a horizontal failure plane, Kavazanjian et al. (1999) and Pelkey et al. (2001) found that the shear strength interpreted from large-scale simple shear tests was similar to the value interpreted from large-scale direct shear tests.
- Specimens with higher fiber content appear to be stronger than specimens with lower fiber content. Kavazanjian et al. (1999) observed that large direct shear specimens with lower fiber content were slightly weaker than specimens with more fiber content. Towhata et al. (2004) observed that triaxial specimens that included plastic inclusions sustained higher stresses at large strain than specimens without plastic inclusions.
- Testing to date has not indicated that the strength of MSW varies significantly due to reasonable variations in its unit weight (Kavazanjian et al. 1999; Vilar and Carvalho 2002).
- "Undisturbed" and reconstituted large-scale direct shear tests on MSW performed by Mazzucato et al. (1999) indicate similar shear strengths; however, only the "undisturbed" specimens exhibited a defined peak strength followed by a postpeak strength reduction.
- The shear strength estimated from stable and failed waste slopes is similar to that estimated from direct shear tests (Kavazanjian et al. 1995; Eid et al. 2000).

Some key observations that may be drawn from these studies on the shear strength of MSW are:

- There is great variability in the reported shear strengths in the literature. Cohesion values from 0 to 80 kPa and friction angles from 0–60° have been reported. In design, the static strength of MSW is often assumed to be that recommended by Kavazanjian et al. (1995) (i.e., $c = 24$ kPa and $\phi = 0°$ for normal stresses less than 37 kPa, and $c = 0$ kPa and $\phi = 33°$ for larger normal stresses) or by Eid et al. (2000) (i.e., a mean value of $c = 25$ kPa and $\phi = 35°$). The dynamic strength of MSW is typically assumed to be at least equal to and occasionally greater than its static strength. Augello et al. (1998) suggest that $\phi \cong 35-38°$ is a reasonable value for the strength of MSW subject to seismic loading.
- Specimen preparation and testing procedures are often not reported. Furthermore, there are significant differences among the specimen preparation and testing procedures that are reported.
- The stress-deformation response of MSW observed in different testing devices is remarkably different. In DS testing, the stress-displacement response is typically observed to be convex shaped (i.e., roughly hyperbolic), may approach an asymptotic value at large deformation, and sometimes includes a postpeak reduction in strength. In TX testing, MSW stress-strain response is often initially convex shaped, then almost linear, and finally becomes concave shaped (i.e. exhibits an increasing upward curvature) without any sign of reaching an asymptotic value, let alone a well-defined peak shear stress.
- The effects of waste degradation on MSW shear strength have not been addressed to any significant extent. Based on limited testing, it has been suggested that degradation will lower the strength of MSW. For example, triaxial test data presented by Turczynski (1988) indicate that the friction angle of MSW reduced from about 39° for fresh waste to 35°, to 32°, and finally to 26°, for 3 yr, 5 yr, and 15 yr old waste, respectively. The cohesion intercept interpreted from these tests also reduced systematically as the age of the waste increased. However, these trends are not observed in all the laboratory data. The problem is compounded by the fact that there has been no quantification of the level of degradation within waste. Although age is an important parameter, other factors, such as the waste composition, climate, moisture content, and landfill operational procedures are likely to contribute significantly to the rate of waste degradation.

Based upon these observations, there are still many uncertainties associated with the shear strength of MSW. Key issues associated with the shear strength of MSW include:

- The influence of specimen preparation procedures on the shear strength measured in laboratory tests;
- The influence of stress state on stress-strain behavior and shear strength (e.g., the discrepancy in the stress-strain-strength response of MSW between the DS and TX testing);
- The influence of dynamic loading;
- The influence of degradation; and
- The relationship of the shear strength measured in laboratory tests to field values of MSW shear strength.

A comprehensive multi-institution testing program was developed to address some of these issues and to develop revised recommendations for the shear strength of MSW for use in landfill stability analyses.

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Soil friction angle

Geotechdata.info - Updated 14.12.2013

Soil friction angle is a shear strength parameter of soils. Its definition is derived from the Mohr-Coulomb failure criterion and it is used to describe the friction shear resistance of soils together with the normal effective stress.

In the stress plane of Shear stress-effective normal stress, the soil friction angle is the angle of inclination with respect to the horizontal axis of the Mohr-Coulomb shear resistance line.

Typical values of soil friction angle for different soils according to USCS

Some typical values of soil friction angle are given below for different USCS soil types at normally consolidated condition unless otherwise stated. These values should be used only as guidline for geotechnical problems; however, specific conition of each engineering problem often needs to be considered for an appropriate choice of geotechnical parameters.

Description	USCS	Soil friction angle [°]			Reference
		min	max	Specific value	
Well graded gravel, sandy gravel, with little or no fines	GW	33	40		[1],[2],
Poorly graded gravel, sandy gravel, with little or no fines	GP	32	44		[1],
Sandy gravels - Loose	(GW, GP)			35	[3 cited in 6]
Sandy gravels - Dense	(GW, GP)			50	[3 cited in 6]
Silty gravels, silty sandy gravels	GM	30	40		[1],
Clayey gravels, clayey sandy gravels	GC	28	35		[1],
Well graded sands, gravelly sands, with little or no fines	SW	33	43		[1],
Well-graded clean sand, gravelly sands - Compacted	SW	-	-	38	[3 cited in 6]
Well-graded sand, angular grains - Loose	(SW)			33	[3 cited in 6]
Well-graded sand, angular grains - Dense	(SW)			45	[3 cited in 6]
Poorly graded sands, gravelly sands, with little or no fines	SP	30	39		[1], [2],
Poorly-garded clean sand - Compacted	SP	-	-	37	[3 cited in 6]
Uniform sand, round grains - Loose	(SP)			27	[3 cited in 6]
Uniform sand, round grains - Dense	(SP)			34	[3 cited in 6]
Sand	SW, SP	37	38		[7],
Loose sand	(SW, SP)	29	30		[5 cited in 6]
Medium sand	(SW, SP)	30	36		[5 cited in 6]
Dense sand	(SW, SP)	36	41		[5 cited in 6]
Silty sands	SM	32	35		[1],
Silty clays, sand-silt mix - Compacted	SM	-	-	34	[3 cited in 6]
Silty sand - Loose	SM	27	33		[3 cited in 6]

Silty sand - Dense	SM	30	34		[3 cited in 6]
Clayey sands	SC	30	40		[1],
Calyey sands, sandy-clay mix - compacted	SC			31	[3 cited in 6]
Loamy sand, sandy clay Loam	SM, SC	31	34		[7],
Inorganic silts, silty or clayey fine sands, with slight plasticity	ML	27	41		[1],
Inorganic silt - Loose	ML	27	30		[3 cited in 6]
Inorganic silt - Dense	ML	30	35		[3 cited in 6]
Inorganic clays, silty clays, sandy clays of low plasticity	CL	27	35		[1],
Clays of low plasticity - compacted	CL			28	[3 cited in 6]
Organic silts and organic silty clays of low plasticity	OL	22	32		[1],
Inorganic silts of high plasticity	MH	23	33		[1],
Clayey silts - compacted	MH			25	[3 cited in 6]
Silts and clayey silts - compacted	ML			32	[3 cited in 6]
Inorganic clays of high plasticity	CH	17	31		[1],
Clays of high plasticity - compacted	CH			19	[3 cited in 6]
Organic clays of high plasticity	OH	17	35		[1],
Loam	ML, OL, MH, OH	28	32		[7],
Silt Loam	ML, OL, MH, OH	25	32		[7],
Clay Loam, Silty Clay Loam	ML, OL, CL, MH, OH, CH	18	32		[7],
Silty clay	OL, CL, OH, CH	18	32		[7],
Clay	CL, CH, OH, OL	18	28		[7],
Peat and other highly organic soils	Pt	0	10		[2],

Correlation between SPT-N value, friction angle, and relative density

Correlation between SPT-N value and friction angle and Relative density (Meyerhoff 1956)

SPT N3 [Blows/0.3 m - 1 ft]	Soi packing	Relative Density [%]	Friction angle [°]
< 4	Very loose	< 20	< 30
4 -10	Loose	20 - 40	30 - 35
10 - 30	Compact	40 - 60	35 - 40
30 - 50	Dense	60 - 80	40 - 45
> 50	Very Dense	> 80	> 45

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Soil Cohesion

Geotechdata.info - Updated 31.10.2014

The cohesion is a term used in describing the shear strength soils. Its definition is mainly derived from the Mohr-Coulomb failure criterion and it is used to describe the non-frictional part of the shear resitance which is independent of the normal stress. In the stress plane of Shear stress-effective normal stress, the soil cohesion is the intercept on the shear axis of the Mohr-Coulomb shear resistance line

Typical values of soil cohesion for different soils

Some typical values of soil cohesion are given below for different soil types. The soil cohesion depends strongly on the consistence, packing, and saturation condition. The values given below correspond to normally consolidated condition unless otherwise stated. These values should be used only as guidline for geotechnical problems; however, specific conition of each engineering problem often needs to be considered for an appropriate choice of geotechnical parameters.

Description	USCS	Cohesion [kPa]			Reference
		min	max	Specific value	
Well graded gravel, sandy gravel, with little or no fines	GW	-	-	0	[1],[2],[3],
Poorly graded gravel, sandy gravel, with little or no fines	GP	-	-	0	[1],[2], [3],
Silty gravels, silty sandy gravels	GM	-	-	0	[1],
Clayey gravels, clayey sandy gravels	GC	-	-	20	[1],
Well graded sands, gravelly sands, with little or no fines	SW	-	-	0	[1],[2], [3],
Poorly graded sands, gravelly sands, with little or no fines	SP	-	-	0	[1],[2], [3],
Silty sands	SM	-	-	22	[1],
Silty sands - Saturated compacted	SM	-	-	50	[3],
Silty sands - Compacted	SM	-	-	20	[3],
Clayey sands	SC	-	-	5	[1],
Clayey sands - Compacted	SC	-	-	74	[3],
Clayey sands -Saturated compacted	SC	-	-	11	[3],
Loamy sand, sandy clay Loam - compacted	SM, SC	50	75		[2],
Loamy sand, sandy clay Loam - saturated	SM, SC	10	20		[2],
Sand silt clay with slightly plastic fines - compacted	SM, SC	-	-	50	[3],
Sand silt clay with slightly plastic fines - saturated compacted	SM, SC	-	-	14	[3],
Inorganic silts, silty or clayey fine sands, with slight plasticity	ML	-	-	7	[1],
Inorganic silts and clayey silts - compacted	ML	-	-	67	[3],
Inorganic silts and clayey silts - saturated compacted	ML	-	-	9	[3],
Inorganic clays, silty clays, sandy clays of low plasticity	CL	-	-	4	[1],
Inorganic clays, silty clays, sandy clays of low plasticity - compacted	CL	-	-	86	[3],
Inorganic clays, silty clays, sandy clays	CL	-	-	13	[3],

of low plasticity - saturated compacted					
Mixture if inorganic silt and clay - compacted	ML-CL	-	-	65	[3],
Mixture if inorganic silt and clay - saturated compacted	ML-CL	-	-	22	[3],
Organic silts and organic silty clays of low plasticity	OL	-	-	5	[1],
Inorganic silts of high plasticity - compactd	MH	-	-	10	[1],
Inorganic silts of high plasticity - saturated compacted	MH	-	-	72	[3],
Inorganic silts of high plasticity	MH	-	-	20	[3],
Inorganic clays of high plasticity	CH	-	-	25	[1],
Inorganic clays of high plasticity - compacted	CH	-	-	103	[3],
Inorganic clays of high plasticity - satrated compacted	CH	-	-	11	[3],
Organic clays of high plasticity	OH	-	-	10	[1],
Loam - Compacted	ML, OL, MH, OH	60	90		[2],
Loam - Saturated	ML, OL, MH, OH	10	20		[2],
Silt Loam - Compacted	ML, OL, MH, OH	60	90		[2],
Silt Loam - Saturated	ML, OL, MH, OH	10	20		[2],
Clay Loam, Silty Clay Loam - Compacted	ML, OL, CL, MH, OH, CH	60	105		[2],
Clay Loam, Silty Clay Loam - Saturated	ML, OL, CL, MH, OH, CH	10	20		[2],
Silty clay, clay - compacted	OL, CL, OH, CH	90	105		[2],
Silty clay, clay - saturated	OL, CL, OH, CH	10	20		[2],
Peat and other highly organic soils	Pt	-	-		

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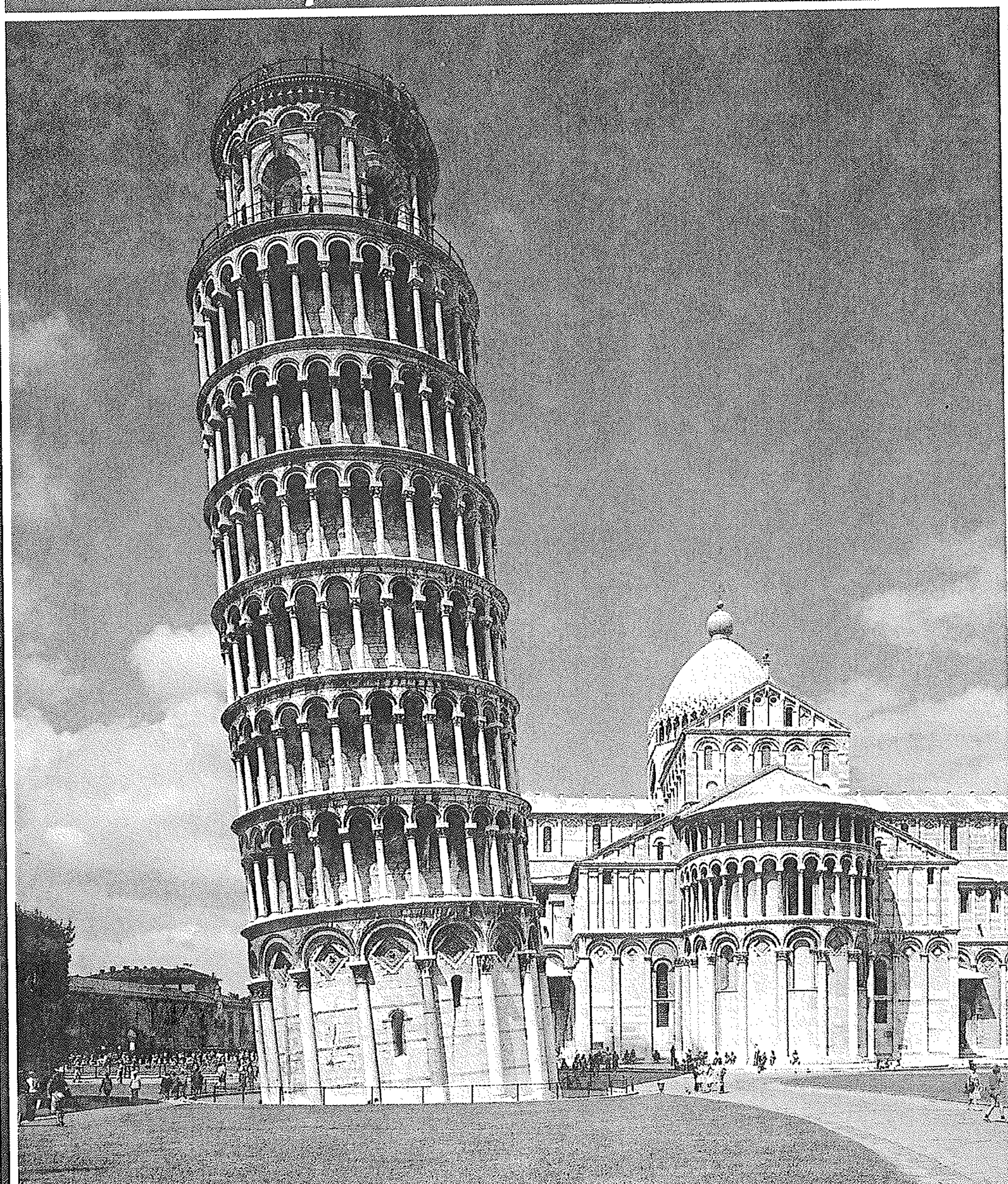
Citation :
Geotechdata.info, Cohesion, http://geotechdata.info/parameter/cohesion (as of December 15, 2013).

Other soil parameters

- » Angle of friction
- » Cohesion
- » Dry unit weight
- » Young's modulus
- » Void ratio
- » Soil Permeability coefficient
- » Soil porosity

GEOTECHNICAL ENGINEERING

Principles and Practices



DONALD P. CODUTO

$$\gamma = \frac{W}{V} \tag{4.5}$$

The unit weight of undisturbed soil samples can easily be determined in the laboratory by measuring their physical dimensions and weighing them. This method produces reliable assessments of γ for many soils. However, it is affected by sample disturbance, especially in sandy and gravelly soils. Sometimes unit weight measurements are made on supposedly "undisturbed" samples that in reality have significant disturbance. Such measurements are very misleading, so it is best to not even attempt unit weight measurements on poor quality samples. Table 4.1 presents typical ranges of γ for various soils.

TABLE 4.1 TYPICAL UNIT WEIGHTS.

Soil Type and Unified Soil Classification (See Section 5.3)	Typical Unit Weight, γ			
	Above Groundwater Table		Below Groundwater Table	
	(lb/ft^3)	(kN/m^3)	(lb/ft^3)	(kN/m^3)
GP — Poorly graded gravel	110 - 130	17.5 - 20.5	125 - 140	19.5 - 22.0
GW — Well graded gravel	110 - 140	17.5 - 22.0	125 - 150	19.5 - 23.5
GM — Silty gravel	100 - 130	16.0 - 20.5	125 - 140	19.5 - 22.0
GC — Clayey gravel	100 - 130	16.0 - 20.5	125 - 140	19.5 - 22.0
SP — Poorly graded sand	95 - 125	15.0 - 19.5	120 - 135	19.0 - 21.0
SW — Well graded sand	95 - 135	15.0 - 21.0	120 - 145	19.0 - 23.0
SM — Silty sand	80 - 135	12.5 - 21.0	110 - 140	17.5 - 22.0
SC — Clayey sand	85 - 130	13.5 - 20.5	110 - 135	17.5 - 21.0
ML — Low plasticity silt	75 - 110	11.5 - 17.5	80 - 130	12.5 - 20.5
MH — High plasticity silt	75 - 110	11.5 - 17.5	75 - 130	11.5 - 20.5
CL — Low plasticity clay	80 - 110	12.5 - 17.5	75 - 130	11.5 - 20.5
CH — High plasticity clay	80 - 110	12.5 - 17.5	70 - 125	11.0 - 19.5

Two variations of unit weight also are commonly used, the *dry unit weight*, γ_d, and the *unit weight of water*, γ_w:

$$\gamma_d = \frac{W_s}{V} \tag{4.6}$$

where:

$(N_1)_{60}$ = corrected SPT N-value, as defined in Chapter 3
C_P = grain size correction factor
C_A = aging correction factor
C_{OCR} = overconsolidation correction factor
D_{50} = grain size at which 50 percent of the soil is finer (mm) as defined in Section 4.4
t = age of soil (time since deposition in years). If no age information data is available, use t = 100 yr.
OCR = overconsolidation ratio, as defined in Chapter 11. If no information is available to assess the OCR, use a value of 2.
q_c = cone resistance (kg/cm^2 or ton/ft^2), as defined in Chapter 3
Q_c = compressibility factor
= 0.91 for highly compressible sands
= 1.00 for moderately compressible sands
= 1.09 for slightly compressible sands
For purposes of solving this formula, a sand with a high fines content or a high mica content is "highly compressible," whereas a pure quartz sand is "slightly compressible."
σ_z' = vertical effective stress (lb/ft^2; kPa), as defined in Chapter 10

Many people confuse relative density with relative compaction. The latter is defined in Chapter 6. Although the names are similar, and they measure similar properties, these two parameters are numerically different. In addition, some people in other professions use the term "relative density" to describe what we call specific gravity! Geotechnical engineers should never use the term in this way.

Table 4.5 presents typical values of e_{min} and e_{max} for various sandy soils. These are not intended to be used in lieu of laboratory or in-situ tests, but could be used to check test results or for preliminary analyses.

TABLE 4.5 TYPICAL VALUES OF e_{min} AND e_{max} (Hough, 1969; Adapted by permission of John Wiley and Sons, Inc.)

Soil Description	e_{min} (dense)	e_{max} (loose)
Equal spheres (theoretical values)	0.35	0.92
Clean, poorly graded medium sand (Ottawa, Illinois)	0.50	0.80
Clean, fine-to-medium sand	0.40	1.0
Uniform inorganic silt	0.40	1.1
Silty sand	0.30	0.90
Clean fine-to-coarse sand	0.20	0.95
Micaceous sand	0.40	1.2
Silty sand and gravel	0.14	0.85

TABLE 11.3 TYPICAL CONSOLIDATION PROPERTIES OF SATURATED NORMALLY CONSOLIDATED SANDY SOILS AT VARIOUS RELATIVE DENSITIES (Adapted from Burmister, 1962)

Soil Type	$C_c / (1+e_0)$					
	$D_r = 0\%$	$D_r = 20\%$	$D_r = 40\%$	$D_r = 60\%$	$D_r = 80\%$	$D_r =$ 100%
Medium to coarse sand, some fine gravel (SW)	-	-	0.005	-	-	-
Medium to coarse sand (SW/SP)	0.010	0.008	0.006	0.005	0.003	0.002
Fine to coarse sand (SW)	0.011	0.009	0.007	0.005	0.003	0.002
Fine to medium sand (SW/SP)	0.013	0.010	0.008	0.006	0.004	0.003
Fine sand (SP)	0.015	0.013	0.010	0.008	0.005	0.003
Fine sand with trace fine to coarse silt (SP-SM)	-	-	0.011	-	-	-
Find sand with little fine to coarse silt (SM)	0.017	0.014	0.012	0.009	0.006	0.003
Fine sand with some fine to coarse silt (SM)	-	-	0.014	-	-	-

For saturated overconsolidated sands, $C_r / (1+e_0)$ is typically about one-third of the values listed in Table 11.3, which makes such soils nearly incompressible. Compacted fills can be considered to be overconsolidated, as can soils that have clear geologic evidence of preloading, such as glacial tills. Therefore, many settlement analyses simply consider the compressibility of such soils to be zero. If it is unclear whether a soil is normally consolidated or overconsolidated, it is conservative to assume it is normally consolidated.

Very few consolidation tests have been performed on gravelly soils, but the compressibility of these soils is probably equal to or less than those for sand, as listed in Table 11.3.

Another characteristic of sands and gravels is their high hydraulic conductivity, which means any excess pore water drains very quickly. Thus, the rate of consolidation is very fast, and typically occurs nearly as fast as the load is applied. Thus, if the load is due to a fill, the consolidation of these soils may have little practical significance.

However, there are at least two cases where consolidation of coarse-grained soils can be very important and needs more careful consideration:

1. **Loose sandy soils subjected to dynamic loads, such as those from an earthquake.** They can experience very large and irregular settlements that can cause serious damage. Kramer (1996) discusses methods of evaluating this problem.

secondary compression and occurs under a constant effective stress. We don't fully understand the physical basis for secondary compression, but it appears to be due to particle rearrangement, creep, and the decomposition of organics. Highly plastic clays, organic soils, and sanitary landfills are most likely to have significant secondary compression. However, secondary compression is negligible in sands and gravels.

The *secondary compression index*, C_α, defines the rate of secondary compression. It can be defined either in terms of either void ratio or strain:

$$C_\alpha = -\frac{de}{d\log t} \tag{11.26}$$

$$\frac{C_\alpha}{1+e_p} = \frac{d\epsilon_z}{d\log t} \tag{11.27}$$

where:

C_α = secondary compression index
e = void ratio
e_p = void ratio at end of consolidation settlement (can use $e_p = e_0$ without introducing much error)
ϵ_z = vertical strain
t = time

Design values are normally determined while conducting a laboratory consolidation test. The consolidation settlement occurs very rapidly in the lab (because of the short drainage distance), so it is not difficult to maintain one or more of the load increments beyond the completion of consolidation settlement. The change in void ratio after this point can be plotted against log time to determine C_α.

Another way of developing design values of C_α is to rely on empirical data that relates it to the compression index, C_c. This data is summarized in Table 11.4.

TABLE 11.4 EMPIRICAL CORRELATION BETWEEN C_α AND C_c (Terzaghi, Peck, and Mesri, 1996)

Material	C_α / C_c
Granular soils, including rockfill	0.02 ± 0.01
Shale and mudstone	0.03 ± 0.01
Inorganic clays and silts	0.04 ± 0.01
Organic clays and silts	0.05 ± 0.01
Peat and muskeg	0.06 ± 0.01

13.4 SHEAR STRENGTH OF SATURATED SANDS AND GRAVELS

Little or no excess pore water pressure occurs in clean sands and gravels under static loading conditions because their hydraulic conductivities are so high. If changes in the normal or shear stresses cause the voids to expand or contract, water easily flows in or out as necessary. Therefore, the pore water pressure, u, is equal to the hydrostatic pore water pressure (Equation 7.7) and shear strength analyses may be based on effective stresses.

Determining c' and ϕ'

If no cementing agents or clay are present, saturated sands and gravels should have $c' = 0$. We determine the friction angle, ϕ', by conducting field or laboratory tests, as discussed later in this chapter. Figure 13.11 presents typical ϕ' values, which may be used for preliminary estimates or for checking test data.

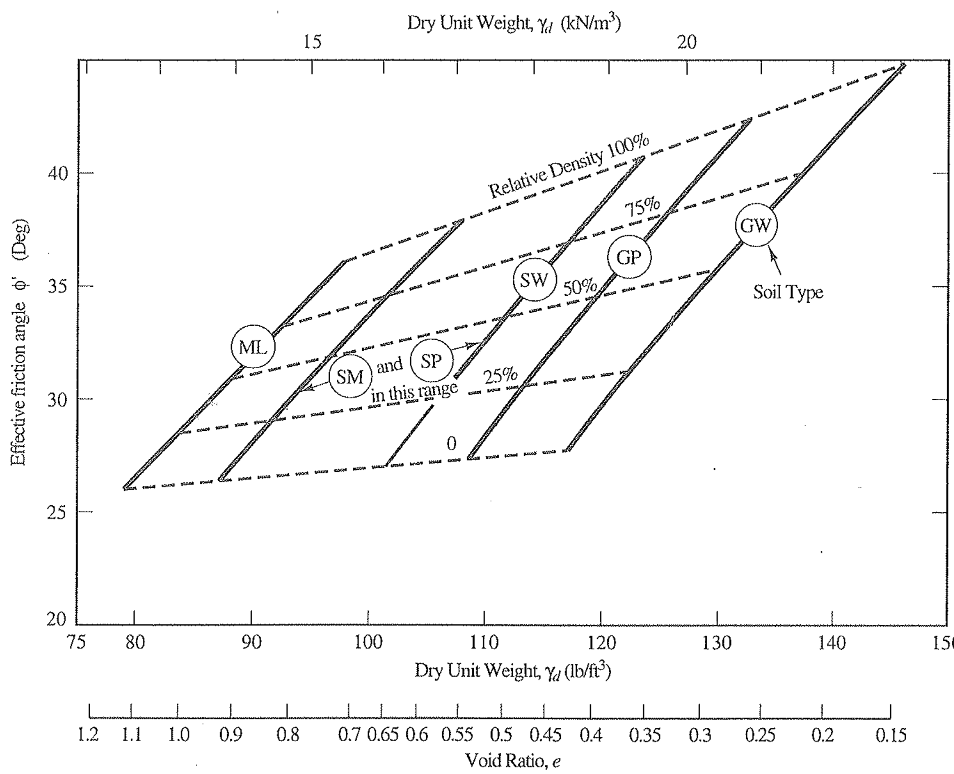


Figure 13.11 Typical ϕ' values for cohesionless soils without clay or cementing agents (Adapted from U.S. Navy, 1982).

Notice how the ϕ' values in Figure 13.11 increase as the unit weight increases. This is one of the reasons for compacting soils. This figure also illustrates that gravels are

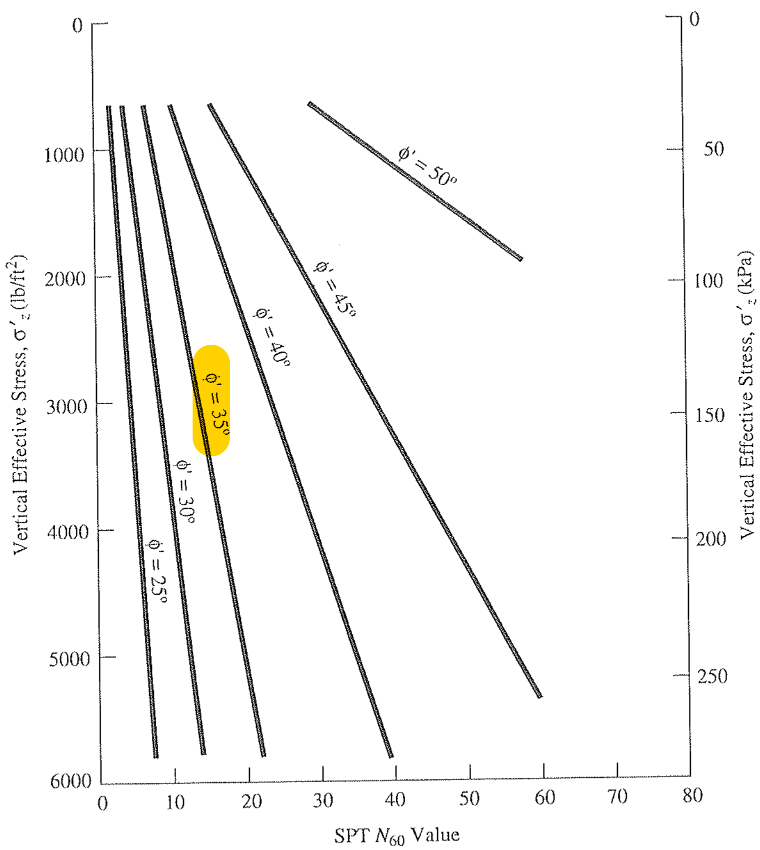


Figure 13.36 Empirical correlation between N_{60} and ϕ' for uncemented sands (Adapted from DeMello, 1971).

Cone Penetration Test

The cone penetration test (CPT), described in Chapter 3, also may be used to determine ϕ', as shown in Figure 13.37.

13.9 SHEAR STRENGTH AT INTERFACES BETWEEN SOIL AND OTHER MATERIALS

Many geotechnical construction projects use geosynthetic materials embedded into the soil for various purposes (Koerner, 1998). For example, geogrids can be used to reinforce the soil, geotextiles can be used for filtration, and geomembranes can be used to provide impervious barriers. Sometimes the shear strength along the interface between these materials and the adjacent soil becomes important and needs to be evaluated. This strength may be measured in the laboratory using a device similar to a direct shear machine.

Shear strength and consolidation properties of Municipal Solid Waste

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Introduction

In recent years there has been an increasing interest on waste management and disposal. When municipal solid waste (MSW) is concerned, landfills are the most used method of final waste disposal. Apart from environmental aspects, an urban waste landfill must be seen as an engineering structure which must satisfy the usual safety requirements, concerning stability against failure, deformation, stress imposed to foundation soil and the behavior of accessory elements, such as liner and gas and leachate drains. This paper summarizes some aspects of mechanical properties of MSW as measured in laboratory and is a synthesis of the paper by Vilar and Carvalho (2004). These tests were part of a research program performed at the University of São Paulo intended to characterize the behavior of MSW and landfill that encompassed field and laboratory tests, the construction of an experimental landfill and the modeling and analysis of landfill based on test results and results from monitoring.

Characterization of MSW

The tested MSW was recovered from a selected area (Test Area), nearly 450 m2, located at Bandeirantes Sanitary Landfill, in the city of São Paulo (Brazil). The waste in this area is about fifteen years old and it was chosen considering the facilities and the existing instruments (gas and leachate piezometers and superficial markers for settlement control). Field penetration tests (SPT and CPT) indicate some large values of strength that were associated to materials such as stone, rubber and wood. So larger values were associated to more resistant materials and were not considered representative of matrix waste. Excluding the values higher than 20 blows, the average SPT is about 7 blows for superficial layers (0-15m depth). It reaches about 12 blows for deeper layers (between 15 and 30m in depth). Tip and lateral resistance of CPT tended also to increase with depth and typical values varied between 2500 - 7500 kPa and 100 - 400 kPa, respectively.
Infiltration tests showed highly variable rates of flow but typical values of refuse coefficient of Hydraulic conductivity vary between 10-4 cm/s and 10-6 cm/s.
Refuse sampling was done using a continuous auger 40cm diameter. The gradation curve for the collected waste sample was determined through sieving of dry waste and direct measurement of components larger than 50 mm. In the sieving, plastic materials and textiles, which represent almost 20% of the total sample, were excluded. So, it was found that around 35% of the components present grain size larger that 20mm and approximately 50%, between 20 and 2mm. The waste sample used in strength and compression tests presented the following average physical composition: wood (4%), paper (2%), plastic (17%), textile (3%), metal (5%), glass (2%), rubber (2%), stone (10%) and past organic (55%) from which 12% is organic mater and 43%, ash.

Triaxial compression tests

A large triaxial cell was constructed to test samples with 300 or 400mm of height and 150 or 200mm of diameter. Laboratory testing has been conducted using deformed waste samples that were molded to unit weights of 10, 12 and 14 kN/m^3. Samples were molded keeping their natural moisture content (in the range between 60 and 68%) and some of them were saturated by back-pressure. Consolidated drained (CD) triaxial tests and undrained tests (CU) were performed at a strain rate of 0.7%/min and effective confining pressures of 100, 200 and 400 kPa. Typical stress- strain curves for CD tests and natural water content waste samples are presented in Figure 1. The results show what can be seen as a typical behavior of urban waste like materials, as reported by many authors. Deviator stress increases with axial strain almost continuously, without any peak in the stress-strain curve or without reaching an ultimate value. The stress path followed in these tests plotted in s',t plane are shown in Fig. 2.
As failure cannot usually be clearly defined when testing MSW and considering the need for an operational shear strength envelope to deal with typical problems such as slope stability, a reliable procedure is to use Mohr-Coulomb criterion related to some value of strain. This is done in Fig. 2, where shear strength envelopes for axial strains of 10, 20 and 30% are included. As can be seen the mobilized shear strength tends to increase with strain. For instance, for the natural moisture specimens and unit weight of 12kN/m3, cohesion departed from 20 kPa for 10% strain and increased to 71 kPa, for 30% strain. For the same strains the friction angle increased from 22^o to 33^o. However the mobilization of shear strength parameters does not follow the same pattern. The cohesion has relatively initial low values and tends to increase continuously at an increase rate that is much more pronounced than that of friction angle. The friction angle on the other side has relatively initial higher values and their rate of increase suggest that it will tend to reach an ultimate value as strain increases.
The large cohesion intercepts calculated have been credited to the fibre components (specially plastics) that provides a reinforcement mechanism (König and Jessberger 1997) responsible, for instance, for the existence of vertical cuts as high as 4m in the tested waste in the field. Among the factors studied, it was found that the unit weights used in the test program (10, 12 and 14 kN/m^3) showed little influence in shear strength, probably because the corresponding dry unit weight varied little between the samples. Similarly, it was noticed that the results from specimens molded at natural moisture content (degree of saturation of about 70%) did not show appreciable differences from the saturated ones. It is believed that the large volume decrease during consolidation and the high initial degree of saturation of natural moisture samples led both samples to similar conditions during shear justifying the closer results.

Confined compression tests

Confined compression tests of waste have been carried out using a oedometer with 385 mm diameter and 365 mm height. The waste sample was placed in the oedometer in 6 layers and lightly pressed to reach the desired initial unit weight. Loading was applied in stages that lasted about 15 days although some stages were prolonged a few days to define adequately the creep characteristics of the waste. Figures 3a shows typical curves of deformation against time. In this figure it can be observed an accentuated secondary compression process (creep).

These data allowed to calculate the secondary compression index C_α ($C_\alpha = \Delta e/\Delta \log t$) and C'_α ($C'_\alpha = C_\alpha/(1+ eo)$) for each stage of loading. C_α ranged between 0.021 and 0.044, with an average value of 0.032, while C'_α varied in a narrow range, between 0.012 and 0.016. The overburden stress did not influence both coefficients in the range between 100 and 640kPa, although a slight decrease in C_α was observed as the stress increased.

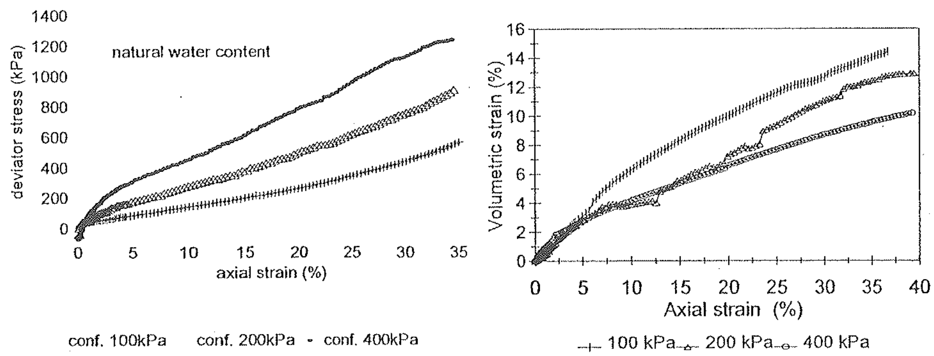

Figure 1. Typical stress - strain curves of waste from triaxial compression tests (CD). Unit weight: 12 kN/m3 and molding water content: 67%.

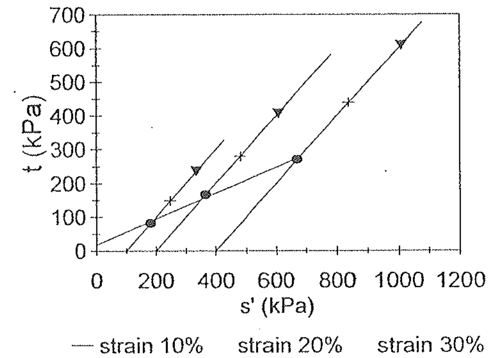

FIG. 2 — Stress paths and shear strength envelopes for different strain of MSW with unit weight of 12kN/m3. Natural moisture content sample.

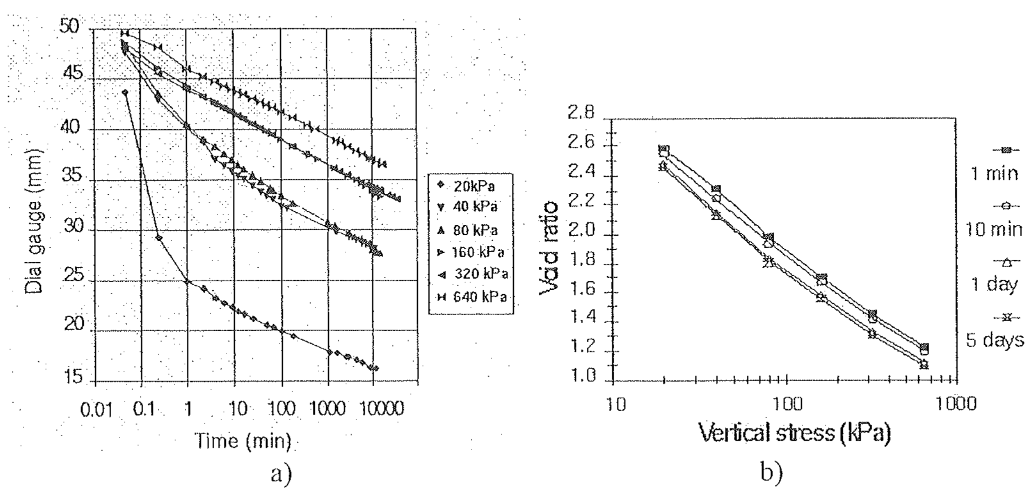

Fig. 3 — Results of consolidation tests of sample T1B molded with unit weight of 10 kN/m^3. Specimen prepared at natural moisture content (68%).

As an equilibrium void ratio was not attained in the time spans used in the tests, some curves for different times of loading were plotted. Fig. 3b illustrates some compression curves of specimens molded with initial unit weight of 10 kN/m^3. The curves were almost parallel but not straight. They were rather slightly concave upwards, however straight curves were fitted to points between 60 and 640 kPa allowing to obtain the primary compression index [$C_c = \Delta e / \Delta \log(\sigma)$]. C_c varied between 0.52 and 0.92, however the normalized compression coefficient C'_c [$C'_c = C_c/(1+e_o)$] obtained were very close, averaging 0.21.

Conclusions

Typical results of consolidation and triaxial compression tests on large remolded specimens of a 15 year old sample of Municipal Solid Waste (MSW) were shown. Due to space limitations, many of the analysis regarding the whole set of results could not be presented, but the general behavior of the waste can be summarized as follows:

1. Consolidation tests showed the large compressibility of MSW where secondary compression plays a fundamental role.

2. Secondary compression index, normalized through e_o, C'_α ($C'_\alpha = C\alpha/(1+e_o)$) showed a small range of variation and yielded an average value of 0.013. Primary compression index (Cc) showed to be also dependent on e_o and normalized C'c [$C'_c = C_c/(1+e_o)$] reached about 0.21.

3. Drained triaxial compression tests showed stress-strain curves that were concave upwards and failure or an ultimate value of deviator stress could not been reached even for large values of strain, above 30%. The shear strength parameters are strain dependent and tended to increase with the deformation.

4. For the same unit weight, the shear strength was little affected by the degree of saturation of the tested specimens. The relatively high initial degree of saturation of the unsaturated specimens (above 70%) and the large volume compression during consolidation probably raised the degree of saturation approaching the saturated condition thus yielding close values of shear strength.

5.The shear strength parameters obtained from specimens with different unit weights presented small variation and an average shear strength envelope could fit the results of the samples in the range of unit weight studied (10, 12, 14kN/m^3).

6. Effective stress shear strength parameters from CU tests were misleading and did not agree with the parameters from CD tests. Undrained shear strength was proportional to the effective confining pressure and the relationship between these variables was larger than that usually observed in soils.

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Constitutive model for municipal solid waste incorporating mechanical creep and biodegradation-induced compression

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ABSTRACT

A constitutive model is proposed to describe the stress–strain behavior of municipal solid waste (MSW) under loading using the critical state soil mechanics framework. The modified cam clay model is extended to incorporate the effects of mechanical creep and time dependent biodegradation to calculate total compression under loading. Model parameters are evaluated based on one-dimensional compression and triaxial consolidated undrained test series conducted on three types of MSW: (a) fresh MSW obtained from working phase of a landfill, (b) landfilled waste retrieved from a landfill after 1.5 years of degradation, and (c) synthetic MSW with controlled composition. The model captures the stress–strain and pore water pressure response of these three types of MSW adequately. The model is useful for assessing the deformation and stability of landfills and any post-closure development structures located on landfills.

1. Introduction

Proper assessment of the stability of municipal solid waste (MSW) landfill slopes has become extremely important in light of the recent failure of several landfills in the United States and worldwide (Koerner and Soong, 2000; Stark et al., 2000; Blight and Fourie, 2005). In addition, the reasonable prediction of MSW settlement has also become important in order to ascertain the stability of landfill appurtenances (e.g., gas collection pipes, leachate collection pipes, etc.) and to plan and design post-closure redevelopment projects. Limit equilibrium methods have been routinely used to analyze landfill slopes and the adopted soil mechanics-based settlement methods have been commonly used to calculate the settlement of MSW (Sharma and Reddy, 2004). These stability and settlement analysis methods require the mechanical properties of MSW such as unit weight, shear strength parameters, and compressibility parameters (compression and recompression ratios, secondary compression ratio). Despite heterogeneous composition, several studies have attempted to quantify the mechanical properties of MSW based on laboratory and field testing programs as well as back-analysis (or inverse analysis) using landfill field performance data (Kavazanjian and Matasovic, 1995; Zekkos, 2005).

The compressibility and shear strength behavior of MSW has drawn the attention of several researchers. For example, Sowers (1973), Yen and Scanlon (1975), Edil et al. (1990), Landva and Clark (1990), Grisolia et al. (1991), Gabr and Valero (1995), Wall and Zeiss (1995), Park and Lee (1997), Ling et al. (1998), Sivakumar Babu (1999), El-Fadel and Khoury (2000), Park et al. (2002, 2007), Marques et al. (2003), Oweis (2006), Gangathulasi (2008), and Reddy et al. (2009a,b) studied the compression response of MSW and/or proposed different approaches to predict immediate compression and time dependent compression under load. Marques et al. (2003) presented a composite model for compressibility considering three important mechanisms; instantaneous compression in response to applied load, secondary mechanical creep, and time dependent biological decomposition. They illustrated the use of the model consisting of five parameters such as compression index and coefficients and rate constants for both mechanical creep and biodegradation, respectively, to predict the settlement of MSW landfill. Sharma and De (2007) presented methods for estimating settlements of MSW landfills, including bioreactor landfills involving leachate recirculation for enhanced waste degradation, in terms of primary and secondary coefficients and demonstrated their application to post-closure maintenance and development plans of landfills.

Singh and Murphy (1990), Jessberger and Kockel (1993), Kavazanjian and Matasovic (1995), Manassero et al. (1996), Sivakumar Babu (1998), Vilar and Carvalho (2002), Zekkos (2005) and Reddy et al. (2009a,b) studied the shear strength response of MSW. Several investigators evaluated the stability of landfill slopes based on limit equilibrium methods using the drained Mohr–Coulomb shear strength parameters of MSW (e.g., Reddy et al., 1999; Stark et al., 2000).

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Table 3
Properties of the three types of MSW tested in this study.

Type of waste	Average initial moisture content (%)		Average bulk wet density (kg/m^3)	Average specific gravity
	Dry weight basis	Wet weight basis		
Fresh MSW	43.7	30.4	740	0.85
Landfill MSW	43.3	30.2	1020	0.97
Synthetic MSW	134.6	57.3	1150	1.09

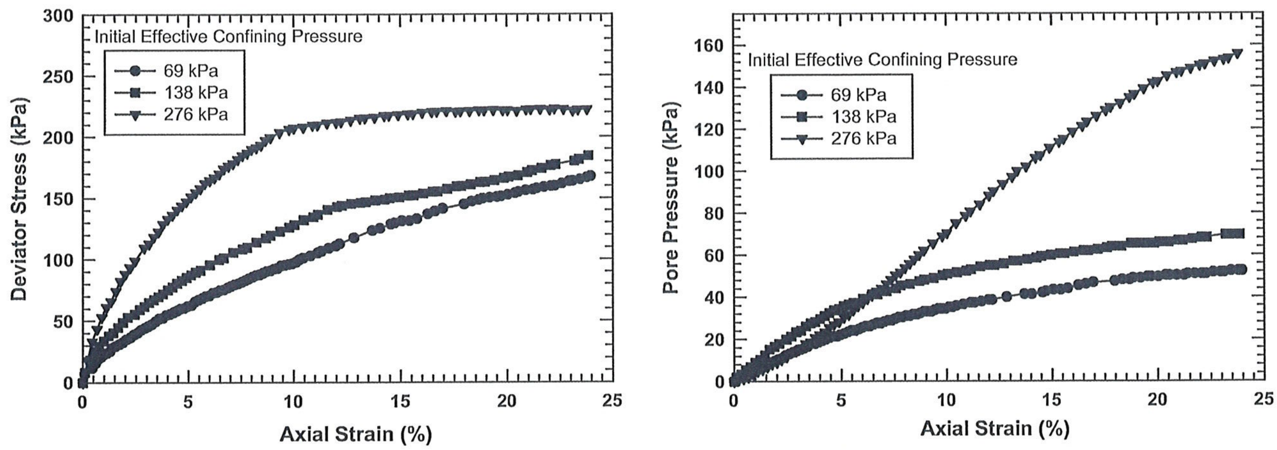

Fig. 5. Typical triaxial consolidated undrained shear test results for landfilled MSW.

ically consolidated under different confining pressures of 69, 138, and 276 kPa and volume change was measured. The MSW samples were finally subjected to shear under undrained condition. Pore water pressures were measured during shearing. To ensure uniform pore pressures throughout the specimen, samples were sheared at a constant strain rate (approximately 1% per minute). Typical results for landfilled MSW are shown in Fig. 5. Reddy et al. (2009a–c) provide the results for fresh MSW and synthetic MSW and also discuss all of the test results.

Table 5
Additional parameters to account for mechanical creep and biodegradation in the proposed model.

Type of waste	b (m^2/kN)	c (day^{-1})	E_{dg}	d (day^{-1})
Fresh MSW	0.0081	0.0105	0.160	0.0315
Landfilled MSW	0.0046	0.0127	0.116	0.0243
Synthetic MSW	0.0095	0.0420	0.210	0.0600

4. Results and discussion

4.1. Model parameters

The proposed model requires the same parameters as the modified cam clay model. These parameters are: frictional constant (M), compression index (λ), recompression or swelling index (κ), and over-consolidation ratio, which is defined as the ratio of pre-consolidation pressure to mean effective stress (OCR $= p'_0/p'$). In addition to these modified cam clay model parameters, the implementation of the proposed constitutive model requires four additional parameters. These are: two parameters representing the mechanical creep, namely coefficient of mechanical creep (b) and rate constant (c); and two other parameters representing the biodegradation effect given by total amount of strain (E_{dg}) and rate constant (d), which are functions of biodegradation.

The compression and swelling indices (λ and κ parameters) are obtained from compression test results shown in Fig. 3. The normal pressure vs. axial strain data is replotted as normal pressure vs. void ratio and the slope of the compression line on this plot gives the value of λ. Compression testing did not include an unload and reload cycle; but, the literature shows that recompression index

Table 4
Modified cam clay model parameters.

Type of MSW	Confining pressure (kPa)	φ'	Void ratio (e)	λ	κ	G	M	OCR
Fresh MSW	69	16	0.61	0.12	0.012	4274	0.61	1
	138	16	0.65	0.12	0.012	8779	0.61	1
	276	16	0.23	0.12	0.012	13206	0.61	1
Landfilled MSW	69	23	0.46	0.091	0.0091	5092	0.90	1
	138	23	0.42	0.091	0.0091	10303	0.90	1
	276	23	0.50	0.091	0.0091	20997	0.90	1
Synthetic MSW	69	10.3	0.47	0.175	0.0175	2672	0.38	1
	138	10.3	0.51	0.175	0.0175	8287	0.38	1
	276	10.3	0.36	0.175	0.0175	14871	0.38	1

The Impact of Degradation on MSW Shear Strength

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ABSTRACT: Multiple lines of evidence are used to draw conclusions concerning the shear strength of degraded municipal solid waste (MSW). Interpretation of the accumulated evidence leads to the conclusion that for conventional "dry" landfills the shear strength envelopes commonly used in practice provide reasonable strength values for circular and non-horizontal failure surfaces even for old landfills where the waste may be in a relatively advanced state of degradation. However, for horizontal failure surfaces in conventional landfills that may not engage the fibrous waste components, for landfills where mechanical pre-processing has been used to reduce waste constituent size and facilitate degradation, and for bioreactor landfills, a strength envelope characterized by zero cohesion and an effective friction angle of 30 degrees appears to provide a conservative representation of degraded MSW shear strength.

INTRODUCTION

The impact of degradation on the shear strength of municipal solid waste (MSW) is an important consideration in the landfill design. Concerns that degradation reduces the shear strength of MSW must be addressed when considering the long term stability of a conventional landfill. Furthermore, degraded MSW shear strength may govern both short and long term stability of bioreactor landfills. Recent studies suggesting that the degraded shear strength of MSW may be lower than the shear strengths typically employed in landfill design practice give cause for a critical revaluation of available data on the shear strength of degraded MSW.

MSW SHEAR STRENGTH ENVELOPES USED IN PRACTICE

Two of the most common MSW shear strength envelopes used in practice are the envelopes recommended by Kavazanjian et al. (1995) and Eid et al. (2000). Kavazanjian et al. (1995) recommended a MSW shear strength envelope represented by a cohesion of 24 kPa at low normal stresses and by a friction angle of 33 degrees at high normal stresses. Eid at al. (2000) provided lower bound, median, and upper bound recommendations for MSW shear strength. The lower bound envelope was represented by a friction angle of 35 degrees, the median envelope was represented by a cohesion of 25 kPa and a friction angle of 35 degrees, and the upper bound envelope was represented by a cohesion of 50 kPa and a friction angle of 35 degrees. The Kavazanjian et al. (1995) bi-linear envelope, based in part on back analysis of stable slopes at existing landfills that are now over 30 year old, may be inferred to include at least some degraded waste and explicitly characterized as a lower bound envelope for all ages of waste. However, Kavazanjian et al. (2001b) suggest that it may not be prudent to include the low normal stress cohesion component of this bi-linear envelope when considering the strength of degraded MSW. As the Eid et al. (2000) back analysis of landfill slopes may also be inferred to include degraded waste, the Eid et al. (2000) lower bound envelope may similarly be considered an indicator of degraded waste shear strength. Thus based on the Kavazanjian et al. (1995) and the Eid et al. (2000) strength envelopes, the shear strength of degraded MSW may be interpreted to be characterized by a friction angle of 33 degrees.

OII LANDFILL SHEAR STRENGTH

The Operating Industries, Inc. (OII) landfill is a predominantly MSW landfill located approximately 20 km east of downtown Los Angeles. Waste was placed in the OII landfill between the late 1940's and 1983. The north slope of the south parcel (NSSP) at OII rises 60 m above grade at a typical inclination of 1.5 horizontal to 1 vertical (1.5H:1V) approximately and were as steep as 1.3H:1V prior to remedial construction in the late 1990s. Waste liquids, including organic solvents, were co-disposed of with MSW at the west end of the OII site from the mid 1970's until 1983. As a result of this co-disposal, much of the waste at the west end of the site is extremely degraded, with samples recovered from depths of 5 m to 30 m described as being composed of greater than 80 percent by weight black, highly organic soil and soil-like material (GeoSyntec, 1996). Based upon the angle of repose alone, the 1.5H:1V slopes on the NSSP suggest a secant friction angle of at least 33 degrees.

The results of direct shear tests on 454 mm-diameter reconstituted specimens reported by Kavazanjian, et al. (1999), conducted as part of the remedial action program at the site, are presented in Figure 1. The numbers next to the data points in Figure 1 represent the percentage of un-degraded waste ("refuse") in the corresponding specimen. The results in Figure 1 suggest that MSW shear strength decreases as the amount of un-degraded waste decreases (i.e. as waste degradation increases). However, the lower bound strength envelope developed using specimens with less than 16 percent and as little as 8 percent refuse, presumed to represent fully degraded MSW, corresponds to a cohesion of 43 kPa and a friction angle of 26 degrees. The secant friction angle (the friction angle calculated assuming zero cohesion) for the point with the highest normal stress on the lower bound envelope (approximately 950 kPa), corresponding to the specimen with 8% refuse and 92% soil and soil-like material, is equal to 28 degrees.

After including the results of direct shear tests and other available data, a shear strength represented by zero cohesion and a friction angle of 30 degrees was adopted for "planes of weakness" in the OII landfill, presumed to represent either continuous layers of daily and intermediate cover soil or soil-like material (e.g. degraded waste)

Compression Indices for Full-Scale Landfills

Date: July 8, 2008

Completed by: Christopher Bareither

Compilation of primary and secondary compression indices from literature

Reference	Origin of Waste	Type of Waste[1]	Comments	Test Surface Area (m^2)	Surcharge Thickness (m)	Waste Thickness (m)	Average C_c'	Average C_α'
Andersen et al. (2004)	Everett Landfill, Washington State	MSW	Averages from extensometer data based on authors interpretation	—	8.64	5.54	0.2	0.027
Bachus et al. (2007)	Tennessee	MSW	Settlement plates on surface monitored for 6 months after construction of surface surcharge	42,100	3	18	0.33	0.010
								0.008
								0.008
								0.008
								0.010
								0.015
								0.007
								0.010
								0.020
			Settlement plates at various depths in landfill monitored for 6 months after construction of surface surcharge, waste thickness not reported	42,100	3	—		0.010
						—		0.008
						—		0.015
				10,525	6	—		0.019
						—		0.019
				4,210	9	—		0.025
						—		0.027
Boutwell & Fiore (1994)	—	Filled early 1970s, left uncovered; MSW (Saturated)	Surcharge placed on unlined MSW/Industrial pit, settlement plates used to monitor surface settlement	100	1	5	0.09	0.007
				100	2	5	0.16	0.009
				100	3	5	0.19	0.012
Bowders and Mitchell (2005)	Columbia, Missouri	MSW - filled from 1986 - 1994	Settlement plate installed 7/23/1999; overburden constant for C_α' calc	—	1.2192	18	—	0.013
		MSW - filled from 1994 - 1998	Settlement plate installed 1/17/2002; overburden constant for C_α' calc	—	11	19	—	0.106
Coduto and Huitric (1990)	Spadra Landfill, Pomona, CA	MSW filled from 1976-1978	Monitored settlement at various depths in landfill with Sondex Tube; instruments installed May 1987, monitored through May 1989; report surface C_α' here	—	—	16	—	0.022
				—	—	22	—	0.021
Deutsch et al. (1994)	Honey Brook, PA (Lanchester)	MSW - newspapers readable to 1970s	—	—	—	9	0.22	—
Dodt et al. (1987)	Collier Road Landfill; Pontiac, MI	MSW and Industrial	Waste filled 1960's to 1985 (capped); 13 acre fill on top of landfill placed 1/1/1985 - 7/1/1986;	—	11	15	—	0.048
Sharma and De (2007)	Northern California	MSW ~ 15 years old	Dump since 1930's; sanitary landfill since 1969; 500,000 m3 fill places on toe of landfill; originally in Sharma et al. (1999)	—	—	16	—	0.020
	San Francisco Bay Area	Commercial	Filled 1956 - 1980s; compression under self weight of waste; originally in Sharma (2000)	—	—	6	—	0.220
	San Francisco Bay Area	Commercial	Filled 1956 - 1980s; compression under self weight of waste; originally in Sharma (2000)	—	—	36	—	0.190

	Southern California	Household and commercial	Filled 1976-1978; used sondex tubes - details in Coduto and Huitric (1990); originally in Sharma (2000)	—	—	16	—	0.280
	Southern California	Household and commercial	Filled 1976-1978; used sondex tubes - details in Coduto and Huitric (1990); originally in Sharma (2000)	—	—	23	—	0.270
Stulgis et al. (1995)	Massachusetts	All Types	Filled 1954 - 1985; ~ 30-50 yrs old in lowest 1/3 and 13-30 yrs old in upper 2/3	32	6.1	21	0.16	0.02
Watts and Charles (1990)	Brogborough (England) - filled 1983 - 1987	Domestic	Monitored settlement at various depths using magnetic extensometer; report active biodegradation during settlement monitoring	—	—	11	—	0.100
	Calvert (England) - filled 1979-1988			—	—	20	—	0.230
Yuen and Styles (2000)	Melbourne, Australia	Composition (dry mass basis) = 47% inert (C&D, soil, etc.), 12% paper, 9% plastic, 23% yard and food + some textile, metal and glass	Control Cell: 150 mm daily cover and 300 mm intermin cover every 2 m of waste (clayey sandy silt), approximately 15% of total volume	36,328	—	7	—	0.019
					—	13	—	0.041
					—	20	—	0.03
					—	43	—	0.028
Zamiskie et al. (1994)	Syosset landfill – Oyster Bay, NY	C&D, minor MSW, ~ 66% soil	Operated from 1936-1976	—	2.75	17	0.03	0.0035

Summary statistics	Average C_c'	Average C_α'
Average	0.172	0.051
Maximum	0.330	0.280
Minimum	0.025	0.004
Coefficient of Variation	0.525	1.529

J.2 – Shear Strength Evaluations

J.2-A	Final Cover Critical Interface
J.2-B	Liner/LCS Prior to Waste Placement
J.2-C	Liner LCS After Waste Placement (Global Stability Analysis)
J.2-D	Rapid Drawdown of Detention Basin (Global Stability Analysis)
J.2-E	Summary of Acceptable Shear Strength Values

APTIM

J.2-A Final Cover Critical Interface

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

Problem Statement

Determine the range of acceptable final cover shear peak strength parameters that provide a factor of safety against slope failure of at least 1.5 for static conditions and 1.3 under seismic conditions, in accordance with 35 Ill. Admin. Code Section 811.304 (d).

Background

The material strengths of the protective soils are based on laboratory testing. As geosynthetics are manufactured products, they can be designed and/or selected to meet strength requirements. The stability of the final cover is influenced by the interface shear strengths between geosynthetic components.

This calculation is developed to identify the lowest peak shear strength that produces acceptable factors of safety for any potential interface within the final cover. The most critical failure surface will be located between one of the following interfaces:

- Low permeable soil layer vs. textured geomembrane;
- Textured geomembrane vs. geocomposite; or
- Geocomposite vs. protective soil cover layer.

It is noted that all interfaces will be required to meet the minimum interface peak shear strength values determined in this calculation.

Given

- ❑ Koerner, R.M., *Designing with Geosynthetics*. Prentice Hall, Fifth Edition (refer to attached pages).
- ❑ Edil, T.B., "Seepage, Slopes, and Dams." University of Wisconsin-Madison (refer to attached pages).
- ❑ Caterpillar Product Brochure: "D8T – Track Type Tractor" (refer to attached pages).
- ❑ Landfill design specifications for layer types, thicknesses, and material properties (refer to **Appendix J.1**).
- ❑ USGS National Seismic Hazard Mapping Project found on the internet / online at http://earthquake.usgs.gov/research/hazmaps/design/ (A value of 0.0461g for horizontal acceleration — please refer to **Appendix J.1**).
- ❑ Cross-sectional sketches of the final cover system and force diagrams of analyses (refer to attached pages).

APTIM

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

Assumptions

❑ The final cover system includes the following components, from top to bottom:

- 3-foot vegetative cover (0.5-foot vegetative support layer and 2.5-foot protective cover layer)
- Double sided geocomposite drainage layer
- 40-mil LLDPE geomembrane
- 2-foot compacted low permeable soil layer ($k \leq 1 \times 10^{-5}$ cm/sec).

❑ The maximum slope of the final landform is 4H:1V, therefore β = 14.04 degrees (refer to sketch).

❑ The final cover is conservatively assumed to be saturated.

❑ The protective cover soil layer and the final cover barrier soil layer of the final cover system are assumed to have a saturated density, γ_{sat}, = 130.3 pcf.

❑ Maximum horizontal acceleration = 0.0461g (see **Appendix J.1**).

❑ α = 2.64 degrees (refer to sketch).

❑ Pore pressure remains unchanged during earthquake conditions.

❑ The stability of the final cover system will depend on interface peak shear strengths between final cover system components. The most critical failure surface will be located between one of the following interfaces:

- Low permeable soil layer vs. textured geomembrane;
- Textured geomembrane vs. geocomposite; or
- Geocomposite vs. protective soil cover layer.

It is noted that all interfaces will be required to meet the minimum interface peak shear strength values determined in this calculation.

❑ Internal friction angle of the final cover soil, ϕ = 11.8 degrees.

❑ Wedges analyzed are shown on attached sketch in the attached pages. Weight per liner foot (W) of each wedge is the cross-sectional area multiplied by the buoyant unit weight. A unit width of 1 was used to determine the cross-sectional area.

❑ Minimum required factor of safety (FS) = 1.5 (static), 1.3 (seismic), per 35 Ill. Admin. Code Section 811.304 (d).

❑ A tractor load of 568 pounds per square foot (psf) over a track length of 15.25 feet was included in the calculation to determine the factor of safety under static conditions. It is noted that this is based on a Caterpillar D8T tractor load.

APTIM

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC **Date:** 05/2022

Checked by: DAM **Date:** 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

- The maximum change in elevation along the steepest slope of the final landform is 139-feet along the 4H:1V portion of the slope. This occurs in the northeast and northwest sections of the horizontal expansion. The final landform slopes vary from 4H:1V along the final landform side slopes to 10H:1V on the final landform plateau.

- The equations on the following page were used to determine the factors of safety against slope failure (refer to attached sketches).

Static Conditions:

$$E_A = \left[W_A \frac{\sin(\beta - \delta_M)}{\sin(90° - \delta_M)} \right] - (C_a)(L)$$

$$E_{NB} = \left[W_{NB} \frac{\sin(\varphi_M)}{\sin(90° - \beta - \varphi_M)} \right]$$

$$\Delta E = E_A - E_{NB}$$

Seismic Conditions:

$$E_A = \left[1.0011 W_A \frac{\sin(\beta - \delta_m + \alpha)}{\sin(90° - \delta_m)} \right] - (C_a)(L)$$

$$E_{NB} = \left[1.0011 W_{NB} \frac{\sin(\varphi_m - \alpha)}{\sin(90° - \beta - \varphi_m)} \right]$$

$$\Delta E = E_A - E_{NB}$$

Where,

E_A	=	Force of Active Block (lb/ft)
E_{NB}	=	Force of Neutral Block (lb/ft)
$W_{A / NB}$	=	Weight of soil blocks (active and neutral) (lb/ft)
β	=	Angle of slope
δ_m	=	Mobilized interface friction angle
ϕ_m	=	Internal soil friction angle
α	=	Resultant angle of seismic force
C_a, C	=	Adhesion, Mobilized Adhesion (psf)
L	=	Length of sliding block (ft)

The factor of safety is adjusted for the next trial based on the difference of the forces acting on the wedges. As shown in the attached reference (Edil), if ΔE is negative, then the assumed factor of safety is too low; if ΔE is positive, then the assumed factor of safety is too high.

Multiple friction angles and adhesion values for the critical interface are evaluated in spreadsheet calculators to determine a window of acceptable values. For demonstrative purposes of this calculation, a friction angle of 21.9 degrees is selected with an associated adhesion of 0 psf.

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
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TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

Saturated Conditions Assumed for Cover Soil

Calculate loading due to CAT D8T tractor (see attached Caterpillar Product Information)

Tractor Weight per Foot = Contact Pressure (P) x (Length of Tractor)
$= 568 \text{ psf} * (183.0 \text{ in} \times \frac{1 \text{ ft}}{12 \text{ in}})$
= 568 psf * (15.25 ft)
= 8,662 lb/ft

Estimate the weight of the active and neutral blocks:

W_A (Seismic) = (Area) γ
= (560.36 ft)(3 ft)(130.3 pcf) = 219,045 lb/ft

W_A (Static) = (Area) γ + (tractor loading)(tractor length)
= (560.36 ft)(3 ft)(130.3 pcf) + (568 psf)(15.25 ft) = 227,707 lb/ft

W_{NB} = (Area) γ
= (0.5)(12.37 ft)(3.09 ft)(130.3 pcf) = 2,491 lb/ft

Calculate δ_M and ϕ_M assuming FS = 1.5:

$$\tan \delta_M = \frac{\tan(\delta)}{FS} \rightarrow \delta_M = \tan^{-1}\left(\frac{\tan(21.9°)}{1.5}\right) = 15.00°$$

$$\tan \varphi_M = \frac{\tan(\phi)}{FS} \rightarrow \varphi_M = \tan^{-1}\left(\frac{\tan(11.8°)}{1.5}\right) = 7.93°$$

$$C_a = \frac{c}{1.5} = \frac{0 \text{ psf}}{1.5} = 0 \text{ psf}$$

For Static Conditions (with tractor loading), calculate ΔE for a factor of safety of 1.5:

$$E_A = \left[W_A \frac{\sin(\beta-\delta_M)}{\sin(90°-\delta_M)}\right] - (C)(L) = \left[(227{,}707 \text{ lb/ft})\left(\frac{\sin(14.04°-15.00°)}{\sin(90°-15.00°)}\right)\right] - (0 \text{ psf})(560.36 \text{ ft}) = -3{,}950 \text{ lb/ft}$$

$$E_{NB} = \left[W_{NB} \frac{\sin(\varphi_M)}{\sin(90°-\beta-\varphi_M)}\right] = \left[(2{,}491 \text{ lb/ft} \left(\frac{\sin(7.93°)}{\sin(90°-14.04°-7.93°)}\right)\right] = 371 \text{ lb/ft}$$

$$\Delta E = E_A - E_{NB} = -3{,}950 \text{ lb/ft} - 371 \text{ lb/ft} = -4{,}320 \text{ lb/ft}$$

For Seismic Conditions (no tractor loading), calculate ΔE for a factor of safety of 1.5:

$$E_A = \left[(1.0011)W_A \frac{\sin(\beta-\delta_M+\alpha)}{\sin(90°-\delta_M)}\right] - (C)(L)$$

$$= \left[(1.0011)(219{,}045 \text{ lb/ft})\left(\frac{\sin(14.04°-15.00°+2.64°)}{\sin(90°-15.00°)}\right)\right] - (0 \text{ psf})(560.36 \text{ ft}) = 6{,}656 \text{ lb/ft}$$

APTIM

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

$$E_{NB}=\left[(1.0011)W_{NB}\,\frac{\sin(\varphi_M-\alpha)}{\sin(90°-\beta-\varphi_M)}\right]=\left[(1.0011)(2{,}491\text{ lb/ft})\left(\frac{\sin(7.93°-2.64°)}{\sin(90°-14.04°-7.93°)}\right)\right]=248\text{ lb/ft}$$

$\Delta E = E_A - E_{NB} = 6{,}656$ lb/ft - 248 lb/ft = 6,408 lb/ft

Iterate the calculation until the correct factor of safety is achieved, as shown in the following table. The correct factor of safety will be achieved when ΔE equals zero.

STATIC CONDITIONS						
FS	δ_M	ϕ_M	C_a	E_A	E_{NB}	ΔE
1.8	12.59	6.62	0.0	5,904	307	5,597
1.7	13.30	7.01	0.0	3,022	326	2,696
1.65	13.69	7.22	0.0	1,432	336	1,096
1.60	14.10	7.44	0.0	-246	347	-592
1.5	15.00	7.93	0.0	-3,950	371	-4,320
1.4	16.02	8.49	0.0	-8,185	398	-8,583

SEISMIC CONDITIONS						
FS	δ_M	ϕ_M	C_a	E_A	E_{NB}	ΔE
1.5	15.00	7.83	0.0	6,656	248	6,408
1.4	16.02	8.49	0.0	2,628	275	2,353
1.35	16.58	8.80	0.0	399	290	109
1.30	17.18	9.13	0.0	-2,003	307	-2,310
1.2	18.52	9.88	0.0	-7,425	344	-7,769
1.1	20.07	10.75	0.0	-13,805	388	-14,193

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
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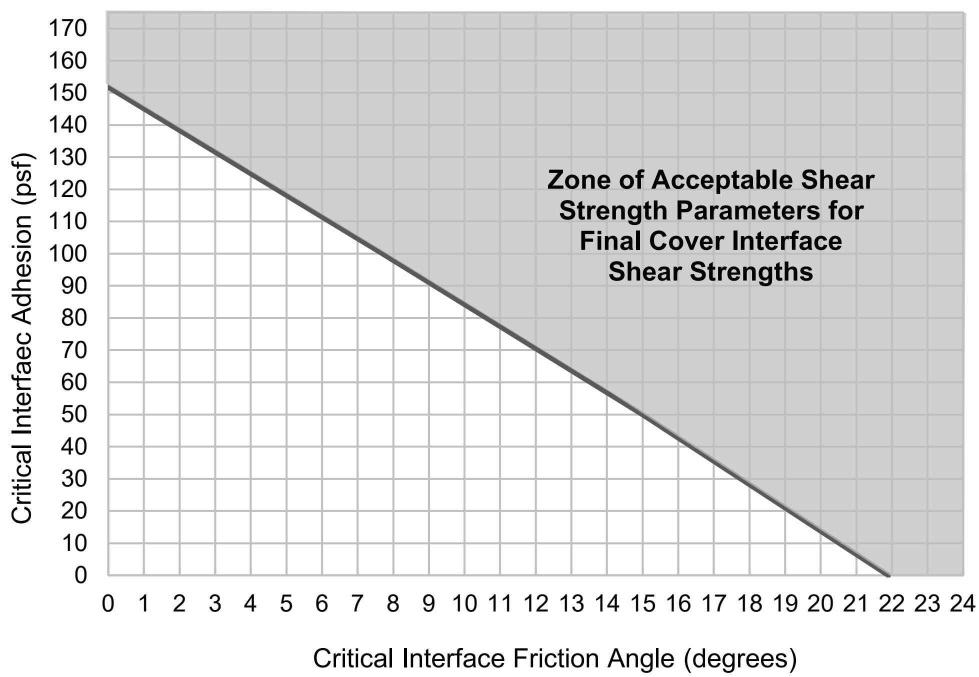
TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

Results

Multiple combinations of friction angles and adhesions were evaluated to determine the minimum acceptable interface peak shear strength envelope to achieve stability of the final cover using the calculation methodology described in the previous text. Spreadsheets of values used to generate this curve are attached.

The acceptable combinations of peak shear strength values are shown in the graph below. It is noted that the grey line identifies the zone of acceptable peak shear strength values for the final cover system and was obtained using this analysis.



Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

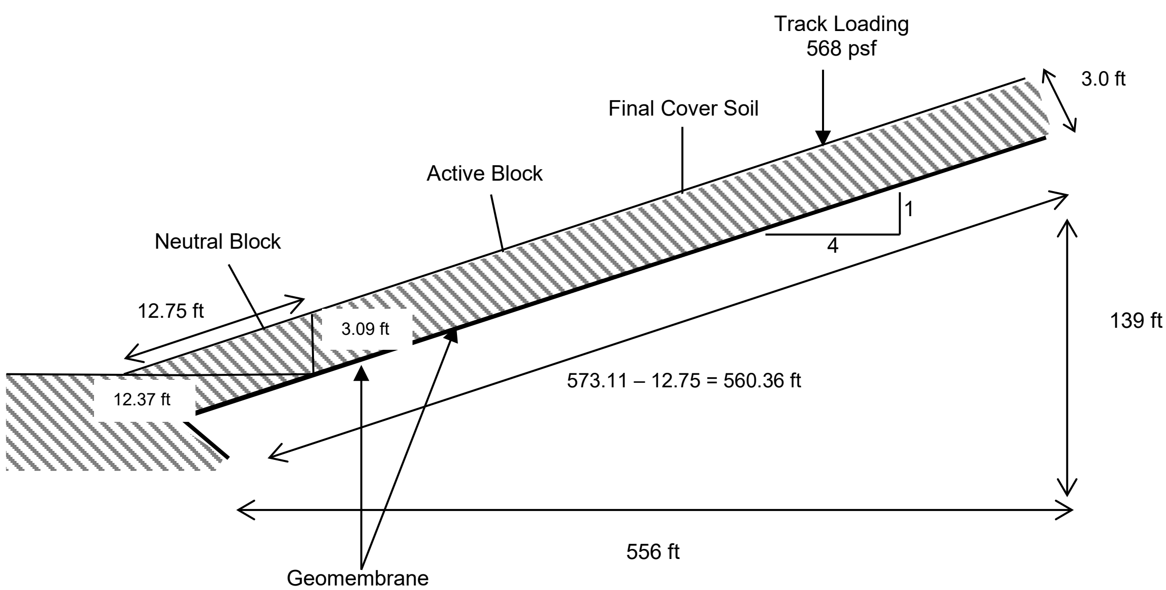
Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

Cross Section of the Final Cover System (not to scale)



Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

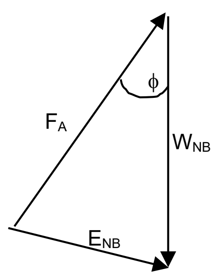
Calculated By: ORC Date: 05/2022

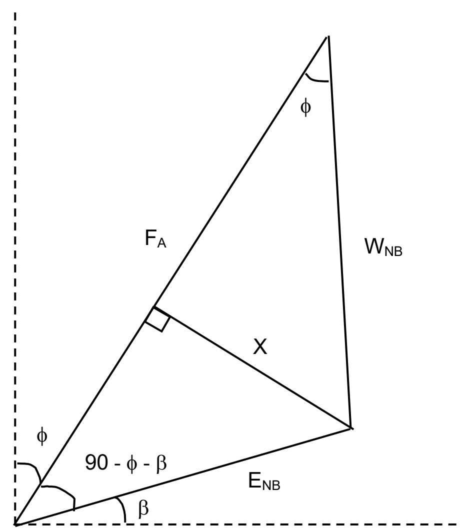
Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

Derive Force of Neutral Block

Static Conditions:



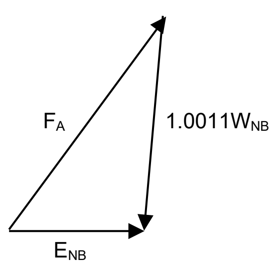


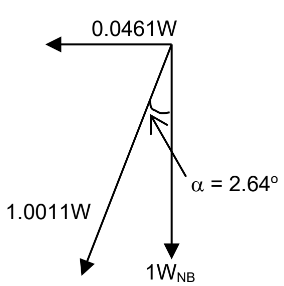
$$\sin\phi = \frac{X}{W_{NB}}$$

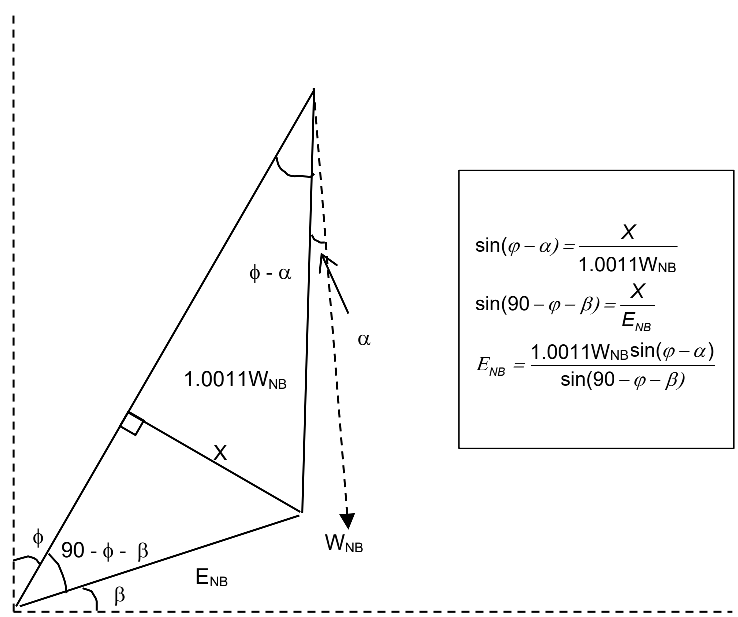
$$\sin(90-\phi-\beta) = \frac{X}{E_{NB}}$$

$$E_{NB} = \frac{W_{NB}\sin\phi}{\sin(90-\phi-\beta)}$$

Seismic Conditions:







$$\sin(\varphi-\alpha) = \frac{X}{1.0011W_{NB}}$$

$$\sin(90-\varphi-\beta) = \frac{X}{E_{NB}}$$

$$E_{NB} = \frac{1.0011W_{NB}\sin(\varphi-\alpha)}{\sin(90-\varphi-\beta)}$$

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

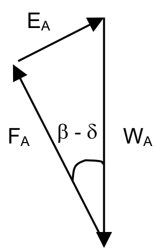
Calculated By: ORC **Date:** 05/2022

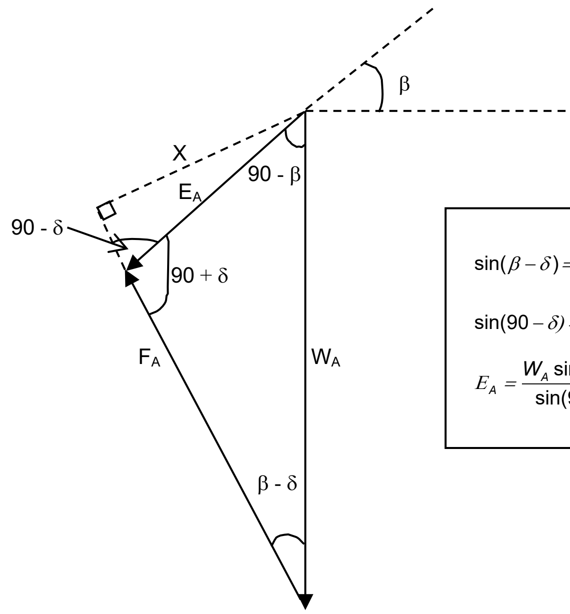
Checked by: DAM **Date:** 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF FINAL COVER CRITICAL INTERFACE

Derive Force of Active Block

Static Conditions:



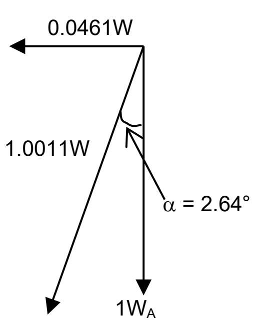


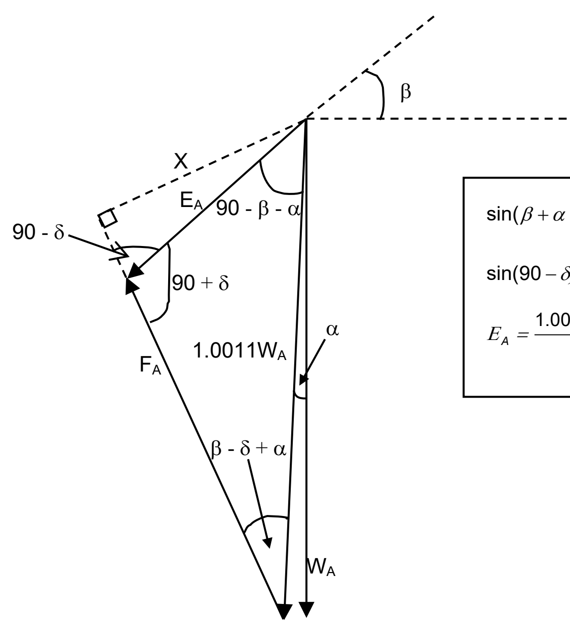
$$\sin(\beta-\delta)=\frac{X}{W_A}$$

$$\sin(90-\delta)=\frac{X}{E_A}$$

$$E_A=\frac{W_A\sin(\beta-\delta)}{\sin(90-\delta)}$$

Seismic Conditions:





$$\sin(\beta+\alpha-\delta)=\frac{X}{1.0011W_A}$$

$$\sin(90-\delta)=\frac{X}{E_A}$$

$$E_A=\frac{1.0011W_A\sin(\beta+\alpha-\delta)}{\sin(90-\delta)}$$

Cover Soil saturated unit weight =	130.3	pcf			
Cover Soil layer thickness =	3	feet			
Tractor weight =	8,662	pcf			
Height of Slope =	139	feet			
Slope (H:V) =	4	Horizontal :	1	Vertical	

Neutral Block Dimensions =	12.37	Base (ft)	3.09	Height (ft)
	12.75	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	21.9	degrees
Critical Interface Adhesion (C) =	0	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.8	14.04	573.11	560.36	227,707	2,491	12	22	0	0.00	6.62	12.59	5,904	307	5,597
1.7	14.04	573.11	560.36	227,707	2,491	12	22	0	0.00	7.01	13.30	3,022	326	2,696
1.65	14.04	573.11	560.36	227,707	2,491	12	22	0	0.00	7.22	13.69	1,432	336	1,096
1.60	14.04	573.11	560.36	227,707	2,491	12	22	0	0.00	7.44	14.10	-246	347	-592
1.5	14.04	573.11	560.36	227,707	2,491	12	22	0	0.00	7.93	15.00	-3,950	371	-4,320
1.4	14.04	573.11	560.36	227,707	2,491	12	22	0	0.00	8.49	16.02	-8,185	398	-8,583

Seismic Conditions - NO Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.5	14.04	573.11	560.36	219,045	2,491	12	22	0	0.00	7.93	15.00	6,656	248	6,408
1.4	14.04	573.11	560.36	219,045	2,491	12	22	0	0.00	8.49	16.02	2,628	275	2,353
1.35	14.04	573.11	560.36	219,045	2,491	12	22	0	0.00	8.80	16.58	399	290	109
1.30	14.04	573.11	560.36	219,045	2,491	12	22	0	0.00	9.13	17.18	-2,003	307	-2,310
1.2	14.04	573.11	560.36	219,045	2,491	12	22	0	0.00	9.88	18.52	-7,425	344	-7,769
1.1	14.04	573.11	560.36	219,045	2,491	12	22	0	0.00	10.75	20.07	-13,805	388	-14,193

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

Cover Soil saturated unit weight =	130.3	pcf		
Cover Soil layer thickness =	3	feet		
Tractor weight =	8,662	pcf		
Height of Slope =	139	feet		
Slope (H:V) =	4	Horizontal :	1	Vertical

Neutral Block Dimensions =	12.37	Base (ft)	3.09	Height (ft)
	12.75	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	15.0	degrees
Critical Interface Adhesion (C) =	50	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.8	14.04	573.11	560.36	227,707	2,491	12	15	50	27.78	6.62	8.47	6,779	307	6,472
1.7	14.04	573.11	560.36	227,707	2,491	12	15	50	29.41	7.01	8.96	3,932	326	3,606
1.60	14.04	573.11	560.36	227,707	2,491	12	15	50	31.25	7.44	9.51	724	347	377
1.55	14.04	573.11	560.36	227,707	2,491	12	15	50	32.26	7.68	9.81	-1,032	358	-1,390
1.5	14.04	573.11	560.36	227,707	2,491	12	15	50	33.33	7.93	10.13	-2,904	371	-3,274
1.4	14.04	573.11	560.36	227,707	2,491	12	15	50	35.71	8.49	10.83	-7,029	398	-7,427

Seismic Conditions - NO Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.5	14.04	573.11	560.36	219,045	2,491	12	15	50	33.33	7.93	10.13	6,733	248	6,485
1.4	14.04	573.11	560.36	219,045	2,491	12	15	50	35.71	8.49	10.83	2,745	275	2,470
1.35	14.04	573.11	560.36	219,045	2,491	12	15	50	37.04	8.80	11.23	478	290	188
1.30	14.04	573.11	560.36	219,045	2,491	12	15	50	38.46	9.13	11.65	-1,921	307	-2,227
1.2	14.04	573.11	560.36	219,045	2,491	12	15	50	41.67	9.88	12.59	-7,325	344	-7,668
1.1	14.04	573.11	560.36	219,045	2,491	12	15	50	45.45	10.75	13.69	-13,696	388	-14,083

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

Cover Soil saturated unit weight =	130.3	pcf		
Cover Soil layer thickness =	3	feet		
Tractor weight =	8,662	pcf		
Height of Slope =	139	feet		
Slope (H:V) =	4	Horizontal :	1	Vertical

Neutral Block Dimensions =	12.37	Base (ft)	3.09	Height (ft)
	12.75	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	7.7	degrees
Critical Interface Adhesion (C) =	100	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.8	14.04	573.11	560.36	227,707	2,491	12	8	100	55.56	6.62	4.30	7,498	307	7,191
1.7	14.04	573.11	560.36	227,707	2,491	12	8	100	58.82	7.01	4.55	4,702	326	4,376
1.60	14.04	573.11	560.36	227,707	2,491	12	8	100	62.50	7.44	4.83	1,553	347	1,206
1.55	14.04	573.11	560.36	227,707	2,491	12	8	100	64.52	7.68	4.99	-201	358	-559
1.5	14.04	573.11	560.36	227,707	2,491	12	8	100	66.67	7.93	5.15	-2,027	371	-2,398
1.4	14.04	573.11	560.36	227,707	2,491	12	8	100	71.43	8.49	5.52	-6,133	398	-6,532

Seismic Conditions - NO Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.5	14.04	573.11	560.36	219,045	2,491	12	8	100	66.67	7.93	5.15	6,650	248	6,402
1.4	14.04	573.11	560.36	219,045	2,491	12	8	100	71.43	8.49	5.52	2,614	275	2,339
1.35	14.04	573.11	560.36	219,045	2,491	12	8	100	74.07	8.80	5.72	394	290	104
1.30	14.04	573.11	560.36	219,045	2,491	12	8	100	76.92	9.13	5.94	-2,018	307	-2,324
1.2	14.04	573.11	560.36	219,045	2,491	12	8	100	83.33	9.88	6.43	-7,427	344	-7,771
1.1	14.04	573.11	560.36	219,045	2,491	12	8	100	90.91	10.75	7.01	-13,831	388	-14,218

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

Cover Soil **saturated** unit weight =	130.3	pcf		
Cover Soil layer thickness =	3	feet		
Tractor weight =	8,662	pcf		
Height of Slope =	139	feet		
Slope (H:V) =	4	Horizontal :	1	Vertical

Neutral Block Dimensions =	12.37	Base (ft)	3.09	Height (ft)
	12.75	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	0.0	degrees
Critical Interface Adhesion (C) =	151.8	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.7	14.04	573.11	560.36	227,707	2,491	12	0	152	89.29	7.01	0.00	5,207	326	4,881
1.6	14.04	573.11	560.36	227,707	2,491	12	0	152	94.88	7.44	0.00	2,075	347	1,728
1.55	14.04	573.11	560.36	227,707	2,491	12	0	152	97.94	7.68	0.00	360	358	2
1.50	14.04	573.11	560.36	227,707	2,491	12	0	152	101.20	7.93	0.00	-1,467	371	-1,837
1.4	14.04	573.11	560.36	227,707	2,491	12	0	152	108.43	8.49	0.00	-5,518	398	-5,916
1.3	14.04	573.11	560.36	227,707	2,491	12	0	152	116.77	9.13	0.00	-10,192	430	-10,622

Seismic Conditions - NO Tractor Loading

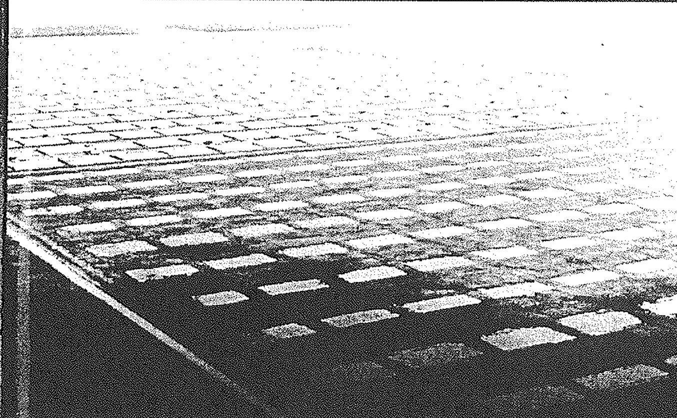
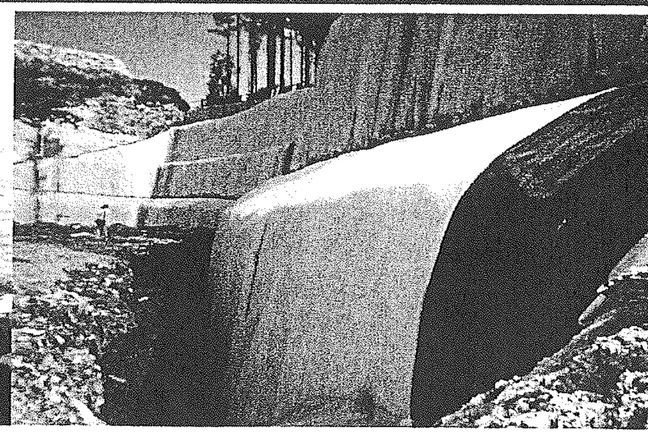
Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Cover Soil Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (cover soil friction angle)	S.F. (critical friction angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.6	14.04	573.11	560.36	219,045	2,491	12	0	152	94.88	7.44	0.00	9,774	224	9,550
1.5	14.04	573.11	560.36	219,045	2,491	12	0	152	101.20	7.93	0.00	6,232	248	5,985
1.40	14.04	573.11	560.36	219,045	2,491	12	0	152	108.43	8.49	0.00	2,181	275	1,906
1.35	14.04	573.11	560.36	219,045	2,491	12	0	152	112.44	8.80	0.00	-66	290	-356
1.3	14.04	573.11	560.36	219,045	2,491	12	0	152	116.77	9.13	0.00	-2,492	307	-2,799
1.2	14.04	573.11	560.36	219,045	2,491	12	0	152	126.50	9.88	0.00	-7,945	344	-8,288

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

Published Technical References

DESIGNING WITH GEOSYNTHETICS

FIFTH EDITION



ROBERT M. KOERNER

the same as that described in Section 2.7.4 using geotextiles. High strength geotextiles and geogrids are competitive in this particular application. The technique is considered very appropriate when stone columns are used as the ground modification technique. Sometimes the stone columns are actually contained in a geogrid enclosure, which appears to be a growing application [56].

3.2.7 Veneer Cover Soils

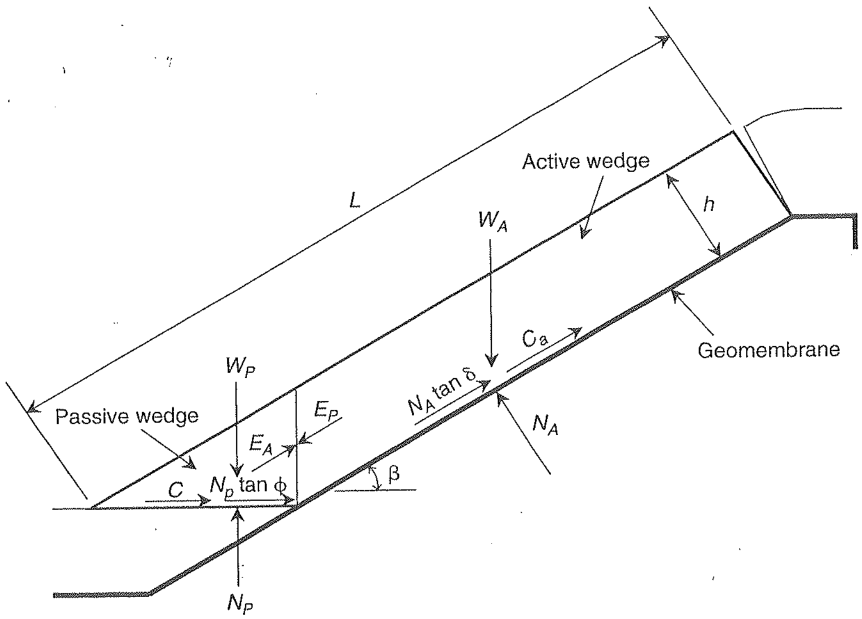
Whenever a lined slope (geomembrane, GCL, or compacted clay) is covered with soil, a stability calculation should be made to assess the potential for sliding failure of the soil on the barrier layer. Three situations come to mind: (1) landfill liners with leachate collection sand or gravel above them until such time that the solid waste acts as a passive resistance restraint; (2) surface impoundment liners where the cover soil is placed over the geomembrane to shield it from ultraviolet light, heat degradation, and equipment damage; and (3) landfill covers that have topsoil and protection soil placed over the geomembrane. In all cases the soil layer is relatively thin (0.3 to 1.0 m), hence the sliding stability of such a veneer of cover soil is the issue.

Due to the typically low shear strength of the covering soil to the liner material, numerous stability problems have arisen. The driving forces creating the instability are gravitational forces, equipment loads, surcharge loads, seepage forces, and/or seismic forces. Each must be carefully considered in the context of the site-specific conditions.

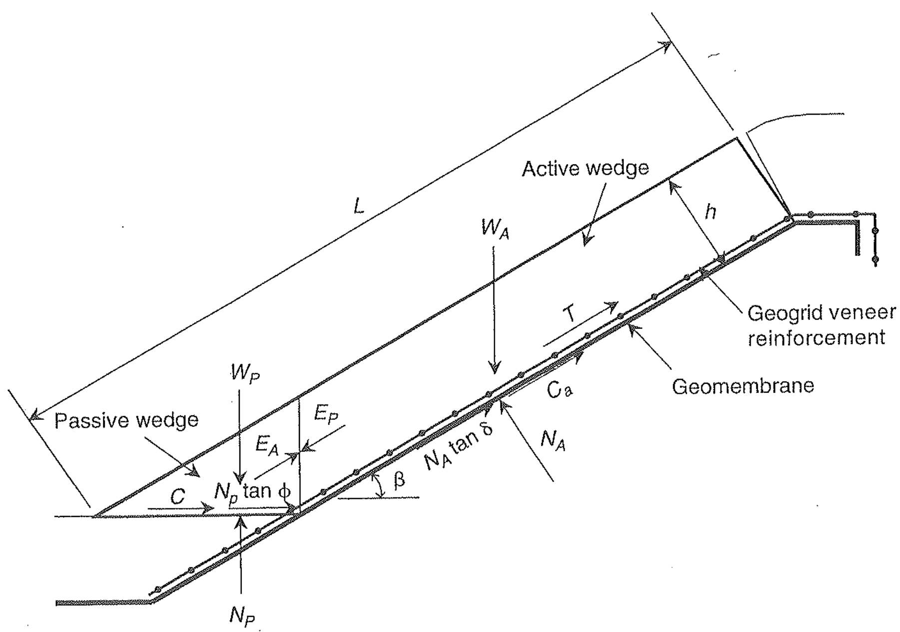
Koerner and Soong [57] have analyzed the general situation through the use of limit equilibrium and a finite slope model, as shown in Figure 3.22. Consider a cover soil placed directly on a geomembrane (or other barrier layer) at a slope angle β. Two discrete zones can be visualized, as shown in Figure 3.22a. There is a small passive wedge near the toe of the slope resisting a long thin active wedge extending the length of the slope. It is assumed that the cover soil is of uniform thickness and constant unit weight. At the top of the slope or at an intermediate berm, we anticipate that a tension crack in the cover soil will occur, thereby breaking continuity with the remaining cover soil at the crest.

Resisting the tendency for the cover soil to slide is the interface friction and/or adhesion of the cover soil to the specific type of underlying geomembrane. The shear strength values of δ and c_a must be obtained from a laboratory direct-shear test, as described earlier. Note that the passive wedge is assumed to move on the underlying cover soil so that the shear strength parameters ϕ and c, which come from soil-to-soil friction tests, will also be required.

By taking free bodies of the passive and active wedges with the appropriate forces being applied, the formulation for the factor of safety results. The resulting equation is not an explicit solution for the FS, and it must be solved using the quadratic equation. The complete development of the equation is given in [57]. Other approaches are found in Giroud and Beech [58], Koerner and Hwu [59], and Thiel and Stewart [60].



(a) Without reinforcement



(b) With the use of geogrid veneer reinforcement

Figure 3.22 Limit equilibrium forces involved in a finite length slope analysis for a uniformly thick cover soil. (After Koerner and Soong [57])

The expression for determining the factor of safety, considering the active wedge, can be derived as follows:

$$W_A = \gamma h^2\left(\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2}\right) \tag{3.15}$$

$$N_A = W_A \cos\beta \tag{3.16}$$

$$C_a = c_a\left(L - \frac{h}{\sin\beta}\right) \tag{3.17}$$

By balancing the forces in the vertical direction, the following formulation results:

$$E_A \sin\beta = W_A - N_A \cos\beta - \frac{N_A \tan\delta + C_a}{FS}\sin\beta$$

Hence the interwedge force acting on the active wedge is

$$E_A = \frac{(FS)(W_A - N_A\cos\beta) - (N_A\tan\delta + C_a)\sin\beta}{\sin\beta(FS)}$$

The passive wedge can be considered in a similar manner:

$$W_p = \frac{\gamma h^2}{\sin 2\beta} \tag{3.18}$$

$$N_P = W_P + E_P \sin\beta \tag{3.19}$$

$$C = \frac{(c)(h)}{\sin\beta} \tag{3.20}$$

By balancing the forces in the horizontal direction, the following formulation results:

$$E_P \cos\beta = \frac{C + N_P \tan\phi}{FS}$$

Hence the interwedge force acting on the passive wedge is

$$E_P = \frac{C + W_P\tan\phi}{\cos\beta(FS) - \sin\beta\tan\phi}$$

By setting $E_A = E_P$, the following equation can be arranged in the form of $ax^2 + bx + c = 0$, which in our case, using FS values, is

$$a(FS)^2 + b(FS) + c = 0 \tag{3.21}$$

where

$$a = (W_A - N_A\cos\beta)\cos\beta, \tag{3.22}$$

$$b = -[(W_A - N_A\cos\beta)\sin\beta\tan\phi + (N_A\tan\delta + C_a)\sin\beta\cos\beta + \sin\beta(C + W_p\tan\phi)],\ \text{and} \tag{3.23}$$

$$c = (N_A\tan\delta + C_a)\sin^2\beta\tan\phi \tag{3.24}$$

The resulting FS value is then obtained from the following equation:

$$FS = \frac{-b + \sqrt{b^2 - 4\,ac}}{2\,a} \tag{3.25}$$

where (in Figure 3.22a and in the above analysis)

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,
N_P = effective force normal to the failure plane of the passive wedge,
γ = unit weight of the cover soil,
h = thickness of the cover soil,
L = length of slope measured along the geomembrane,
β = soil slope angle beneath the geomembrane,
ϕ = friction angle of the cover soil,
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,
E_A = interwedge force acting on the active wedge from the passive wedge,
E_P = interwedge force acting on the passive wedge from the active wedge, and
FS = factor of safety against cover soil sliding on the geomembrane

When the calculated FS value falls below 1.0, a stability failure of the cover soil sliding on the geomembrane is to be anticipated. Thus a value greater than 1.0 must be targeted as being the minimum factor of safety. How much greater than 1.0 the FS value should be is a design and/or regulatory issue. Example 3.12 illustrates the procedure.

Example 3.12

Given a cover soil slope of $\beta = 18.4°$ (i.e. $3H$-to-$1V$), $L = 30$ m, $h = 900$ mm, $\gamma = 18$ kN/m^3, $c = 0$, $\phi = 30°$, $c_a = 0$, $\delta = 18°$, determine the resulting factor of safety.

Solution:

$$W_A = \gamma h^2\left(\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2}\right)$$
$$= (18.0)(0.90)^2\left(\frac{30}{0.90} - \frac{1}{\sin 18.4} - \frac{\tan 18.4}{2}\right)$$
$$= 14.58(33.3 - 3.17 - 0.17)$$
$$= 437 \text{ kN/m}$$

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University of Wisconsin - Madison

If the cut-slope is made in a cohesive material (containing clay and silt), the failure is usually deeper and like rotational slips as shown in Fig. 2. The long-term (prior to waste filling and after waste filling) and the end-of-excavation stability have to be analyzed separately. The former requires an effective stress analysis using drained (effective) strength parameters (ϕ', c') and the later a total stress analysis using undrained (total) strength parameters (c_u, usually $\phi_u = 0$) determined on undisturbed samples of the materials. Typically, a finite slope analysis using a method of slices such as the modified Bishop method is used for the stability analysis. The total stress analysis can be performed also with the simpler circular arc method. The position of the failure surface is unknown and determined by a trial and error method. There are computer programs available for slope stability analysis (Bosscher, 1990). Chart solutions for simple slopes using the finite slope analysis are provided in Appendix A.

Berm Slopes

Since berms are constructed by compacting selected earthen materials, the characterization of the materials is much simpler than the cuts. The end-of-construction and the long-term analyses can be made in a manner similar to the ones described for cut slopes. The end-of-construction stability is likely to be more critical than the long-term stability. The strength parameters are determined on compacted specimens of the borrow materials, i.e., ϕ_u, c_u and ϕ', c'.

COVER SOIL STABILITY

The usual cover soil is a relatively thin layer of soil of either uniform thickness or tapered thickness. When clay covers are placed on side slopes, they sometimes fail by slumping. The accumulated soil gathers at the toe of the slope. This same situation is even more apt to occur for cover soils placed on geosynthetics, which are invariably lower in frictional resistance than the substrate soils from which the slope itself is formed.

The failure of cover soils with uniform depth is basically a surface raveling type of failure along the interface as shown in Fig. 3 and can be analyzed by an infinite slope analysis using the following expression for a safety factor:

$$F = (\tan \delta/\tan \beta)\,[1-(\gamma_w h_p/\gamma d) \sec^2 \beta] \qquad (2)$$

where δ is the interface friction (between the geosynthetic and cover soil or the in situ soil); the other terms are as defined before in Fig. 1. The critical parameters are the interface friction angle or the shear strength between the soil and the geosynthetic, the inclination of slope, and the seepage forces (due to infiltrating water or rapid draw down of reservoir levels).

To alleviate the slumping of cover soils down slope, it is quite common to construct them with a taper, i.e., thicker at the bottom and gradually thinner going toward the top as shown in Fig. 4. The stability can be analyzed using a wedge stability method as described in Appendix B.

SLOPE LINER STABILITY

Principal sliding surfaces in landfills often coincide within the multi-layer liner system underlying the wastefill. The Kettleman Hills waste landfill slide in California occurred in this fashion in 1988. The foundation soil including the cut slopes is usually

...ch stronger than the critical liner-system interfaces because the settlement considerations ...ally dictate selection of sites with competent foundation soils. There is some evidence that relatively steep slopes of high refuse fills also do not fail in deep rotational slides if they are founded on firm foundations. Therefore, the liner-system interfaces become the most critical slip zone. The interfaces may be: (1) between geomembrane liner and geotextile or geonet layer, (2) between geomembrane liner and compacted clay liner, and (3) between geotextile or geomembrane and granular layer. The interfaces between these materials are characterized by low frictional resistance. The frictional resistance is affected by various properties including degree of polishing (of geomembrane by geotextile with increasing shear displacement) and whether the interfaces are wet or dry. The interface strength properties can be evaluated by use of laboratory direct shear or pullout tests (Mitchell et al, 1990).

Failure by Sliding on Liner Interfaces

The stability analysis for sliding along planar liner interface surfaces as shown in Fig. 5 can be performed using a wedge stability method as given in Appendix B. The analysis of Kettleman Hills waste landfill slide by this approach provided a reasonable estimate of the failure based on the interface shear strengths measured in the laboratory. Three-dimensional effects were found to lower safety factors by 10 to 15% (Seed et al., 1990).

Failure with Liner Pullout or Break

In the geomembrane lined reservoirs or landfills, the liner comes up from the bottom of the pit, covering the side slopes, then running over the top a short distance. It often terminates vertically down in an anchor trench as shown in Fig. 6.

The stress generated in the geomembrane, σ, for a given length of runout, L_{TO}, and trench depth, d_t, can be obtained from the following expression:

$$\sigma = \frac{\gamma d_c \tan\delta + 2K_o \gamma d_t (d_c + 0.5\, d_t) \tan\delta + 2\gamma(d_c + d_t) b \tan\delta}{t\,(\cos\beta - \sin\beta \tan\delta)} \qquad (3)$$

where

t = the geomembrane thickness

β = the slope angle

δ = the interface friction angle

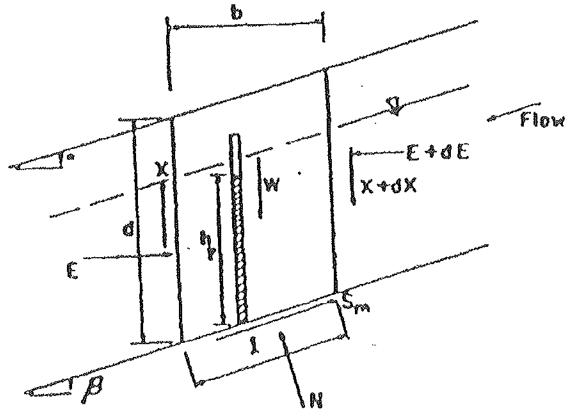
d_c = the depth of cover soil

b = the width of trench

γ = the unit weight of cover and trench soil

K_o = the lateral coefficient of earth in trench (it can be taken as 0.5)

The safety factor, F, against pullout or break can be computed from



γ: unit weight of soil

γ_W: unit weight of water

φ': friction angle of soil

Fig. 1. Idealized Infinite Slope Analysis

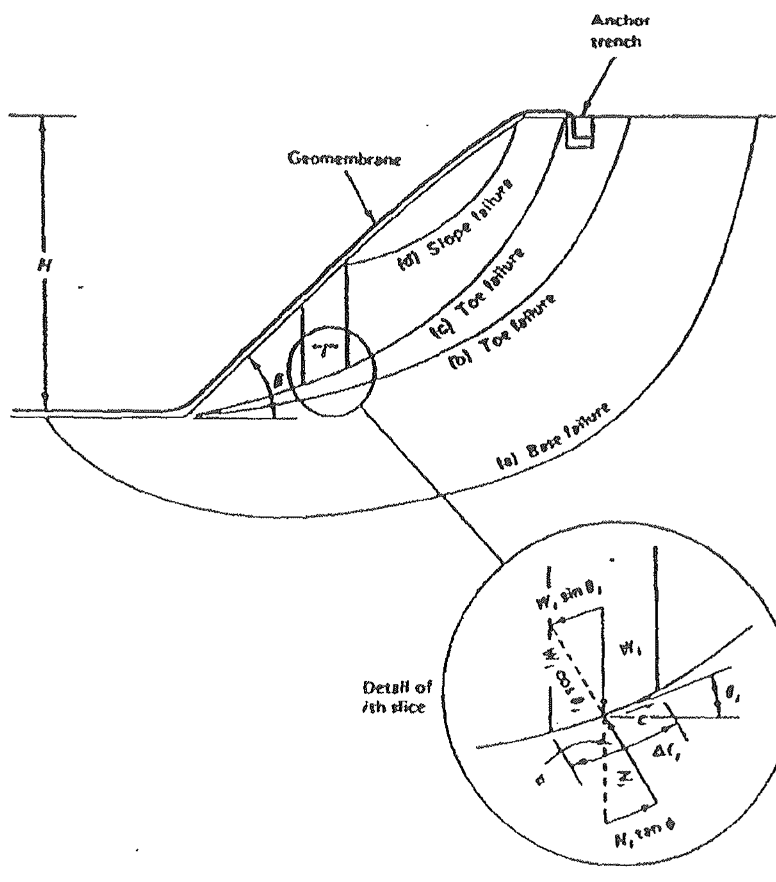


Fig. 2. Various Types of Finite Slope Failures

APPENDIX B

WEDGE METHOD OF SLOPE STABILITY ANALYSIS IN WASTE DISPOSAL

.nis method the potential sliding mass is separated into a series of wedges and the vertical and horizontal force equilibrium of each wedge is considered in turn. This method is most appropriate for conditions where the failure surface can be approximated by a series of planar surfaces. For analysis by the wedge method, the mass above the trial slip surface is divided by vertical lines into a number of wedges. The side force transmitted across the interface between any two wedges is not known but an assumption regarding its inclination must be made. The assumption that the side forces between wedges are horizontal is conservative with an error for most cases no more than 15%. Experience indicates that assuming an inclination of 10 to 15 degrees from the horizontal usually gives reasonable results. The factor of safety, F (defined as the ratio between the shear strength and the shear stress required for equilibrium), is calculated by trial-and-error. A value of F is assumed, and then checked to determine if the shear resistance along the failure surface reduced by this F satisfies equilibrium. If not, a new trial is initiated with another assumed safety factor. The analysis can be performed either graphically or numerically.

Two common cases encountered in waste disposal which can be analyzed by the wedge method are presented by use of the numerical method. These cases involve the stability along a liner and tapered depth soil cover as shown in Figure B1 and B2. The steps are as follows:

1. Define a trial slip surface. In these two cases it is primarily along the soil or waste and liner interface.

2. Divide the mass above the slip surface into wedges. In these two cases, the sliding mass is divided into an active wedge and a neutral block.

3. Calculate the weight of each wedge. This analysis is a two-dimensional analysis and the stability of a unit length of material along the slope is considered. Therefore, the weight of each wedge is its cross-sectional area (times unit length) times the unit weight of the sliding mass.

4. Assume a value of factor of safety, F and calculate the trial values of mobilized friction angle along the slip surface, δ_m (soil/waste-liner friction angle) or $\emptyset_m$ (soil-soil friction angle) using the following definitions:

$$\tan \delta_m = \frac{\tan \delta}{F} \qquad \tan \phi_m = \frac{\tan \phi}{F}$$

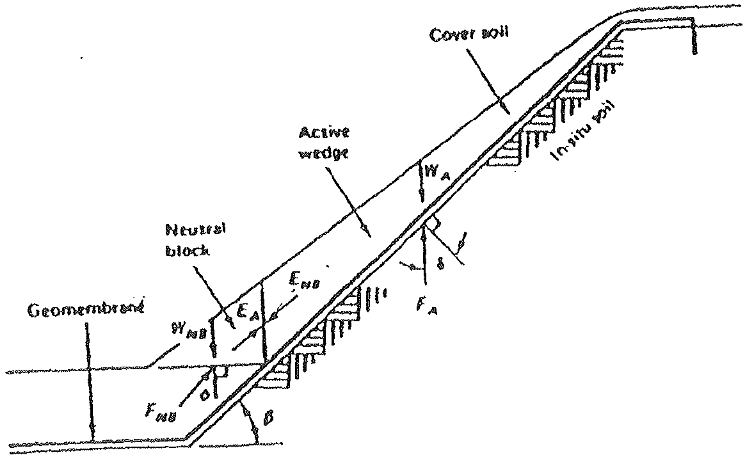
5. Assume the inclination of the force acting between the active wedge and the neutral block, α. For the tapered depth cover soil, α may be assumed parallel to cover soil slope. Otherwise, assume a value between 0 - 20°.

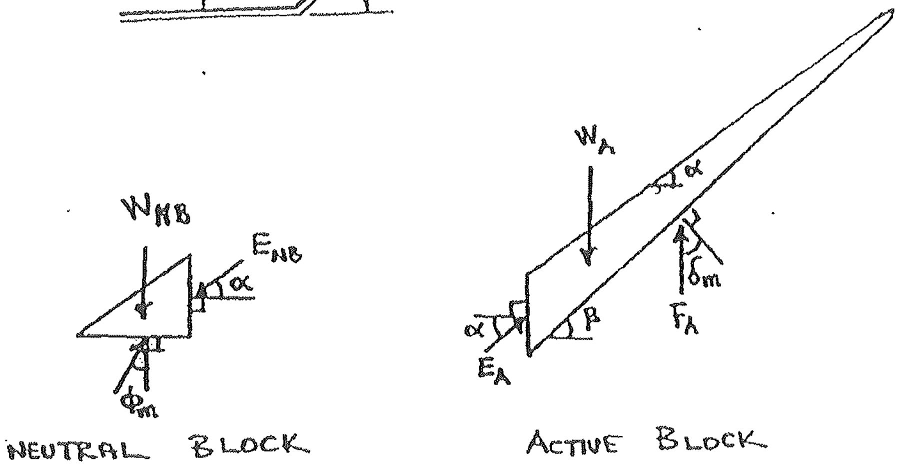
6. Using the equations given in Figures B1 and B2, calculate the force from neutral block acting on active wedge, E_A and the force from active wedge acting on neutral block, E_{NB} from the force equilibrium of each block. These forces are equal in magnitude opposite in direction at equilibrium. Note that the friction is mobilized in proportion to the assumed F along the slip surface; therefore, there may be a difference, ΔE in the calculated magnitudes of E_A and E_{NB}.

7. Plot ΔE versus assumed F.

8. Assume a new F and repeat steps 6 and 7. Try additional values of F until ΔE is negligibly small. This value of F is the correct safety factor.

TBE:kf\wdg





$$E_A = W_A \frac{\sin(\beta - \delta_m)}{\sin(90^\circ + \alpha - \beta + \delta_m)}$$

$$E_{NB} = W_{NB} \frac{\sin \phi_m}{\sin(90^\circ - \alpha - \phi_m)}$$

$$\Delta E = E_A - E_{NB}$$

$$\tan \delta_m = \frac{\tan \delta}{F}$$

$\alpha = \beta$ in leachate collection system (18.4°)

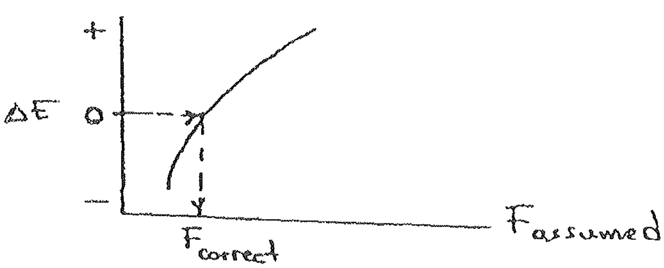


Figure B1. Wedge analysis as applied to tapered depth soil cover.

D8T

Track-Type Tractor

Engine

Engine Model	Cat® C15 ACERT™	
Emissions	U.S. EPA Tier 4 Final/EU Stage IV/ Japan 2014 (Tier 4 Final)/ Korea Tier 4 Final	
Engine Power (Maximum)		
SAE J1995	271 kW	363 hp
ISO 14396	268 kW	359 hp
ISO 14396 (DIN)		364 hp

Engine (continued)

Net Power (Rated)		
ISO 9249/SAE J1349	233 kW	312 hp
ISO 9249/SAE J1349 (DIN)		317 hp
Net Power (Maximum)		
ISO 9249/SAE J1349	252 kW	335 hp
ISO 9249/SAE J1349 DIN		343 hp

Operating Weights

Standard	39 420 kg	86,900 lb
LGP	37 420 kg	82,496 lb

D8T Track-Type Tractor Specifications

Engine

Engine Model	C15 ACERT	
Engine Power (Maximum*)		
SAE J1995	271 kW	363 hp
ISO 14396	268 kW	359 hp
ISO 14396 (DIN)		364 hp
Net Power (Rated**)		
ISO 9249/SAE J1349	233 kW	312 hp
ISO 9249/SAE J1349 (DIN)		317 hp
Net Power (Maximum*)		
ISO 9249/SAE J1349	252 kW	335 hp
ISO 9249/SAE J1349 DIN		343 hp
Bore	137 mm	5.4 in
Stroke	172 mm	6.75 in
Displacement	15.2 L	928 in^3

*Engine speed 1,700 rpm
**Rated speed 1,900 rpm

- Net power advertised is the power available at the flywheel when the engine is equipped with fan, air cleaner, muffler, and alternator.
- No derating required up to 3566 m (11,700 ft) altitude, beyond 3566 m (11,700 ft) automatic derating occurs.
- All non road Tier 4 Interim and Final, Stage IIIB and IV, Japan 2011 and 2014 (Tier 4 Interim and Tier 4 Final) and Korea Tier 4 Final diesel engines are required to use only Ultra Low Sulfur Diesel (ULSD) fuels containing 15 ppm (mg/kg) sulfur or less. Biodiesel blends up to B20 (20% blend by volume) are acceptable when blended with 15 ppm (mg/kg) sulfur or less ULSD. B20 should meet ASTM D7467 specification (biodiesel blend stock should meet Cat biodiesel spec, ASTM D6751 or EN 14214). Cat DEO-ULS™ or oils that meet the Cat ECF-3, API CJ-4, and ACEA E9 specification are required. Consult your OMM for further machine specific fuel recommendations.
- Diesel Exhaust Fluid (DEF) used in Cat Selective Catalytic Reduction (SCR) systems must meet the requirements outlined in the International Organization for Standardization (ISO) standard 22241.

Service Refill Capacities

Fuel Tank	627 L	165 gal
DEF Tank	24 L	6.3 gal
Cooling System	86 L	22.7 gal
Engine Crankcase*	38 L	10 gal
Power Train	155 L	41 gal
Final Drives (each)	12.5 L	3.3 gal
Roller Frames (each)	65 L	17.2 gal
Pivot Shaft Compartment	40 L	10.6 gal
Hydraulic Tank	75 L	19.8 gal

*With oil filter

Weights

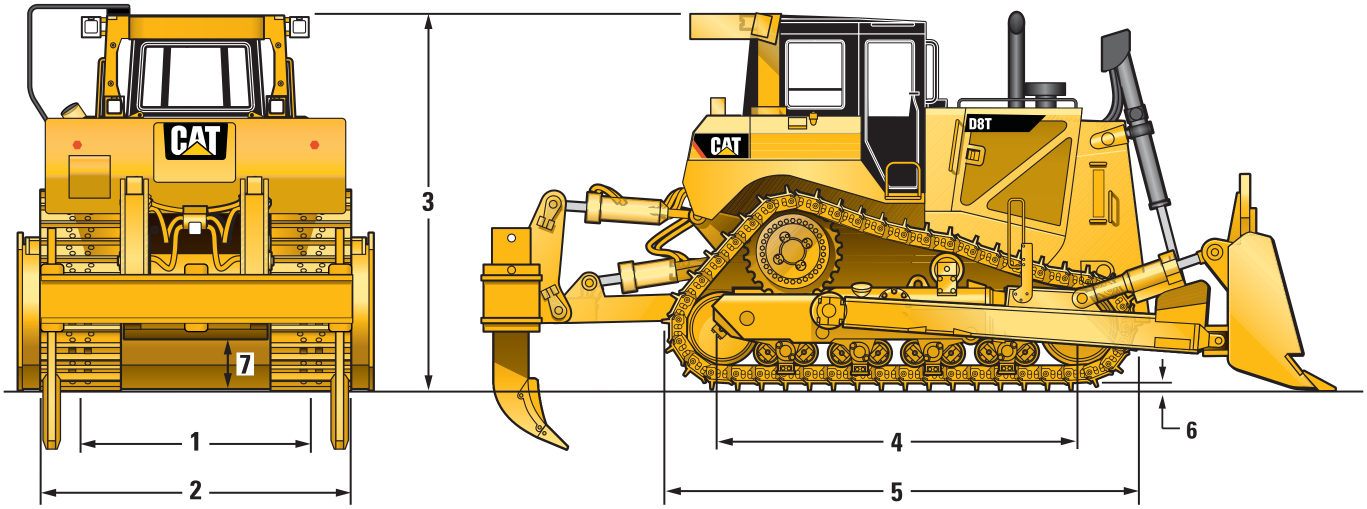
Operating Weight		
Standard	39 420 kg	86,900 lb
LGP	37 420 kg	82,496 lb
Shipping Weight		
Standard SU Blade	30 070 kg	66,300 lb
LGP	31 160 kg	68,700 lb

- Operating Weight – Standard: Includes hydraulic controls, blade, tilt cylinder, coolant, lubricants, 100% fuel, ROPS, FOPS cab, SU-Blade, Single-Shank Ripper, 610 mm (24 in) MS shoes, and operator.
- Operating Weight – LGP: Includes hydraulic controls, blade, tilt cylinder, drawbar, coolant, lubricants, 100% fuel, ROPS, FOPS cab, SU-Blade, 965 mm (38 in) MS shoes, and operator.
- Shipping Weight – Standard: Includes coolant, lubricants, 20% fuel, ROPS, FOPS cab, and 610 mm (24 in) MS shoes.
- Shipping Weight – LGP: Includes coolant, lubricants, 20% fuel, ROPS, FOPS cab, and 965 mm (38 in) MS shoes.

D8T Track-Type Tractor Specifications

Dimensions

All dimensions are approximate.



	Standard		Non-Suspended		LGP*	
1 Track Gauge	2083 mm	82.0 in	2083 mm	82.0 in	2337 mm	92.0 in
2 Width of Tractor						
Over Trunnions	3057 mm	120.4 in	3057 mm	120.4 in	3311 mm	130.4 in
Without Trunnions (Standard shoe width)	2693 mm	106.0 in	2693 mm	106.0 in	3302 mm	130.0 in
3 Machine Height**, from Tip of Grouser						
Exhaust Stack	3472 mm	136.7 in	3463 mm	136.3 in	3295 mm	129.7 in
EROPS (to top of railing)	3566 mm	140.4 in	3575 mm	140.7 in	3566 mm	140.4 in
4 Length of Track on Ground	3206 mm	126.2 in	3258 mm	128.3 in	3206 mm	126.2 in
5 Length of Basic Tractor (tag link trunnion to tip of rear grouser)	4647 mm	183.0 in	4647 mm	183.0 in	4647 mm	183.0 in
With the following attachments add:						
Ripper – Single Shank (with tip at ground line)	1519 mm	59.8 in	1519 mm	59.8 in	N/A	
Ripper – Multi Shank (with tip at ground line)	1613 mm	63.5 in	1613 mm	63.5 in	N/A	
SU Blade	1844 mm	72.6 in	1844 mm	72.6 in	1844 mm	72.6 in
U Blade	2241 mm	88.2 in	2241 mm	88.2 in	N/A	
A Blade (not angled)	2027 mm	79.8 in	2027 mm	79.8 in	N/A	
A Blade (angled 25 degrees)	3068 mm	120.8 in	3068 mm	120.8 in	N/A	
Drawbar	406 mm	16.0 in	406 mm	16.0 in	406 mm	16.0 in
6 Height of Grouser	78 mm	3.1 in	78 mm	3.1 in	78 mm	3.1 in
7 Ground Clearance	613 mm	24.1 in	606 mm	23.8 in	613 mm	24.1 in

*Standard shoe width of D8T LGP with non-suspended undercarriage is 965 mm (38 in).

**When Cat Grade Control 3D antennas are installed, overall machine height increases by approximately 82 mm/3.2 in.

J.2-B Liner/LCS Prior to Waste Placement

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF LINER / LEACHATE COLLECTION SYSTEM PRIOR TO WASTE PLACEMENT

Problem Statement

Determine the range of acceptable liner and leachate collection system peak shear strength parameters that provide a factor of safety against slope failure prior to waste placement, in accordance with 35 Ill. Admin. Code Section 811.306 (b). This regulation requires factors of safety of at least 1.3 for static conditions and 1.0 under seismic conditions.

It is noted that this range may not be acceptable for global stability analyses after waste placement. The range for global stability is evaluated in a subsequent calculation. Please refer to **Appendix J.2-E** for a shear strength window that meets all landfill design requirements.

Background

The material strengths of earthen layers (recompacted clay liner, granular drainage layer) are based on laboratory testing. However, as geosynthetics are manufactured products, they can be designed and/or selected to meet strength requirements. The stability of the liner and leachate collection system is influenced by the interface shear strengths between geosynthetic liner/leachate collection system components.

This calculation is developed to identify the lowest peak shear strength that produces acceptable factors of safety for any potential interface within the liner and leachate collection system prior to waste placement. The interfaces that are considered include the following:

- Geotextile to granular drainage layer;
- Geotextile to geomembrane; or
- Geomembrane to low permeable earth liner.

It is noted that all interfaces will be required to meet the minimum interface peak shear strength values determined in this calculation.

Given

- ❑ Landfill design specifications for layer types, thicknesses, and material properties (refer to **Appendix J.1**).
- ❑ Koerner, R.M., Designing with Geosynthetics. Prentice Hall, Fifth Edition (refer to attached pages).
- ❑ Edil, T.B., “Seepage, Slopes, and Dams.” University of Wisconsin-Madison (refer to attached pages).
- ❑ Caterpillar Product Information, 836K Landfill Compactor (refer to attached pages).
- ❑ Landfill design specifications for layer types and thicknesses.

- ❑ Cross-sectional sketches of liner and leachate collection system and force diagrams of analyses (refer to attached pages).

Assumptions

- ❑ Liner and leachate collection system in the vertical and horizontal expansion sideslopes includes (assumed to be worst case scenario), from top to bottom:
  - 8-oz/yd^2 non-woven geotextile filter
  - 1-foot granular drainage layer ($k \geq 1x10^{-3}$ cm/sec)
  - 12-oz/yd^2 non-woven cushion geotextile
  - 60-mil HDPE textured geomembrane
  - 5-foot low permeability earth liner ($k \leq 1x10^{-7}$ cm/sec)
- ❑ Slope of the proposed liner sideslopes is 3H:1V, therefore β = 18.43 degrees.
- ❑ The granular drainage layer is conservatively assumed to be saturated.
- ❑ Saturated unit weight of granular material, γ_{sat}, = 130 pcf.
- ❑ Buoyant unit weight of granular material, $\gamma_b = \gamma_{sat} - \gamma_w$ = 130 - 62.4 = 67.6 pcf.
- ❑ Maximum horizontal acceleration = 0.0461g (reference **Appendix J.1**).
- ❑ Pore pressure remains unchanged during earthquake conditions.
- ❑ Internal friction angle of the low permeable earth liner, Φ = 11.8 degrees.
- ❑ The material strengths of earthen layers (recompacted clay liner, granular drainage layer) are based on laboratory testing. As geosynthetics are manufactured products, they can be designed to meet strength requirements.
- ❑ Wedges analyzed are shown on attached sketch. Weight per liner foot (W) of each wedge is the cross-sectional area multiplied by the buoyant unit weight. A unit width of one foot (1’) was used to determine the cross-sectional area.
- ❑ A compactor load of 3,397 pounds per square foot (psf) was included in the calculation to determine the factor of safety under static conditions. It is noted that this is based on a Caterpillar 836K compactor load. Although a compactor will not operate directly over the liner and leachate collection system, in provides significantly more bearing pressure than a dozer and therefore is conservatively used in this analysis.

- The maximum depth of excavation is assumed to be approximately 63 feet – vertical distance measured from the crest of the liner system slope (edge of waste boundary) to the toe of the liner slope. The maximum depth of excavation is located along the southwest edge of the horizontal landfill expansion.

- The following equations were used to determine the factors of safety against slope failure (refer to attached sketches).

Static Conditions:

$$E_A = \left[W_A \frac{\sin(\beta - \delta_M)}{\sin(90° - \delta_M)} \right] - (C_a)(L)$$

$$E_{NB} = \left[W_{NB} \frac{\sin(\varphi_M)}{\sin(90° - \beta - \varphi_M)} \right]$$

$$\Delta E = E_A - E_{NB}$$

Seismic Conditions:

$$E_A = \left[1.0011 W_A \frac{\sin(\beta - \delta_m + \alpha)}{\sin(90° - \delta_m)} \right] - (C_a)(L)$$

$$E_{NB} = \left[1.0011 W_{NB} \frac{\sin(\varphi_m - \alpha)}{\sin(90° - \beta - \varphi_m)} \right]$$

$$\Delta E = E_A - E_{NB}$$

Where,

E_A	=	Force of Active Block (lb/ft)
E_{NB}	=	Force of Neutral Block (lb/ft)
$W_{A / NB}$	=	Weight of soil blocks (active and neutral) (lb/ft)
β	=	Angle of slope
δ_m	=	Mobilized interface friction angle
ϕ_m	=	Internal soil friction angle (drainage layer)
α	=	Resultant angle of seismic force
C_a	=	Mobilized Adhesion (psf)
L	=	Length of sliding block (ft)

The factor of safety is adjusted for the next trial based on the difference of the forces acting on the wedges. As shown in the attached reference (Edil), if ΔE is negative, then the assumed factor of safety is too low; if ΔE is positive, then the assumed factor of safety is too high.

Multiple friction angle and adhesion values for the interfaces are evaluated in spreadsheet calculators to determine a window of acceptable values. For demonstrative purposes of this calculation, a friction angle of 24.1 degrees is selected with an associated adhesion of 0 psf.

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF LINER / LEACHATE COLLECTION SYSTEM PRIOR TO WASTE PLACEMENT

Saturated Conditions Assumed for Random Fill / Select Waste Layer

Calculate loading due to CAT 836K compactor (see attached Caterpillar Product Information)

Weight of the Vehicle (W_{eq}) = 123,319 lb

Contact Pressure (P)

$$P = \frac{123{,}319 \text{ lb}}{(4 \text{ drums x Area}_{contact})}$$

$$P = \frac{123{,}319 \text{ lb}}{(4 \text{ drums x } (4.67 \text{ ft x } \frac{1}{3} \text{ x } 5.83 \text{ ft}))}$$

P = 3,397 psf

Weight per Wheel = P x (Wheelbase of Vehicle / 2)
= 3,397 psf * (14.92 ft / 2)
= 3,397 psf * (7.46 ft)
= 25,342 lb/ft

Estimate the weight of the active and neutral blocks:

W_A (Seismic) = (Area) γ
= (195.89 ft)(1.0 ft)(130 pcf) = 25,466 lb/ft

W_A (Static) = (Area) γ + (compactor loading)(compactor length)
= (195.89 ft)(1.0 ft)(130 pcf) + (3,397 psf)(7.46 ft) = 50,807 lb/ft

W_{NB} = (Area) γ
= (0.5)(3.16 ft)(1.05 ft)(130 pcf) = 217 lb/ft

Calculate δ_M and ϕ_M assuming FS = 1.3:

$$\tan \delta_M = \frac{\tan(\delta)}{FS} \rightarrow \delta_M = \tan^{-1}\left(\frac{\tan(24.1°)}{1.3}\right) = 18.99°$$

$$\tan \varphi_M = \frac{\tan(\phi)}{FS} \rightarrow \varphi_M = \tan^{-1}\left(\frac{\tan(11.8°)}{1.3}\right) = 9.13°$$

$$C_a = \frac{c}{1.3} = \frac{0 \text{ psf}}{1.3} = 0 \text{ psf}$$

For Static Conditions (with compactor loading), calculate ΔE for a factor of safety of 1.3:

$$E_A = \left[W_A \frac{\sin(\beta-\delta_M)}{\sin(90°-\delta_M)}\right] - (C_a)(L) = \left[(50{,}807 \text{ lb/ft})\left(\frac{\sin(18.43°- 18.99°)}{\sin(90°- 18.99°)}\right)\right] - (0 \text{ psf})(195.89 \text{ ft}) = -525 \text{ lb/ft}$$

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$$E_{NB} = \left[W_{NB} \frac{\sin(\varphi_M)}{\sin(90° - \beta - \varphi_M)} \right] = \left[(217 \text{ lb/ft} \left(\frac{\sin(9.13°)}{\sin(90° - 18.43° - 9.13°)} \right) \right] = 39 \text{ lb/ft}$$

$\Delta E = E_A - E_{NB} = -525 \text{ lb/ft} - 39 \text{ lb/ft} = -564 \text{ lb/ft}$

For Seismic Conditions (no compactor loading), calculate ΔE for a factor of safety of 1.3:

$$E_A = \left[(1.0011) W_A \frac{\sin(\beta - \delta_M + \alpha)}{\sin(90° - \delta_M)} \right] - (C_a)(L) =$$

$$= \left[(1.0011)(25{,}466 \text{ lb/ft}) \left(\frac{\sin(18.43° - 18.99° + 2.64°)}{\sin(90° - 18.99°)} \right) \right] - (0 \text{ psf})(195.89 \text{ ft}) = 979 \text{ lb/ft}$$

$$E_{NB} = \left[(1.0011) W_{NB} \frac{\sin(\varphi_M - \alpha)}{\sin(90° - \beta - \varphi_M)} \right] = \left[(1.0011)(217 \text{ lb/ft}) \left(\frac{\sin(9.13° - 2.64°)}{\sin(90° - 18.43° - 9.13°)} \right) \right] = 28 \text{ lb/ft}$$

$\Delta E = E_A - E_{NB} = 979 \text{ lb/ft} - 28 \text{ lb/ft} = 952 \text{ lb/ft}$

Iterate the calculation until the correct factor of safety is achieved, as shown in the following table. The correct factor of safety will be achieved when ΔE equals zero.

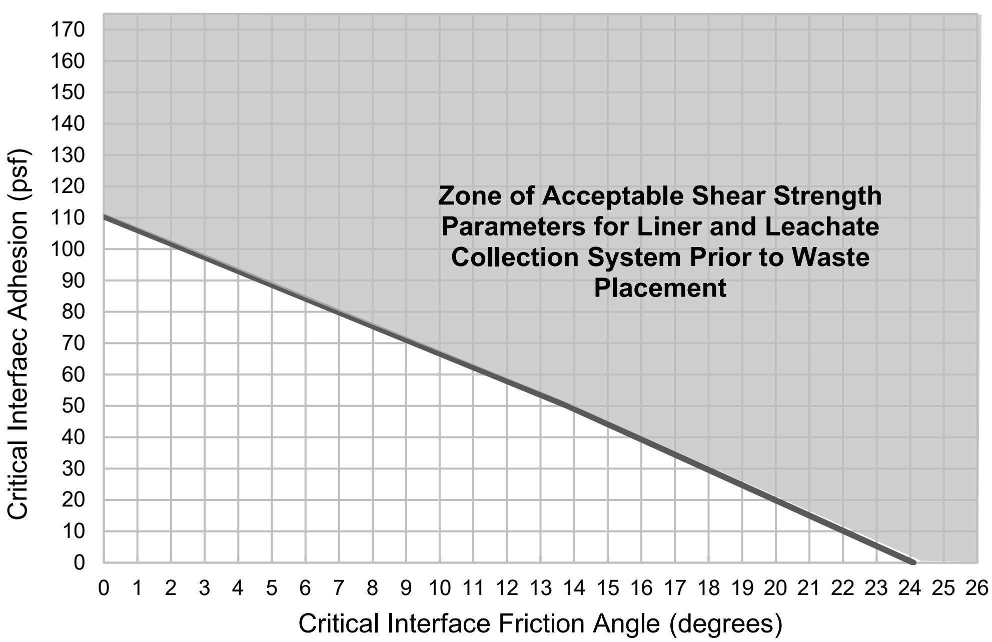
STATIC CONDITIONS						
FS	**δ_M**	**ϕ_M**	**C_a**	**E_A**	**E_{NB}**	**ΔE**
1.5	16.61	7.93	0.0	1,684	33	1,651
1.4	17.72	8.49	0.0	661	36	625
1.35	18.33	8.80	0.0	93	37	56
1.30	18.99	9.13	0.0	-525	39	-564
1.2	20.44	9.88	0.0	-1,902	42	-1,944
1.1	22.13	10.75	0.0	-3,539	46	-3,586
1.0	24.10	11.80	0.0	-5,499	51	-5,550

SEISMIC CONDITIONS						
FS	**δ_M**	**ϕ_M**	**C_a**	**E_A**	**E_{NB}**	**ΔE**
1.4	17.72	8.49	0.0	1,564	25	1,539
1.3	18.99	9.13	0.0	979	28	952
1.20	20.44	9.88	0.0	297	31	266
1.15	21.25	10.30	0.0	-88	33	-121
1.1	22.13	10.75	0.0	-509	35	-544
1.0	24.10	11.38	0.0	-1,476	40	-1,516
0.9	26.43	13.07	0.0	-2,659	46	-2,705

Results

Multiple combinations of friction angles and adhesions were evaluated to determine the minimum acceptable interface peak shear strength envelope to achieve stability of the liner and leachate collection system prior to waste placement using the calculation methodology described in the previous text. Spreadsheets of values used to generate this curve are attached.

The acceptable combinations of peak shear strength values are shown in the shaded region in the graph below. It is noted that the grey line identifies the zone of acceptable shear strength values for the liner and leachate collection system prior to waste placement and the results were obtained using this analysis. It is noted that this range may not be acceptable for global stability analyses after waste placement. Please refer to **Appendix J.2-E** for a shear strength window that meets all landfill design requirements.



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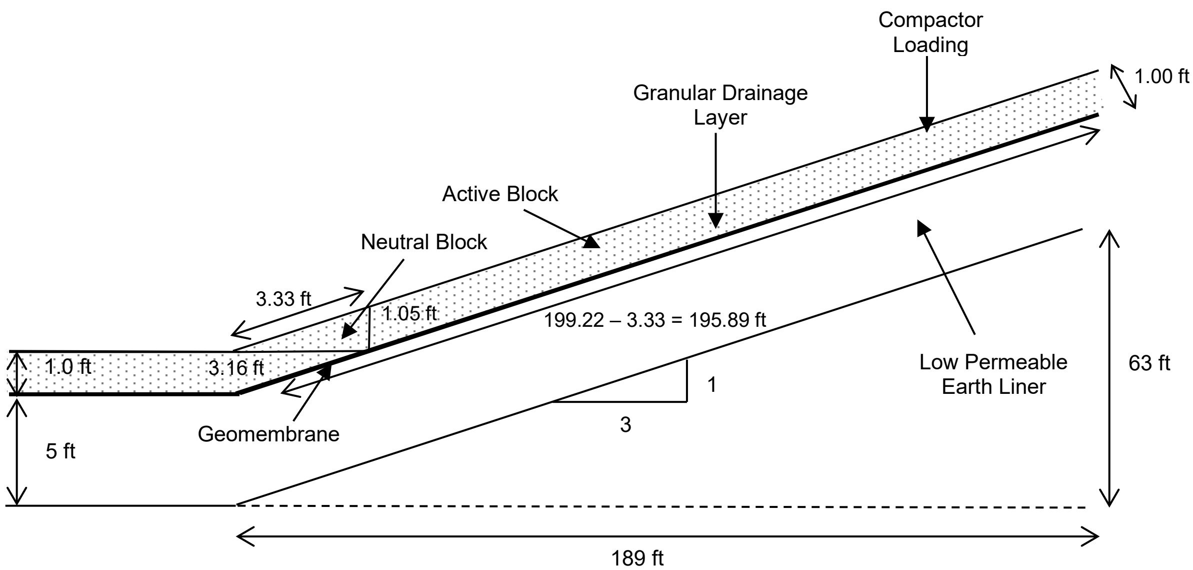
TITLE: **SHEAR STRENGTH EVALUATION OF LINER / LEACHATE COLLECTION SYSTEM PRIOR TO WASTE PLACEMENT**

Cross Section of Liner and Leachate Collection System (not to scale)



Client: Zion Landfill, Inc.

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Project #: 631020105

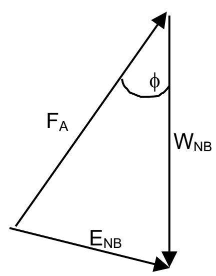
Calculated By: ORC **Date:** 05/2022

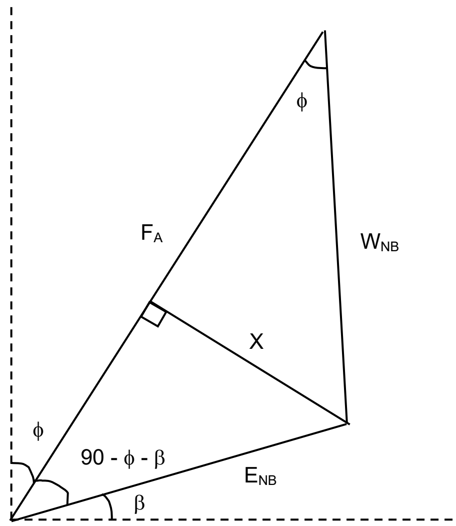
Checked by: DAM **Date:** 05/2022

TITLE: **SHEAR STRENGTH EVALUATION OF LINER / LEACHATE COLLECTION SYSTEM PRIOR TO WASTE PLACEMENT**

Derive Force of Neutral Block

Static Conditions:



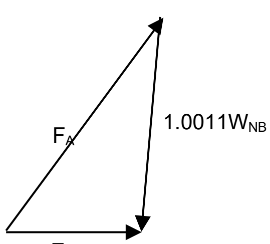


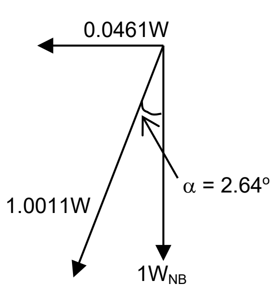
$$\sin\phi = \frac{X}{W_{NB}}$$

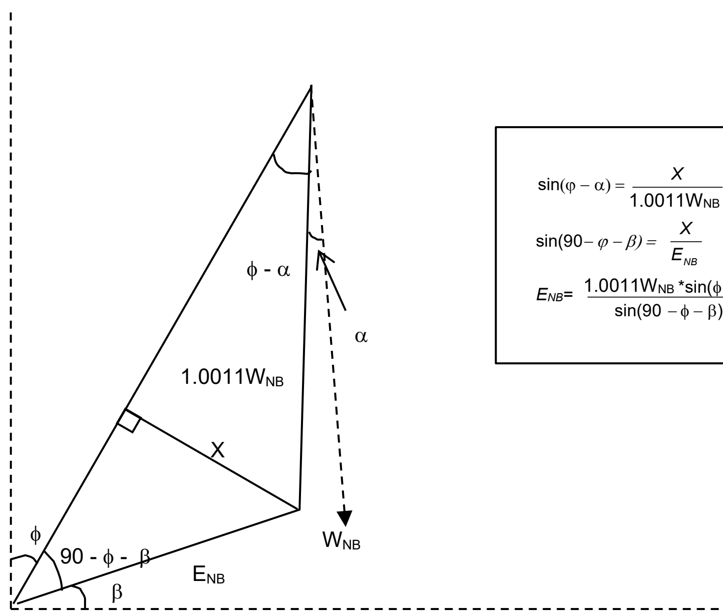
$$\sin(90 - \phi - \beta) = \frac{X}{E_{NB}}$$

$$E_{NB} = \frac{W_{NB}\sin\phi}{\sin(90 - \phi - \beta)}$$

Seismic Conditions







$$\sin(\varphi - \alpha) = \frac{X}{1.0011W_{NB}}$$

$$\sin(90 - \varphi - \beta) = \frac{X}{E_{NB}}$$

$$E_{NB} = \frac{1.0011W_{NB} * \sin(\phi - \alpha)}{\sin(90 - \phi - \beta)}$$

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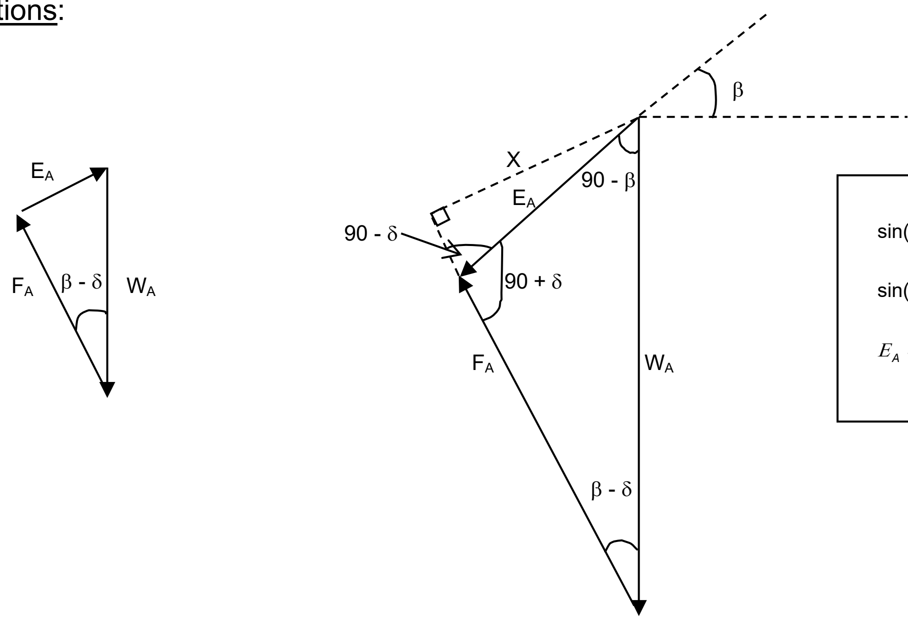
TITLE: SHEAR STRENGTH EVALUATION OF LINER / LEACHATE COLLECTION SYSTEM PRIOR TO WASTE PLACEMENT

Derive Force of Active Block

Static Conditions:

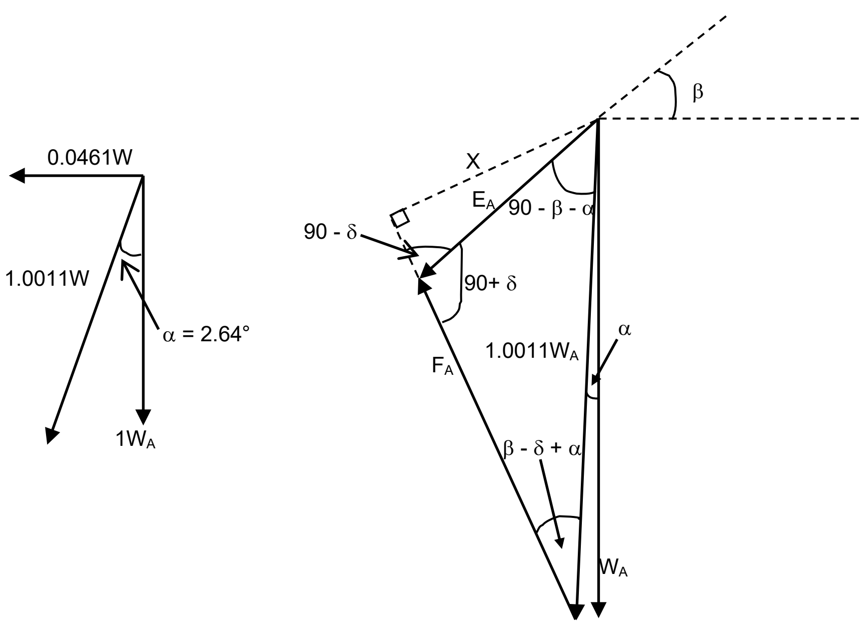


$$\sin(\beta-\delta)=\frac{X}{W_A}$$

$$\sin(90-\delta)=\frac{X}{E_A}$$

$$E_A=\frac{W_A\sin(\beta-\delta)}{\sin(90-\delta)}$$

Seismic Conditions:



$$\sin(\beta-\alpha-\delta)=\frac{X}{1.0011W_A}$$

$$\sin(90-\delta)=\frac{X}{E_A}$$

$$E_A=\frac{1.0011W_A\sin(\beta+\alpha-\delta)}{\sin(90-\delta)}$$

LCS saturated unit weight =	130	pcf	
LCS drainage layer thickness =	1	feet	
Tractor weight =	25,342	lb/ft	
Height of Slope =	63	feet	
Slope (H:V) =	3	Horizontal : 1	Vertical

Neutral Block Dimensions =	3.16	Base (ft)	1.05	Height (ft)
	3.33	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	24.1	degrees
Critical Interface Adhesion (C) =	0	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.5	18.43	199.22	195.89	50,807	217	11.8	24	0	0.00	7.93	16.61	1,684	33	1,651
1.4	18.43	199.22	195.89	50,807	217	11.8	24	0	0.00	8.49	17.72	661	36	625
1.35	18.43	199.22	195.89	50,807	217	11.8	24	0	0.00	8.80	18.33	93	37	56
1.30	18.43	199.22	195.89	50,807	217	11.8	24	0	0.00	9.13	18.99	-525	39	-564
1.2	18.43	199.22	195.89	50,807	217	11.8	24	0	0.00	9.88	20.44	-1,902	42	-1,944
1.1	18.43	199.22	195.89	50,807	217	11.8	24	0	0.00	10.75	22.13	-3,539	46	-3,586
1.0	18.43	199.22	195.89	50,807	217	11.8	24	0	0.00	11.80	24.10	-5,499	51	-5,550

Seismic Conditions - NO Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.4	18.43	199.22	195.89	25,466	217	11.8	24	0	0.00	8.49	17.72	1,564	25	1,539
1.3	18.43	199.22	195.89	25,466	217	11.8	24	0	0.00	9.13	18.99	979	28	952
1.20	18.43	199.22	195.89	25,466	217	11.8	24	0	0.00	9.88	20.44	297	31	266
1.15	18.43	199.22	195.89	25,466	217	11.8	24	0	0.00	10.30	21.25	-88	33	-121
1.1	18.43	199.22	195.89	25,466	217	11.8	24	0	0.00	10.75	22.13	-509	35	-544
1.0	18.43	199.22	195.89	25,466	217	11.8	24	0	0.00	11.80	24.10	-1,476	40	-1,516
0.9	18.43	199.22	195.89	25,466	217	11.8	24	0	0.00	13.07	26.43	-2,659	46	-2,705

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

LCS saturated unit weight =	130	pcf		
LCS drainage layer thickness =	1	feet		
Tractor weight =	25,342	lb/ft		
Height of Slope =	63	feet		
Slope (H:V) =	3	Horizontal :	1	Vertical

Neutral Block Dimensions =	3.16	Base (ft)	1.05	Height (ft)
	3.33	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	13.8	degrees
Critical Interface Adhesion (C) =	50	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.5	18.43	199.22	195.89	50,807	217	11.8	14	50	33.30	7.93	9.30	1,646	33	1,613
1.4	18.43	199.22	195.89	50,807	217	11.8	14	50	35.70	8.49	9.95	613	36	578
1.35	18.43	199.22	195.89	50,807	217	11.8	14	50	37.00	8.80	10.31	46	37	9
1.30	18.43	199.22	195.89	50,807	217	11.8	14	50	38.50	9.13	10.70	-587	39	-626
1.2	18.43	199.22	195.89	50,807	217	11.8	14	50	41.70	9.88	11.57	-1,974	42	-2,016
1.1	18.43	199.22	195.89	50,807	217	11.8	14	50	45.50	10.75	12.59	-3,616	46	-3,662
1.0	18.43	199.22	195.89	50,807	217	11.8	14	50	50.00	11.80	13.80	-5,571	51	-5,623

Seismic Conditions - NO Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.9	18.43	199.22	195.89	25,466	217	11.8	14	50	26.30	6.27	7.37	937	15	922
1.8	18.43	199.22	195.89	25,466	217	11.8	14	50	27.80	6.62	7.77	473	17	456
1.75	18.43	199.22	195.89	25,466	217	11.8	14	50	28.60	6.81	7.99	223	17	206
1.70	18.43	199.22	195.89	25,466	217	11.8	14	50	29.40	7.01	8.22	-32	18	-50
1.6	18.43	199.22	195.89	25,466	217	11.8	14	50	31.30	7.44	8.73	-619	20	-639
1.5	18.43	199.22	195.89	25,466	217	11.8	14	50	33.30	7.93	9.30	-1,254	22	-1,276
1.4	18.43	199.22	195.89	25,466	217	11.8	14	50	35.70	8.49	9.95	-2,002	25	-2,027

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

LCS saturated unit weight =	130	pcf		
LCS drainage layer thickness =	1	feet		
Tractor weight =	25,342	lb/ft		
Height of Slope =	63	feet		
Slope (H:V) =	3	Horizontal :	1	Vertical

Neutral Block Dimensions =	3.16	Base (ft)	1.05	Height (ft)
	3.33	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	2.4	degrees
Critical Interface Adhesion (C) =	100	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.5	18.43	199.22	195.89	50,807	217	11.8	2	100	66.70	7.93	1.60	1,650	33	1,617
1.4	18.43	199.22	195.89	50,807	217	11.8	2	100	71.40	8.49	1.71	637	36	601
1.35	18.43	199.22	195.89	50,807	217	11.8	2	100	74.10	8.80	1.78	49	37	12
1.30	18.43	199.22	195.89	50,807	217	11.8	2	100	76.90	9.13	1.85	-558	39	-597
1.2	18.43	199.22	195.89	50,807	217	11.8	2	100	83.30	9.88	2.00	-1,938	42	-1,981
1.1	18.43	199.22	195.89	50,807	217	11.8	2	100	90.90	10.75	2.18	-3,579	46	-3,625
1.0	18.43	199.22	195.89	50,807	217	11.8	2	100	100.00	11.80	2.40	-5,547	51	-5,598

Seismic Conditions - NO Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
2.4	18.43	199.22	195.89	25,466	217	11.8	2	100	41.70	4.97	1.00	581	10	571
2.3	18.43	199.22	195.89	25,466	217	11.8	2	100	43.50	5.19	1.04	210	11	199
2.25	18.43	199.22	195.89	25,466	217	11.8	2	100	44.40	5.30	1.07	24	11	13
2.20	18.43	199.22	195.89	25,466	217	11.8	2	100	45.50	5.42	1.09	-202	12	-213
2.1	18.43	199.22	195.89	25,466	217	11.8	2	100	47.60	5.68	1.14	-635	13	-647
2.0	18.43	199.22	195.89	25,466	217	11.8	2	100	50.00	5.96	1.20	-1,128	14	-1,142
1.9	18.43	199.22	195.89	25,466	217	11.8	2	100	52.60	6.27	1.26	-1,664	15	-1,679

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

APTIM

LCS saturated unit weight =	130	pcf		
LCS drainage layer thickness =	1	feet		
Tractor weight =	25,342	lb/ft		
Height of Slope =	63	feet		
Slope (H:V) =	3	Horizontal :	1	Vertical

Neutral Block Dimensions =	3.16	Base (ft)	1.05	Height (ft)
	3.33	Length along Slope (ft)		

Cover Soil Friction Angle (ϕ) =	11.8	degrees
Critical Interface Friction Angle (δ) =	0.0	degrees
Critical Interface Adhesion (C) =	110.4	psf

Static Conditions - Tractor Loading

Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
1.5	18.43	199.22	195.89	50,807	217	11.8	0	110	73.60	7.93	0.00	1,645	33	1,612
1.4	18.43	199.22	195.89	50,807	217	11.8	0	110	78.90	8.49	0.00	607	36	571
1.35	18.43	199.22	195.89	50,807	217	11.8	0	110	81.80	8.80	0.00	39	37	1
1.30	18.43	199.22	195.89	50,807	217	11.8	0	110	84.90	9.13	0.00	-569	39	-607
1.2	18.43	199.22	195.89	50,807	217	11.8	0	110	92.00	9.88	0.00	-1,959	42	-2,002
1.1	18.43	199.22	195.89	50,807	217	11.8	0	110	100.40	10.75	0.00	-3,605	46	-3,651
1.0	18.43	199.22	195.89	50,807	217	11.8	0	110	110.40	11.80	0.00	-5,564	51	-5,615

Seismic Conditions - NO Tractor Loading

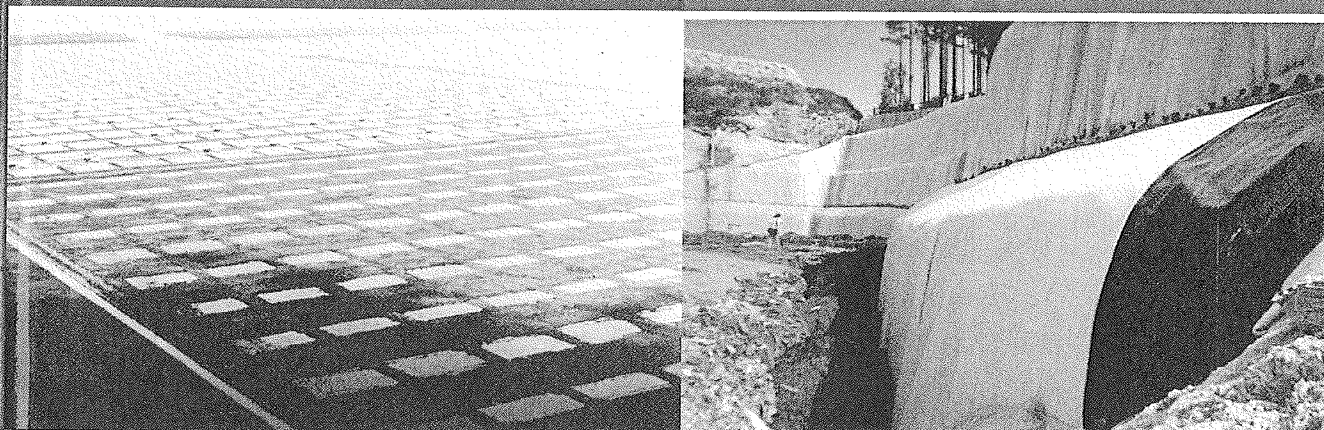
Safety Factor	Slope (degrees)	Length of Slope (ft)	Lenth of Sliding Block (ft)	Weight of Active Block (Wa)	Weight of Neutral Block (Wnb)	Internal Friction Angle (degrees)	Critical Interface Friction Angle (degrees)	Critical Interface Adhesion (psf)	Mobilized Adhesion (psf)	S.F. (drainage friction angle)	S.F. (critical fricition angle)	Active Block (Ea)	Neutral Block (Enb)	Ea - Enb
2.6	18.43	199.22	195.89	25,466	217	11.8	0	110	42.50	4.59	0.00	839	8	831
2.5	18.43	199.22	195.89	25,466	217	11.8	0	110	44.20	4.78	0.00	506	9	497
2.40	18.43	199.22	195.89	25,466	217	11.8	0	110	46.00	4.97	0.00	154	10	144
2.35	18.43	199.22	195.89	25,466	217	11.8	0	110	47.00	5.08	0.00	-42	10	-52
2.3	18.43	199.22	195.89	25,466	217	11.8	0	110	48.00	5.19	0.00	-238	11	-249
2.2	18.43	199.22	195.89	25,466	217	11.8	0	110	50.20	5.42	0.00	-669	12	-681
2.1	18.43	199.22	195.89	25,466	217	11.8	0	110	52.60	5.68	0.00	-1,139	13	-1,152

PGA 2%,50yr (%g)	α (degrees)	Result. Force
4.61	2.64	1.0011

Published Technical References

DESIGNING WITH GEOSYNTHETICS

FIFTH EDITION



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the same as that described in Section 2.7.4 using geotextiles. High strength geotextiles and geogrids are competitive in this particular application. The technique is considered very appropriate when stone columns are used as the ground modification technique. Sometimes the stone columns are actually contained in a geogrid enclosure, which appears to be a growing application [56].

3.2.7 Veneer Cover Soils

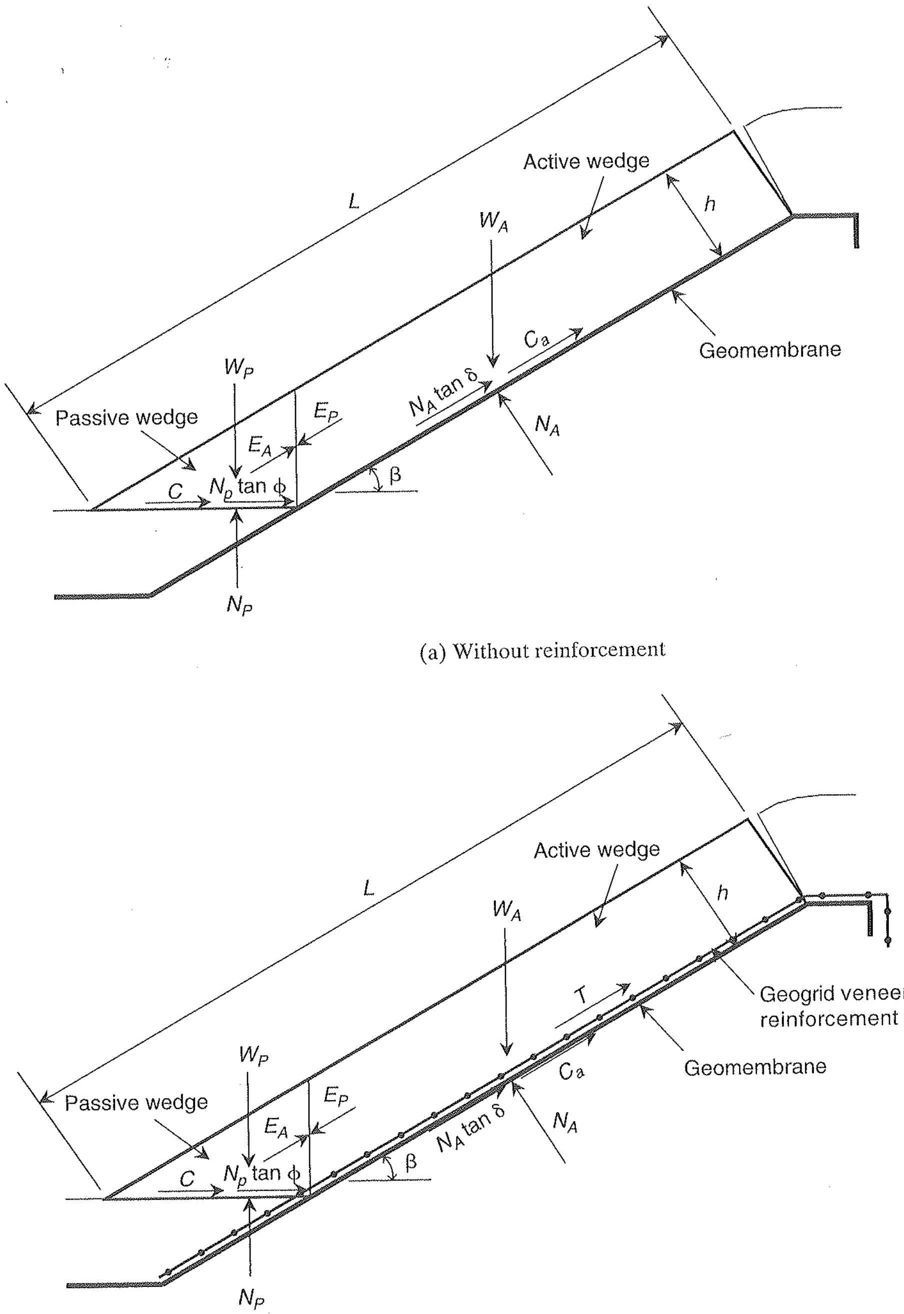
Whenever a lined slope (geomembrane, GCL, or compacted clay) is covered with soil, a stability calculation should be made to assess the potential for sliding failure of the soil on the barrier layer. Three situations come to mind: (1) landfill liners with leachate collection sand or gravel above them until such time that the solid waste acts as a passive resistance restraint; (2) surface impoundment liners where the cover soil is placed over the geomembrane to shield it from ultraviolet light, heat degradation, and equipment damage; and (3) landfill covers that have topsoil and protection soil placed over the geomembrane. In all cases the soil layer is relatively thin (0.3 to 1.0 m), hence the sliding stability of such a veneer of cover soil is the issue.

Due to the typically low shear strength of the covering soil to the liner material, numerous stability problems have arisen. The driving forces creating the instability are gravitational forces, equipment loads, surcharge loads, seepage forces, and/or seismic forces. Each must be carefully considered in the context of the site-specific conditions.

Koerner and Soong [57] have analyzed the general situation through the use of limit equilibrium and a finite slope model, as shown in Figure 3.22. Consider a cover soil placed directly on a geomembrane (or other barrier layer) at a slope angle β. Two discrete zones can be visualized, as shown in Figure 3.22a. There is a small passive wedge near the toe of the slope resisting a long thin active wedge extending the length of the slope. It is assumed that the cover soil is of uniform thickness and constant unit weight. At the top of the slope or at an intermediate berm, we anticipate that a tension crack in the cover soil will occur, thereby breaking continuity with the remaining cover soil at the crest.

Resisting the tendency for the cover soil to slide is the interface friction and/or adhesion of the cover soil to the specific type of underlying geomembrane. The shear strength values of δ and c_a must be obtained from a laboratory direct-shear test, as described earlier. Note that the passive wedge is assumed to move on the underlying cover soil so that the shear strength parameters ϕ and c, which come from soil-to-soil friction tests, will also be required.

By taking free bodies of the passive and active wedges with the appropriate forces being applied, the formulation for the factor of safety results. The resulting equation is not an explicit solution for the FS, and it must be solved using the quadratic equation. The complete development of the equation is given in [57]. Other approaches are found in Giroud and Beech [58], Koerner and Hwu [59], and Thiel and Stewart [60].



(a) Without reinforcement

(b) With the use of geogrid veneer reinforcement

Figure 3.22 Limit equilibrium forces involved in a finite length slope analysis for a uniformly thick cover soil. (After Koerner and Soong [57])

The expression for determining the factor of safety, considering the active wedge, can be derived as follows:

$$W_A = \gamma h^2\left(\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2}\right) \tag{3.15}$$

$$N_A = W_A \cos\beta \tag{3.16}$$

$$C_a = c_a\left(L - \frac{h}{\sin\beta}\right) \tag{3.17}$$

By balancing the forces in the vertical direction, the following formulation results:

$$E_A \sin\beta = W_A - N_A \cos\beta - \frac{N_A \tan\delta + C_a}{\text{FS}} \sin\beta$$

Hence the interwedge force acting on the active wedge is

$$E_A = \frac{(\text{FS})(W_A - N_A\cos\beta) - (N_A \tan\delta + C_a)\sin\beta}{\sin\beta(\text{FS})}$$

The passive wedge can be considered in a similar manner:

$$W_p = \frac{\gamma h^2}{\sin 2\beta} \tag{3.18}$$

$$N_P = W_P + E_P \sin\beta \tag{3.19}$$

$$C = \frac{(c)(h)}{\sin\beta} \tag{3.20}$$

By balancing the forces in the horizontal direction, the following formulation results:

$$E_P \cos\beta = \frac{C + N_P \tan\phi}{\text{FS}}$$

Hence the interwedge force acting on the passive wedge is

$$E_P = \frac{C + W_P \tan\phi}{\cos\beta(\text{FS}) - \sin\beta\tan\phi}$$

By setting $E_A = E_P$, the following equation can be arranged in the form of $ax^2 + bx + c = 0$, which in our case, using FS values, is

$$a(\text{FS})^2 + b(\text{FS}) + c = 0 \tag{3.21}$$

where

$$a = (W_A - N_A\cos\beta)\cos\beta, \tag{3.22}$$

$$b = -[(W_A - N_A\cos\beta)\sin\beta\tan\phi + (N_A\tan\delta + C_a)\sin\beta\cos\beta + \sin\beta(C + W_p\tan\phi)], \text{ and} \tag{3.23}$$

$$c = (N_A\tan\delta + C_a)\sin^2\beta\tan\phi \tag{3.24}$$

The resulting FS value is then obtained from the following equation:

$$FS = \frac{-b + \sqrt{b^2 - 4\,ac}}{2\,a} \tag{3.25}$$

where (in Figure 3.22a and in the above analysis)

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,
N_P = effective force normal to the failure plane of the passive wedge,
γ = unit weight of the cover soil,
h = thickness of the cover soil,
L = length of slope measured along the geomembrane,
β = soil slope angle beneath the geomembrane,
ϕ = friction angle of the cover soil,
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,
E_A = interwedge force acting on the active wedge from the passive wedge,
E_P = interwedge force acting on the passive wedge from the active wedge, and
FS = factor of safety against cover soil sliding on the geomembrane

When the calculated FS value falls below 1.0, a stability failure of the cover soil sliding on the geomembrane is to be anticipated. Thus a value greater than 1.0 must be targeted as being the minimum factor of safety. How much greater than 1.0 the FS value should be is a design and/or regulatory issue. Example 3.12 illustrates the procedure.

Example 3.12

Given a cover soil slope of $\beta = 18.4°$ (i.e. $3H$-to-$1V$), $L = 30$ m, $h = 900$ mm, $\gamma = 18$ kN/m^3, $c = 0$, $\phi = 30°$, $c_a = 0$, $\delta = 18°$, determine the resulting factor of safety.

Solution:

$$W_A = \gamma h^2\left(\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2}\right)$$
$$= (18.0)(0.90)^2\left(\frac{30}{0.90} - \frac{1}{\sin 18.4} - \frac{\tan 18.4}{2}\right)$$
$$= 14.58(33.3 - 3.17 - 0.17)$$
$$= 437 \text{ kN/m}$$

For termination of double liner systems, the designer is faced with a number of possible choices. Major considerations are to protect the integrity of both geomembranes and to keep surface water out of the leak detection system. In this regard, the two geomembranes can enter separate anchor trenches or come together in a common anchor trench. The primary geomembrane can also be cut short of the anchor trench and welded to the secondary geomembrane along the horizontal runout distance. In seismically active areas, consideration should be given to this latter approach with no vertical anchor trench at all; the logic being that geomembrane pullout is more desirable than geomembrane tensile failure somewhere along the side slope.

The terminus of the liner of a completed internal cell within a zoned landfill, with its eventual extension into an adjacent cell, is usually done by overlapping and seaming along the horizontal runout length of an intermediate berm. When waste fills the second cell, the berm is entombed and the process is then continued from cell to cell. Shear stresses on the geomembranes in both cells over this berm have been evaluated by large-scale laboratory models and found to be generally small and geomembrane-dependent (see Koerner and Wayne [79]). In high berms where higher stresses are generated, an auxiliary (or sacrificial) geomembrane rub-sheet over the crest of the berm should effectively dissipate the stresses before they propagate down to the underlying primary geomembrane.

5.6.9 Side Slope Subgrade Soil Stability

The design of the stability of the soil mass beneath the liner system of a solid-waste landfill is carried out in exactly the same manner as was discussed for liquid containment (reservoir) slopes and berms (recall Section 5.3.5). The process can include the strength of the covering liner materials, but if they are not included in the analysis, the error is on the conservative side. Interior berms, with or without geosynthetic inclusions, are also handled in the same manner as previously described.

5.6.10 Multilined Side Slope Cover Soil Stability

The situation of a liner and its leachate collection cover soil stability, or slumping, becomes quite complicated for multilined geomembrane and geonet collection systems of the type shown in Figure 5.40. Consider such a system, as shown in Figure 5.40e The leachate collection system soil gravitationally induces shear stress through the system, thereby challenging each of the interface layers that are in the cross section. If all of the interface shear strengths are greater than the slope angle, stability is achieved and the only deformation involved is a small amount to achieve elastic equilibrium (Wilson-Fahmy and Koerner [80]). However, if any interface shear strengths are lower than the slope angle, wide-width tensile stresses are induced into the overlying geosynthetics. This can cause the failure of the geosynthetics or pullout from the anchor trench, or it can result in quasistability via tensile reinforcement. If the last is the case, we can refer to the overlying geosynthetics as acting as *nonintentional* veneer reinforcement.

If the situation consists of the double liner system shown in Figure 5.45, all of the interface surfaces can be made quite stable by proper selection of the geosynthetics.

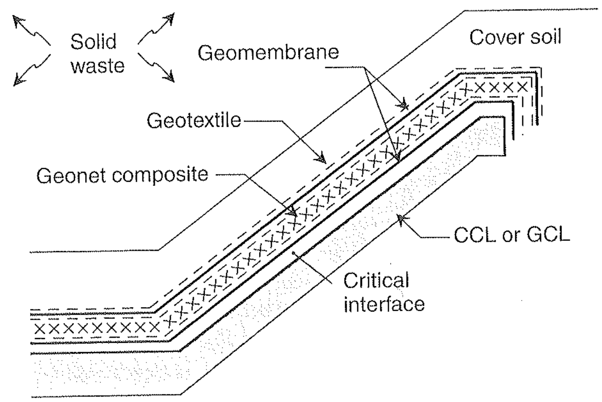


Figure 5.45 Geotextile/geomembrane/geonet composite/geomembrane above a CCL or GCL.

For example, textured geomembranes could be selected, and these together with non-woven needle-punched geotextiles will usually result in peak friction angles in excess of 25°. Furthermore, by thermally bonding the geotextiles in the leak detection system to the geonet, these surfaces are also stable at relatively high slope angles. Thus, the critical interfaces are at the upper (leachate collection sand or gravel) and the lower (CCL or GCL) surfaces. The upper surface is analyzed exactly as described in Section 3.2.7 for the case without geogrid reinforcement. The proper selection of cover soil against a nonwoven needle-punched geotextile (acting as a protection material, recall Section 5.6.7) should also result in a peak friction angle in excess of 25°. This leaves the lower surface of the secondary geomembrane against the clay liner as being the potentially low-interface surface. If the clay liner is a CCL, the concern is with the expelled consolidation water lubricating the interface. This surface has been involved in a major failure of a hazardous waste liner system, as reported by Byrne et al. [81] with an interface friction angle of 10°. If the liner is a GCL, the concern is the hydrated bentonite being extruded out of the upper geotextile and lubricating the interface with an interface friction angle of 5 to 10°. This surface was involved in two slides of full-scale field tests both involving woven geotextiles on the GCL, by Daniel et al. [82].

The analysis of multilined slopes of the type being discussed is a direct extension of the veneer reinforcement model presented in Section 3.2.7 on geogrids. Recalling Figure 3.22b, the analysis results in equation (3.21):

$$a(\mathrm{FS})^2 + b(\mathrm{FS}) + c = 0$$

where

$$a = (W_A - N_A \cos\beta - T\sin\beta)\cos\beta,$$

$$b = -[(W_A - N_A\cos\beta - T\sin\beta)\sin\beta\tan\phi + (N_A\tan\delta + C_a)\sin\beta\cos\beta + \sin\beta(C + W_P\tan\phi)],\ \text{and}$$

$$c = (N_A\tan\delta + C_a)\sin^2\beta\tan\phi.$$

The resulting FS value is then obtained from equation (3.22):

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

The variables and values of W_A, N_A, T, and W_P were defined in Sections 3.2.7 and 5.3.5. The critical parameter in the above equation is T, the allowable wide-width tension strength of the geosynthetic layers above the potential failure surface. For the cross section shown in Figure 5.45, T represents the allowable strength of all of the geosynthetic materials above the critical interface. Not only is the issue of reduction factors difficult to assess for the liner materials per se, but the issue of strain compatibility is also unwieldy. In this latter regard, the wide-width tensile strength of each geosynthetic material must be determined, plotted on the same axes, and assessed at a specific value of strain. That is, the liner system components cannot act individually and must act as an equally strained unit. Example 5.20 illustrates the situation.

Example 5.20

For a 30 m long slope at 3(H) to 1(V)—i.e., $\beta = 18.4°$ — lined with a double liner system consisting of GT/GM/GC/GM/CCL or GCL (as in Figure 5.45), the lowest friction angle is assumed to be the secondary geomembrane to the underlying clay interface, which is 10°. All other interface friction angles are in excess of 18.4°. The wide-width tensile behavior of the various candidate geosynthetics is given in the following graph. The leachate collection cover soil is 450 mm thick with a unit weight of 18.0 kN/m^3 and a friction angle of 30°. What is the factor of safety of the slope based on a cumulative reduction factor of 2.0?

Solution:

$$\begin{aligned}
W_A &= \gamma h^2\left[\frac{L}{h} - \frac{1}{\sin\beta} - \frac{\tan\beta}{2}\right]\\
&= (18.0)(0.45)^2\left[\frac{30}{0.45} - \frac{1}{\sin 18.4} - \frac{\tan 18.4}{2}\right]\\
&= 3.65[63.3]\\
&= 231 \text{ kN/m}\\
N_A &= W_A \cos\beta\\
&= 231 \cos 18.4\\
&= 219 \text{ kN/m}\\
W_P &= \frac{\gamma h^2}{\sin 2\beta}\\
&= \frac{(18.0)(0.45)^2}{\sin 36.8}\\
&= 6.08 \text{ kN/m}
\end{aligned}$$

T_{ult} taken at the first geosynthetic failure, which is the nonwoven needle-punched geotextile at 25 kN/m, is

$$\begin{aligned}
T_{ult} &= 25 + 2(22) + 36\\
&= 105 \text{ kN/m}
\end{aligned}$$

Edil, T. B., "Seepage, Slopes, and Dams" University of Wisconsin - Madison

If the cut-slope is made in a cohesive material (containing clay and silt), the failure is usually deeper and like rotational slips as shown in Fig. 2. The long-term (prior to waste filling and after waste filling) and the end-of-excavation stability have to be analyzed separately. The former requires an effective stress analysis using drained (effective) strength parameters (ϕ', c') and the later a total stress analysis using undrained (total) strength parameters (c_u, usually $\phi_u = 0$) determined on undisturbed samples of the materials. Typically, a finite slope analysis using a method of slices such as the modified Bishop method is used for the stability analysis. The total stress analysis can be performed also with the simpler circular arc method. The position of the failure surface is unknown and determined by a trial and error method. There are computer programs available for slope stability analysis (Bosscher, 1990). Chart solutions for simple slopes using the finite slope analysis are provided in Appendix A.

Berm Slopes

Since berms are constructed by compacting selected earthen materials, the characterization of the materials is much simpler than the cuts. The end-of-construction and the long-term analyses can be made in a manner similar to the ones described for cut slopes. The end-of-construction stability is likely to be more critical than the long-term stability. The strength parameters are determined on compacted specimens of the borrow materials, i.e., ϕ_u, c_u and ϕ', c'.

COVER SOIL STABILITY

The usual cover soil is a relatively thin layer of soil of either uniform thickness or tapered thickness. When clay covers are placed on side slopes, they sometimes fail by slumping. The accumulated soil gathers at the toe of the slope. This same situation is even more apt to occur for cover soils placed on geosynthetics, which are invariably lower in frictional resistance than the substrate soils from which the slope itself is formed.

The failure of cover soils with uniform depth is basically a surface raveling type of failure along the interface as shown in Fig. 3 and can be analyzed by an infinite slope analysis using the following expression for a safety factor:

$$F = (\tan \delta/\tan \beta)\,[1-(\gamma_w h_p/\gamma d) \sec^2 \beta] \qquad (2)$$

where δ is the interface friction (between the geosynthetic and cover soil or the in situ soil); the other terms are as defined before in Fig. 1. The critical parameters are the interface friction angle or the shear strength between the soil and the geosynthetic, the inclination of slope, and the seepage forces (due to infiltrating water or rapid draw down of reservoir levels).

To alleviate the slumping of cover soils down slope, it is quite common to construct them with a taper, i.e., thicker at the bottom and gradually thinner going toward the top as shown in Fig. 4. The stability can be analyzed using a wedge stability method as described in Appendix B.

SLOPE LINER STABILITY

Principal sliding surfaces in landfills often coincide within the multi-layer liner system underlying the wastefill. The Kettleman Hills waste landfill slide in California occurred in this fashion in 1988. The foundation soil including the cut slopes is usually ch stronger than the critical liner-system interfaces because the settlement considerations ually dictate selection of sites with competent foundation soils. There is some evidence hat relatively steep slopes of high refuse fills also do not fail in deep rotational slides if they are founded on firm foundations. Therefore, the liner-system interfaces become the most critical slip zone. The interfaces may be: (1) between geomembrane liner and geotextile or geonet layer, (2) between geomembrane liner and compacted clay liner, and (3) between geotextile or geomembrane and granular layer. The interfaces between these materials are characterized by low frictional resistance. The frictional resistance is affected by various properties including degree of polishing (of geomembrane by geotextile with increasing shear displacement) and whether the interfaces are wet or dry. The interface strength properties can be evaluated by use of laboratory direct shear or pullout tests (Mitchell et al, 1990).

Failure by Sliding on Liner Interfaces

The stability analysis for sliding along planar liner interface surfaces as shown in Fig. 5 can be performed using a wedge stability method as given in Appendix B. The analysis of Kettleman Hills waste landfill slide by this approach provided a reasonable estimate of the failure based on the interface shear strengths measured in the laboratory. Three-dimensional effects were found to lower safety factors by 10 to 15% (Seed et al., 1990).

Failure with Liner Pullout or Break

In the geomembrane lined reservoirs or landfills, the liner comes up from the bottom of the pit, covering the side slopes, then running over the top a short distance. It often terminates vertically down in an anchor trench as shown in Fig. 6.

The stress generated in the geomembrane, σ, for a given length of runout, L_{TO}, and trench depth, d_t, can be obtained from the following expression:

$$\sigma = \frac{\gamma d_c \tan\delta + 2K_o \gamma d_t (d_c + 0.5\, d_t) \tan\delta + 2\gamma (d_c + d_t) b \tan\delta}{t\,(\cos\beta - \sin\beta \tan\delta)} \qquad (3)$$

where

t = the geomembrane thickness

β = the slope angle

δ = the interface friction angle

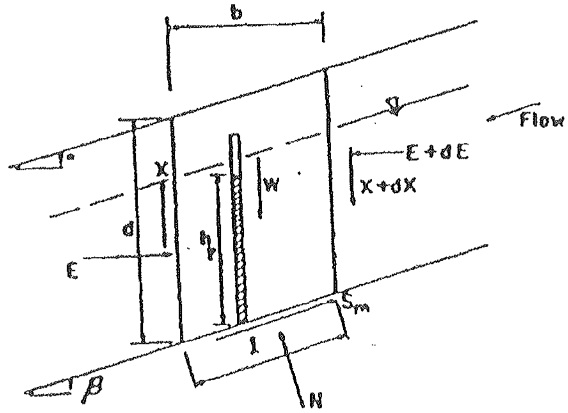
d_C = the depth of cover soil

b = the width of trench

γ = the unit weight of cover and trench soil

K_O = the lateral coefficient of earth in trench (it can be taken as 0.5)

The safety factor, F, against pullout or break can be computed from



γ: unit weight of soil

γ_W: unit weight of water

φ': friction angle of soil

Fig. 1. Idealized Infinite Slope Analysis

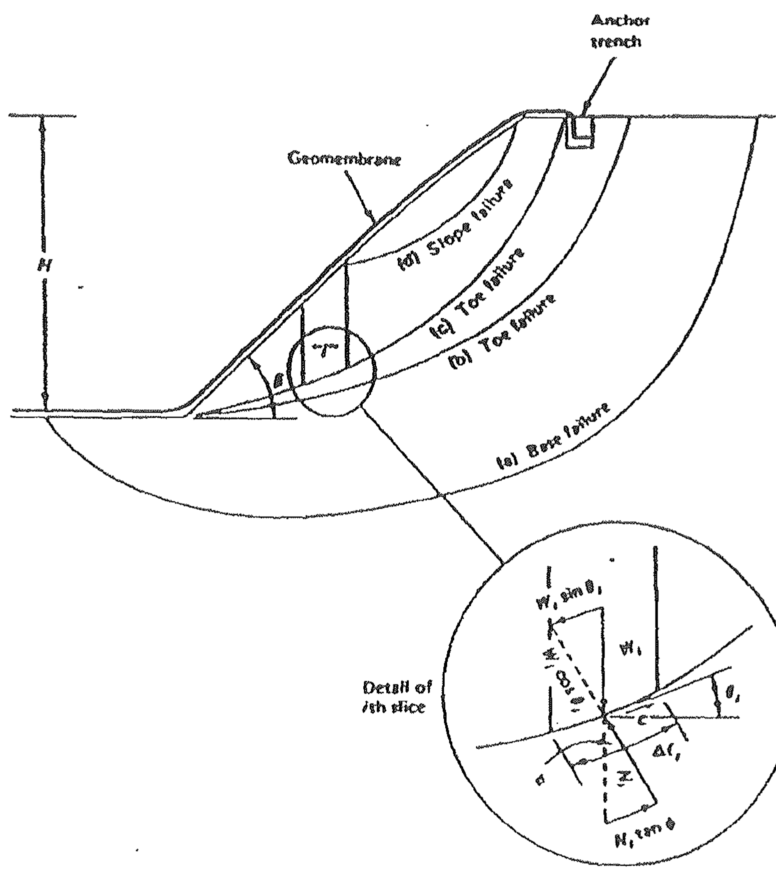


Fig. 2. Various Types of Finite Slope Failures

APPENDIX B

WEDGE METHOD OF SLOPE STABILITY ANALYSIS IN WASTE DISPOSAL

.nis method the potential sliding mass is separated into a series of wedges and the vertical and horizontal force equilibrium of each wedge is considered in turn. This method is most appropriate for conditions where the failure surface can be approximated by a series of planar surfaces. For analysis by the wedge method, the mass above the trial slip surface is divided by vertical lines into a number of wedges. The side force transmitted across the interface between any two wedges is not known but an assumption regarding its inclination must be made. The assumption that the side forces between wedges are horizontal is conservative with an error for most cases no more than 15%. Experience indicates that assuming an inclination of 10 to 15 degrees from the horizontal usually gives reasonable results. The factor of safety, F (defined as the ratio between the shear strength and the shear stress required for equilibrium), is calculated by trial-and-error. A value of F is assumed, and then checked to determine if the shear resistance along the failure surface reduced by this F satisfies equilibrium. If not, a new trial is initiated with another assumed safety factor. The analysis can be performed either graphically or numerically.

Two common cases encountered in waste disposal which can be analyzed by the wedge method are presented by use of the numerical method. These cases involve the stability along a liner and tapered depth soil cover as shown in Figure B1 and B2. The steps are as follows:

1. Define a trial slip surface. In these two cases it is primarily along the soil or waste and liner interface.

2. Divide the mass above the slip surface into wedges. In these two cases, the sliding mass is divided into an active wedge and a neutral block.

3. Calculate the weight of each wedge. This analysis is a two-dimensional analysis and the stability of a unit length of material along the slope is considered. Therefore, the weight of each wedge is its cross-sectional area (times unit length) times the unit weight of the sliding mass.

4. Assume a value of factor of safety, F and calculate the trial values of mobilized friction angle along the slip surface, δ_m (soil/waste-liner friction angle) or ϕ_m (soil-soil friction angle) using the following definitions:

$$\tan \delta_m = \frac{\tan \delta}{F} \qquad \tan \phi_m = \frac{\tan \phi}{F}$$

5. Assume the inclination of the force acting between the active wedge and the neutral block, α. For the tapered depth cover soil, α may be assumed parallel to cover soil slope. Otherwise, assume a value between 0 - 20°.

6. Using the equations given in Figures B1 and B2, calculate the force from neutral block acting on active wedge, E_A and the force from active wedge acting on neutral block, E_{NB} from the force equilibrium of each block. These forces are equal in magnitude opposite in direction at equilibrium. Note that the friction is mobilized in proportion to the assumed F along the slip surface; therefore, there may be a difference, ΔE in the calculated magnitudes of E_A and E_{NB}.

7. Plot ΔE versus assumed F.

8. Assume a new F and repeat steps 6 and 7. Try additional values of F until ΔE is negligibly small. This value of F is the correct safety factor.

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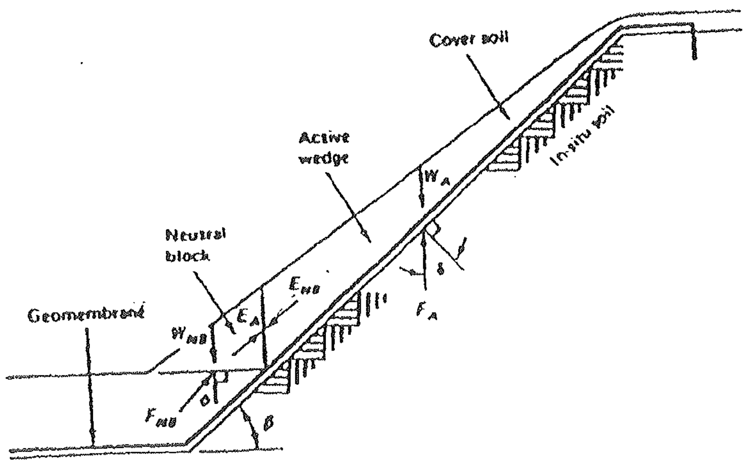
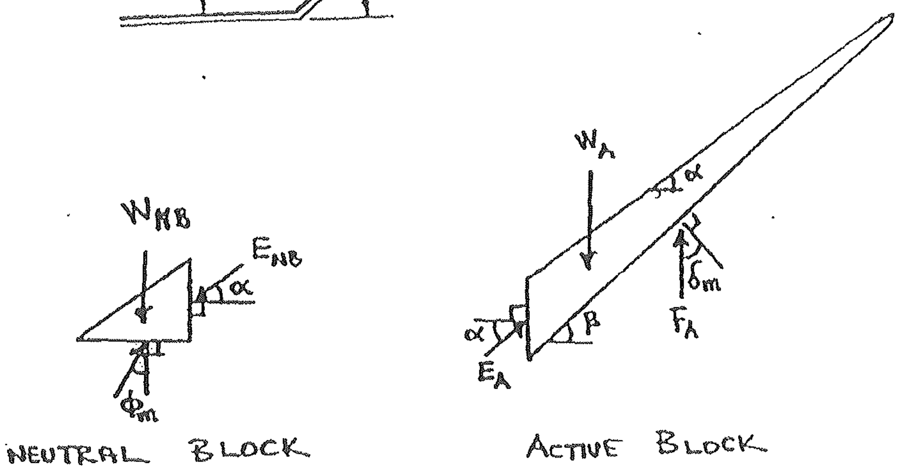




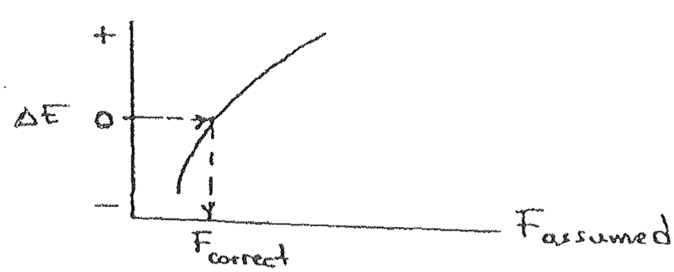
$$E_A = W_A \frac{\sin(\beta - \delta_m)}{\sin(90° + \alpha - \beta + \delta_m)}$$

$$E_{NB} = W_{NB} \frac{\sin \Phi_m}{\sin(90° - \alpha - \Phi_m)}$$

$$\Delta E = E_A - E_{NB}$$

$$\tan \delta_m = \frac{\tan \delta}{F}$$

$\alpha = \beta$ in leachate collection system (18.4°)



;ure B1. Wedge analysis as applied to tapered depth soil cover.

836K

Landfill Compactor

Engine		
Engine Model	Cat® C18 ACERT™	
Emissions	Tier 4 Final/Stage IV	
Gross (SAE J1349)	419 kW	562 hp

Operating Specifications		
Maximum Operating Weight – Multiple Blade and Wheel Offerings	55 927 kg	123,319 lb

836K Landfill Compactor Specifications

Engine

Engine Model	C18 ACERT	
Emissions	U.S. EPA Tier 4 Final and EU Stage IV	
Rated Power (Lab)	414 kW	555 hp
Rated Power (Net ISO 14396)	412 kW	553 hp
Gross (SAE J1349)	419 kW	562 hp
Net Power – SAE J1349		
Direct Drive – Gross Power	370 kW	496 hp
Direct Drive – Torque Rise	52%	
Converter Drive – Gross Power	370 kW	496 hp
Converter Drive – Torque Rise	52%	
Maximum Gross Torque @ 1,300 rpm	3085 N·m	2,275 lbf-ft
Maximum Altitude without Derating	2286 m	7,500 ft
Bore	145 mm	5.71 in
Stroke	183 mm	7.2 in
Displacement	18.1 L	1,104.5 in^3
High Idle Speed	2,120 rpm	
Low Idle Speed	750 rpm	

Operating Specifications

Operating Weight with Full Tank Capacities and U-blade	55 927 kg	123,319 lb

Transmission

Transmission Type	Planetary – Powershift – ECPC	
Travel Speeds		
Forward – Converter 1st	6.2 km/h	3.9 mph
Forward – Lockup 1st	6.5 km/h	4 mph
Forward – Converter 2nd	10.9 km/h	6.8 mph
Forward – Lockup 2nd	11.7 km/h	7.3 mph
Reverse – Converter 1st	6.5 km/h	4 mph
Reverse – Lockup 1st	6.9 km/h	4.3 mph
Reverse – Converter 2nd	10.4 km/h	6.5 mph
Reverse – Lockup 2nd	12.3 km/h	7.6 mph

Hydraulic System

Hydraulic System	Flow Sharing Implement	
Maximum Supply Pressure	32 000 kPa	4,640 psi
Main Relief Pressure	24 100 kPa	3,495 psi
Pump Flow at 2,006 rpm	250 L/min	66 gal/min
Steering System	Double Acting – End Mounted	
Bore	127 mm	5 in
Stroke	740 mm	29.1 in
Vehicle Articulation Angle	86°	
Lift System	Double Acting Cylinder	
Bore	137.9 mm	5.5 in
Stroke	1021 mm	40.2 in

Service Refill Capacities

Fuel Tank	793 L	209 gal
Cooling System	107 L	28 gal
Crankcase	60 L	16 gal
Diesel Engine Fluid Tank	32.8 L	9 gal
Transmission	120 L	32 gal
Differentials and Final Drives – Front	186 L	49 gal
Differentials and Final Drives – Rear	190 L	50 gal
Hydraulic System (tank only)	240 L	63 gal

- All non-road Tier 4 Final/Stage IV, and Japan (MLIT) Step 4 diesel engines are required to use:
  - Ultra Low Sulfur Diesel (ULSD) fuels containing 15 ppm (mg/kg) sulfur or less. Biodiesel blends up to B20 are acceptable when blended with 15 ppm (mg/kg) sulfur or less ULSD and when the biodiesel feedstock meets ASTM D7467 specifications.
  - Cat DEO-ULS™ or oils that meet the Cat ECF-3, API CJ-4, and ACEA E9 specifications are required.

Axles

Front	Planetary – Fixed
Rear	Planetary – Oscillating
Oscillation Angle	13°

Brakes

Control System	Full Hydraulic Split Circuit
Parking Brake	Spring Applied, Hydraulic Released

Cab

	Standard	Suppression
Interior Sound Level	72 dB(A)	71 dB(A)
Exterior Sound Level	111 dB(A)	109 dB(A)

Hydraulic System – Steering

Steering System – Circuit	Steering Double Acting – End Mounted	
Steering System – Pump	Piston – Variable Displacement	
Maximum Flow @ × rpm	52 L/min @ 2,006 rpm	
Steering Pressure Limited	24 100 kPa	3,495 psi
Total Steering Angle	86 degrees	

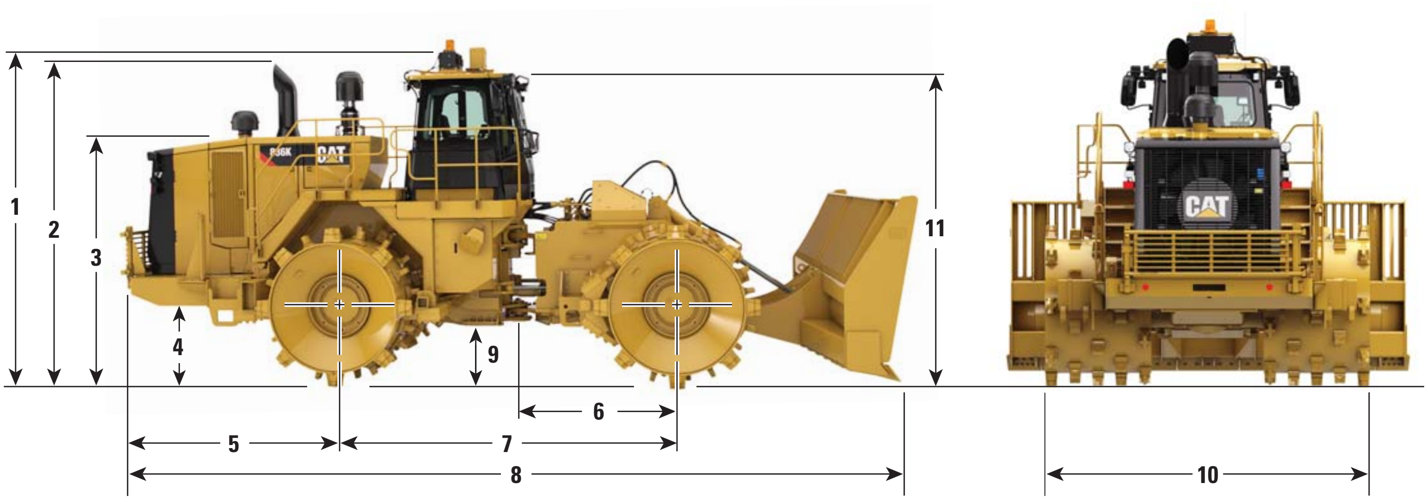
Wheels and Tips

Drum Width	1400 mm	4 ft 8 in
Drum Diameter	1770 mm	5 ft 10 in
Diameter with Tips	2125 mm	7 ft 0 in
Tips per Wheel	40	

836K Landfill Compactor Specifications

Dimensions

All dimensions are approximate.



1	Height to Top of Cab with A/C	4655 mm	15 ft 3 in
2	Height to Top of Exhaust Pipe	4608 mm	15 ft 1 in
3	Height to Top of Hood	3421 mm	11 ft 3 in
4	Ground Clearance to Bumper	1029 mm	3 ft 5 in
5	Center Line of Rear Axle to Edge of Counterweight	3187 mm	10 ft 5 in
6	Hitch to Center Line of Front Axle	2275 mm	7 ft 6 in
7	Wheelbase	4550 mm	14 ft 11 in
8	Length with Blade on Ground (straight blade)	10 182 mm	33 ft 5 in
9	Ground Clearance	632 mm	2 ft 1 in
10	Width over Wheels	4280 mm	14 ft 1 in
11	Height to ROPS/Canopy	4284 mm	14 ft 1 in
	Height to Top of Cab with Strobe	4845 mm	15 ft 11 in
Turning Radius – Inside of Wheels		3635 mm	11 ft 11 in

Blade Selection

	Straight Blade		Semi U-blade		U-blade	
Width – Moldboard Length	4990 mm	16 ft 4 in	5238 mm	17 ft 2 in	5172 mm	17 ft
Width Over End Bits	5193 mm	17 ft	5311 mm	17 ft 5 in	5258 mm	17 ft 3 in
Height with Cutting Edge and Screen	2236 mm	7 ft 4 in	2215 mm	7 ft 3 in	2210 mm	7 ft 3 in
Height with Cutting Edge, No Screen	1217 mm	4 ft	1253 mm	4 ft 1 in	1255 mm	4 ft 1 in
Maximum Depth of Cut	364 mm	1 ft 2 in	362 mm	1 ft 2 in	934 mm	3 ft 1 in
Maximum Lift above Ground	1730 mm	5 ft 8 in	1735 mm	5 ft 8 in	1198 mm	3 ft 11 in
Cutting Edges, Reversible						
Length, Each End Section (3 edges)	1408.2 mm	4 ft 7 in	816.6 mm	2 ft 8 in	2 @ 779.1 mm and 1 @ 856 mm	2 @ 2 ft 7 in and 1 @ 2 ft 10 in
Length, Each End Section (2 edges)	NA		988 mm	3 ft 3 in	1094.4 mm	3 ft 7 in
Width × Thickness	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in
End Bits (2), Self-sharpening						
Length, Each	472 mm	1 ft 7 in	472 mm	1 ft 7 in	472 mm	1 ft 7 in
Width × Thickness	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in
Capacity, Rated	19.3 m^3	25.9 yd^3	22.4 m^3	29.3 yd^3	9.74 m^3	13 yd^3
Turning Diameter, Outside Corner of Blade at 43° ART	8737 mm	28 ft 8 in	8823 mm	28 ft 11 in	8795 mm	28 ft 10 in
Overall Machine Length	10 182 mm	33 ft 5 in	10 379 mm	34 ft 1 in	10 272 mm	33 ft 8 in

J.2-C Liner/LCS After Waste Placement (Global Stability Analysis)

APTIM

Client:	Zion Landfill, Inc.
Project:	Zion Landfill – Site 2 North Expansion
Project #:	631020105
Calculated By: ORC	Date: 05/2021
Checked by: DAM	Date: 05/2021

TITLE: SHEAR STRENGTH EVALUATION OF LINER / LEACHATE COLLECTION SYSTEM AFTER WASTE PLACEMENT (GLOBAL STABILITY ANALYSIS)

Problem Statement

Determine the range of acceptable liner and leachate collection system peak shear strength parameters that provide a factor of safety against slope failure during the construction/operation and closure periods of the landfill under static and seismic loading conditions.

Title 35 Ill. Admin. Code Section 811.304 (d) requires that "the waste disposal unit shall be designed to achieve a factor of safety against slope failure of at least: 1.5 for static conditions and 1.3 under seismic conditions."

Background

The material strengths of earthen layers (recompacted clay liner, granular drainage layer) are based on laboratory testing. However, as geosynthetics are manufactured products, they can be designed and/or selected to meet strength requirements. The stability of the liner and leachate collection system is influenced by the interface shear strengths between geosynthetic liner/leachate collection system components.

This calculation is developed to identify the lowest peak shear strength that produces acceptable factors of safety for any potential interface within the liner and leachate collection system during operations and after complete build-out of the landfill. The interfaces that are considered include the following:

- Geotextile to granular drainage layer;
- Geotextile to geomembrane; or
- Geomembrane to low permeable earth liner.

It is noted that all interfaces will be required to meet the minimum interface peak shear strength values determined in this calculation.

Given

- ❑ Hydrogeologic and Design Drawings contained in this Application.
- ❑ **Appendix J.1** "Summary of Geotechnical Design Parameters" contained in this Application.
- ❑ Peak horizontal ground acceleration (PGHA) determined from USGS National Seismic Hazard Mapping Project website (value of 0.0461g for horizontal acceleration — please refer to **Appendix J.1**).
- ❑ Computer model SLIDE - An Interactive Slope Stability Program, version 9.006, developed by Rocscience, Inc. was used for the stability analyses.
- ❑ **Figure Nos. 1** and **2** shows the locations of the critical cross section (please refer to the attached pages).

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

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Assumptions

Selected Critical Cross Section

Critical Cross Section A-A' - Cross Section A-A' as shown on **Figure Nos. 1** and **2** (see attached pages) is a critical cross section oriented overall from south to north, starting in the existing landfill and moving north through the vertical and then horizontal expansions, and then through the detention basin. A critical cross section is used to be conservative, as it captures the steepest possible slopes and peak elevations. The cross section is characterized by the following features:

- Peak final landform elevation of 896 feet MSL for the horizontal and vertical expansions;
- Maximum waste column thickness of 198 feet located at peak final landform elevation of approximately 896 feet MSL in the horizontal expansion area (Cell 11);
- Maximum waste column thickness of 206 feet located at final landform elevation of approximately 896 feet MSL in the vertical expansion area (Cell 7);
- Final cover side slopes of 4H:1V with a slope of 10H:1V across the plateau;
- Intermediate waste slopes of 3H:1V; and
- Cell excavation side slopes of 3H:1V in the horizontal and vertical expansion areas.

Critical Cross Section B-B' - Cross Section B-B' as shown on **Figure Nos. 1** and **2** (see attached pages) is a critical cross section oriented overall from west to east in Cell 11 of the horizontal expansion. The cross section moves along the LCS pipe through Cell 11 and through the facility boundary to the east. A critical cross section is used to be conservative, as it captures the steepest possible slopes and peak elevations. The cross section is characterized by the following features:

- Peak final landform elevation of 896 feet MSL for the horizontal expansion;
- Maximum waste column thickness of 198 feet located at peak final landform elevation of approximately 896 feet MSL in the horizontal expansion area (Cell 11);
- Final cover side slopes of 4H:1V with a slope of 10H:1V across the plateau;
- Intermediate waste slopes of 3H:1V; and
- Cell excavation side slopes of 3H:1V in the horizontal expansion area.

Landfill Stages Analyzed and Modes of Failure

Stability of the landfill was analyzed for two different landfill stages:

- Complete landfill build-out / final landform; and
- Intermediate/operational buildout from the liner to the maximum waste height in the horizontal expansion, with complete buildout of the vertical expansion area.

The landfill stages were analyzed using two modes of failure within the SLIDE model — translational (non-circular / block) failure and rotational (circular) failure. The translational failure mode was used to analyze the stability of the liner system along critical (weak) interfaces; and the rotational failure mode was used to analyze the stability of the waste mass and the foundation.

Stability of Liner System by Translational Failure Mode. The stability of the liner system was evaluated by constraining the failure surfaces (generated by the SLIDE model) to occur within the liner system at the most critical interface. The SLIDE model was used to perform a block search for translational failure surfaces (i.e., non-circular failure surfaces that follow along a weak plane or interface). A constraining boundary was applied through the upper portion of the base liner and side slope liner within the SLIDE model. Failure surfaces were then generated through the liner layer, and the most critical failure surface was determined (i.e., lowest factor of safety).

Stability of Waste Mass and Foundation by Rotational Failure Mode. The stability of the waste mass and foundation was evaluated within the SLIDE model using a grid search to find the most critical circular failure surfaces within the waste mass and foundation. The grid search was performed in an iterative manner by the SLIDE model user. Each time the user adjusted / fine-tuned the grid to the point where the model generated the absolute lowest factor of safety.

Limit Equilibrium Analysis Methods

The limit equilibrium analysis methods used in the SLIDE model analyses included the Bishop Simplified Method, the Janbu Corrected Method, the Spencer Method, and the GLE (Generalized Limit Equilibrium) / Morgenstern-Price Method. The lowest factor of safety from the four methods used is reported on the SLIDE plot for each modeled scenario (attached pages) and on the summary table on the following page. All of the modeled scenarios are graphically presented on the SLIDE plots provided in the attached pages.

Failure Conditions

The stability analyses were performed for both short-term and long-term shear strength under static and seismic loading conditions. Long-term shear strength conditions will most likely occur following the complete buildout of the landfill. Short term shear strength conditions will most likely occur in the intermediate/operation scenario.

Global Stability Analysis of Intermediate Build-Out (Operational Period)

For the operational period, an interim waste slope was developed that rises from the base grades to the peak landfill height (206' along Cross Section A-A' and 196' along Cross Section B-B'). The waste slope was assumed to have a slope of 3H:1V.

Global stability of the intermediate landfill buildout (operational landform) condition was analyzed to identify liner and leachate collection system shear strength parameters that provide adequate factors of safety for the constructed landfill. This scenario was modeled to ensure that the expanded landfill will be stable after closure.

The stability of the landform was evaluated using the unit weights of the geologic units and earthen constructed landfill components as described in **Appendix J.1**.

The water table was assumed to be located in contact with the bottom the low permeable earth liner or 5-feet below the ground surface (beyond the limits of the landfill). This is conservative and represents the worst-case groundwater scenario across the site. A liquid level representing a 1-foot leachate level was modeled as a piezometric surface, at the top of the LCS drainage layer.

The final cover critical interface was modeled as a thin layer, sandwiched within the final cover soil. The final cover critical interface shear strength value was selected based on minimum acceptable geosynthetic interface peak shear strength evaluations provided in **Appendix J.2-A**. The final cover critical interface was modeled using a friction angle of 21.9 degrees and no cohesion. It is noted that this is conservative because the friction angle used in the model is shown to barely be within the zone of acceptable peak shear strength values (see **Appendix J.2-A**). The shear strength of the final cover soils was modeled using the reported values in **Appendix J.1**.

The shear strength values of the critical interface in the leachate and liner system was conservatively assumed to rely only on interface friction angle. The model was iteratively run to identify the minimum interface friction angle that provided adequate factors of safety for the peak shear strength values of the critical interface for the textured geomembrane (used in vertical and horizontal expansion and on side slopes underlying vertical expansion).

The north side of Cross Section A-A' (i.e. horizontal expansion) and the east side of Cross Section (B-B') were analyzed for the following conditions:

- ❑ *Stability of Liner System* - evaluated stability of the liner system under short-term shear strength / static and seismic conditions.
- ❑ *Stability of Waste and Foundation* - evaluated stability of the waste mass and foundation under short-term strength / static and seismic conditions.

Generally speaking, short term analyses evaluate the stability shortly after complete buildout. These analyses conservatively assume that the waste is placed before the foundation soils are allowed to consolidate under the weight of the overlying landfill and before excess pore-water pressures induced by the loading are allowed to dissipate. Long-term analyses typically represent the final conditions after the foundation soils consolidate and excess pore-water pressure dissipates. Therefore, long-term conditions were not modeled for the intermediate scenario as operational conditions are not anticipated to occur for extended periods of time.

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

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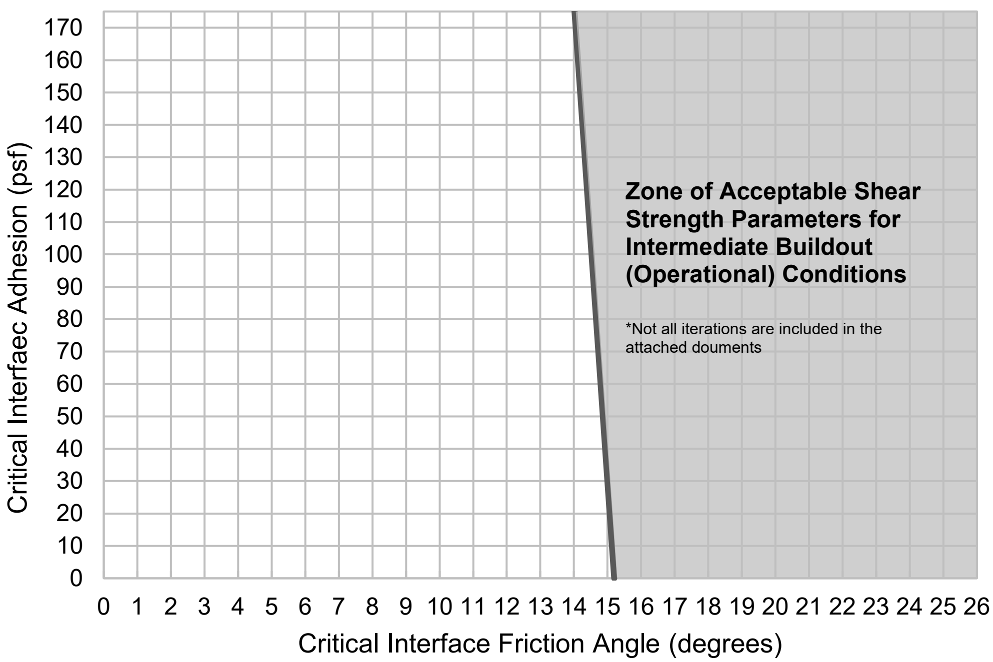
TITLE: SHEAR STRENGTH EVALUATION OF LINER / LEACHATE COLLECTION SYSTEM AFTER WASTE PLACEMENT (GLOBAL STABILITY ANALYSIS)

Intermediate conditions of the vertical expansion were not analyzed. The existing landfill was designed and permitted with a larger waste thickness and elevation than what is proposed for the vertical expansion. Therefore, it is not anticipated that the vertical expansion will cause failure during intermediate/operational conditions.

Intermediate Conditions (Operational) Results

A critical landfill stability model (with 3H:1V operational slopes) was completed to determine the range of interface shear strength friction angles of the LCS/liner system in the horizontal expansion and adhesion parameters that meet the minimum safety factors of 1.5 for static conditions and 1.3 for seismic conditions, as shown below.



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Project: Zion Landfill – Site 2 North Expansion

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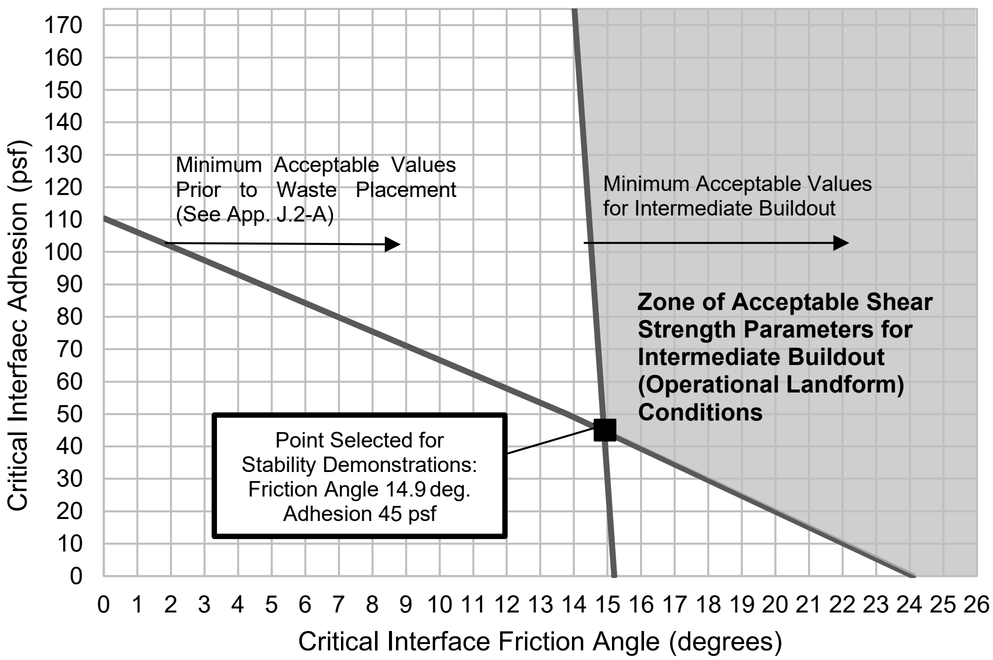
Based on these modeling results and the analyses conducted in **Appendix J.2-B**, a friction angle of 14.9 degrees with an adhesion of 45 psf for the base liner and leachate collection system critical interface was chosen based on the figure below.



Using this critical interface friction angle for the bottom liner system for the horizontal expansion, the required factors of safety for the complete buildout were achieved, as shown in **Table J.2C-1**.

Table J.2C-1 Zion Landfill – Site 2 North Expansion Intermediate Waste Height / Partial Buildout Liner/LCS Interface: Friction Angle 14.9 degrees, 45 psf adhesion		
Analysis	**Factors of Safety**	
	Short-Term Shear Strength	
	Static	**Seismic**
Stability Cross Section A-A' – Horizontal Expansion (northern slope): Intermediate Waste Height / Partial Buildout		
NonCircular / Liner Block Search	1.523	1.300
Circular / Grid Search	1.709	1.332
Stability Cross Section B-B' – Horizontal Expansion (eastern slope): Intermediate Waste Height / Partial Buildout		
NonCircular / Liner Block Search	1.549	1.320
Circular / Grid Search	1.850	1.532

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Global Stability Analysis of Complete Build-Out (Final Landform) Condition

Global stability of the complete landfill buildout (final landform) condition was analyzed to ensure that the expanded landfill will be stable after closure. The material properties for these conditions were the same as in the intermediate buildout scenario.

The north side of Cross Section A-A' and the west and east sides of Cross Section B-B' were analyzed to ensure that the landfill would be stable under both of the following conditions:

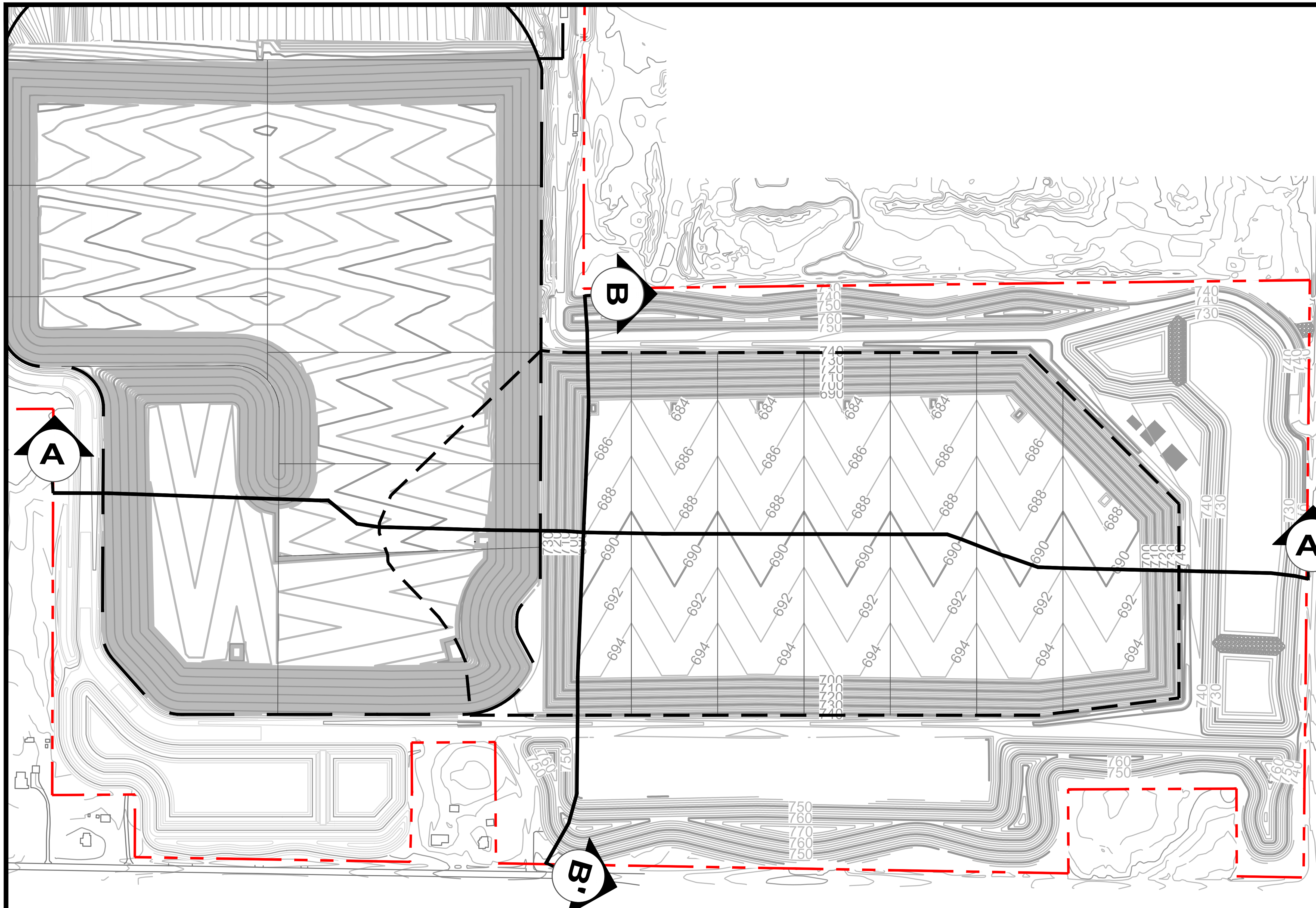
- ❑ *Stability of Liner System* - evaluated stability of the liner system under short-term and long-term shear strength / static and seismic conditions.
- ❑ *Stability of Waste and Foundation* - evaluated stability of the waste mass and foundation under short-term and long-term shear strength / static and seismic conditions.

Complete Build-Out (Final Landform) Results

A landfill stability model was completed to ensure that the final buildout would achieve the required factors of safety of 1.5 and 1.3 for static and seismic conditions, respectively, based on liner and leachate collection system interfaces of 14.9 degrees and 45 psf adhesion. See **Table J.2C-2** below for the achieved factors of safety.

Table J.2C-2
Zion Landfill – Site 2 North Expansion
Complete Buildout / Final Conditions
Liner/LCS Interface: Friction Angle 14.9 degrees, 45 psf adhesion

Analysis	Factors of Safety			
	Short-Term Shear Strength		Long-Term Shear Strength	
	Static	Seismic	Static	Seismic
Stability Cross Section A-A' – Horizontal Expansion (northern slope) : Complete Buildout				
NonCircular / Liner Block Search	2.127	1.738	1.984	1.628
Circular / Grid Search	2.658	1.914	2.337	1.949
Stability Cross Section B-B' – Horizontal Expansion (western slope) : Complete Buildout				
NonCircular / Liner Block Search	2.188	1.790	2.040	1.676
Circular / Grid Search	2.711	2.117	2.339	1.951
Stability Cross Section B-B' – Horizontal Expansion (eastern slope) : Complete Buildout				
NonCircular / Liner Block Search	2.128	1.742	1.982	1.629
Circular / Grid Search	2.623	2.042	2.340	1.953



LEGEND

- APPROXIMATE FACILITY BOUNDARY
- APPROXIMATE EXISTING WASTE BOUNDARY
- APPROXIMATE PROPOSED EXPANSION WASTE BOUNDARY

NOTES

1. EXISTING CONTOURS DEVELOPED FROM SITE AERIAL TOPOGPRAHIC SURVEY BY CQA, INC. ON 10/22/2018.
2. FOR CLARITY, NOT ALL SITE FEATURES MAY BE SHOWN.
3. CURRENT TOPOGRAPHY MAY DIFFER FROM THAT SHOWN.

REV. NO.	DATE	DESCRIPTION

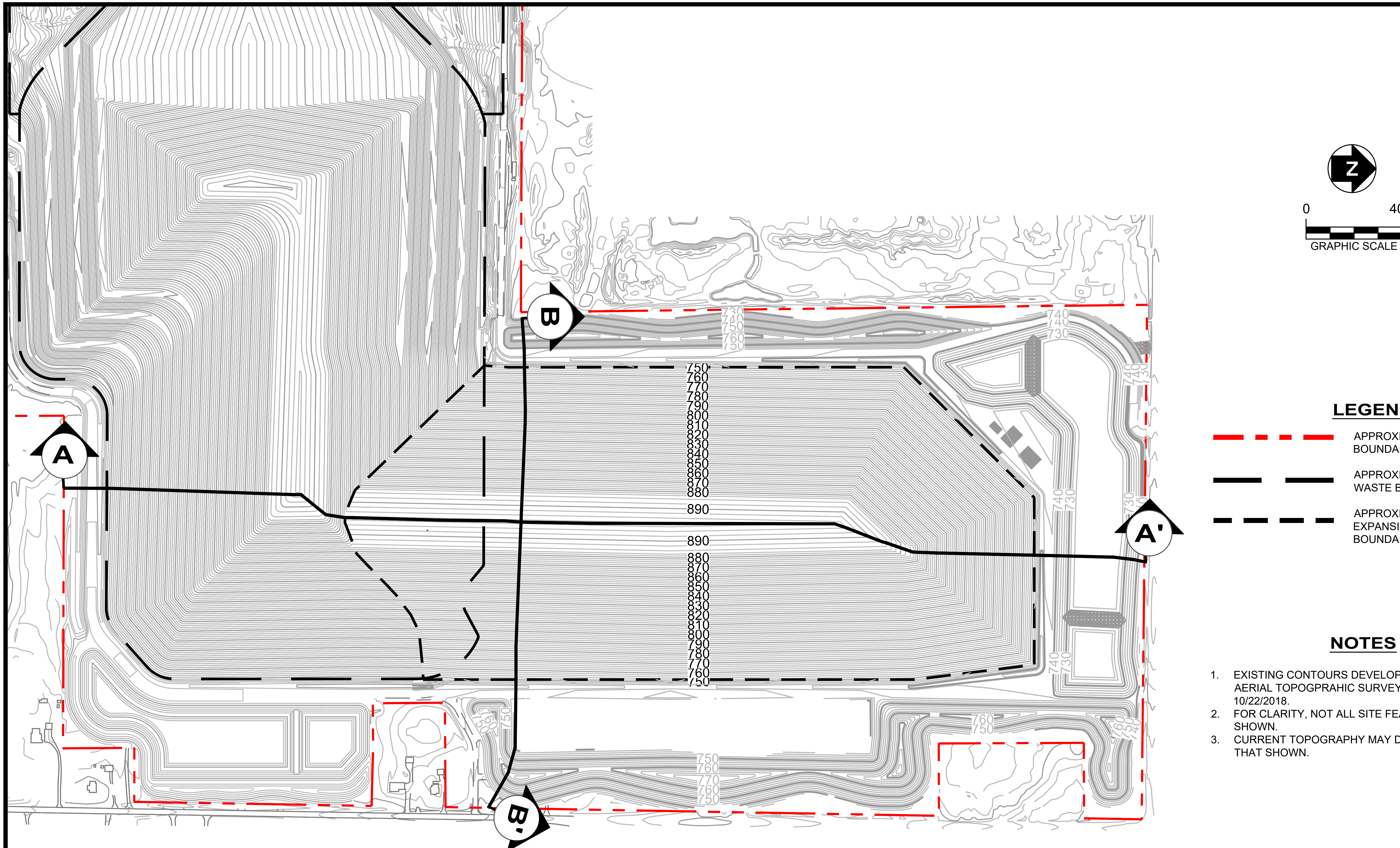
APTIM

APTIM Environmental & Infrastructure, LLC

GFL EVERGLADES HOLDINGS, LLC
ZION, ILLINOIS

FIGURE 1
SLOPE STABILITY CROSS SECTION LOCATION
EXCAVATION GRADES

DRAWN BY: ORC | APPROVED BY: RDS | PROJ. NO.: 003211 | DATE: FEBRUARY 2020



LEGEND

- APPROXIMATE FACILITY BOUNDARY
- APPROXIMATE EXISTING WASTE BOUNDARY
- APPROXIMATE PROPOSED EXPANSION WASTE BOUNDARY

NOTES

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2. FOR CLARITY, NOT ALL SITE FEATURES MAY BE SHOWN.
3. CURRENT TOPOGRAPHY MAY DIFFER FROM THAT SHOWN.

REV. NO.	DATE	DESCRIPTION

APTIM Environmental & Infrastructure, LLC

APTIM

GFL EVERGLADES HOLDINGS, LLC
ZION, ILLINOIS

FIGURE 2
SLOPE STABILITY CROSS SECTION LOCATION
FINAL COVER GRADES

DRAWN BY:	APPROVED BY:	PROJ. NO.:	DATE:
ORC	RDS	003211	MAY 2020

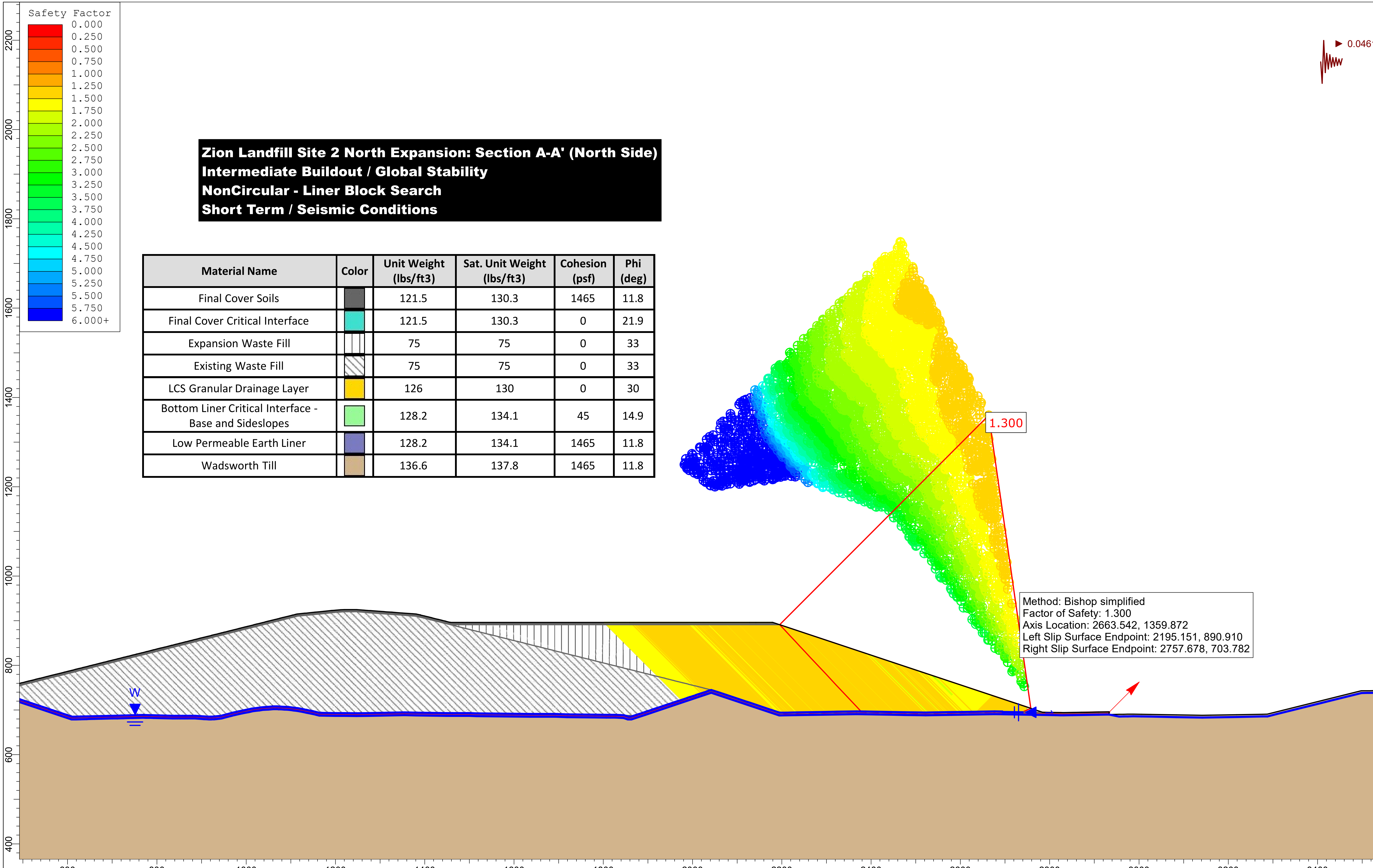
SLIDE OUTPUT:
PLOTS & MODEL RUNS

SLOPE STABILITY

SECTION **A-A**' – HORIZONTAL EXPANSION **(NORTH SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

INTERIM WASTE HEIGHT / PARTIAL BUILDOUT LANDFORM
BLOCK ANALYSIS OF LINER SYSTEM
(TRANSLATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

A-A_inter_north_ST.slmd

APTIM

Slide Analysis Information

A-A_inter_north_ST

Project Summary

File Name:	A-A_inter_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:11m:56.708s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1

Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.299580
Axis Location:	2663.542, 1359.872
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2757.678, 703.782
Resisting Moment:	7.57371e+08 lb-ft
Driving Moment:	5.8278e+08 lb-ft
Total Slice Area:	39674.6 ft2
Surface Horizontal Width:	562.526 ft
Surface Average Height:	70.5294 ft

Method: janbu corrected

FS	1.323270
Axis Location:	2663.542, 1359.872
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2757.678, 703.782
Resisting Horizontal Force:	1.02225e+06 lb
Driving Horizontal Force:	772519 lb
Total Slice Area:	39674.6 ft2
Surface Horizontal Width:	562.526 ft
Surface Average Height:	70.5294 ft

Method: spencer

FS	1.362860
Axis Location:	2663.542, 1359.872
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2757.678, 703.782
Resisting Moment:	7.34814e+08 lb-ft
Driving Moment:	5.39171e+08 lb-ft
Resisting Horizontal Force:	947266 lb
Driving Horizontal Force:	695058 lb
Total Slice Area:	39674.6 ft2
Surface Horizontal Width:	562.526 ft
Surface Average Height:	70.5294 ft

Method: gle/morgenstern-price

FS	1.356640
Axis Location:	2663.542, 1359.872
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2757.678, 703.782
Resisting Moment:	7.29318e+08 lb-ft
Driving Moment:	5.37591e+08 lb-ft
Resisting Horizontal Force:	941002 lb
Driving Horizontal Force:	693626 lb
Total Slice Area:	39674.6 ft2
Surface Horizontal Width:	562.526 ft
Surface Average Height:	70.5294 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
2195.15	890.91
2206.6	878.702
2218.06	866.493
2229.51	854.285
2240.96	842.077
2252.41	829.869
2263.86	817.661
2275.32	805.453
2286.77	793.244
2298.22	781.036
2309.67	768.828
2321.12	756.62
2332.58	744.412
2344.03	732.204
2355.48	719.995
2366.93	707.787
2378.38	695.579
2396.46	695.232
2414.54	694.884
2432.62	694.537
2452.62	694.178
2472.61	693.818
2487.31	693.561
2500.41	693.334
2521.91	692.963
2537.26	693.229
2552.62	693.495
2567.98	693.76
2583.34	694.026
2602.44	694.358
2621.55	694.689
2635.72	694.935
2649.89	695.181
2664.06	695.428
2678.23	695.674
2699.34	695.308
2715.89	695.025
2738.11	694.742
2747.9	699.262
2757.68	703.782

Method: janbu corrected

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2366.93	707.787
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2396.46	695.232
2414.54	694.884
2432.62	694.537
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2583.34	694.026
2602.44	694.358
2621.55	694.689
2635.72	694.935
2649.89	695.181
2664.06	695.428
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Method: gle/morgenstern-price

X	Y
2195.15	890.91
2206.6	878.702
2218.06	866.493
2229.51	854.285
2240.96	842.077
2252.41	829.869
2263.86	817.661
2275.32	805.453
2286.77	793.244
2298.22	781.036
2309.67	768.828
2321.12	756.62
2332.58	744.412
2344.03	732.204
2355.48	719.995
2366.93	707.787
2378.38	695.579
2396.46	695.232
2414.54	694.884
2432.62	694.537
2452.62	694.178
2472.61	693.818
2487.31	693.561
2500.41	693.334
2521.91	692.963
2537.26	693.229
2552.62	693.495
2567.98	693.76
2583.34	694.026
2602.44	694.358
2621.55	694.689
2635.72	694.935
2649.89	695.181
2664.06	695.428
2678.23	695.674
2699.34	695.308
2715.89	695.025
2738.11	694.742
2747.9	699.262
2757.68	703.782

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4874
Number of Invalid Surfaces:	130

Error Codes
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 126 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4872
Number of Invalid Surfaces:	132
Error Codes	
Error Code -108 reported for 6 surfaces	
Error Code -110 reported for 126 surfaces	

Method: spencer

Number of Valid Surfaces:	4318
Number of Invalid Surfaces:	686
Error Codes	
Error Code -108 reported for 44 surfaces	
Error Code -110 reported for 126 surfaces	
Error Code -111 reported for 516 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	4164
Number of Invalid Surfaces:	840
Error Codes	
Error Code -108 reported for 50 surfaces	
Error Code -110 reported for 126 surfaces	
Error Code -111 reported for 664 surfaces	

Error Code Descriptions

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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	2179.66, 896.002 2177.34, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703

	1446.76, 898.853	
	1439.22, 900.721	
	1438.69, 900.853	
	1431.08, 902.74	
	1430.62, 902.853	
	1429.15, 903.217	
	1429.15, 903.218	
	1422.55, 904.853	
	1415.47, 906.607	
	1415.47, 906.607	
	1414.48, 906.853	
	1406.62, 908.801	
	1406.4, 908.853	
	1398.46, 910.822	
	1398.33, 910.853	
	1390.3, 912.844	
	1390.26, 912.853	
	1390.12, 912.889	
	1390.12, 912.889	
	1386.77, 913.717	
	1380.94, 914.966	
	1373.16, 915.464	
	1354.04, 916.986	
	1349.5, 917.317	
	1340.81, 917.854	
	1326.59, 918.986	
	1314.16, 919.891	
	1308.46, 920.243	
	1299.13, 920.986	
	1278.82, 922.465	
	1276.11, 922.633	
	1271.72, 922.983	
	1264.11, 923.65	
	1247.79, 925	
	1244.03, 925	
	1239.2, 925	
	1223.74, 925	
	1219.79, 925	
	1211.96, 924.561	
	1200.98, 923.615	
	1197.39, 923.302	
	1194.12, 922.975	
	1192.25, 922.788	
	1174.12, 920.975	
	1161.84, 919.746	
	1154.12, 918.975	
	1141.84, 917.746	
	1134.12, 916.975	
	1131.52, 916.714	
	1113.76, 914.939	
	1110.03, 914.006	
	1110.01, 914.002	
	1105.41, 912.851	
	1104.42, 912.604	
	1097.41, 910.851	
	1096.34, 910.584	
	1089.41, 908.851	
	1088.27, 908.565	
	1081.41, 906.851	

	1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206	

	913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629	

External Boundary	705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025

	473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 743.418 4805.97, 742.154 4801.53, 742.091 4801.11, 742.088 4800.95, 742.141 4796.95, 743.439 4796.06, 743.712 4795.85, 743.772 4795.68, 743.818 4795.57, 743.848 4795, 744 4794.45, 744.18 4788.96, 746 4788.47, 746.165 4782.93, 748 4782.49, 748.15 4776.9, 750 4776.47, 750.156 4770.43, 752 4763.91, 752 4762.52, 752 4729.64, 740.967 4726.72, 740 4725.92, 739.84 4716.69, 738

	4715.85, 737.832 4706.65, 736 4705.77, 735.824 4696.61, 734 4695.7, 733.817 4686.57, 732 4685.73, 732 4682.95, 732 4679.32, 732 4677.82, 732 4659.51, 732 4622.82, 732 4486.94, 732 4486.94, 732 4481.52, 733.084 4476.94, 734 4476.94, 734 4471.48, 735.093 4466.94, 736 4466.94, 736 4461.43, 737.102 4456.94, 738 4456.94, 738 4451.39, 739.111 4446.94, 740 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4369.04, 742.975 4347.22, 735.704 4336.1, 732 4314.27, 732 4302.4, 732 4288.26, 732 4287.06, 732 4278.23, 732 4258.25, 732 4253.3, 732 4251.63, 732 4240.16, 732 4227.99, 732 4222.66, 732 4220.71, 732 4218.09, 732 4217.08, 732 4213.12, 732 4212.98, 732 4212.9, 732 4212.47, 732.03 4210.82, 732.161 4193.89, 733.498	

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Material Boundary	1458.25, 890.855 1495.01, 890.845 1549.83, 890.87 1858.87, 891 2127.47, 890.865 2142.12, 890.909 2195.15, 890.91
	2932.94, 694.87 2908.97, 694.455 2851.01, 693.449 2831.93, 693.119 2824.98, 693.239 2812.84, 693.449 2754.87, 694.452 2698.12, 695.433 2676.93, 695.8 2620.04, 694.813 2600.94, 694.482 2580.01, 694.119 2521.93, 693.112 2503.22, 693.435 2475.13, 693.921 2447.68, 694.392 2388.56, 695.405 2366.91, 695.776 2195.59, 692.778 2195.24, 692.771 2195.11, 692.769 2195.04, 692.792

	2173.38, 700 2127.47, 715.257 2072.88, 733.432 2060, 737.734 2041.91, 743.743 2036.53, 742 2031.73, 740.4 2030.55, 740 2025.75, 738.402 2025.72, 738.402 2024.55, 738 2019.76, 736.403 2019.73, 736.403 2018.55, 736 2013.76, 734.405 2013.73, 734.405 2012.55, 734 2007.77, 732.406 2007.74, 732.406 2006.55, 732 2001.77, 730.408 2001.74, 730.408 2000.55, 730 1995.77, 728.41 1995.75, 728.41 1994.54, 728 1994.52, 728 1993.32, 727.59 1988.54, 726 1988.52, 726 1987.31, 725.589 1982.54, 724 1977.79, 722.414 1977.76, 722.414 1976.54, 722 1971.79, 720.416 1971.76, 720.416 1970.54, 720 1965.79, 718.417 1965.76, 718.417 1964.54, 718 1959.8, 716.419 1959.76, 716.419 1958.54, 716 1953.8, 714.42 1953.76, 714.42 1952.54, 714 1947.81, 712.422 1947.76, 712.422 1946.54, 712 1941.81, 710.423 1941.76, 710.423 1940.54, 710 1935.82, 708.425 1935.76, 708.425 1934.54, 708 1929.82, 706.426 1929.77, 706.426 1928.54, 706	

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Material Boundary	435.797, 740.289	
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	468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186	

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	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745

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Material Boundary	1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364

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	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465

	495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544	

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	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733

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	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114 482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94

	566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719 713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837	

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Material Boundary	

	982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94 1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922	

	1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791 1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2188.78, 893
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919 466.102, 750.086 473.419, 751.912

	474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949 698.111, 808.086 702.685, 809.229	

	706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773 906.101, 860.086 912.746, 861.747	

Material Boundary	914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423 1074.1, 902.086 1076.99, 902.808

	1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974 1438.01, 898.087 1438.54, 897.955	

	1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2188.32, 893.15

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789	Assigned to: Wadsworth Till

	412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092		

	948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683		

Water Table	1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2928.03, 689.785 2933.03, 689.872 2955.52, 685.26 2966.15, 685.445 2974.76, 685.594 2986.93, 685.805 3005.67, 685.481 3026.51, 685.12 3083.88, 684.128 3141.93, 683.124 3161.05, 683.455 3219.11, 684.462 3276.35, 685.455 3287.99, 685.657 3307.91, 690.624 3403.42, 714.438 3425.9, 720.041 3498.4, 738.118 3511.05, 738.153 3513.27, 738.159 3516.47, 738.166 3555.99, 738.915 3560.24, 738.996 3560.38, 738.996 3562.81, 738.996 3565.35, 738.996 3572.15, 738.997 3572.42, 738.997 3572.75, 738.997 3574.89, 738.997 3575.23, 738.997 3575.59, 738.997		

	3576, 738.997 3576.53, 738.997 3577.15, 738.997 3579.94, 738.997 3582.64, 738.997 3589.33, 738.997 3589.49, 738.996 3608.27, 738.896 3660.68, 738.616 3711.23, 738.347 3731.88, 738.243 3847.86, 737.635 3874.25, 737.524 3878.92, 737.484 3880.4, 737.484 3891.32, 737.481 3896.18, 737.436 3923.28, 737.159 3936.98, 737.008 3939.65, 737.003 3940.24, 737.002 3940.54, 737.001 3941.23, 737 3943.19, 736.963 3984.29, 736.189 4046.31, 735.003 4069.83, 733.736 4083.35, 733.007 4091.4, 732.6 4099.87, 732.313 4107.4, 732.001 4111.22, 731.848 4120.86, 731.486 4126.77, 731.314 4134.44, 731.066 4136.21, 731.004 4147.03, 730.471 4149.86, 730.331 4152.27, 730.207 4159.68, 729.828 4161.98, 729.722 4168.35, 729.381 4170.28, 729.323 4176.46, 729.027 4183.66, 729 4184.9, 728.957 4186.51, 728.967 4190.68, 728.712 4192, 728.641 4193.48, 728.515 4210.43, 727.177 4212.1, 727.044 4212.72, 727 4212.98, 727 4213.12, 727 4217.08, 727 4218.09, 727 4220.71, 727 4222.66, 727		

	4227.99, 727 4240.16, 727 4251.63, 727 4253.3, 727 4258.25, 727 4278.23, 727 4287.06, 727 4288.26, 727 4302.4, 727 4314.27, 727 4336.91, 727 4362.15, 735.41 4369.76, 737.944 4370.23, 737.927 4374.32, 736.567 4379.34, 734.898 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4434.16, 742.558 4734.38, 742.558 4750.1, 742.558 4763.34, 747 4763.91, 747 4769.69, 747 4774.89, 745.413 4775.26, 745.277 4780.91, 743.405 4781.36, 743.255 4786.89, 741.421 4787.39, 741.255 4792.88, 739.436 4793.56, 739.207 4794.3, 739.011 4794.4, 738.986 4794.51, 738.956 4794.64, 738.918 4795.45, 738.671 4799.4, 737.389 4800.33, 737.082 4801.58, 737.091 4806.03, 737.155 5009.05, 738.418		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608		

Piezoline	966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225		

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1881.86, 691.439
1886.54, 693
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1893.8, 695.436
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1899.79, 697.434
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1911.78, 701.431
1911.83, 701.431
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1917.78, 703.43
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1922.54, 705
1923.77, 705.428
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1928.54, 707
1929.77, 707.426
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1935.76, 709.425
1935.82, 709.425
1940.54, 711
1941.76, 711.423
1941.81, 711.423
1946.54, 713
1947.76, 713.422
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1952.54, 715
1953.76, 715.42
1953.8, 715.42
1958.54, 717
1959.76, 717.419
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1964.54, 719
1965.76, 719.417
1965.79, 719.417
1970.54, 721
1971.76, 721.416
1971.79, 721.416
1976.54, 723
1977.76, 723.414
1977.79, 723.414
1982.54, 725

	1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2575.19, 695.035 2605.61, 695.563 2676.93, 696.8 2694.06, 696.504 2694.06, 695.504 2739.16, 694.723 2739.16, 694.573		
	425.446, 740.017 435.797, 740.214		

	440.59, 740.214 447.446, 737.929 450.009, 737.075 453.446, 735.929 454.615, 735.539 456.889, 734.782 459.451, 733.929 462, 733.08 465.468, 731.925 465.47, 731.925 470.544, 730.236 477.472, 727.929 480.007, 727.085 483.482, 725.929 486.011, 725.087 489.489, 723.929 493.677, 722.536 495.5, 721.929 499.136, 720.718 507.512, 717.929 509.321, 717.327 513.52, 715.929 515.323, 715.328 519.528, 713.929 521.326, 713.33 525.536, 711.929 529.138, 710.736 537.726, 707.929 539.803, 707.23 543.567, 705.929 545.671, 705.229 549.575, 703.929 551.683, 703.227 555.583, 701.929 560.51, 700.288 567.591, 697.929 570.047, 697.111 573.599, 695.929 577.668, 694.574 579.607, 693.929 583.685, 692.571 583.686, 692.571 585.615, 691.929 594.527, 688.962 597.631, 687.929 599.548, 687.291 603.639, 685.929 608.105, 684.442 609.658, 683.925 618.234, 683.925 628.129, 684.166 628.177, 684.167 700.515, 685.925 768.454, 687.578 835.533, 685.925 874.622, 685.925 885.02, 685.925 885.834, 685.925 914.498, 683.981		

	914.511, 683.981		
	916.781, 683.925		
	918.713, 683.877		
	920.672, 683.925		
	922.863, 683.983		
	931.358, 684.358		
	933.954, 684.848		
	944.281, 685.926		
	947.085, 686.777		
	951.905, 687.927		
	965.156, 691.535		
	966.664, 691.928		
	967.079, 692.043		
	971.634, 693.213		
	974.471, 693.85		
	974.857, 693.927		
	982.558, 695.618		
	984.156, 695.927		
	990.842, 697.36		
	993.868, 697.926		
	1011.98, 701.598		
	1013.64, 701.927		
	1014.5, 702.11		
	1029.04, 703.926		
	1036.49, 705.07		
	1049.44, 705.925		
	1054.51, 706.35		
	1060.93, 706.72		
	1067.29, 706.783		
	1069.81, 706.787		
	1084.54, 705.925		
	1094.29, 705.441		
	1105.89, 703.925		
	1109.3, 703.581		
	1114.61, 702.889		
	1116.79, 702.605		
	1119.84, 702.052		
	1120.43, 701.926		
	1128.58, 700.387		
	1130.67, 699.927		
	1136.58, 698.73		
	1140.33, 697.927		
	1147.14, 696.555		
	1150.08, 695.926		
	1152.33, 695.513		
	1158.73, 693.927		
	1164.45, 692.441		
	1180.86, 692.083		
	1199.19, 691.925		
	1219.92, 691.746		
	1247.58, 691.455		
	1274.37, 691.925		
	1354.83, 693.335		
	1380.25, 692.817		
	1449.64, 691.925		
	1461.71, 691.925		
	1495.01, 691.925		
	1500.47, 691.925		
	1516.31, 691.202		

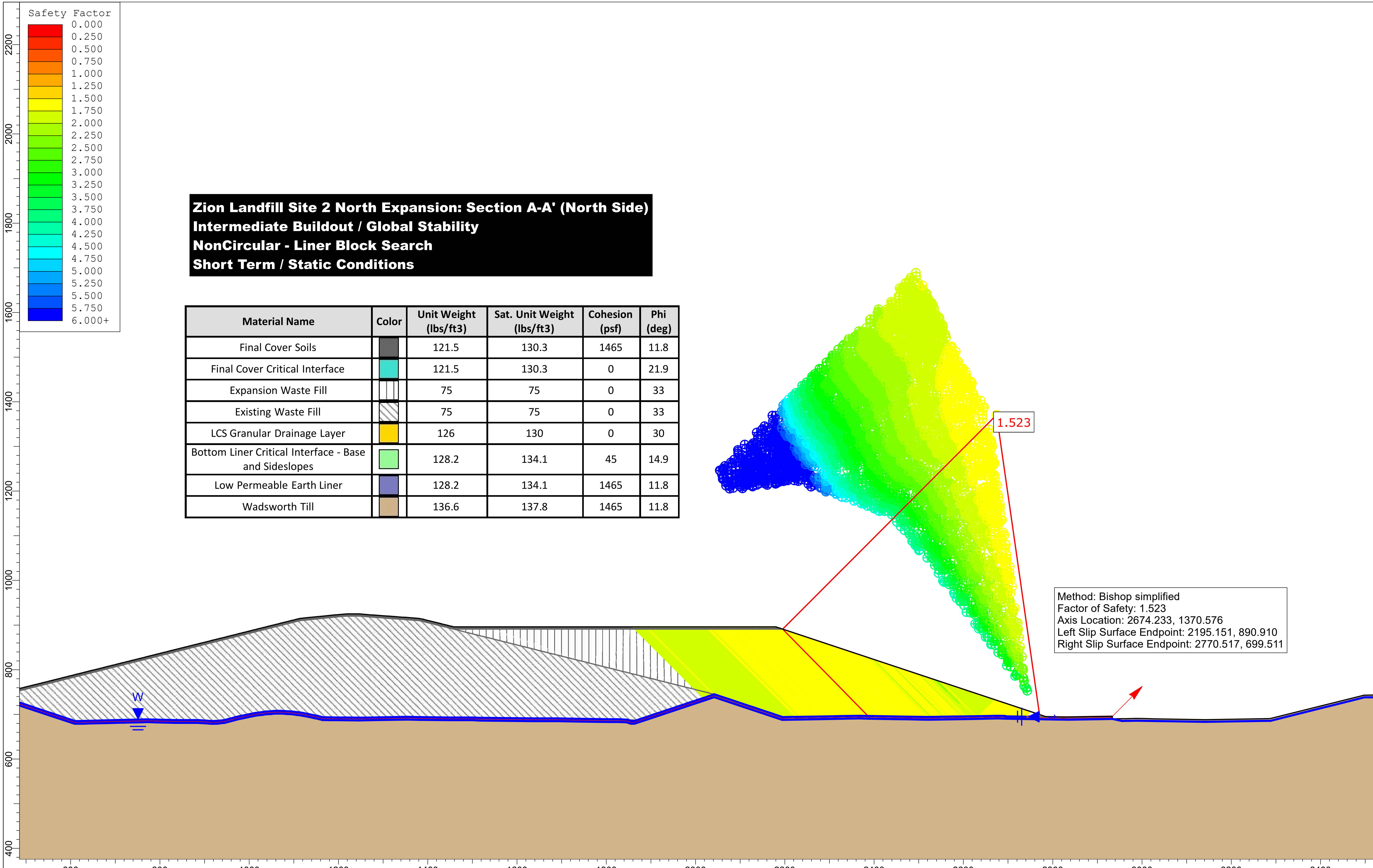
Block Search Polyline	1637.28, 689.925 1692.85, 689.925 1719.06, 689.062 1781.17, 688.321 1807.13, 687.925 1816.05, 687.925 1826.74, 687.925 1846.45, 687.095 1850.06, 685.929 1855, 684.207 1855.85, 683.925 1856.55, 683.925 1858.87, 683.925 1862.02, 683.925 1866.63, 685.435 1867.46, 685.702 1868.14, 685.929 1868.43, 686.031 1874.48, 687.925 1874.48, 687.925 1875.81, 688.369 1880.5, 689.925 1880.55, 689.925 1881.88, 690.368 1886.56, 691.929 1891.25, 693.492 1892.56, 693.929 1893.81, 694.361 1893.86, 694.361 1898.56, 695.929 1899.8, 696.359 1899.85, 696.359 1904.56, 697.929 1905.8, 698.358 1905.85, 698.358 1910.56, 699.929 1911.79, 700.356 1911.84, 700.356 1916.56, 701.929 1917.79, 702.355 1917.84, 702.354 1922.56, 703.929 1923.78, 704.353 1923.84, 704.353 1928.56, 705.929 1929.78, 706.351 1929.83, 706.351 1934.56, 707.929 1935.78, 708.35 1935.83, 708.35 1940.57, 709.929 1941.77, 710.348 1941.82, 710.348 1946.56, 711.929 1947.77, 712.347 1947.82, 712.347 1952.57, 713.929 1953.77, 714.345 1953.82, 714.345		

	1958.57, 715.929 1959.77, 716.344 1959.81, 716.344 1964.57, 717.929 1965.77, 718.342 1965.81, 718.342 1970.57, 719.929 1971.77, 720.341 1971.8, 720.341 1976.57, 721.929 1977.77, 722.339 1977.8, 722.339 1982.57, 723.929 1987.33, 725.518 1988.53, 725.925 1988.56, 725.925 1993.34, 727.519 1994.53, 727.925 1994.56, 727.925 1995.76, 728.335 1995.79, 728.335 2000.57, 729.929 2001.76, 730.333 2001.78, 730.333 2006.57, 731.929 2007.75, 732.331 2007.78, 732.331 2012.57, 733.929 2013.75, 734.33 2013.77, 734.33 2018.57, 735.929 2019.74, 736.328 2019.77, 736.328 2024.57, 737.929 2025.74, 738.327 2025.76, 738.327 2030.57, 739.929 2031.75, 740.329 2036.55, 741.929 2041.91, 743.664 2059.98, 737.663 2072.86, 733.361 2127.45, 715.185 2173.36, 699.929 2195.02, 692.72 2195.1, 692.694 2195.24, 692.696 2195.59, 692.703 2366.91, 695.701 2388.56, 695.33 2447.68, 694.317 2475.13, 693.846 2503.22, 693.36 2521.93, 693.037 2580.01, 694.044 2600.94, 694.407 2620.04, 694.738 2676.93, 695.725 2698.12, 695.358		

	2754.86, 694.377 2812.84, 693.374 2824.98, 693.164 2831.93, 693.044 2851.01, 693.374 2908.97, 694.38 2932.95, 694.795	

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Intermediate Buildout / Global Stability
NonCircular - Liner Block Search
Short Term / Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8



A-A_inter_north_ST.slmd

APTIM

Slide Analysis Information

A-A_inter_north_ST

Project Summary

File Name:	A-A_inter_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:03m:05.813s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465

Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.522900
Axis Location:	2674.233, 1370.576
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2770.517, 699.511
Resisting Moment:	7.86325e+08 lb-ft
Driving Moment:	5.16332e+08 lb-ft
Total Slice Area:	38938.6 ft2
Surface Horizontal Width:	575.365 ft
Surface Average Height:	67.6762 ft

Method: janbu corrected

FS	1.555300
Axis Location:	2674.233, 1370.576
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2770.517, 699.511
Resisting Horizontal Force:	1.0411e+06 lb
Driving Horizontal Force:	669383 lb
Total Slice Area:	38938.6 ft2
Surface Horizontal Width:	575.365 ft
Surface Average Height:	67.6762 ft

Method: spencer

FS	1.586940
Axis Location:	2674.233, 1370.576
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2770.517, 699.511
Resisting Moment:	7.62896e+08 lb-ft
Driving Moment:	4.80735e+08 lb-ft
Resisting Horizontal Force:	961819 lb
Driving Horizontal Force:	606085 lb
Total Slice Area:	38938.6 ft2
Surface Horizontal Width:	575.365 ft
Surface Average Height:	67.6762 ft

Method: gle/morgenstern-price

FS	1.591750
Axis Location:	2674.233, 1370.576
Left Slip Surface Endpoint:	2195.151, 890.910
Right Slip Surface Endpoint:	2770.517, 699.511
Resisting Moment:	7.60825e+08 lb-ft
Driving Moment:	4.7798e+08 lb-ft
Resisting Horizontal Force:	959700 lb
Driving Horizontal Force:	602922 lb
Total Slice Area:	38938.6 ft2
Surface Horizontal Width:	575.365 ft
Surface Average Height:	67.6762 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
2195.15	890.91
2291.11	793.17
2387.07	695.43
2446.3	694.266
2473.92	693.791
2502.36	693.301
2521.95	692.962
2586.23	694.081
2601.71	694.346
2621.26	694.685
2677.31	695.656
2699.65	695.274
2735.4	694.71
2770.52	699.511

Method: janbu corrected

X	Y
2195.15	890.91
2291.11	793.17
2387.07	695.43
2446.3	694.266
2473.92	693.791
2502.36	693.301
2521.95	692.962
2586.23	694.081
2601.71	694.346
2621.26	694.685
2677.31	695.656
2699.65	695.274
2735.4	694.71
2770.52	699.511

Method: spencer

X	Y
2195.15	890.91
2291.11	793.17
2387.07	695.43
2446.3	694.266
2473.92	693.791
2502.36	693.301
2521.95	692.962
2586.23	694.081
2601.71	694.346
2621.26	694.685
2677.31	695.656
2699.65	695.274
2735.4	694.71
2770.52	699.511

Method: gle/morgenstern-price

X	Y
2195.15	890.91
2291.11	793.17
2387.07	695.43
2446.3	694.266
2473.92	693.791
2502.36	693.301
2521.95	692.962
2586.23	694.081
2601.71	694.346
2621.26	694.685
2677.31	695.656
2699.65	695.274
2735.4	694.71
2770.52	699.511

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4446
Number of Invalid Surfaces:	558

Error Codes
Error Code -106 reported for 2 surfaces
Error Code -108 reported for 5 surfaces
Error Code -110 reported for 527 surfaces
Error Code -111 reported for 24 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4448
Number of Invalid Surfaces:	556

Error Codes
Error Code -106 reported for 2 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 527 surfaces
Error Code -111 reported for 23 surfaces

Method: spencer

Number of Valid Surfaces:	4006
Number of Invalid Surfaces:	998

Error Codes
Error Code -106 reported for 2 surfaces
Error Code -108 reported for 42 surfaces
Error Code -110 reported for 527 surfaces
Error Code -111 reported for 427 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	3884
Number of Invalid Surfaces:	1120

Error Codes
Error Code -106 reported for 2 surfaces
Error Code -108 reported for 29 surfaces
Error Code -110 reported for 527 surfaces
Error Code -111 reported for 562 surfaces

Error Code Descriptions

The following errors were encountered during the computation:
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.
-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	2179.66, 896.002 2177.34, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896

	1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604	

	1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851	

	935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851	

External Boundary	714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85

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Material Boundary	1458.25, 890.855 1495.01, 890.845 1549.83, 890.87 1858.87, 891 2127.47, 890.865 2142.12, 890.909 2195.15, 890.91
	2932.94, 694.87 2908.97, 694.455 2851.01, 693.449 2831.93, 693.119 2824.98, 693.239 2812.84, 693.449 2754.87, 694.452 2698.12, 695.433 2676.93, 695.8 2620.04, 694.813 2600.94, 694.482 2580.01, 694.119 2521.93, 693.112 2503.22, 693.435 2475.13, 693.921 2447.68, 694.392 2388.56, 695.405

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Material Boundary	435.797, 740.289 426.87, 740.119 426.201, 740.106 425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918

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	435.797, 740.289

	442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766 538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021 618.632, 786 622.745, 787.031 626.622, 788 633.831, 789.802 634.622, 790 635.422, 790.2 642.622, 792 646.38, 792.939 650.632, 794 654.898, 795.067 658.632, 796 662.927, 797.076 666.622, 798	

	673.797, 799.792 674.632, 800 675.475, 800.211 675.482, 800.213 682.633, 802 686.119, 802.872 690.633, 804 694.086, 804.863 698.633, 806 703.206, 807.143 706.633, 808 713.748, 809.779 713.756, 809.781 714.633, 810 715.521, 810.222 715.529, 810.224 722.633, 812 727.298, 813.169 730.622, 814 735.33, 815.177 738.622, 816 743.363, 817.185 746.622, 818 753.689, 819.767 753.697, 819.769 754.622, 820 755.557, 820.234 755.564, 820.236 762.622, 822 767.408, 823.196 770.622, 824 777.968, 825.837 777.971, 825.837 778.622, 826 779.282, 826.165 786.622, 828 793.638, 829.754 793.646, 829.756 794.622, 830 795.611, 830.247 802.622, 832 808.959, 833.584 810.622, 834 812.332, 834.427 818.622, 836 820.364, 836.436 826.622, 838 833.562, 839.735 834.622, 840 835.724, 840.275 842.622, 842 849.689, 843.767 850.622, 844 851.594, 844.243 858.622, 846 859.638, 846.254 866.622, 848 867.683, 848.265 874.622, 850	

	881.516, 851.724 882.622, 852 883.778, 852.289 884.667, 852.511 890.622, 854 896.384, 855.44 898.622, 856 905.369, 857.687 906.622, 858 913.267, 859.661 914.622, 860 916.042, 860.355 922.622, 862 924.05, 862.357 930.622, 864 936.682, 865.515 938.622, 866 945.083, 867.615 945.703, 867.77 946.463, 867.96 946.622, 868 948.807, 868.546 950.282, 868.915 951.413, 869.198 952.09, 869.367 954.622, 870 959.165, 871.136 960.758, 871.534 962.622, 872 965.435, 872.703 970.622, 874 974.464, 874.96 978.622, 876 983.295, 877.168 986.622, 878 987.722, 878.275 989.579, 878.739 989.696, 878.768 990.941, 879.08 994.622, 880 999.548, 881.232 999.665, 881.261 1001.52, 881.725 1002.62, 882 1002.75, 882.031 1003.06, 882.11 1003.09, 882.116 1003.45, 882.208 1010.62, 884 1016.85, 885.557 1018.62, 886 1024.91, 887.573 1026.62, 888 1032.44, 889.455 1032.46, 889.459 1034.62, 890 1036.95, 890.581 1036.96, 890.585 1042.62, 892	

	1044.19, 892.392
	1050.62, 894
	1052.12, 894.375
	1058.62, 896
	1065.26, 897.659
	1066.62, 898
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	1105.63, 907.753
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	1111.24, 909.155
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	1194.62, 918
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	1212.31, 919.573
	1219.93, 920
	1223.74, 920
	1239.2, 920
	1244.03, 920
	1247.58, 920
	1263.68, 918.668
	1271.3, 918
	1275.76, 917.645
	1278.49, 917.476
	1298.75, 916
	1308.11, 915.255
	1313.82, 914.902
	1326.21, 914
	1340.45, 912.866
	1349.16, 912.328
	1353.66, 912
	1372.8, 910.476
Material Boundary	1380.25, 910
	1385.65, 908.845
	1388.91, 908.035
	1388.92, 908.035
	1389.06, 908
	1389.1, 907.991
	1397.13, 906
	1397.26, 905.969
	1405.2, 904
	1405.41, 903.947

	1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1458.25, 890.855 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854	

	1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800	

	1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033 1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969 1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582 1965.72, 764 1967.39, 763.583 1973.7, 762 1977.57, 761.034 1977.58, 761.033 1981.71, 760 1985.9, 758.959 1985.9, 758.958 1989.74, 758 1991.4, 757.584 1997.72, 756 1999.4, 755.58 2005.72, 754 2007.48, 753.558 2013.7, 752 2017.55, 751.04	

	2017.56, 751.039 2021.71, 750 2025.87, 748.959 2025.88, 748.958 2029.73, 748 2032.55, 747.298 2037.73, 746 2040.08, 745.405 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2680.62, 696.736 2689.29, 696.586 2703.76, 696.336 2723.86, 695.988 2748.24, 695.566 2784.25, 694.943
Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858

	479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855	

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Material Boundary	1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85

	1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264	

	1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2932.95, 694.72
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737

	454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685

Material Boundary	922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396

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	1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8
Material Boundary	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114 482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768

	546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719 713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176	

	762.137, 823.94
	766.923, 825.137
	770.137, 825.94
	777.722, 827.837
	777.725, 827.837
	778.137, 827.94
	778.797, 828.105
	786.137, 829.94
	793.153, 831.694
	793.161, 831.696
	794.137, 831.94
	795.126, 832.187
	802.137, 833.94
	808.474, 835.525
	810.137, 835.94
	811.847, 836.368
	818.137, 837.94
	819.879, 838.376
	826.137, 839.94
	833.077, 841.675
	834.137, 841.94
	835.239, 842.216
	842.137, 843.94
	849.204, 845.707
	850.137, 845.94
	851.109, 846.183
	858.137, 847.94
	859.153, 848.194
	866.137, 849.94
	867.198, 850.205
	874.137, 851.94
	881.031, 853.664
	882.137, 853.94
	883.293, 854.229
	884.182, 854.452
	890.137, 855.94
	895.898, 857.381
	898.137, 857.94
	904.884, 859.627
	906.137, 859.94
	912.782, 861.602
	914.137, 861.94
Material Boundary	915.557, 862.295
	922.137, 863.94
	923.565, 864.297
	930.137, 865.94
	936.197, 867.455
	938.137, 867.94
	944.598, 869.556
	945.218, 869.71
	945.978, 869.9
	946.137, 869.94
	948.322, 870.486
	949.797, 870.855
	950.928, 871.138
	951.605, 871.307
	954.137, 871.94
	958.68, 873.076
	960.273, 873.474

	962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94 1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803	

	1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791 1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2188.78, 893
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167

	454.117, 747.086 458.111, 748.086 461.436, 748.919 466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086	

	685.598, 804.957 690.111, 806.086 693.564, 806.949 698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086	

Material Boundary	895.862, 857.526 898.101, 858.086 904.848, 859.773 906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745

	1066.1, 900.086 1071.43, 901.419 1071.45, 901.423 1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451	

	1428.47, 900.45
	1429.93, 900.087
	1430.39, 899.974
	1438.01, 898.087
	1438.54, 897.955
	1446.08, 896.087
	1446.69, 895.936
	1454.15, 894.087
	1456.17, 893.588
	1456.17, 893.587
	1457.93, 893.15
	1495.01, 893.15
	1616.33, 893.15
	1858.87, 893.15
	2127.47, 893.15
	2141.81, 893.15
	2181.65, 893.15
	2188.32, 893.15

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896	Assigned to:
	0.809461, 723.908	Wadsworth Till
	1.15168, 723.913	
	1.45658, 723.917	
	1.93345, 723.924	
	4.30816, 723.96	
	12.6281, 724.084	
	24.2881, 724.257	
	113.381, 725.584	
	150.125, 726.131	
	251.754, 727.644	
	262.684, 727.807	
	264.857, 727.839	
	267.412, 727.877	
	267.74, 727.882	
	267.83, 727.883	
	268.093, 727.885	
	268.368, 727.882	
	269.061, 727.877	
	272.624, 727.847	
	281.529, 727.773	
	284.508, 727.748	
	284.959, 727.743	
	286.557, 727.708	
	289.734, 727.637	
	295.936, 727.498	
	301.316, 727.378	
	309.904, 727.186	
	313.768, 727.1	
	314.73, 727	
	317.794, 727	
	322.428, 727	
	327.892, 727	
	334.438, 727	
	352.838, 735.003	
	356.385, 735.013	
	366.425, 735.2	

	372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332		

	930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278		

	1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683		
Water Table	1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2928.03, 689.785 2933.03, 689.872 2955.52, 685.26 2966.15, 685.445 2974.76, 685.594 2986.93, 685.805 3005.67, 685.481 3026.51, 685.12 3083.88, 684.128 3141.93, 683.124 3161.05, 683.455 3219.11, 684.462 3276.35, 685.455 3287.99, 685.657 3307.91, 690.624 3403.42, 714.438 3425.9, 720.041 3498.4, 738.118 3511.05, 738.153 3513.27, 738.159 3516.47, 738.166 3555.99, 738.915 3560.24, 738.996 3560.38, 738.996 3562.81, 738.996 3565.35, 738.996 3572.15, 738.997		

	3572.42, 738.997 3572.75, 738.997 3574.89, 738.997 3575.23, 738.997 3575.59, 738.997 3576, 738.997 3576.53, 738.997 3577.15, 738.997 3579.94, 738.997 3582.64, 738.997 3589.33, 738.997 3589.49, 738.996 3608.27, 738.896 3660.68, 738.616 3711.23, 738.347 3731.88, 738.243 3847.86, 737.635 3874.25, 737.524 3878.92, 737.484 3880.4, 737.484 3891.32, 737.481 3896.18, 737.436 3923.28, 737.159 3936.98, 737.008 3939.65, 737.003 3940.24, 737.002 3940.54, 737.001 3941.23, 737 3943.19, 736.963 3984.29, 736.189 4046.31, 735.003 4069.83, 733.736 4083.35, 733.007 4091.4, 732.6 4099.87, 732.313 4107.4, 732.001 4111.22, 731.848 4120.86, 731.486 4126.77, 731.314 4134.44, 731.066 4136.21, 731.004 4147.03, 730.471 4149.86, 730.331 4152.27, 730.207 4159.68, 729.828 4161.98, 729.722 4168.35, 729.381 4170.28, 729.323 4176.46, 729.027 4183.66, 729 4184.9, 728.957 4186.51, 728.967 4190.68, 728.712 4192, 728.641 4193.48, 728.515 4210.43, 727.177 4212.1, 727.044 4212.72, 727 4212.98, 727		

	4213.12, 727 4217.08, 727 4218.09, 727 4220.71, 727 4222.66, 727 4227.99, 727 4240.16, 727 4251.63, 727 4253.3, 727 4258.25, 727 4278.23, 727 4287.06, 727 4288.26, 727 4302.4, 727 4314.27, 727 4336.91, 727 4362.15, 735.41 4369.76, 737.944 4370.23, 737.927 4374.32, 736.567 4379.34, 734.898 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4434.16, 742.558 4734.38, 742.558 4750.1, 742.558 4763.34, 747 4763.91, 747 4769.69, 747 4774.89, 745.413 4775.26, 745.277 4780.91, 743.405 4781.36, 743.255 4786.89, 741.421 4787.39, 741.255 4792.88, 739.436 4793.56, 739.207 4794.3, 739.011 4794.4, 738.986 4794.51, 738.956 4794.64, 738.918 4795.45, 738.671 4799.4, 737.389 4800.33, 737.082 4801.58, 737.091 4806.03, 737.155 5009.05, 738.418	
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and

	459.474, 735	Sideslopes	
	462.023, 734.151	Low Permeable	
	465.481, 733	Earth Liner	
	465.482, 733		
	470.568, 731.307		
	477.496, 729		
	480.031, 728.156		
	483.505, 727		
	486.035, 726.158		
	489.513, 725		
	493.701, 723.607		
	495.524, 723		
	499.16, 721.79		
	507.535, 719		
	509.344, 718.398		
	513.543, 717		
	515.347, 716.4		
	519.551, 715		
	521.35, 714.401		
	525.559, 713		
	529.162, 711.807		
	537.749, 709		
	539.827, 708.301		
	543.591, 707		
	545.694, 706.3		
	549.599, 705		
	551.706, 704.298		
	555.606, 703		
	560.534, 701.359		
	567.615, 699		
	570.071, 698.182		
	573.623, 697		
	577.692, 695.645		
	579.631, 695		
	583.706, 693.643		
	583.706, 693.643		
	585.639, 693		
	594.551, 690.033		
	597.655, 689		
	599.571, 688.362		
	603.662, 687		
	608.129, 685.513		
	609.67, 685		
	618.233, 685		
	628.127, 685.241		
	628.175, 685.242		
	700.514, 687		
	768.454, 688.654		
	835.534, 687		
	874.622, 687		
	885.02, 687		
	885.837, 687		
	914.501, 685.056		
	914.512, 685.056		
	916.783, 685		
	918.713, 684.952		
	920.67, 685		
	922.861, 685.058		
	931.35, 685.433		
	933.943, 685.923		

Piezoline	944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689		

	1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416		

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	2739.16, 694.573		
	425.446, 740.017 435.797, 740.214 440.59, 740.214 447.446, 737.929 450.009, 737.075 453.446, 735.929 454.615, 735.539 456.889, 734.782 459.451, 733.929 462, 733.08 465.468, 731.925 465.47, 731.925 470.544, 730.236 477.472, 727.929 480.007, 727.085 483.482, 725.929 486.011, 725.087 489.489, 723.929 493.677, 722.536 495.5, 721.929 499.136, 720.718 507.512, 717.929 509.321, 717.327 513.52, 715.929 515.323, 715.328 519.528, 713.929 521.326, 713.33 525.536, 711.929 529.138, 710.736 537.726, 707.929 539.803, 707.23 543.567, 705.929 545.671, 705.229 549.575, 703.929 551.683, 703.227 555.583, 701.929 560.51, 700.288 567.591, 697.929 570.047, 697.111 573.599, 695.929 577.668, 694.574 579.607, 693.929 583.685, 692.571 583.686, 692.571 585.615, 691.929 594.527, 688.962 597.631, 687.929 599.548, 687.291 603.639, 685.929 608.105, 684.442 609.658, 683.925 618.234, 683.925 628.129, 684.166 628.177, 684.167 700.515, 685.925 768.454, 687.578 835.533, 685.925		

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Block Search Polyline	1461.71, 691.925 1495.01, 691.925 1500.47, 691.925 1516.31, 691.202 1637.28, 689.925 1692.85, 689.925 1719.06, 689.062 1781.17, 688.321 1807.13, 687.925 1816.05, 687.925 1826.74, 687.925 1846.45, 687.095 1850.06, 685.929 1855, 684.207 1855.85, 683.925 1856.55, 683.925 1858.87, 683.925 1862.02, 683.925 1866.63, 685.435 1867.46, 685.702 1868.14, 685.929 1868.43, 686.031 1874.48, 687.925 1874.48, 687.925 1875.81, 688.369 1880.5, 689.925 1880.55, 689.925 1881.88, 690.368 1886.56, 691.929 1891.25, 693.492 1892.56, 693.929 1893.81, 694.361 1893.86, 694.361 1898.56, 695.929 1899.8, 696.359 1899.85, 696.359 1904.56, 697.929 1905.8, 698.358 1905.85, 698.358 1910.56, 699.929 1911.79, 700.356 1911.84, 700.356 1916.56, 701.929 1917.79, 702.355 1917.84, 702.354 1922.56, 703.929 1923.78, 704.353 1923.84, 704.353 1928.56, 705.929 1929.78, 706.351 1929.83, 706.351 1934.56, 707.929 1935.78, 708.35 1935.83, 708.35 1940.57, 709.929 1941.77, 710.348 1941.82, 710.348 1946.56, 711.929 1947.77, 712.347		

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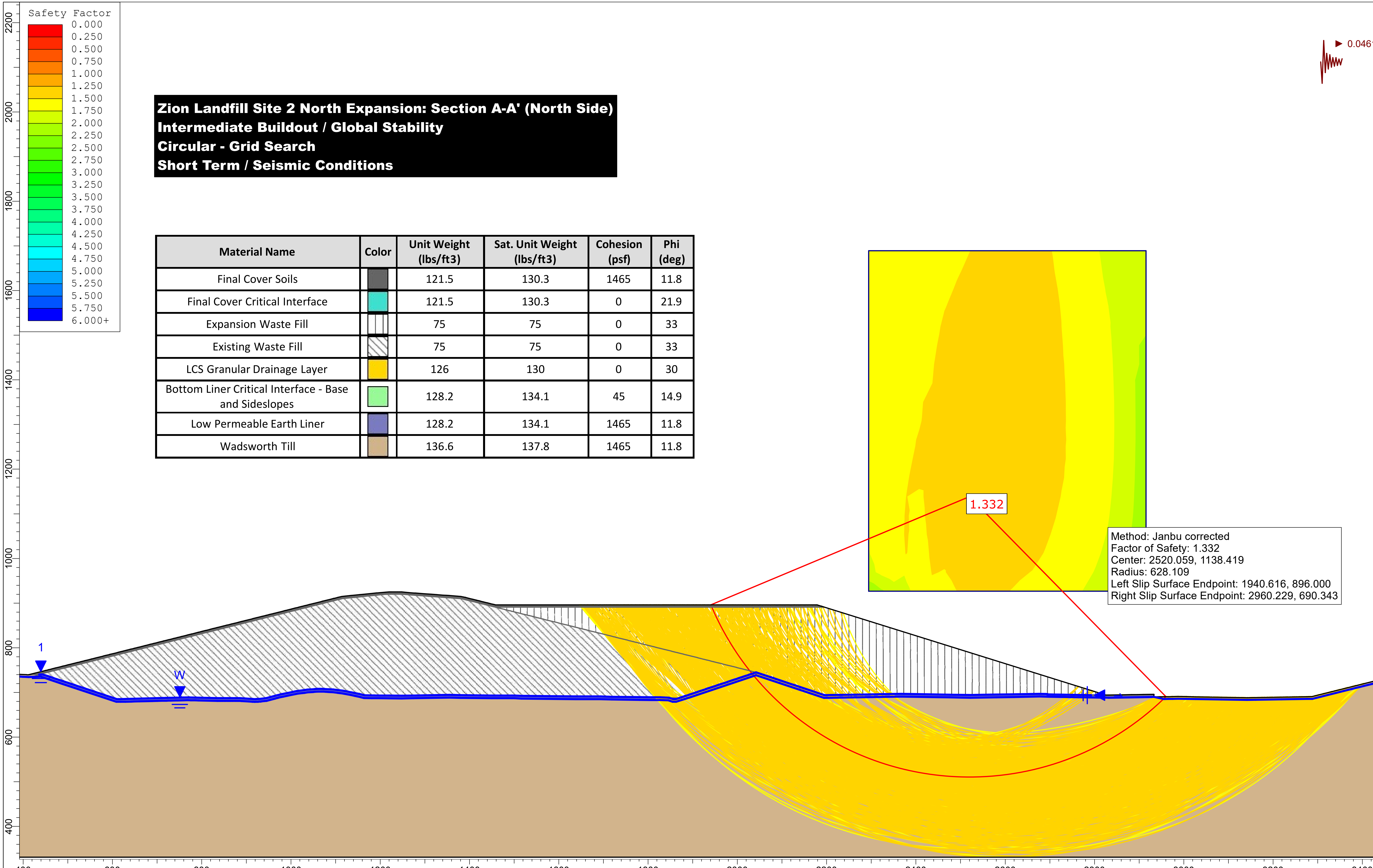
	2600.94, 694.407 2620.04, 694.738 2676.93, 695.725 2698.12, 695.358 2754.86, 694.377 2812.84, 693.374 2824.98, 693.164 2831.93, 693.044 2851.01, 693.374 2908.97, 694.38 2932.95, 694.795	

SLOPE STABILITY

SECTION **A-A**' – HORIZONTAL EXPANSION **(NORTH SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

INTERIM WASTE HEIGHT / PARTIAL BUILDOUT LANDFORM
CIRCULAR ANALYSIS OF WASTE AND FOUNDATION
(ROTATIONAL SLOPE FAILURE)



Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Intermediate Buildout / Global Stability
Circular - Grid Search
Short Term / Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

A-A_inter_north_ST.slmd

APTIM

Slide Analysis Information

A-A_inter_north_ST

Project Summary

File Name:	A-A_inter_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:01m:13.171s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.402300
Center:	2520.059, 1265.503
Radius:	725.194
Left Slip Surface Endpoint:	1896.061, 896.000
Right Slip Surface Endpoint:	2961.793, 690.370
Resisting Moment:	3.79593e+09 lb-ft
Driving Moment:	2.70693e+09 lb-ft
Total Slice Area:	200273 ft2
Surface Horizontal Width:	1065.73 ft
Surface Average Height:	187.921 ft

Method: janbu corrected

FS	1.331790
Center:	2520.059, 1138.419
Radius:	628.109
Left Slip Surface Endpoint:	1940.616, 896.000
Right Slip Surface Endpoint:	2960.229, 690.343
Resisting Horizontal Force:	5.19977e+06 lb
Driving Horizontal Force:	3.90434e+06 lb
Total Slice Area:	213900 ft2
Surface Horizontal Width:	1019.61 ft
Surface Average Height:	209.786 ft

Method: spencer

FS	1.394670
Center:	2520.059, 1307.864
Radius:	758.315
Left Slip Surface Endpoint:	1883.342, 896.000
Right Slip Surface Endpoint:	2960.182, 690.342
Resisting Moment:	3.87945e+09 lb-ft
Driving Moment:	2.78162e+09 lb-ft
Resisting Horizontal Force:	4.66009e+06 lb
Driving Horizontal Force:	3.34135e+06 lb
Total Slice Area:	195494 ft2
Surface Horizontal Width:	1076.84 ft
Surface Average Height:	181.544 ft

Method: gle/morgenstern-price

FS	1.398200
Center:	2548.305, 1307.864
Radius:	755.890
Left Slip Surface Endpoint:	1914.477, 896.000
Right Slip Surface Endpoint:	2984.842, 690.770
Resisting Moment:	3.74508e+09 lb-ft
Driving Moment:	2.6785e+09 lb-ft
Resisting Horizontal Force:	4.50888e+06 lb
Driving Horizontal Force:	3.22477e+06 lb
Total Slice Area:	186725 ft2
Surface Horizontal Width:	1070.37 ft
Surface Average Height:	174.45 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	3040
Number of Invalid Surfaces:	1767
Error Codes	
Error Code -103 reported for 1355 surfaces	
Error Code -110 reported for 384 surfaces	
Error Code -112 reported for 28 surfaces	

Method: janbu corrected

Number of Valid Surfaces:	3056
Number of Invalid Surfaces:	1751
Error Codes	
Error Code -103 reported for 1355 surfaces	
Error Code -110 reported for 384 surfaces	
Error Code -112 reported for 12 surfaces	

Method: spencer

Number of Valid Surfaces:	3031
Number of Invalid Surfaces:	1776
Error Codes	
Error Code -103 reported for 1355 surfaces	
Error Code -110 reported for 384 surfaces	
Error Code -111 reported for 3 surfaces	
Error Code -112 reported for 34 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	3036
Number of Invalid Surfaces:	1771
Error Codes	
Error Code -103 reported for 1355 surfaces	
Error Code -110 reported for 384 surfaces	
Error Code -112 reported for 32 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Entity Information

Circular - thin layers

Shared Entities

Type	Coordinates (x,y)
	2178.64, 896.001 2177.34, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966

	1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407	

	1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126

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Material Boundary	1458.25, 890.855 1495.01, 890.845 1549.83, 890.87 1858.87, 891 2127.47, 890.865 2142.12, 890.909 2195.15, 890.91
	2932.94, 694.87 2908.97, 694.455 2851.01, 693.449 2831.93, 693.119 2824.98, 693.239 2812.84, 693.449 2754.87, 694.452 2698.12, 695.433 2676.93, 695.8 2620.04, 694.813 2600.94, 694.482 2580.01, 694.119 2521.93, 693.112 2503.22, 693.435 2475.13, 693.921 2447.68, 694.392 2388.56, 695.405 2366.91, 695.776 2195.59, 692.778 2195.24, 692.771 2195.11, 692.769 2195.04, 692.792 2173.38, 700 2127.47, 715.257 2072.88, 733.432 2060, 737.734 2041.91, 743.743 2036.53, 742 2031.73, 740.4 2030.55, 740 2025.75, 738.402 2025.72, 738.402 2024.55, 738 2019.76, 736.403 2019.73, 736.403 2018.55, 736 2013.76, 734.405 2013.73, 734.405 2012.55, 734 2007.77, 732.406 2007.74, 732.406 2006.55, 732 2001.77, 730.408 2001.74, 730.408

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Material Boundary	513.543, 716 509.344, 717.398 507.535, 718 499.16, 720.79 495.524, 722 493.701, 722.607 489.513, 724 486.035, 725.158 483.505, 726 480.031, 727.156 477.496, 728 470.568, 730.307 465.482, 732 465.481, 732 462.023, 733.151 459.474, 734 456.913, 734.853 454.639, 735.61 453.47, 736 450.033, 737.146 447.47, 738 440.602, 740.289 435.797, 740.289 426.87, 740.119 426.201, 740.106 425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307

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	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766

	538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021 618.632, 786 622.745, 787.031 626.622, 788 633.831, 789.802 634.622, 790 635.422, 790.2 642.622, 792 646.38, 792.939 650.632, 794 654.898, 795.067 658.632, 796 662.927, 797.076 666.622, 798 673.797, 799.792 674.632, 800 675.475, 800.211 675.482, 800.213 682.633, 802 686.119, 802.872 690.633, 804 694.086, 804.863 698.633, 806 703.206, 807.143 706.633, 808 713.748, 809.779 713.756, 809.781 714.633, 810 715.521, 810.222 715.529, 810.224 722.633, 812 727.298, 813.169 730.622, 814 735.33, 815.177 738.622, 816 743.363, 817.185 746.622, 818 753.689, 819.767 753.697, 819.769 754.622, 820 755.557, 820.234	

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	960.758, 871.534 962.622, 872 965.435, 872.703 970.622, 874 974.464, 874.96 978.622, 876 983.295, 877.168 986.622, 878 987.722, 878.275 989.579, 878.739 989.696, 878.768 990.941, 879.08 994.622, 880 999.548, 881.232 999.665, 881.261 1001.52, 881.725 1002.62, 882 1002.75, 882.031 1003.06, 882.11 1003.09, 882.116 1003.45, 882.208 1010.62, 884 1016.85, 885.557 1018.62, 886 1024.91, 887.573 1026.62, 888 1032.44, 889.455 1032.46, 889.459 1034.62, 890 1036.95, 890.581 1036.96, 890.585 1042.62, 892 1044.19, 892.392 1050.62, 894 1052.12, 894.375 1058.62, 896 1065.26, 897.659 1066.62, 898 1071.96, 899.334 1071.97, 899.337 1074.62, 900 1077.51, 900.722 1077.53, 900.726 1082.62, 902 1089.48, 903.714 1090.62, 904 1097.56, 905.733 1098.62, 906 1105.63, 907.753 1106.62, 908 1111.23, 909.151 1111.24, 909.155 1114.62, 910 1132.01, 911.739 1134.62, 912 1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916	

Material Boundary	1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1458.25, 890.855 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287

	1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759	

	1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033 1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969	

	1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582 1965.72, 764 1967.39, 763.583 1973.7, 762 1977.57, 761.034 1977.58, 761.033 1981.71, 760 1985.9, 758.959 1985.9, 758.958 1989.74, 758 1991.4, 757.584 1997.72, 756 1999.4, 755.58 2005.72, 754 2007.48, 753.558 2013.7, 752 2017.55, 751.04 2017.56, 751.039 2021.71, 750 2025.87, 748.959 2025.88, 748.958 2029.73, 748 2032.55, 747.298 2037.73, 746 2040.08, 745.405 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696	

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Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503

	579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313	

Material Boundary	1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858

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2012.59, 733.858
2013.76, 734.255
2013.79, 734.255
2018.59, 735.858
2019.75, 736.253
2019.78, 736.253
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2025.75, 738.252
2025.78, 738.252
2030.6, 739.858
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	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3

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	1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43
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	1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114 482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941

	654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719 713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94	

Material Boundary	859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295 922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399	

	1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94 1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932	

	1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791 1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2188.36, 893
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919 466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27

	562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949 698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987	

Material Boundary	777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773 906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046

	978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423 1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718	

	1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974 1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2187.87, 893.15

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924	Assigned to: Wadsworth Till

	4.30816, 723.96		
	12.6281, 724.084		
	24.2881, 724.257		
	113.381, 725.584		
	150.125, 726.131		
	251.754, 727.644		
	262.684, 727.807		
	264.857, 727.839		
	267.412, 727.877		
	267.74, 727.882		
	267.83, 727.883		
	268.093, 727.885		
	268.368, 727.882		
	269.061, 727.877		
	272.624, 727.847		
	281.529, 727.773		
	284.508, 727.748		
	284.959, 727.743		
	286.557, 727.708		
	289.734, 727.637		
	295.936, 727.498		
	301.316, 727.378		
	309.904, 727.186		
	313.768, 727.1		
	314.73, 727		
	317.794, 727		
	322.428, 727		
	327.892, 727		
	334.438, 727		
	352.838, 735.003		
	356.385, 735.013		
	366.425, 735.2		
	372.719, 735.318		
	379.181, 735.415		
	391.383, 735.573		
	399.078, 735.005		
	407.323, 734.789		
	412.029, 734.347		
	439.628, 735.289		
	488.131, 719.138		
	522.779, 707.602		
	608.698, 679		
	618.307, 679		
	629.067, 679.262		
	642.777, 679.595		
	647.559, 679.711		
	660.405, 680.023		
	675.999, 680.402		
	689.108, 680.721		
	700.659, 681.002		
	711.292, 681.261		
	721.531, 681.51		
	724.458, 681.581		
	731.21, 681.745		
	742.989, 682.032		
	746.542, 682.118		
	760.228, 682.452		
	768.453, 682.652		
	775.361, 682.481		

	785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951		

	1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683		
Water Table	1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452		

	2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2928.03, 689.785 2933.03, 689.872 2955.52, 685.26 2966.15, 685.445 2974.76, 685.594 2986.93, 685.805 3005.67, 685.481 3026.51, 685.12 3083.88, 684.128 3141.93, 683.124 3161.05, 683.455 3219.11, 684.462 3276.35, 685.455 3287.99, 685.657 3307.91, 690.624 3403.42, 714.438 3425.9, 720.041 3498.4, 738.118 3511.05, 738.153 3513.27, 738.159 3516.47, 738.166 3555.99, 738.915 3560.24, 738.996 3560.38, 738.996 3562.81, 738.996 3565.35, 738.996 3572.15, 738.997 3572.42, 738.997 3572.75, 738.997 3574.89, 738.997 3575.23, 738.997 3575.59, 738.997 3576, 738.997 3576.53, 738.997 3577.15, 738.997 3579.94, 738.997 3582.64, 738.997 3589.33, 738.997 3589.49, 738.996 3608.27, 738.896 3660.68, 738.616 3711.23, 738.347 3731.88, 738.243 3847.86, 737.635 3874.25, 737.524 3878.92, 737.484 3880.4, 737.484 3891.32, 737.481 3896.18, 737.436 3923.28, 737.159 3936.98, 737.008 3939.65, 737.003 3940.24, 737.002 3940.54, 737.001		

	3941.23, 737 3943.19, 736.963 3984.29, 736.189 4046.31, 735.003 4069.83, 733.736 4083.35, 733.007 4091.4, 732.6 4099.87, 732.313 4107.4, 732.001 4111.22, 731.848 4120.86, 731.486 4126.77, 731.314 4134.44, 731.066 4136.21, 731.004 4147.03, 730.471 4149.86, 730.331 4152.27, 730.207 4159.68, 729.828 4161.98, 729.722 4168.35, 729.381 4170.28, 729.323 4176.46, 729.027 4183.66, 729 4184.9, 728.957 4186.51, 728.967 4190.68, 728.712 4192, 728.641 4193.48, 728.515 4210.43, 727.177 4212.1, 727.044 4212.72, 727 4212.98, 727 4213.12, 727 4217.08, 727 4218.09, 727 4220.71, 727 4222.66, 727 4227.99, 727 4240.16, 727 4251.63, 727 4253.3, 727 4258.25, 727 4278.23, 727 4287.06, 727 4288.26, 727 4302.4, 727 4314.27, 727 4336.91, 727 4362.15, 735.41 4369.76, 737.944 4370.23, 737.927 4374.32, 736.567 4379.34, 734.898 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546		

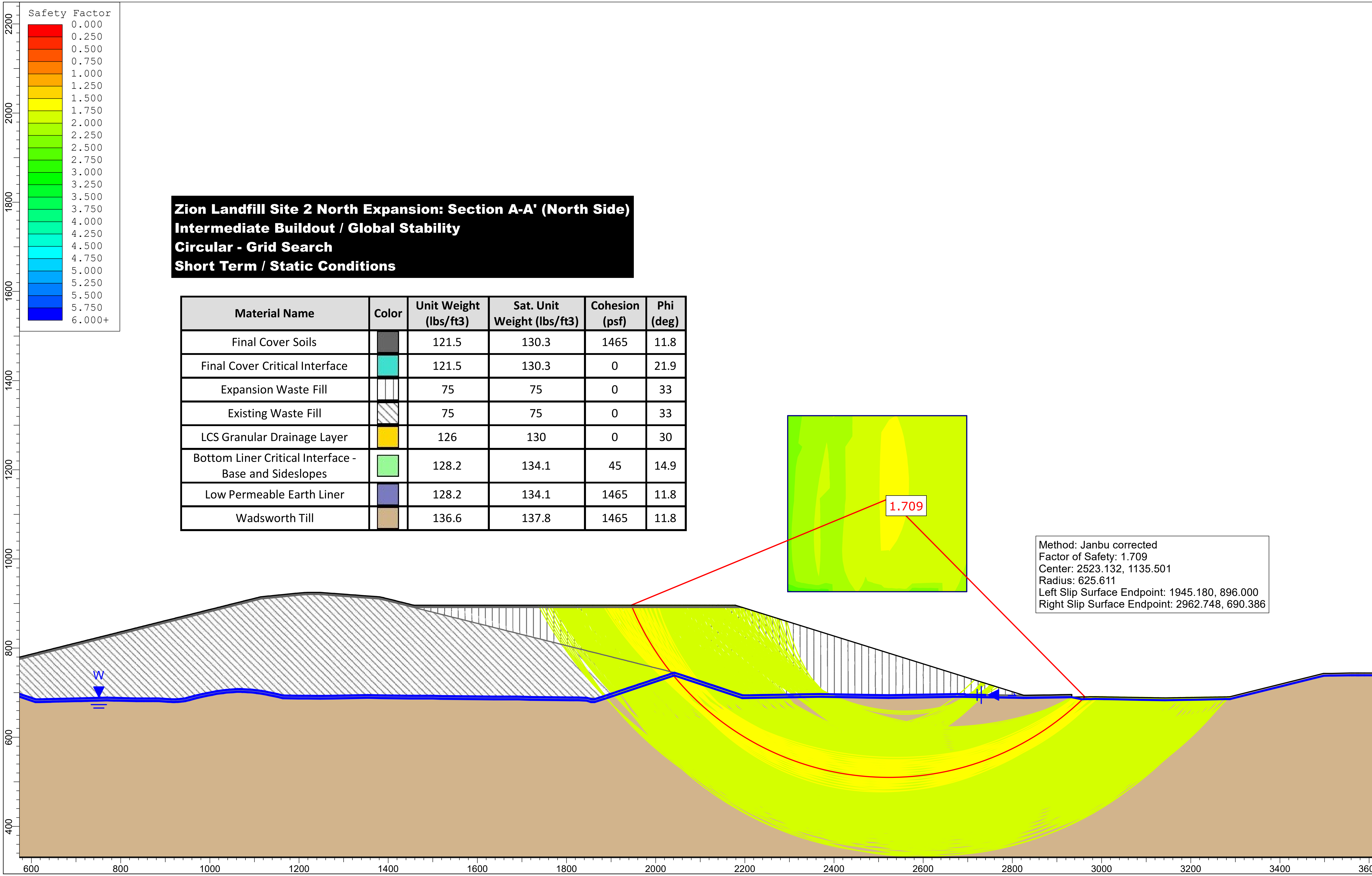
	4434.16, 742.558 4734.38, 742.558 4750.1, 742.558 4763.34, 747 4763.91, 747 4769.69, 747 4774.89, 745.413 4775.26, 745.277 4780.91, 743.405 4781.36, 743.255 4786.89, 741.421 4787.39, 741.255 4792.88, 739.436 4793.56, 739.207 4794.3, 739.011 4794.4, 738.986 4794.51, 738.956 4794.64, 738.918 4795.45, 738.671 4799.4, 737.389 4800.33, 737.082 4801.58, 737.091 4806.03, 737.155 5009.05, 738.418		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705		

Piezoline	1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433		

	1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402		

	2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2575.19, 695.035 2605.61, 695.563 2676.93, 696.8 2694.06, 696.504 2694.06, 695.504 2792.52, 693.8 2792.52, 693.65	



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Slide Analysis Information

A-A_inter_north_ST

Project Summary

File Name:	A-A_inter_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:01m:08.443s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.786670
Center:	2540.592, 1274.851
Radius:	730.642
Left Slip Surface Endpoint:	1915.845, 896.000
Right Slip Surface Endpoint:	2979.428, 690.676
Resisting Moment:	3.75664e+09 lb-ft
Driving Moment:	2.1026e+09 lb-ft
Total Slice Area:	192763 ft2
Surface Horizontal Width:	1063.58 ft
Surface Average Height:	181.239 ft

Method: janbu corrected

FS	1.708600
Center:	2523.132, 1135.501
Radius:	625.611
Left Slip Surface Endpoint:	1945.180, 896.000
Right Slip Surface Endpoint:	2962.748, 690.386
Resisting Horizontal Force:	5.22396e+06 lb
Driving Horizontal Force:	3.05745e+06 lb
Total Slice Area:	213179 ft2
Surface Horizontal Width:	1017.57 ft
Surface Average Height:	209.498 ft

Method: spencer

FS	1.777800
Center:	2540.592, 1274.851
Radius:	730.642
Left Slip Surface Endpoint:	1915.845, 896.000
Right Slip Surface Endpoint:	2979.428, 690.676
Resisting Moment:	3.738e+09 lb-ft
Driving Moment:	2.1026e+09 lb-ft
Resisting Horizontal Force:	4.61498e+06 lb
Driving Horizontal Force:	2.5959e+06 lb
Total Slice Area:	192763 ft2
Surface Horizontal Width:	1063.58 ft
Surface Average Height:	181.239 ft

Method: gle/morgenstern-price

FS	1.779740
Center:	2540.592, 1321.301
Radius:	767.156
Left Slip Surface Endpoint:	1902.119, 896.000
Right Slip Surface Endpoint:	2977.394, 690.640
Resisting Moment:	3.85454e+09 lb-ft
Driving Moment:	2.16579e+09 lb-ft
Resisting Horizontal Force:	4.57226e+06 lb
Driving Horizontal Force:	2.56907e+06 lb
Total Slice Area:	187618 ft2
Surface Horizontal Width:	1075.27 ft
Surface Average Height:	174.484 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	1994
Number of Invalid Surfaces:	2758
Error Codes	
Error Code -103 reported for 2055 surfaces	
Error Code -110 reported for 639 surfaces	
Error Code -112 reported for 64 surfaces	

Method: janbu corrected

Number of Valid Surfaces:	2022
Number of Invalid Surfaces:	2730
Error Codes	
Error Code -103 reported for 2055 surfaces	
Error Code -110 reported for 639 surfaces	
Error Code -112 reported for 36 surfaces	

Method: spencer

Number of Valid Surfaces:	1991
Number of Invalid Surfaces:	2761
Error Codes	
Error Code -103 reported for 2055 surfaces	
Error Code -110 reported for 639 surfaces	
Error Code -112 reported for 67 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	1992
Number of Invalid Surfaces:	2760
Error Codes	
Error Code -103 reported for 2055 surfaces	
Error Code -110 reported for 639 surfaces	
Error Code -112 reported for 66 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Entity Information

Circular - thin layers

Shared Entities

Type	Coordinates (x,y)
	2178.64, 896.001 2177.34, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464

	1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851	

	1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851	

	832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851	

External Boundary	621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736

	338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 743.418 4805.97, 742.154 4801.53, 742.091 4801.11, 742.088 4800.95, 742.141 4796.95, 743.439 4796.06, 743.712 4795.85, 743.772 4795.68, 743.818 4795.57, 743.848 4795, 744 4794.45, 744.18 4788.96, 746 4788.47, 746.165 4782.93, 748 4782.49, 748.15 4776.9, 750 4776.47, 750.156 4770.43, 752 4763.91, 752 4762.52, 752 4729.64, 740.967 4726.72, 740 4725.92, 739.84 4716.69, 738 4715.85, 737.832 4706.65, 736 4705.77, 735.824 4696.61, 734 4695.7, 733.817 4686.57, 732 4685.73, 732 4682.95, 732 4679.32, 732 4677.82, 732 4659.51, 732 4622.82, 732 4486.94, 732 4486.94, 732 4481.52, 733.084 4476.94, 734 4476.94, 734 4471.48, 735.093 4466.94, 736 4466.94, 736 4461.43, 737.102 4456.94, 738	

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	2882.94, 695.003 2870.81, 694.793 2831.93, 694.119 2824.98, 694.239 2195.15, 890.91 2188.36, 893 2187.87, 893.15
Material Boundary	1458.25, 890.855 1495.01, 890.845 1549.83, 890.87 1858.87, 891 2127.47, 890.865 2142.12, 890.909 2195.15, 890.91
	2932.94, 694.87 2908.97, 694.455 2851.01, 693.449 2831.93, 693.119 2824.98, 693.239 2812.84, 693.449 2754.87, 694.452 2698.12, 695.433 2676.93, 695.8 2620.04, 694.813 2600.94, 694.482 2580.01, 694.119 2521.93, 693.112 2503.22, 693.435 2475.13, 693.921 2447.68, 694.392 2388.56, 695.405 2366.91, 695.776 2195.59, 692.778 2195.24, 692.771 2195.11, 692.769 2195.04, 692.792 2173.38, 700 2127.47, 715.257 2072.88, 733.432 2060, 737.734 2041.91, 743.743 2036.53, 742 2031.73, 740.4 2030.55, 740 2025.75, 738.402 2025.72, 738.402 2024.55, 738 2019.76, 736.403 2019.73, 736.403 2018.55, 736 2013.76, 734.405 2013.73, 734.405 2012.55, 734 2007.77, 732.406 2007.74, 732.406 2006.55, 732 2001.77, 730.408 2001.74, 730.408 2000.55, 730

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	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766 538.64, 766.005

	546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021 618.632, 786 622.745, 787.031 626.622, 788 633.831, 789.802 634.622, 790 635.422, 790.2 642.622, 792 646.38, 792.939 650.632, 794 654.898, 795.067 658.632, 796 662.927, 797.076 666.622, 798 673.797, 799.792 674.632, 800 675.475, 800.211 675.482, 800.213 682.633, 802 686.119, 802.872 690.633, 804 694.086, 804.863 698.633, 806 703.206, 807.143 706.633, 808 713.748, 809.779 713.756, 809.781 714.633, 810 715.521, 810.222 715.529, 810.224 722.633, 812 727.298, 813.169 730.622, 814 735.33, 815.177 738.622, 816 743.363, 817.185 746.622, 818 753.689, 819.767 753.697, 819.769 754.622, 820 755.557, 820.234 755.564, 820.236	

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	583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853	

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	1060.93, 707.795	
	1067.29, 707.858	
	1069.81, 707.862	
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	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114 482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941

	654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719 713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94	

Material Boundary	859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295 922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399	

	1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94 1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932	

	1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791 1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2188.36, 893
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919 466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27

	562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949 698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987

	777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773 906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046
Material Boundary	

	978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423 1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718	

	1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974 1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2187.87, 893.15

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924	Assigned to: Wadsworth Till

	4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481		

	785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951		

	1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683		
Water Table	1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452		

	2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2928.03, 689.785 2933.03, 689.872 2955.52, 685.26 2966.15, 685.445 2974.76, 685.594 2986.93, 685.805 3005.67, 685.481 3026.51, 685.12 3083.88, 684.128 3141.93, 683.124 3161.05, 683.455 3219.11, 684.462 3276.35, 685.455 3287.99, 685.657 3307.91, 690.624 3403.42, 714.438 3425.9, 720.041 3498.4, 738.118 3511.05, 738.153 3513.27, 738.159 3516.47, 738.166 3555.99, 738.915 3560.24, 738.996 3560.38, 738.996 3562.81, 738.996 3565.35, 738.996 3572.15, 738.997 3572.42, 738.997 3572.75, 738.997 3574.89, 738.997 3575.23, 738.997 3575.59, 738.997 3576, 738.997 3576.53, 738.997 3577.15, 738.997 3579.94, 738.997 3582.64, 738.997 3589.33, 738.997 3589.49, 738.996 3608.27, 738.896 3660.68, 738.616 3711.23, 738.347 3731.88, 738.243 3847.86, 737.635 3874.25, 737.524 3878.92, 737.484 3880.4, 737.484 3891.32, 737.481 3896.18, 737.436 3923.28, 737.159 3936.98, 737.008 3939.65, 737.003 3940.24, 737.002 3940.54, 737.001		

	3941.23, 737 3943.19, 736.963 3984.29, 736.189 4046.31, 735.003 4069.83, 733.736 4083.35, 733.007 4091.4, 732.6 4099.87, 732.313 4107.4, 732.001 4111.22, 731.848 4120.86, 731.486 4126.77, 731.314 4134.44, 731.066 4136.21, 731.004 4147.03, 730.471 4149.86, 730.331 4152.27, 730.207 4159.68, 729.828 4161.98, 729.722 4168.35, 729.381 4170.28, 729.323 4176.46, 729.027 4183.66, 729 4184.9, 728.957 4186.51, 728.967 4190.68, 728.712 4192, 728.641 4193.48, 728.515 4210.43, 727.177 4212.1, 727.044 4212.72, 727 4212.98, 727 4213.12, 727 4217.08, 727 4218.09, 727 4220.71, 727 4222.66, 727 4227.99, 727 4240.16, 727 4251.63, 727 4253.3, 727 4258.25, 727 4278.23, 727 4287.06, 727 4288.26, 727 4302.4, 727 4314.27, 727 4336.91, 727 4362.15, 735.41 4369.76, 737.944 4370.23, 737.927 4374.32, 736.567 4379.34, 734.898 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546		

	4434.16, 742.558 4734.38, 742.558 4750.1, 742.558 4763.34, 747 4763.91, 747 4769.69, 747 4774.89, 745.413 4775.26, 745.277 4780.91, 743.405 4781.36, 743.255 4786.89, 741.421 4787.39, 741.255 4792.88, 739.436 4793.56, 739.207 4794.3, 739.011 4794.4, 738.986 4794.51, 738.956 4794.64, 738.918 4795.45, 738.671 4799.4, 737.389 4800.33, 737.082 4801.58, 737.091 4806.03, 737.155 5009.05, 738.418		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705		

Piezoline	1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433		

	1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402		

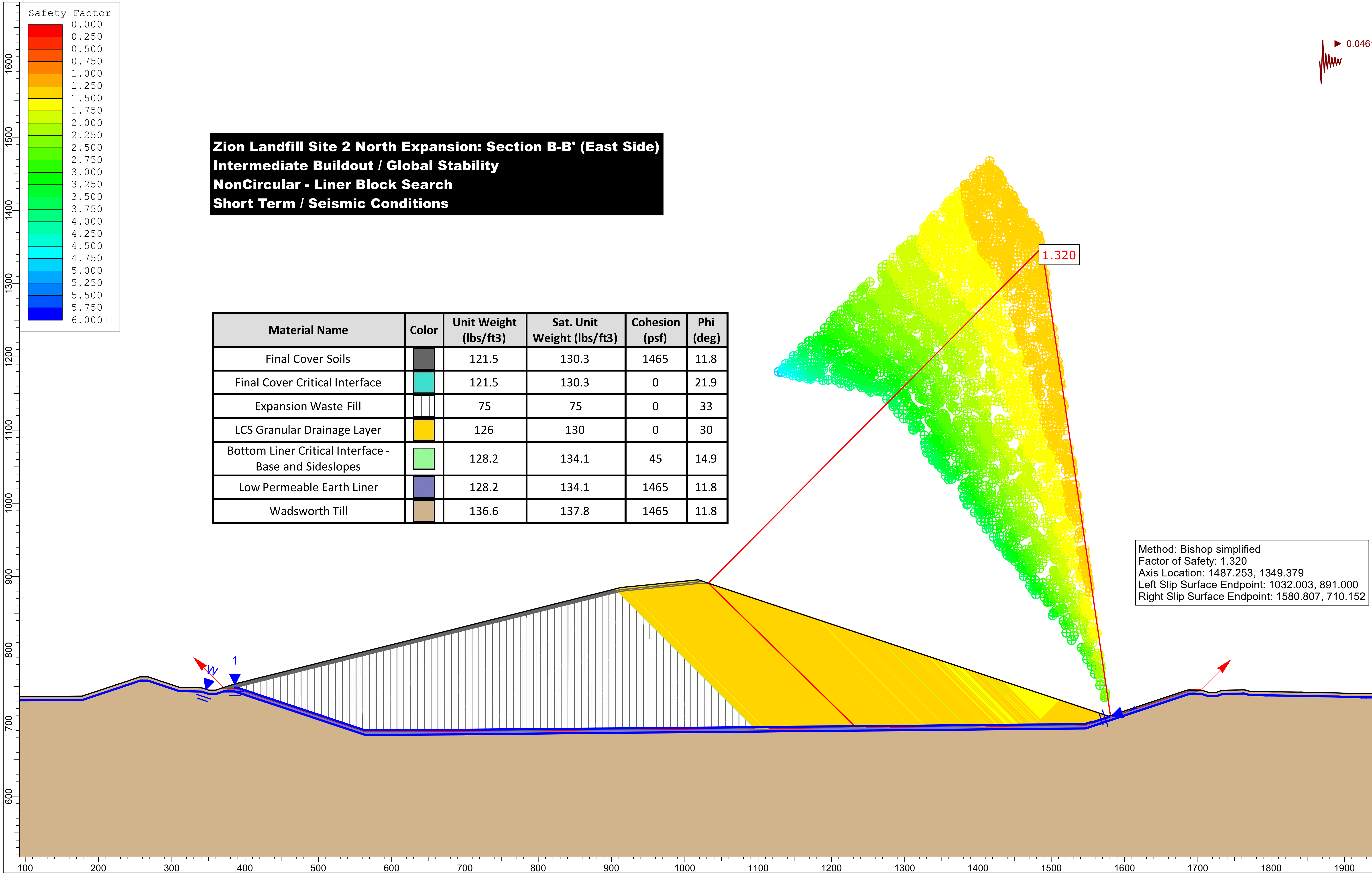
	2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2575.19, 695.035 2605.61, 695.563 2676.93, 696.8 2694.06, 696.504 2694.06, 695.504 2739.16, 694.723 2739.16, 694.573	

SLOPE STABILITY

SECTION **B-B**' – HORIZONTAL EXPANSION **(EAST SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

INTERIM WASTE HEIGHT / PARTIAL BUILDOUT LANDFORM
BLOCK ANALYSIS OF LINER SYSTEM
(TRANSLATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Slide Analysis Information

B-B_inter_east_ST

Project Summary

File Name:	B-B_inter_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:10m:53.588s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8

Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.319690
Axis Location:	1487.253, 1349.379
Left Slip Surface Endpoint:	1032.003, 891.000
Right Slip Surface Endpoint:	1580.807, 710.152
Resisting Moment:	7.12336e+08 lb-ft
Driving Moment:	5.39776e+08 lb-ft
Total Slice Area:	37219.3 ft2
Surface Horizontal Width:	548.803 ft
Surface Average Height:	67.819 ft

Method: janbu corrected

FS	1.343590
Axis Location:	1486.824, 1346.376
Left Slip Surface Endpoint:	1032.003, 891.000
Right Slip Surface Endpoint:	1578.232, 709.294
Resisting Horizontal Force:	993871 lb
Driving Horizontal Force:	739712 lb
Total Slice Area:	37742.5 ft2
Surface Horizontal Width:	546.229 ft
Surface Average Height:	69.0965 ft

Method: spencer

FS	1.367370
Axis Location:	1477.562, 1376.895
Left Slip Surface Endpoint:	1006.007, 894.328
Right Slip Surface Endpoint:	1580.683, 710.111
Resisting Moment:	7.65887e+08 lb-ft
Driving Moment:	5.60118e+08 lb-ft
Resisting Horizontal Force:	987892 lb
Driving Horizontal Force:	722477 lb
Total Slice Area:	37629.2 ft2
Surface Horizontal Width:	574.676 ft
Surface Average Height:	65.4789 ft

Method: gle/morgenstern-price

FS	1.377360
Axis Location:	1477.562, 1376.895
Left Slip Surface Endpoint:	1006.007, 894.328
Right Slip Surface Endpoint:	1580.683, 710.111
Resisting Moment:	7.63127e+08 lb-ft
Driving Moment:	5.54051e+08 lb-ft
Resisting Horizontal Force:	985702 lb
Driving Horizontal Force:	715647 lb
Total Slice Area:	37629.2 ft2
Surface Horizontal Width:	574.676 ft
Surface Average Height:	65.4789 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
1032	891
1233.03	694.54
1509.97	697.113
1540.14	697.393
1546.14	697.53
1556.93	700.982
1575.74	707.284
1580.81	710.152

Method: janbu corrected

X	Y
1032	891
1227.73	694.499
1510.3	697.116
1540.15	697.394
1543.74	697.429
1546.19	697.582
1547.71	697.908
1575.79	707.268
1578.23	709.294

Method: spencer

X	Y
1006.01	894.328
1250.94	694.857
1508.27	697.097
1540.13	697.394
1546.04	697.53
1549.18	698.396
1575.98	707.387
1580.68	710.111

Method: gle/morgenstern-price

X	Y
1006.01	894.328
1250.94	694.857
1508.27	697.097
1540.13	697.394
1546.04	697.53
1549.18	698.396
1575.98	707.387
1580.68	710.111

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 3086
Number of Invalid Surfaces: 1919

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 1896 surfaces

Method: janbu corrected

Number of Valid Surfaces: 3085
Number of Invalid Surfaces: 1919

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 1896 surfaces

Method: spencer

Number of Valid Surfaces: 2814
Number of Invalid Surfaces: 2190

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 17 surfaces
Error Code -110 reported for 1896 surfaces
Error Code -111 reported for 256 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces: 2657
Number of Invalid Surfaces: 2348

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 23 surfaces
Error Code -110 reported for 1896 surfaces
Error Code -111 reported for 408 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1688.75, 745.08 1685.18, 744.943 1685.18, 744.943 1685.16, 744.936 1685.16, 744.935 1685.15, 744.933 1685.14, 744.929 1685.08, 744.911 1664.79, 738.147 1578.23, 709.294 1032, 891 1025.99, 893 1025.54, 893.15 1018.3, 895.558 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095

	712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076	

External Boundary	205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729	

	2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962	

	1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824	

	1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539 1705.77, 744.739 1703.67, 744.781 1695.56, 744.943

Material Boundary	371.139, 747.994 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639

Material Boundary	369.041, 747.954 369.564, 747.963 371.196, 747.996 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1555.18, 701.611 1578.23, 709.294

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43 713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1025.54, 893.15

Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1025.99, 893

Material Boundary	386.057, 748.292 387.433, 748.636 391.315, 749.607 391.546, 749.665 392.519, 749.908 393.512, 750.156 394.527, 750.409 395.563, 750.668 396.622, 750.933 397.705, 751.204 398.812, 751.48 400.043, 751.789 413.487, 755.149 448.308, 763.851 565.249, 793.073 627.576, 808.658 686.32, 823.344 713.934, 830.247 737.922, 836.244 760.786, 841.96 782.6, 847.414 803.434, 852.623 823.354, 857.603 841.359, 862.105 842.427, 862.372 860.802, 866.965 878.345, 871.351 912.948, 880 913.197, 880.025 913.606, 880.066 923.199, 881.025 924.02, 881.107 943.205, 883.025 944.023, 883.107 963.211, 885.025 964.027, 885.106 983.216, 887.025 984.03, 887.106 1003.08, 889.011 1003.22, 889.025 1004.25, 889.128 1022.97, 891 1024.07, 891 1032, 891
Material Boundary	371.139, 747.994 371.196, 747.996

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364	Assigned to: Wadsworth Till

	198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257 223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203		

	385.911, 743.07	
	390.102, 741.672	
	392.178, 740.98	
	393.625, 740.498	
	395.889, 739.743	
	404.687, 736.81	
	418.13, 732.329	
	426.507, 729.536	
	447.096, 722.672	
	507.505, 702.534	
	563.515, 683.862	
	563.605, 683.831	
	563.976, 683.705	
	564.036, 683.685	
	564.179, 683.637	
	564.311, 683.592	
	564.361, 683.575	
	564.491, 683.575	
	564.857, 683.576	
	586.189, 683.61	
	626.363, 684	
	698.374, 684.674	
	703.436, 684.721	
	840.146, 686	
	1002.59, 687.5	
	1031.85, 687.778	
	1056.47, 688	
	1070.79, 688.133	
	1076.9, 688.19	
	1113.49, 688.53	
	1198.73, 689.322	
	1487.03, 692	
	1546.99, 692.557	
	1550.33, 693.668	
	1688.75, 739.809	
	1689.03, 739.9	
	1704.21, 739.987	
	1707.78, 738.796	
	1713.96, 736.738	
	1718.76, 736.738	
	1725.58, 736.737	
	1729.95, 738.193	
	1734.63, 739.753	
	1760.99, 740.279	
	1763.01, 740.319	
	1763.33, 740.212	
	1764.53, 739.813	
	1764.53, 739.811	
	1764.57, 739.8	
	1764.59, 739.79	
	1764.67, 739.764	
	1765.01, 739.653	
	1765.03, 739.645	
	1765.1, 739.622	
	1765.5, 739.489	
	1767.7, 739.105	
Water Table	1767.72, 739.101	
	1768.46, 738.913	
	1772.79, 737.949	

	1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722 1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383		

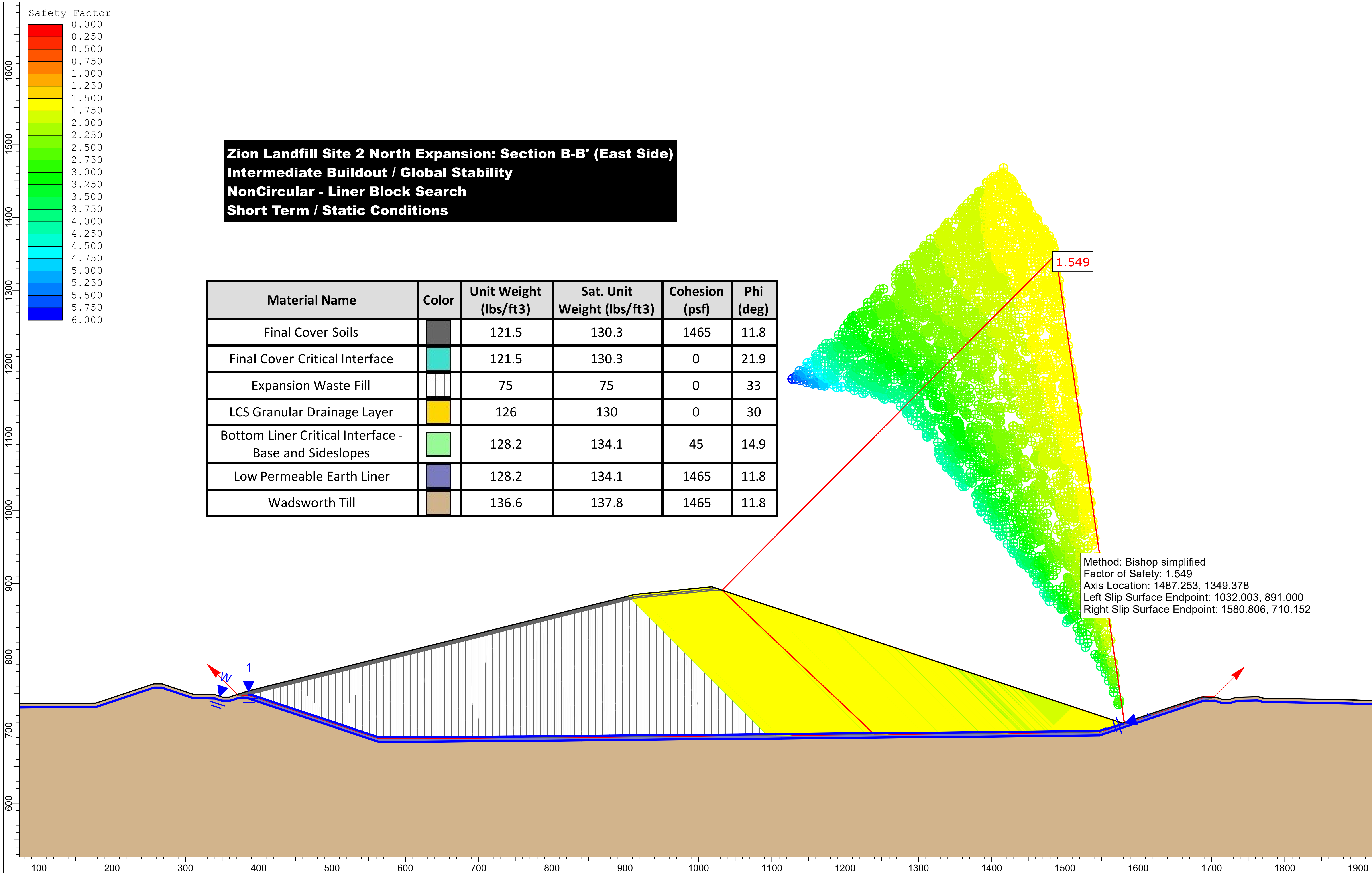
	1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335 2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493		

	2243.14, 734.24 2246.4, 734.069 2300, 733.229	
Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1555.88, 701.845 1556.2, 700.896 1569.82, 705.436 1578.49, 708.327 1578.54, 708.185	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	

Zion Landfill Site 2 North Expansion: Section B-B' (East Side)
Intermediate Buildout / Global Stability
NonCircular - Liner Block Search
Short Term / Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8



Slide Analysis Information

B-B_inter_east_ST

Project Summary

File Name:	B-B_inter_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:12m:50.768s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465

Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.549040
Axis Location:	1487.253, 1349.378
Left Slip Surface Endpoint:	1032.003, 891.000
Right Slip Surface Endpoint:	1580.806, 710.152
Resisting Moment:	7.23986e+08 lb-ft
Driving Moment:	4.67377e+08 lb-ft
Total Slice Area:	36591.7 ft2
Surface Horizontal Width:	548.802 ft
Surface Average Height:	66.6755 ft

Method: janbu corrected

FS	1.581870
Axis Location:	1486.824, 1346.376
Left Slip Surface Endpoint:	1032.003, 891.000
Right Slip Surface Endpoint:	1578.232, 709.294
Resisting Horizontal Force:	1.00947e+06 lb
Driving Horizontal Force:	638151 lb
Total Slice Area:	36995.2 ft2
Surface Horizontal Width:	546.229 ft
Surface Average Height:	67.7284 ft

Method: spencer

FS	1.605820
Axis Location:	1478.681, 1374.088
Left Slip Surface Endpoint:	1008.072, 894.535
Right Slip Surface Endpoint:	1579.958, 709.869
Resisting Moment:	7.65599e+08 lb-ft
Driving Moment:	4.76764e+08 lb-ft
Resisting Horizontal Force:	992212 lb
Driving Horizontal Force:	617883 lb
Total Slice Area:	36332.6 ft2
Surface Horizontal Width:	571.886 ft
Surface Average Height:	63.5312 ft

Method: gle/morgenstern-price

FS	1.618270
Axis Location:	1478.681, 1374.088
Left Slip Surface Endpoint:	1008.072, 894.535
Right Slip Surface Endpoint:	1579.958, 709.869
Resisting Moment:	7.63198e+08 lb-ft
Driving Moment:	4.71614e+08 lb-ft
Resisting Horizontal Force:	990193 lb
Driving Horizontal Force:	611884 lb
Total Slice Area:	36332.6 ft2
Surface Horizontal Width:	571.886 ft
Surface Average Height:	63.5312 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
1032	891
1239.34	694.599
1510.25	697.115
1540.22	697.394
1544.71	697.502
1546.33	697.609
1564.66	703.557
1576.17	707.526
1580.81	710.152

Method: janbu corrected

X	Y
1032	891
1235.25	694.568
1510.3	697.116
1540.15	697.394
1543.63	697.428
1546.15	697.575
1547.72	697.91
1576.02	707.447
1578.23	709.294

Method: spencer

X	Y
1008.07	894.535
1261.49	694.955
1508.28	697.097
1540.13	697.394
1546.04	697.53
1549.12	698.377
1576.18	707.399
1579.96	709.869

Method: gle/morgenstern-price

X	Y
1008.07	894.535
1261.49	694.955
1508.28	697.097
1540.13	697.394
1546.04	697.53
1549.12	698.377
1576.18	707.399
1579.96	709.869

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	3088
Number of Invalid Surfaces:	1916

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 1894 surfaces

Method: janbu corrected

Number of Valid Surfaces:	3087
Number of Invalid Surfaces:	1917

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 1894 surfaces

Method: spencer

Number of Valid Surfaces:	2865
Number of Invalid Surfaces:	2139

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 21 surfaces
Error Code -110 reported for 1894 surfaces
Error Code -111 reported for 203 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	2729
Number of Invalid Surfaces:	2276

Error Codes

Error Code -106 reported for 21 surfaces
Error Code -108 reported for 15 surfaces
Error Code -110 reported for 1894 surfaces
Error Code -111 reported for 346 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1688.75, 745.08 1685.18, 744.943 1685.18, 744.943 1685.16, 744.936 1685.16, 744.935 1685.15, 744.933 1685.14, 744.929 1685.08, 744.911 1664.79, 738.147 1578.23, 709.294 1032, 891 1025.99, 893 1025.54, 893.15 1018.3, 895.558 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095

	712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076	

External Boundary	205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729	

	2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962	

1955.97, 739.894
1955.8, 739.899
1952.02, 739.831
1947.2, 739.799
1942.5, 739.789
1940.44, 740
1939.92, 740.009
1935.35, 740.008
1934.96, 740.008
1930.81, 740.006
1930.4, 740.007
1927.26, 740.005
1923.77, 740.001
1923.7, 740.001
1923.26, 740
1923.21, 740
1920.59, 740.087
1917.66, 740.181
1916.72, 740.203
1915.68, 740.226
1898.08, 740.833
1892.28, 741.057
1847.51, 742
1841.58, 742.146
1841.29, 742.151
1840.84, 742.154
1840.05, 742.158
1838.74, 742.163
1826.34, 742.37
1814.92, 742.579
1800.98, 742.614
1792.37, 742.721
1787.88, 742.786
1779.33, 742.929
1773.39, 742.943
1773.36, 742.944
1769.62, 743.777
1768.75, 744
1768.54, 744.035
1766.72, 744.351
1766.68, 744.366
1766.61, 744.388
1766.59, 744.396
1766.25, 744.508
1766.18, 744.534
1766.15, 744.543
1766.11, 744.554
1766.11, 744.557
1765.72, 744.685
1765.58, 744.732
1765.48, 744.767
1765.46, 744.772
1765.43, 744.781
1765.41, 744.79
1765.39, 744.795
1765.38, 744.799
1765.36, 744.806
1765.35, 744.809
1765.3, 744.824

	1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539 1705.77, 744.739 1703.67, 744.781 1695.56, 744.943

Material Boundary	371.139, 747.994 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639

Material Boundary	369.041, 747.954 369.564, 747.963 371.196, 747.996 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1555.18, 701.611 1578.23, 709.294

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43 713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1025.54, 893.15

Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1025.99, 893

Material Boundary	386.057, 748.292 387.433, 748.636 391.315, 749.607 391.546, 749.665 392.519, 749.908 393.512, 750.156 394.527, 750.409 395.563, 750.668 396.622, 750.933 397.705, 751.204 398.812, 751.48 400.043, 751.789 413.487, 755.149 448.308, 763.851 565.249, 793.073 627.576, 808.658 686.32, 823.344 713.934, 830.247 737.922, 836.244 760.786, 841.96 782.6, 847.414 803.434, 852.623 823.354, 857.603 841.359, 862.105 842.427, 862.372 860.802, 866.965 878.345, 871.351 912.948, 880 913.197, 880.025 913.606, 880.066 923.199, 881.025 924.02, 881.107 943.205, 883.025 944.023, 883.107 963.211, 885.025 964.027, 885.106 983.216, 887.025 984.03, 887.106 1003.08, 889.011 1003.22, 889.025 1004.25, 889.128 1022.97, 891 1024.07, 891 1032, 891
Material Boundary	371.139, 747.994 371.196, 747.996

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364	Assigned to: Wadsworth Till

	198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257 223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203		

	385.911, 743.07		
	390.102, 741.672		
	392.178, 740.98		
	393.625, 740.498		
	395.889, 739.743		
	404.687, 736.81		
	418.13, 732.329		
	426.507, 729.536		
	447.096, 722.672		
	507.505, 702.534		
	563.515, 683.862		
	563.605, 683.831		
	563.976, 683.705		
	564.036, 683.685		
	564.179, 683.637		
	564.311, 683.592		
	564.361, 683.575		
	564.491, 683.575		
	564.857, 683.576		
	586.189, 683.61		
	626.363, 684		
	698.374, 684.674		
	703.436, 684.721		
	840.146, 686		
	1002.59, 687.5		
	1031.85, 687.778		
	1056.47, 688		
	1070.79, 688.133		
	1076.9, 688.19		
	1113.49, 688.53		
	1198.73, 689.322		
	1487.03, 692		
	1546.99, 692.557		
	1550.33, 693.668		
	1688.75, 739.809		
	1689.03, 739.9		
	1704.21, 739.987		
	1707.78, 738.796		
	1713.96, 736.738		
	1718.76, 736.738		
	1725.58, 736.737		
	1729.95, 738.193		
	1734.63, 739.753		
	1760.99, 740.279		
	1763.01, 740.319		
	1763.33, 740.212		
	1764.53, 739.813		
	1764.53, 739.811		
	1764.57, 739.8		
	1764.59, 739.79		
	1764.67, 739.764		
	1765.01, 739.653		
	1765.03, 739.645		
	1765.1, 739.622		
	1765.5, 739.489		
	1767.7, 739.105		
Water Table	1767.72, 739.101		
	1768.46, 738.913		
	1772.79, 737.949		

	1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722 1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383		

	1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335 2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493		

	2243.14, 734.24 2246.4, 734.069 2300, 733.229	
Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1555.88, 701.845 1556.2, 700.896 1569.82, 705.436 1578.49, 708.327 1578.54, 708.185	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

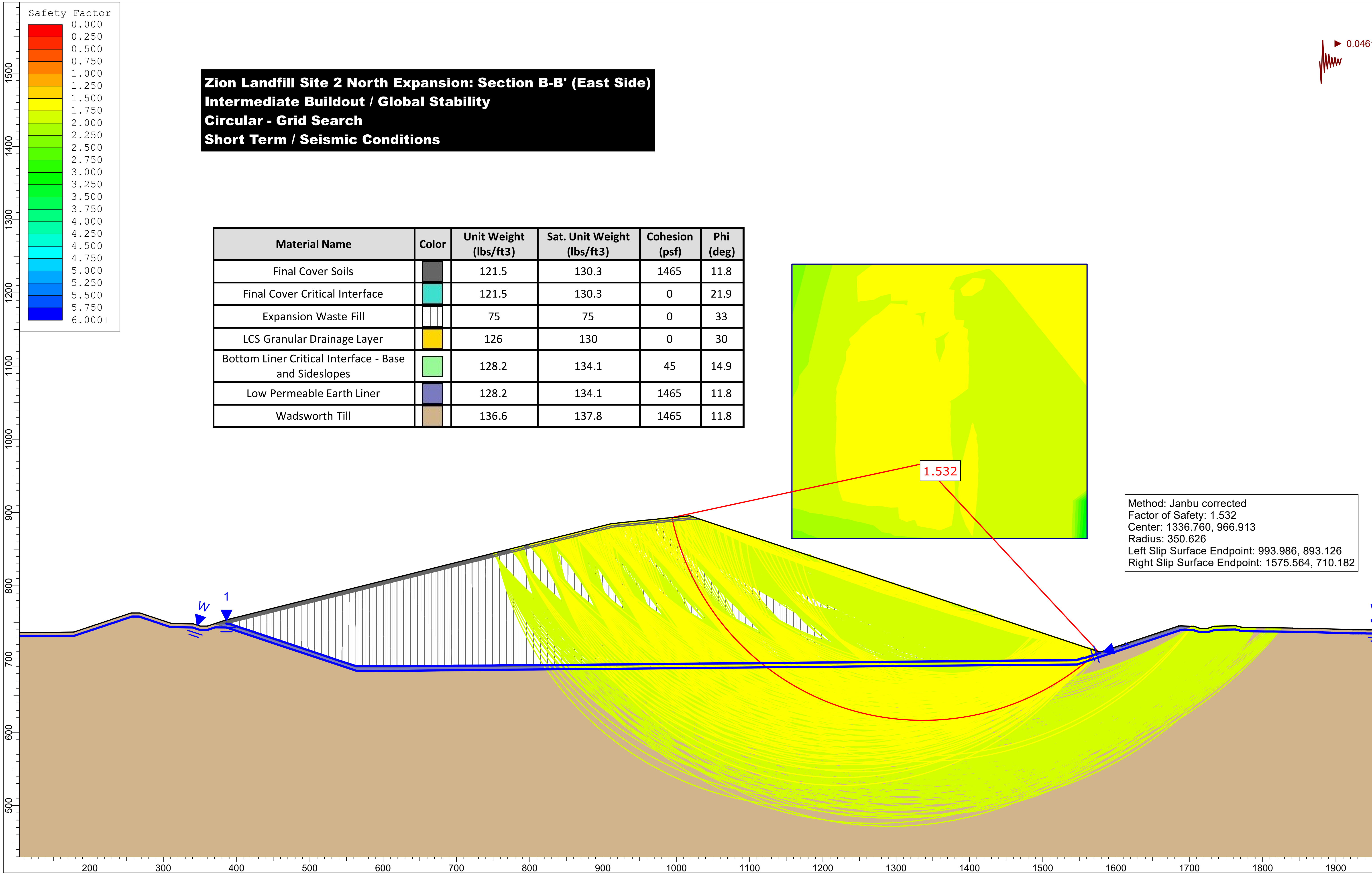
Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	

SLOPE STABILITY

SECTION **B-B'** – HORIZONTAL EXPANSION **(EAST SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

INTERIM WASTE HEIGHT / PARTIAL BUILDOUT LANDFORM
CIRCULAR ANALYSIS OF WASTE AND FOUNDATION
(ROTATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

B-B_inter_east_ST.slmd

APTIM

Slide Analysis Information

B-B_inter_east_ST

Project Summary

File Name:	B-B_inter_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:06.205s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.663310
Center:	1314.382, 1052.026
Radius:	428.452
Left Slip Surface Endpoint:	919.538, 885.684
Right Slip Surface Endpoint:	1573.555, 710.850
Resisting Moment:	1.25102e+09 lb-ft
Driving Moment:	7.52127e+08 lb-ft
Total Slice Area:	90101.7 ft2
Surface Horizontal Width:	654.016 ft
Surface Average Height:	137.767 ft

Method: janbu corrected

FS	1.532290
Center:	1336.760, 966.913
Radius:	350.626
Left Slip Surface Endpoint:	993.986, 893.126
Right Slip Surface Endpoint:	1575.564, 710.182
Resisting Horizontal Force:	2.33608e+06 lb
Driving Horizontal Force:	1.52457e+06 lb
Total Slice Area:	79621.5 ft2
Surface Horizontal Width:	581.578 ft
Surface Average Height:	136.906 ft

Method: spencer

FS	1.627470
Center:	1336.760, 1017.981
Radius:	384.332
Left Slip Surface Endpoint:	973.967, 891.125
Right Slip Surface Endpoint:	1569.560, 712.179
Resisting Moment:	9.41997e+08 lb-ft
Driving Moment:	5.7881e+08 lb-ft
Resisting Horizontal Force:	2.12121e+06 lb
Driving Horizontal Force:	1.30338e+06 lb
Total Slice Area:	74221.2 ft2
Surface Horizontal Width:	595.593 ft
Surface Average Height:	124.617 ft

Method: gle/morgenstern-price

FS	1.626360
Center:	1336.760, 1035.003
Radius:	395.922
Left Slip Surface Endpoint:	968.134, 890.542
Right Slip Surface Endpoint:	1567.114, 712.992
Resisting Moment:	9.58708e+08 lb-ft
Driving Moment:	5.8948e+08 lb-ft
Resisting Horizontal Force:	2.10439e+06 lb
Driving Horizontal Force:	1.29392e+06 lb
Total Slice Area:	72428.5 ft2
Surface Horizontal Width:	598.98 ft
Surface Average Height:	120.92 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	3952
Number of Invalid Surfaces:	855

Error Codes

Error Code -103 reported for 62 surfaces
Error Code -110 reported for 435 surfaces
Error Code -112 reported for 192 surfaces
Error Code -114 reported for 166 surfaces

Method: janbu corrected

Number of Valid Surfaces:	3980
Number of Invalid Surfaces:	827

Error Codes

Error Code -103 reported for 62 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 435 surfaces
Error Code -112 reported for 163 surfaces
Error Code -114 reported for 166 surfaces

Method: spencer

Number of Valid Surfaces:	3920
Number of Invalid Surfaces:	887

Error Codes

Error Code -103 reported for 62 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 435 surfaces
Error Code -111 reported for 7 surfaces
Error Code -112 reported for 216 surfaces
Error Code -114 reported for 166 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	3931
Number of Invalid Surfaces:	876

Error Codes
Error Code -103 reported for 62 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 435 surfaces
Error Code -112 reported for 212 surfaces
Error Code -114 reported for 166 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

Entity Information

Circ - thin layers

Shared Entities

Type	Coordinates (x,y)
	1688.75, 745.08 1685.18, 744.943 1685.18, 744.943 1685.16, 744.936 1685.16, 744.935 1685.15, 744.933 1685.14, 744.929 1685.08, 744.911 1664.79, 738.147 1578.23, 709.294 1032, 891 1026.16, 893 1025.72, 893.15 1018.58, 895.585 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082

	962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762

	267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014	

External Boundary	2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16

	1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366	

	1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539 1705.77, 744.739 1703.67, 744.781 1695.56, 744.943

Material Boundary	371.139, 747.994 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639

Material Boundary	369.041, 747.954 369.564, 747.963 371.196, 747.996 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1555.18, 701.611 1578.23, 709.294

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43 713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1025.72, 893.15

Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1026.16, 893

Material Boundary	386.057, 748.292 387.433, 748.636 391.315, 749.607 391.546, 749.665 392.519, 749.908 393.512, 750.156 394.527, 750.409 395.563, 750.668 396.622, 750.933 397.705, 751.204 398.812, 751.48 400.043, 751.789 413.487, 755.149 448.308, 763.851 565.249, 793.073 627.576, 808.658 686.32, 823.344 713.934, 830.247 737.922, 836.244 760.786, 841.96 782.6, 847.414 803.434, 852.623 823.354, 857.603 841.359, 862.105 842.427, 862.372 860.802, 866.965 878.345, 871.351 912.948, 880 913.197, 880.025 913.606, 880.066 923.199, 881.025 924.02, 881.107 943.205, 883.025 944.023, 883.107 963.211, 885.025 964.027, 885.106 983.216, 887.025 984.03, 887.106 1003.08, 889.011 1003.22, 889.025 1004.25, 889.128 1022.97, 891 1024.07, 891 1032, 891
Material Boundary	371.139, 747.994 371.196, 747.996

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364	Assigned to: Wadsworth Till

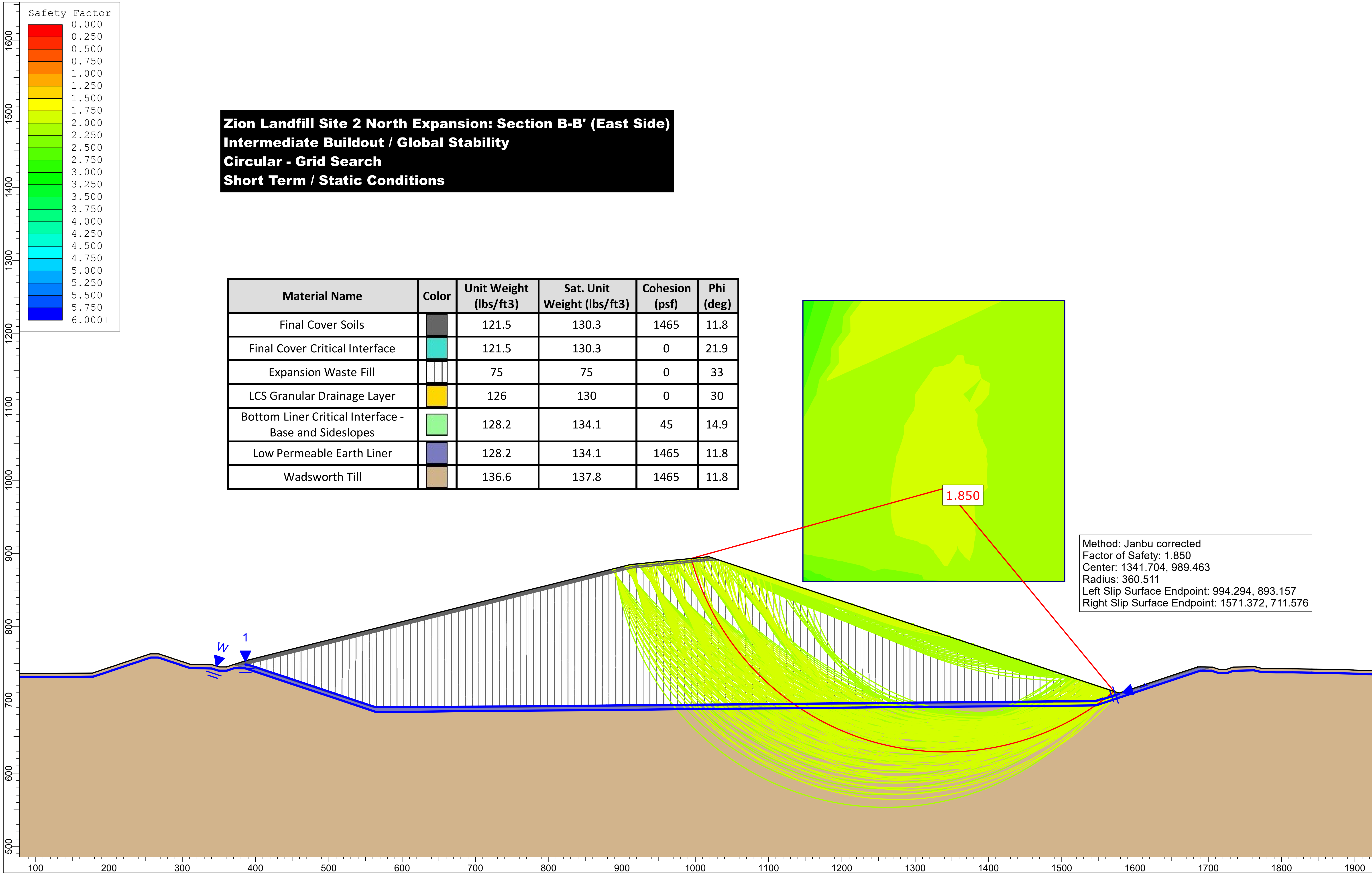
	198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257 223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203		

	385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.33, 740.212 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105		
Water Table	1767.72, 739.101 1768.46, 738.913 1772.79, 737.949		

	1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722 1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383		

	1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335 2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493		

	2243.14, 734.24 2246.4, 734.069 2300, 733.229	
Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1555.88, 701.845 1556.2, 700.896 1569.82, 705.436 1578.49, 708.327 1578.54, 708.185	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

B-B_inter_east_ST.slmd

APTIM

Slide Analysis Information

B-B_inter_east_ST

Project Summary

File Name:	B-B_inter_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:05.414s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.976480
Center:	1227.976, 1245.266
Radius:	403.573
Left Slip Surface Endpoint:	1038.996, 888.674
Right Slip Surface Endpoint:	1165.690, 846.528
Resisting Moment:	9.27754e+06 lb-ft
Driving Moment:	4.69397e+06 lb-ft
Total Slice Area:	495.404 ft2
Surface Horizontal Width:	126.694 ft
Surface Average Height:	3.91026 ft

Method: janbu corrected

FS	1.850490
Center:	1341.704, 989.463
Radius:	360.511
Left Slip Surface Endpoint:	994.294, 893.157
Right Slip Surface Endpoint:	1571.372, 711.576
Resisting Horizontal Force:	2.253e+06 lb
Driving Horizontal Force:	1.21752e+06 lb
Total Slice Area:	72867.6 ft2
Surface Horizontal Width:	577.078 ft
Surface Average Height:	126.27 ft

Method: spencer

FS	1.940670
Center:	1357.951, 1053.414
Radius:	407.705
Left Slip Surface Endpoint:	983.533, 892.081
Right Slip Surface Endpoint:	1577.156, 709.652
Resisting Moment:	9.52647e+08 lb-ft
Driving Moment:	4.90886e+08 lb-ft
Resisting Horizontal Force:	2.04125e+06 lb
Driving Horizontal Force:	1.05183e+06 lb
Total Slice Area:	66038.9 ft2
Surface Horizontal Width:	593.624 ft
Surface Average Height:	111.247 ft

Method: gle/morgenstern-price

FS	1.933010
Center:	1357.951, 1074.730
Radius:	420.574
Left Slip Surface Endpoint:	979.311, 891.659
Right Slip Surface Endpoint:	1570.553, 711.849
Resisting Moment:	9.44916e+08 lb-ft
Driving Moment:	4.88831e+08 lb-ft
Resisting Horizontal Force:	1.97787e+06 lb
Driving Horizontal Force:	1.02321e+06 lb
Total Slice Area:	62422 ft2
Surface Horizontal Width:	591.241 ft
Surface Average Height:	105.578 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	3990
Number of Invalid Surfaces:	817
Error Codes	
Error Code -103 reported for 11 surfaces	
Error Code -110 reported for 368 surfaces	
Error Code -112 reported for 172 surfaces	
Error Code -114 reported for 266 surfaces	

Method: janbu corrected

Number of Valid Surfaces:	4005
Number of Invalid Surfaces:	802
Error Codes	
Error Code -103 reported for 11 surfaces	
Error Code -108 reported for 2 surfaces	
Error Code -110 reported for 368 surfaces	
Error Code -112 reported for 155 surfaces	
Error Code -114 reported for 266 surfaces	

Method: spencer

Number of Valid Surfaces:	3977
Number of Invalid Surfaces:	830
Error Codes	
Error Code -103 reported for 11 surfaces	
Error Code -108 reported for 2 surfaces	
Error Code -110 reported for 368 surfaces	
Error Code -111 reported for 8 surfaces	
Error Code -112 reported for 175 surfaces	
Error Code -114 reported for 266 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	3982
Number of Invalid Surfaces:	825
Error Codes	
Error Code -103 reported for 11 surfaces	
Error Code -108 reported for 2 surfaces	
Error Code -110 reported for 368 surfaces	
Error Code -111 reported for 2 surfaces	
Error Code -112 reported for 176 surfaces	
Error Code -114 reported for 266 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

Entity Information

Circ - thin layers

Shared Entities

Type	Coordinates (x,y)
	1688.75, 745.08 1685.18, 744.943 1685.18, 744.943 1685.16, 744.936 1685.16, 744.935 1685.15, 744.933 1685.14, 744.929 1685.08, 744.911 1664.79, 738.147 1578.23, 709.294 1032, 891 1026.16, 893 1025.72, 893.15 1018.58, 895.585 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892

	963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229	

	270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014	

External Boundary	2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335

	1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351	

	1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539 1705.77, 744.739 1703.67, 744.781 1695.56, 744.943

Material Boundary	371.139, 747.994 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639

Material Boundary	369.041, 747.954 369.564, 747.963 371.196, 747.996 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1555.18, 701.611 1578.23, 709.294

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43 713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1025.72, 893.15

Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1026.16, 893

Material Boundary	386.057, 748.292 387.433, 748.636 391.315, 749.607 391.546, 749.665 392.519, 749.908 393.512, 750.156 394.527, 750.409 395.563, 750.668 396.622, 750.933 397.705, 751.204 398.812, 751.48 400.043, 751.789 413.487, 755.149 448.308, 763.851 565.249, 793.073 627.576, 808.658 686.32, 823.344 713.934, 830.247 737.922, 836.244 760.786, 841.96 782.6, 847.414 803.434, 852.623 823.354, 857.603 841.359, 862.105 842.427, 862.372 860.802, 866.965 878.345, 871.351 912.948, 880 913.197, 880.025 913.606, 880.066 923.199, 881.025 924.02, 881.107 943.205, 883.025 944.023, 883.107 963.211, 885.025 964.027, 885.106 983.216, 887.025 984.03, 887.106 1003.08, 889.011 1003.22, 889.025 1004.25, 889.128 1022.97, 891 1024.07, 891 1032, 891
Material Boundary	371.139, 747.994 371.196, 747.996

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364	Assigned to: Wadsworth Till

	198.554, 738.399		
	198.861, 738.501		
	199.339, 738.661		
	200.776, 739.14		
	200.997, 739.213		
	201.651, 739.431		
	201.708, 739.45		
	202.375, 739.673		
	202.96, 739.868		
	203.066, 739.903		
	203.951, 740.198		
	204.163, 740.269		
	205.695, 740.779		
	206.113, 740.918		
	206.403, 741.015		
	206.704, 741.116		
	206.992, 741.211		
	207.162, 741.268		
	207.356, 741.333		
	213.598, 743.414		
	219.127, 745.257		
	223.854, 746.832		
	225.127, 747.257		
	229.854, 748.832		
	231.127, 749.257		
	232.4, 749.681		
	237.127, 751.257		
	238.4, 751.681		
	243.127, 753.257		
	247.941, 754.861		
	249.127, 755.257		
	254.049, 756.897		
	255.127, 757.257		
	257.07, 757.904		
	259.897, 757.906		
	267.095, 757.918		
	269.085, 757.256		
	274.405, 755.485		
	275.094, 755.256		
	280.488, 753.46		
	281.102, 753.256		
	286.576, 751.434		
	287.111, 751.256		
	292.616, 749.424		
	293.12, 749.256		
	298.867, 747.343		
	299.129, 747.256		
	299.331, 747.189		
	305.137, 745.256		
	306.093, 744.938		
	308.139, 744.257		
	310.17, 743.58		
	311.956, 743.54		
	340.176, 742.974		
	349.223, 739.958		
	350.337, 739.956		
	360.847, 739.955		
	361.891, 740.301		
	370.6, 743.203		

	385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.33, 740.212 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105		
Water Table	1767.72, 739.101 1768.46, 738.913 1772.79, 737.949		

	1773.36, 737.944	
	1779.28, 737.93	
	1787.81, 737.786	
	1792.3, 737.722	
	1800.94, 737.614	
	1814.87, 737.579	
	1826.26, 737.371	
	1838.69, 737.163	
	1840.03, 737.158	
	1840.81, 737.155	
	1841.22, 737.151	
	1841.48, 737.147	
	1847.4, 737.001	
	1892.14, 736.059	
	1897.9, 735.837	
	1915.54, 735.228	
	1916.61, 735.205	
	1917.52, 735.183	
	1920.42, 735.09	
	1923.11, 735.001	
	1923.25, 735	
	1923.71, 735.001	
	1923.77, 735.001	
	1927.27, 735.005	
	1930.39, 735.007	
	1930.8, 735.006	
	1934.96, 735.008	
	1935.34, 735.008	
	1939.87, 735.009	
	1940.15, 735.004	
	1942.25, 734.789	
	1947.23, 734.799	
	1952.08, 734.831	
	1955.77, 734.898	
	1955.95, 734.892	
	1958.79, 734.961	
	1958.82, 734.96	
	1960.66, 734.994	
	1962.1, 734.978	
	1966.34, 734.837	
	1970.07, 734.872	
	1970.19, 734.876	
	1971.89, 734.933	
	1972.06, 734.942	
	1972.35, 734.958	
	1974.24, 735.179	
	1974.56, 735.224	
	1976.51, 735.491	
	1977.05, 735.576	
	1979.08, 735.893	
	1981.03, 736.234	
	1982.08, 736.415	
	1983.3, 736.648	
	1984.15, 736.81	
	1985.71, 737.106	
	1987.91, 737.555	
	1990.31, 738.046	
	1992.64, 738.554	
	1996.46, 739.383	

	1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335 2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493		

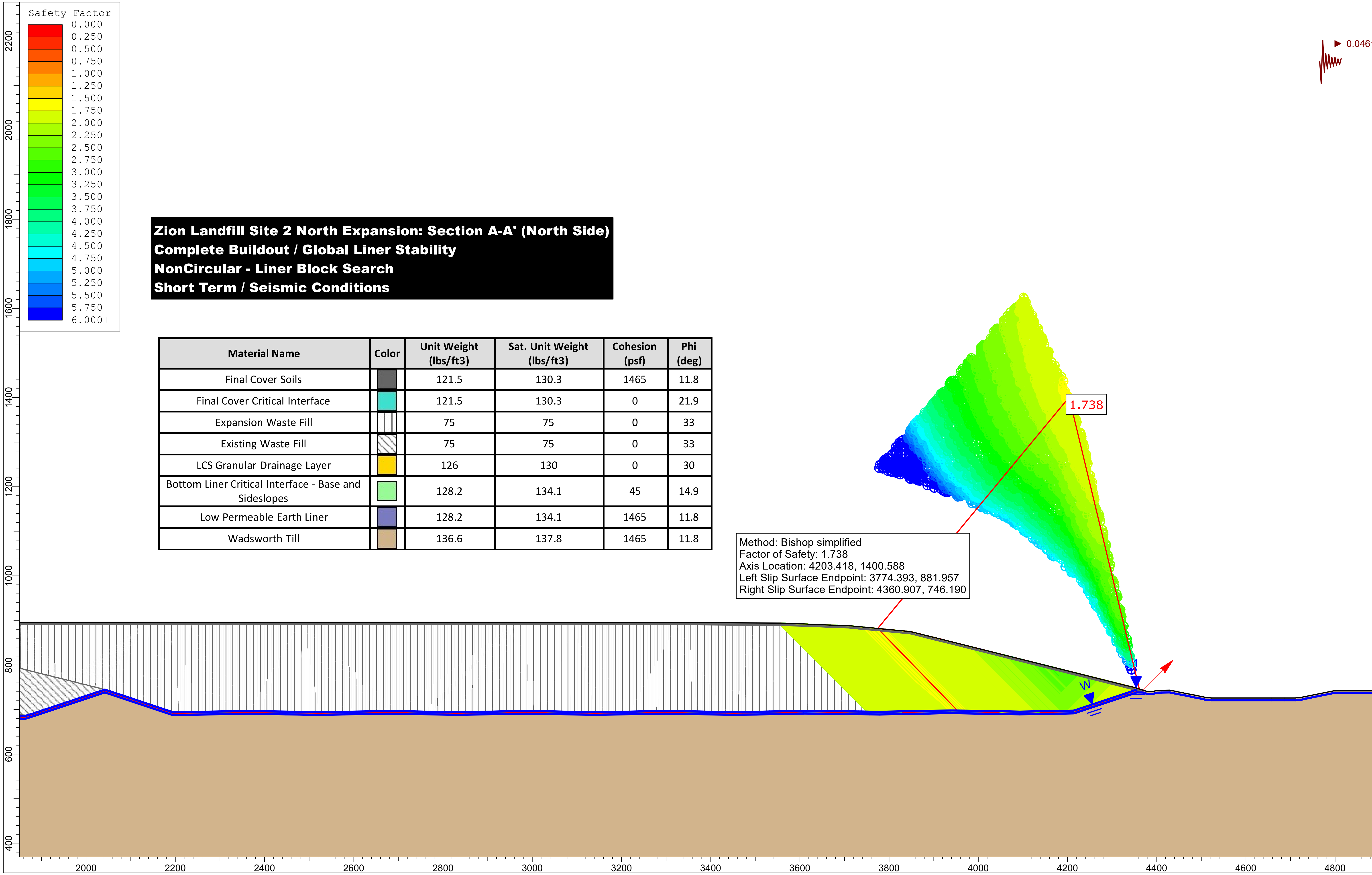
	2243.14, 734.24 2246.4, 734.069 2300, 733.229	
Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1555.88, 701.845 1556.2, 700.896 1569.82, 705.436 1578.49, 708.327 1578.54, 708.185	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

SLOPE STABILITY

SECTION A-A' – HORIZONTAL EXPANSION (NORTH SLOPE)

GLOBAL LINER STABILITY ANALYSIS

COMPLETE BUILD-OUT / FINAL LANDFORM
BLOCK ANALYSIS OF LINER SYSTEM
(TRANSLATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Slide Analysis Information

A-A_final_north_ST

Project Summary

File Name:	A-A_final_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:12m:03.634s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1

Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.738030
Axis Location:	4203.418, 1400.588
Left Slip Surface Endpoint:	3774.393, 881.957
Right Slip Surface Endpoint:	4360.907, 746.190
Resisting Moment:	1.08098e+09 lb-ft
Driving Moment:	6.2196e+08 lb-ft
Total Slice Area:	52042.4 ft2
Surface Horizontal Width:	586.514 ft
Surface Average Height:	88.7316 ft

Method: janbu corrected

FS	1.760990
Axis Location:	4203.418, 1400.588
Left Slip Surface Endpoint:	3774.393, 881.957
Right Slip Surface Endpoint:	4360.907, 746.190
Resisting Horizontal Force:	1.43568e+06 lb
Driving Horizontal Force:	815273 lb
Total Slice Area:	52042.4 ft2
Surface Horizontal Width:	586.514 ft
Surface Average Height:	88.7316 ft

Method: spencer

FS	1.821320
Axis Location:	4186.238, 1446.790
Left Slip Surface Endpoint:	3730.756, 886.112
Right Slip Surface Endpoint:	4361.491, 745.997
Resisting Moment:	1.24661e+09 lb-ft
Driving Moment:	6.84454e+08 lb-ft
Resisting Horizontal Force:	1.48704e+06 lb
Driving Horizontal Force:	816461 lb
Total Slice Area:	56177.1 ft2
Surface Horizontal Width:	630.735 ft
Surface Average Height:	89.0661 ft

Method: gle/morgenstern-price

FS	1.819090
Axis Location:	4190.916, 1436.686
Left Slip Surface Endpoint:	3740.937, 885.141
Right Slip Surface Endpoint:	4362.164, 745.775
Resisting Moment:	1.24034e+09 lb-ft
Driving Moment:	6.81848e+08 lb-ft
Resisting Horizontal Force:	1.48512e+06 lb
Driving Horizontal Force:	816411 lb
Total Slice Area:	57221 ft2
Surface Horizontal Width:	621.227 ft
Surface Average Height:	92.1097 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
3774.39	881.957
3954.26	696.749
3963.45	696.44
4024.47	695.397
4071.54	694.593
4094.56	694.261
4151.61	695.262
4172.87	695.634
4213.72	696.502
4287.96	721.074
4346.98	740.737
4357.25	744.154
4360.91	746.19

Method: janbu corrected

X	Y
3774.39	881.957
3954.26	696.749
3963.45	696.44
4024.47	695.397
4071.54	694.593
4094.56	694.261
4151.61	695.262
4172.87	695.634
4213.72	696.502
4287.96	721.074
4346.98	740.737
4357.25	744.154
4360.91	746.19

Method: spencer

X	Y
3730.76	886.112
3949.28	696.833
3963.05	696.446
4023.52	695.413
4071.81	694.588
4093.12	694.236
4151.17	695.254
4172.66	695.631
4213.72	696.502
4287.94	721.069
4346.98	740.734
4357.26	744.158
4361.49	745.997

Method: gle/morgenstern-price

X	Y
3740.94	885.141
3856.43	765.938
3938.02	697.024
3961.75	696.469
3964.7	696.418
4024.69	695.394
4068.42	694.646
4092.93	694.233
4151.64	695.262
4172.75	695.633
4213.72	696.502
4286.68	720.648
4346.58	740.611
4347.5	740.924
4362.16	745.775

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4753
Number of Invalid Surfaces:	251

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 6 surfaces
Error Code -110 reported for 242 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4755
Number of Invalid Surfaces:	249

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 242 surfaces

Method: spencer

Number of Valid Surfaces:	4411
Number of Invalid Surfaces:	593

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 44 surfaces
Error Code -110 reported for 242 surfaces
Error Code -111 reported for 304 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4118
Number of Invalid Surfaces:	886

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 54 surfaces
Error Code -110 reported for 242 surfaces
Error Code -111 reported for 587 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	4801.25, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.31, 736.526 4461.97, 736.994 4456.92, 738 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012

	3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889

	1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851	

External Boundary	1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851

	848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851	

	634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740	

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Material Boundary	1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868

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	1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033 1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969 1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582	

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Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009

	465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852	

	947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02	

	1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858
Material Boundary	1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266

	1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657	

	3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054 3660.7, 695.468 3690.86, 695.09 3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156

	483.505, 727
	486.035, 726.158
	489.513, 725
	493.701, 723.607
	495.524, 723
	499.16, 721.79
	507.535, 719
	509.344, 718.398
	513.543, 717
	515.347, 716.4
	519.551, 715
	521.35, 714.401
	525.559, 713
	529.162, 711.807
	537.749, 709
	539.827, 708.301
	543.591, 707
	545.694, 706.3
	549.599, 705
	551.706, 704.298
	555.606, 703
	560.534, 701.359
	567.615, 699
	570.071, 698.182
	573.623, 697
	577.692, 695.645
	579.631, 695
	583.706, 693.643
	583.706, 693.643
	585.639, 693
	594.551, 690.033
	597.655, 689
	599.571, 688.362
	603.662, 687
	608.129, 685.513
	609.67, 685
	618.233, 685
	628.127, 685.241
	628.175, 685.242
	700.514, 687
	768.454, 688.654
	835.534, 687
	874.622, 687
	885.02, 687
	885.837, 687
	914.501, 685.056
	914.512, 685.056
	916.783, 685
	918.713, 684.952
	920.67, 685
	922.861, 685.058
	931.35, 685.433
	933.943, 685.923
	944.266, 687
	947.065, 687.849
	951.886, 689
	965.137, 692.608
	966.644, 693
	967.06, 693.116

Material Boundary	971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691	

	1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731	

	2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

466.102, 750.086
473.419, 751.912
474.113, 752.086
474.811, 752.26
482.112, 754.086
486.617, 755.213
490.077, 756.086
493.601, 756.959
498.102, 758.085
501.607, 758.968
506.077, 760.086
513.383, 761.907
514.104, 762.086
514.812, 762.264
522.084, 764.086
525.707, 764.991
530.085, 766.086
538.079, 768.081
538.353, 768.15
538.357, 768.15
546.101, 770.086
553.36, 771.901
554.096, 772.086
554.833, 772.27
562.083, 774.086
565.979, 775.06
570.084, 776.086
574.006, 777.066
578.084, 778.086
582.033, 779.073
586.085, 780.086
593.341, 781.898
594.104, 782.086
594.853, 782.275
602.111, 784.086
606.157, 785.097
610.11, 786.086
614.194, 787.107
618.11, 788.086
622.223, 789.116
626.101, 790.086
633.31, 791.888
634.101, 792.086
634.901, 792.286
642.101, 794.086
645.858, 795.025
650.112, 796.086
654.377, 797.152
658.111, 798.086
662.404, 799.162
666.101, 800.086
673.276, 801.878
674.112, 802.086
674.953, 802.296
674.961, 802.298
682.111, 804.086
685.598, 804.957
690.111, 806.086
693.564, 806.949

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423	

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4481.94, 733 4486.94, 732

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581	Assigned to: Wadsworth Till

	731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352		

	1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687		
Water Table	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112		

	2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899		

	4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097		

	4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054	
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

	594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628		

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	2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44		

	3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273		
	425.446, 740.017 435.797, 740.214 440.59, 740.214 447.446, 737.929 450.009, 737.075 453.446, 735.929 454.615, 735.539 456.889, 734.782 459.451, 733.929 462, 733.08 465.468, 731.925 465.47, 731.925 470.544, 730.236 477.472, 727.929 480.007, 727.085 483.482, 725.929 486.011, 725.087 489.489, 723.929 493.677, 722.536 495.5, 721.929 499.136, 720.718 507.512, 717.929 509.321, 717.327 513.52, 715.929 515.323, 715.328 519.528, 713.929 521.326, 713.33 525.536, 711.929 529.138, 710.736 537.726, 707.929 539.803, 707.23 543.567, 705.929 545.671, 705.229 549.575, 703.929 551.683, 703.227 555.583, 701.929 560.51, 700.288 567.591, 697.929 570.047, 697.111 573.599, 695.929 577.668, 694.574 579.607, 693.929 583.685, 692.571		

	583.686, 692.571		
	585.615, 691.929		
	594.527, 688.962		
	597.631, 687.929		
	599.548, 687.291		
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	609.658, 683.925		
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	914.511, 683.981		
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	982.558, 695.618		
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	993.868, 697.926		
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	1013.64, 701.927		
	1014.5, 702.11		
	1029.04, 703.926		
	1036.49, 705.07		
	1049.44, 705.925		
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	1060.93, 706.72		
	1067.29, 706.783		
	1069.81, 706.787		
	1084.54, 705.925		
	1094.29, 705.441		
	1105.89, 703.925		
	1109.3, 703.581		
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	1116.79, 702.605		
	1119.84, 702.052		
	1120.43, 701.926		
	1128.58, 700.387		
	1130.67, 699.927		
	1136.58, 698.73		

Block Search Polyline	1140.33, 697.927 1147.14, 696.555 1150.08, 695.926 1152.33, 695.513 1158.73, 693.927 1164.45, 692.441 1180.86, 692.083 1199.19, 691.925 1219.92, 691.746 1247.58, 691.455 1274.37, 691.925 1354.83, 693.335 1380.25, 692.817 1449.64, 691.925 1461.71, 691.925 1495.01, 691.925 1500.47, 691.925 1516.31, 691.202 1637.28, 689.925 1692.85, 689.925 1719.06, 689.062 1781.17, 688.321 1807.13, 687.925 1816.05, 687.925 1826.74, 687.925 1846.45, 687.095 1850.06, 685.929 1855, 684.207 1855.85, 683.925 1856.55, 683.925 1858.87, 683.925 1862.02, 683.925 1866.63, 685.435 1867.46, 685.702 1868.14, 685.929 1868.43, 686.031 1874.48, 687.925 1874.48, 687.925 1875.81, 688.369 1880.5, 689.925 1880.55, 689.925 1881.88, 690.368 1886.56, 691.929 1891.25, 693.492 1892.56, 693.929 1893.81, 694.361 1893.86, 694.361 1898.56, 695.929 1899.8, 696.359 1899.85, 696.359 1904.56, 697.929 1905.8, 698.358 1905.85, 698.358 1910.56, 699.929 1911.79, 700.356 1911.84, 700.356 1916.56, 701.929 1917.79, 702.355 1917.84, 702.354		

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	2072.86, 733.361 2127.45, 715.185 2173.36, 699.929 2195.02, 692.72 2195.1, 692.694 2195.24, 692.696 2195.59, 692.703 2366.91, 695.701 2388.56, 695.33 2447.68, 694.317 2475.13, 693.846 2503.22, 693.36 2521.93, 693.037 2580.01, 694.044 2600.94, 694.407 2620.04, 694.738 2676.93, 695.725 2698.12, 695.358 2754.86, 694.377 2812.84, 693.374 2824.98, 693.164 2831.93, 693.044 2851.01, 693.374 2908.97, 694.38 2965.96, 695.368 2986.93, 695.732 3007.83, 695.37 3064.92, 694.383 3122.95, 693.379 3141.93, 693.05 3160.86, 693.379 3218.92, 694.386 3276.17, 695.378 3296.93, 695.738 3317.63, 695.381 3374.97, 694.389 3433.1, 693.383 3451.93, 693.057 3470.7, 693.383 3501.92, 693.924 3529.71, 694.47 3555.9, 694.984 3593.09, 695.719 3608.3, 696.02 3613.84, 696.129 3660.7, 695.543 3690.86, 695.165 3711.25, 694.909 3731.91, 694.621 3737.39, 694.549 3756.25, 694.303 3778.84, 694.008 3829.53, 695.004 3847.89, 695.365 3856.62, 695.519 3876.56, 695.872 3891.57, 696.137 3937.75, 696.953 3943.28, 696.859		

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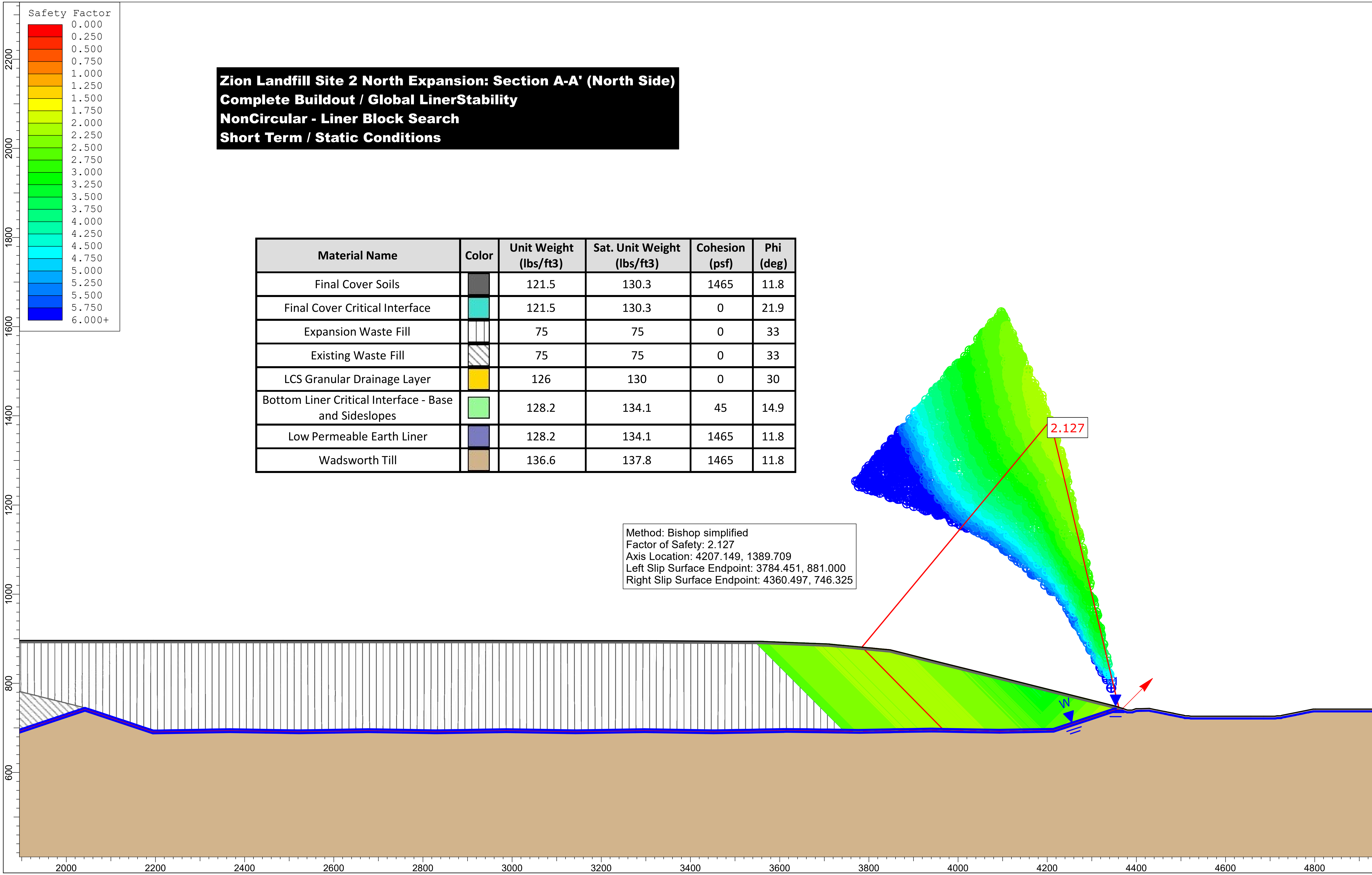

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

A-A_final_north_ST.slmd

APTIM

Slide Analysis Information

A-A_final_north_ST

Project Summary

File Name:	A-A_final_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:09m:07.240s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465

Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.127390
Axis Location:	4207.149, 1389.709
Left Slip Surface Endpoint:	3784.451, 881.000
Right Slip Surface Endpoint:	4360.497, 746.325
Resisting Moment:	1.05585e+09 lb-ft
Driving Moment:	4.96314e+08 lb-ft
Total Slice Area:	50052.7 ft2
Surface Horizontal Width:	576.046 ft
Surface Average Height:	86.8901 ft

Method: janbu corrected

FS	2.161960
Axis Location:	4207.149, 1389.709
Left Slip Surface Endpoint:	3784.451, 881.000
Right Slip Surface Endpoint:	4360.497, 746.325
Resisting Horizontal Force:	1.42178e+06 lb
Driving Horizontal Force:	657634 lb
Total Slice Area:	50052.7 ft2
Surface Horizontal Width:	576.046 ft
Surface Average Height:	86.8901 ft

Method: spencer

FS	2.241000
Axis Location:	4188.360, 1437.635
Left Slip Surface Endpoint:	3738.516, 885.371
Right Slip Surface Endpoint:	4360.265, 746.402
Resisting Moment:	1.24003e+09 lb-ft
Driving Moment:	5.53339e+08 lb-ft
Resisting Horizontal Force:	1.48699e+06 lb
Driving Horizontal Force:	663542 lb
Total Slice Area:	55419.1 ft2
Surface Horizontal Width:	621.749 ft
Surface Average Height:	89.1343 ft

Method: gle/morgenstern-price

FS	2.244370
Axis Location:	4187.938, 1445.456
Left Slip Surface Endpoint:	3732.849, 885.910
Right Slip Surface Endpoint:	4362.521, 745.658
Resisting Moment:	1.29292e+09 lb-ft
Driving Moment:	5.76074e+08 lb-ft
Resisting Horizontal Force:	1.53181e+06 lb
Driving Horizontal Force:	682511 lb
Total Slice Area:	57027.2 ft2
Surface Horizontal Width:	629.672 ft
Surface Average Height:	90.5665 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
3784.45	881
3966.58	696.536
4024.94	695.39
4071.47	694.594
4092.81	694.23
4150.86	695.249
4178.73	695.738
4213.73	696.503
4288.71	721.484
4344.39	739.878
4355.64	743.619
4360.5	746.325

Method: janbu corrected

X	Y
3784.45	881
3966.58	696.536
4024.94	695.39
4071.47	694.594
4092.81	694.23
4150.86	695.249
4178.73	695.738
4213.73	696.503
4288.71	721.484
4344.39	739.878
4355.64	743.619
4360.5	746.325

Method: spencer

X	Y
3738.52	885.371
3950.25	696.817
3961.54	696.472
4024.6	695.395
4071.5	694.594
4092.8	694.23
4151.6	695.262
4172.27	695.625
4213.72	696.502
4288.26	721.174
4346.38	740.692
4354.72	743.301
4360.26	746.402

Method: gle/morgenstern-price

X	Y
3732.85	885.91
3876.39	752.578
3943.07	696.976
3943.32	696.895
3963.47	696.439
4024.75	695.393
4074.07	694.55
4095.38	694.275
4151.55	695.261
4172.71	695.632
4213.72	696.502
4288.21	721.16
4348.82	741.412
4351.35	742.275
4362.52	745.658

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4758
Number of Invalid Surfaces:	246

Error Codes
Error Code -106 reported for 3 surfaces
Error Code -108 reported for 5 surfaces
Error Code -110 reported for 238 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4759
Number of Invalid Surfaces:	245

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 238 surfaces

Method: spencer

Number of Valid Surfaces:	4289
Number of Invalid Surfaces:	715

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 66 surfaces
Error Code -110 reported for 238 surfaces
Error Code -111 reported for 408 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4131
Number of Invalid Surfaces:	873

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 64 surfaces
Error Code -110 reported for 238 surfaces
Error Code -111 reported for 568 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	4801.25, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355

	4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.31, 736.526 4461.97, 736.994 4456.92, 738 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939	

	3742.72, 884.971
	3742.42, 885
	3736.08, 885.603
	3731.91, 886
	3712.33, 887.896
	3711.25, 888
	3660.7, 890
	3608.3, 892
	3555.9, 894
	3501.92, 894.208
	3324.04, 895.343
	3093.34, 895.755
	2956.54, 896
	2486.56, 896
	2475.13, 896
	2234.57, 896
	2195.59, 896
	2181.65, 896
	2141.81, 896
	2127.47, 896
	1858.87, 896
	1616.33, 896
	1495.01, 896
	1458.28, 896
	1456.86, 896.353
	1456.85, 896.354
	1454.84, 896.853
	1447.37, 898.703
	1446.76, 898.853
	1439.22, 900.721
	1438.69, 900.853
	1431.08, 902.74
	1430.62, 902.853
	1429.15, 903.217
	1429.15, 903.218
	1422.55, 904.853
	1415.47, 906.607
	1415.47, 906.607
	1414.48, 906.853
	1406.62, 908.801
	1406.4, 908.853
	1398.46, 910.822
	1398.33, 910.853
	1390.3, 912.844
	1390.26, 912.853
	1390.12, 912.889
	1390.12, 912.889
	1386.77, 913.717
	1380.94, 914.966
	1373.16, 915.464
	1354.04, 916.986
	1349.5, 917.317
	1340.81, 917.854
	1326.59, 918.986
	1314.16, 919.891
	1308.46, 920.243
	1299.13, 920.986
	1278.82, 922.465
	1276.11, 922.633

External Boundary	1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851	

	989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098	

	793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664	

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	1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692 1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426
Material Boundary	

	1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769	

	2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336	

	4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896
	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307

	606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206 968.611, 687.32 973.02, 688.452 975.698, 689.053 976.071, 689.127 983.756, 690.815 985.339, 691.121 992.008, 692.55 995.001, 693.111 1013.14, 696.789 1014.83, 697.123 1015.48, 697.262 1029.86, 699.057 1037.13, 700.174 1049.88, 701.017 1054.93, 701.439 1061.13, 701.796 1067.32, 701.858 1069.64, 701.862 1084.22, 701.009 1093.76, 700.535 1105.21, 699.039 1108.62, 698.694 1113.85, 698.014 1115.88, 697.749 1118.7, 697.239 1119.27, 697.117 1127.39, 695.581 1129.45, 695.129 1135.37, 693.93 1139.13, 693.125 1145.94, 691.753 1148.93, 691.114 1151.08, 690.719 1157.27, 689.184 1163.63, 687.532	

	1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1848.18, 681.312 1853.09, 679.599 1854.88, 679 1856.55, 679 1858.87, 679 1862.97, 679 1868.47, 680.801 1869.31, 681.074 1870.05, 681.322 1870.29, 681.404 1875.39, 683 1875.45, 683 1877.69, 683.747 1881.46, 685 1881.51, 685
Material Boundary	1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431 1912.81, 695.431 1918.47, 697.32 1918.79, 697.429 1918.8, 697.429 1924.47, 699.32 1924.78, 699.428 1924.8, 699.428 1930.47, 701.32 1930.78, 701.426 1930.79, 701.426

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	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255

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Material Boundary	1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26

	2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308	

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	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713

	529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707	

	1054.51, 707.425	
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	1147.15, 697.628	
	1150.1, 697	
Material Boundary	1152.34, 696.587	
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	1899.79, 697.434	
	1899.84, 697.434	
	1904.54, 699	
	1905.79, 699.433	
	1905.84, 699.433	

	1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402	

	2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8
Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94

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	693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719 713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94	

Material Boundary	904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295 922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274	

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	426.201, 740.106 442.121, 744.086 449.756, 745.995

	450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919 466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296	

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	884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773 906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461	
Material Boundary		

	1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423 1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84

	1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974 1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686	

	4361.26, 743.112
Material Boundary	4481.94, 733 4486.94, 732

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023	Assigned to: Wadsworth Till

	675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316		

Water Table	1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38		

	2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517		

	4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448		

		4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054	
		435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

	573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126		

Piezoline	1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703		

	1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743		

	2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984		

	3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273		
	425.446, 740.017 435.797, 740.214 440.59, 740.214 447.446, 737.929 450.009, 737.075 453.446, 735.929 454.615, 735.539 456.889, 734.782 459.451, 733.929 462, 733.08 465.468, 731.925 465.47, 731.925 470.544, 730.236 477.472, 727.929 480.007, 727.085 483.482, 725.929 486.011, 725.087 489.489, 723.929 493.677, 722.536 495.5, 721.929 499.136, 720.718 507.512, 717.929 509.321, 717.327 513.52, 715.929 515.323, 715.328 519.528, 713.929 521.326, 713.33 525.536, 711.929 529.138, 710.736 537.726, 707.929 539.803, 707.23 543.567, 705.929 545.671, 705.229 549.575, 703.929 551.683, 703.227 555.583, 701.929 560.51, 700.288		

	567.591, 697.929 570.047, 697.111 573.599, 695.929 577.668, 694.574 579.607, 693.929 583.685, 692.571 583.686, 692.571 585.615, 691.929 594.527, 688.962 597.631, 687.929 599.548, 687.291 603.639, 685.929 608.105, 684.442 609.658, 683.925 618.234, 683.925 628.129, 684.166 628.177, 684.167 700.515, 685.925 768.454, 687.578 835.533, 685.925 874.622, 685.925 885.02, 685.925 885.834, 685.925 914.498, 683.981 914.511, 683.981 916.781, 683.925 918.713, 683.877 920.672, 683.925 922.863, 683.983 931.358, 684.358 933.954, 684.848 944.281, 685.926 947.085, 686.777 951.905, 687.927 965.156, 691.535 966.664, 691.928 967.079, 692.043 971.634, 693.213 974.471, 693.85 974.857, 693.927 982.558, 695.618 984.156, 695.927 990.842, 697.36 993.868, 697.926 1011.98, 701.598 1013.64, 701.927 1014.5, 702.11 1029.04, 703.926 1036.49, 705.07 1049.44, 705.925 1054.51, 706.35 1060.93, 706.72 1067.29, 706.783 1069.81, 706.787 1084.54, 705.925 1094.29, 705.441 1105.89, 703.925 1109.3, 703.581 1114.61, 702.889		

Block Search Polyline	1116.79, 702.605 1119.84, 702.052 1120.43, 701.926 1128.58, 700.387 1130.67, 699.927 1136.58, 698.73 1140.33, 697.927 1147.14, 696.555 1150.08, 695.926 1152.33, 695.513 1158.73, 693.927 1164.45, 692.441 1180.86, 692.083 1199.19, 691.925 1219.92, 691.746 1247.58, 691.455 1274.37, 691.925 1354.83, 693.335 1380.25, 692.817 1449.64, 691.925 1461.71, 691.925 1495.01, 691.925 1500.47, 691.925 1516.31, 691.202 1637.28, 689.925 1692.85, 689.925 1719.06, 689.062 1781.17, 688.321 1807.13, 687.925 1816.05, 687.925 1826.74, 687.925 1846.45, 687.095 1850.06, 685.929 1855, 684.207 1855.85, 683.925 1856.55, 683.925 1858.87, 683.925 1862.02, 683.925 1866.63, 685.435 1867.46, 685.702 1868.14, 685.929 1868.43, 686.031 1874.48, 687.925 1874.48, 687.925 1875.81, 688.369 1880.5, 689.925 1880.55, 689.925 1881.88, 690.368 1886.56, 691.929 1891.25, 693.492 1892.56, 693.929 1893.81, 694.361 1893.86, 694.361 1898.56, 695.929 1899.8, 696.359 1899.85, 696.359 1904.56, 697.929 1905.8, 698.358 1905.85, 698.358	

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	2025.76, 738.327	
	2030.57, 739.929	
	2031.75, 740.329	
	2036.55, 741.929	
	2041.91, 743.664	
	2059.98, 737.663	
	2072.86, 733.361	
	2127.45, 715.185	
	2173.36, 699.929	
	2195.02, 692.72	
	2195.1, 692.694	
	2195.24, 692.696	
	2195.59, 692.703	
	2366.91, 695.701	
	2388.56, 695.33	
	2447.68, 694.317	
	2475.13, 693.846	
	2503.22, 693.36	
	2521.93, 693.037	
	2580.01, 694.044	
	2600.94, 694.407	
	2620.04, 694.738	
	2676.93, 695.725	
	2698.12, 695.358	
	2754.86, 694.377	
	2812.84, 693.374	
	2824.98, 693.164	
	2831.93, 693.044	
	2851.01, 693.374	
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	2965.96, 695.368	
	2986.93, 695.732	
	3007.83, 695.37	
	3064.92, 694.383	
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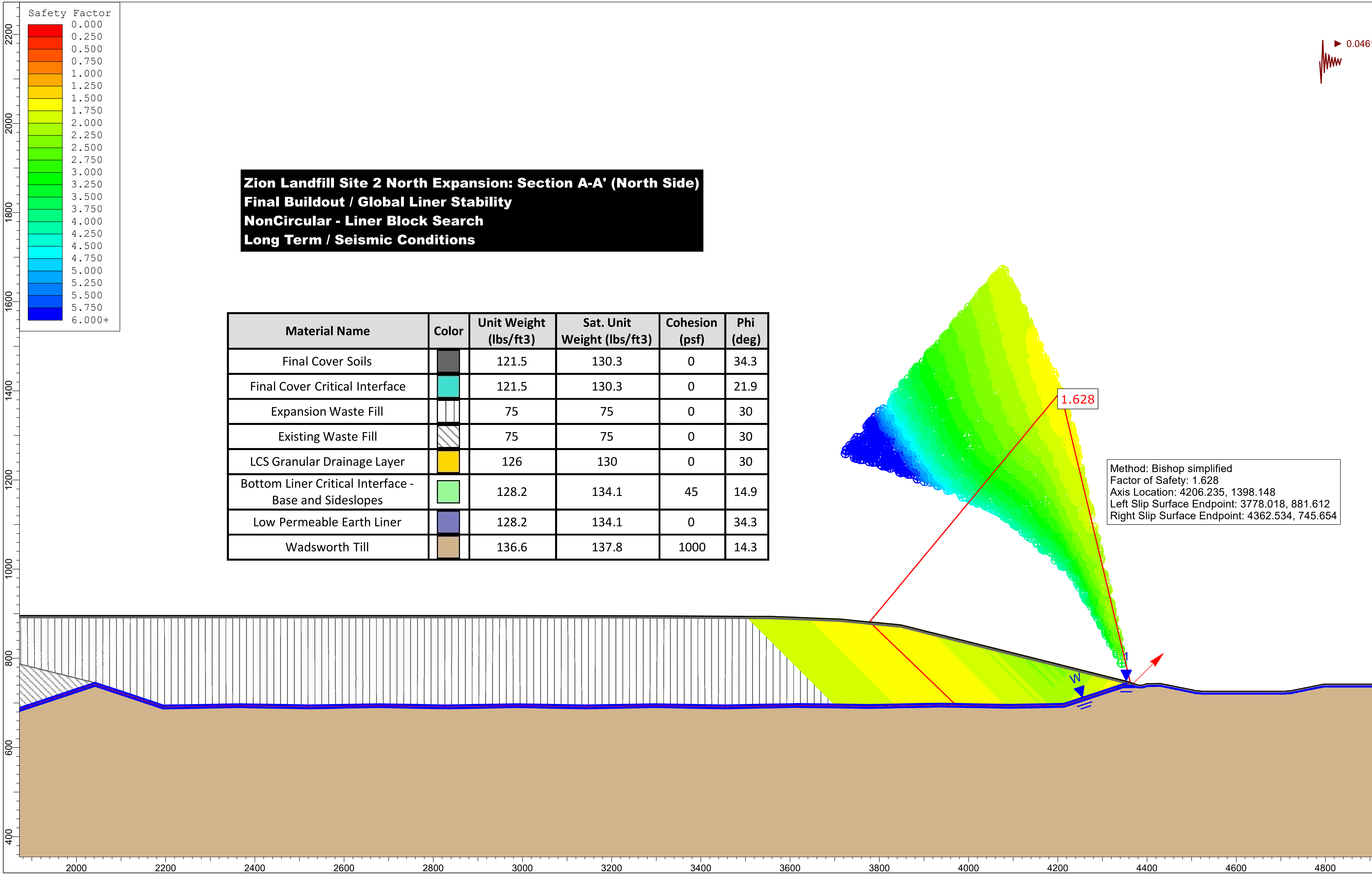
	3141.93, 693.05	
	3160.86, 693.379	
	3218.92, 694.386	
	3276.17, 695.378	
	3296.93, 695.738	
	3317.63, 695.381	
	3374.97, 694.389	
	3433.1, 693.383	
	3451.93, 693.057	
	3470.7, 693.383	
	3501.92, 693.924	
	3529.71, 694.47	
	3555.9, 694.984	
	3593.09, 695.719	
	3608.3, 696.02	
	3613.84, 696.129	
	3660.7, 695.543	
	3690.86, 695.165	
	3711.25, 694.909	
	3731.91, 694.621	
	3737.39, 694.549	
	3756.25, 694.303	
	3778.84, 694.008	
	3829.53, 695.004	

	3847.89, 695.365 3856.62, 695.519 3876.56, 695.872 3891.57, 696.137 3937.75, 696.953 3943.28, 696.859 3967.86, 696.44 4028.78, 695.399 4075.88, 694.594 4092.79, 694.305 4147.28, 695.261 4168.47, 695.633 4213.73, 696.427 4287.78, 721.093 4347.24, 740.9 4354.13, 743.197 4363.81, 742.98 4368.83, 742.903	



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
Existing Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:08m:56.753s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1

Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.627820
Axis Location:	4206.235, 1398.148
Left Slip Surface Endpoint:	3778.018, 881.612
Right Slip Surface Endpoint:	4362.534, 745.654
Resisting Moment:	9.96668e+08 lb-ft
Driving Moment:	6.12271e+08 lb-ft
Total Slice Area:	50249.9 ft2
Surface Horizontal Width:	584.515 ft
Surface Average Height:	85.9685 ft

Method: janbu corrected

FS	1.643350
Axis Location:	4209.187, 1390.534
Left Slip Surface Endpoint:	3785.293, 880.920
Right Slip Surface Endpoint:	4362.542, 745.651
Resisting Horizontal Force:	1.31816e+06 lb
Driving Horizontal Force:	802120 lb
Total Slice Area:	49439.4 ft2
Surface Horizontal Width:	577.249 ft
Surface Average Height:	85.6466 ft

Method: spencer

FS	1.710850
Axis Location:	4188.962, 1441.780
Left Slip Surface Endpoint:	3736.084, 885.603
Right Slip Surface Endpoint:	4362.177, 745.771
Resisting Moment:	1.1447e+09 lb-ft
Driving Moment:	6.69084e+08 lb-ft
Resisting Horizontal Force:	1.39117e+06 lb
Driving Horizontal Force:	813141 lb
Total Slice Area:	53911.6 ft2
Surface Horizontal Width:	626.093 ft
Surface Average Height:	86.1079 ft

Method: gle/morgenstern-price

FS	1.713160
Axis Location:	4191.987, 1434.678
Left Slip Surface Endpoint:	3743.057, 884.939
Right Slip Surface Endpoint:	4362.421, 745.691
Resisting Moment:	1.15033e+09 lb-ft
Driving Moment:	6.71465e+08 lb-ft
Resisting Horizontal Force:	1.40056e+06 lb
Driving Horizontal Force:	817531 lb
Total Slice Area:	55227.6 ft2
Surface Horizontal Width:	619.363 ft
Surface Average Height:	89.1683 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
3778.02	881.612
3970.55	696.469
4023.62	695.412
4072.53	694.576
4096.96	694.304
4151.36	695.257
4172.8	695.634
4213.72	696.502
4289.23	721.591
4345.65	740.293
4355.55	743.59
4362.53	745.654

Method: janbu corrected

X	Y
3785.29	880.92
3972.85	696.43
4023.62	695.412
4072.53	694.576
4094.16	694.255
4151.36	695.257
4172.85	695.635
4213.72	696.502
4286.81	720.692
4345.64	740.29
4355.55	743.589
4362.54	745.651

Method: spencer

X	Y
3736.08	885.603
3935.76	723.062
3971.74	696.449
4014.42	695.569
4077.97	694.483
4095.67	694.281
4151.49	695.26
4174.31	695.66
4213.75	696.503
4287.99	721.086
4347.72	740.984
4352.24	742.492
4362.18	745.771

Method: gle/morgenstern-price

X	Y
3743.06	884.939
3867.53	766.943
3959.55	696.657
4024.4	695.399
4071.5	694.594
4094	694.252
4145.62	695.157
4172.74	695.633
4213.72	696.502
4288.12	721.127
4348.33	741.194
4353.45	742.905
4362.42	745.691

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4769
Number of Invalid Surfaces:	235

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 3 surfaces
Error Code -110 reported for 229 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4766
Number of Invalid Surfaces:	238

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 6 surfaces
Error Code -110 reported for 229 surfaces

Method: spencer

Number of Valid Surfaces:	4381
Number of Invalid Surfaces:	623

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 49 surfaces
Error Code -110 reported for 229 surfaces
Error Code -111 reported for 342 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4131
Number of Invalid Surfaces:	873

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 44 surfaces
Error Code -110 reported for 229 surfaces
Error Code -111 reported for 597 surfaces

Error Code Descriptions

The following errors were encountered during the computation:
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-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).
-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.
-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	4801.13, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4481.94, 733 4481.87, 733 4476.94, 734 4476.94, 734 4471.48, 735.093 4466.94, 736 4466.94, 736 4466.94, 736 4464.31, 736.526 4461.43, 737.102 4456.94, 738 4456.94, 738 4451.39, 739.111 4446.94, 740 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875

	3838.52, 875.876
	3826.49, 877
	3817.3, 877.874
	3805.47, 879
	3795.83, 879.918
	3784.45, 881
	3774.39, 881.957
	3763.43, 883
	3753.28, 883.966
	3743.06, 884.939
	3742.72, 884.971
	3742.42, 885
	3736.08, 885.603
	3731.91, 886
	3712.33, 887.896
	3711.25, 888
	3660.7, 890
	3608.3, 892
	3555.9, 894
	3501.92, 894.208
	3324.04, 895.343
	3093.34, 895.755
	2956.54, 896
	2486.56, 896
	2475.13, 896
	2234.57, 896
	2195.59, 896
	2181.65, 896
	2141.81, 896
	2127.47, 896
	1858.87, 896
	1616.33, 896
	1495.01, 896
	1458.28, 896
	1456.86, 896.353
	1456.85, 896.354
	1454.84, 896.853
	1447.37, 898.703
	1446.76, 898.853
	1439.22, 900.721
	1438.69, 900.853
	1431.08, 902.74
	1430.62, 902.853
	1429.15, 903.217
	1429.15, 903.218
	1422.55, 904.853
	1415.47, 906.607
	1415.47, 906.607
	1414.48, 906.853
	1406.62, 908.801
	1406.4, 908.853
	1398.46, 910.822
	1398.33, 910.853
	1390.3, 912.844
	1390.26, 912.853
	1390.12, 912.889
	1390.12, 912.889
	1386.77, 913.717
	1380.94, 914.966

	1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407	

External Boundary	1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126	

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	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698

	570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654 835.534, 686 874.622, 686 885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68	

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Material Boundary	

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	2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44	

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	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49

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Material Boundary	1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431

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	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766 538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021

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	826.622, 838 833.562, 839.735 834.622, 840 835.724, 840.275 842.622, 842 849.689, 843.767 850.622, 844 851.594, 844.243 858.622, 846 859.638, 846.254 866.622, 848 867.683, 848.265 874.622, 850 881.516, 851.724 882.622, 852 883.778, 852.289 884.667, 852.511 890.622, 854 896.384, 855.44 898.622, 856 905.369, 857.687 906.622, 858 913.267, 859.661 914.622, 860 916.042, 860.355 922.622, 862 924.05, 862.357 930.622, 864 936.682, 865.515 938.622, 866 945.083, 867.615 945.703, 867.77 946.463, 867.96 946.622, 868 948.807, 868.546 950.282, 868.915 951.413, 869.198 952.09, 869.367 954.622, 870 959.165, 871.136 960.758, 871.534 962.622, 872 965.435, 872.703 970.622, 874 974.464, 874.96 978.622, 876 983.295, 877.168 986.622, 878 987.722, 878.275 989.579, 878.739 989.696, 878.768 990.941, 879.08 994.622, 880 999.548, 881.232 999.665, 881.261 1001.52, 881.725 1002.62, 882 1002.75, 882.031 1003.06, 882.11

	1003.09, 882.116 1003.45, 882.208 1010.62, 884 1016.85, 885.557 1018.62, 886 1024.91, 887.573 1026.62, 888 1032.44, 889.455 1032.46, 889.459 1034.62, 890 1036.95, 890.581 1036.96, 890.585 1042.62, 892 1044.19, 892.392 1050.62, 894 1052.12, 894.375 1058.62, 896 1065.26, 897.659 1066.62, 898 1071.96, 899.334 1071.97, 899.337 1074.62, 900 1077.51, 900.722 1077.53, 900.726 1082.62, 902 1089.48, 903.714 1090.62, 904 1097.56, 905.733 1098.62, 906 1105.63, 907.753 1106.62, 908 1111.23, 909.151 1111.24, 909.155 1114.62, 910 1132.01, 911.739 1134.62, 912 1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866	

Material Boundary	1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043

	1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812

	1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033 1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969 1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582 1965.72, 764 1967.39, 763.583 1973.7, 762	

	1977.57, 761.034 1977.58, 761.033 1981.71, 760 1985.9, 758.959 1985.9, 758.958 1989.74, 758 1991.4, 757.584 1997.72, 756 1999.4, 755.58 2005.72, 754 2007.48, 753.558 2013.7, 752 2017.55, 751.04 2017.56, 751.039 2021.71, 750 2025.87, 748.959 2025.88, 748.958 2029.73, 748 2032.55, 747.298 2037.73, 746 2040.08, 745.405 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479	

	3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273
Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164

	477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463	

	966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85	

Material Boundary	1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264

	1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304

	3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054 3660.7, 695.468 3690.86, 695.09 3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725

	493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695	

Material Boundary	982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693	

	1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733	

	2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

466.102, 750.086
473.419, 751.912
474.113, 752.086
474.811, 752.26
482.112, 754.086
486.617, 755.213
490.077, 756.086
493.601, 756.959
498.102, 758.085
501.607, 758.968
506.077, 760.086
513.383, 761.907
514.104, 762.086
514.812, 762.264
522.084, 764.086
525.707, 764.991
530.085, 766.086
538.079, 768.081
538.353, 768.15
538.357, 768.15
546.101, 770.086
553.36, 771.901
554.096, 772.086
554.833, 772.27
562.083, 774.086
565.979, 775.06
570.084, 776.086
574.006, 777.066
578.084, 778.086
582.033, 779.073
586.085, 780.086
593.341, 781.898
594.104, 782.086
594.853, 782.275
602.111, 784.086
606.157, 785.097
610.11, 786.086
614.194, 787.107
618.11, 788.086
622.223, 789.116
626.101, 790.086
633.31, 791.888
634.101, 792.086
634.901, 792.286
642.101, 794.086
645.858, 795.025
650.112, 796.086
654.377, 797.152
658.111, 798.086
662.404, 799.162
666.101, 800.086
673.276, 801.878
674.112, 802.086
674.953, 802.296
674.961, 802.298
682.111, 804.086
685.598, 804.957
690.111, 806.086
693.564, 806.949

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423	

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4442.27, 740.935 4456.92, 738 4464.31, 736.526 4466.94, 736

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261	Assigned to: Wadsworth Till

	721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174		

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Water Table	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921		

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	583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804		

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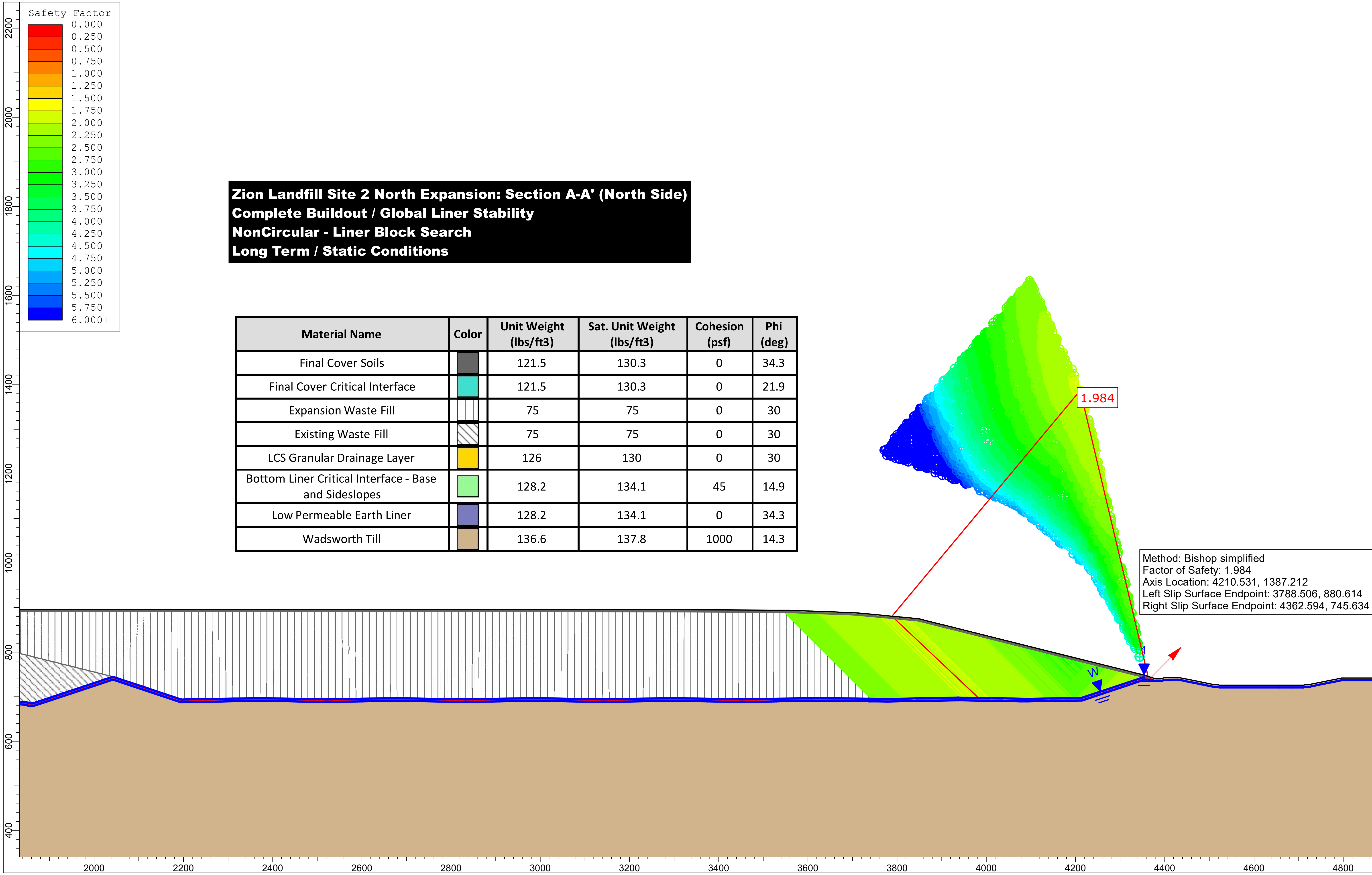

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
Existing Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:08m:23.24s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0

Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.984410
Axis Location:	4210.531, 1387.212
Left Slip Surface Endpoint:	3788.506, 880.614
Right Slip Surface Endpoint:	4362.594, 745.634
Resisting Moment:	9.67497e+08 lb-ft
Driving Moment:	4.8755e+08 lb-ft
Total Slice Area:	48190.2 ft2
Surface Horizontal Width:	574.088 ft
Surface Average Height:	83.9422 ft

Method: janbu corrected

FS	2.008640
Axis Location:	4212.653, 1381.722
Left Slip Surface Endpoint:	3793.747, 880.115
Right Slip Surface Endpoint:	4362.595, 745.633
Resisting Horizontal Force:	1.30624e+06 lb
Driving Horizontal Force:	650310 lb
Total Slice Area:	47753 ft2
Surface Horizontal Width:	568.848 ft
Surface Average Height:	83.9468 ft

Method: spencer

FS	2.092910
Axis Location:	4191.785, 1434.475
Left Slip Surface Endpoint:	3743.057, 884.939
Right Slip Surface Endpoint:	4362.177, 745.771
Resisting Moment:	1.14844e+09 lb-ft
Driving Moment:	5.48727e+08 lb-ft
Resisting Horizontal Force:	1.40338e+06 lb
Driving Horizontal Force:	670537 lb
Total Slice Area:	53099.8 ft2
Surface Horizontal Width:	619.12 ft
Surface Average Height:	85.7665 ft

Method: gle/morgenstern-price

FS	2.100150
Axis Location:	4197.715, 1420.379
Left Slip Surface Endpoint:	3756.846, 883.627
Right Slip Surface Endpoint:	4362.595, 745.633
Resisting Moment:	1.11824e+09 lb-ft
Driving Moment:	5.32459e+08 lb-ft
Resisting Horizontal Force:	1.38197e+06 lb
Driving Horizontal Force:	658035 lb
Total Slice Area:	53078.3 ft2
Surface Horizontal Width:	605.749 ft
Surface Average Height:	87.6242 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
3788.51	880.614
3983.54	696.247
4026.94	695.355
4071.54	694.593
4094.45	694.259
4151.29	695.257
4171.12	695.604
4213.68	696.49
4288.76	721.501
4346.44	740.712
4355.33	743.493
4362.59	745.634

Method: janbu corrected

X	Y
3793.75	880.115
3983.54	696.247
4023.63	695.412
4072.53	694.576
4094.09	694.264
4151.36	695.257
4172.85	695.635
4213.68	696.49
4288.76	721.501
4346.5	740.733
4355.32	743.489
4362.59	745.633

Method: spencer

X	Y
3743.06	884.939
3898.31	755.21
3977.46	696.351
4014.16	695.573
4077.92	694.484
4095.67	694.281
4151.49	695.26
4173.51	695.646
4213.72	696.502
4288	721.088
4347.71	740.979
4352.24	742.492
4362.18	745.771

Method: gle/morgenstern-price

X	Y
3756.85	883.627
3872.04	772.143
3972.44	696.437
4024.56	695.396
4074.25	694.547
4094.24	694.256
4149.75	695.229
4172.75	695.633
4213.72	696.502
4288.12	721.127
4347.48	741.05
4353.61	742.964
4362.6	745.633

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 4761
Number of Invalid Surfaces: 243

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 238 surfaces

Method: janbu corrected

Number of Valid Surfaces: 4761
Number of Invalid Surfaces: 243

Error Codes

Error Code -106 reported for 3 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 238 surfaces

Method: spencer

Number of Valid Surfaces:	4271
Number of Invalid Surfaces:	733
Error Codes	
Error Code -106 reported for 3 surfaces	
Error Code -108 reported for 48 surfaces	
Error Code -110 reported for 238 surfaces	
Error Code -111 reported for 444 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	4127
Number of Invalid Surfaces:	877
Error Codes	
Error Code -106 reported for 3 surfaces	
Error Code -108 reported for 55 surfaces	
Error Code -110 reported for 238 surfaces	
Error Code -111 reported for 581 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	4801.13, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727

	4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4481.94, 733 4481.87, 733 4476.94, 734 4476.94, 734 4471.48, 735.093 4466.94, 736 4466.94, 736 4466.94, 736 4464.31, 736.526 4461.43, 737.102 4456.94, 738 4456.94, 738 4451.39, 739.111 4446.94, 740 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888	

	3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925	

	1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019
External Boundary	

977.409, 880.851
973.251, 879.811
969.409, 878.851
964.222, 877.554
961.409, 876.851
959.545, 876.385
957.953, 875.986
953.409, 874.851
950.878, 874.218
950.2, 874.048
949.069, 873.766
947.594, 873.397
945.409, 872.851
945.25, 872.811
944.49, 872.621
943.871, 872.466
937.409, 870.851
935.469, 870.366
929.409, 868.851
922.837, 867.208
921.409, 866.851
914.83, 865.206
913.409, 864.851
912.054, 864.512
905.409, 862.851
904.157, 862.538
897.409, 860.851
895.171, 860.291
889.409, 858.851
883.455, 857.362
882.565, 857.14
881.409, 856.851
880.304, 856.574
873.409, 854.851
866.47, 853.116
865.409, 852.851
858.425, 851.105
857.409, 850.851
850.382, 849.094
849.409, 848.851
848.476, 848.617
841.409, 846.851
834.511, 845.126
833.409, 844.851
832.349, 844.586
825.409, 842.851
819.152, 841.286
817.409, 840.851
811.119, 839.278
809.409, 838.851
807.747, 838.435
801.409, 836.851
794.398, 835.098
793.409, 834.851
792.434, 834.607
792.426, 834.605
785.409, 832.851
778.07, 831.016
777.409, 830.851

	777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824	

	561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054

	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242	

	700.514, 686 768.454, 687.654 835.534, 686 874.622, 686 885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692	

	1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692 1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423
Material Boundary	

	1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921	

	2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124	

	4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896
	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002

	768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206 968.611, 687.32 973.02, 688.452 975.698, 689.053 976.071, 689.127 983.756, 690.815 985.339, 691.121 992.008, 692.55 995.001, 693.111 1013.14, 696.789 1014.83, 697.123 1015.48, 697.262 1029.86, 699.057 1037.13, 700.174 1049.88, 701.017 1054.93, 701.439 1061.13, 701.796 1067.32, 701.858 1069.64, 701.862 1084.22, 701.009 1093.76, 700.535 1105.21, 699.039 1108.62, 698.694 1113.85, 698.014 1115.88, 697.749 1118.7, 697.239 1119.27, 697.117 1127.39, 695.581 1129.45, 695.129 1135.37, 693.93 1139.13, 693.125 1145.94, 691.753 1148.93, 691.114 1151.08, 690.719 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409

Material Boundary	1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1848.18, 681.312 1853.09, 679.599 1854.88, 679 1856.55, 679 1858.87, 679 1862.97, 679 1868.47, 680.801 1869.31, 681.074 1870.05, 681.322 1870.29, 681.404 1875.39, 683 1875.45, 683 1877.69, 683.747 1881.46, 685 1881.51, 685 1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431 1912.81, 695.431 1918.47, 697.32 1918.79, 697.429 1918.8, 697.429 1924.47, 699.32 1924.78, 699.428 1924.8, 699.428 1930.47, 701.32 1930.78, 701.426 1930.79, 701.426 1936.47, 703.32 1936.78, 703.425 1936.79, 703.425 1942.47, 705.32 1942.77, 705.423 1942.78, 705.423

	1948.47, 707.319 1948.77, 707.422 1948.78, 707.422 1954.47, 709.318 1954.77, 709.42 1954.78, 709.42 1960.47, 711.317 1960.76, 711.419 1960.77, 711.419 1966.47, 713.316 1966.76, 713.417 1966.77, 713.417 1972.46, 715.315 1972.76, 715.416 1972.76, 715.416 1978.46, 717.315 1978.75, 717.414 1978.76, 717.414 1984.44, 719.308 1989.23, 720.903 1989.51, 721 1989.52, 721 1995.23, 722.904 1995.51, 723 1995.54, 723 1996.74, 723.41 1996.75, 723.41 2002.46, 725.314 2002.74, 725.408 2002.74, 725.408 2008.46, 727.314 2008.73, 727.406 2008.74, 727.406 2014.46, 729.314 2014.73, 729.405 2014.73, 729.405 2020.46, 731.315 2020.72, 731.403 2020.73, 731.403 2026.46, 733.315 2026.72, 733.402 2026.73, 733.402 2032.46, 735.313 2033.64, 735.713 2037.69, 737.065 2041.9, 738.472 2061.54, 731.927 2127.47, 709.948 2194.18, 687.752 2195.59, 687.778 2206.66, 687.971 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482	

	2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4368.61, 742.832 4369.04, 742.975
	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744

	450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766 538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021 618.632, 786 622.745, 787.031 626.622, 788 633.831, 789.802 634.622, 790 635.422, 790.2 642.622, 792 646.38, 792.939 650.632, 794 654.898, 795.067 658.632, 796 662.927, 797.076 666.622, 798 673.797, 799.792 674.632, 800 675.475, 800.211	

	675.482, 800.213 682.633, 802 686.119, 802.872 690.633, 804 694.086, 804.863 698.633, 806 703.206, 807.143 706.633, 808 713.748, 809.779 713.756, 809.781 714.633, 810 715.521, 810.222 715.529, 810.224 722.633, 812 727.298, 813.169 730.622, 814 735.33, 815.177 738.622, 816 743.363, 817.185 746.622, 818 753.689, 819.767 753.697, 819.769 754.622, 820 755.557, 820.234 755.564, 820.236 762.622, 822 767.408, 823.196 770.622, 824 777.968, 825.837 777.971, 825.837 778.622, 826 779.282, 826.165 786.622, 828 793.638, 829.754 793.646, 829.756 794.622, 830 795.611, 830.247 802.622, 832 808.959, 833.584 810.622, 834 812.332, 834.427 818.622, 836 820.364, 836.436 826.622, 838 833.562, 839.735 834.622, 840 835.724, 840.275 842.622, 842 849.689, 843.767 850.622, 844 851.594, 844.243 858.622, 846 859.638, 846.254 866.622, 848 867.683, 848.265 874.622, 850 881.516, 851.724 882.622, 852 883.778, 852.289	

	884.667, 852.511 890.622, 854 896.384, 855.44 898.622, 856 905.369, 857.687 906.622, 858 913.267, 859.661 914.622, 860 916.042, 860.355 922.622, 862 924.05, 862.357 930.622, 864 936.682, 865.515 938.622, 866 945.083, 867.615 945.703, 867.77 946.463, 867.96 946.622, 868 948.807, 868.546 950.282, 868.915 951.413, 869.198 952.09, 869.367 954.622, 870 959.165, 871.136 960.758, 871.534 962.622, 872 965.435, 872.703 970.622, 874 974.464, 874.96 978.622, 876 983.295, 877.168 986.622, 878 987.722, 878.275 989.579, 878.739 989.696, 878.768 990.941, 879.08 994.622, 880 999.548, 881.232 999.665, 881.261 1001.52, 881.725 1002.62, 882 1002.75, 882.031 1003.06, 882.11 1003.09, 882.116 1003.45, 882.208 1010.62, 884 1016.85, 885.557 1018.62, 886 1024.91, 887.573 1026.62, 888 1032.44, 889.455 1032.46, 889.459 1034.62, 890 1036.95, 890.581 1036.96, 890.585 1042.62, 892 1044.19, 892.392 1050.62, 894 1052.12, 894.375

	1058.62, 896 1065.26, 897.659 1066.62, 898 1071.96, 899.334 1071.97, 899.337 1074.62, 900 1077.51, 900.722 1077.53, 900.726 1082.62, 902 1089.48, 903.714 1090.62, 904 1097.56, 905.733 1098.62, 906 1105.63, 907.753 1106.62, 908 1111.23, 909.151 1111.24, 909.155 1114.62, 910 1132.01, 911.739 1134.62, 912 1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754	

Material Boundary	1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901

	1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798	

	1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033 1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969 1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582 1965.72, 764 1967.39, 763.583 1973.7, 762 1977.57, 761.034 1977.58, 761.033 1981.71, 760 1985.9, 758.959 1985.9, 758.958 1989.74, 758 1991.4, 757.584 1997.72, 756 1999.4, 755.58 2005.72, 754 2007.48, 753.558 2013.7, 752 2017.55, 751.04 2017.56, 751.039 2021.71, 750 2025.87, 748.959	

	2025.88, 748.958 2029.73, 748 2032.55, 747.298 2037.73, 746 2040.08, 745.405 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784	

	3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273
Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665

	537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275

	1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858
Material Boundary	1891.28, 693.421 1892.59, 693.858

	1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256	

	2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054	

	3660.7, 695.468 3690.86, 695.09 3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705

	551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515	

Material Boundary	1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429

	1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94	
	486.653, 755.067	
	490.114, 755.94	
	493.637, 756.814	
	498.139, 757.94	
	501.644, 758.823	
	506.113, 759.94	
	513.419, 761.762	
	514.14, 761.94	
	514.848, 762.119	
	522.12, 763.94	
	525.743, 764.846	
	530.121, 765.94	
	538.115, 767.936	
	538.372, 768	
	538.376, 768	
	546.137, 769.94	
	553.397, 771.755	
	554.133, 771.94	
	554.87, 772.124	
	562.119, 773.94	
	566.015, 774.914	
	570.12, 775.94	
	574.042, 776.921	
	578.12, 777.94	
	582.069, 778.927	
	586.121, 779.94	
	593.377, 781.753	
	594.14, 781.941	
	594.889, 782.13	
	602.147, 783.941	
	606.193, 784.952	
	610.147, 785.94	
	614.23, 786.961	
	618.147, 787.94	
	622.259, 788.971	
	626.137, 789.94	
	633.346, 791.743	
	634.137, 791.94	
	634.937, 792.14	
	642.137, 793.94	
	645.894, 794.88	
	650.148, 795.941	
	654.413, 797.007	
	658.147, 797.94	
	662.44, 799.016	
	666.137, 799.94	
	673.312, 801.732	
	674.148, 801.941	
	674.99, 802.151	
	674.997, 802.153	
	682.148, 803.94	
	685.634, 804.812	
	690.148, 805.94	
	693.601, 806.804	
	698.148, 807.94	
	702.721, 809.084	
	706.148, 809.94	
	713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94
Material Boundary	

	1088.99, 905.655	
	1090.14, 905.94	
	1097.07, 907.674	
	1098.14, 907.94	
	1105.15, 909.693	
	1106.14, 909.94	
	1110.74, 911.092	
	1110.76, 911.095	
	1114.28, 911.976	
	1131.82, 913.729	
	1134.42, 913.99	
	1142.14, 914.761	
	1154.42, 915.99	
	1162.14, 916.761	
	1174.42, 917.99	
	1192.55, 919.803	
	1194.42, 919.99	
	1197.67, 920.315	
	1201.24, 920.626	
	1212.17, 921.569	
	1219.87, 922	
	1223.74, 922	
	1239.2, 922	
	1244.03, 922	
	1247.67, 922	
	1263.85, 920.661	
	1271.47, 919.993	
	1275.9, 919.64	
	1278.62, 919.472	
	1298.9, 917.994	
	1308.25, 917.25	
	1313.96, 916.898	
	1326.36, 915.994	
	1340.59, 914.861	
	1349.3, 914.323	
	1353.81, 913.994	
	1372.94, 912.471	
	1380.52, 911.987	
	1386.1, 910.794	
	1389.4, 909.977	
	1389.4, 909.977	
	1389.54, 909.941	
	1389.58, 909.932	
	1397.61, 907.941	
	1397.74, 907.91	
	1405.68, 905.941	
	1405.89, 905.889	
	1413.75, 903.941	
	1414.75, 903.696	
	1414.75, 903.695	
	1421.83, 901.941	
	1428.43, 900.306	
	1428.43, 900.305	
	1429.9, 899.941	
	1430.35, 899.828	
	1437.97, 897.941	
	1438.5, 897.809	
	1446.04, 895.941	
	1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423	
Material Boundary		

1074.1, 902.086
1076.99, 902.808
1077.01, 902.812
1082.1, 904.086
1088.96, 905.8
1090.1, 906.086
1097.03, 907.819
1098.1, 908.086
1105.11, 909.839
1106.1, 910.086
1110.71, 911.237
1110.72, 911.241
1114.25, 912.124
1131.8, 913.879
1134.41, 914.139
1142.12, 914.911
1154.41, 916.139
1162.12, 916.911
1174.41, 918.139
1192.53, 919.952
1194.41, 920.139
1197.66, 920.465
1201.22, 920.776
1212.16, 921.718
1219.87, 922.15
1223.74, 922.15
1239.2, 922.15
1244.03, 922.15
1247.67, 922.15
1263.87, 920.811
1271.48, 920.143
1275.91, 919.79
1278.63, 919.622
1298.92, 918.144
1308.26, 917.4
1313.97, 917.047
1326.37, 916.144
1340.6, 915.011
1349.31, 914.473
1353.82, 914.144
1372.95, 912.621
1380.54, 912.136
1386.13, 910.94
1389.43, 910.122
1389.43, 910.122
1389.57, 910.087
1389.61, 910.077
1397.65, 908.087
1397.77, 908.056
1405.72, 906.087
1405.93, 906.034
1413.79, 904.087
1414.78, 903.841
1414.79, 903.84
1421.86, 902.087
1428.46, 900.451
1428.47, 900.45
1429.93, 900.087
1430.39, 899.974

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4442.27, 740.935 4456.92, 738 4464.31, 736.526 4466.94, 736

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261	Assigned to: Wadsworth Till

	721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174		

	1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687		
Water Table	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921		

	2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142		

	4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797		

	4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804		

Piezoline	1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428		

1923.82, 705.428
1928.54, 707
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1941.76, 711.423
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1946.54, 713
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1953.76, 715.42
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1995.77, 729.41
2000.55, 731
2001.74, 731.408
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2006.55, 733
2007.74, 733.406
2007.77, 733.406
2012.55, 735
2013.73, 735.405
2013.76, 735.405
2018.55, 737
2019.73, 737.403
2019.76, 737.403
2024.55, 739
2025.72, 739.402
2025.75, 739.402
2030.55, 741
2031.73, 741.4
2036.53, 743
2041.91, 744.8
2060.85, 738.545
2075.51, 733.686
2122.09, 718.246

	2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083		

	3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273		
	425.446, 740.017 435.797, 740.214 440.59, 740.214 447.446, 737.929 450.009, 737.075 453.446, 735.929 454.615, 735.539 456.889, 734.782 459.451, 733.929 462, 733.08 465.468, 731.925 465.47, 731.925 470.544, 730.236 477.472, 727.929 480.007, 727.085 483.482, 725.929 486.011, 725.087 489.489, 723.929 493.677, 722.536 495.5, 721.929 499.136, 720.718 507.512, 717.929 509.321, 717.327 513.52, 715.929 515.323, 715.328 519.528, 713.929 521.326, 713.33 525.536, 711.929 529.138, 710.736 537.726, 707.929 539.803, 707.23 543.567, 705.929 545.671, 705.229 549.575, 703.929 551.683, 703.227 555.583, 701.929 560.51, 700.288 567.591, 697.929 570.047, 697.111 573.599, 695.929 577.668, 694.574		

	579.607, 693.929 583.685, 692.571 583.686, 692.571 585.615, 691.929 594.527, 688.962 597.631, 687.929 599.548, 687.291 603.639, 685.929 608.105, 684.442 609.658, 683.925 618.234, 683.925 628.129, 684.166 628.177, 684.167 700.515, 685.925 768.454, 687.578 835.533, 685.925 874.622, 685.925 885.02, 685.925 885.834, 685.925 914.498, 683.981 914.511, 683.981 916.781, 683.925 918.713, 683.877 920.672, 683.925 922.863, 683.983 931.358, 684.358 933.954, 684.848 944.281, 685.926 947.085, 686.777 951.905, 687.927 965.156, 691.535 966.664, 691.928 967.079, 692.043 971.634, 693.213 974.471, 693.85 974.857, 693.927 982.558, 695.618 984.156, 695.927 990.842, 697.36 993.868, 697.926 1011.98, 701.598 1013.64, 701.927 1014.5, 702.11 1029.04, 703.926 1036.49, 705.07 1049.44, 705.925 1054.51, 706.35 1060.93, 706.72 1067.29, 706.783 1069.81, 706.787 1084.54, 705.925 1094.29, 705.441 1105.89, 703.925 1109.3, 703.581 1114.61, 702.889 1116.79, 702.605 1119.84, 702.052 1120.43, 701.926 1128.58, 700.387		

Block Search Polyline	1130.67, 699.927 1136.58, 698.73 1140.33, 697.927 1147.14, 696.555 1150.08, 695.926 1152.33, 695.513 1158.73, 693.927 1164.45, 692.441 1180.86, 692.083 1199.19, 691.925 1219.92, 691.746 1247.58, 691.455 1274.37, 691.925 1354.83, 693.335 1380.25, 692.817 1449.64, 691.925 1461.71, 691.925 1495.01, 691.925 1500.47, 691.925 1516.31, 691.202 1637.28, 689.925 1692.85, 689.925 1719.06, 689.062 1781.17, 688.321 1807.13, 687.925 1816.05, 687.925 1826.74, 687.925 1846.45, 687.095 1850.06, 685.929 1855, 684.207 1855.85, 683.925 1856.55, 683.925 1858.87, 683.925 1862.02, 683.925 1866.63, 685.435 1867.46, 685.702 1868.14, 685.929 1868.43, 686.031 1874.48, 687.925 1874.48, 687.925 1875.81, 688.369 1880.5, 689.925 1880.55, 689.925 1881.88, 690.368 1886.56, 691.929 1891.25, 693.492 1892.56, 693.929 1893.81, 694.361 1893.86, 694.361 1898.56, 695.929 1899.8, 696.359 1899.85, 696.359 1904.56, 697.929 1905.8, 698.358 1905.85, 698.358 1910.56, 699.929 1911.79, 700.356 1911.84, 700.356 1916.56, 701.929		

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	2041.91, 743.664 2059.98, 737.663 2072.86, 733.361 2127.45, 715.185 2173.36, 699.929 2195.02, 692.72 2195.1, 692.694 2195.24, 692.696 2195.59, 692.703 2366.91, 695.701 2388.56, 695.33 2447.68, 694.317 2475.13, 693.846 2503.22, 693.36 2521.93, 693.037 2580.01, 694.044 2600.94, 694.407 2620.04, 694.738 2676.93, 695.725 2698.12, 695.358 2754.86, 694.377 2812.84, 693.374 2824.98, 693.164 2831.93, 693.044 2851.01, 693.374 2908.97, 694.38 2965.96, 695.368 2986.93, 695.732 3007.83, 695.37 3064.92, 694.383 3122.95, 693.379 3141.93, 693.05 3160.86, 693.379 3218.92, 694.386 3276.17, 695.378 3296.93, 695.738 3317.63, 695.381 3374.97, 694.389 3433.1, 693.383 3451.93, 693.057 3470.7, 693.383 3501.92, 693.924 3529.71, 694.47 3555.9, 694.984 3593.09, 695.719 3608.3, 696.02 3613.84, 696.129 3660.7, 695.543 3690.86, 695.165 3711.25, 694.909 3731.91, 694.621 3737.39, 694.549 3756.25, 694.303 3778.84, 694.008 3829.53, 695.004 3847.89, 695.365 3856.62, 695.519 3876.56, 695.872 3891.57, 696.137		

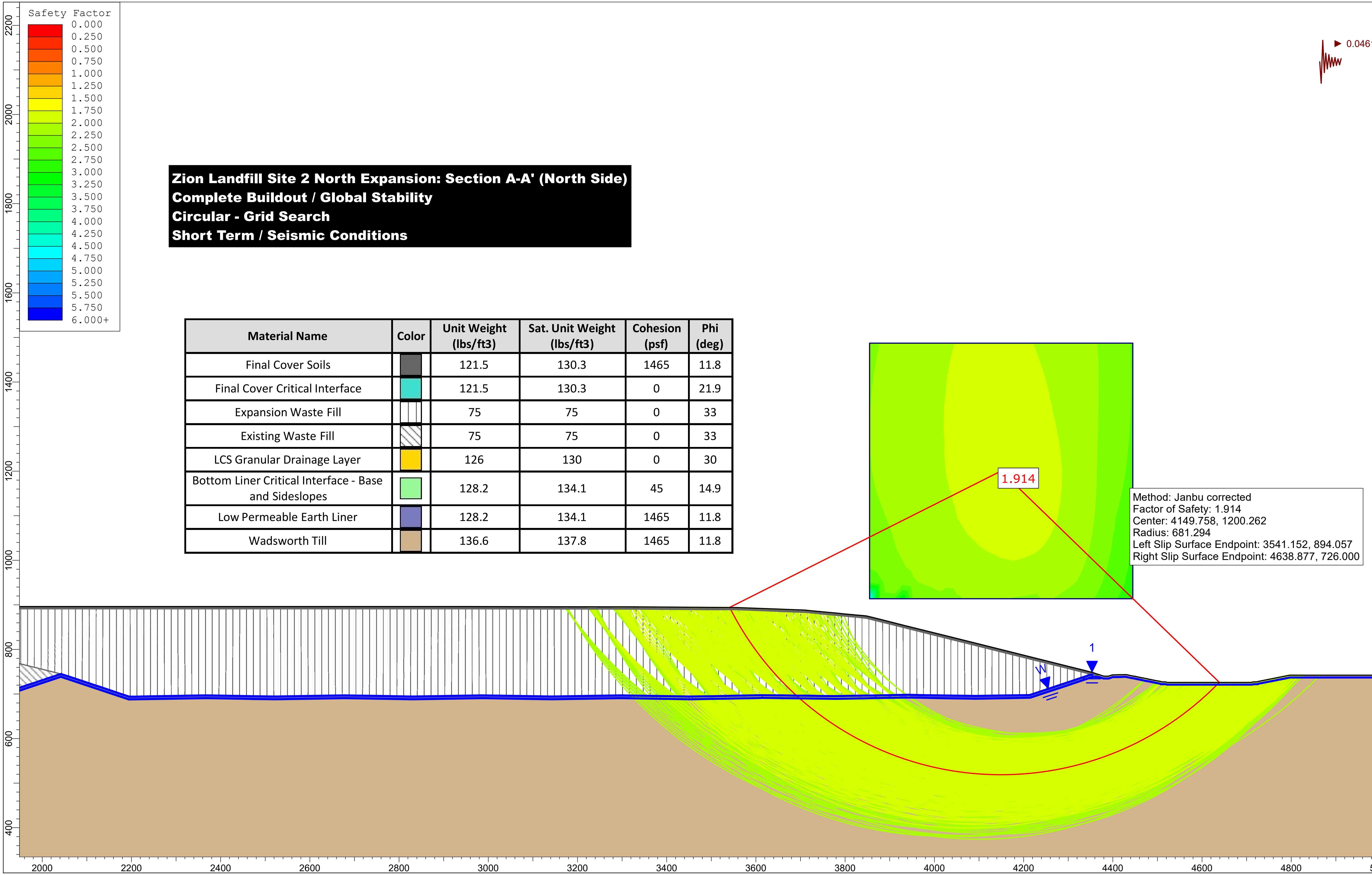
	3937.75, 696.953 3943.28, 696.859 3967.86, 696.44 4028.78, 695.399 4075.88, 694.594 4092.79, 694.305 4147.28, 695.261 4168.47, 695.633 4213.73, 696.427 4287.78, 721.093 4347.24, 740.9 4354.13, 743.197 4363.81, 742.98 4368.83, 742.903	

SLOPE STABILITY

SECTION A-A' – HORIZONTAL EXPANSION **(NORTH SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

COMPLETE BUILD-OUT / FINAL LANDFORM
CIRCULAR ANALYSIS OF WASTE AND FOUNDATION
(ROTATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Slide Analysis Information

A-A_final_north_ST

Project Summary

File Name:	A-A_final_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:01m:28.779s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.995640
Center:	4174.347, 1415.305
Radius:	880.076
Left Slip Surface Endpoint:	3464.954, 894.444
Right Slip Surface Endpoint:	4722.773, 727.000
Resisting Moment:	5.68851e+09 lb-ft
Driving Moment:	2.85047e+09 lb-ft
Total Slice Area:	237548 ft2
Surface Horizontal Width:	1257.82 ft
Surface Average Height:	188.857 ft

Method: janbu corrected

FS	1.914250
Center:	4149.758, 1200.262
Radius:	681.294
Left Slip Surface Endpoint:	3541.152, 894.057
Right Slip Surface Endpoint:	4638.877, 726.000
Resisting Horizontal Force:	5.76186e+06 lb
Driving Horizontal Force:	3.00999e+06 lb
Total Slice Area:	225430 ft2
Surface Horizontal Width:	1097.72 ft
Surface Average Height:	205.361 ft

Method: spencer

FS	1.983240
Center:	4174.347, 1415.305
Radius:	880.076
Left Slip Surface Endpoint:	3464.954, 894.444
Right Slip Surface Endpoint:	4722.773, 727.000
Resisting Moment:	5.65318e+09 lb-ft
Driving Moment:	2.85047e+09 lb-ft
Resisting Horizontal Force:	5.85127e+06 lb
Driving Horizontal Force:	2.95036e+06 lb
Total Slice Area:	237548 ft2
Surface Horizontal Width:	1257.82 ft
Surface Average Height:	188.857 ft

Method: gle/morgenstern-price

FS	1.988770
Center:	4174.347, 1415.305
Radius:	880.076
Left Slip Surface Endpoint:	3464.954, 894.444
Right Slip Surface Endpoint:	4722.773, 727.000
Resisting Moment:	5.66893e+09 lb-ft
Driving Moment:	2.85047e+09 lb-ft
Resisting Horizontal Force:	5.86176e+06 lb
Driving Horizontal Force:	2.94744e+06 lb
Total Slice Area:	237548 ft2
Surface Horizontal Width:	1257.82 ft
Surface Average Height:	188.857 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	3981
Number of Invalid Surfaces:	694
Error Codes	
Error Code -103 reported for 497 surfaces	
Error Code -110 reported for 56 surfaces	
Error Code -112 reported for 141 surfaces	

Method: janbu corrected

Number of Valid Surfaces:	4020
Number of Invalid Surfaces:	655
Error Codes	
Error Code -103 reported for 497 surfaces	
Error Code -110 reported for 56 surfaces	
Error Code -112 reported for 102 surfaces	

Method: spencer

Number of Valid Surfaces:	3977
Number of Invalid Surfaces:	698
Error Codes	
Error Code -103 reported for 497 surfaces	
Error Code -110 reported for 56 surfaces	
Error Code -111 reported for 1 surface	
Error Code -112 reported for 144 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	3979
Number of Invalid Surfaces:	696
Error Codes	
Error Code -103 reported for 497 surfaces	
Error Code -110 reported for 56 surfaces	
Error Code -112 reported for 143 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	4806.95, 742.054 4801.2, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4464.31, 736.526

4461.97, 736.994
4456.94, 738
4456.94, 738
4451.39, 739.111
4447.57, 739.873
4442.27, 740.935
4431.95, 743
4429.16, 743.558
4410.47, 743.103
4399.15, 742.903
4395.49, 741.691
4390.15, 739.897
4386.69, 739.881
4380.14, 739.897
4377.03, 740.918
4371.14, 742.896
4365, 744.839
4354.12, 748.427
4347.22, 750.154
4333.51, 753.581
4307.9, 760
4147.28, 800.154
4034.9, 828.248
3943.28, 851.154
3927.9, 855
3907.85, 860.012
3887.89, 865
3862.48, 871.353
3847.89, 875
3838.52, 875.876
3826.49, 877
3817.3, 877.874
3805.47, 879
3795.83, 879.918
3784.45, 881
3774.39, 881.957
3763.43, 883
3753.28, 883.966
3743.06, 884.939
3742.72, 884.971
3742.42, 885
3736.08, 885.603
3731.91, 886
3712.33, 887.896
3711.25, 888
3660.7, 890
3608.3, 892
3555.9, 894
3501.92, 894.208
3324.04, 895.343
3093.34, 895.755
2956.54, 896
2486.56, 896
2475.13, 896
2234.57, 896
2195.59, 896
2181.65, 896
2141.81, 896
2127.47, 896

	1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006	

	1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811
External Boundary	

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	729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673	

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	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734

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	1011.96, 701.672
	1013.62, 702
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	1147.15, 696.628
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	1180.87, 692.158
	1199.19, 692
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	1380.25, 692.892
	1449.64, 692
	1461.71, 692
	1495.01, 692
	1500.48, 692
	1516.31, 691.277
	1637.28, 690
	1692.86, 690
	1719.06, 689.137
	1781.17, 688.396
	1807.13, 688
	1816.05, 688
	1826.74, 688

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	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458

	464.508, 727	
	464.51, 727	
	468.673, 725.614	
	475.6, 723.307	
	478.136, 722.463	
	481.611, 721.307	
	484.14, 720.465	
	487.618, 719.307	
	491.807, 717.914	
	493.629, 717.307	
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	505.64, 713.307	
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	513.452, 710.707	
	517.656, 709.307	
	519.455, 708.708	
	523.669, 707.306	
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	535.86, 703.305	
	537.89, 702.622	
	541.663, 701.318	
	543.799, 700.607	
	547.704, 699.307	
	549.811, 698.606	
	553.711, 697.307	
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	565.718, 693.308	
	568.176, 692.49	
	571.728, 691.307	
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	577.736, 689.307	
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	618.307, 679	
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	768.453, 682.652	
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	914.411, 679.057	
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	934.813, 679.981	
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1972.76, 715.416
1978.46, 717.315
1978.75, 717.414
1978.76, 717.414
1984.44, 719.308
1989.23, 720.903
1989.51, 721
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1995.23, 722.904
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1995.54, 723
1996.74, 723.41
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2002.74, 725.408
2008.46, 727.314
2008.73, 727.406
2008.74, 727.406
2014.46, 729.314
2014.73, 729.405
2014.73, 729.405
2020.46, 731.315
2020.72, 731.403
2020.73, 731.403
2026.46, 733.315
2026.72, 733.402
2026.73, 733.402
2032.46, 735.313
2033.64, 735.713
2037.69, 737.065
2041.9, 738.472
2061.54, 731.927
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2194.18, 687.752
2195.59, 687.778
2206.66, 687.971
2366.91, 690.776
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2475.13, 688.921
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Material Boundary	1455.65, 891.5 1457.67, 891 1461.71, 890

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	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499

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Material Boundary	1152.34, 696.587 1158.74, 695

	1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422	

	1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

	922.137, 863.94	
	923.565, 864.297	
	930.137, 865.94	
	936.197, 867.455	
	938.137, 867.94	
	944.598, 869.556	
	945.218, 869.71	
	945.978, 869.9	
	946.137, 869.94	
	948.322, 870.486	
	949.797, 870.855	
	950.928, 871.138	
	951.605, 871.307	
	954.137, 871.94	
	958.68, 873.076	
	960.273, 873.474	
	962.137, 873.94	
	964.95, 874.643	
	970.137, 875.94	
Material Boundary	973.979, 876.901	
	978.137, 877.94	
	982.81, 879.109	
	986.137, 879.94	
	987.237, 880.215	
	989.094, 880.68	
	989.211, 880.709	
	990.456, 881.02	
	994.137, 881.94	
	999.063, 883.172	
	999.18, 883.201	
	1001.04, 883.665	
	1002.14, 883.94	
	1002.26, 883.971	
	1002.58, 884.05	
	1002.6, 884.057	
	1002.97, 884.148	
	1010.14, 885.94	
	1016.36, 887.497	
	1018.14, 887.94	
	1024.43, 889.513	
	1026.14, 889.94	
	1031.96, 891.396	
	1031.97, 891.399	
	1034.14, 891.94	
	1036.46, 892.522	
	1036.48, 892.525	
	1042.14, 893.94	
	1043.71, 894.333	
	1050.14, 895.94	
	1051.64, 896.316	
	1058.14, 897.94	
	1064.77, 899.599	
	1066.14, 899.94	
	1071.47, 901.274	
	1071.49, 901.277	
	1074.14, 901.94	
	1077.03, 902.663	
	1077.04, 902.666	
	1082.14, 903.94	

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

	906.101, 860.086
	912.746, 861.747
	914.101, 862.086
	915.521, 862.441
	922.101, 864.086
	923.528, 864.443
	930.101, 866.086
	936.16, 867.601
	938.101, 868.086
	944.562, 869.701
	945.181, 869.856
	945.941, 870.046
	946.101, 870.086
	948.285, 870.632
	949.761, 871.001
	950.891, 871.283
	951.569, 871.453
	954.101, 872.086
	958.644, 873.222
	960.237, 873.62
	962.101, 874.086
	964.913, 874.789
	970.101, 876.086
Material Boundary	973.942, 877.046
	978.101, 878.086
	982.774, 879.254
	986.101, 880.086
	987.201, 880.361
	989.058, 880.825
	989.174, 880.854
	990.419, 881.165
	994.101, 882.086
	999.027, 883.317
	999.144, 883.347
	1001, 883.811
	1002.1, 884.086
	1002.22, 884.117
	1002.54, 884.195
	1002.57, 884.202
	1002.93, 884.294
	1010.1, 886.086
	1016.33, 887.642
	1018.1, 888.086
	1024.39, 889.659
	1026.1, 890.086
	1031.92, 891.541
	1031.94, 891.544
	1034.1, 892.086
	1036.43, 892.667
	1036.44, 892.671
	1042.1, 894.086
	1043.67, 894.478
	1050.1, 896.086
	1051.6, 896.461
	1058.1, 898.086
	1064.74, 899.745
	1066.1, 900.086
	1071.43, 901.419
	1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738 4461.97, 736.994

Material Boundary	4484.34, 732.521 4486.94, 732

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402	Assigned to: Wadsworth Till

	689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262		

	1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687		
Water Table	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776		

	2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935		

	4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097		

	4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703		

Piezoline	1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43		

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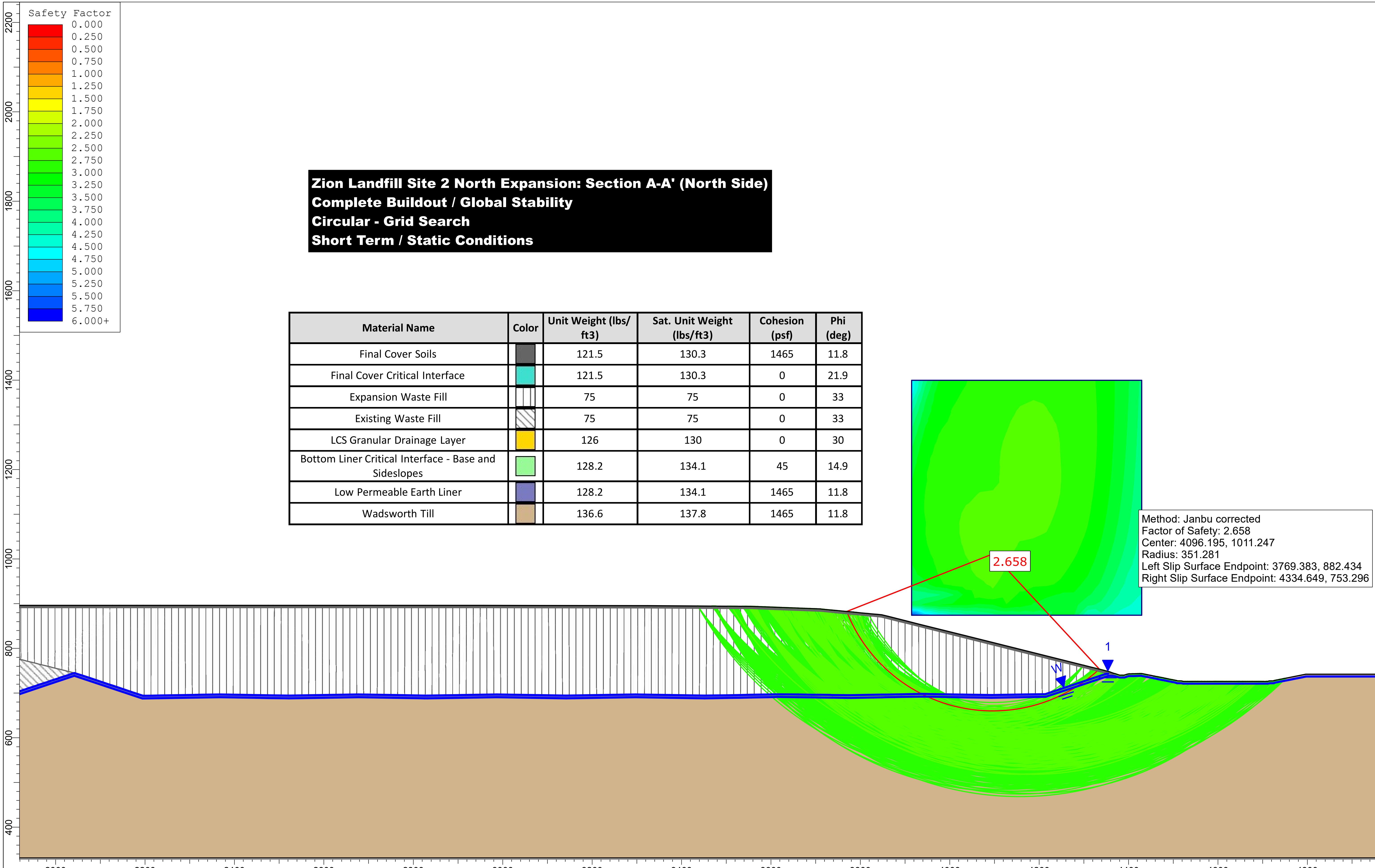
	2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696		

	3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
Existing Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

A-A_final_north_ST.slmd

APTIM

Slide Analysis Information

A-A_final_north_ST

Project Summary

File Name:	A-A_final_north_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:01m:06.868s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.817890
Center:	4187.018, 1331.145
Radius:	737.247
Left Slip Surface Endpoint:	3594.440, 892.529
Right Slip Surface Endpoint:	4608.126, 726.000
Resisting Moment:	3.41617e+09 lb-ft
Driving Moment:	1.21231e+09 lb-ft
Total Slice Area:	148678 ft2
Surface Horizontal Width:	1013.69 ft
Surface Average Height:	146.67 ft

Method: janbu corrected

FS	2.657970
Center:	4096.195, 1011.247
Radius:	351.281
Left Slip Surface Endpoint:	3769.383, 882.434
Right Slip Surface Endpoint:	4334.649, 753.296
Resisting Horizontal Force:	2.25304e+06 lb
Driving Horizontal Force:	847656 lb
Total Slice Area:	65199.7 ft2
Surface Horizontal Width:	565.265 ft
Surface Average Height:	115.344 ft

Method: spencer

FS	2.790070
Center:	4187.018, 1262.596
Radius:	655.725
Left Slip Surface Endpoint:	3647.078, 890.520
Right Slip Surface Endpoint:	4563.900, 726.000
Resisting Moment:	2.64477e+09 lb-ft
Driving Moment:	9.47923e+08 lb-ft
Resisting Horizontal Force:	3.6442e+06 lb
Driving Horizontal Force:	1.30613e+06 lb
Total Slice Area:	126309 ft2
Surface Horizontal Width:	916.821 ft
Surface Average Height:	137.769 ft

Method: gle/morgenstern-price

FS	2.783710
Center:	4065.921, 1079.796
Radius:	425.001
Left Slip Surface Endpoint:	3686.158, 888.993
Right Slip Surface Endpoint:	4337.219, 752.653
Resisting Moment:	1.20644e+09 lb-ft
Driving Moment:	4.33393e+08 lb-ft
Resisting Horizontal Force:	2.50833e+06 lb
Driving Horizontal Force:	901074 lb
Total Slice Area:	80851.1 ft2
Surface Horizontal Width:	651.061 ft
Surface Average Height:	124.184 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4115
Number of Invalid Surfaces:	637
Error Codes	
Error Code -103 reported for 209 surfaces	
Error Code -110 reported for 69 surfaces	
Error Code -112 reported for 282 surfaces	
Error Code -114 reported for 77 surfaces	

Method: janbu corrected

Number of Valid Surfaces:	4142
Number of Invalid Surfaces:	610
Error Codes	
Error Code -103 reported for 209 surfaces	
Error Code -108 reported for 3 surfaces	
Error Code -110 reported for 69 surfaces	
Error Code -112 reported for 252 surfaces	
Error Code -114 reported for 77 surfaces	

Method: spencer

Number of Valid Surfaces:	4100
Number of Invalid Surfaces:	652
Error Codes	
Error Code -103 reported for 209 surfaces	
Error Code -108 reported for 3 surfaces	
Error Code -110 reported for 69 surfaces	
Error Code -112 reported for 294 surfaces	
Error Code -114 reported for 77 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	4101
Number of Invalid Surfaces:	651

Error Codes

Error Code -103 reported for 209 surfaces
Error Code -108 reported for 3 surfaces
Error Code -110 reported for 69 surfaces
Error Code -112 reported for 293 surfaces
Error Code -114 reported for 77 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	4806.95, 742.054 4801.2, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732

	4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4464.31, 736.526 4461.97, 736.994 4456.94, 738 4456.94, 738 4451.39, 739.111 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892	

	3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561	

	1200.98, 923.615
	1197.39, 923.302
	1194.12, 922.975
	1192.25, 922.788
	1174.12, 920.975
	1161.84, 919.746
	1154.12, 918.975
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	1134.12, 916.975
	1131.52, 916.714
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	1110.03, 914.006
	1110.01, 914.002
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	1104.42, 912.604
	1097.41, 910.851
	1096.34, 910.584
	1089.41, 908.851
	1088.27, 908.565
	1081.41, 906.851
	1076.31, 905.577
	1076.3, 905.573
	1073.41, 904.851
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	1070.74, 904.184
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	1064.04, 902.51
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	1035.73, 895.432
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	1031.23, 894.306
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	1023.7, 892.424
	1017.41, 890.851
	1015.64, 890.407
	1009.41, 888.851
	1002.24, 887.059
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	1001.85, 886.96
	1001.53, 886.882
	1001.41, 886.851
External Boundary	1000.31, 886.576
	998.452, 886.111
	998.336, 886.082
	993.409, 884.851
	989.728, 883.93
	988.483, 883.619
	988.367, 883.59
	986.509, 883.126
	985.409, 882.851
	982.082, 882.019
	977.409, 880.851
	973.251, 879.811

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	961.409, 876.851	
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	957.953, 875.986	
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	950.2, 874.048	
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	947.594, 873.397	
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	943.871, 872.466	
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	921.409, 866.851	
	914.83, 865.206	
	913.409, 864.851	
	912.054, 864.512	
	905.409, 862.851	
	904.157, 862.538	
	897.409, 860.851	
	895.171, 860.291	
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	882.565, 857.14	
	881.409, 856.851	
	880.304, 856.574	
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	857.409, 850.851	
	850.382, 849.094	
	849.409, 848.851	
	848.476, 848.617	
	841.409, 846.851	
	834.511, 845.126	
	833.409, 844.851	
	832.349, 844.586	
	825.409, 842.851	
	819.152, 841.286	
	817.409, 840.851	
	811.119, 839.278	
	809.409, 838.851	
	807.747, 838.435	
	801.409, 836.851	
	794.398, 835.098	
	793.409, 834.851	
	792.434, 834.607	
	792.426, 834.605	
	785.409, 832.851	
	778.07, 831.016	
	777.409, 830.851	
	777.357, 830.838	
	777.354, 830.838	

	769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035	

	553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054
	411.625, 739.4 415.074, 739.104

	419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654	

	835.534, 686 874.622, 686 885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892

	1449.64, 692 1461.71, 692 1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712
Material Boundary	

	1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112	

	2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055	

	4369.04, 742.975 4371.14, 742.896
	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681

	874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206 968.611, 687.32 973.02, 688.452 975.698, 689.053 976.071, 689.127 983.756, 690.815 985.339, 691.121 992.008, 692.55 995.001, 693.111 1013.14, 696.789 1014.83, 697.123 1015.48, 697.262 1029.86, 699.057 1037.13, 700.174 1049.88, 701.017 1054.93, 701.439 1061.13, 701.796 1067.32, 701.858 1069.64, 701.862 1084.22, 701.009 1093.76, 700.535 1105.21, 699.039 1108.62, 698.694 1113.85, 698.014 1115.88, 697.749 1118.7, 697.239 1119.27, 697.117 1127.39, 695.581 1129.45, 695.129 1135.37, 693.93 1139.13, 693.125 1145.94, 691.753 1148.93, 691.114 1151.08, 690.719 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687	

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Material Boundary	

	1948.78, 707.422 1954.47, 709.318 1954.77, 709.42 1954.78, 709.42 1960.47, 711.317 1960.76, 711.419 1960.77, 711.419 1966.47, 713.316 1966.76, 713.417 1966.77, 713.417 1972.46, 715.315 1972.76, 715.416 1972.76, 715.416 1978.46, 717.315 1978.75, 717.414 1978.76, 717.414 1984.44, 719.308 1989.23, 720.903 1989.51, 721 1989.52, 721 1995.23, 722.904 1995.51, 723 1995.54, 723 1996.74, 723.41 1996.75, 723.41 2002.46, 725.314 2002.74, 725.408 2002.74, 725.408 2008.46, 727.314 2008.73, 727.406 2008.74, 727.406 2014.46, 729.314 2014.73, 729.405 2014.73, 729.405 2020.46, 731.315 2020.72, 731.403 2020.73, 731.403 2026.46, 733.315 2026.72, 733.402 2026.73, 733.402 2032.46, 735.313 2033.64, 735.713 2037.69, 737.065 2041.9, 738.472 2061.54, 731.927 2127.47, 709.948 2194.18, 687.752 2195.59, 687.778 2206.66, 687.971 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8	

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	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159

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	2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054 3660.7, 695.468 3690.86, 695.09	

	3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832	
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703	

	560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655	

	1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697	
Material Boundary	1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428	

	1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423	

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738 4461.97, 736.994

Material Boundary	4484.34, 732.521 4486.94, 732	

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402	Assigned to: Wadsworth Till

	689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262		

Water Table	1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776		

	2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935		

	4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097		

	4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703		

Piezoline	1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43		

	1917.83, 703.429		
	1922.54, 705		
	1923.77, 705.428		
	1923.82, 705.428		
	1928.54, 707		
	1929.77, 707.426		
	1929.82, 707.426		
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	1935.82, 709.425		
	1940.54, 711		
	1941.76, 711.423		
	1941.81, 711.423		
	1946.54, 713		
	1947.76, 713.422		
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	1952.54, 715		
	1953.76, 715.42		
	1953.8, 715.42		
	1958.54, 717		
	1959.76, 717.419		
	1959.8, 717.419		
	1964.54, 719		
	1965.76, 719.417		
	1965.79, 719.417		
	1970.54, 721		
	1971.76, 721.416		
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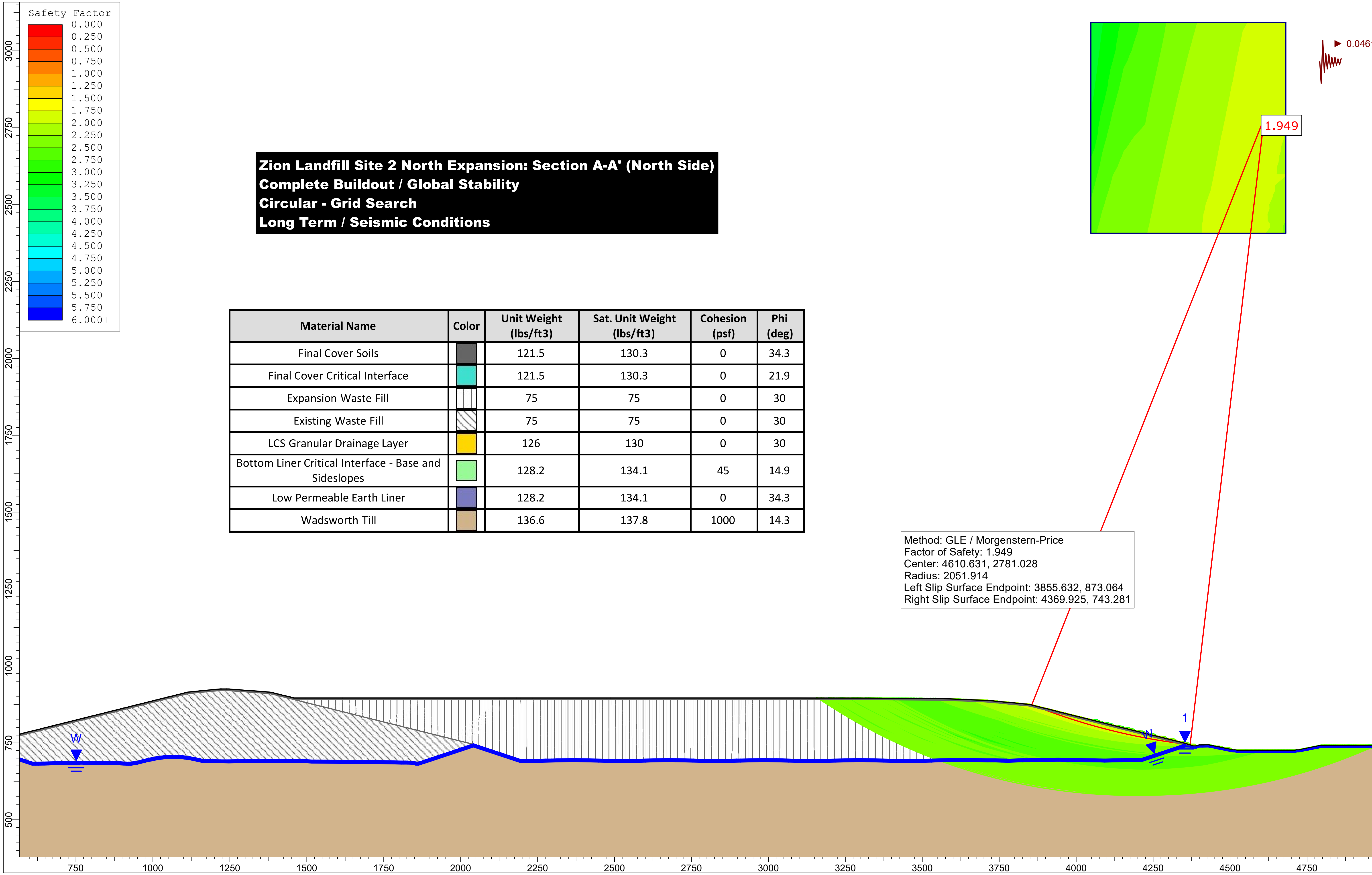
	1976.54, 723		
	1977.76, 723.414		
	1977.79, 723.414		
	1982.54, 725		
	1987.31, 726.589		
	1988.52, 727		
	1988.54, 727		
	1993.32, 728.59		
	1994.52, 729		
	1994.54, 729		
	1995.75, 729.41		
	1995.77, 729.41		
	2000.55, 731		
	2001.74, 731.408		
	2001.77, 731.408		
	2006.55, 733		
	2007.74, 733.406		
	2007.77, 733.406		
	2012.55, 735		
	2013.73, 735.405		
	2013.76, 735.405		
	2018.55, 737		
	2019.73, 737.403		
	2019.76, 737.403		
	2024.55, 739		
	2025.72, 739.402		
	2025.75, 739.402		
	2030.55, 741		
	2031.73, 741.4		
	2036.53, 743		
	2041.91, 744.8		

	2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696		

	3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Complete Buildout / Global Stability
Circular - Grid Search
Long Term / Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
Existing Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3



A-A_final_north_LT.slmd

APTIM

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:01m:17.926s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.953020
Center:	4610.631, 2781.028
Radius:	2051.914
Left Slip Surface Endpoint:	3855.632, 873.064
Right Slip Surface Endpoint:	4369.925, 743.281
Resisting Moment:	6.8163e+08 lb-ft
Driving Moment:	3.49014e+08 lb-ft
Total Slice Area:	6389.84 ft2
Surface Horizontal Width:	514.293 ft
Surface Average Height:	12.4245 ft

Method: janbu corrected

FS	1.963790
Center:	4610.631, 2781.028
Radius:	2051.914
Left Slip Surface Endpoint:	3855.632, 873.064
Right Slip Surface Endpoint:	4369.925, 743.281
Resisting Horizontal Force:	324712 lb
Driving Horizontal Force:	165350 lb
Total Slice Area:	6389.84 ft2
Surface Horizontal Width:	514.293 ft
Surface Average Height:	12.4245 ft

Method: spencer

FS	1.950620
Center:	4610.631, 2781.028
Radius:	2051.914
Left Slip Surface Endpoint:	3855.632, 873.064
Right Slip Surface Endpoint:	4369.925, 743.281
Resisting Moment:	6.80791e+08 lb-ft
Driving Moment:	3.49014e+08 lb-ft
Resisting Horizontal Force:	321780 lb
Driving Horizontal Force:	164963 lb
Total Slice Area:	6389.84 ft2
Surface Horizontal Width:	514.293 ft
Surface Average Height:	12.4245 ft

Method: gle/morgenstern-price

FS	1.949460
Center:	4610.631, 2781.028
Radius:	2051.914
Left Slip Surface Endpoint:	3855.632, 873.064
Right Slip Surface Endpoint:	4369.925, 743.281
Resisting Moment:	6.80387e+08 lb-ft
Driving Moment:	3.49014e+08 lb-ft
Resisting Horizontal Force:	321684 lb
Driving Horizontal Force:	165012 lb
Total Slice Area:	6389.84 ft2
Surface Horizontal Width:	514.293 ft
Surface Average Height:	12.4245 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4504
Number of Invalid Surfaces:	303
Error Codes	
Error Code -106 reported for 10 surfaces	
Error Code -107 reported for 97 surfaces	
Error Code -110 reported for 196 surfaces	

Method: janbu corrected

Number of Valid Surfaces:	4504
Number of Invalid Surfaces:	303
Error Codes	
Error Code -106 reported for 10 surfaces	
Error Code -107 reported for 97 surfaces	
Error Code -110 reported for 196 surfaces	

Method: spencer

Number of Valid Surfaces:	4504
Number of Invalid Surfaces:	303
Error Codes	
Error Code -106 reported for 10 surfaces	
Error Code -107 reported for 97 surfaces	
Error Code -110 reported for 196 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	4504
Number of Invalid Surfaces:	303
Error Codes	
Error Code -106 reported for 10 surfaces	
Error Code -107 reported for 97 surfaces	
Error Code -110 reported for 196 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	4805.86, 742.054 4801.56, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4516.53, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4481.94, 733 4481.52, 733.084 4476.94, 734 4476.94, 734 4471.48, 735.093 4466.94, 736 4466.94, 736 4466.94, 736 4464.31, 736.526 4461.43, 737.102 4456.94, 738 4456.94, 738 4451.39, 739.111 4446.94, 740 4442.27, 740.935 4431.95, 743 4429.16, 743.558

	4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703	

	1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851	

External Boundary	1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206	

	913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629	

	705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025	

	473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054
	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158

	489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654 835.534, 686 874.622, 686 885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923	

	974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692 1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507	

	1867.43, 685.773
	1868.11, 686
	1868.4, 686.102
	1874.47, 688
	1874.47, 688
	1875.79, 688.44
	1880.49, 690
	1880.54, 690
	1881.86, 690.439
Material Boundary	1886.54, 692
	1891.23, 693.563
	1892.54, 694
	1893.8, 694.436
	1893.84, 694.436
	1898.54, 696
	1899.79, 696.434
	1899.84, 696.434
	1904.54, 698
	1905.79, 698.433
	1905.84, 698.433
	1910.54, 700
	1911.78, 700.431
	1911.83, 700.431
	1916.54, 702
	1917.78, 702.43
	1917.83, 702.429
	1922.54, 704
	1923.77, 704.428
	1923.82, 704.428
	1928.54, 706
	1929.77, 706.426
	1929.82, 706.426
	1934.54, 708
	1935.76, 708.425
	1935.82, 708.425
	1940.54, 710
	1941.76, 710.423
	1941.81, 710.423
	1946.54, 712
	1947.76, 712.422
	1947.81, 712.422
	1952.54, 714
	1953.76, 714.42
	1953.8, 714.42
	1958.54, 716
	1959.76, 716.419
	1959.8, 716.419
	1964.54, 718
	1965.76, 718.417
	1965.79, 718.417
	1970.54, 720
	1971.76, 720.416
	1971.79, 720.416
	1976.54, 722
	1977.76, 722.414
	1977.79, 722.414
	1982.54, 724
	1987.31, 725.589
	1988.52, 726

	1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453	

	3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896
	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307

	491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206 968.611, 687.32 973.02, 688.452 975.698, 689.053 976.071, 689.127	

	983.756, 690.815 985.339, 691.121 992.008, 692.55 995.001, 693.111 1013.14, 696.789 1014.83, 697.123 1015.48, 697.262 1029.86, 699.057 1037.13, 700.174 1049.88, 701.017 1054.93, 701.439 1061.13, 701.796 1067.32, 701.858 1069.64, 701.862 1084.22, 701.009 1093.76, 700.535 1105.21, 699.039 1108.62, 698.694 1113.85, 698.014 1115.88, 697.749 1118.7, 697.239 1119.27, 697.117 1127.39, 695.581 1129.45, 695.129 1135.37, 693.93 1139.13, 693.125 1145.94, 691.753 1148.93, 691.114 1151.08, 690.719 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1848.18, 681.312 1853.09, 679.599 1854.88, 679 1856.55, 679 1858.87, 679 1862.97, 679 1868.47, 680.801 1869.31, 681.074	

	1870.05, 681.322 1870.29, 681.404 1875.39, 683 1875.45, 683 1877.69, 683.747 1881.46, 685 1881.51, 685
Material Boundary	1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431 1912.81, 695.431 1918.47, 697.32 1918.79, 697.429 1918.8, 697.429 1924.47, 699.32 1924.78, 699.428 1924.8, 699.428 1930.47, 701.32 1930.78, 701.426 1930.79, 701.426 1936.47, 703.32 1936.78, 703.425 1936.79, 703.425 1942.47, 705.32 1942.77, 705.423 1942.78, 705.423 1948.47, 707.319 1948.77, 707.422 1948.78, 707.422 1954.47, 709.318 1954.77, 709.42 1954.78, 709.42 1960.47, 711.317 1960.76, 711.419 1960.77, 711.419 1966.47, 713.316 1966.76, 713.417 1966.77, 713.417 1972.46, 715.315 1972.76, 715.416 1972.76, 715.416 1978.46, 717.315 1978.75, 717.414 1978.76, 717.414 1984.44, 719.308 1989.23, 720.903 1989.51, 721 1989.52, 721

	1995.23, 722.904 1995.51, 723 1995.54, 723 1996.74, 723.41 1996.75, 723.41 2002.46, 725.314 2002.74, 725.408 2002.74, 725.408 2008.46, 727.314 2008.73, 727.406 2008.74, 727.406 2014.46, 729.314 2014.73, 729.405 2014.73, 729.405 2020.46, 731.315 2020.72, 731.403 2020.73, 731.403 2026.46, 733.315 2026.72, 733.402 2026.73, 733.402 2032.46, 735.313 2033.64, 735.713 2037.69, 737.065 2041.9, 738.472 2061.54, 731.927 2127.47, 709.948 2194.18, 687.752 2195.59, 687.778 2206.66, 687.971 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457	

	3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4368.61, 742.832 4369.04, 742.975
	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995

	538.618, 766 538.622, 766 538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021 618.632, 786 622.745, 787.031 626.622, 788 633.831, 789.802 634.622, 790 635.422, 790.2 642.622, 792 646.38, 792.939 650.632, 794 654.898, 795.067 658.632, 796 662.927, 797.076 666.622, 798 673.797, 799.792 674.632, 800 675.475, 800.211 675.482, 800.213 682.633, 802 686.119, 802.872 690.633, 804 694.086, 804.863 698.633, 806 703.206, 807.143 706.633, 808 713.748, 809.779 713.756, 809.781 714.633, 810 715.521, 810.222 715.529, 810.224 722.633, 812 727.298, 813.169 730.622, 814 735.33, 815.177 738.622, 816 743.363, 817.185 746.622, 818 753.689, 819.767 753.697, 819.769	

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Material Boundary	1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08

	1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383	

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	4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273
Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85

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Material Boundary	1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275	

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	4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654

	835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892
Material Boundary	

	1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719

	1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721	
	714.148, 811.94	
	715.036, 812.162	
	715.044, 812.164	
	722.148, 813.94	
	726.812, 815.109	
	730.137, 815.94	
	734.845, 817.117	
	738.137, 817.94	
	742.878, 819.125	
	746.137, 819.94	
	753.204, 821.707	
	753.211, 821.709	
	754.137, 821.94	
	755.071, 822.174	
	755.079, 822.176	
	762.137, 823.94	
	766.923, 825.137	
	770.137, 825.94	
	777.722, 827.837	
	777.725, 827.837	
	778.137, 827.94	
	778.797, 828.105	
	786.137, 829.94	
	793.153, 831.694	
	793.161, 831.696	
	794.137, 831.94	
	795.126, 832.187	
	802.137, 833.94	
	808.474, 835.525	
	810.137, 835.94	
	811.847, 836.368	
	818.137, 837.94	
	819.879, 838.376	
	826.137, 839.94	
	833.077, 841.675	
	834.137, 841.94	
	835.239, 842.216	
	842.137, 843.94	
	849.204, 845.707	
	850.137, 845.94	
	851.109, 846.183	
	858.137, 847.94	
	859.153, 848.194	
	866.137, 849.94	
	867.198, 850.205	
	874.137, 851.94	
	881.031, 853.664	
	882.137, 853.94	
	883.293, 854.229	
	884.182, 854.452	
	890.137, 855.94	
	895.898, 857.381	
	898.137, 857.94	
	904.884, 859.627	
	906.137, 859.94	
	912.782, 861.602	
	914.137, 861.94	
	915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086	
	702.685, 809.229	
	706.111, 810.086	
	713.227, 811.865	
	713.234, 811.867	
	714.111, 812.086	
	714.999, 812.308	
	715.007, 812.31	
	722.112, 814.086	
	726.775, 815.254	
	730.101, 816.086	
	734.809, 817.263	
	738.101, 818.086	
	742.842, 819.271	
	746.101, 820.086	
	753.167, 821.852	
	753.175, 821.854	
	754.101, 822.086	
	755.035, 822.319	
	755.043, 822.321	
	762.101, 824.086	
	766.886, 825.282	
	770.101, 826.086	
	777.704, 827.987	
	777.707, 827.987	
	778.101, 828.086	
	778.761, 828.251	
	786.101, 830.086	
	793.117, 831.84	
	793.125, 831.842	
	794.101, 832.086	
	795.089, 832.333	
	802.101, 834.086	
	808.438, 835.67	
	810.101, 836.086	
	811.81, 836.513	
	818.101, 838.086	
	819.843, 838.521	
	826.101, 840.086	
	833.041, 841.821	
	834.101, 842.086	
	835.202, 842.361	
	842.101, 844.086	
	849.167, 845.852	
	850.101, 846.086	
	851.073, 846.329	
	858.101, 848.086	
	859.116, 848.34	
	866.101, 850.086	
	867.161, 850.351	
	874.101, 852.086	
	880.995, 853.809	
	882.101, 854.086	
	883.256, 854.375	
	884.146, 854.597	
	890.101, 856.086	
	895.862, 857.526	
	898.101, 858.086	
	904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112

Material Boundary	4442.27, 740.935 4456.92, 738 4464.31, 736.526 4464.44, 736.5 4466.94, 736
Material Boundary	4466.94, 736 4476.94, 734 4481.87, 733 4481.94, 733 4481.94, 733 4486.94, 732

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289	Assigned to: Wadsworth Till

	488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186		

	964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687		
Water Table	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683		

	1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028		

	3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45		

	4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858		

Piezoline	1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434		

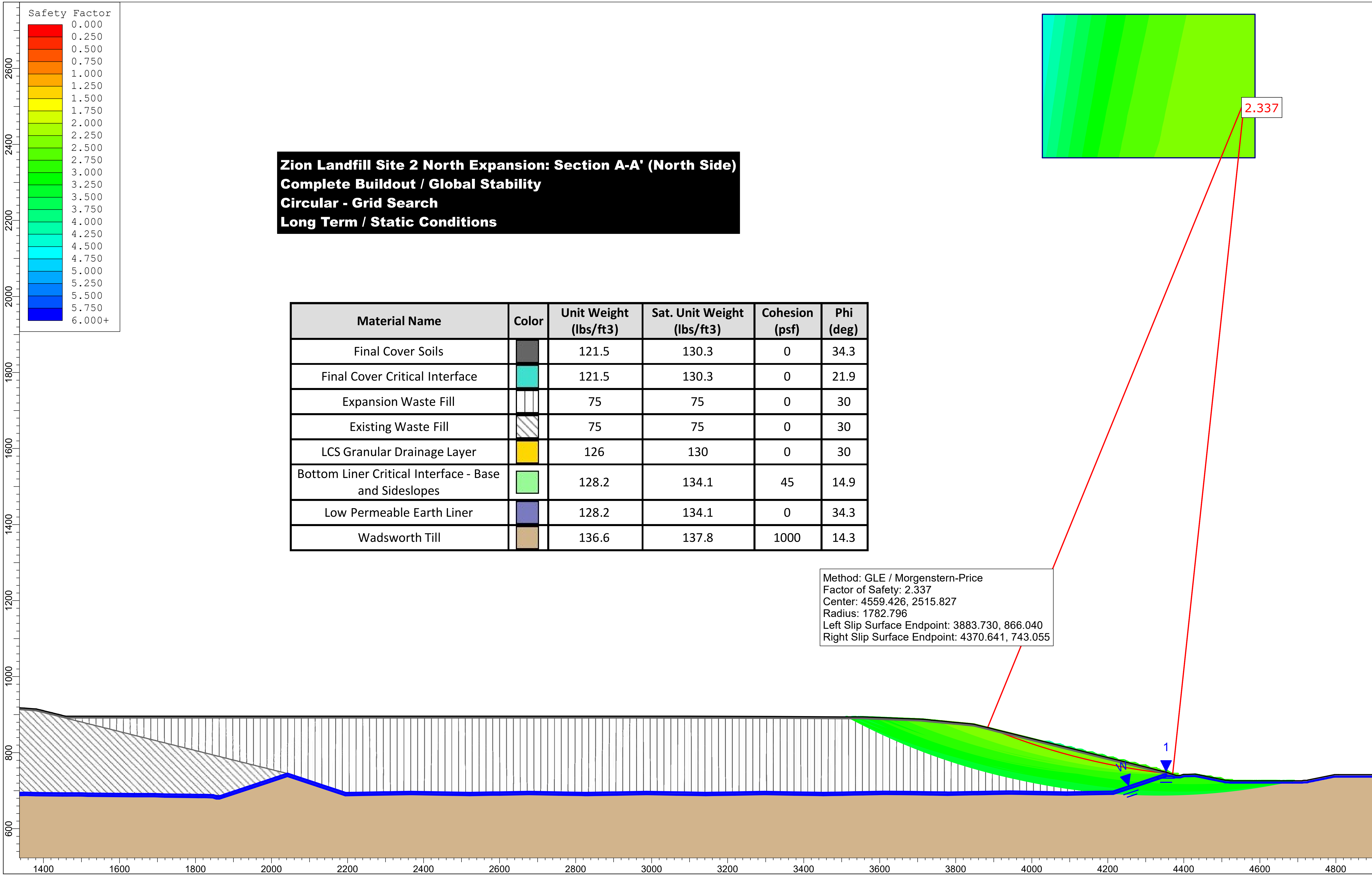
Piezoline	1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737		

	2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999		

	3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Complete Buildout / Global Stability
Circular - Grid Search
Long Term / Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
Existing Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3



A-A_final_north_LT.slmd

APTIM

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:01m:10.309s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.340870
Center:	4559.426, 2515.827
Radius:	1782.796
Left Slip Surface Endpoint:	3883.730, 866.040
Right Slip Surface Endpoint:	4370.641, 743.055
Resisting Moment:	5.82407e+08 lb-ft
Driving Moment:	2.48799e+08 lb-ft
Total Slice Area:	6248.77 ft2
Surface Horizontal Width:	486.912 ft
Surface Average Height:	12.8335 ft

Method: janbu corrected

FS	2.354170
Center:	4587.412, 2704.743
Radius:	1972.918
Left Slip Surface Endpoint:	3852.270, 873.905
Right Slip Surface Endpoint:	4367.152, 744.159
Resisting Horizontal Force:	337875 lb
Driving Horizontal Force:	143522 lb
Total Slice Area:	6612.43 ft2
Surface Horizontal Width:	514.882 ft
Surface Average Height:	12.8426 ft

Method: spencer

FS	2.338840
Center:	4559.426, 2515.827
Radius:	1782.796
Left Slip Surface Endpoint:	3883.730, 866.040
Right Slip Surface Endpoint:	4370.641, 743.055
Resisting Moment:	5.81903e+08 lb-ft
Driving Moment:	2.48799e+08 lb-ft
Resisting Horizontal Force:	316329 lb
Driving Horizontal Force:	135250 lb
Total Slice Area:	6248.77 ft2
Surface Horizontal Width:	486.912 ft
Surface Average Height:	12.8335 ft

Method: gle/morgenstern-price

FS	2.337150
Center:	4559.426, 2515.827
Radius:	1782.796
Left Slip Surface Endpoint:	3883.730, 866.040
Right Slip Surface Endpoint:	4370.641, 743.055
Resisting Moment:	5.81481e+08 lb-ft
Driving Moment:	2.48799e+08 lb-ft
Resisting Horizontal Force:	316287 lb
Driving Horizontal Force:	135330 lb
Total Slice Area:	6248.77 ft2
Surface Horizontal Width:	486.912 ft
Surface Average Height:	12.8335 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4165
Number of Invalid Surfaces:	686

Error Codes

Error Code -110 reported for 186 surfaces
Error Code -115 reported for 500 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4165
Number of Invalid Surfaces:	686

Error Codes

Error Code -110 reported for 186 surfaces
Error Code -115 reported for 500 surfaces

Method: spencer

Number of Valid Surfaces:	4165
Number of Invalid Surfaces:	686

Error Codes

Error Code -110 reported for 186 surfaces
Error Code -115 reported for 500 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4165
Number of Invalid Surfaces:	686

Error Codes

Error Code -110 reported for 186 surfaces
Error Code -115 reported for 500 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	4805.86, 742.054 4801.56, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4516.53, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4481.94, 733 4481.52, 733.084 4476.94, 734 4476.94, 734 4471.48, 735.093 4466.94, 736 4466.94, 736 4466.94, 736 4464.31, 736.526 4461.43, 737.102 4456.94, 738 4456.94, 738 4451.39, 739.111 4446.94, 740 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897

	4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217	

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External Boundary	1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291

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	538.003, 771
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	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398

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Material Boundary	1886.54, 692
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	1899.79, 696.434
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	513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206 968.611, 687.32 973.02, 688.452 975.698, 689.053 976.071, 689.127 983.756, 690.815 985.339, 691.121 992.008, 692.55 995.001, 693.111 1013.14, 696.789 1014.83, 697.123	

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Material Boundary	1883.75, 685.747
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	2002.74, 725.408	
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	2008.74, 727.406	
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	2014.73, 729.405	
	2020.46, 731.315	
	2020.72, 731.403	
	2020.73, 731.403	
	2026.46, 733.315	
	2026.72, 733.402	
	2026.73, 733.402	
	2032.46, 735.313	
	2033.64, 735.713	
	2037.69, 737.065	
	2041.9, 738.472	
	2061.54, 731.927	
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	2195.59, 687.778	
	2206.66, 687.971	
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	2475.13, 688.921	
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	2965.99, 690.443	
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	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766 538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770

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	777.968, 825.837 777.971, 825.837 778.622, 826 779.282, 826.165 786.622, 828 793.638, 829.754 793.646, 829.756 794.622, 830 795.611, 830.247 802.622, 832 808.959, 833.584 810.622, 834 812.332, 834.427 818.622, 836 820.364, 836.436 826.622, 838 833.562, 839.735 834.622, 840 835.724, 840.275 842.622, 842 849.689, 843.767 850.622, 844 851.594, 844.243 858.622, 846 859.638, 846.254 866.622, 848 867.683, 848.265 874.622, 850 881.516, 851.724 882.622, 852 883.778, 852.289 884.667, 852.511 890.622, 854 896.384, 855.44 898.622, 856 905.369, 857.687 906.622, 858 913.267, 859.661 914.622, 860 916.042, 860.355 922.622, 862 924.05, 862.357 930.622, 864 936.682, 865.515 938.622, 866 945.083, 867.615 945.703, 867.77 946.463, 867.96 946.622, 868 948.807, 868.546 950.282, 868.915 951.413, 869.198 952.09, 869.367 954.622, 870 959.165, 871.136 960.758, 871.534 962.622, 872 965.435, 872.703 970.622, 874	

	974.464, 874.96 978.622, 876 983.295, 877.168 986.622, 878 987.722, 878.275 989.579, 878.739 989.696, 878.768 990.941, 879.08 994.622, 880 999.548, 881.232 999.665, 881.261 1001.52, 881.725 1002.62, 882 1002.75, 882.031 1003.06, 882.11 1003.09, 882.116 1003.45, 882.208 1010.62, 884 1016.85, 885.557 1018.62, 886 1024.91, 887.573 1026.62, 888 1032.44, 889.455 1032.46, 889.459 1034.62, 890 1036.95, 890.581 1036.96, 890.585 1042.62, 892 1044.19, 892.392 1050.62, 894 1052.12, 894.375 1058.62, 896 1065.26, 897.659 1066.62, 898 1071.96, 899.334 1071.97, 899.337 1074.62, 900 1077.51, 900.722 1077.53, 900.726 1082.62, 902 1089.48, 903.714 1090.62, 904 1097.56, 905.733 1098.62, 906 1105.63, 907.753 1106.62, 908 1111.23, 909.151 1111.24, 909.155 1114.62, 910 1132.01, 911.739 1134.62, 912 1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634	

Material Boundary	1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880

	1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602	

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	1937.57, 771.035	
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	2235.83, 694.482	
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	2366.91, 696.776	
	2387.58, 696.422	
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Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85

	768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26	

Material Boundary	1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273	

	1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285	

	2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054 3660.7, 695.468 3690.86, 695.09 3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832

	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687	

	914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693
Material Boundary	

	1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416	

	1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

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	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

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	1429.93, 900.087	
	1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112

Material Boundary	4442.27, 740.935 4456.92, 738 4464.31, 736.526 4464.44, 736.5 4466.94, 736
Material Boundary	4466.94, 736 4476.94, 734 4481.87, 733 4481.94, 733 4481.94, 733 4486.94, 732

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289	Assigned to: Wadsworth Till

	488.131, 719.138		
	522.779, 707.602		
	608.698, 679		
	618.307, 679		
	629.067, 679.262		
	642.777, 679.595		
	647.559, 679.711		
	660.405, 680.023		
	675.999, 680.402		
	689.108, 680.721		
	700.659, 681.002		
	711.292, 681.261		
	721.531, 681.51		
	724.458, 681.581		
	731.21, 681.745		
	742.989, 682.032		
	746.542, 682.118		
	760.228, 682.452		
	768.453, 682.652		
	775.361, 682.481		
	785.608, 682.229		
	792.858, 682.05		
	834.445, 681.025		
	836.108, 681		
	839.229, 681		
	842.442, 681		
	846.403, 681		
	851.249, 681		
	853.768, 681		
	858.565, 681		
	861.768, 681		
	864.838, 681		
	868.722, 681		
	876.123, 681		
	879.684, 681		
	882.824, 681		
	885.634, 681		
	888.824, 680.784		
	905.654, 679.642		
	913.684, 679.098		
	914.27, 679.058		
	916.598, 679.003		
	918.712, 678.951		
	920.654, 678.998		
	921.208, 679.012		
	921.899, 679.03		
	923.072, 679.061		
	924.878, 679.141		
	925.393, 679.164		
	926.99, 679.234		
	928.274, 679.291		
	929.213, 679.332		
	930.561, 679.392		
	932.042, 679.457		
	934.813, 679.981		
	940.841, 680.61		
	945.459, 681.092		
	948.634, 682.055		
	953.372, 683.186		

	964.682, 686.266		
	968.611, 687.32		
	970.51, 687.807		
	973.537, 688.568		
	983.137, 690.678		
	992.201, 692.586		
	995.001, 693.111		
	1005.88, 695.316		
	1015.48, 697.262		
	1026.16, 698.595		
	1029.95, 699.071		
	1037.13, 700.174		
	1049.53, 700.993		
	1053.89, 701.352		
	1060.67, 701.77		
	1068.84, 701.86		
	1069.64, 701.862		
	1072.74, 701.68		
	1077.4, 701.408		
	1085.39, 700.951		
	1093.76, 700.535		
	1103.93, 699.206		
	1105.21, 699.039		
	1108.51, 698.705		
	1108.62, 698.694		
	1115.88, 697.749		
	1119.27, 697.117		
	1126.35, 695.778		
	1134.85, 694.035		
	1143.12, 692.32		
	1144.75, 691.993		
	1145.42, 691.857		
	1146.43, 691.649		
	1147.98, 691.316		
	1148.3, 691.248		
	1149.18, 691.068		
	1151.08, 690.719		
	1156.36, 689.409		
	1157.27, 689.184		
	1163.63, 687.532		
	1180.77, 687.159		
	1199.14, 687		
	1219.87, 686.821		
	1247.6, 686.53		
	1274.47, 687.001		
	1354.82, 688.409		
	1380.15, 687.893		
	1449.6, 687		
	1461.71, 687		
	1495.01, 687		
	1500.34, 687		
Water Table	1516.14, 686.278		
	1637.24, 685		
	1692.76, 685		
	1718.93, 684.138		
	1781.09, 683.397		
	1807.08, 683		
	1816.05, 683		
	1826.62, 683		

	1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028		

	3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45		

	4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054	
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

	543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858		

	1069.81, 707.862		
	1084.55, 707		
	1094.3, 706.515		
	1105.9, 705		
	1109.31, 704.655		
	1114.62, 703.964		
	1116.8, 703.68		
	1119.86, 703.126		
	1120.45, 703		
	1128.59, 701.46		
	1130.69, 701		
	1136.6, 699.804		
	1140.35, 699		
	1147.15, 697.628		
	1150.1, 697		
	1152.34, 696.587		
	1158.74, 695		
	1164.46, 693.516		
	1180.87, 693.158		
	1199.19, 693		
	1219.93, 692.821		
	1247.58, 692.53		
	1274.37, 693		
	1354.83, 694.411		
	1380.25, 693.892		
	1449.64, 693		
	1461.71, 693		
	1495.01, 693		
	1500.48, 693		
	1516.31, 692.277		
	1637.28, 691		
	1692.86, 691		
	1719.06, 690.137		
	1781.17, 689.396		
	1807.13, 689		
	1816.05, 689		
	1826.74, 689		
	1846.47, 688.169		
	1846.65, 688.162		
	1850.41, 686.948		
	1855.35, 685.225		
	1856.02, 685		
	1856.55, 685		
	1858.87, 685		
	1861.85, 685		
	1868.81, 687.228		
	1874.47, 689		
	1874.47, 689		
	1875.79, 689.44		
	1880.49, 691		
	1880.54, 691		
	1881.86, 691.439		
	1886.54, 693		
	1891.23, 694.563		
	1892.54, 695		
	1893.8, 695.436		
	1893.84, 695.436		
	1898.54, 697		
Piezoline	1899.79, 697.434		

Piezoline	1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737		

	2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999		

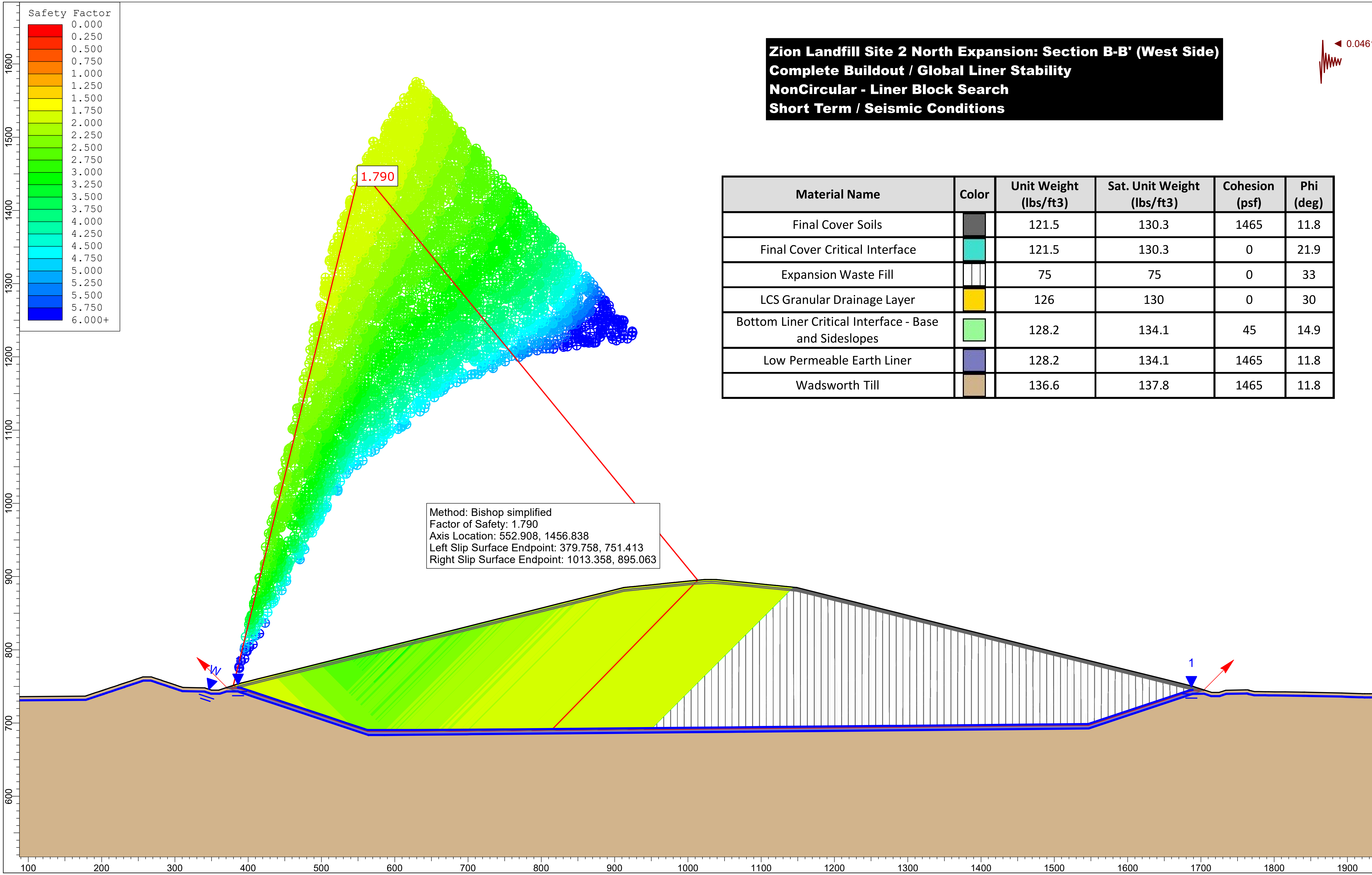
	3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	

SLOPE STABILITY

SECTION **B-B'** – **HORIZONTAL** EXPANSION **(WEST SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

COMPLETE BUILD-OUT / FINAL LANDFORM
BLOCK ANALYSIS OF LINER SYSTEM
(TRANSLATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

B-B_final_west_ST.slmd

APTIM

Slide Analysis Information

B-B_final_west_ST

Project Summary

File Name:	B-B_final_west_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:10m:02.182s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8

Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.789550
Axis Location:	552.908, 1456.838
Left Slip Surface Endpoint:	379.758, 751.413
Right Slip Surface Endpoint:	1013.358, 895.063
Resisting Moment:	1.41659e+09 lb-ft
Driving Moment:	7.91587e+08 lb-ft
Total Slice Area:	62740.3 ft2
Surface Horizontal Width:	633.6 ft
Surface Average Height:	99.0219 ft

Method: janbu corrected

FS	1.810390
Axis Location:	547.693, 1443.011
Left Slip Surface Endpoint:	379.805, 751.428
Right Slip Surface Endpoint:	1000.226, 893.750
Resisting Horizontal Force:	1.67674e+06 lb
Driving Horizontal Force:	926173 lb
Total Slice Area:	60701.8 ft2
Surface Horizontal Width:	620.422 ft
Surface Average Height:	97.8397 ft

Method: spencer

FS	1.891970
Axis Location:	570.371, 1494.094
Left Slip Surface Endpoint:	378.634, 751.050
Right Slip Surface Endpoint:	1049.764, 894.879
Resisting Moment:	1.58041e+09 lb-ft
Driving Moment:	8.35325e+08 lb-ft
Resisting Horizontal Force:	1.76466e+06 lb
Driving Horizontal Force:	932711 lb
Total Slice Area:	66629.2 ft2
Surface Horizontal Width:	671.13 ft
Surface Average Height:	99.2792 ft

Method: gle/morgenstern-price

FS	1.898430
Axis Location:	571.731, 1493.884
Left Slip Surface Endpoint:	379.738, 751.407
Right Slip Surface Endpoint:	1050.517, 894.803
Resisting Moment:	1.5829e+09 lb-ft
Driving Moment:	8.33795e+08 lb-ft
Resisting Horizontal Force:	1.76511e+06 lb
Driving Horizontal Force:	929778 lb
Total Slice Area:	67403.1 ft2
Surface Horizontal Width:	670.779 ft
Surface Average Height:	100.485 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
379.758	751.413
385.483	748.325
394.475	745.328
398.827	743.877
399.282	743.725
406.922	741.178
409.058	740.466
418.13	737.442
428.218	734.079
439.311	730.382
440.293	730.055
513.018	705.845
559.553	690.394
562.825	689.315
567.674	689.204
627.659	689.218
635.264	689.268
707.149	689.738
708.377	689.746
744.273	690.003
756.21	690.115
814.382	690.809
1013.36	895.063

Method: janbu corrected

X	Y
379.805	751.428
385.481	748.324
391.614	746.298
398.414	744.014
400.175	743.427
406.79	741.222
408.733	740.574
419.674	736.927
430.059	733.465
436.645	731.268
442.374	729.36
514.455	705.33
559.775	690.321
562.761	689.359
568.961	689.195
625.94	689.23
631.636	689.244
637.907	689.284
707.172	689.738
708.591	689.747
744.393	690.004
756.18	690.114
806.111	690.732
1000.23	893.75

Method: spencer

X	Y
378.634	751.05
382.392	749.357
392.038	746.14
398.57	743.961
400.026	743.477
406.875	741.193
409.772	740.228
418.094	737.453
427.913	734.18
437.762	730.897
444.566	728.629
510.879	706.524
559.204	690.357
562.666	689.314
569.429	689.197
629.562	689.23
637.748	689.283
706.564	689.735
708.708	689.748
744.264	690.002
755.89	690.111
815.519	690.82
1049.76	894.879

Method: gle/morgenstern-price

X	Y
379.738	751.407
384.907	748.508
387.099	747.795
399.009	743.816
399.922	743.512
408.661	740.597
408.95	740.502
410.569	739.961
430.935	733.173
438.139	730.771
445.935	728.172
513.932	705.504
556.902	691.121
562.774	689.358
570.87	689.207
612.528	689.212
626.416	689.209
637.823	689.284
704.484	689.72
710.202	689.758
742.454	689.986
756.485	690.117
822.402	690.884
1050.52	894.803

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 4778
Number of Invalid Surfaces: 227

Error Codes

Error Code -108 reported for 1 surface
Error Code -110 reported for 226 surfaces

Method: janbu corrected

Number of Valid Surfaces: 4778
Number of Invalid Surfaces: 226

Error Codes

Error Code -110 reported for 226 surfaces

Method: spencer

Number of Valid Surfaces: 4442
Number of Invalid Surfaces: 563

Error Codes

Error Code -108 reported for 50 surfaces
Error Code -110 reported for 226 surfaces
Error Code -111 reported for 287 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4092
Number of Invalid Surfaces:	912

Error Codes

Error Code -108 reported for 50 surfaces
Error Code -110 reported for 226 surfaces
Error Code -111 reported for 636 surfaces

Error Code Descriptions

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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072

	1058.55, 894	
	1056.47, 894.208	
	1047.76, 895.079	
	1038.54, 896	
	1031.85, 896	
	1031.28, 896	
	1024.07, 896	
	1022.73, 896	
	1003.75, 894.103	
	1002.72, 894	
	1002.59, 893.986	
	983.533, 892.081	
	982.719, 892	
	963.529, 890.082	
	962.713, 890	
	943.526, 888.082	
	942.708, 888	
	923.523, 886.082	
	922.702, 886	
	913.109, 885.041	
	912.699, 885	
	912.114, 884.941	
	912.089, 884.939	
	877.133, 876.202	
	859.589, 871.816	
	841.214, 867.222	
	840.146, 866.956	
	822.141, 862.454	
	802.222, 857.474	
	781.387, 852.265	
	759.573, 846.811	
	736.709, 841.095	
	712.721, 835.098	
	685.108, 828.195	
	626.363, 813.508	
	564.036, 797.924	
	447.096, 768.701	
	412.275, 760	
	398.83, 756.64	
	397.597, 756.33	
	396.492, 756.054	
	395.41, 755.784	
	394.351, 755.519	
	393.315, 755.26	
	392.3, 755.007	
	391.307, 754.759	
	390.334, 754.516	
	390.102, 754.458	
	386.057, 753.446	
	369.041, 747.954	
	360.315, 745.046	
	360.041, 744.955	
	350.343, 744.956	
	350.039, 744.956	
	341.31, 747.867	
	341.038, 747.958	
	312.062, 748.539	
	311.035, 748.562	
	309.721, 749	

	307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281	

External Boundary	0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56

	2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158	

	1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08
Material Boundary	

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711	

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

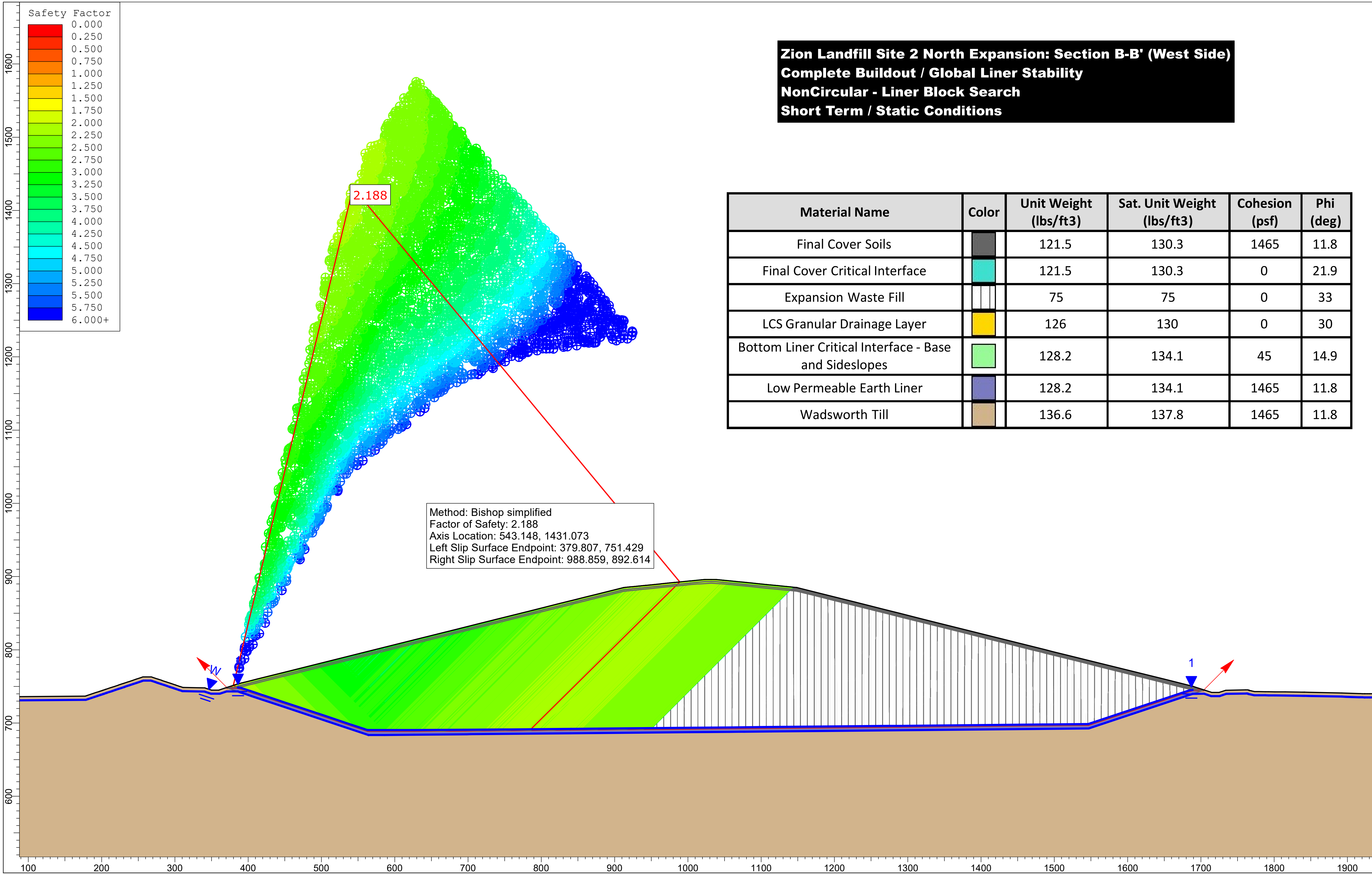
Water Table	698.374, 684.674		
	703.436, 684.721		
	840.146, 686		
	1002.59, 687.5		
	1031.85, 687.778		
	1056.47, 688		
	1070.79, 688.133		
	1076.9, 688.19		
	1113.49, 688.53		
	1198.73, 689.322		
	1487.03, 692		
	1546.99, 692.557		
	1550.33, 693.668		
	1688.75, 739.809		
	1689.03, 739.9		
	1704.21, 739.987		
	1707.78, 738.796		
	1713.96, 736.738		
	1718.76, 736.738		
	1725.58, 736.737		
	1729.95, 738.193		
	1734.63, 739.753		
	1760.99, 740.279		
	1763.01, 740.319		
	1763.65, 740.104		
	1763.66, 740.102		
	1763.67, 740.098		
	1763.68, 740.094		
	1763.69, 740.092		
	1763.71, 740.084		
	1763.72, 740.082		
	1763.72, 740.081		
	1763.77, 740.065		
	1763.78, 740.062		
	1763.8, 740.056		
	1763.81, 740.051		
	1763.83, 740.046		
	1763.85, 740.038		
	1763.88, 740.028		
	1763.89, 740.024		
	1764, 739.989		
	1764.14, 739.942		
	1764.53, 739.813		
	1764.53, 739.811		
	1764.57, 739.8		
	1764.59, 739.79		
	1764.67, 739.764		
	1765.01, 739.653		
	1765.03, 739.645		
	1765.1, 739.622		
	1765.5, 739.489		
	1767.7, 739.105		
	1767.72, 739.101		
	1768.46, 738.913		
	1772.79, 737.949		
	1773.36, 737.944		
	1779.28, 737.93		
	1787.81, 737.786		
	1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	



Zion Landfill Site 2 North Expansion: Section B-B' (West Side)
Complete Buildout / Global Liner Stability
NonCircular - Liner Block Search
Short Term / Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Slide Analysis Information

B-B_final_west_ST

Project Summary

File Name:	B-B_final_west_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:16m:11.170s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465

Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.187580
Axis Location:	543.148, 1431.073
Left Slip Surface Endpoint:	379.807, 751.429
Right Slip Surface Endpoint:	988.859, 892.614
Resisting Moment:	1.30568e+09 lb-ft
Driving Moment:	5.96858e+08 lb-ft
Total Slice Area:	57455.3 ft2
Surface Horizontal Width:	609.052 ft
Surface Average Height:	94.3357 ft

Method: janbu corrected

FS	2.220250
Axis Location:	543.148, 1431.073
Left Slip Surface Endpoint:	379.807, 751.429
Right Slip Surface Endpoint:	988.859, 892.614
Resisting Horizontal Force:	1.65578e+06 lb
Driving Horizontal Force:	745762 lb
Total Slice Area:	57455.3 ft2
Surface Horizontal Width:	609.052 ft
Surface Average Height:	94.3357 ft

Method: spencer

FS	2.323780
Axis Location:	559.786, 1477.697
Left Slip Surface Endpoint:	377.841, 750.794
Right Slip Surface Endpoint:	1032.142, 896.000
Resisting Moment:	1.53492e+09 lb-ft
Driving Moment:	6.60529e+08 lb-ft
Resisting Horizontal Force:	1.74426e+06 lb
Driving Horizontal Force:	750614 lb
Total Slice Area:	62741.2 ft2
Surface Horizontal Width:	654.3 ft
Surface Average Height:	95.8906 ft

Method: gle/morgenstern-price

FS	2.336710
Axis Location:	567.703, 1487.199
Left Slip Surface Endpoint:	379.882, 751.453
Right Slip Surface Endpoint:	1043.607, 895.494
Resisting Moment:	1.57445e+09 lb-ft
Driving Moment:	6.73789e+08 lb-ft
Resisting Horizontal Force:	1.76546e+06 lb
Driving Horizontal Force:	755533 lb
Total Slice Area:	65307.9 ft2
Surface Horizontal Width:	663.725 ft
Surface Average Height:	98.396 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
379.807	751.429
385.472	748.322
387.637	747.627
399.031	743.967
399.528	743.801
407.968	740.973
408.584	740.754
416.588	738.114
431.915	733.004
436.847	731.36
451.844	726.36
513.894	705.674
558.556	690.725
562.759	689.359
568.914	689.195
585.003	689.21
626.3	689.209
629.988	689.233
707.208	689.738
708.693	689.748
744.952	690.009
756.167	690.114
784.667	690.532
988.859	892.614

Method: janbu corrected

X	Y
379.807	751.429
385.472	748.322
387.637	747.627
399.031	743.967
399.528	743.801
407.968	740.973
408.584	740.754
416.588	738.114
431.915	733.004
436.847	731.36
451.844	726.36
513.894	705.674
558.556	690.725
562.759	689.359
568.914	689.195
585.003	689.21
626.3	689.209
629.988	689.233
707.208	689.738
708.693	689.748
744.952	690.009
756.167	690.114
784.667	690.532
988.859	892.614

Method: spencer

X	Y
377.841	750.794
394.172	745.506
399.813	743.612
426.464	734.663
452.359	726.032
462.375	722.692
477.663	717.594
493.059	712.462
510.815	706.553
533.924	698.812
562.715	689.36
568.522	689.206
627.187	689.214
627.411	689.216
637.881	689.284
655.076	689.397
672.401	689.51
708.37	689.746
740.546	689.968
757.283	690.125
777.945	690.317
788.982	690.573
806.397	703.727
823.045	716.586
839.415	729.448
854.3	741.359
870.459	754.565
886.772	768.245
902.655	781.974
916.524	794.198
930.368	806.401
944.754	819.055
959.143	831.671
973.518	844.204
988.065	856.769
1006.96	872.813
1027.91	890.79
1032.14	896

Method: gle/morgenstern-price

X	Y
379.882	751.453
385.463	748.326
397.03	744.592
399.38	743.851
408.361	740.855
408.761	740.723
433.228	732.471
434.473	732.04
434.607	731.994
446.355	728.032
513.134	705.771
561.509	689.731
562.776	689.358
571.116	689.196
593.103	689.209
626.333	689.21
635.763	689.271
706.975	689.737
714.251	689.784
744.385	690.004
756.331	690.116
809.901	690.767
1043.61	895.494

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 4772
Number of Invalid Surfaces: 232

Error Codes

Error Code -108 reported for 6 surfaces
Error Code -110 reported for 226 surfaces

Method: janbu corrected

Number of Valid Surfaces: 4777
Number of Invalid Surfaces: 227

Error Codes

Error Code -108 reported for 1 surface
Error Code -110 reported for 226 surfaces

Method: spencer

Number of Valid Surfaces: 4338
Number of Invalid Surfaces: 666

Error Codes

Error Code -108 reported for 61 surfaces
Error Code -110 reported for 226 surfaces
Error Code -111 reported for 379 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4149
Number of Invalid Surfaces:	856
Error Codes	
Error Code -108 reported for 74 surfaces	
Error Code -110 reported for 226 surfaces	
Error Code -111 reported for 556 surfaces	

Error Code Descriptions

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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072

	1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749

	307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281	

External Boundary	0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56

	2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158	

	1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888
	1079.05, 886.926
	1088.31, 886
	1098.98, 884.933
	1108.31, 884
	1118.92, 882.939
	1128.32, 882
	1138.86, 880.946
	1138.94, 880.946
	1148.32, 880
	1170.76, 874.561
	1189.01, 870
	1189.01, 870
	1211.61, 864.353
	1229.02, 860
	1229.02, 860
	1252.48, 854.135
	1269.03, 850
	1269.03, 850
	1293.27, 843.94
	1309.04, 840
	1309.04, 840
	1334.07, 833.743
	1349.05, 830
	1349.05, 830
	1374.81, 823.56
	1389.05, 820
	1389.05, 820
	1415.4, 813.414
	1429.06, 810
	1429.06, 810
	1455.94, 803.282
	1469.07, 800
	1482.16, 796.729
	1487.03, 795.51
	1509.08, 790
	1521.9, 786.796
	1549.09, 780
	1550.33, 779.69
	1561.74, 776.837
	1589.1, 770
	1601.64, 766.866
	1629.1, 760
	1641.53, 756.892
	1669.11, 749.997
	1687.47, 745.402
	1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711
Material Boundary	

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

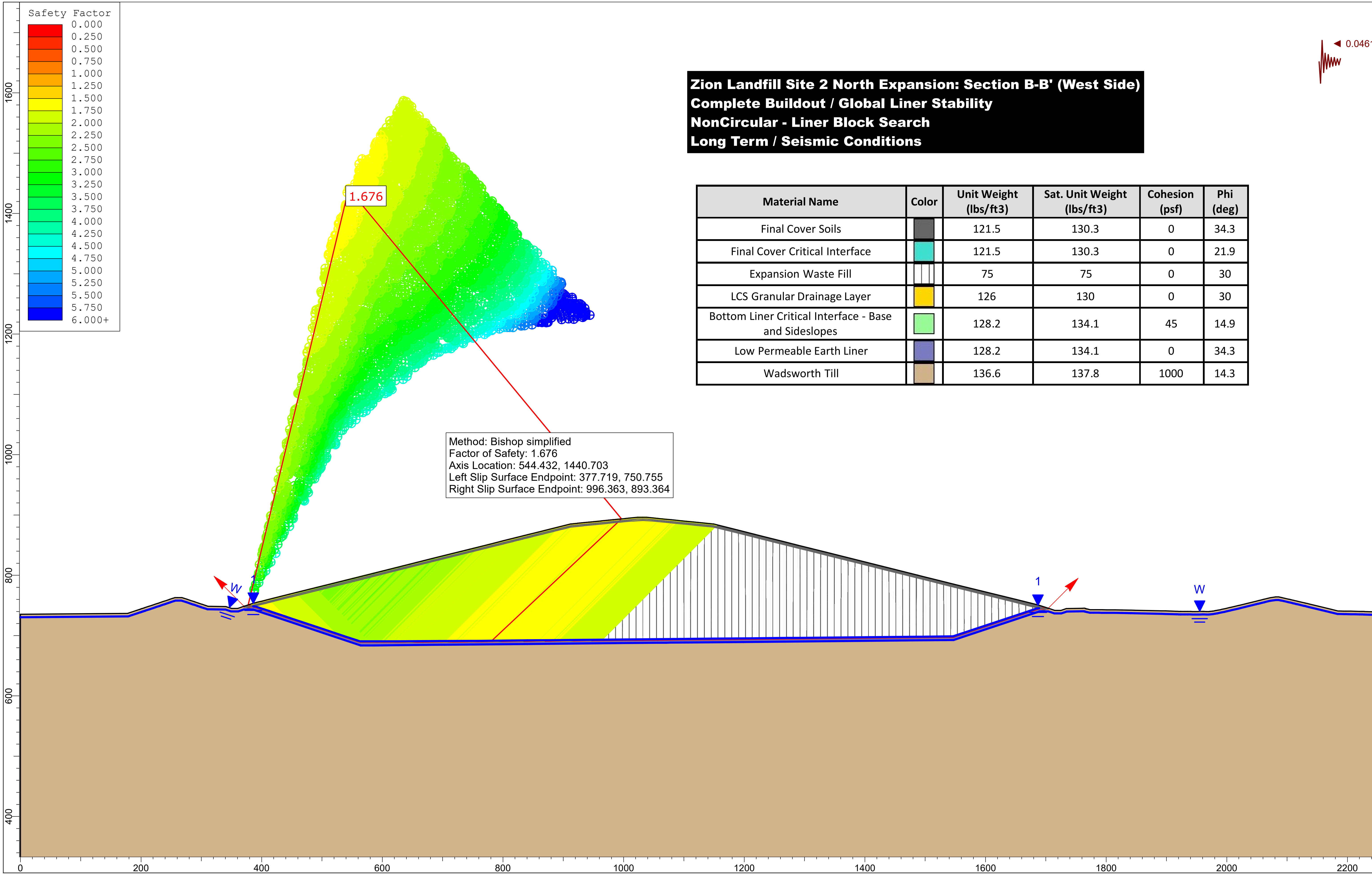
Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71		



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

B-B_final_west_LT.slmd

APTIM

Slide Analysis Information

B-B_final_west_LT

Project Summary

File Name:	B-B_final_west_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:13m:20.505s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8

Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.676000
Axis Location:	544.432, 1440.703
Left Slip Surface Endpoint:	377.719, 750.755
Right Slip Surface Endpoint:	996.363, 893.364
Resisting Moment:	1.23473e+09 lb-ft
Driving Moment:	7.36714e+08 lb-ft
Total Slice Area:	57758.4 ft2
Surface Horizontal Width:	618.644 ft
Surface Average Height:	93.363 ft

Method: janbu corrected

FS	1.689770
Axis Location:	541.909, 1434.570
Left Slip Surface Endpoint:	377.556, 750.702
Right Slip Surface Endpoint:	990.392, 892.767
Resisting Horizontal Force:	1.54616e+06 lb
Driving Horizontal Force:	915015 lb
Total Slice Area:	57435.5 ft2
Surface Horizontal Width:	612.836 ft
Surface Average Height:	93.7209 ft

Method: spencer

FS	1.778520
Axis Location:	566.584, 1490.203
Left Slip Surface Endpoint:	377.651, 750.733
Right Slip Surface Endpoint:	1044.801, 895.375
Resisting Moment:	1.44072e+09 lb-ft
Driving Moment:	8.10065e+08 lb-ft
Resisting Horizontal Force:	1.63953e+06 lb
Driving Horizontal Force:	921849 lb
Total Slice Area:	63222.6 ft2
Surface Horizontal Width:	667.149 ft
Surface Average Height:	94.7653 ft

Method: gle/morgenstern-price

FS	1.783480
Axis Location:	561.862, 1481.782
Left Slip Surface Endpoint:	377.868, 750.803
Right Slip Surface Endpoint:	1036.249, 896.000
Resisting Moment:	1.50477e+09 lb-ft
Driving Moment:	8.43723e+08 lb-ft
Resisting Horizontal Force:	1.70362e+06 lb
Driving Horizontal Force:	955222 lb
Total Slice Area:	67428.4 ft2
Surface Horizontal Width:	658.381 ft
Surface Average Height:	102.415 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
377.719	750.755
387.034	747.827
392.964	745.831
399.028	743.859
399.173	743.811
407.08	741.151
407.937	740.864
410.783	739.911
433.977	732.164
435.866	731.532
450.651	726.6
514.247	705.556
558.552	690.726
562.758	689.359
568.348	689.208
626.559	689.21
628.954	689.226
636.462	689.277
707.001	689.736
708.726	689.748
744.424	690.004
756.492	690.117
780.398	690.492
996.363	893.364

Method: janbu corrected

X	Y
377.556	750.702
384.955	748.488
392.635	746.022
398.789	743.951
399.65	743.661
406.896	741.22
408.906	740.542
416.046	738.136
431.718	732.912
435.144	731.77
453.43	725.674
512.305	706.046
556.258	691.404
562.76	689.359
568.855	689.194
590.401	689.209
627.036	689.214
638.238	689.287
707.235	689.738
709.126	689.751
744.429	690.004
776.778	690.308
782.484	690.514
990.392	892.767

Method: spencer

X	Y
377.651	750.733
382.874	749.183
392.316	746.07
398.459	744.012
400.057	743.477
406.822	741.212
409.781	740.225
418.456	737.333
429.148	733.768
438.569	730.628
444.489	728.655
511.852	706.197
559.288	690.409
562.772	689.358
570.363	689.203
626.43	689.22
630.095	689.234
637.994	689.285
704.92	689.723
710.565	689.76
743.365	689.995
754.337	690.097
787.469	690.557
1044.8	895.375

Method: gle/morgenstern-price

X	Y
377.868	750.803
392.384	746.072
414.47	738.661
435.998	731.485
455.499	724.983
475.009	718.48
494.511	711.978
514.007	705.479
536.228	698.041
560	690.19
562.774	689.358
571.439	689.197
586.673	689.207
629.292	689.228
647.122	689.345
664.567	689.459
681.792	689.573
699.623	689.688
724.003	689.849
744.39	690.004
767.006	690.215
788.43	690.417
804.723	690.568
815.087	690.817
832.346	703.221
848.814	715.428
866.471	728.89
881.483	740.738
895.714	752.386
910.826	765.288
927.655	780.216
945.683	796.683
963.563	813.564
981.004	830.722
997	847.254
1011.18	862.864
1022.99	877.239
1036.25	896

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 4774
Number of Invalid Surfaces: 230

Error Codes

Error Code -108 reported for 4 surfaces
Error Code -110 reported for 226 surfaces

Method: janbu corrected

Number of Valid Surfaces: 4773
Number of Invalid Surfaces: 231

Error Codes

Error Code -108 reported for 5 surfaces
Error Code -110 reported for 226 surfaces

Method: spencer

Number of Valid Surfaces: 4391
Number of Invalid Surfaces: 613

Error Codes

Error Code -108 reported for 65 surfaces
Error Code -110 reported for 226 surfaces
Error Code -111 reported for 322 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces: 4076
Number of Invalid Surfaces: 928

Error Codes

Error Code -108 reported for 36 surfaces
Error Code -110 reported for 226 surfaces
Error Code -111 reported for 666 surfaces

Error Code Descriptions

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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649

	1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054	

	395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646	

External Boundary	201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992

	2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008	

	1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278	

	1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539
Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157

Material Boundary	390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688

Material Boundary	389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871 398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890

	1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075 1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

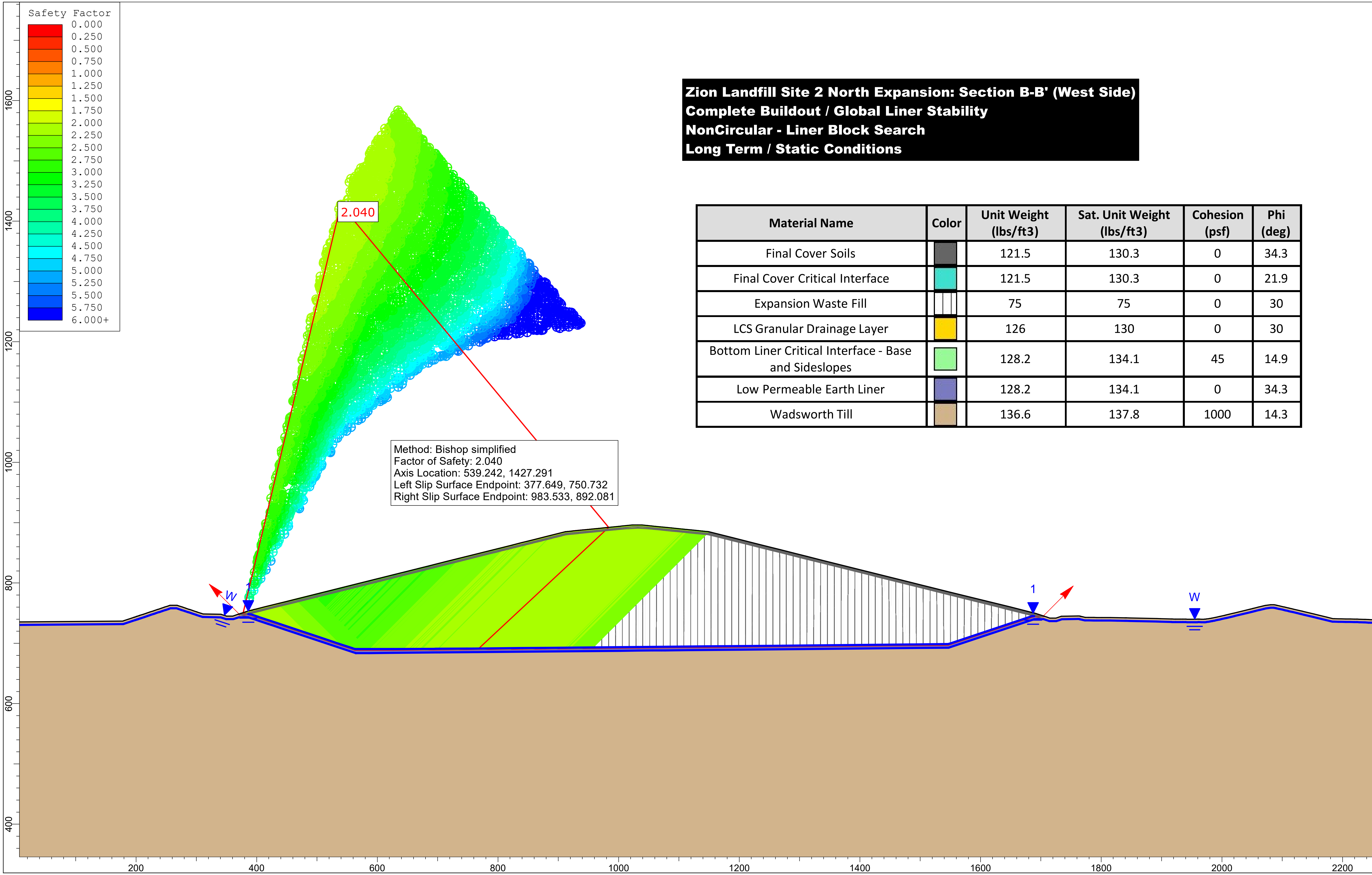
Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

Slide Analysis Information

B-B_final_west_LT

Project Summary

File Name:	B-B_final_west_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:23m:05.172s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000

Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.040230
Axis Location:	539.242, 1427.291
Left Slip Surface Endpoint:	377.649, 750.732
Right Slip Surface Endpoint:	983.533, 892.081
Resisting Moment:	1.1902e+09 lb-ft
Driving Moment:	5.83365e+08 lb-ft
Total Slice Area:	55221.5 ft2
Surface Horizontal Width:	605.884 ft
Surface Average Height:	91.142 ft

Method: janbu corrected

FS	2.063370
Axis Location:	539.242, 1427.291
Left Slip Surface Endpoint:	377.649, 750.732
Right Slip Surface Endpoint:	983.533, 892.081
Resisting Horizontal Force:	1.53688e+06 lb
Driving Horizontal Force:	744843 lb
Total Slice Area:	55221.5 ft2
Surface Horizontal Width:	605.884 ft
Surface Average Height:	91.142 ft

Method: spencer

FS	2.173900
Axis Location:	556.239, 1470.307
Left Slip Surface Endpoint:	377.960, 750.833
Right Slip Surface Endpoint:	1024.851, 896.000
Resisting Moment:	1.42446e+09 lb-ft
Driving Moment:	6.55253e+08 lb-ft
Resisting Horizontal Force:	1.64633e+06 lb
Driving Horizontal Force:	757317 lb
Total Slice Area:	61532.6 ft2
Surface Horizontal Width:	646.891 ft
Surface Average Height:	95.1205 ft

Method: gle/morgenstern-price

FS	2.187820
Axis Location:	556.239, 1470.307
Left Slip Surface Endpoint:	377.960, 750.833
Right Slip Surface Endpoint:	1024.851, 896.000
Resisting Moment:	1.42049e+09 lb-ft
Driving Moment:	6.49271e+08 lb-ft
Resisting Horizontal Force:	1.64238e+06 lb
Driving Horizontal Force:	750694 lb
Total Slice Area:	61532.6 ft2
Surface Horizontal Width:	646.891 ft
Surface Average Height:	95.1205 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
377.649	750.732
387.166	747.792
392.166	746.198
399.275	743.847
399.735	743.695
406.872	741.328
408.75	740.687
419.95	736.993
430.333	733.531
437.208	731.24
455.697	725.074
514.718	705.398
557.701	691.01
562.666	689.36
569.194	689.195
599.794	689.214
626.425	689.209
637.112	689.279
707.096	689.738
708.563	689.747
744.406	690.004
755.216	690.115
767.076	690.368
983.533	892.081

Method: janbu corrected

X	Y
377.649	750.732
387.166	747.792
392.166	746.198
399.275	743.847
399.735	743.695
406.872	741.328
408.75	740.687
419.95	736.993
430.333	733.531
437.208	731.24
455.697	725.074
514.718	705.398
557.701	691.01
562.666	689.36
569.194	689.195
599.794	689.214
626.425	689.209
637.112	689.279
707.096	689.738
708.563	689.747
744.406	690.004
755.216	690.115
767.076	690.368
983.533	892.081

Method: spencer

X	Y
377.96	750.833
403.577	742.294
430.101	733.451
458.359	724.03
484.022	715.506
513.512	705.643
536.231	698.039
561.452	689.769
561.582	689.728
562.772	689.357
577.318	689.2
586.77	689.206
643.984	689.324
663.841	689.454
693.281	689.647
706.613	689.735
726.241	689.862
744.296	690.003
761.404	690.196
774.647	690.438
804.335	710.414
816.04	718.474
831.237	729.134
846.948	740.435
865.001	753.857
882.102	767.11
897.653	779.746
912.434	792.404
927.666	805.931
942.767	819.572
957.263	832.909
971.03	845.776
983.927	858.011
995.9	869.458
1007.11	880.094
1024.85	896

Method: gle/morgenstern-price

X	Y
377.96	750.833
403.577	742.294
430.101	733.451
458.359	724.03
484.022	715.506
513.512	705.643
536.231	698.039
561.452	689.769
561.582	689.728
562.772	689.357
577.318	689.2
586.77	689.206
643.984	689.324
663.841	689.454
693.281	689.647
706.613	689.735
726.241	689.862
744.296	690.003
761.404	690.196
774.647	690.438
804.335	710.414
816.04	718.474
831.237	729.134
846.948	740.435
865.001	753.857
882.102	767.11
897.653	779.746
912.434	792.404
927.666	805.931
942.767	819.572
957.263	832.909
971.03	845.776
983.927	858.011
995.9	869.458
1007.11	880.094
1024.85	896

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4775
Number of Invalid Surfaces:	229

Error Codes

Error Code -108 reported for 1 surface

Error Code -110 reported for 228 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4773
Number of Invalid Surfaces:	231

Error Codes

Error Code -108 reported for 3 surfaces
Error Code -110 reported for 228 surfaces

Method: spencer

Number of Valid Surfaces:	4313
Number of Invalid Surfaces:	691

Error Codes

Error Code -108 reported for 48 surfaces
Error Code -110 reported for 228 surfaces
Error Code -111 reported for 415 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4134
Number of Invalid Surfaces:	870

Error Codes

Error Code -108 reported for 67 surfaces
Error Code -110 reported for 228 surfaces
Error Code -111 reported for 575 surfaces

Error Code Descriptions

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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028

1228.73, 865.012
1188.81, 874.99
1149.18, 884.939
1148.86, 884.971
1148.57, 885
1148.54, 885.012
1143.27, 885.539
1138.57, 886
1128.02, 887.055
1123.25, 887.539
1118.57, 888
1107.98, 889.059
1098.56, 890
1087.91, 891.065
1078.56, 892
1067.84, 893.072
1058.55, 894
1056.47, 894.208
1047.76, 895.079
1038.54, 896
1031.85, 896
1031.28, 896
1024.07, 896
1022.73, 896
1003.75, 894.103
1002.72, 894
1002.59, 893.986
983.533, 892.081
982.719, 892
963.529, 890.082
962.713, 890
943.526, 888.082
942.708, 888
923.523, 886.082
922.702, 886
913.109, 885.041
912.699, 885
912.114, 884.941
912.089, 884.939
877.133, 876.202
859.589, 871.816
841.214, 867.222
840.146, 866.956
822.141, 862.454
802.222, 857.474
781.387, 852.265
759.573, 846.811
736.709, 841.095
712.721, 835.098
685.108, 828.195
626.363, 813.508
564.036, 797.924
447.096, 768.701
412.275, 760
398.83, 756.64
397.597, 756.33
396.492, 756.054
395.41, 755.784
394.351, 755.519

	393.315, 755.26	
	392.3, 755.007	
	391.307, 754.759	
	390.334, 754.516	
	390.102, 754.458	
	386.057, 753.446	
	369.041, 747.954	
	360.315, 745.046	
	360.041, 744.955	
	350.343, 744.956	
	350.039, 744.956	
	341.31, 747.867	
	341.038, 747.958	
	312.062, 748.539	
	311.035, 748.562	
	309.721, 749	
	307.672, 749.682	
	306.716, 750	
	300.91, 751.933	
	300.708, 752	
	300.446, 752.087	
	294.699, 754	
	294.195, 754.168	
	288.69, 756	
	288.155, 756.178	
	282.681, 758	
	282.067, 758.204	
	276.673, 760	
	275.984, 760.229	
	270.664, 762	
	267.902, 762.919	
	259.888, 762.906	
	256.257, 762.904	
	253.546, 762	
	252.468, 761.641	
	247.546, 760	
	246.36, 759.605	
	241.546, 758	
	236.819, 756.424	
	235.546, 756	
	230.819, 754.424	
	229.546, 754	
	228.273, 753.576	
	223.546, 752	
	222.273, 751.576	
	217.546, 750	
	212.017, 748.157	
	205.774, 746.076	
	205.581, 746.012	
	205.411, 745.955	
	205.123, 745.859	
	204.822, 745.759	
	204.532, 745.662	
	204.114, 745.523	
	202.582, 745.012	
	202.37, 744.941	
	201.485, 744.646	
	201.379, 744.611	
	200.794, 744.416	

	200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348
External Boundary	

	2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007	

	1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936

	1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539
Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962

Material Boundary	403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304

Material Boundary	391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871 398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91	

	1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075 1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823
Material Boundary	736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711	
Material Boundary		

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

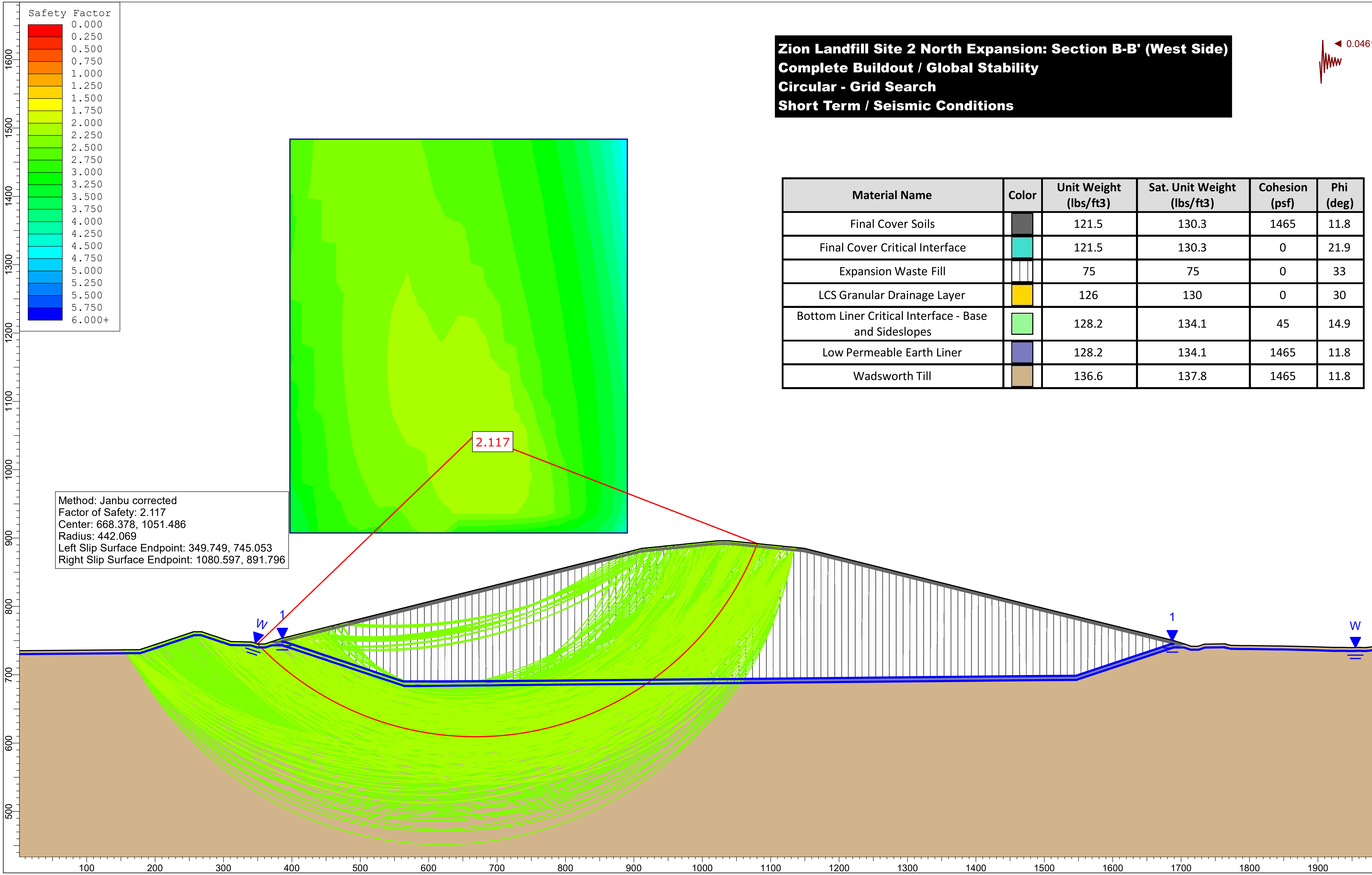
Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	

SLOPE STABILITY

SECTION **B-B'** – **HORIZONTAL** EXPANSION **(WEST SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

COMPLETE BUILD-OUT / FINAL LANDFORM
CIRCULAR ANALYSIS OF WASTE AND FOUNDATION
(ROTATIONAL SLOPE FAILURE)



Zion Landfill Site 2 North Expansion: Section B-B' (West Side)
Complete Buildout / Global Stability
Circular - Grid Search
Short Term / Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Method: Janbu corrected
Factor of Safety: 2.117
Center: 668.378, 1051.486
Radius: 442.069
Left Slip Surface Endpoint: 349.749, 745.053
Right Slip Surface Endpoint: 1080.597, 891.796

B-B_final_west_ST.slmd

APTIM

Slide Analysis Information

B-B_final_west_ST

Project Summary

File Name:	B-B_final_west_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:09.797s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.293920
Center:	668.378, 1166.761
Radius:	545.507
Left Slip Surface Endpoint:	318.286, 748.414
Right Slip Surface Endpoint:	1136.227, 886.234
Resisting Moment:	2.14635e+09 lb-ft
Driving Moment:	9.35667e+08 lb-ft
Total Slice Area:	122816 ft2
Surface Horizontal Width:	817.94 ft
Surface Average Height:	150.153 ft

Method: janbu corrected

FS	2.116930
Center:	668.378, 1051.486
Radius:	442.069
Left Slip Surface Endpoint:	349.749, 745.053
Right Slip Surface Endpoint:	1080.597, 891.796
Resisting Horizontal Force:	3.42353e+06 lb
Driving Horizontal Force:	1.61722e+06 lb
Total Slice Area:	117562 ft2
Surface Horizontal Width:	730.848 ft
Surface Average Height:	160.857 ft

Method: spencer

FS	2.255600
Center:	668.378, 1137.942
Radius:	509.361
Left Slip Surface Endpoint:	340.710, 747.964
Right Slip Surface Endpoint:	1112.539, 888.603
Resisting Moment:	1.84966e+09 lb-ft
Driving Moment:	8.20034e+08 lb-ft
Resisting Horizontal Force:	3.22567e+06 lb
Driving Horizontal Force:	1.43007e+06 lb
Total Slice Area:	112513 ft2
Surface Horizontal Width:	771.829 ft
Surface Average Height:	145.774 ft

Method: gle/morgenstern-price

FS	2.258740
Center:	668.378, 1137.942
Radius:	509.361
Left Slip Surface Endpoint:	340.710, 747.964
Right Slip Surface Endpoint:	1112.539, 888.603
Resisting Moment:	1.85224e+09 lb-ft
Driving Moment:	8.20034e+08 lb-ft
Resisting Horizontal Force:	3.22712e+06 lb
Driving Horizontal Force:	1.42873e+06 lb
Total Slice Area:	112513 ft2
Surface Horizontal Width:	771.829 ft
Surface Average Height:	145.774 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4527
Number of Invalid Surfaces:	324

Error Codes
Error Code -110 reported for 92 surfaces
Error Code -112 reported for 142 surfaces
Error Code -115 reported for 90 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4554
Number of Invalid Surfaces:	297

Error Codes
Error Code -108 reported for 1 surface
Error Code -110 reported for 92 surfaces
Error Code -112 reported for 114 surfaces
Error Code -115 reported for 90 surfaces

Method: spencer

Number of Valid Surfaces:	4509
Number of Invalid Surfaces:	342

Error Codes
Error Code -108 reported for 1 surface
Error Code -110 reported for 92 surfaces
Error Code -111 reported for 16 surfaces
Error Code -112 reported for 143 surfaces
Error Code -115 reported for 90 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4524
Number of Invalid Surfaces:	327

Error Codes
Error Code -108 reported for 1 surface
Error Code -110 reported for 92 surfaces
Error Code -112 reported for 144 surfaces
Error Code -115 reported for 90 surfaces

Error Code Descriptions

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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888

	1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956	

	341.31, 747.867	
	341.038, 747.958	
	312.062, 748.539	
	311.035, 748.562	
	309.721, 749	
	307.672, 749.682	
	306.716, 750	
	300.91, 751.933	
	300.708, 752	
	300.446, 752.087	
	294.699, 754	
	294.195, 754.168	
	288.69, 756	
	288.155, 756.178	
	282.681, 758	
	282.067, 758.204	
	276.673, 760	
	275.984, 760.229	
	270.664, 762	
	267.902, 762.919	
	259.888, 762.906	
	256.257, 762.904	
	253.546, 762	
	252.468, 761.641	
	247.546, 760	
	246.36, 759.605	
	241.546, 758	
	236.819, 756.424	
	235.546, 756	
	230.819, 754.424	
	229.546, 754	
	228.273, 753.576	
	223.546, 752	
	222.273, 751.576	
	217.546, 750	
	212.017, 748.157	
	205.774, 746.076	
	205.581, 746.012	
	205.411, 745.955	
	205.123, 745.859	
	204.822, 745.759	
	204.532, 745.662	
	204.114, 745.523	
	202.582, 745.012	
	202.37, 744.941	
	201.485, 744.646	
	201.379, 744.611	
	200.794, 744.416	
	200.126, 744.193	
	200.07, 744.175	
	199.416, 743.957	
	199.195, 743.883	
	197.758, 743.404	
	197.28, 743.245	
	196.972, 743.142	
	196.867, 743.107	
	195.97, 742.808	
	192.571, 741.675	
	180.393, 737.616	

External Boundary	179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758	

	2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057	

	1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

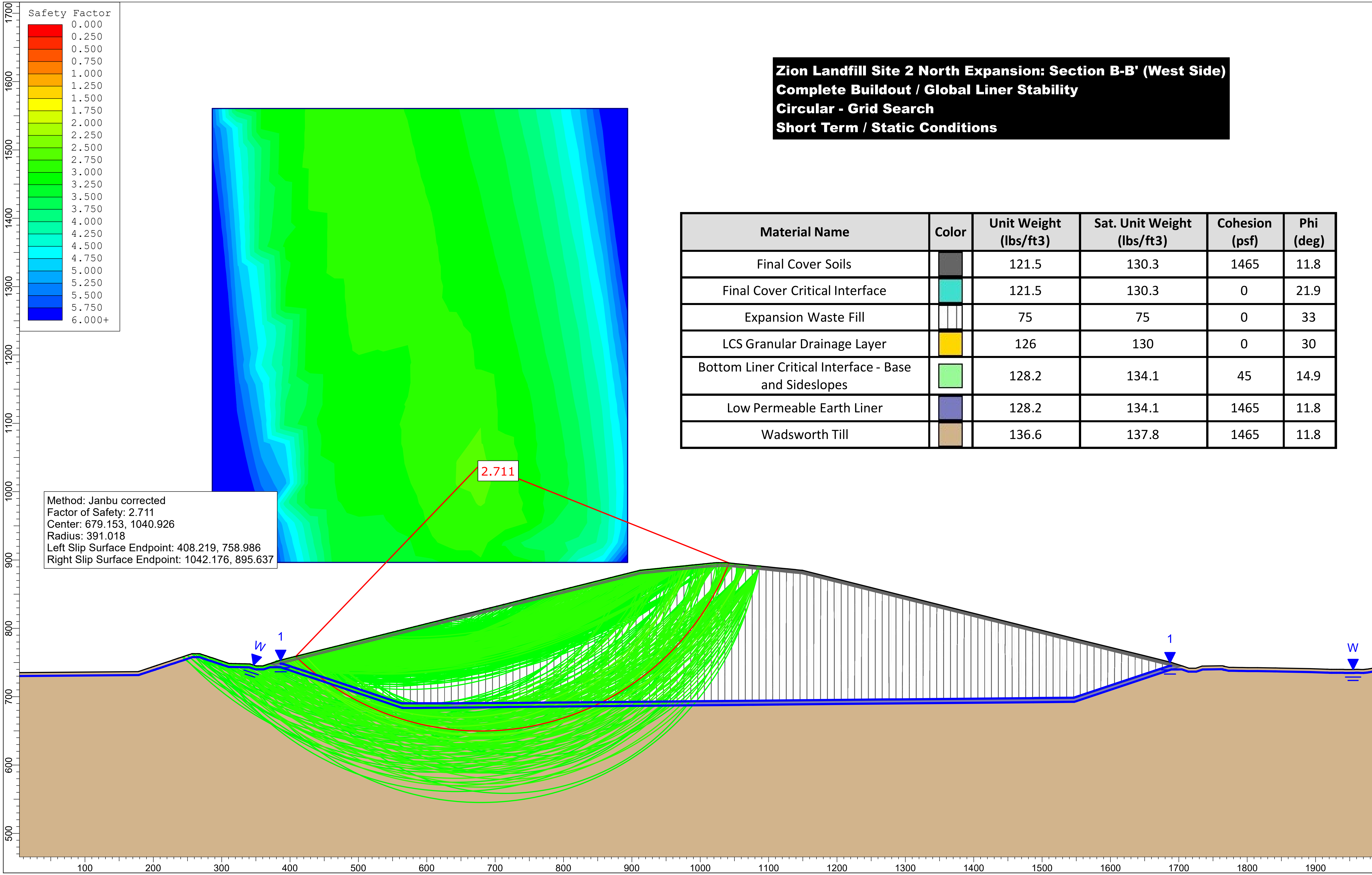
	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

B-B_final_west_ST.slmd

APTIM

Slide Analysis Information

B-B_final_west_ST

Project Summary

File Name:	B-B_final_west_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:08.829s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.834820
Center:	464.751, 1560.631
Radius:	815.796
Left Slip Surface Endpoint:	374.792, 749.810
Right Slip Surface Endpoint:	923.568, 886.087
Resisting Moment:	8.70461e+08 lb-ft
Driving Moment:	3.0706e+08 lb-ft
Total Slice Area:	19850.7 ft2
Surface Horizontal Width:	548.776 ft
Surface Average Height:	36.1727 ft

Method: janbu corrected

FS	2.710950
Center:	679.153, 1040.926
Radius:	391.018
Left Slip Surface Endpoint:	408.219, 758.986
Right Slip Surface Endpoint:	1042.176, 895.637
Resisting Horizontal Force:	2.79708e+06 lb
Driving Horizontal Force:	1.03177e+06 lb
Total Slice Area:	84204.3 ft2
Surface Horizontal Width:	633.957 ft
Surface Average Height:	132.823 ft

Method: spencer

FS	2.831730
Center:	464.751, 1560.631
Radius:	815.796
Left Slip Surface Endpoint:	374.792, 749.810
Right Slip Surface Endpoint:	923.568, 886.087
Resisting Moment:	8.69513e+08 lb-ft
Driving Moment:	3.0706e+08 lb-ft
Resisting Horizontal Force:	1.02219e+06 lb
Driving Horizontal Force:	360978 lb
Total Slice Area:	19850.7 ft2
Surface Horizontal Width:	548.776 ft
Surface Average Height:	36.1727 ft

Method: gle/morgenstern-price

FS	2.834960
Center:	464.751, 1560.631
Radius:	815.796
Left Slip Surface Endpoint:	374.792, 749.810
Right Slip Surface Endpoint:	923.568, 886.087
Resisting Moment:	8.70503e+08 lb-ft
Driving Moment:	3.0706e+08 lb-ft
Resisting Horizontal Force:	1.02329e+06 lb
Driving Horizontal Force:	360955 lb
Total Slice Area:	19850.7 ft2
Surface Horizontal Width:	548.776 ft
Surface Average Height:	36.1727 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4166
Number of Invalid Surfaces:	586

Error Codes
Error Code -107 reported for 76 surfaces
Error Code -110 reported for 125 surfaces
Error Code -112 reported for 126 surfaces
Error Code -115 reported for 259 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4181
Number of Invalid Surfaces:	571

Error Codes
Error Code -107 reported for 76 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 125 surfaces
Error Code -112 reported for 109 surfaces
Error Code -115 reported for 259 surfaces

Method: spencer

Number of Valid Surfaces:	4158
Number of Invalid Surfaces:	594

Error Codes
Error Code -107 reported for 76 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 125 surfaces
Error Code -111 reported for 4 surfaces
Error Code -112 reported for 128 surfaces
Error Code -115 reported for 259 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4162
Number of Invalid Surfaces:	590
Error Codes	
Error Code -107 reported for 76 surfaces	
Error Code -108 reported for 2 surfaces	
Error Code -110 reported for 125 surfaces	
Error Code -111 reported for 2 surfaces	
Error Code -112 reported for 126 surfaces	
Error Code -115 reported for 259 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-107 = Total driving moment or total driving force is negative. This will occur if the wrong failure direction is specified, or if high external or anchor loads are applied against the failure direction.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539

	1138.57, 886	
	1128.02, 887.055	
	1123.25, 887.539	
	1118.57, 888	
	1107.98, 889.059	
	1098.56, 890	
	1087.91, 891.065	
	1078.56, 892	
	1067.84, 893.072	
	1058.55, 894	
	1056.47, 894.208	
	1047.76, 895.079	
	1038.54, 896	
	1031.85, 896	
	1031.28, 896	
	1024.07, 896	
	1022.73, 896	
	1003.75, 894.103	
	1002.72, 894	
	1002.59, 893.986	
	983.533, 892.081	
	982.719, 892	
	963.529, 890.082	
	962.713, 890	
	943.526, 888.082	
	942.708, 888	
	923.523, 886.082	
	922.702, 886	
	913.109, 885.041	
	912.699, 885	
	912.114, 884.941	
	912.089, 884.939	
	877.133, 876.202	
	859.589, 871.816	
	841.214, 867.222	
	840.146, 866.956	
	822.141, 862.454	
	802.222, 857.474	
	781.387, 852.265	
	759.573, 846.811	
	736.709, 841.095	
	712.721, 835.098	
	685.108, 828.195	
	626.363, 813.508	
	564.036, 797.924	
	447.096, 768.701	
	412.275, 760	
	398.83, 756.64	
	397.597, 756.33	
	396.492, 756.054	
	395.41, 755.784	
	394.351, 755.519	
	393.315, 755.26	
	392.3, 755.007	
	391.307, 754.759	
	390.334, 754.516	
	390.102, 754.458	
	386.057, 753.446	
	369.041, 747.954	

	360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142	

External Boundary	196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334

	2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181	

	1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711	

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

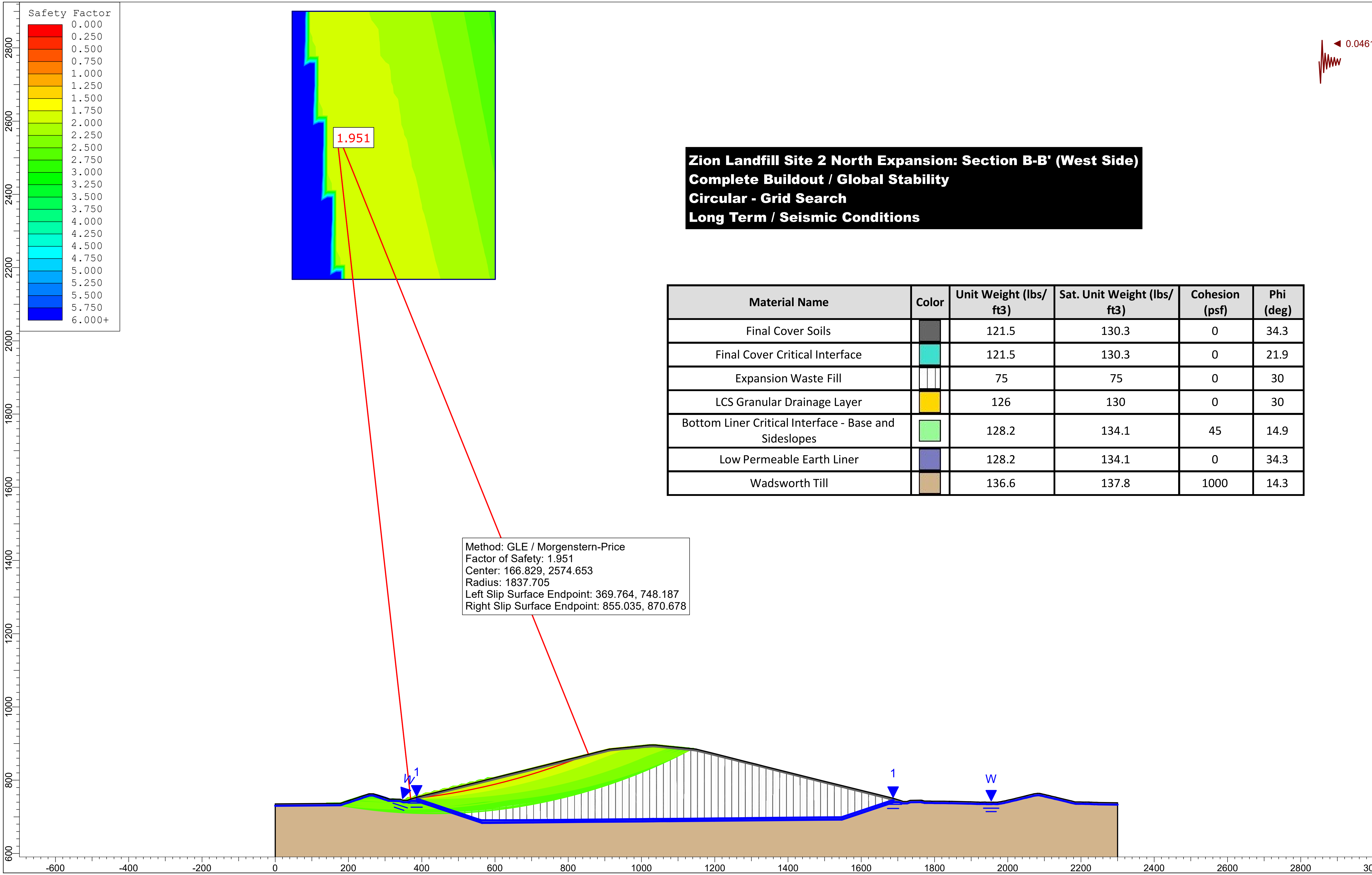
	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner



Zion Landfill Site 2 North Expansion: Section B-B' (West Side)
Complete Buildout / Global Stability
Circular - Grid Search
Long Term / Seismic Conditions

Material Name	Color	Unit Weight (lbs/ ft3)	Sat. Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

Method: GLE / Morgenstern-Price
Factor of Safety: 1.951
Center: 166.829, 2574.653
Radius: 1837.705
Left Slip Surface Endpoint: 369.764, 748.187
Right Slip Surface Endpoint: 855.035, 870.678

B-B_final_west_LT.slmd

APTIM

Slide Analysis Information

B-B_final_west_LT

Project Summary

File Name:	B-B_final_west_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:09.381s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.954990
Center:	166.829, 2574.653
Radius:	1837.705
Left Slip Surface Endpoint:	369.764, 748.187
Right Slip Surface Endpoint:	855.035, 870.678
Resisting Moment:	5.73103e+08 lb-ft
Driving Moment:	2.93149e+08 lb-ft
Total Slice Area:	5990.16 ft2
Surface Horizontal Width:	485.271 ft
Surface Average Height:	12.344 ft

Method: janbu corrected

FS	1.965850
Center:	166.829, 2574.653
Radius:	1837.705
Left Slip Surface Endpoint:	369.764, 748.187
Right Slip Surface Endpoint:	855.035, 870.678
Resisting Horizontal Force:	304922 lb
Driving Horizontal Force:	155109 lb
Total Slice Area:	5990.16 ft2
Surface Horizontal Width:	485.271 ft
Surface Average Height:	12.344 ft

Method: spencer

FS	1.952320
Center:	166.829, 2574.653
Radius:	1837.705
Left Slip Surface Endpoint:	369.764, 748.187
Right Slip Surface Endpoint:	855.035, 870.678
Resisting Moment:	5.72319e+08 lb-ft
Driving Moment:	2.93149e+08 lb-ft
Resisting Horizontal Force:	302035 lb
Driving Horizontal Force:	154706 lb
Total Slice Area:	5990.16 ft2
Surface Horizontal Width:	485.271 ft
Surface Average Height:	12.344 ft

Method: gle/morgenstern-price

FS	1.951040
Center:	166.829, 2574.653
Radius:	1837.705
Left Slip Surface Endpoint:	369.764, 748.187
Right Slip Surface Endpoint:	855.035, 870.678
Resisting Moment:	5.71944e+08 lb-ft
Driving Moment:	2.93149e+08 lb-ft
Resisting Horizontal Force:	301937 lb
Driving Horizontal Force:	154757 lb
Total Slice Area:	5990.16 ft2
Surface Horizontal Width:	485.271 ft
Surface Average Height:	12.344 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	3894
Number of Invalid Surfaces:	1122

Error Codes
Error Code -106 reported for 22 surfaces
Error Code -110 reported for 167 surfaces
Error Code -115 reported for 933 surfaces

Method: janbu corrected

Number of Valid Surfaces:	3894
Number of Invalid Surfaces:	1122

Error Codes
Error Code -106 reported for 22 surfaces
Error Code -110 reported for 167 surfaces
Error Code -115 reported for 933 surfaces

Method: spencer

Number of Valid Surfaces:	3894
Number of Invalid Surfaces:	1122

Error Codes
Error Code -106 reported for 22 surfaces
Error Code -110 reported for 167 surfaces
Error Code -115 reported for 933 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	3894
Number of Invalid Surfaces:	1122

Error Codes
Error Code -106 reported for 22 surfaces
Error Code -110 reported for 167 surfaces
Error Code -115 reported for 933 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894

	1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758	

	282.067, 758.204	
	276.673, 760	
	275.984, 760.229	
	270.664, 762	
	267.902, 762.919	
	259.888, 762.906	
	256.257, 762.904	
	253.546, 762	
	252.468, 761.641	
	247.546, 760	
	246.36, 759.605	
	241.546, 758	
	236.819, 756.424	
	235.546, 756	
	230.819, 754.424	
	229.546, 754	
	228.273, 753.576	
	223.546, 752	
	222.273, 751.576	
	217.546, 750	
	212.017, 748.157	
	205.774, 746.076	
	205.581, 746.012	
	205.411, 745.955	
	205.123, 745.859	
	204.822, 745.759	
	204.532, 745.662	
	204.114, 745.523	
	202.582, 745.012	
	202.37, 744.941	
	201.485, 744.646	
	201.379, 744.611	
	200.794, 744.416	
	200.126, 744.193	
	200.07, 744.175	
	199.416, 743.957	
	199.195, 743.883	
	197.758, 743.404	
	197.28, 743.245	
	196.972, 743.142	
	196.867, 743.107	
	195.97, 742.808	
	192.571, 741.675	
	180.393, 737.616	
	179.777, 737.41	
	179.104, 737.186	
	178.684, 737.046	
	177.683, 736.712	
	0, 735.281	
	0, 330	
	2300, 329.864	
	2300, 738.23	
	2246.57, 739.067	
	2243.38, 739.234	
	2237.66, 739.488	
	2236.06, 739.552	
	2228.45, 739.866	
External Boundary	2227.6, 739.905	
	2224.96, 740	

	2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012

	1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777	

	1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711
Material Boundary	

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07
	1138.27, 883.015
	1142.97, 882.553
	1147.91, 882.06
	1147.94, 882.048
	1148.56, 881.986
	1148.66, 881.976
	1188.08, 872.08
	1228, 862.102
	1247.94, 857.118
	1267.81, 852.104
	1289.06, 846.74
	1311.8, 841.003
	1335.66, 834.996
	1486.31, 797.334
	1497.43, 794.552
	1516.51, 789.734
	1549.61, 781.577
	1649, 757.085
	1683.06, 748.565
	1687.92, 747.349
	1691.01, 746.338
	1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281	Assigned to:
	178.514, 731.719	Wadsworth Till
	180.265, 732.302	
	180.685, 732.443	
	181.358, 732.667	
	181.974, 732.872	
	194.152, 736.932	
	197.551, 738.064	
	198.448, 738.364	
	198.554, 738.399	
	198.861, 738.501	
	199.339, 738.661	
	200.776, 739.14	
	200.997, 739.213	
	201.651, 739.431	
	201.708, 739.45	
	202.375, 739.673	
	202.96, 739.868	
	203.066, 739.903	
	203.951, 740.198	
	204.163, 740.269	
	205.695, 740.779	
	206.113, 740.918	
	206.403, 741.015	
	206.704, 741.116	
	206.992, 741.211	
	207.162, 741.268	
	207.356, 741.333	
	213.598, 743.414	
	219.127, 745.257	

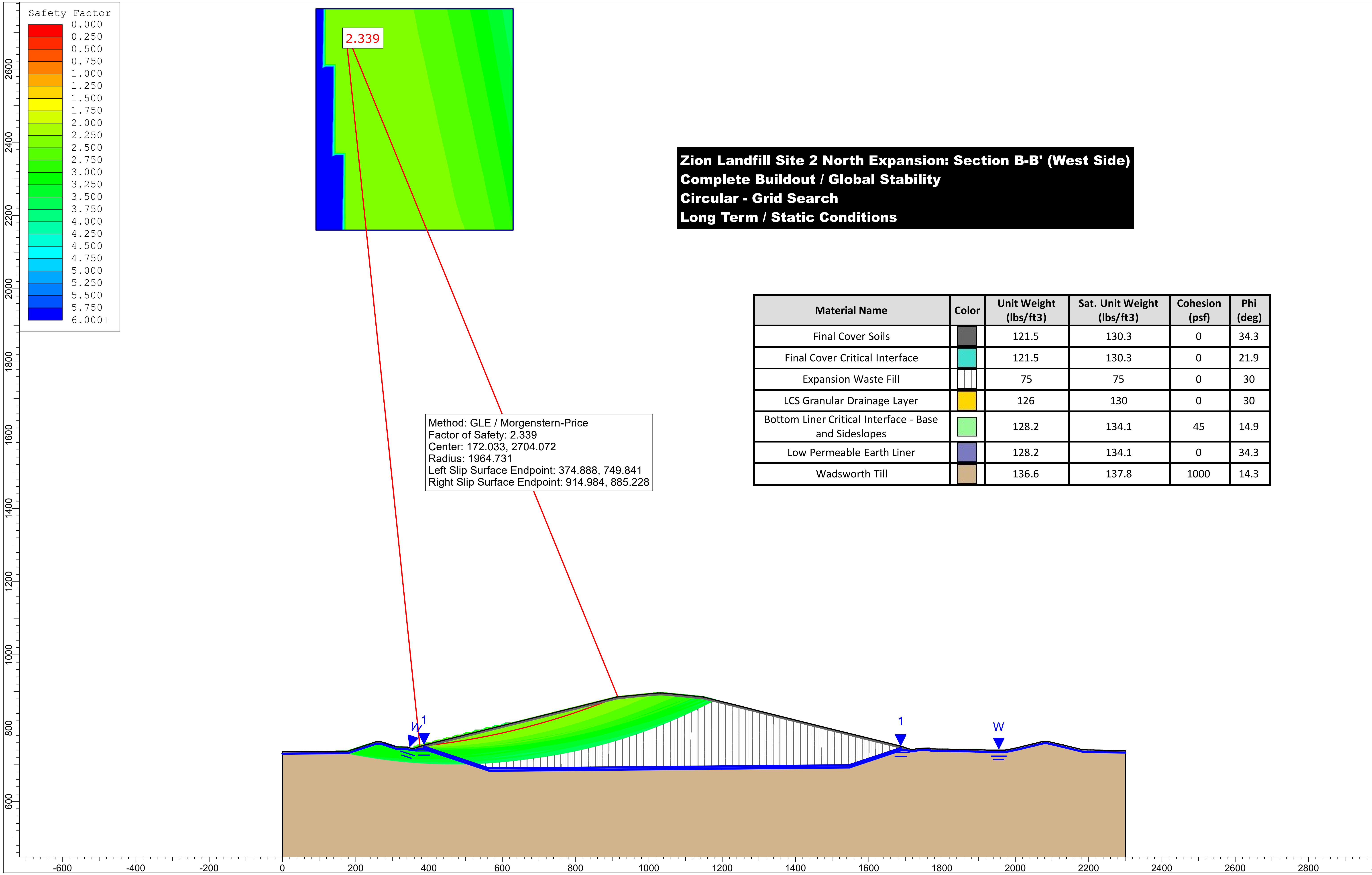
	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229		

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

Slide Analysis Information

B-B_final_west_LT

Project Summary

File Name:	B-B_final_west_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:07.738s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.342460
Center:	172.033, 2704.072
Radius:	1964.731
Left Slip Surface Endpoint:	374.888, 749.841
Right Slip Surface Endpoint:	914.984, 885.228
Resisting Moment:	7.7592e+08 lb-ft
Driving Moment:	3.31241e+08 lb-ft
Total Slice Area:	7692.55 ft2
Surface Horizontal Width:	540.095 ft
Surface Average Height:	14.243 ft

Method: janbu corrected

FS	2.355780
Center:	172.033, 2704.072
Radius:	1964.731
Left Slip Surface Endpoint:	374.888, 749.841
Right Slip Surface Endpoint:	914.984, 885.228
Resisting Horizontal Force:	386256 lb
Driving Horizontal Force:	163961 lb
Total Slice Area:	7692.55 ft2
Surface Horizontal Width:	540.095 ft
Surface Average Height:	14.243 ft

Method: spencer

FS	2.340410
Center:	172.033, 2704.072
Radius:	1964.731
Left Slip Surface Endpoint:	374.888, 749.841
Right Slip Surface Endpoint:	914.984, 885.228
Resisting Moment:	7.75241e+08 lb-ft
Driving Moment:	3.31241e+08 lb-ft
Resisting Horizontal Force:	382440 lb
Driving Horizontal Force:	163407 lb
Total Slice Area:	7692.55 ft2
Surface Horizontal Width:	540.095 ft
Surface Average Height:	14.243 ft

Method: gle/morgenstern-price

FS	2.338690
Center:	172.033, 2704.072
Radius:	1964.731
Left Slip Surface Endpoint:	374.888, 749.841
Right Slip Surface Endpoint:	914.984, 885.228
Resisting Moment:	7.74671e+08 lb-ft
Driving Moment:	3.31241e+08 lb-ft
Resisting Horizontal Force:	382390 lb
Driving Horizontal Force:	163506 lb
Total Slice Area:	7692.55 ft2
Surface Horizontal Width:	540.095 ft
Surface Average Height:	14.243 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	3842
Number of Invalid Surfaces:	1009

Error Codes

Error Code -106 reported for 1 surface
Error Code -110 reported for 175 surfaces
Error Code -115 reported for 833 surfaces

Method: janbu corrected

Number of Valid Surfaces:	3842
Number of Invalid Surfaces:	1009

Error Codes

Error Code -106 reported for 1 surface
Error Code -110 reported for 175 surfaces
Error Code -115 reported for 833 surfaces

Method: spencer

Number of Valid Surfaces:	3842
Number of Invalid Surfaces:	1009

Error Codes

Error Code -106 reported for 1 surface
Error Code -110 reported for 175 surfaces
Error Code -115 reported for 833 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	3842
Number of Invalid Surfaces:	1009

Error Codes

Error Code -106 reported for 1 surface
Error Code -110 reported for 175 surfaces
Error Code -115 reported for 833 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894

	1002.59, 893.986	
	983.533, 892.081	
	982.719, 892	
	963.529, 890.082	
	962.713, 890	
	943.526, 888.082	
	942.708, 888	
	923.523, 886.082	
	922.702, 886	
	913.109, 885.041	
	912.699, 885	
	912.114, 884.941	
	912.089, 884.939	
	877.133, 876.202	
	859.589, 871.816	
	841.214, 867.222	
	840.146, 866.956	
	822.141, 862.454	
	802.222, 857.474	
	781.387, 852.265	
	759.573, 846.811	
	736.709, 841.095	
	712.721, 835.098	
	685.108, 828.195	
	626.363, 813.508	
	564.036, 797.924	
	447.096, 768.701	
	412.275, 760	
	398.83, 756.64	
	397.597, 756.33	
	396.492, 756.054	
	395.41, 755.784	
	394.351, 755.519	
	393.315, 755.26	
	392.3, 755.007	
	391.307, 754.759	
	390.334, 754.516	
	390.102, 754.458	
	386.057, 753.446	
	369.041, 747.954	
	360.315, 745.046	
	360.041, 744.955	
	350.343, 744.956	
	350.039, 744.956	
	341.31, 747.867	
	341.038, 747.958	
	312.062, 748.539	
	311.035, 748.562	
	309.721, 749	
	307.672, 749.682	
	306.716, 750	
	300.91, 751.933	
	300.708, 752	
	300.446, 752.087	
	294.699, 754	
	294.195, 754.168	
	288.69, 756	
	288.155, 756.178	
	282.681, 758	

	282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740
External Boundary	

	2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012	

	1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777	

	1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

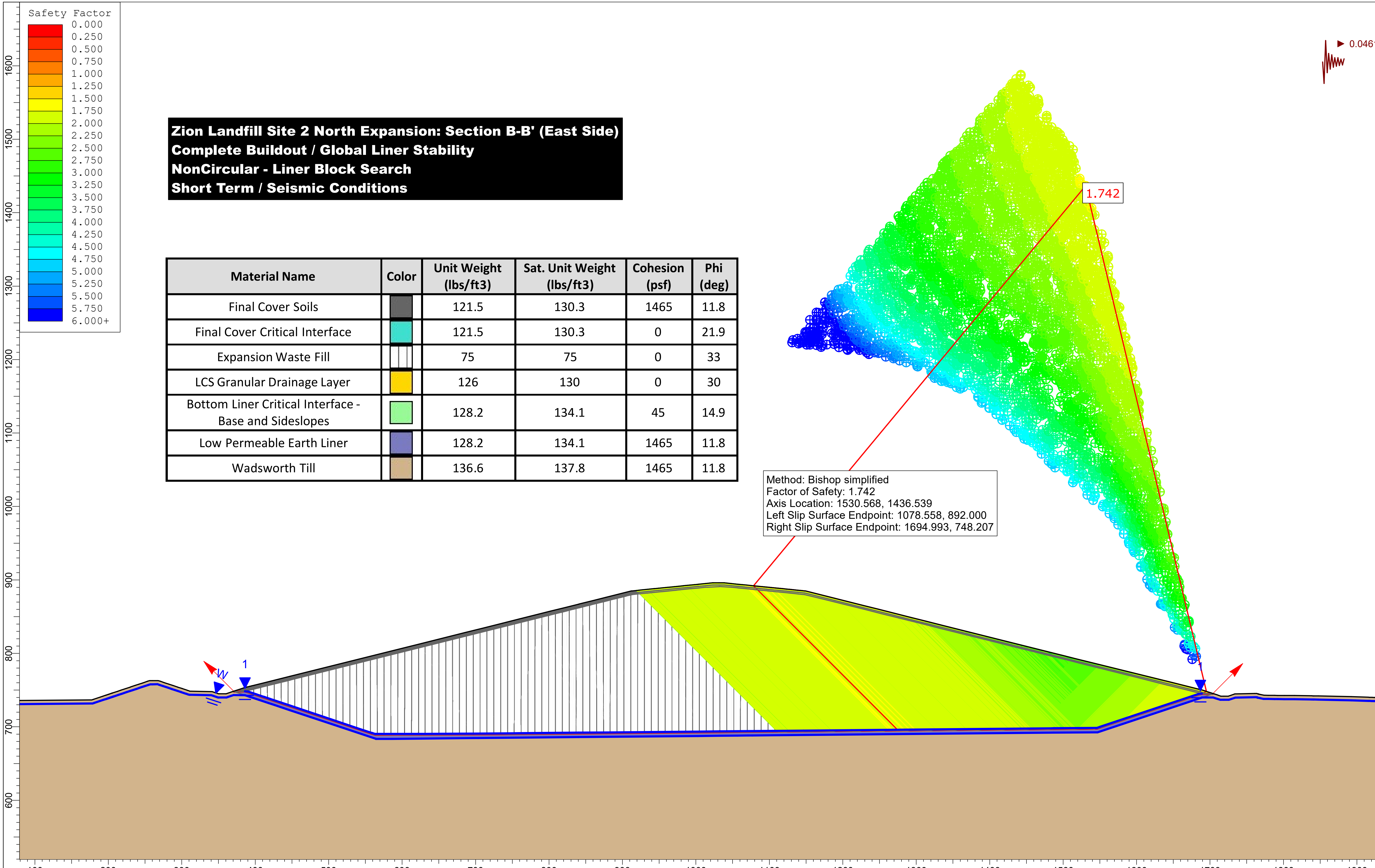
Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

SLOPE STABILITY

SECTION **B-B**' – **HORIZONTAL** EXPANSION **(EAST SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

COMPLETE BUILD-OUT / FINAL LANDFORM
BLOCK ANALYSIS OF LINER SYSTEM
(TRANSLATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Slide Analysis Information

B-B_final_east_ST

Project Summary

File Name:	B-B_final_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:01m:56.878s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8

Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.741940
Axis Location:	1530.568, 1436.539
Left Slip Surface Endpoint:	1078.558, 892.000
Right Slip Surface Endpoint:	1694.993, 748.207
Resisting Moment:	1.23694e+09 lb-ft
Driving Moment:	7.10097e+08 lb-ft
Total Slice Area:	56242.6 ft2
Surface Horizontal Width:	616.435 ft
Surface Average Height:	91.2384 ft

Method: janbu corrected

FS	1.765060
Axis Location:	1533.217, 1429.509
Left Slip Surface Endpoint:	1085.233, 891.333
Right Slip Surface Endpoint:	1694.967, 748.216
Resisting Horizontal Force:	1.53701e+06 lb
Driving Horizontal Force:	870798 lb
Total Slice Area:	55440 ft2
Surface Horizontal Width:	609.734 ft
Surface Average Height:	90.9249 ft

Method: spencer

FS	1.828350
Axis Location:	1513.436, 1485.868
Left Slip Surface Endpoint:	1032.940, 896.000
Right Slip Surface Endpoint:	1697.033, 747.551
Resisting Moment:	1.42797e+09 lb-ft
Driving Moment:	7.81018e+08 lb-ft
Resisting Horizontal Force:	1.62618e+06 lb
Driving Horizontal Force:	889426 lb
Total Slice Area:	60172.7 ft2
Surface Horizontal Width:	664.092 ft
Surface Average Height:	90.609 ft

Method: gle/morgenstern-price

FS	1.832750
Axis Location:	1508.684, 1490.866
Left Slip Surface Endpoint:	1026.420, 896.000
Right Slip Surface Endpoint:	1695.218, 748.135
Resisting Moment:	1.46717e+09 lb-ft
Driving Moment:	8.00529e+08 lb-ft
Resisting Horizontal Force:	1.65424e+06 lb
Driving Horizontal Force:	902602 lb
Total Slice Area:	62648.5 ft2
Surface Horizontal Width:	668.798 ft
Surface Average Height:	93.6733 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
1078.56	892
1275.4	695.084
1495.13	696.975
1540.18	697.394
1543.26	697.474
1546.33	697.607
1549.28	698.588
1652.16	732.726
1689.32	745.112
1694.99	748.207

Method: janbu corrected

X	Y
1085.23	891.333
1277.55	695.104
1492.5	696.95
1540.07	697.394
1543.2	697.473
1546.33	697.607
1550.43	698.945
1652.8	732.936
1689.31	745.112
1694.97	748.216

Method: spencer

X	Y
1032.94	896
1277.28	695.101
1495.1	696.974
1537.63	697.371
1546.27	697.595
1549.63	698.549
1652.41	732.807
1684.99	743.729
1697.03	747.551

Method: gle/morgenstern-price

X	Y
1026.42	896
1259.32	694.935
1495.15	696.975
1539.98	697.391
1543.15	697.484
1546.32	697.607
1552.16	699.39
1654.35	733.495
1690.71	745.573
1695.22	748.135

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 4744
Number of Invalid Surfaces: 260

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 1 surface
Error Code -110 reported for 257 surfaces

Method: janbu corrected

Number of Valid Surfaces: 4742
Number of Invalid Surfaces: 262

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 3 surfaces
Error Code -110 reported for 257 surfaces

Method: spencer

Number of Valid Surfaces:	4370
Number of Invalid Surfaces:	635

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 63 surfaces
Error Code -110 reported for 257 surfaces
Error Code -111 reported for 313 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4085
Number of Invalid Surfaces:	919

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 46 surfaces
Error Code -110 reported for 257 surfaces
Error Code -111 reported for 614 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939

	1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759	

	390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957	

External Boundary	199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764	

	2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001	

	1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738	

	1709.37, 743.539
Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625

Material Boundary	420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415

Material Boundary	396.375, 750.871 398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183	

	1057.55, 889.075 1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

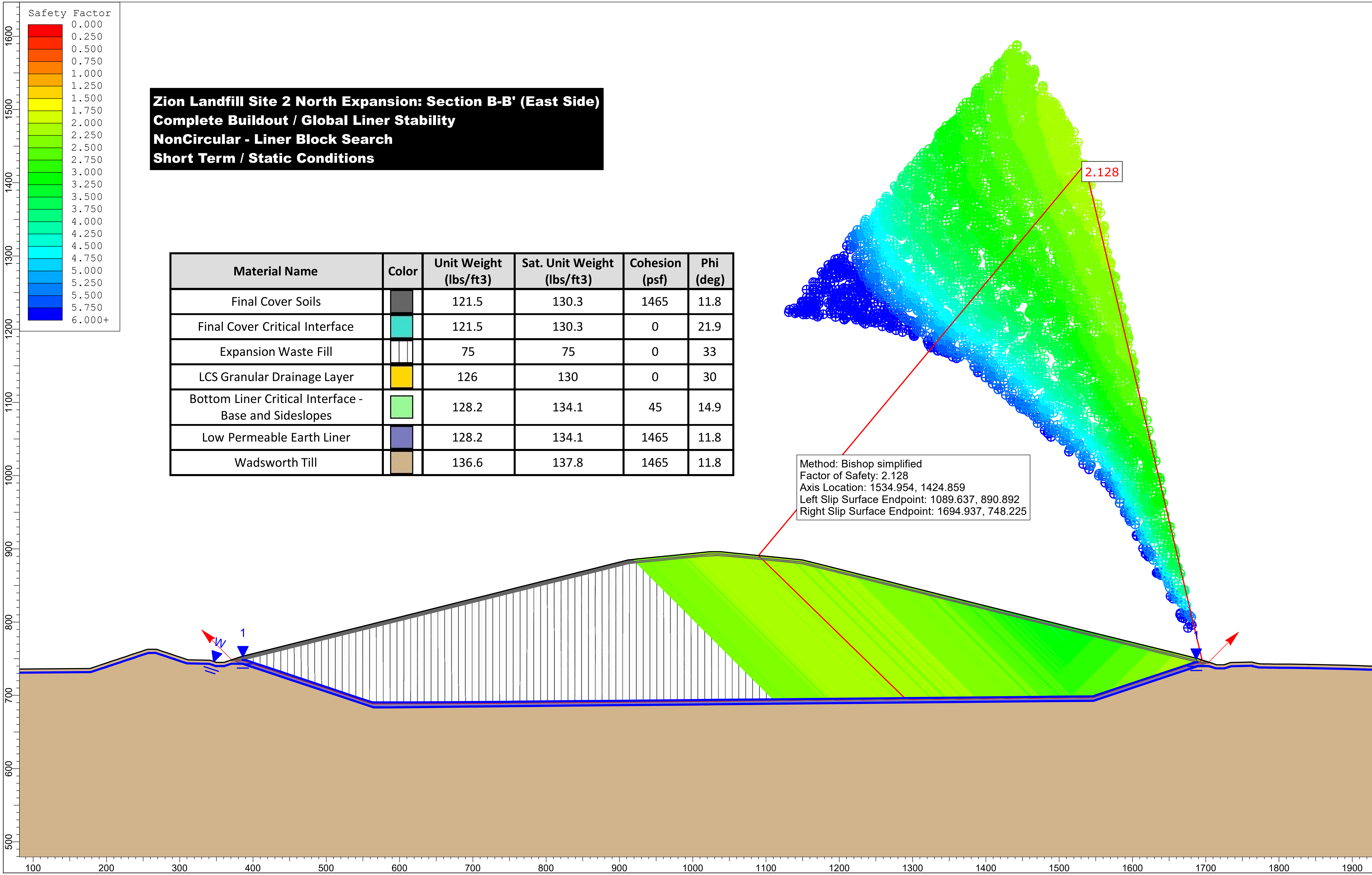
Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614		
	1814.87, 737.579		
	1826.26, 737.371		
	1838.69, 737.163		
	1840.03, 737.158		
	1840.81, 737.155		
	1841.22, 737.151		
	1841.48, 737.147		
	1847.4, 737.001		
	1892.14, 736.059		
	1897.9, 735.837		
	1915.54, 735.228		
	1916.61, 735.205		
	1917.52, 735.183		
	1920.42, 735.09		
	1923.11, 735.001		
	1923.25, 735		
	1923.71, 735.001		
	1923.77, 735.001		
	1927.27, 735.005		
	1930.39, 735.007		
	1930.8, 735.006		
	1934.96, 735.008		
	1935.34, 735.008		
	1939.87, 735.009		
	1940.15, 735.004		
	1942.25, 734.789		
	1947.23, 734.799		
	1952.08, 734.831		
	1955.77, 734.898		
	1955.95, 734.892		
	1958.79, 734.961		
	1958.82, 734.96		
	1960.66, 734.994		
	1962.1, 734.978		
	1966.34, 734.837		
	1970.07, 734.872		
	1970.19, 734.876		
	1971.89, 734.933		
	1972.06, 734.942		
	1972.35, 734.958		
	1974.24, 735.179		
	1974.56, 735.224		
	1976.51, 735.491		
	1977.05, 735.576		
	1979.08, 735.893		
	1981.03, 736.234		
	1982.08, 736.415		
	1983.3, 736.648		
	1984.15, 736.81		
	1985.71, 737.106		
	1987.91, 737.555		
	1990.31, 738.046		
	1992.64, 738.554		
	1996.46, 739.383		
	1998.94, 739.947		
	2005.36, 741.412		
	2007.91, 742.015		
	2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

B-B_final_east_ST.slmd

APTIM

Slide Analysis Information

B-B_final_east_ST

Project Summary

File Name:	B-B_final_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:15m:18.148s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465

Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.127690
Axis Location:	1534.954, 1424.859
Left Slip Surface Endpoint:	1089.637, 890.892
Right Slip Surface Endpoint:	1694.937, 748.225
Resisting Moment:	1.20242e+09 lb-ft
Driving Moment:	5.65132e+08 lb-ft
Total Slice Area:	53763.6 ft2
Surface Horizontal Width:	605.3 ft
Surface Average Height:	88.8214 ft

Method: janbu corrected

FS	2.162230
Axis Location:	1536.880, 1419.764
Left Slip Surface Endpoint:	1094.478, 890.408
Right Slip Surface Endpoint:	1694.924, 748.230
Resisting Horizontal Force:	1.52477e+06 lb
Driving Horizontal Force:	705182 lb
Total Slice Area:	53190.9 ft2
Surface Horizontal Width:	600.445 ft
Surface Average Height:	88.5858 ft

Method: spencer

FS	2.236230
Axis Location:	1525.697, 1454.849
Left Slip Surface Endpoint:	1062.592, 893.596
Right Slip Surface Endpoint:	1696.836, 747.614
Resisting Moment:	1.33114e+09 lb-ft
Driving Moment:	5.95262e+08 lb-ft
Resisting Horizontal Force:	1.56726e+06 lb
Driving Horizontal Force:	700852 lb
Total Slice Area:	55970.6 ft2
Surface Horizontal Width:	634.244 ft
Surface Average Height:	88.2477 ft

Method: gle/morgenstern-price

FS	2.246610
Axis Location:	1525.697, 1454.849
Left Slip Surface Endpoint:	1062.592, 893.596
Right Slip Surface Endpoint:	1696.836, 747.614
Resisting Moment:	1.32761e+09 lb-ft
Driving Moment:	5.90939e+08 lb-ft
Resisting Horizontal Force:	1.56405e+06 lb
Driving Horizontal Force:	696184 lb
Total Slice Area:	55970.6 ft2
Surface Horizontal Width:	634.244 ft
Surface Average Height:	88.2477 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
1089.64	890.892
1290.39	695.223
1495.05	696.974
1540.09	697.393
1543.21	697.476
1546.33	697.607
1550.79	699.092
1653.91	733.465
1689.33	745.111
1694.94	748.225

Method: janbu corrected

X	Y
1094.48	890.408
1291.88	695.237
1495.18	696.975
1540.14	697.394
1543.24	697.477
1546.33	697.607
1550.79	699.092
1653.91	733.465
1689.33	745.11
1694.92	748.23

Method: spencer

X	Y
1062.59	893.596
1066.46	888.277
1086.11	872.038
1102.12	858.441
1117.51	845.008
1132.59	831.668
1146.03	819.762
1160.52	806.928
1174.71	794.599
1189.62	782.048
1204.93	769.498
1218.85	758.339
1234	746.407
1248.59	735.091
1265.41	722.243
1292.63	701.811
1301.51	695.327
1331.36	695.454
1359.65	695.717
1382.52	695.928
1404.98	696.137
1432.24	696.39
1450.12	696.557
1472.41	696.764
1495.08	696.975
1517.93	697.186
1546.12	697.542
1549.3	698.56
1575.81	707.275
1592.69	712.901
1612.3	719.437
1627.79	724.602
1640.51	728.841
1653.92	733.31
1668.88	738.297
1680.6	742.205
1696.84	747.614

Method: gle/morgenstern-price

X	Y
1062.59	893.596
1066.46	888.277
1086.11	872.038
1102.12	858.441
1117.51	845.008
1132.59	831.668
1146.03	819.762
1160.52	806.928
1174.71	794.599
1189.62	782.048
1204.93	769.498
1218.85	758.339
1234	746.407
1248.59	735.091
1265.41	722.243
1292.63	701.811
1301.51	695.327
1331.36	695.454
1359.65	695.717
1382.52	695.928
1404.98	696.137
1432.24	696.39
1450.12	696.557
1472.41	696.764
1495.08	696.975
1517.93	697.186
1546.12	697.542
1549.3	698.56
1575.81	707.275
1592.69	712.901
1612.3	719.437
1627.79	724.602
1640.51	728.841
1653.92	733.31
1668.88	738.297
1680.6	742.205
1696.84	747.614

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4737
Number of Invalid Surfaces:	267

Error Codes
Error Code -106 reported for 2 surfaces
Error Code -108 reported for 8 surfaces
Error Code -110 reported for 257 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4745
Number of Invalid Surfaces:	259

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -110 reported for 257 surfaces

Method: spencer

Number of Valid Surfaces:	4301
Number of Invalid Surfaces:	703

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 57 surfaces
Error Code -110 reported for 257 surfaces
Error Code -111 reported for 387 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4146
Number of Invalid Surfaces:	858

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 58 surfaces
Error Code -110 reported for 257 surfaces
Error Code -111 reported for 541 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244

	1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760	

	398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523

External Boundary	202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762

2092.07, 762.714
2091.21, 762.906
2090.82, 762.992
2090.04, 763.165
2089.21, 763.348
2087.8, 763.655
2086.22, 764
2081.11, 764
2080.83, 764
2071.8, 762.725
2068.87, 762
2062.14, 760.334
2060.79, 760
2055.71, 758.743
2053.39, 758.173
2052.69, 758
2051.46, 757.69
2050.07, 757.348
2049.83, 757.288
2047.2, 756.637
2046.89, 756.56
2020.89, 750.238
2018.62, 749.686
2006.76, 746.88
2004.23, 746.282
1997.83, 744.822
1995.37, 744.264
1991.58, 743.44
1989.28, 742.939
1986.9, 742.454
1984.74, 742.012
1983.22, 741.722
1982.37, 741.56
1981.18, 741.335
1980.18, 741.16
1978.26, 740.826
1976.28, 740.516
1975.78, 740.438
1973.88, 740.177
1973.61, 740.14
1971.91, 739.942
1971.78, 739.934
1971.67, 739.928
1970.03, 739.874
1969.97, 739.872
1966.4, 739.837
1962.15, 739.979
1962.12, 739.978
1960.65, 739.995
1960.65, 739.995
1960.64, 739.995
1958.84, 739.961
1958.8, 739.962
1955.97, 739.894
1955.8, 739.899
1952.02, 739.831
1947.2, 739.799
1942.5, 739.789
1940.44, 740

	1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845	

	1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539
Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16

Material Boundary	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781

	1705.77, 744.739
Material Boundary	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871 398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888

	993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075 1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711	

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

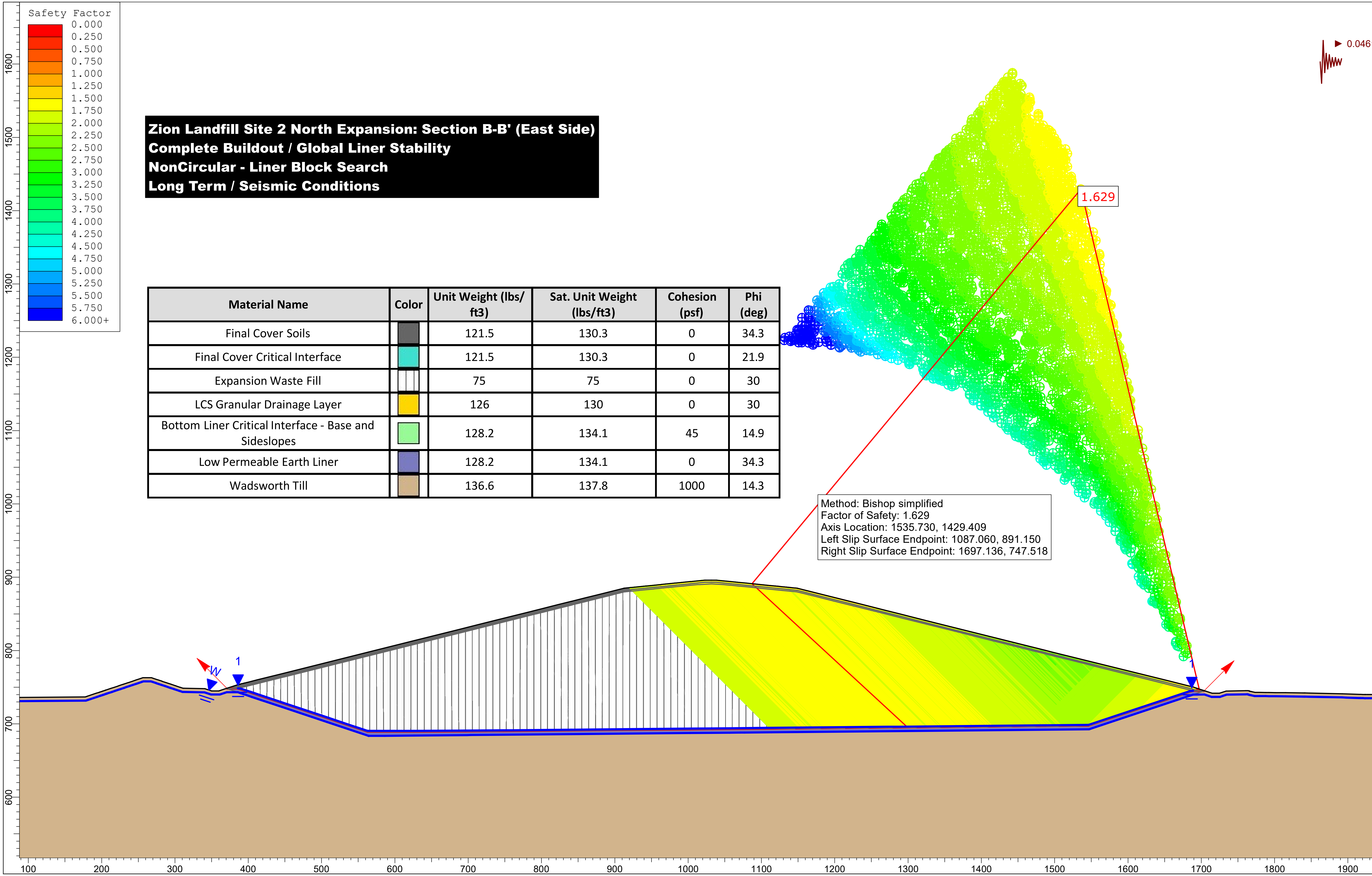
	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71		

Zion Landfill Site 2 North Expansion: Section B-B' (East Side)
Complete Buildout / Global Liner Stability
NonCircular - Liner Block Search
Long Term / Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3



B-B_final_east_LT.slmd

APTIM

Slide Analysis Information

B-B_final_east_LT

Project Summary

File Name:	B-B_final_east_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:11m:48.151s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0

Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8

Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.628560
Axis Location:	1535.730, 1429.409
Left Slip Surface Endpoint:	1087.060, 891.150
Right Slip Surface Endpoint:	1697.136, 747.518
Resisting Moment:	1.1107e+09 lb-ft
Driving Moment:	6.82015e+08 lb-ft
Total Slice Area:	53122.5 ft2
Surface Horizontal Width:	610.075 ft
Surface Average Height:	87.0753 ft

Method: janbu corrected

FS	1.645100
Axis Location:	1536.926, 1426.298
Left Slip Surface Endpoint:	1090.031, 890.853
Right Slip Surface Endpoint:	1697.145, 747.515
Resisting Horizontal Force:	1.43216e+06 lb
Driving Horizontal Force:	870562 lb
Total Slice Area:	53274.4 ft2
Surface Horizontal Width:	607.115 ft
Surface Average Height:	87.7502 ft

Method: spencer

FS	1.712550
Axis Location:	1517.338, 1477.691
Left Slip Surface Endpoint:	1041.079, 895.747
Right Slip Surface Endpoint:	1697.138, 747.517
Resisting Moment:	1.27503e+09 lb-ft
Driving Moment:	7.44517e+08 lb-ft
Resisting Horizontal Force:	1.48644e+06 lb
Driving Horizontal Force:	867966 lb
Total Slice Area:	56811.7 ft2
Surface Horizontal Width:	656.06 ft
Surface Average Height:	86.5953 ft

Method: gle/morgenstern-price

FS	1.721050
Axis Location:	1514.667, 1483.983
Left Slip Surface Endpoint:	1035.021, 896.000
Right Slip Surface Endpoint:	1697.265, 747.476
Resisting Moment:	1.30793e+09 lb-ft
Driving Moment:	7.59964e+08 lb-ft
Resisting Horizontal Force:	1.51209e+06 lb
Driving Horizontal Force:	878587 lb
Total Slice Area:	58275.2 ft2
Surface Horizontal Width:	662.245 ft
Surface Average Height:	87.9964 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
1087.06	891.15
1299.36	695.307
1495.08	696.975
1540.18	697.393
1543.23	697.467
1546.27	697.588
1549.61	698.699
1653.11	733.041
1691.8	745.938
1697.14	747.518

Method: janbu corrected

X	Y
1090.03	890.853
1295.2	695.268
1495.18	696.975
1540.1	697.394
1543.22	697.476
1546.33	697.607
1549.22	698.568
1653.61	733.205
1691.79	745.935
1697.15	747.515

Method: spencer

X	Y
1041.08	895.747
1302.65	695.337
1495.15	696.974
1540.04	697.394
1543.18	697.488
1546.32	697.607
1551.41	699.142
1653.56	733.19
1691.91	745.975
1697.14	747.517

Method: gle/morgenstern-price

X	Y
1035.02	896
1293.91	695.256
1494.97	696.974
1540.18	697.394
1543.25	697.487
1546.31	697.607
1549.46	698.492
1652.28	732.765
1689.88	745.297
1697.27	747.476

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4742
Number of Invalid Surfaces:	262

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 256 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4739
Number of Invalid Surfaces:	265

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 7 surfaces
Error Code -110 reported for 256 surfaces

Method: spencer

Number of Valid Surfaces:	4366
Number of Invalid Surfaces:	638

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 55 surfaces
Error Code -110 reported for 256 surfaces
Error Code -111 reported for 325 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4061
Number of Invalid Surfaces:	943

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 53 surfaces
Error Code -110 reported for 256 surfaces
Error Code -111 reported for 632 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939

	1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759	

	390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957	

External Boundary	199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764

	2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001	

	1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738	

	1709.37, 743.539
Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625

Material Boundary	420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415

Material Boundary	396.375, 750.871 398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183

	1057.55, 889.075 1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08
Material Boundary	

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

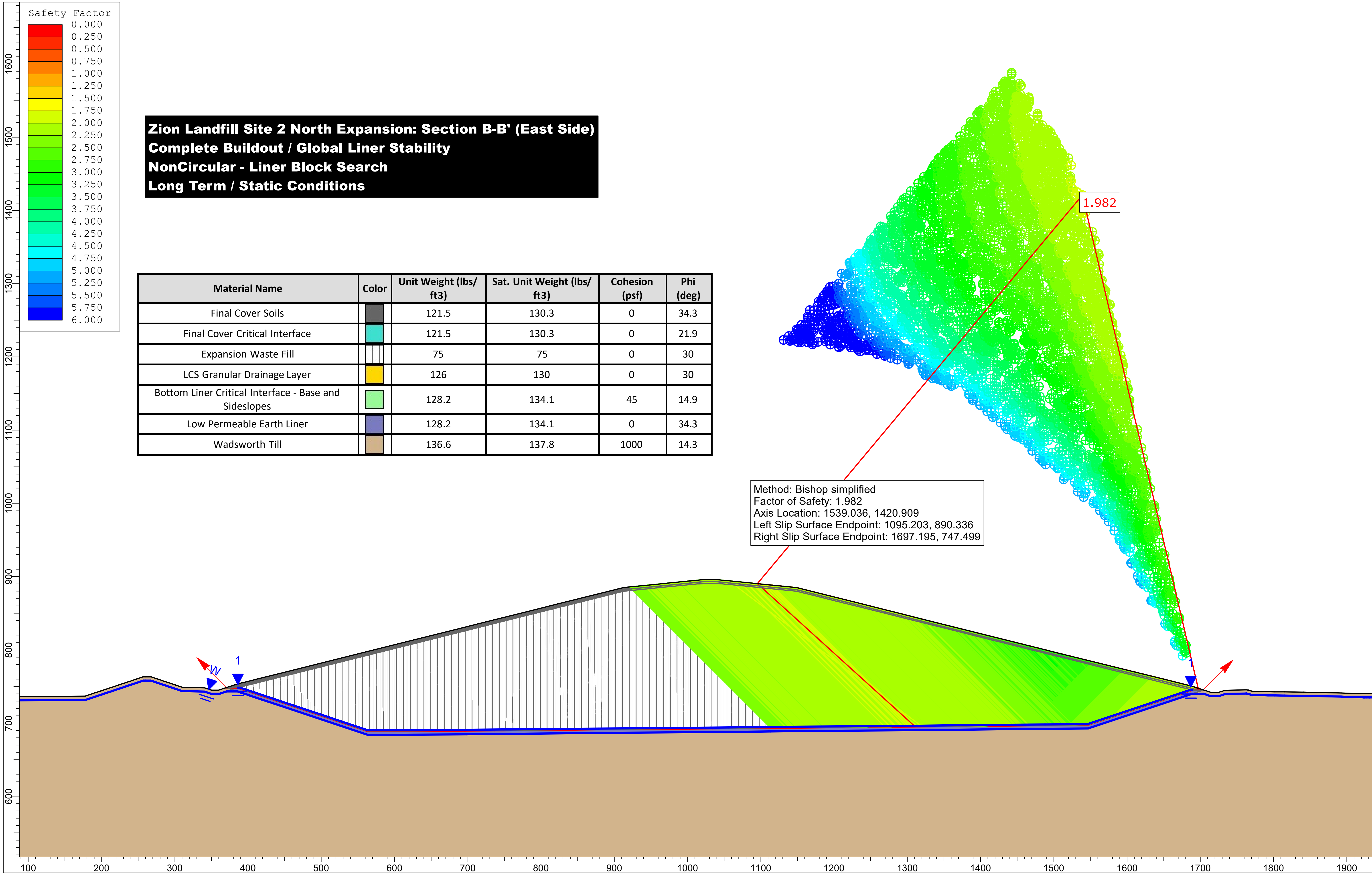
Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	



Material Name	Color	Unit Weight (lbs/ ft3)	Sat. Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

Slide Analysis Information

B-B_final_east_LT

Project Summary

File Name:	B-B_final_east_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:05m:52.122s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

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
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [deg]:	135
Left Projection Angle (End Angle) [deg]:	135
Right Projection Angle (Start Angle) [deg]:	45
Right Projection Angle (End Angle) [deg]:	45
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000

Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.982430
Axis Location:	1539.036, 1420.909
Left Slip Surface Endpoint:	1095.203, 890.336
Right Slip Surface Endpoint:	1697.195, 747.499
Resisting Moment:	1.08928e+09 lb-ft
Driving Moment:	5.49466e+08 lb-ft
Total Slice Area:	51335.7 ft2
Surface Horizontal Width:	601.992 ft
Surface Average Height:	85.2765 ft

Method: janbu corrected

FS	2.007580
Axis Location:	1541.877, 1413.509
Left Slip Surface Endpoint:	1102.265, 889.630
Right Slip Surface Endpoint:	1697.213, 747.493
Resisting Horizontal Force:	1.39965e+06 lb
Driving Horizontal Force:	697182 lb
Total Slice Area:	50438.9 ft2
Surface Horizontal Width:	594.948 ft
Surface Average Height:	84.7787 ft

Method: spencer

FS	2.090860
Axis Location:	1523.579, 1461.617
Left Slip Surface Endpoint:	1056.470, 894.208
Right Slip Surface Endpoint:	1697.240, 747.484
Resisting Moment:	1.21774e+09 lb-ft
Driving Moment:	5.82411e+08 lb-ft
Resisting Horizontal Force:	1.44794e+06 lb
Driving Horizontal Force:	692509 lb
Total Slice Area:	53754.4 ft2
Surface Horizontal Width:	640.771 ft
Surface Average Height:	83.8903 ft

Method: gle/morgenstern-price

FS	2.105400
Axis Location:	1519.968, 1471.271
Left Slip Surface Endpoint:	1047.321, 895.123
Right Slip Surface Endpoint:	1697.299, 747.465
Resisting Moment:	1.26161e+09 lb-ft
Driving Moment:	5.99226e+08 lb-ft
Resisting Horizontal Force:	1.48271e+06 lb
Driving Horizontal Force:	704239 lb
Total Slice Area:	55243.5 ft2
Surface Horizontal Width:	649.978 ft
Surface Average Height:	84.993 ft

Global Minimum Coordinates

Method: bishop simplified

X	Y
1095.2	890.336
1310.16	695.407
1495.16	696.975
1540.23	697.394
1546.09	697.527
1550.92	699.137
1658.72	735.067
1687.14	744.429
1697.19	747.499

Method: janbu corrected

X	Y
1102.27	889.63
1313.29	695.325
1495.18	696.975
1539.64	697.389
1546.09	697.526
1551.55	699.346
1657.41	734.632
1690.06	745.35
1697.21	747.493

Method: spencer

X	Y
1056.47	894.208
1319.69	695.496
1500.72	697.026
1539.38	697.387
1542.87	697.483
1546.32	697.606
1552.13	699.383
1652.56	732.86
1690.28	745.432
1697.24	747.484

Method: gle/morgenstern-price

X	Y
1047.32	895.123
1312.78	695.431
1495.04	696.973
1538.45	697.379
1546.09	697.526
1549.59	698.532
1652.65	732.89
1689.33	745.114
1697.3	747.465

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces: 4745
Number of Invalid Surfaces: 260

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 254 surfaces

Method: janbu corrected

Number of Valid Surfaces: 4746
Number of Invalid Surfaces: 259

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 3 surfaces
Error Code -110 reported for 254 surfaces

Method: spencer

Number of Valid Surfaces:	4279
Number of Invalid Surfaces:	725

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 54 surfaces
Error Code -110 reported for 254 surfaces
Error Code -111 reported for 415 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4136
Number of Invalid Surfaces:	869

Error Codes

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 56 surfaces
Error Code -110 reported for 254 surfaces
Error Code -111 reported for 557 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-111 = safety factor equation did not converge

Entity Information

Block Search - thin layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939

	1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759	

	390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957	

External Boundary	199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764

2080.83, 764
2071.8, 762.725
2068.87, 762
2062.14, 760.334
2060.79, 760
2055.71, 758.743
2053.39, 758.173
2052.69, 758
2051.46, 757.69
2050.07, 757.348
2049.83, 757.288
2047.2, 756.637
2046.89, 756.56
2020.89, 750.238
2018.62, 749.686
2006.76, 746.88
2004.23, 746.282
1997.83, 744.822
1995.37, 744.264
1991.58, 743.44
1989.28, 742.939
1986.9, 742.454
1984.74, 742.012
1983.22, 741.722
1982.37, 741.56
1981.18, 741.335
1980.18, 741.16
1978.26, 740.826
1976.28, 740.516
1975.78, 740.438
1973.88, 740.177
1973.61, 740.14
1971.91, 739.942
1971.78, 739.934
1971.67, 739.928
1970.03, 739.874
1969.97, 739.872
1966.4, 739.837
1962.15, 739.979
1962.12, 739.978
1960.65, 739.995
1960.65, 739.995
1960.64, 739.995
1958.84, 739.961
1958.8, 739.962
1955.97, 739.894
1955.8, 739.899
1952.02, 739.831
1947.2, 739.799
1942.5, 739.789
1940.44, 740
1939.92, 740.009
1935.35, 740.008
1934.96, 740.008
1930.81, 740.006
1930.4, 740.007
1927.26, 740.005
1923.77, 740.001
1923.7, 740.001

	1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738	

	1709.37, 743.539
Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625

Material Boundary	420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415

Material Boundary	396.375, 750.871 398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183	

	1057.55, 889.075 1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824	
	2022.07, 745.38	
	2048.08, 751.704	
	2048.4, 751.784	
	2051.03, 752.434	
	2051.27, 752.494	
	2052.67, 752.839	
	2053.9, 753.148	
	2054.59, 753.317	
	2056.91, 753.888	
	2061.99, 755.146	
	2063.34, 755.481	
	2070.07, 757.147	
	2072.75, 757.81	
	2081.18, 759	
	2085.68, 759	
	2086.73, 758.77	
	2088.14, 758.464	
	2088.96, 758.282	
	2089.74, 758.111	
	2090.12, 758.026	
	2090.97, 757.836	
	2094.09, 757.125	
	2100.14, 755.745	
	2101.08, 755.528	
	2102.84, 755.126	
	2104.41, 754.768	
	2105.48, 754.523	
	2108.33, 753.859	
	2109.8, 753.517	
	2111.42, 753.135	
	2114.73, 752.349	
	2117.29, 751.74	
	2127.76, 749.27	
	2129.51, 748.856	
	2131.93, 748.281	
	2135.49, 747.427	
	2151.4, 743.569	
	2158.03, 741.971	
	2172.67, 738.411	
	2183.45, 735.767	
	2186.05, 735.696	
	2193.75, 735.575	
	2197.12, 735.484	
	2205.31, 735.357	
	2212.75, 735.233	
	2219.59, 735.014	
	2220.19, 735.014	
	2222.89, 735.007	
	2223.15, 735.005	
	2224.86, 735	
	2227.4, 734.909	
	2228.23, 734.871	
	2235.86, 734.556	
	2237.44, 734.493	
	2243.14, 734.24	
	2246.4, 734.069	
	2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

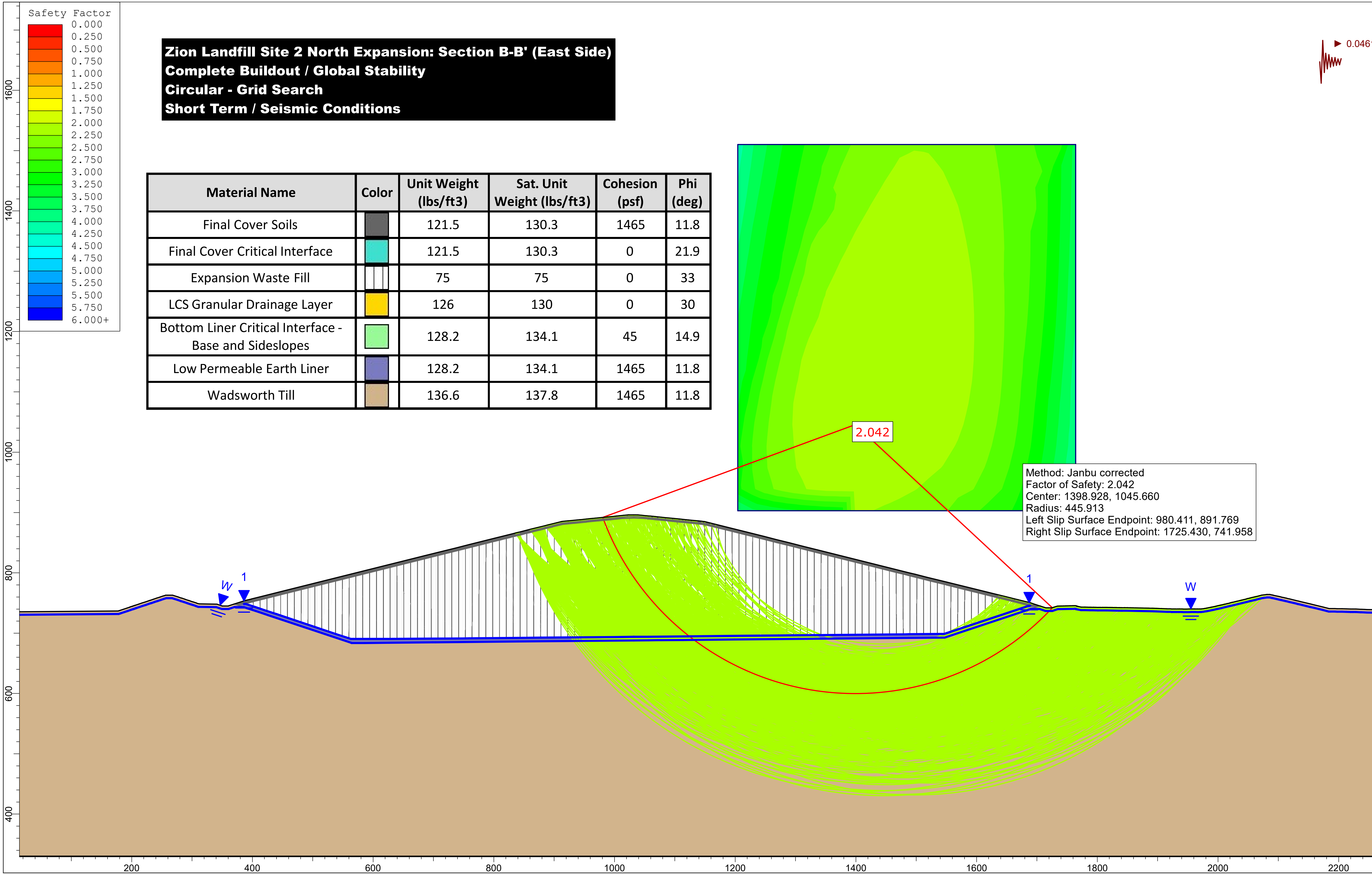
Block Search Polyline	371.35, 747.924 386.046, 748.217 390.079, 746.872 398.881, 743.938 399.765, 743.643 406.945, 741.249 409.081, 740.537 417.36, 737.777 429.79, 733.633 437.541, 731.05 447.072, 727.872 513.038, 705.881 558.707, 690.597 562.754, 689.282 564.036, 689.269 567.392, 689.269 591.838, 689.285 626.364, 689.285 695.699, 689.738 697.255, 689.748 736.377, 690.004 748.109, 690.114 840.147, 690.975 877.73, 691.322 1002.59, 692.475 1030.76, 692.742 1031.85, 692.753 1033.44, 692.767 1033.47, 692.767 1056.47, 692.975 1104.66, 693.423 1147.07, 693.817 1212.44, 694.424 1487.03, 696.975 1532.11, 697.394 1546.04, 697.525 1546.33, 697.528 1550.35, 698.868 1653.04, 733.095 1688.76, 745.005 1695.56, 744.868 1703.46, 744.71	

SLOPE STABILITY

SECTION **B-B**' – **HORIZONTAL E**XPANSION **(EAST SLOPE)**

GLOBAL LINER STABILITY ANALYSIS

COMPLETE BUILD-OUT / FINAL LANDFORM
CIRCULAR ANALYSIS OF WASTE AND FOUNDATION
(ROTATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8

Slide Analysis Information

B-B_final_east_ST

Project Summary

File Name:	B-B_final_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:09.252s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.184350
Center:	1471.936, 1224.256
Radius:	636.197
Left Slip Surface Endpoint:	932.500, 886.980
Right Slip Surface Endpoint:	1885.935, 741.191
Resisting Moment:	2.93398e+09 lb-ft
Driving Moment:	1.34318e+09 lb-ft
Total Slice Area:	152552 ft2
Surface Horizontal Width:	953.435 ft
Surface Average Height:	160.002 ft

Method: janbu corrected

FS	2.041600
Center:	1398.928, 1045.660
Radius:	445.913
Left Slip Surface Endpoint:	980.411, 891.769
Right Slip Surface Endpoint:	1725.430, 741.958
Resisting Horizontal Force:	3.52703e+06 lb
Driving Horizontal Force:	1.72759e+06 lb
Total Slice Area:	124354 ft2
Surface Horizontal Width:	745.019 ft
Surface Average Height:	166.913 ft

Method: spencer

FS	2.158890
Center:	1447.600, 1188.537
Radius:	566.686
Left Slip Surface Endpoint:	965.740, 890.303
Right Slip Surface Endpoint:	1797.352, 742.659
Resisting Moment:	2.13041e+09 lb-ft
Driving Moment:	9.86809e+08 lb-ft
Resisting Horizontal Force:	3.36456e+06 lb
Driving Horizontal Force:	1.55847e+06 lb
Total Slice Area:	116844 ft2
Surface Horizontal Width:	831.613 ft
Surface Average Height:	140.503 ft

Method: gle/morgenstern-price

FS	2.161150
Center:	1447.600, 1188.537
Radius:	566.686
Left Slip Surface Endpoint:	965.740, 890.303
Right Slip Surface Endpoint:	1797.352, 742.659
Resisting Moment:	2.13265e+09 lb-ft
Driving Moment:	9.86809e+08 lb-ft
Resisting Horizontal Force:	3.36756e+06 lb
Driving Horizontal Force:	1.55822e+06 lb
Total Slice Area:	116844 ft2
Surface Horizontal Width:	831.613 ft
Surface Average Height:	140.503 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4466
Number of Invalid Surfaces:	286

Error Codes
Error Code -103 reported for 16 surfaces
Error Code -110 reported for 101 surfaces
Error Code -112 reported for 164 surfaces
Error Code -115 reported for 5 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4490
Number of Invalid Surfaces:	262

Error Codes
Error Code -103 reported for 16 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 101 surfaces
Error Code -112 reported for 138 surfaces
Error Code -115 reported for 5 surfaces

Method: spencer

Number of Valid Surfaces:	4453
Number of Invalid Surfaces:	299

Error Codes
Error Code -103 reported for 16 surfaces
Error Code -108 reported for 2 surfaces
Error Code -110 reported for 101 surfaces
Error Code -112 reported for 175 surfaces
Error Code -115 reported for 5 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4456
Number of Invalid Surfaces:	296
Error Codes	
Error Code -103 reported for 16 surfaces	
Error Code -108 reported for 2 surfaces	
Error Code -110 reported for 101 surfaces	
Error Code -112 reported for 172 surfaces	
Error Code -115 reported for 5 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539

	1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954	

	360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142	

External Boundary	196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334

	2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181	

	1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08
Material Boundary	

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

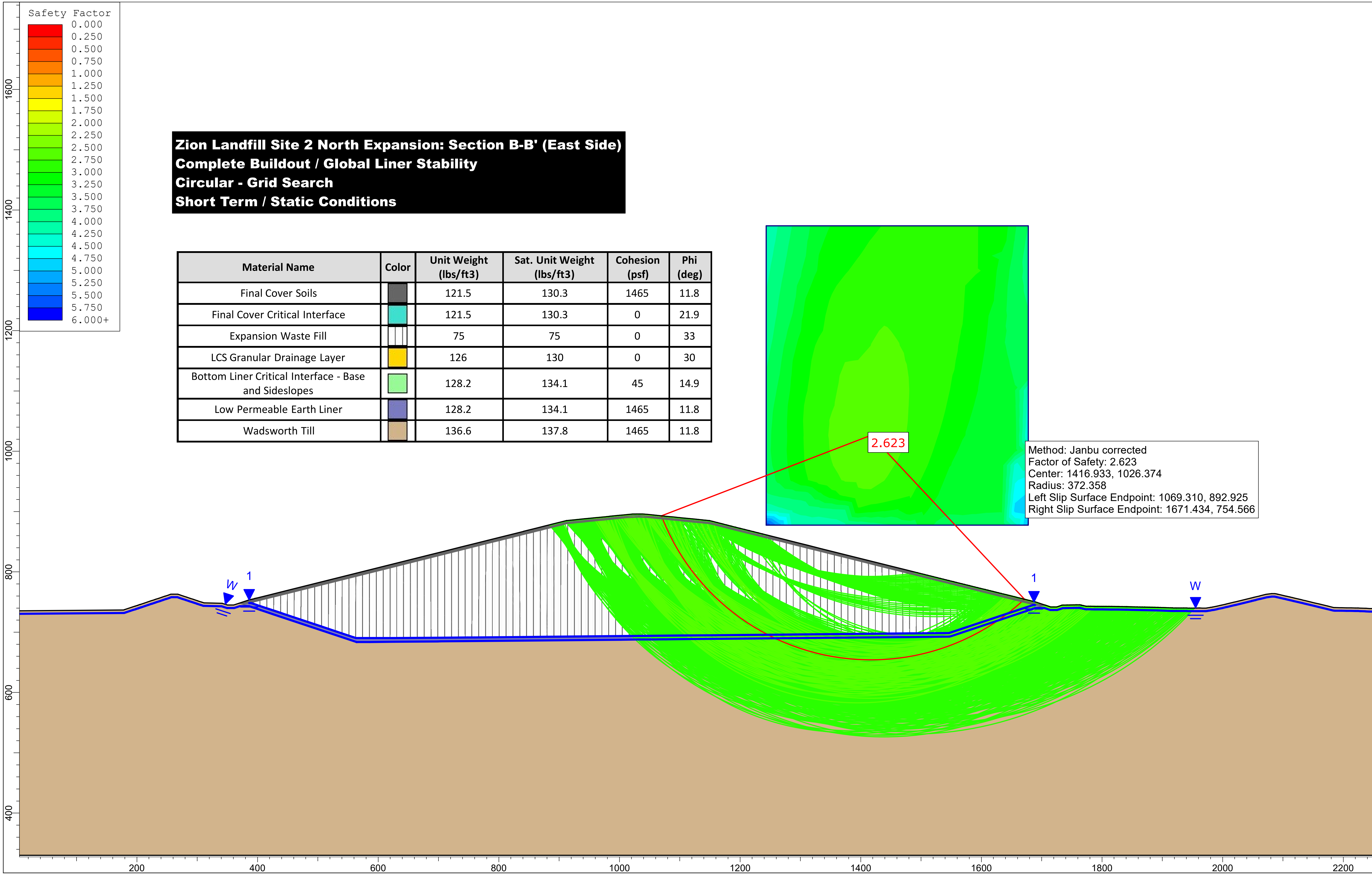
	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Zion Landfill Site 2 North Expansion: Section B-B' (East Side)
Complete Buildout / Global Liner Stability
Circular - Grid Search
Short Term / Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	1465	11.8
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	33
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	1465	11.8
Wadsworth Till		136.6	137.8	1465	11.8



Slide Analysis Information

B-B_final_east_ST

Project Summary

File Name:	B-B_final_east_ST.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:09.411s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	33
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1465
Friction Angle [deg]	11.8
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.806140
Center:	1395.203, 1100.816
Radius:	444.985
Left Slip Surface Endpoint:	1001.275, 893.855
Right Slip Surface Endpoint:	1673.931, 753.941
Resisting Moment:	1.36541e+09 lb-ft
Driving Moment:	4.8658e+08 lb-ft
Total Slice Area:	85002.4 ft2
Surface Horizontal Width:	672.657 ft
Surface Average Height:	126.368 ft

Method: janbu corrected

FS	2.622640
Center:	1416.933, 1026.374
Radius:	372.358
Left Slip Surface Endpoint:	1069.310, 892.925
Right Slip Surface Endpoint:	1671.434, 754.566
Resisting Horizontal Force:	2.50845e+06 lb
Driving Horizontal Force:	956461 lb
Total Slice Area:	74383 ft2
Surface Horizontal Width:	602.124 ft
Surface Average Height:	123.534 ft

Method: spencer

FS	2.756500
Center:	1395.203, 1100.816
Radius:	444.985
Left Slip Surface Endpoint:	1001.275, 893.855
Right Slip Surface Endpoint:	1673.931, 753.941
Resisting Moment:	1.34126e+09 lb-ft
Driving Moment:	4.8658e+08 lb-ft
Resisting Horizontal Force:	2.66748e+06 lb
Driving Horizontal Force:	967704 lb
Total Slice Area:	85002.4 ft2
Surface Horizontal Width:	672.657 ft
Surface Average Height:	126.368 ft

Method: gle/morgenstern-price

FS	2.747190
Center:	1395.203, 1100.816
Radius:	444.985
Left Slip Surface Endpoint:	1001.275, 893.855
Right Slip Surface Endpoint:	1673.931, 753.941
Resisting Moment:	1.33673e+09 lb-ft
Driving Moment:	4.8658e+08 lb-ft
Resisting Horizontal Force:	2.65782e+06 lb
Driving Horizontal Force:	967467 lb
Total Slice Area:	85002.4 ft2
Surface Horizontal Width:	672.657 ft
Surface Average Height:	126.368 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4216
Number of Invalid Surfaces:	635

Error Codes

Error Code -103 reported for 112 surfaces
Error Code -110 reported for 81 surfaces
Error Code -112 reported for 339 surfaces
Error Code -114 reported for 103 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4250
Number of Invalid Surfaces:	601

Error Codes

Error Code -103 reported for 112 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 81 surfaces
Error Code -112 reported for 301 surfaces
Error Code -114 reported for 103 surfaces

Method: spencer

Number of Valid Surfaces:	4204
Number of Invalid Surfaces:	647

Error Codes

Error Code -103 reported for 112 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 81 surfaces
Error Code -112 reported for 347 surfaces
Error Code -114 reported for 103 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4205
Number of Invalid Surfaces:	646

Error Codes
Error Code -103 reported for 112 surfaces
Error Code -108 reported for 4 surfaces
Error Code -110 reported for 81 surfaces
Error Code -112 reported for 346 surfaces
Error Code -114 reported for 103 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539

	1138.57, 886
	1128.02, 887.055
	1123.25, 887.539
	1118.57, 888
	1107.98, 889.059
	1098.56, 890
	1087.91, 891.065
	1078.56, 892
	1067.84, 893.072
	1058.55, 894
	1056.47, 894.208
	1047.76, 895.079
	1038.54, 896
	1031.85, 896
	1031.28, 896
	1024.07, 896
	1022.73, 896
	1003.75, 894.103
	1002.72, 894
	1002.59, 893.986
	983.533, 892.081
	982.719, 892
	963.529, 890.082
	962.713, 890
	943.526, 888.082
	942.708, 888
	923.523, 886.082
	922.702, 886
	913.109, 885.041
	912.699, 885
	912.114, 884.941
	912.089, 884.939
	877.133, 876.202
	859.589, 871.816
	841.214, 867.222
	840.146, 866.956
	822.141, 862.454
	802.222, 857.474
	781.387, 852.265
	759.573, 846.811
	736.709, 841.095
	712.721, 835.098
	685.108, 828.195
	626.363, 813.508
	564.036, 797.924
	447.096, 768.701
	412.275, 760
	398.83, 756.64
	397.597, 756.33
	396.492, 756.054
	395.41, 755.784
	394.351, 755.519
	393.315, 755.26
	392.3, 755.007
	391.307, 754.759
	390.334, 754.516
	390.102, 754.458
	386.057, 753.446
	369.041, 747.954

	360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178 282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142	

External Boundary	196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905 2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695 2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334	

	2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181	

	1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

	398.239, 751.337	
	400.145, 751.813	
	402.095, 752.3	
	404.089, 752.798	
	406.128, 753.308	
	411.367, 754.619	
	447.096, 763.546	
	449.685, 764.193	
	564.036, 792.77	
	626.363, 808.356	
	792.922, 850	
	793.256, 850.084	
	800.923, 852	
	801.257, 852.084	
	808.924, 854	
	809.258, 854.084	
	816.925, 856	
	817.259, 856.084	
	824.926, 858	
	825.261, 858.084	
	832.927, 860	
	833.262, 860.084	
	840.146, 861.804	
	840.929, 862	
	841.263, 862.084	
	848.931, 864	
	849.265, 864.083	
	856.933, 866	
	857.267, 866.083	
	864.935, 868	
	865.269, 868.083	
	872.938, 870	
	873.27, 870.083	
	880.94, 872	
	881.272, 872.083	
	888.942, 874	
	889.273, 874.083	
	896.944, 876	
	897.274, 876.082	
	904.947, 878	
	905.275, 878.082	
	912.949, 880.002	
	913.77, 880.084	
	932.954, 882	
	933.767, 882.081	
	952.96, 884	
	953.77, 884.081	
	972.965, 886	
Material Boundary	973.774, 886.081	
	992.971, 888	
	993.788, 888.082	
	1002.59, 888.961	
	1012.97, 890	
	1015.9, 890	
	1031.85, 890.91	
	1032.05, 890.921	
	1048.3, 890	
	1056.47, 889.183	
	1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

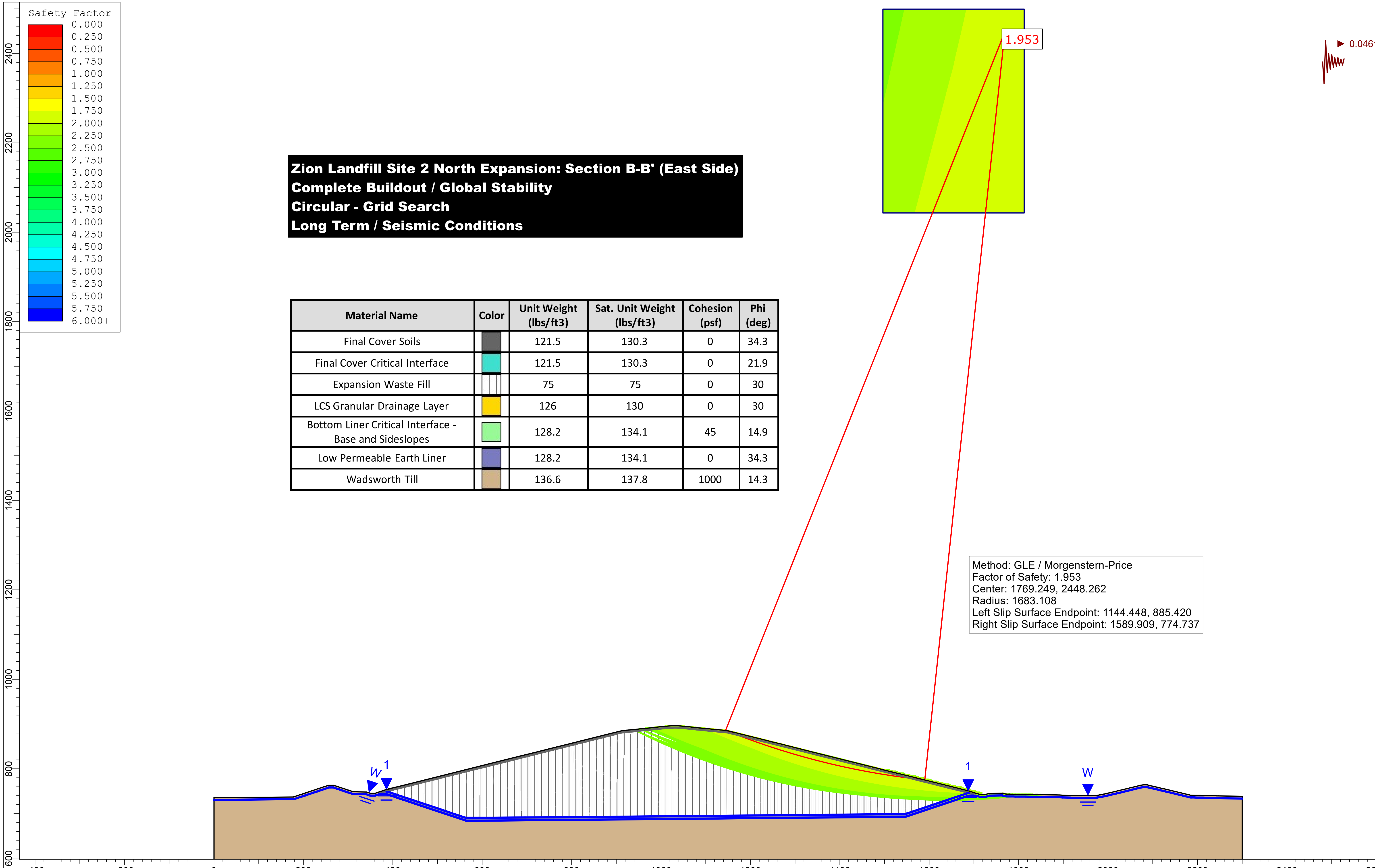
	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

Zion Landfill Site 2 North Expansion: Section B-B' (East Side)
Complete Buildout / Global Stability
Circular - Grid Search
Long Term / Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3



B-B_final_east_LT.slmd

APTIM

Slide Analysis Information

B-B_final_east_LT

Project Summary

File Name:	B-B_final_east_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:08.413s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	1.956520
Center:	1769.249, 2448.262
Radius:	1683.108
Left Slip Surface Endpoint:	1144.448, 885.420
Right Slip Surface Endpoint:	1589.909, 774.737
Resisting Moment:	4.33332e+08 lb-ft
Driving Moment:	2.2148e+08 lb-ft
Total Slice Area:	4903.29 ft2
Surface Horizontal Width:	445.461 ft
Surface Average Height:	11.0072 ft

Method: janbu corrected

FS	1.967460
Center:	1769.249, 2448.262
Radius:	1683.108
Left Slip Surface Endpoint:	1144.448, 885.420
Right Slip Surface Endpoint:	1589.909, 774.737
Resisting Horizontal Force:	251735 lb
Driving Horizontal Force:	127950 lb
Total Slice Area:	4903.29 ft2
Surface Horizontal Width:	445.461 ft
Surface Average Height:	11.0072 ft

Method: spencer

FS	1.953960
Center:	1769.249, 2448.262
Radius:	1683.108
Left Slip Surface Endpoint:	1144.448, 885.420
Right Slip Surface Endpoint:	1589.909, 774.737
Resisting Moment:	4.32763e+08 lb-ft
Driving Moment:	2.2148e+08 lb-ft
Resisting Horizontal Force:	249357 lb
Driving Horizontal Force:	127616 lb
Total Slice Area:	4903.29 ft2
Surface Horizontal Width:	445.461 ft
Surface Average Height:	11.0072 ft

Method: gle/morgenstern-price

FS	1.952660
Center:	1769.249, 2448.262
Radius:	1683.108
Left Slip Surface Endpoint:	1144.448, 885.420
Right Slip Surface Endpoint:	1589.909, 774.737
Resisting Moment:	4.32475e+08 lb-ft
Driving Moment:	2.2148e+08 lb-ft
Resisting Horizontal Force:	249272 lb
Driving Horizontal Force:	127658 lb
Total Slice Area:	4903.29 ft2
Surface Horizontal Width:	445.461 ft
Surface Average Height:	11.0072 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4137
Number of Invalid Surfaces:	670

Error Codes

Error Code -110 reported for 183 surfaces
Error Code -115 reported for 487 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4137
Number of Invalid Surfaces:	670

Error Codes

Error Code -110 reported for 183 surfaces
Error Code -115 reported for 487 surfaces

Method: spencer

Number of Valid Surfaces:	4137
Number of Invalid Surfaces:	670

Error Codes

Error Code -110 reported for 183 surfaces
Error Code -115 reported for 487 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4137
Number of Invalid Surfaces:	670

Error Codes

Error Code -110 reported for 183 surfaces
Error Code -115 reported for 487 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103 1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886

913.109, 885.041
912.699, 885
912.114, 884.941
912.089, 884.939
877.133, 876.202
859.589, 871.816
841.214, 867.222
840.146, 866.956
822.141, 862.454
802.222, 857.474
781.387, 852.265
759.573, 846.811
736.709, 841.095
712.721, 835.098
685.108, 828.195
626.363, 813.508
564.036, 797.924
447.096, 768.701
412.275, 760
398.83, 756.64
397.597, 756.33
396.492, 756.054
395.41, 755.784
394.351, 755.519
393.315, 755.26
392.3, 755.007
391.307, 754.759
390.334, 754.516
390.102, 754.458
386.057, 753.446
369.041, 747.954
360.315, 745.046
360.041, 744.955
350.343, 744.956
350.039, 744.956
341.31, 747.867
341.038, 747.958
312.062, 748.539
311.035, 748.562
309.721, 749
307.672, 749.682
306.716, 750
300.91, 751.933
300.708, 752
300.446, 752.087
294.699, 754
294.195, 754.168
288.69, 756
288.155, 756.178
282.681, 758
282.067, 758.204
276.673, 760
275.984, 760.229
270.664, 762
267.902, 762.919
259.888, 762.906
256.257, 762.904
253.546, 762
252.468, 761.641

	247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866
External Boundary	2227.6, 739.905
	2224.96, 740 2223.17, 740.005 2222.91, 740.007 2220.2, 740.014 2219.67, 740.014 2212.87, 740.232 2205.39, 740.356 2197.23, 740.483 2193.85, 740.574 2186.16, 740.695

	2184.12, 740.751 2173.86, 743.268 2159.21, 746.831 2152.58, 748.429 2136.66, 752.288 2133.09, 753.144 2130.67, 753.722 2128.9, 754.137 2118.44, 756.605 2115.88, 757.214 2112.57, 758 2110.94, 758.385 2109.47, 758.729 2106.6, 759.395 2105.52, 759.642 2103.96, 760 2102.2, 760.402 2101.25, 760.619 2095.2, 762 2092.07, 762.714 2091.21, 762.906 2090.82, 762.992 2090.04, 763.165 2089.21, 763.348 2087.8, 763.655 2086.22, 764 2081.11, 764 2080.83, 764 2071.8, 762.725 2068.87, 762 2062.14, 760.334 2060.79, 760 2055.71, 758.743 2053.39, 758.173 2052.69, 758 2051.46, 757.69 2050.07, 757.348 2049.83, 757.288 2047.2, 756.637 2046.89, 756.56 2020.89, 750.238 2018.62, 749.686 2006.76, 746.88 2004.23, 746.282 1997.83, 744.822 1995.37, 744.264 1991.58, 743.44 1989.28, 742.939 1986.9, 742.454 1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14	

	1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944 1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543	

	1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

Material Boundary	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15 1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711	

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

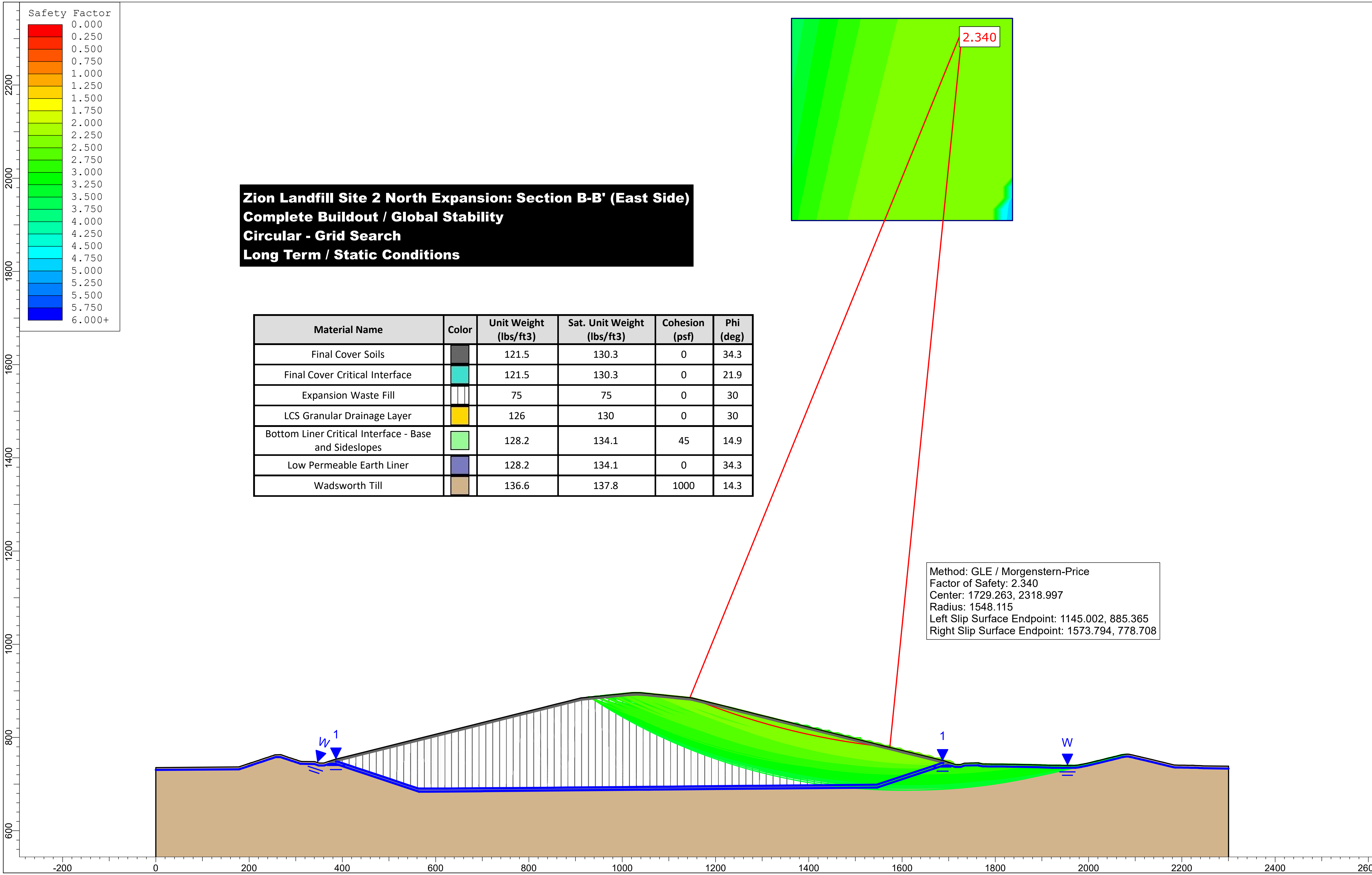
	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Final Cover Soils		121.5	130.3	0	34.3
Final Cover Critical Interface		121.5	130.3	0	21.9
Expansion Waste Fill		75	75	0	30
LCS Granular Drainage Layer		126	130	0	30
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9
Low Permeable Earth Liner		128.2	134.1	0	34.3
Wadsworth Till		136.6	137.8	1000	14.3

B-B_final_east_LT.slmd

APTIM

Slide Analysis Information

B-B_final_east_LT

Project Summary

File Name:	B-B_final_east_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:08.725s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3

Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1

Global Minimums

Method: bishop simplified

FS	2.343420
Center:	1729.263, 2318.997
Radius:	1548.115
Left Slip Surface Endpoint:	1145.002, 885.365
Right Slip Surface Endpoint:	1573.794, 778.708
Resisting Moment:	3.9008e+08 lb-ft
Driving Moment:	1.66457e+08 lb-ft
Total Slice Area:	4750.35 ft2
Surface Horizontal Width:	428.792 ft
Surface Average Height:	11.0784 ft

Method: janbu corrected

FS	2.356840
Center:	1729.263, 2318.997
Radius:	1548.115
Left Slip Surface Endpoint:	1145.002, 885.365
Right Slip Surface Endpoint:	1573.794, 778.708
Resisting Horizontal Force:	246421 lb
Driving Horizontal Force:	104556 lb
Total Slice Area:	4750.35 ft2
Surface Horizontal Width:	428.792 ft
Surface Average Height:	11.0784 ft

Method: spencer

FS	2.341450
Center:	1729.263, 2318.997
Radius:	1548.115
Left Slip Surface Endpoint:	1145.002, 885.365
Right Slip Surface Endpoint:	1573.794, 778.708
Resisting Moment:	3.89752e+08 lb-ft
Driving Moment:	1.66457e+08 lb-ft
Resisting Horizontal Force:	243978 lb
Driving Horizontal Force:	104199 lb
Total Slice Area:	4750.35 ft2
Surface Horizontal Width:	428.792 ft
Surface Average Height:	11.0784 ft

Method: gle/morgenstern-price

FS	2.339700
Center:	1729.263, 2318.997
Radius:	1548.115
Left Slip Surface Endpoint:	1145.002, 885.365
Right Slip Surface Endpoint:	1573.794, 778.708
Resisting Moment:	3.8946e+08 lb-ft
Driving Moment:	1.66457e+08 lb-ft
Resisting Horizontal Force:	243942 lb
Driving Horizontal Force:	104262 lb
Total Slice Area:	4750.35 ft2
Surface Horizontal Width:	428.792 ft
Surface Average Height:	11.0784 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4411
Number of Invalid Surfaces:	396

Error Codes

Error Code -109 reported for 2 surfaces
Error Code -110 reported for 77 surfaces
Error Code -115 reported for 317 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4411
Number of Invalid Surfaces:	396

Error Codes

Error Code -109 reported for 2 surfaces
Error Code -110 reported for 77 surfaces
Error Code -115 reported for 317 surfaces

Method: spencer

Number of Valid Surfaces:	4411
Number of Invalid Surfaces:	396

Error Codes

Error Code -109 reported for 2 surfaces
Error Code -110 reported for 77 surfaces
Error Code -115 reported for 317 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4411
Number of Invalid Surfaces:	396

Error Codes

Error Code -109 reported for 2 surfaces
Error Code -110 reported for 77 surfaces
Error Code -115 reported for 317 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-115 = Surface too shallow, below the minimum depth.

Entity Information

Circ - Thin Layers

Shared Entities

Type	Coordinates (x,y)
	1705.77, 744.739 1691.94, 749.191 1688.75, 750.234 1683.79, 751.475 1649.72, 759.997 1550.33, 784.49 1517.24, 792.645 1498.17, 797.461 1487.03, 800.244 1336.39, 837.906 1312.53, 843.912 1289.79, 849.649 1268.54, 855.013 1248.67, 860.028 1228.73, 865.012 1188.81, 874.99 1149.18, 884.939 1148.86, 884.971 1148.57, 885 1148.54, 885.012 1143.27, 885.539 1138.57, 886 1128.02, 887.055 1123.25, 887.539 1118.57, 888 1107.98, 889.059 1098.56, 890 1087.91, 891.065 1078.56, 892 1067.84, 893.072 1058.55, 894 1056.47, 894.208 1047.76, 895.079 1038.54, 896 1031.85, 896 1031.28, 896 1024.07, 896 1022.73, 896 1003.75, 894.103

	1002.72, 894 1002.59, 893.986 983.533, 892.081 982.719, 892 963.529, 890.082 962.713, 890 943.526, 888.082 942.708, 888 923.523, 886.082 922.702, 886 913.109, 885.041 912.699, 885 912.114, 884.941 912.089, 884.939 877.133, 876.202 859.589, 871.816 841.214, 867.222 840.146, 866.956 822.141, 862.454 802.222, 857.474 781.387, 852.265 759.573, 846.811 736.709, 841.095 712.721, 835.098 685.108, 828.195 626.363, 813.508 564.036, 797.924 447.096, 768.701 412.275, 760 398.83, 756.64 397.597, 756.33 396.492, 756.054 395.41, 755.784 394.351, 755.519 393.315, 755.26 392.3, 755.007 391.307, 754.759 390.334, 754.516 390.102, 754.458 386.057, 753.446 369.041, 747.954 360.315, 745.046 360.041, 744.955 350.343, 744.956 350.039, 744.956 341.31, 747.867 341.038, 747.958 312.062, 748.539 311.035, 748.562 309.721, 749 307.672, 749.682 306.716, 750 300.91, 751.933 300.708, 752 300.446, 752.087 294.699, 754 294.195, 754.168 288.69, 756 288.155, 756.178

External Boundary	282.681, 758 282.067, 758.204 276.673, 760 275.984, 760.229 270.664, 762 267.902, 762.919 259.888, 762.906 256.257, 762.904 253.546, 762 252.468, 761.641 247.546, 760 246.36, 759.605 241.546, 758 236.819, 756.424 235.546, 756 230.819, 754.424 229.546, 754 228.273, 753.576 223.546, 752 222.273, 751.576 217.546, 750 212.017, 748.157 205.774, 746.076 205.581, 746.012 205.411, 745.955 205.123, 745.859 204.822, 745.759 204.532, 745.662 204.114, 745.523 202.582, 745.012 202.37, 744.941 201.485, 744.646 201.379, 744.611 200.794, 744.416 200.126, 744.193 200.07, 744.175 199.416, 743.957 199.195, 743.883 197.758, 743.404 197.28, 743.245 196.972, 743.142 196.867, 743.107 195.97, 742.808 192.571, 741.675 180.393, 737.616 179.777, 737.41 179.104, 737.186 178.684, 737.046 177.683, 736.712 0, 735.281 0, 330 2300, 329.864 2300, 738.23 2246.57, 739.067 2243.38, 739.234 2237.66, 739.488 2236.06, 739.552 2228.45, 739.866 2227.6, 739.905	

2224.96, 740
2223.17, 740.005
2222.91, 740.007
2220.2, 740.014
2219.67, 740.014
2212.87, 740.232
2205.39, 740.356
2197.23, 740.483
2193.85, 740.574
2186.16, 740.695
2184.12, 740.751
2173.86, 743.268
2159.21, 746.831
2152.58, 748.429
2136.66, 752.288
2133.09, 753.144
2130.67, 753.722
2128.9, 754.137
2118.44, 756.605
2115.88, 757.214
2112.57, 758
2110.94, 758.385
2109.47, 758.729
2106.6, 759.395
2105.52, 759.642
2103.96, 760
2102.2, 760.402
2101.25, 760.619
2095.2, 762
2092.07, 762.714
2091.21, 762.906
2090.82, 762.992
2090.04, 763.165
2089.21, 763.348
2087.8, 763.655
2086.22, 764
2081.11, 764
2080.83, 764
2071.8, 762.725
2068.87, 762
2062.14, 760.334
2060.79, 760
2055.71, 758.743
2053.39, 758.173
2052.69, 758
2051.46, 757.69
2050.07, 757.348
2049.83, 757.288
2047.2, 756.637
2046.89, 756.56
2020.89, 750.238
2018.62, 749.686
2006.76, 746.88
2004.23, 746.282
1997.83, 744.822
1995.37, 744.264
1991.58, 743.44
1989.28, 742.939
1986.9, 742.454

	1984.74, 742.012 1983.22, 741.722 1982.37, 741.56 1981.18, 741.335 1980.18, 741.16 1978.26, 740.826 1976.28, 740.516 1975.78, 740.438 1973.88, 740.177 1973.61, 740.14 1971.91, 739.942 1971.78, 739.934 1971.67, 739.928 1970.03, 739.874 1969.97, 739.872 1966.4, 739.837 1962.15, 739.979 1962.12, 739.978 1960.65, 739.995 1960.65, 739.995 1960.64, 739.995 1958.84, 739.961 1958.8, 739.962 1955.97, 739.894 1955.8, 739.899 1952.02, 739.831 1947.2, 739.799 1942.5, 739.789 1940.44, 740 1939.92, 740.009 1935.35, 740.008 1934.96, 740.008 1930.81, 740.006 1930.4, 740.007 1927.26, 740.005 1923.77, 740.001 1923.7, 740.001 1923.26, 740 1923.21, 740 1920.59, 740.087 1917.66, 740.181 1916.72, 740.203 1915.68, 740.226 1898.08, 740.833 1892.28, 741.057 1847.51, 742 1841.58, 742.146 1841.29, 742.151 1840.84, 742.154 1840.05, 742.158 1838.74, 742.163 1826.34, 742.37 1814.92, 742.579 1800.98, 742.614 1792.37, 742.721 1787.88, 742.786 1779.33, 742.929 1773.39, 742.943 1773.36, 742.944	

	1769.62, 743.777 1768.75, 744 1768.54, 744.035 1766.72, 744.351 1766.68, 744.366 1766.61, 744.388 1766.59, 744.396 1766.25, 744.508 1766.18, 744.534 1766.15, 744.543 1766.11, 744.554 1766.11, 744.557 1765.72, 744.685 1765.58, 744.732 1765.48, 744.767 1765.46, 744.772 1765.43, 744.781 1765.41, 744.79 1765.39, 744.795 1765.38, 744.799 1765.36, 744.806 1765.35, 744.809 1765.3, 744.824 1765.3, 744.826 1765.29, 744.828 1765.27, 744.835 1765.27, 744.837 1765.25, 744.842 1765.24, 744.845 1765.23, 744.848 1763.77, 745.335 1760.89, 745.278 1733.77, 744.737 1728.36, 742.936 1724.77, 741.738 1718.76, 741.738 1714.77, 741.738 1709.37, 743.539

Material Boundary	371.139, 747.994 371.35, 747.924 371.563, 747.853 384.979, 743.38 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684 698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1696.74, 742.47 1703.25, 744.639 1703.64, 744.772 1703.65, 744.774 1703.66, 744.776 1703.67, 744.781
	369.041, 747.954 369.564, 747.963 371.299, 747.998 378.927, 748.15 379.447, 748.16 386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91

Material Boundary	432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08 1695.33, 744.948 1695.56, 744.943 1695.85, 744.937 1703.67, 744.781 1705.77, 744.739
	386.057, 748.292 387.636, 748.688 389.31, 749.106 390.102, 749.304 391.02, 749.533 392.766, 749.97 394.551, 750.415 396.375, 750.871

Material Boundary	398.239, 751.337 400.145, 751.813 402.095, 752.3 404.089, 752.798 406.128, 753.308 411.367, 754.619 447.096, 763.546 449.685, 764.193 564.036, 792.77 626.363, 808.356 792.922, 850 793.256, 850.084 800.923, 852 801.257, 852.084 808.924, 854 809.258, 854.084 816.925, 856 817.259, 856.084 824.926, 858 825.261, 858.084 832.927, 860 833.262, 860.084 840.146, 861.804 840.929, 862 841.263, 862.084 848.931, 864 849.265, 864.083 856.933, 866 857.267, 866.083 864.935, 868 865.269, 868.083 872.938, 870 873.27, 870.083 880.94, 872 881.272, 872.083 888.942, 874 889.273, 874.083 896.944, 876 897.274, 876.082 904.947, 878 905.275, 878.082 912.949, 880.002 913.77, 880.084 932.954, 882 933.767, 882.081 952.96, 884 953.77, 884.081 972.965, 886 973.774, 886.081 992.971, 888 993.788, 888.082 1002.59, 888.961 1012.97, 890 1015.9, 890 1031.85, 890.91 1032.05, 890.921 1048.3, 890 1056.47, 889.183 1057.55, 889.075	

	1068.31, 888 1079.05, 886.926 1088.31, 886 1098.98, 884.933 1108.31, 884 1118.92, 882.939 1128.32, 882 1138.86, 880.946 1138.94, 880.946 1148.32, 880 1170.76, 874.561 1189.01, 870 1189.01, 870 1211.61, 864.353 1229.02, 860 1229.02, 860 1252.48, 854.135 1269.03, 850 1269.03, 850 1293.27, 843.94 1309.04, 840 1309.04, 840 1334.07, 833.743 1349.05, 830 1349.05, 830 1374.81, 823.56 1389.05, 820 1389.05, 820 1415.4, 813.414 1429.06, 810 1429.06, 810 1455.94, 803.282 1469.07, 800 1482.16, 796.729 1487.03, 795.51 1509.08, 790 1521.9, 786.796 1549.09, 780 1550.33, 779.69 1561.74, 776.837 1589.1, 770 1601.64, 766.866 1629.1, 760 1641.53, 756.892 1669.11, 749.997 1687.47, 745.402 1688.75, 745.08

Material Boundary	386.057, 748.292 390.102, 746.943 398.905, 744.009 399.789, 743.714 406.969, 741.321 409.105, 740.609 417.384, 737.849 429.814, 733.705 437.565, 731.121 447.096, 727.943 513.062, 705.952 558.73, 690.668 562.767, 689.357 564.036, 689.344 567.392, 689.344 591.838, 689.36 626.363, 689.36 695.698, 689.813 697.254, 689.823 736.377, 690.079 748.109, 690.189 840.146, 691.05 877.729, 691.397 1002.59, 692.55 1030.76, 692.817 1031.85, 692.828 1033.44, 692.842 1033.47, 692.842 1056.47, 693.05 1104.66, 693.498 1147.07, 693.892 1212.44, 694.499 1487.03, 697.05 1532.11, 697.469 1546.04, 697.6 1546.32, 697.603 1550.33, 698.939 1653.01, 733.166 1688.75, 745.08

Material Boundary	371.563, 747.853 386.035, 748.141 390.055, 746.801 398.858, 743.867 399.741, 743.572 406.921, 741.178 409.057, 740.466 417.336, 737.706 429.767, 733.562 437.517, 730.978 447.048, 727.801 513.014, 705.81 558.684, 690.525 562.742, 689.207 564.035, 689.194 567.392, 689.194 591.838, 689.21 626.364, 689.21 695.699, 689.663 697.255, 689.673 736.378, 689.929 748.11, 690.039 840.147, 690.9 877.73, 691.247 1002.59, 692.4 1030.76, 692.667 1031.85, 692.678 1033.44, 692.692 1033.47, 692.692 1056.47, 692.9 1104.66, 693.348 1147.07, 693.742 1212.44, 694.349 1487.04, 696.9 1532.11, 697.319 1546.04, 697.45 1546.34, 697.453 1550.38, 698.797 1653.06, 733.024 1688.78, 744.929 1695.55, 744.793 1703.25, 744.639
	378.927, 748.15 386.841, 750.704 390.794, 751.693 391.025, 751.751 391.998, 751.994 392.991, 752.242 394.005, 752.495 395.042, 752.754 396.101, 753.019 397.183, 753.289 398.289, 753.566 399.521, 753.875 412.966, 757.235 447.787, 765.936 564.727, 795.159 627.055, 810.743 685.799, 825.43

	713.413, 832.333 737.4, 838.33 760.264, 844.046 782.078, 849.5 802.913, 854.709 822.833, 859.689 840.838, 864.191 841.905, 864.458 860.28, 869.051 877.824, 873.437 912.579, 882.124 912.983, 882.164 913.393, 882.205 922.986, 883.164 923.806, 883.246 942.991, 885.164 943.81, 885.246 962.997, 887.164 963.813, 887.246 983.002, 889.164 983.816, 889.246 1002.87, 891.15
Material Boundary	1003.01, 891.164 1004.04, 891.267 1022.87, 893.15 1024.07, 893.15 1031.28, 893.15 1031.85, 893.15 1038.4, 893.15 1047.48, 892.243 1056.19, 891.373 1058.27, 891.164 1067.55, 890.236 1078.27, 889.164 1087.62, 888.229 1098.28, 887.164 1107.69, 886.223 1118.28, 885.164 1122.97, 884.703 1127.74, 884.219 1138.29, 883.164 1142.99, 882.702 1147.94, 882.207 1147.97, 882.196 1148.58, 882.135 1148.69, 882.124 1188.12, 872.225 1228.04, 862.248 1247.98, 857.264 1267.84, 852.25 1289.09, 846.886 1311.83, 841.149 1335.69, 835.141 1486.34, 797.479 1497.47, 794.697 1516.55, 789.88 1549.65, 781.723 1649.04, 757.231 1683.09, 748.711

	1687.96, 747.493 1691.06, 746.481 1695.85, 744.937
Material Boundary	379.447, 748.16 386.882, 750.56 390.83, 751.547 391.061, 751.605 392.034, 751.848 393.027, 752.096 394.042, 752.35 395.078, 752.609 396.137, 752.873 397.22, 753.144 398.326, 753.42 399.558, 753.729 413.002, 757.089 447.823, 765.791 564.764, 795.013 627.091, 810.598 685.835, 825.284 713.449, 832.187 737.436, 838.184 760.301, 843.901 782.115, 849.354 802.949, 854.563 822.869, 859.544 840.874, 864.045 841.942, 864.312 860.317, 868.905 877.86, 873.291 912.605, 881.976 912.998, 882.015 913.408, 882.056 923, 883.015 923.821, 883.097 943.006, 885.015 943.825, 885.097 963.012, 887.015 963.828, 887.096 983.017, 889.015 983.831, 889.096 1002.88, 891.001 1003.02, 891.015 1004.05, 891.118 1022.87, 893 1024.07, 893 1031.28, 893 1031.85, 893 1038.39, 893 1047.46, 892.093 1056.17, 891.223 1058.26, 891.015 1067.54, 890.087 1078.26, 889.015 1087.61, 888.08 1098.26, 887.015 1107.68, 886.073 1118.27, 885.015 1122.95, 884.554

	1127.72, 884.07 1138.27, 883.015 1142.97, 882.553 1147.91, 882.06 1147.94, 882.048 1148.56, 881.986 1148.66, 881.976 1188.08, 872.08 1228, 862.102 1247.94, 857.118 1267.81, 852.104 1289.06, 846.74 1311.8, 841.003 1335.66, 834.996 1486.31, 797.334 1497.43, 794.552 1516.51, 789.734 1549.61, 781.577 1649, 757.085 1683.06, 748.565 1687.92, 747.349 1691.01, 746.338 1695.33, 744.948
Material Boundary	371.139, 747.994 371.299, 747.998

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-2.66e-14, 730.281 178.514, 731.719 180.265, 732.302 180.685, 732.443 181.358, 732.667 181.974, 732.872 194.152, 736.932 197.551, 738.064 198.448, 738.364 198.554, 738.399 198.861, 738.501 199.339, 738.661 200.776, 739.14 200.997, 739.213 201.651, 739.431 201.708, 739.45 202.375, 739.673 202.96, 739.868 203.066, 739.903 203.951, 740.198 204.163, 740.269 205.695, 740.779 206.113, 740.918 206.403, 741.015 206.704, 741.116 206.992, 741.211 207.162, 741.268 207.356, 741.333 213.598, 743.414 219.127, 745.257	Assigned to: Wadsworth Till

	223.854, 746.832 225.127, 747.257 229.854, 748.832 231.127, 749.257 232.4, 749.681 237.127, 751.257 238.4, 751.681 243.127, 753.257 247.941, 754.861 249.127, 755.257 254.049, 756.897 255.127, 757.257 257.07, 757.904 259.897, 757.906 267.095, 757.918 269.085, 757.256 274.405, 755.485 275.094, 755.256 280.488, 753.46 281.102, 753.256 286.576, 751.434 287.111, 751.256 292.616, 749.424 293.12, 749.256 298.867, 747.343 299.129, 747.256 299.331, 747.189 305.137, 745.256 306.093, 744.938 308.139, 744.257 310.17, 743.58 311.956, 743.54 340.176, 742.974 349.223, 739.958 350.337, 739.956 360.847, 739.955 361.891, 740.301 370.6, 743.203 385.911, 743.07 390.102, 741.672 392.178, 740.98 393.625, 740.498 395.889, 739.743 404.687, 736.81 418.13, 732.329 426.507, 729.536 447.096, 722.672 507.505, 702.534 563.515, 683.862 563.605, 683.831 563.976, 683.705 564.036, 683.685 564.179, 683.637 564.311, 683.592 564.361, 683.575 564.491, 683.575 564.857, 683.576 586.189, 683.61 626.363, 684		

Water Table	698.374, 684.674 703.436, 684.721 840.146, 686 1002.59, 687.5 1031.85, 687.778 1056.47, 688 1070.79, 688.133 1076.9, 688.19 1113.49, 688.53 1198.73, 689.322 1487.03, 692 1546.99, 692.557 1550.33, 693.668 1688.75, 739.809 1689.03, 739.9 1704.21, 739.987 1707.78, 738.796 1713.96, 736.738 1718.76, 736.738 1725.58, 736.737 1729.95, 738.193 1734.63, 739.753 1760.99, 740.279 1763.01, 740.319 1763.65, 740.104 1763.66, 740.102 1763.67, 740.098 1763.68, 740.094 1763.69, 740.092 1763.71, 740.084 1763.72, 740.082 1763.72, 740.081 1763.77, 740.065 1763.78, 740.062 1763.8, 740.056 1763.81, 740.051 1763.83, 740.046 1763.85, 740.038 1763.88, 740.028 1763.89, 740.024 1764, 739.989 1764.14, 739.942 1764.53, 739.813 1764.53, 739.811 1764.57, 739.8 1764.59, 739.79 1764.67, 739.764 1765.01, 739.653 1765.03, 739.645 1765.1, 739.622 1765.5, 739.489 1767.7, 739.105 1767.72, 739.101 1768.46, 738.913 1772.79, 737.949 1773.36, 737.944 1779.28, 737.93 1787.81, 737.786 1792.3, 737.722		

	1800.94, 737.614 1814.87, 737.579 1826.26, 737.371 1838.69, 737.163 1840.03, 737.158 1840.81, 737.155 1841.22, 737.151 1841.48, 737.147 1847.4, 737.001 1892.14, 736.059 1897.9, 735.837 1915.54, 735.228 1916.61, 735.205 1917.52, 735.183 1920.42, 735.09 1923.11, 735.001 1923.25, 735 1923.71, 735.001 1923.77, 735.001 1927.27, 735.005 1930.39, 735.007 1930.8, 735.006 1934.96, 735.008 1935.34, 735.008 1939.87, 735.009 1940.15, 735.004 1942.25, 734.789 1947.23, 734.799 1952.08, 734.831 1955.77, 734.898 1955.95, 734.892 1958.79, 734.961 1958.82, 734.96 1960.66, 734.994 1962.1, 734.978 1966.34, 734.837 1970.07, 734.872 1970.19, 734.876 1971.89, 734.933 1972.06, 734.942 1972.35, 734.958 1974.24, 735.179 1974.56, 735.224 1976.51, 735.491 1977.05, 735.576 1979.08, 735.893 1981.03, 736.234 1982.08, 736.415 1983.3, 736.648 1984.15, 736.81 1985.71, 737.106 1987.91, 737.555 1990.31, 738.046 1992.64, 738.554 1996.46, 739.383 1998.94, 739.947 2005.36, 741.412 2007.91, 742.015 2017.72, 744.335		

	2019.79, 744.824 2022.07, 745.38 2048.08, 751.704 2048.4, 751.784 2051.03, 752.434 2051.27, 752.494 2052.67, 752.839 2053.9, 753.148 2054.59, 753.317 2056.91, 753.888 2061.99, 755.146 2063.34, 755.481 2070.07, 757.147 2072.75, 757.81 2081.18, 759 2085.68, 759 2086.73, 758.77 2088.14, 758.464 2088.96, 758.282 2089.74, 758.111 2090.12, 758.026 2090.97, 757.836 2094.09, 757.125 2100.14, 755.745 2101.08, 755.528 2102.84, 755.126 2104.41, 754.768 2105.48, 754.523 2108.33, 753.859 2109.8, 753.517 2111.42, 753.135 2114.73, 752.349 2117.29, 751.74 2127.76, 749.27 2129.51, 748.856 2131.93, 748.281 2135.49, 747.427 2151.4, 743.569 2158.03, 741.971 2172.67, 738.411 2183.45, 735.767 2186.05, 735.696 2193.75, 735.575 2197.12, 735.484 2205.31, 735.357 2212.75, 735.233 2219.59, 735.014 2220.19, 735.014 2222.89, 735.007 2223.15, 735.005 2224.86, 735 2227.4, 734.909 2228.23, 734.871 2235.86, 734.556 2237.44, 734.493 2243.14, 734.24 2246.4, 734.069 2300, 733.229	

Piezoline	386.057, 748.292 386.203, 748.286 389.631, 748.157 390.102, 748 402.215, 743.962 403.086, 743.672 410.125, 741.325 412.226, 740.625 420.368, 737.91 432.54, 733.852 440.132, 731.322 447.096, 729 503.929, 710.053 539.503, 697.951 558.611, 691.762 558.865, 691.679 562.929, 690.36 564.036, 690.348 567.84, 690.349 591.835, 690.364 623.213, 690.364 626.363, 690.364 694.207, 690.807 696.794, 690.824 748.23, 691.161 758.969, 691.241 840.146, 692 840.75, 692.006 878.605, 692.355 1002.59, 693.5 1031.66, 693.776 1031.69, 693.776 1031.85, 693.778 1056.47, 694 1104.1, 694.443 1146.52, 694.837 1211.99, 695.445 1271.75, 696 1271.77, 696 1289.59, 696.166 1484.09, 698.02 1487.03, 698.047 1488.81, 698.064 1546.16, 698.605 1550.33, 699.993 1550.34, 699.997 1664.79, 738.147 1685.08, 744.911 1685.14, 744.929 1685.15, 744.933 1685.16, 744.935 1685.16, 744.936 1685.18, 744.943 1685.18, 744.943 1688.75, 745.08	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

J.2-D Rapid Drawdown of Detention Basin (Global Stability Analysis)

APTIM

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: SHEAR STRENGTH EVALUATION OF WADSWORTH TILL DURING RAPID DRAWDOWN OF DETENTION BASIN (GLOBAL STABILITY ANALYSIS)

Problem Statement

Determine the factor of safety of the horizontal expansion during rapid drawdown conditions of the detention basin, with the landfill in final buildout (after final cover placement).

Background

The rapid drawdown condition arises when submerged slopes experience a rapid reduction in water level. The reduction in water level removes the stabilizing force from the weight of the water and the pore pressure of the basin foundation material (Wadsworth Till) will be slow to dissipate. These scenarios will reduce the slope stability of the basin.

This calculation is developed to identify the lowest factor of safety assuming that rapid drawdown of the detention basin occurs with the force of the fully constructed landfill behind it (worst case scenario).

Given

- ❑ Hydrogeologic and Design Drawings contained in this Application.
- ❑ **Appendix J.1** “Summary of Geotechnical Design Parameters” contained in this Application.
- ❑ Peak horizontal ground acceleration (PGHA) determined from USGS National Seismic Hazard Mapping Project website (value of 0.0461g for horizontal acceleration — please refer to **Appendix J.1**).
- ❑ **Appendix J.2-C** contained in this Application.
- ❑ Computer model SLIDE - An Interactive Slope Stability Program, version 9.006, developed by Rocscience, Inc. was used for the stability analyses.

Assumptions

Selected Critical Cross Section

Critical Cross Section A-A’ - Cross Section A-A’ as shown on **Figure Nos. 1** and **2** in **Appendix J.2-C** is a critical cross section oriented overall from south to north, starting in the existing landfill and moving north through the vertical expansion and then horizontal expansion, and then through the detention basin. A critical cross section is used to be conservative, as it captures the steepest possible slopes and peak elevations. The cross section is characterized by the following features:

- ❑ Peak final landform elevation of 896 feet MSL for the horizontal and vertical expansions;
- ❑ Maximum waste column thickness of 198 feet located at peak final landform elevation of approximately 896 feet MSL in the horizontal expansion area (Cell 11);
- ❑ Maximum waste column thickness of 206 feet located at final landform elevation of approximately 896 feet MSL in the vertical expansion area (Cell 7);

APTIM

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: **SHEAR STRENGTH EVALUATION OF WADSWORTH TILL DURING RAPID DRAWDOWN OF DETENTION BASIN (GLOBAL STABILITY ANALYSIS)**

- Final cover side slopes of 4H:1V with a slope of 10H:1V across the plateau;
- Cell excavation side slopes of 3H:1V in the horizontal and vertical expansion areas; and
- Detention basin slopes and depth.

Landfill Stages Analyzed and Modes of Failure

Stability of the landfill was analyzed during final buildout (following final cover placement) conditions and during rapid drawdown conditions of the detention basin. There are three methods of rapid drawdown analyses in SLIDE with two of the methods having different interpolation methods:

- Duncan and Wright (3-stage) (1990)
  - VandenBerge, Wright (2016)
  - Duncan, Wright and Wong (1990)
- Lowe and Karafiath (1960)
  - VandenBerge, Wright (2016)
  - Duncan, Wright and Wong (1990)
- Army Corps (2-Stage) (1970)

These methods relate the undrained strength of the soil (after drawdown) to the pre-drawdown strength.

The stability of the waste mass and foundation after rapid drawdown was evaluated within the SLIDE model using the rotational (circular) failure. This uses a grid search to find the most critical circular failure surfaces within the waste mass and foundation. The grid search was performed in an iterative manner by the SLIDE model user. Each time the user adjusted / fine-tuned the grid to the point where the model generated the absolute lowest factor of safety.

Limit Equilibrium Analysis Methods

The limit equilibrium analysis methods used in the SLIDE model analyses included the Bishop Simplified Method, the Janbu Corrected Method, the Spencer Method, and the GLE (Generalized Limit Equilibrium) / Morgenstern-Price Method. The lowest factor of safety from the four methods used is reported on the SLIDE plot for each modeled scenario (attached pages) and on the summary table on the following page. All of the modeled scenarios are graphically presented on the SLIDE plots provided in the attached pages.

TITLE: SHEAR STRENGTH EVALUATION OF WADSWORTH TILL DURING RAPID DRAWDOWN OF DETENTION BASIN (GLOBAL STABILITY ANALYSIS)

Failure Conditions

In a rapid drawdown model it is typical to model initial soil loading as effective stress conditions (drained, consolidated). As rapid drawdown occurs, the pore-water pressures present in the soil do not have time to dissipate. Therefore, post-drawdown conditions of the soil become undrained and therefore less stable, and the total stress conditions are assumed (undrained, consolidated).

The model assumes long-term material properties for the pre-drawdown conditions. The long-term shear strength of the Wadsworth Till is obtained from the total stress consolidated undrained (CU) triaxial shear strength test. Therefore, the initial Wadsworth Till conditions are consolidated and undrained. This accurately reflects the groundwater conditions in final buildout, as the groundwater table is consistently high. Short-term shear strength values were used for the Wadsworth Till to mimic the drop in shear strength that occurs after rapid drawdown. The short-term shear strength value in the model are obtained from the unconsolidated undrained (UU) triaxial shear strength test. This is a conservative assumption, as short-term conditions conservatively assume that the waste is placed before the foundation soils are allowed to consolidate and dissipate excess pore-water pressures.

The stability analyses were performed under static and seismic conditions with the assumption that rapid drawdown of the detention basin during final buildout conditions. All material properties are from **Appendices J.1**, **J.2-A** and **J.2-C**.

Global Stability Analysis of Rapid Drawdown of the Detention Basin

Global stability of the landfill and detention basin was analyzed to determine if an adequate factor of safety is achieved if rapid drawdown were to occur.

The stability of the landform was evaluated using the unit weights and shear strengths as described in **Appendix J.1** and **Appendix J.2-C**. All materials were modeled under long-term shear strength parameters. After rapid drawdown occurs, the Wadsworth Till was modeled under short-term shear strength parameters. This switch in shear strength of the Wadsworth Till was to model the loss of strength of the Till after rapid drawdown has occurred. Both shear strength conditions are conservative and derived from site specific testing, as described in **Appendix J.1**.

The initial water table (pre-drawdown) was assumed to be located in contact with the bottom the low permeable earth liner and 5-feet below the ground surface (beyond the limits of the landfill). The initial water level in the detention basin was modeled as being 1-foot below the crest of the detention basin. The post-drawdown water level in the detention basin was modeled as five feet below the base of the detention basin. The groundwater was modeled as tying into the water elevation within the detention basin in the initial and post-drawdown water elevations. This is conservative and represents the worst-case groundwater scenario across the site. A liquid level representing a 1-foot leachate level was modeled as a piezometric surface, at the top of the LCS drainage layer.

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

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TITLE: SHEAR STRENGTH EVALUATION OF WADSWORTH TILL DURING RAPID DRAWDOWN OF DETENTION BASIN (GLOBAL STABILITY ANALYSIS)

Rapid Drawdown Results

The factors of safety for the landfill if rapid drawdown were to occur are shown in **Table J.2D-1**. The factors of safety meet the typical minimum requirements of 1.3 for seismic conditions and 1.5 for static conditions.

Table J.2D-1
Zion Landfill – Site 2 North Expansion
Rapid Drawdown Conditions
Stability Cross Section A-A' – Horizontal Expansion (northern slope)

Analysis (Interpolation Method)	Factors of Safety	
	Short-Term Shear Strength	
	Seismic (>1.3)	Static (>1.5)
Duncan, Wright and Wong (VandenBerge, Wright)	1.951	2.657
Duncan, Wright and Wong (Duncan, Wright and Wong)	1.950	2.655
Lowe and Karafiath (VandenBerge, Wright)	2.076	2.771
Lowe and Karafiath (Duncan, Wright and Wong)	2.084	2.728
Army Corp of Engineers (NA)	**1.862**	**2.584**

SLOPE STABILITY

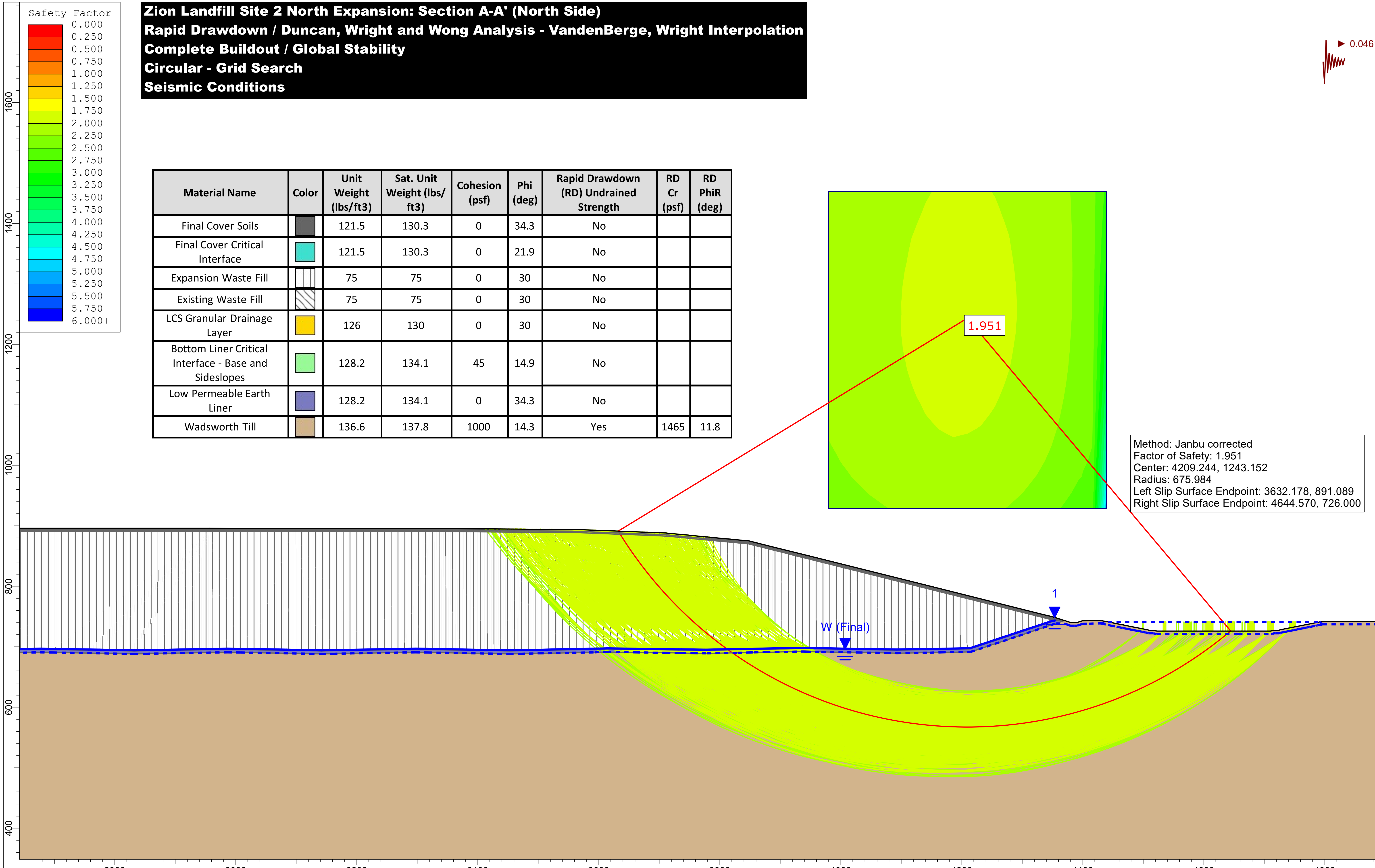
SECTION **A-A**' – HORIZONTAL EXPANSION

RAPID DRAWDOWN GLOBAL STABILITY
DUNCAN, WRIGHT AND WONG ANALYSIS
VANDENBERGE, WRIGHT INTERPOLATION

COMPLETE BUILDOUT LANDFORM
CIRCULAR ANALYSIS
(ROTATIONAL SLOPE FAILURE)

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Duncan, Wright and Wong Analysis - VandenBerge, Wright Interpolation
Complete Buildout / Global Stability
Circular - Grid Search
Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8



Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:53.705s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Duncan, Wright, Wong 3 Stage (1990)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb

Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1

Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.029960
Center:	4209.244, 1374.191
Radius:	781.814
Left Slip Surface Endpoint:	3593.392, 892.569
Right Slip Surface Endpoint:	4646.374, 726.000
Resisting Moment:	3.64157e+09 lb-ft
Driving Moment:	1.79391e+09 lb-ft
Total Slice Area:	154474 ft2
Surface Horizontal Width:	1052.98 ft
Surface Average Height:	146.702 ft

Method: janbu corrected

FS	1.950740
Center:	4209.244, 1243.152
Radius:	675.984
Left Slip Surface Endpoint:	3632.178, 891.089
Right Slip Surface Endpoint:	4644.570, 726.000
Resisting Horizontal Force:	4.69667e+06 lb
Driving Horizontal Force:	2.40763e+06 lb
Total Slice Area:	166182 ft2
Surface Horizontal Width:	1012.39 ft
Surface Average Height:	164.148 ft

Method: spencer

FS	2.013800
Center:	4209.244, 1374.191
Radius:	781.814
Left Slip Surface Endpoint:	3593.392, 892.569
Right Slip Surface Endpoint:	4646.374, 726.000
Resisting Moment:	3.61257e+09 lb-ft
Driving Moment:	1.79391e+09 lb-ft
Resisting Horizontal Force:	4.25043e+06 lb
Driving Horizontal Force:	2.11065e+06 lb
Total Slice Area:	154474 ft2
Surface Horizontal Width:	1052.98 ft
Surface Average Height:	146.702 ft

Method: gle/morgenstern-price

FS	2.015610
Center:	4209.244, 1374.191
Radius:	781.814
Left Slip Surface Endpoint:	3593.392, 892.569
Right Slip Surface Endpoint:	4646.374, 726.000
Resisting Moment:	3.61581e+09 lb-ft
Driving Moment:	1.79391e+09 lb-ft
Resisting Horizontal Force:	4.2543e+06 lb
Driving Horizontal Force:	2.11068e+06 lb
Total Slice Area:	154474 ft2
Surface Horizontal Width:	1052.98 ft
Surface Average Height:	146.702 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4720
Number of Invalid Surfaces:	131

Error Codes

Error Code -103 reported for 87 surfaces
Error Code -110 reported for 29 surfaces
Error Code -118 reported for 15 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4720
Number of Invalid Surfaces:	131

Error Codes

Error Code -103 reported for 87 surfaces
Error Code -110 reported for 29 surfaces
Error Code -118 reported for 15 surfaces

Method: spencer

Number of Valid Surfaces:	4720
Number of Invalid Surfaces:	131

Error Codes

Error Code -103 reported for 87 surfaces
Error Code -110 reported for 29 surfaces
Error Code -118 reported for 15 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4720
Number of Invalid Surfaces:	131

Error Codes

Error Code -103 reported for 87 surfaces
Error Code -110 reported for 29 surfaces
Error Code -118 reported for 15 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-118 = Surface does not pass through the search focus

Entity Information

DWW - Van

Shared Entities

Type	Coordinates (x,y)
	4805.95, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4484.34, 732.521

	4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4456.92, 738 4451.39, 739.111 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755	

	2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788	

External Boundary	1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385

	957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086	

	754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771	

	538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054
	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119

	435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654 835.534, 686 874.622, 686 885.02, 686 885.837, 686	

	914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692 1495.01, 692 1500.48, 692	

Material Boundary	1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42

	1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8	

	2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896
	425.234, 740.088 425.659, 739.946

	439.628, 735.289
	445.572, 733.308
	448.135, 732.454
	451.572, 731.308
	452.741, 730.918
	455.017, 730.16
	457.579, 729.307
	460.127, 728.458
	464.508, 727
	464.51, 727
	468.673, 725.614
	475.6, 723.307
	478.136, 722.463
	481.611, 721.307
	484.14, 720.465
	487.618, 719.307
	491.807, 717.914
	493.629, 717.307
	497.265, 716.097
	505.64, 713.307
	507.449, 712.705
	511.648, 711.307
	513.452, 710.707
	517.656, 709.307
	519.455, 708.708
	523.669, 707.306
	527.287, 706.108
	535.86, 703.305
	537.89, 702.622
	541.663, 701.318
	543.799, 700.607
	547.704, 699.307
	549.811, 698.606
	553.711, 697.307
	558.639, 695.666
	565.718, 693.308
	568.176, 692.49
	571.728, 691.307
	575.797, 689.953
	577.736, 689.307
	582.052, 687.87
	582.052, 687.87
	583.743, 687.307
	592.656, 684.34
	595.759, 683.307
	597.676, 682.669
	601.767, 681.307
	606.234, 679.82
	608.698, 679
	618.307, 679
	628.226, 679.242
	628.274, 679.242
	700.659, 681.002
	768.453, 682.652
	835.46, 681
	874.622, 681
	885.02, 681
	885.634, 681
	914.27, 679.058

	914.411, 679.057
	916.635, 679.002
	918.712, 678.951
	920.822, 679.002
	923.072, 679.061
	932.042, 679.457
	934.813, 679.981
	945.459, 681.092
	948.634, 682.055
	953.372, 683.186
	966.68, 686.81
	968.205, 687.206
	968.611, 687.32
	973.02, 688.452
	975.698, 689.053
	976.071, 689.127
	983.756, 690.815
	985.339, 691.121
	992.008, 692.55
	995.001, 693.111
	1013.14, 696.789
	1014.83, 697.123
	1015.48, 697.262
	1029.86, 699.057
	1037.13, 700.174
	1049.88, 701.017
	1054.93, 701.439
	1061.13, 701.796
	1067.32, 701.858
	1069.64, 701.862
	1084.22, 701.009
	1093.76, 700.535
	1105.21, 699.039
	1108.62, 698.694
	1113.85, 698.014
	1115.88, 697.749
	1118.7, 697.239
	1119.27, 697.117
	1127.39, 695.581
	1129.45, 695.129
	1135.37, 693.93
	1139.13, 693.125
	1145.94, 691.753
	1148.93, 691.114
	1151.08, 690.719
	1157.27, 689.184
	1163.63, 687.532
	1180.77, 687.159
	1199.14, 687
	1219.87, 686.821
	1247.6, 686.53
	1274.47, 687.001
	1354.82, 688.409
	1380.15, 687.893
	1449.6, 687
	1461.71, 687
	1495.01, 687
	1500.34, 687
	1516.14, 686.278

Material Boundary	1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1848.18, 681.312 1853.09, 679.599 1854.88, 679 1856.55, 679 1858.87, 679 1862.97, 679 1868.47, 680.801 1869.31, 681.074 1870.05, 681.322 1870.29, 681.404 1875.39, 683 1875.45, 683 1877.69, 683.747 1881.46, 685 1881.51, 685 1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431 1912.81, 695.431 1918.47, 697.32 1918.79, 697.429 1918.8, 697.429 1924.47, 699.32 1924.78, 699.428 1924.8, 699.428 1930.47, 701.32 1930.78, 701.426 1930.79, 701.426 1936.47, 703.32 1936.78, 703.425 1936.79, 703.425 1942.47, 705.32 1942.77, 705.423 1942.78, 705.423 1948.47, 707.319 1948.77, 707.422 1948.78, 707.422 1954.47, 709.318 1954.77, 709.42 1954.78, 709.42

	1960.47, 711.317	
	1960.76, 711.419	
	1960.77, 711.419	
	1966.47, 713.316	
	1966.76, 713.417	
	1966.77, 713.417	
	1972.46, 715.315	
	1972.76, 715.416	
	1972.76, 715.416	
	1978.46, 717.315	
	1978.75, 717.414	
	1978.76, 717.414	
	1984.44, 719.308	
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	1989.51, 721	
	1989.52, 721	
	1995.23, 722.904	
	1995.51, 723	
	1995.54, 723	
	1996.74, 723.41	
	1996.75, 723.41	
	2002.46, 725.314	
	2002.74, 725.408	
	2002.74, 725.408	
	2008.46, 727.314	
	2008.73, 727.406	
	2008.74, 727.406	
	2014.46, 729.314	
	2014.73, 729.405	
	2014.73, 729.405	
	2020.46, 731.315	
	2020.72, 731.403	
	2020.73, 731.403	
	2026.46, 733.315	
	2026.72, 733.402	
	2026.73, 733.402	
	2032.46, 735.313	
	2033.64, 735.713	
	2037.69, 737.065	
	2041.9, 738.472	
	2061.54, 731.927	
	2127.47, 709.948	
	2194.18, 687.752	
	2195.59, 687.778	
	2206.66, 687.971	
	2366.91, 690.776	
	2388.53, 690.405	
	2447.68, 689.392	
	2475.13, 688.921	
	2503.25, 688.435	
	2521.93, 688.112	
	2580.04, 689.12	
	2600.94, 689.482	
	2620.01, 689.813	
	2676.93, 690.8	
	2698.09, 690.434	
	2754.87, 689.452	
	2812.87, 688.448	
	2824.98, 688.239	

	2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4368.61, 742.832 4369.04, 742.975
	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826

	474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883 506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766 538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021 618.632, 786 622.745, 787.031 626.622, 788 633.831, 789.802 634.622, 790 635.422, 790.2 642.622, 792 646.38, 792.939 650.632, 794 654.898, 795.067 658.632, 796 662.927, 797.076 666.622, 798 673.797, 799.792 674.632, 800 675.475, 800.211 675.482, 800.213 682.633, 802 686.119, 802.872 690.633, 804 694.086, 804.863 698.633, 806	

	703.206, 807.143 706.633, 808 713.748, 809.779 713.756, 809.781 714.633, 810 715.521, 810.222 715.529, 810.224 722.633, 812 727.298, 813.169 730.622, 814 735.33, 815.177 738.622, 816 743.363, 817.185 746.622, 818 753.689, 819.767 753.697, 819.769 754.622, 820 755.557, 820.234 755.564, 820.236 762.622, 822 767.408, 823.196 770.622, 824 777.968, 825.837 777.971, 825.837 778.622, 826 779.282, 826.165 786.622, 828 793.638, 829.754 793.646, 829.756 794.622, 830 795.611, 830.247 802.622, 832 808.959, 833.584 810.622, 834 812.332, 834.427 818.622, 836 820.364, 836.436 826.622, 838 833.562, 839.735 834.622, 840 835.724, 840.275 842.622, 842 849.689, 843.767 850.622, 844 851.594, 844.243 858.622, 846 859.638, 846.254 866.622, 848 867.683, 848.265 874.622, 850 881.516, 851.724 882.622, 852 883.778, 852.289 884.667, 852.511 890.622, 854 896.384, 855.44 898.622, 856 905.369, 857.687 906.622, 858	

	913.267, 859.661 914.622, 860 916.042, 860.355 922.622, 862 924.05, 862.357 930.622, 864 936.682, 865.515 938.622, 866 945.083, 867.615 945.703, 867.77 946.463, 867.96 946.622, 868 948.807, 868.546 950.282, 868.915 951.413, 869.198 952.09, 869.367 954.622, 870 959.165, 871.136 960.758, 871.534 962.622, 872 965.435, 872.703 970.622, 874 974.464, 874.96 978.622, 876 983.295, 877.168 986.622, 878 987.722, 878.275 989.579, 878.739 989.696, 878.768 990.941, 879.08 994.622, 880 999.548, 881.232 999.665, 881.261 1001.52, 881.725 1002.62, 882 1002.75, 882.031 1003.06, 882.11 1003.09, 882.116 1003.45, 882.208 1010.62, 884 1016.85, 885.557 1018.62, 886 1024.91, 887.573 1026.62, 888 1032.44, 889.455 1032.46, 889.459 1034.62, 890 1036.95, 890.581 1036.96, 890.585 1042.62, 892 1044.19, 892.392 1050.62, 894 1052.12, 894.375 1058.62, 896 1065.26, 897.659 1066.62, 898 1071.96, 899.334 1071.97, 899.337 1074.62, 900	

	1077.51, 900.722 1077.53, 900.726 1082.62, 902 1089.48, 903.714 1090.62, 904 1097.56, 905.733 1098.62, 906 1105.63, 907.753 1106.62, 908 1111.23, 909.151 1111.24, 909.155 1114.62, 910 1132.01, 911.739 1134.62, 912 1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896	

Material Boundary	1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469

	1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792	

	1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033 1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969 1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582 1965.72, 764 1967.39, 763.583 1973.7, 762 1977.57, 761.034 1977.58, 761.033 1981.71, 760 1985.9, 758.959 1985.9, 758.958 1989.74, 758 1991.4, 757.584 1997.72, 756 1999.4, 755.58 2005.72, 754 2007.48, 753.558 2013.7, 752 2017.55, 751.04 2017.56, 751.039 2021.71, 750 2025.87, 748.959 2025.88, 748.958 2029.73, 748 2032.55, 747.298 2037.73, 746 2040.08, 745.405 2041.91, 744.8	

	2060.85, 738.545
	2075.51, 733.686
	2122.09, 718.246
	2127.47, 716.441
	2149.16, 709.179
	2175.38, 700.392
	2176.55, 700
	2195.21, 693.791
	2195.27, 693.772
	2195.49, 693.776
	2195.5, 693.776
	2195.59, 693.778
	2208.3, 694
	2235.83, 694.482
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	2295.76, 695.531
	2313.04, 695.833
	2322.59, 696
	2366.91, 696.776
	2387.58, 696.422
	2475.13, 694.921
	2521.93, 694.112
	2580.01, 695.119
	2599.02, 695.449
	2655.66, 696.431
	2676.93, 696.8
	2698.12, 696.433
	2756.78, 695.419
	2775.37, 695.097
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	3026.7, 696.119
	3084.07, 695.126
	3141.93, 694.125
	3160.86, 694.454
	3218.92, 695.461
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	3296.93, 696.814
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	3373.9, 695.482
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	3472.59, 694.49
	3501.92, 694.999
	3532.41, 695.598
	3555.9, 696.059
	3592.57, 696.784
	3608.3, 697.095
	3613.84, 697.204
	3660.7, 696.618
	3690.91, 696.239
	3711.25, 695.984
	3731.91, 695.696

	3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273
Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156

	555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851	

	1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858	
Material Boundary		

	1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253	

	2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054 3660.7, 695.468 3690.86, 695.09 3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228	

	3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697

	577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703	

Material Boundary	1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426

	1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581	Assigned to: Wadsworth Till

	731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352		

Water Table	1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112		

	2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899		

	4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054		
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679		

	629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568		

Drawdown Line	983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871	

	1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669		

	4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773		

	4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	560.534, 701.359	
	567.615, 699	
	570.071, 698.182	
	573.623, 697	
	577.692, 695.645	
	579.631, 695	
	583.706, 693.643	
	583.706, 693.643	
	585.639, 693	
	594.551, 690.033	
	597.655, 689	
	599.571, 688.362	
	603.662, 687	
	608.129, 685.513	
	609.67, 685	
	618.233, 685	
	628.127, 685.241	
	628.175, 685.242	
	700.514, 687	
	768.454, 688.654	
	835.534, 687	
	874.622, 687	
	885.02, 687	
	885.837, 687	
	914.501, 685.056	
	914.512, 685.056	
	916.783, 685	
	918.713, 684.952	
	920.67, 685	
	922.861, 685.058	
	931.35, 685.433	
	933.943, 685.923	
	944.266, 687	
	947.065, 687.849	
	951.886, 689	
	965.137, 692.608	
	966.644, 693	
	967.06, 693.116	
	971.617, 694.286	
	974.456, 694.923	
	974.842, 695	
	982.543, 696.691	
	984.141, 697	
	990.827, 698.433	
	993.853, 699	
	1011.96, 702.672	
	1013.62, 703	
	1014.48, 703.184	
	1029.03, 705	
	1036.48, 706.144	
	1049.43, 707	
	1054.51, 707.425	
	1060.93, 707.795	
	1067.29, 707.858	
	1069.81, 707.862	
	1084.55, 707	
	1094.3, 706.515	
	1105.9, 705	
	1109.31, 704.655	

Piezoline	1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701		

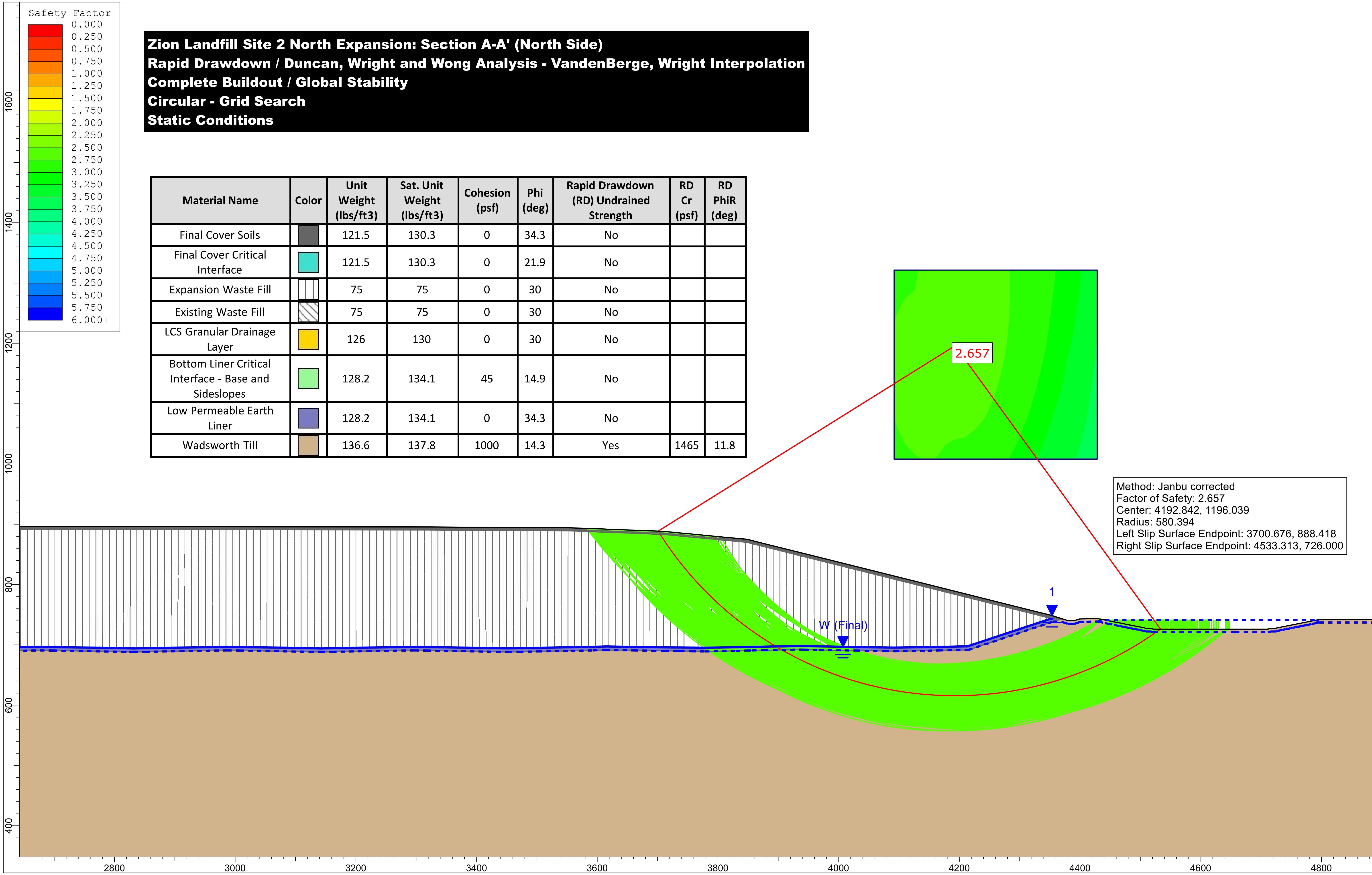
	1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402		

	2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204		

	3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	
Focus Search Window	4434.16, 720.98 4762.52, 720.98 4762.52, 752 4434.16, 742.558	

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Duncan, Wright and Wong Analysis - VandenBerge, Wright Interpolation
Complete Buildout / Global Stability
Circular - Grid Search
Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8



Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:47.141s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Duncan, Wright, Wong 3 Stage (1990)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.764060
Center:	4209.664, 1321.306
Radius:	696.993
Left Slip Surface Endpoint:	3662.194, 889.941
Right Slip Surface Endpoint:	4572.168, 726.000
Resisting Moment:	2.57999e+09 lb-ft
Driving Moment:	9.33404e+08 lb-ft
Total Slice Area:	112586 ft2
Surface Horizontal Width:	909.974 ft
Surface Average Height:	123.724 ft

Method: janbu corrected

FS	2.657280
Center:	4192.842, 1196.039
Radius:	580.394
Left Slip Surface Endpoint:	3700.676, 888.418
Right Slip Surface Endpoint:	4533.313, 726.000
Resisting Horizontal Force:	3.42358e+06 lb
Driving Horizontal Force:	1.28838e+06 lb
Total Slice Area:	109554 ft2
Surface Horizontal Width:	832.637 ft
Surface Average Height:	131.574 ft

Method: spencer

FS	2.735100
Center:	4226.486, 1321.306
Radius:	689.917
Left Slip Surface Endpoint:	3688.902, 888.884
Right Slip Surface Endpoint:	4575.192, 726.000
Resisting Moment:	2.35855e+09 lb-ft
Driving Moment:	8.62326e+08 lb-ft
Resisting Horizontal Force:	3.14768e+06 lb
Driving Horizontal Force:	1.15085e+06 lb
Total Slice Area:	102836 ft2
Surface Horizontal Width:	886.29 ft
Surface Average Height:	116.029 ft

Method: gle/morgenstern-price

FS	2.731910
Center:	4226.486, 1321.306
Radius:	689.917
Left Slip Surface Endpoint:	3688.902, 888.884
Right Slip Surface Endpoint:	4575.192, 726.000
Resisting Moment:	2.3558e+09 lb-ft
Driving Moment:	8.62326e+08 lb-ft
Resisting Horizontal Force:	3.14725e+06 lb
Driving Horizontal Force:	1.15203e+06 lb
Total Slice Area:	102836 ft2
Surface Horizontal Width:	886.29 ft
Surface Average Height:	116.029 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4830
Number of Invalid Surfaces:	21

Error Codes
Error Code -110 reported for 17 surfaces
Error Code -118 reported for 4 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4829
Number of Invalid Surfaces:	22

Error Codes
Error Code -110 reported for 17 surfaces
Error Code -118 reported for 4 surfaces
Error Code -200 reported for 1 surface

Method: spencer

Number of Valid Surfaces:	4829
Number of Invalid Surfaces:	22

Error Codes

Error Code -110 reported for 17 surfaces
Error Code -118 reported for 4 surfaces
Error Code -200 reported for 1 surface

Method: gle/morgenstern-price

Number of Valid Surfaces:	4828
Number of Invalid Surfaces:	23

Error Codes

Error Code -108 reported for 1 surface
Error Code -110 reported for 17 surfaces
Error Code -118 reported for 4 surfaces
Error Code -200 reported for 1 surface

Error Code Descriptions

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).

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-118 = Surface does not pass through the search focus

-200 = Factor of Safety <= min iteration value. Could mean 0 Normal/Shear resistance along part of the slip surface

Entity Information

DWW - Van

Shared Entities

Type	Coordinates (x,y)
	4805.95, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732

	4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4456.92, 738 4451.39, 739.111 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343	

	3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975	

External Boundary	1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851	

	959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851	

	754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851

	538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054
	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106

	426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654 835.534, 686 874.622, 686 885.02, 686	

	885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692 1495.01, 692	

Material Boundary	1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714

	1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813	

	2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896
	425.234, 740.088

	425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681

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Material Boundary	1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426

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Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
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Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

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	895.862, 857.526
	898.101, 858.086
	904.848, 859.773

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581	Assigned to: Wadsworth Till

	731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352		

Water Table	1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112		

	2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899		

	4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054	
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679	

	629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568		

Drawdown Line	983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871		

	1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669		

	4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773		

	4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655		

Piezoline	1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701		

	1911.78, 701.431		
	1911.83, 701.431		
	1916.54, 703		
	1917.78, 703.43		
	1917.83, 703.429		
	1922.54, 705		
	1923.77, 705.428		
	1923.82, 705.428		
	1928.54, 707		
	1929.77, 707.426		
	1929.82, 707.426		
	1934.54, 709		
	1935.76, 709.425		
	1935.82, 709.425		
	1940.54, 711		
	1941.76, 711.423		
	1941.81, 711.423		
	1946.54, 713		
	1947.76, 713.422		
	1947.81, 713.422		
	1952.54, 715		
	1953.76, 715.42		
	1953.8, 715.42		
	1958.54, 717		
	1959.76, 717.419		
	1959.8, 717.419		
	1964.54, 719		
	1965.76, 719.417		
	1965.79, 719.417		
	1970.54, 721		
	1971.76, 721.416		
	1971.79, 721.416		
	1976.54, 723		
	1977.76, 723.414		
	1977.79, 723.414		
	1982.54, 725		
	1987.31, 726.589		
	1988.52, 727		
	1988.54, 727		
	1993.32, 728.59		
	1994.52, 729		
	1994.54, 729		
	1995.75, 729.41		
	1995.77, 729.41		
	2000.55, 731		
	2001.74, 731.408		
	2001.77, 731.408		
	2006.55, 733		
	2007.74, 733.406		
	2007.77, 733.406		
	2012.55, 735		
	2013.73, 735.405		
	2013.76, 735.405		
	2018.55, 737		
	2019.73, 737.403		
	2019.76, 737.403		
	2024.55, 739		
	2025.72, 739.402		
	2025.75, 739.402		

	2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204		

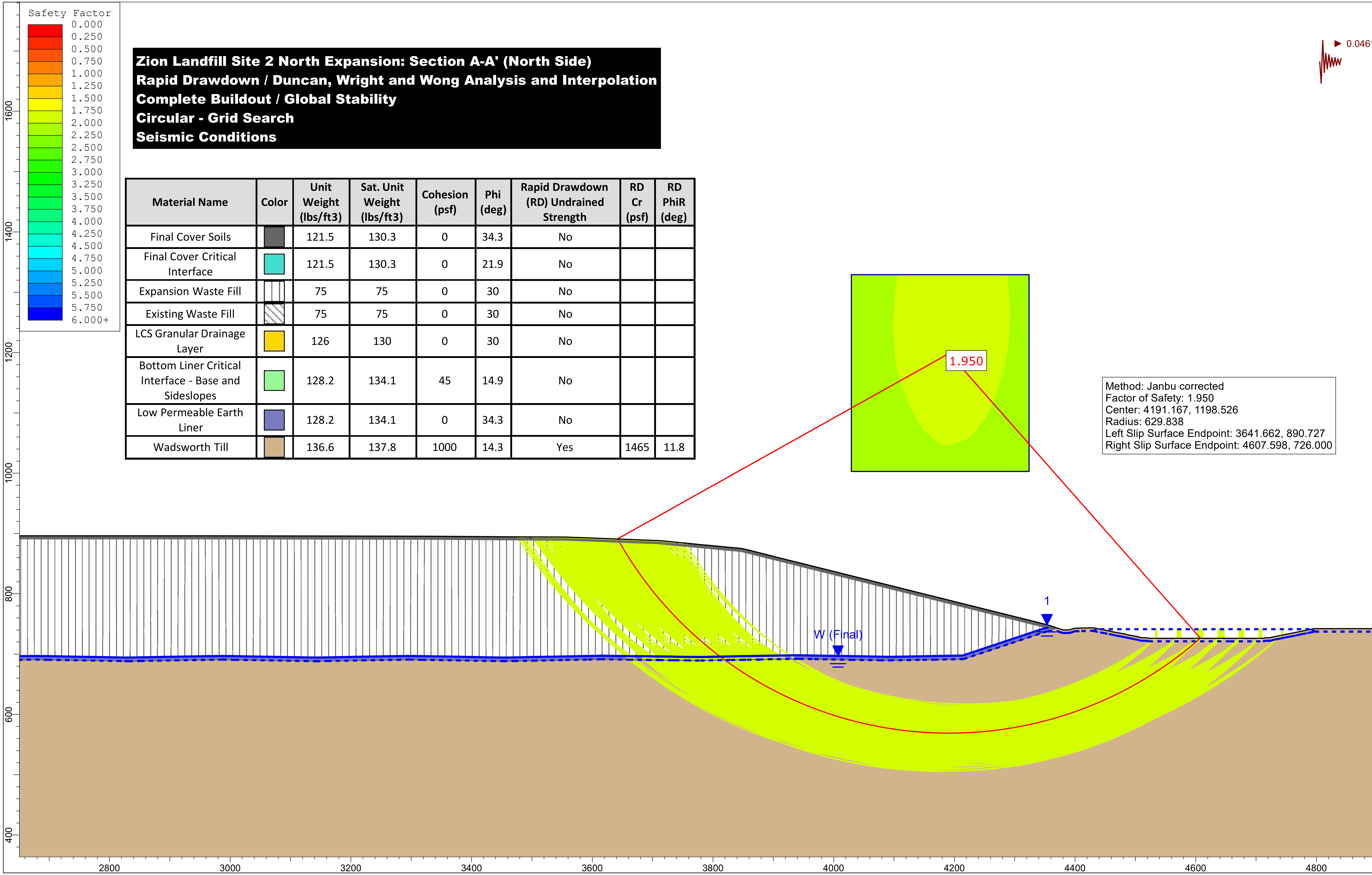
	3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	
Focus Search Window	4434.16, 724.122 4762.52, 724.122 4762.52, 752 4434.16, 742.558	

SLOPE STABILITY

SECTION **A-A**' – HORIZONTAL EXPANSION

RAPID DRAWDOWN GLOBAL STABILITY
DUNCAN, WRIGHT AND WONG ANALYSIS
DUNCAN, WRIGHT AND WONG INTERPOLATION

COMPLETE BUILDOUT LANDFORM
CIRCULAR ANALYSIS
(ROTATIONAL SLOPE FAILURE)



Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Duncan, Wright and Wong Analysis and Interpolation
Complete Buildout / Global Stability
Circular - Grid Search
Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:56.107s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Duncan, Wright, Wong 3 Stage (1990)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb

Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1

Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.031810
Center:	4220.618, 1329.029
Radius:	737.196
Left Slip Surface Endpoint:	3627.471, 891.268
Right Slip Surface Endpoint:	4644.663, 726.000
Resisting Moment:	3.29535e+09 lb-ft
Driving Moment:	1.62188e+09 lb-ft
Total Slice Area:	147681 ft2
Surface Horizontal Width:	1017.19 ft
Surface Average Height:	145.185 ft

Method: janbu corrected

FS	1.950050
Center:	4191.167, 1198.526
Radius:	629.838
Left Slip Surface Endpoint:	3641.662, 890.727
Right Slip Surface Endpoint:	4607.598, 726.000
Resisting Horizontal Force:	4.52006e+06 lb
Driving Horizontal Force:	2.31791e+06 lb
Total Slice Area:	159979 ft2
Surface Horizontal Width:	965.935 ft
Surface Average Height:	165.621 ft

Method: spencer

FS	2.016870
Center:	4220.618, 1329.029
Radius:	737.196
Left Slip Surface Endpoint:	3627.471, 891.268
Right Slip Surface Endpoint:	4644.663, 726.000
Resisting Moment:	3.27112e+09 lb-ft
Driving Moment:	1.62188e+09 lb-ft
Resisting Horizontal Force:	4.0602e+06 lb
Driving Horizontal Force:	2.01312e+06 lb
Total Slice Area:	147681 ft2
Surface Horizontal Width:	1017.19 ft
Surface Average Height:	145.185 ft

Method: gle/morgenstern-price

FS	2.017470
Center:	4205.893, 1329.029
Radius:	745.208
Left Slip Surface Endpoint:	3602.115, 892.236
Right Slip Surface Endpoint:	4643.719, 726.000
Resisting Moment:	3.51257e+09 lb-ft
Driving Moment:	1.74108e+09 lb-ft
Resisting Horizontal Force:	4.31346e+06 lb
Driving Horizontal Force:	2.13806e+06 lb
Total Slice Area:	159369 ft2
Surface Horizontal Width:	1041.6 ft
Surface Average Height:	153.004 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4829
Number of Invalid Surfaces:	22

Error Codes

Error Code -103 reported for 22 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4829
Number of Invalid Surfaces:	22

Error Codes

Error Code -103 reported for 22 surfaces

Method: spencer

Number of Valid Surfaces:	4829
Number of Invalid Surfaces:	22

Error Codes

Error Code -103 reported for 22 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4829
Number of Invalid Surfaces:	22

Error Codes
Error Code -103 reported for 22 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

Entity Information

DWW - DWW

Shared Entities

Type	Coordinates (x,y)
	4806.09, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4456.94, 738 4456.94, 738 4451.39, 739.111 4447.57, 739.873 4442.27, 740.935

	4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354	

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1446.76, 898.853
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1429.15, 903.217
1429.15, 903.218
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1414.48, 906.853
1406.62, 908.801
1406.4, 908.853
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1398.33, 910.853
1390.3, 912.844
1390.26, 912.853
1390.12, 912.889
1390.12, 912.889
1386.77, 913.717
1380.94, 914.966
1373.16, 915.464
1354.04, 916.986
1349.5, 917.317
1340.81, 917.854
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1244.03, 925
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1223.74, 925
1219.79, 925
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1200.98, 923.615
1197.39, 923.302
1194.12, 922.975
1192.25, 922.788
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1110.01, 914.002
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1104.42, 912.604
1097.41, 910.851
1096.34, 910.584
1089.41, 908.851

External Boundary	1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208	

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Material Boundary	1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724

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Material Boundary	1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431 1912.81, 695.431 1918.47, 697.32 1918.79, 697.429 1918.8, 697.429 1924.47, 699.32 1924.78, 699.428 1924.8, 699.428 1930.47, 701.32 1930.78, 701.426 1930.79, 701.426 1936.47, 703.32 1936.78, 703.425 1936.79, 703.425 1942.47, 705.32 1942.77, 705.423 1942.78, 705.423 1948.47, 707.319 1948.77, 707.422 1948.78, 707.422 1954.47, 709.318 1954.77, 709.42 1954.78, 709.42 1960.47, 711.317 1960.76, 711.419 1960.77, 711.419 1966.47, 713.316 1966.76, 713.417 1966.77, 713.417 1972.46, 715.315 1972.76, 715.416 1972.76, 715.416 1978.46, 717.315 1978.75, 717.414 1978.76, 717.414 1984.44, 719.308 1989.23, 720.903

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Material Boundary	1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773	

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Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
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Material Boundary	

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Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
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Material Boundary	973.979, 876.901	
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	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738 4461.97, 736.994

Material Boundary	4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602	Assigned to: Wadsworth Till

	608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32		

Water Table	970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679		

	1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516		

	4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054	
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013	

	366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291		

	929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687		
Drawdown Line			

Drawdown Line	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624		

	3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721		

	4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054	
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

	515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703		

	1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439		

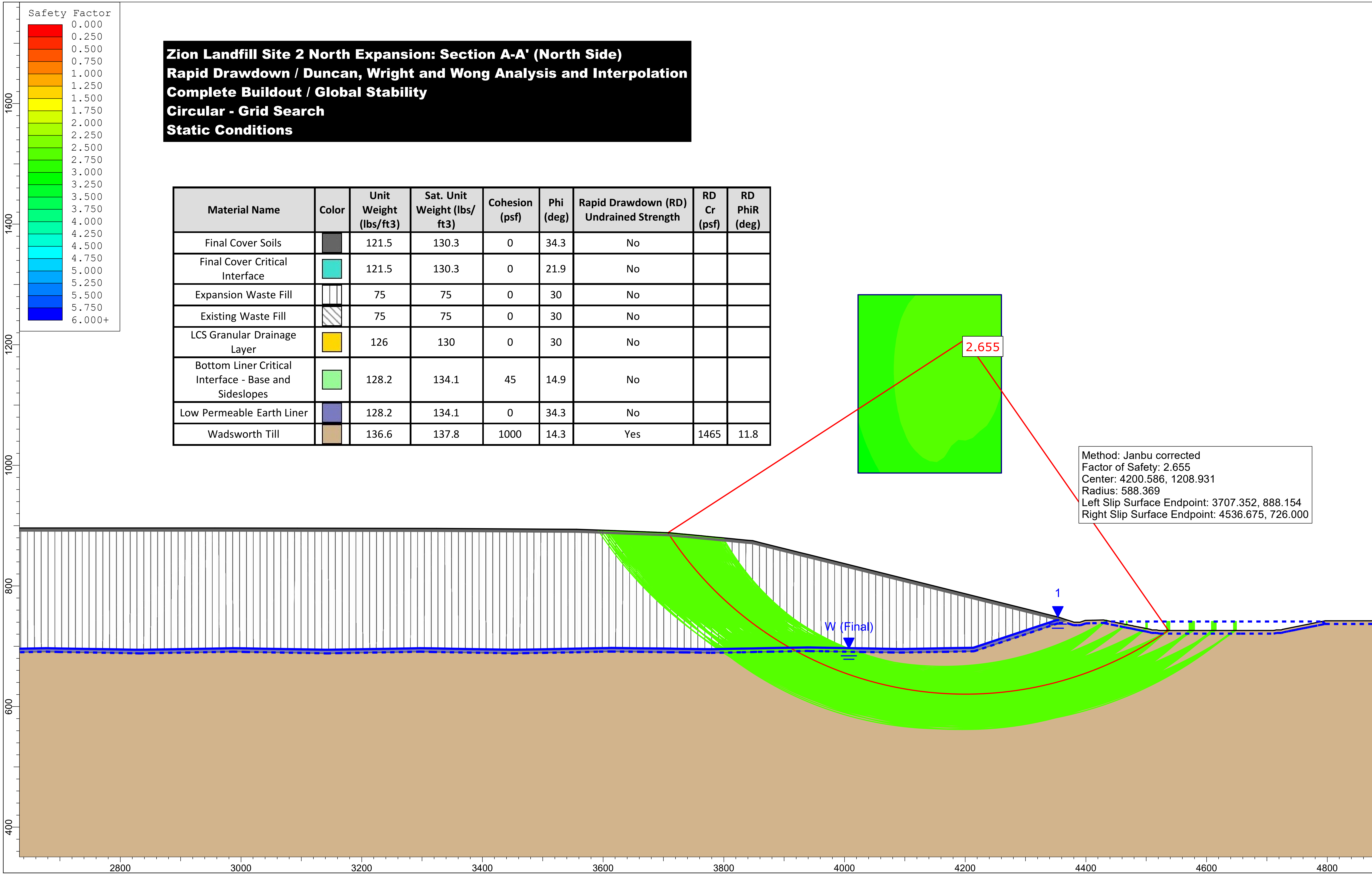
Piezoline	1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408		

	2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453	

	3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	
Focus Search Window	4434.16, 723.545 4762.52, 723.545 4762.52, 752 4434.16, 742.558	

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Duncan, Wright and Wong Analysis and Interpolation
Complete Buildout / Global Stability
Circular - Grid Search
Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8



A-A_final_north_LT.slmd

APTIM

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:50.57s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Duncan, Wright, Wong 3 Stage (1990)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.769340
Center:	4200.586, 1282.848
Radius:	650.412
Left Slip Surface Endpoint:	3682.884, 889.122
Right Slip Surface Endpoint:	4536.676, 726.000
Resisting Moment:	2.22357e+09 lb-ft
Driving Moment:	8.02925e+08 lb-ft
Total Slice Area:	101740 ft2
Surface Horizontal Width:	853.792 ft
Surface Average Height:	119.162 ft

Method: janbu corrected

FS	2.655280
Center:	4200.586, 1208.931
Radius:	588.369
Left Slip Surface Endpoint:	3707.352, 888.154
Right Slip Surface Endpoint:	4536.675, 726.000
Resisting Horizontal Force:	3.32984e+06 lb
Driving Horizontal Force:	1.25404e+06 lb
Total Slice Area:	105188 ft2
Surface Horizontal Width:	829.324 ft
Surface Average Height:	126.836 ft

Method: spencer

FS	2.738080
Center:	4200.586, 1282.848
Radius:	650.412
Left Slip Surface Endpoint:	3682.884, 889.122
Right Slip Surface Endpoint:	4536.676, 726.000
Resisting Moment:	2.19847e+09 lb-ft
Driving Moment:	8.02925e+08 lb-ft
Resisting Horizontal Force:	3.09967e+06 lb
Driving Horizontal Force:	1.13206e+06 lb
Total Slice Area:	101740 ft2
Surface Horizontal Width:	853.792 ft
Surface Average Height:	119.162 ft

Method: gle/morgenstern-price

FS	2.737540
Center:	4212.455, 1282.848
Radius:	644.682
Left Slip Surface Endpoint:	3702.572, 888.343
Right Slip Surface Endpoint:	4537.316, 726.000
Resisting Moment:	2.05877e+09 lb-ft
Driving Moment:	7.52051e+08 lb-ft
Resisting Horizontal Force:	2.93527e+06 lb
Driving Horizontal Force:	1.07223e+06 lb
Total Slice Area:	94434.3 ft2
Surface Horizontal Width:	834.744 ft
Surface Average Height:	113.13 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4782
Number of Invalid Surfaces:	69

Error Codes
Error Code -103 reported for 69 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4772
Number of Invalid Surfaces:	79

Error Codes
Error Code -103 reported for 69 surfaces
Error Code -108 reported for 7 surfaces
Error Code -200 reported for 3 surfaces

Method: spencer

Number of Valid Surfaces:	4770
Number of Invalid Surfaces:	81
Error Codes	
Error Code -103 reported for 69 surfaces	
Error Code -108 reported for 9 surfaces	
Error Code -200 reported for 3 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	4773
Number of Invalid Surfaces:	78
Error Codes	
Error Code -103 reported for 69 surfaces	
Error Code -108 reported for 6 surfaces	
Error Code -200 reported for 3 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-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).

-200 = Factor of Safety <= min iteration value. Could mean 0 Normal/Shear resistance along part of the slip surface

Entity Information

DWW - DWW

Shared Entities

Type	Coordinates (x,y)
	4806.09, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4484.34, 732.521

	4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4456.94, 738 4456.94, 738 4451.39, 739.111 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208	

3324.04, 895.343
3093.34, 895.755
2956.54, 896
2486.56, 896
2475.13, 896
2234.57, 896
2195.59, 896
2181.65, 896
2141.81, 896
2127.47, 896
1858.87, 896
1616.33, 896
1495.01, 896
1458.28, 896
1456.86, 896.353
1456.85, 896.354
1454.84, 896.853
1447.37, 898.703
1446.76, 898.853
1439.22, 900.721
1438.69, 900.853
1431.08, 902.74
1430.62, 902.853
1429.15, 903.217
1429.15, 903.218
1422.55, 904.853
1415.47, 906.607
1415.47, 906.607
1414.48, 906.853
1406.62, 908.801
1406.4, 908.853
1398.46, 910.822
1398.33, 910.853
1390.3, 912.844
1390.26, 912.853
1390.12, 912.889
1390.12, 912.889
1386.77, 913.717
1380.94, 914.966
1373.16, 915.464
1354.04, 916.986
1349.5, 917.317
1340.81, 917.854
1326.59, 918.986
1314.16, 919.891
1308.46, 920.243
1299.13, 920.986
1278.82, 922.465
1276.11, 922.633
1271.72, 922.983
1264.11, 923.65
1247.79, 925
1244.03, 925
1239.2, 925
1223.74, 925
1219.79, 925
1211.96, 924.561
1200.98, 923.615
1197.39, 923.302

External Boundary	1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554	

	961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047	

	761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665	

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	885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692	

Material Boundary	1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422

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Material Boundary

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	898.622, 856	

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951.413, 869.198
952.09, 869.367
954.622, 870
959.165, 871.136
960.758, 871.534
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1003.09, 882.116
1003.45, 882.208
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1016.85, 885.557
1018.62, 886
1024.91, 887.573
1026.62, 888
1032.44, 889.455
1032.46, 889.459
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1036.95, 890.581
1036.96, 890.585
1042.62, 892
1044.19, 892.392
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	1071.97, 899.337 1074.62, 900 1077.51, 900.722 1077.53, 900.726 1082.62, 902 1089.48, 903.714 1090.62, 904 1097.56, 905.733 1098.62, 906 1105.63, 907.753 1106.62, 908 1111.23, 909.151 1111.24, 909.155 1114.62, 910 1132.01, 911.739 1134.62, 912 1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898	

Material Boundary	1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135	

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Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157

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Material Boundary	1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284

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	2019.78, 736.253	
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	2025.78, 738.252	
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	2195.59, 692.628	
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	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699

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Material Boundary	1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707	

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Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721
	714.148, 811.94
	715.036, 812.162
	715.044, 812.164
	722.148, 813.94
	726.812, 815.109
	730.137, 815.94
	734.845, 817.117
	738.137, 817.94
	742.878, 819.125
	746.137, 819.94
	753.204, 821.707
	753.211, 821.709
	754.137, 821.94
	755.071, 822.174
	755.079, 822.176
	762.137, 823.94
	766.923, 825.137
	770.137, 825.94
	777.722, 827.837
	777.725, 827.837
	778.137, 827.94
	778.797, 828.105
	786.137, 829.94
	793.153, 831.694
	793.161, 831.696
	794.137, 831.94
	795.126, 832.187
	802.137, 833.94
	808.474, 835.525
	810.137, 835.94
	811.847, 836.368
	818.137, 837.94
	819.879, 838.376
	826.137, 839.94
	833.077, 841.675
	834.137, 841.94
	835.239, 842.216
	842.137, 843.94
	849.204, 845.707
	850.137, 845.94
	851.109, 846.183
	858.137, 847.94
	859.153, 848.194
	866.137, 849.94
	867.198, 850.205
	874.137, 851.94
	881.031, 853.664
	882.137, 853.94
	883.293, 854.229
	884.182, 854.452
	890.137, 855.94
	895.898, 857.381
	898.137, 857.94
	904.884, 859.627
	906.137, 859.94
	912.782, 861.602
	914.137, 861.94
	915.557, 862.295

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

466.102, 750.086
473.419, 751.912
474.113, 752.086
474.811, 752.26
482.112, 754.086
486.617, 755.213
490.077, 756.086
493.601, 756.959
498.102, 758.085
501.607, 758.968
506.077, 760.086
513.383, 761.907
514.104, 762.086
514.812, 762.264
522.084, 764.086
525.707, 764.991
530.085, 766.086
538.079, 768.081
538.353, 768.15
538.357, 768.15
546.101, 770.086
553.36, 771.901
554.096, 772.086
554.833, 772.27
562.083, 774.086
565.979, 775.06
570.084, 776.086
574.006, 777.066
578.084, 778.086
582.033, 779.073
586.085, 780.086
593.341, 781.898
594.104, 782.086
594.853, 782.275
602.111, 784.086
606.157, 785.097
610.11, 786.086
614.194, 787.107
618.11, 788.086
622.223, 789.116
626.101, 790.086
633.31, 791.888
634.101, 792.086
634.901, 792.286
642.101, 794.086
645.858, 795.025
650.112, 796.086
654.377, 797.152
658.111, 798.086
662.404, 799.162
666.101, 800.086
673.276, 801.878
674.112, 802.086
674.953, 802.296
674.961, 802.298
682.111, 804.086
685.598, 804.957
690.111, 806.086
693.564, 806.949

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738 4461.97, 736.994

Material Boundary	4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602	Assigned to: Wadsworth Till

	608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32		

Water Table	970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679		

	1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516		

	4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054		
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013		

	366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291		

	929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687		
Drawdown Line			

Drawdown Line	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624		

	3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721		

	4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054	
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

	515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703		

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Focus Search Window	4434.16, 721.047 4762.52, 721.047 4762.52, 752 4434.16, 742.558	

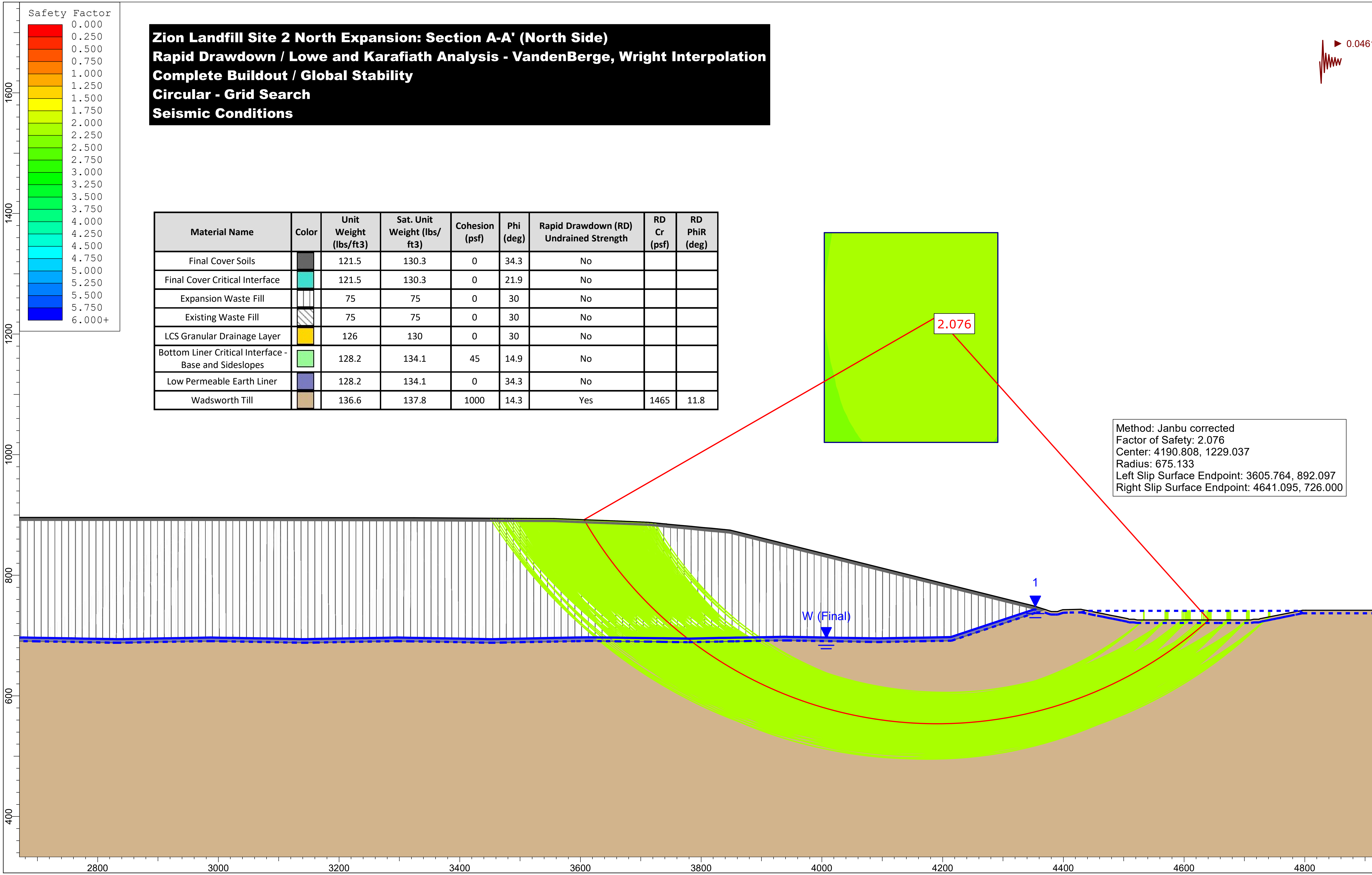
SLOPE STABILITY
SECTION **A-A**' – HORIZONTAL EXPANSION

RAPID DRAWDOWN GLOBAL STABILITY
LOWE AND KARAFIATH ANALYSIS
VANDENBERGE, WRIGHT INTERPOLATION

COMPLETE BUILDOUT LANDFORM
CIRCULAR ANALYSIS
(ROTATIONAL SLOPE FAILURE)

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Lowe and Karafiath Analysis - VandenBerge, Wright Interpolation
Complete Buildout / Global Stability
Circular - Grid Search
Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8



Method: Janbu corrected
Factor of Safety: 2.076
Center: 4190.808, 1229.037
Radius: 675.133
Left Slip Surface Endpoint: 3605.764, 892.097
Right Slip Surface Endpoint: 4641.095, 726.000

A-A_final_north_LT.slmd

APTIM

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:56.819s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Lowe and Karafiath (1960)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb

Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1

Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	**2.172020**
Center:	4205.188, 1368.202
Radius:	795.952
Left Slip Surface Endpoint:	3566.205, 893.607
Right Slip Surface Endpoint:	4675.419, 726.000
Resisting Moment:	4.44557e+09 lb-ft
Driving Moment:	2.04674e+09 lb-ft
Total Slice Area:	179145 ft2
Surface Horizontal Width:	1109.21 ft
Surface Average Height:	161.506 ft

Method: janbu corrected

FS	**2.076110**
Center:	4190.808, 1229.037
Radius:	675.133
Left Slip Surface Endpoint:	3605.764, 892.097
Right Slip Surface Endpoint:	4641.095, 726.000
Resisting Horizontal Force:	5.39345e+06 lb
Driving Horizontal Force:	2.59786e+06 lb
Total Slice Area:	182626 ft2
Surface Horizontal Width:	1035.33 ft
Surface Average Height:	176.394 ft

Method: spencer

FS	2.154950
Center:	4205.188, 1368.202
Radius:	777.420
Left Slip Surface Endpoint:	3590.149, 892.693
Right Slip Surface Endpoint:	4643.319, 726.000
Resisting Moment:	3.87576e+09 lb-ft
Driving Moment:	1.79854e+09 lb-ft
Resisting Horizontal Force:	4.58945e+06 lb
Driving Horizontal Force:	2.12973e+06 lb
Total Slice Area:	156252 ft2
Surface Horizontal Width:	1053.17 ft
Surface Average Height:	148.363 ft

Method: gle/morgenstern-price

FS	2.156370
Center:	4205.188, 1368.202
Radius:	777.420
Left Slip Surface Endpoint:	3590.149, 892.693
Right Slip Surface Endpoint:	4643.319, 726.000
Resisting Moment:	3.87831e+09 lb-ft
Driving Moment:	1.79854e+09 lb-ft
Resisting Horizontal Force:	4.59425e+06 lb
Driving Horizontal Force:	2.13055e+06 lb
Total Slice Area:	156252 ft2
Surface Horizontal Width:	1053.17 ft
Surface Average Height:	148.363 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4836
Number of Invalid Surfaces:	15

Error Codes

Error Code -103 reported for 15 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4836
Number of Invalid Surfaces:	15

Error Codes

Error Code -103 reported for 15 surfaces

Method: spencer

Number of Valid Surfaces:	4836
Number of Invalid Surfaces:	15

Error Codes

Error Code -103 reported for 15 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4836
Number of Invalid Surfaces:	15

Error Codes
Error Code -103 reported for 15 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

Entity Information

L&K - Van

Shared Entities

Type	Coordinates (x,y)
	4801.65, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4461.43, 737.102 4456.94, 738 4456.94, 738 4451.39, 739.111

	4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896	

	1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851	

External Boundary	1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366	

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Material Boundary	1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414

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	478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206

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Material Boundary	1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431 1912.81, 695.431 1918.47, 697.32 1918.79, 697.429 1918.8, 697.429 1924.47, 699.32 1924.78, 699.428 1924.8, 699.428 1930.47, 701.32 1930.78, 701.426 1930.79, 701.426 1936.47, 703.32 1936.78, 703.425 1936.79, 703.425 1942.47, 705.32 1942.77, 705.423 1942.78, 705.423 1948.47, 707.319 1948.77, 707.422 1948.78, 707.422 1954.47, 709.318 1954.77, 709.42 1954.78, 709.42 1960.47, 711.317 1960.76, 711.419 1960.77, 711.419 1966.47, 713.316 1966.76, 713.417 1966.77, 713.417 1972.46, 715.315 1972.76, 715.416 1972.76, 715.416 1978.46, 717.315 1978.75, 717.414 1978.76, 717.414	

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	2014.73, 729.405
	2020.46, 731.315
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	2026.73, 733.402
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	2127.47, 709.948
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	2206.66, 687.971
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	3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4368.61, 742.832 4369.04, 742.975
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	1024.91, 887.573
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	1036.95, 890.581
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	1042.62, 892
	1044.19, 892.392
	1050.62, 894
	1052.12, 894.375
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	1071.97, 899.337
	1074.62, 900
	1077.51, 900.722
	1077.53, 900.726
	1082.62, 902
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	1106.62, 908
	1111.23, 909.151
	1111.24, 909.155
	1114.62, 910

Material Boundary	1132.01, 911.739 1134.62, 912 1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793

	1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393	

	1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577	

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Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858

	599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44	

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	4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685

	628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697
Material Boundary	1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821

	1247.58, 692.53
	1274.37, 693
	1354.83, 694.411
	1380.25, 693.892
	1449.64, 693
	1461.71, 693
	1495.01, 693
	1500.48, 693
	1516.31, 692.277
	1637.28, 691
	1692.86, 691
	1719.06, 690.137
	1781.17, 689.396
	1807.13, 689
	1816.05, 689
	1826.74, 689
	1846.47, 688.169
	1868.81, 687.228
	1874.47, 689
	1874.47, 689
	1875.79, 689.44
	1880.49, 691
	1880.54, 691
	1881.86, 691.439
	1886.54, 693
	1891.23, 694.563
	1892.54, 695
	1893.8, 695.436
	1893.84, 695.436
	1898.54, 697
	1899.79, 697.434
	1899.84, 697.434
	1904.54, 699
	1905.79, 699.433
	1905.84, 699.433
	1910.54, 701
	1911.78, 701.431
	1911.83, 701.431
	1916.54, 703
	1917.78, 703.43
	1917.83, 703.429
	1922.54, 705
	1923.77, 705.428
	1923.82, 705.428
	1928.54, 707
	1929.77, 707.426
	1929.82, 707.426
	1934.54, 709
	1935.76, 709.425
	1935.82, 709.425
	1940.54, 711
	1941.76, 711.423
	1941.81, 711.423
	1946.54, 713
	1947.76, 713.422
	1947.81, 713.422
	1952.54, 715
	1953.76, 715.42
	1953.8, 715.42

	1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738 4461.97, 736.994

Material Boundary	4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602	Assigned to: Wadsworth Till

	608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32		

Water Table	970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679		

	1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516		

	4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054	
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013	

	366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291		

	929.213, 679.332		
	930.561, 679.392		
	932.042, 679.457		
	934.813, 679.981		
	940.841, 680.61		
	945.459, 681.092		
	948.634, 682.055		
	953.372, 683.186		
	964.682, 686.266		
	968.611, 687.32		
	970.51, 687.807		
	973.537, 688.568		
	983.137, 690.678		
	992.201, 692.586		
	995.001, 693.111		
	1005.88, 695.316		
	1015.48, 697.262		
	1026.16, 698.595		
	1029.95, 699.071		
	1037.13, 700.174		
	1049.53, 700.993		
	1053.89, 701.352		
	1060.67, 701.77		
	1068.84, 701.86		
	1069.64, 701.862		
	1072.74, 701.68		
	1077.4, 701.408		
	1085.39, 700.951		
	1093.76, 700.535		
	1103.93, 699.206		
	1105.21, 699.039		
	1108.51, 698.705		
	1108.62, 698.694		
	1115.88, 697.749		
	1119.27, 697.117		
	1126.35, 695.778		
	1134.85, 694.035		
	1143.12, 692.32		
	1144.75, 691.993		
	1145.42, 691.857		
	1146.43, 691.649		
	1147.98, 691.316		
	1148.3, 691.248		
	1149.18, 691.068		
	1151.08, 690.719		
	1156.36, 689.409		
	1157.27, 689.184		
	1163.63, 687.532		
	1180.77, 687.159		
	1199.14, 687		
	1219.87, 686.821		
	1247.6, 686.53		
	1274.47, 687.001		
	1354.82, 688.409		
	1380.15, 687.893		
	1449.6, 687		
	1461.71, 687		
	1495.01, 687		
Drawdown Line	1500.34, 687		

Drawdown Line	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624		

	3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721		

	4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

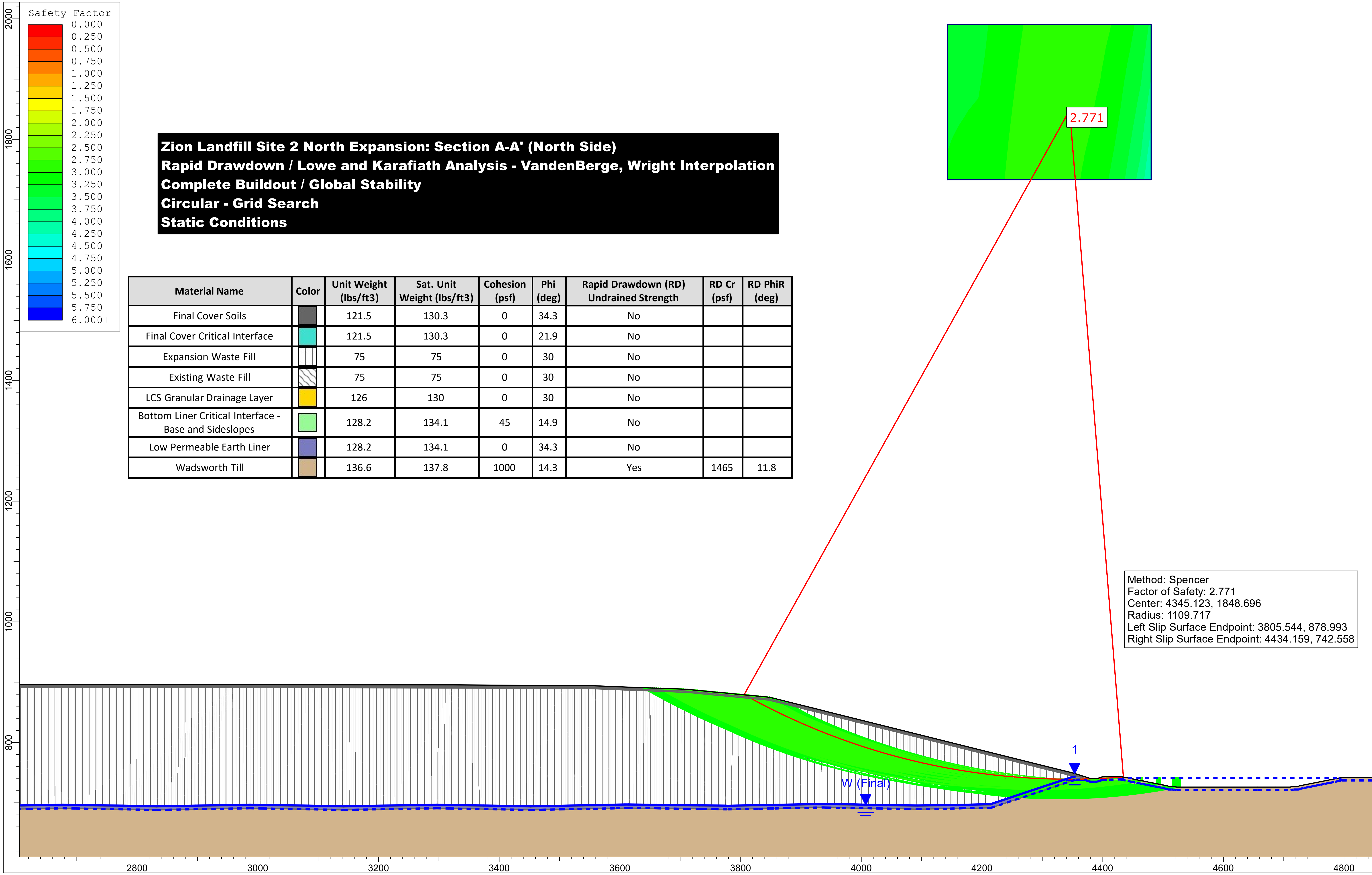
	515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703		

	1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439		

Piezoline	1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408		

	2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453		

	3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	
Focus Search Window	4434.16, 742.558 4434.16, 724.371 4762.52, 724.371 4762.52, 752	



Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Lowe and Karafiath Analysis - VandenBerge, Wright Interpolation
Complete Buildout / Global Stability
Circular - Grid Search
Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8

Method: Spencer
Factor of Safety: 2.771
Center: 4345.123, 1848.696
Radius: 1109.717
Left Slip Surface Endpoint: 3805.544, 878.993
Right Slip Surface Endpoint: 4434.159, 742.558

A-A_final_north_LT.slmd

APTIM

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:52.346s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Lowe and Karafiath (1960)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.782260
Center:	4345.123, 1848.696
Radius:	1109.717
Left Slip Surface Endpoint:	3805.544, 878.993
Right Slip Surface Endpoint:	4434.159, 742.558
Resisting Moment:	1.08473e+09 lb-ft
Driving Moment:	3.89873e+08 lb-ft
Total Slice Area:	18354.6 ft2
Surface Horizontal Width:	628.615 ft
Surface Average Height:	29.1985 ft

Method: janbu corrected

FS	2.814670
Center:	4345.123, 1848.696
Radius:	1109.717
Left Slip Surface Endpoint:	3805.544, 878.993
Right Slip Surface Endpoint:	4434.159, 742.558
Resisting Horizontal Force:	977161 lb
Driving Horizontal Force:	347167 lb
Total Slice Area:	18354.6 ft2
Surface Horizontal Width:	628.615 ft
Surface Average Height:	29.1985 ft

Method: spencer

FS	2.771350
Center:	4345.123, 1848.696
Radius:	1109.717
Left Slip Surface Endpoint:	3805.544, 878.993
Right Slip Surface Endpoint:	4434.159, 742.558
Resisting Moment:	1.08048e+09 lb-ft
Driving Moment:	3.89873e+08 lb-ft
Resisting Horizontal Force:	943351 lb
Driving Horizontal Force:	340394 lb
Total Slice Area:	18354.6 ft2
Surface Horizontal Width:	628.615 ft
Surface Average Height:	29.1985 ft

Method: gle/morgenstern-price

FS	2.777760
Center:	4345.123, 1848.696
Radius:	1109.717
Left Slip Surface Endpoint:	3805.544, 878.993
Right Slip Surface Endpoint:	4434.159, 742.558
Resisting Moment:	1.08297e+09 lb-ft
Driving Moment:	3.89873e+08 lb-ft
Resisting Horizontal Force:	945523 lb
Driving Horizontal Force:	340391 lb
Total Slice Area:	18354.6 ft2
Surface Horizontal Width:	628.615 ft
Surface Average Height:	29.1985 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4422
Number of Invalid Surfaces:	429
Error Codes	
Error Code -110 reported for 66 surfaces	
Error Code -118 reported for 363 surfaces	

Method: janbu corrected

Number of Valid Surfaces:	4422
Number of Invalid Surfaces:	429
Error Codes	
Error Code -110 reported for 66 surfaces	
Error Code -118 reported for 363 surfaces	

Method: spencer

Number of Valid Surfaces:	4422
Number of Invalid Surfaces:	429
Error Codes	
Error Code -110 reported for 66 surfaces	
Error Code -118 reported for 363 surfaces	

Method: gle/morgenstern-price

Number of Valid Surfaces:	4422
Number of Invalid Surfaces:	429
Error Codes	
Error Code -110 reported for 66 surfaces	
Error Code -118 reported for 363 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-118 = Surface does not pass through the search focus

Entity Information

L&K - Van

Shared Entities

Type	Coordinates (x,y)
	4801.65, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4461.43, 737.102

4456.94, 738
4456.94, 738
4451.39, 739.111
4447.57, 739.873
4442.27, 740.935
4431.95, 743
4429.16, 743.558
4410.47, 743.103
4399.15, 742.903
4395.49, 741.691
4390.15, 739.897
4386.69, 739.881
4380.14, 739.897
4377.03, 740.918
4371.14, 742.896
4365, 744.839
4354.12, 748.427
4347.22, 750.154
4333.51, 753.581
4307.9, 760
4147.28, 800.154
4034.9, 828.248
3943.28, 851.154
3927.9, 855
3907.85, 860.012
3887.89, 865
3862.48, 871.353
3847.89, 875
3838.52, 875.876
3826.49, 877
3817.3, 877.874
3805.47, 879
3795.83, 879.918
3784.45, 881
3774.39, 881.957
3763.43, 883
3753.28, 883.966
3743.06, 884.939
3742.72, 884.971
3742.42, 885
3736.08, 885.603
3731.91, 886
3712.33, 887.896
3711.25, 888
3660.7, 890
3608.3, 892
3555.9, 894
3501.92, 894.208
3324.04, 895.343
3093.34, 895.755
2956.54, 896
2486.56, 896
2475.13, 896
2234.57, 896
2195.59, 896
2181.65, 896
2141.81, 896
2127.47, 896
1858.87, 896

	1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002	

External Boundary	1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621

	943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851	

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	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151

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1013.62, 702
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1116.8, 702.68
1119.86, 702.126
1120.45, 702
1128.59, 700.46
1130.69, 700
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1150.1, 696
1152.34, 695.587
1158.74, 694
1164.46, 692.516
1180.87, 692.158
1199.19, 692
1219.93, 691.821
1247.58, 691.53
1274.37, 692
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1380.25, 692.892
1449.64, 692
1461.71, 692
1495.01, 692
1500.48, 692
1516.31, 691.277
1637.28, 690
1692.86, 690
1719.06, 689.137
1781.17, 688.396
1807.13, 688
1816.05, 688
1826.74, 688
1846.47, 687.169

Material Boundary	1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416

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	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727

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	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499

	585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853	

	1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858
Material Boundary	

	1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591 2072.84, 733.29	

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	608.129, 685.513
	609.67, 685
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	628.127, 685.241
	628.175, 685.242
	700.514, 687
	768.454, 688.654
	835.534, 687
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	885.02, 687
	885.837, 687
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	914.512, 685.056
	916.783, 685
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	984.141, 697
	990.827, 698.433
	993.853, 699
	1011.96, 702.672
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	1014.48, 703.184
	1029.03, 705
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	1069.81, 707.862
	1084.55, 707
	1094.3, 706.515
	1105.9, 705
	1109.31, 704.655
	1114.62, 703.964
	1116.8, 703.68
	1119.86, 703.126
	1120.45, 703
	1128.59, 701.46
	1130.69, 701
	1136.6, 699.804
	1140.35, 699
	1147.15, 697.628
	1150.1, 697
Material Boundary	1152.34, 696.587
	1158.74, 695
	1164.46, 693.516

	1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422	

	1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94	
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	490.114, 755.94	
	493.637, 756.814	
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	501.644, 758.823	
	506.113, 759.94	
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	525.743, 764.846	
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	538.115, 767.936	
	538.372, 768	
	538.376, 768	
	546.137, 769.94	
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	554.87, 772.124	
	562.119, 773.94	
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	570.12, 775.94	
	574.042, 776.921	
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	618.147, 787.94	
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	626.137, 789.94	
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	634.137, 791.94	
	634.937, 792.14	
	642.137, 793.94	
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	673.312, 801.732	
	674.148, 801.941	
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	674.997, 802.153	
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	685.634, 804.812	
	690.148, 805.94	
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	698.148, 807.94	
	702.721, 809.084	
	706.148, 809.94	
	713.263, 811.719	

	713.271, 811.721
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	715.036, 812.162
	715.044, 812.164
	722.148, 813.94
	726.812, 815.109
	730.137, 815.94
	734.845, 817.117
	738.137, 817.94
	742.878, 819.125
	746.137, 819.94
	753.204, 821.707
	753.211, 821.709
	754.137, 821.94
	755.071, 822.174
	755.079, 822.176
	762.137, 823.94
	766.923, 825.137
	770.137, 825.94
	777.722, 827.837
	777.725, 827.837
	778.137, 827.94
	778.797, 828.105
	786.137, 829.94
	793.153, 831.694
	793.161, 831.696
	794.137, 831.94
	795.126, 832.187
	802.137, 833.94
	808.474, 835.525
	810.137, 835.94
	811.847, 836.368
	818.137, 837.94
	819.879, 838.376
	826.137, 839.94
	833.077, 841.675
	834.137, 841.94
	835.239, 842.216
	842.137, 843.94
	849.204, 845.707
	850.137, 845.94
	851.109, 846.183
	858.137, 847.94
	859.153, 848.194
	866.137, 849.94
	867.198, 850.205
	874.137, 851.94
	881.031, 853.664
	882.137, 853.94
	883.293, 854.229
	884.182, 854.452
	890.137, 855.94
	895.898, 857.381
	898.137, 857.94
	904.884, 859.627
	906.137, 859.94
	912.782, 861.602
	914.137, 861.94
	915.557, 862.295

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

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	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086	
	702.685, 809.229	
	706.111, 810.086	
	713.227, 811.865	
	713.234, 811.867	
	714.111, 812.086	
	714.999, 812.308	
	715.007, 812.31	
	722.112, 814.086	
	726.775, 815.254	
	730.101, 816.086	
	734.809, 817.263	
	738.101, 818.086	
	742.842, 819.271	
	746.101, 820.086	
	753.167, 821.852	
	753.175, 821.854	
	754.101, 822.086	
	755.035, 822.319	
	755.043, 822.321	
	762.101, 824.086	
	766.886, 825.282	
	770.101, 826.086	
	777.704, 827.987	
	777.707, 827.987	
	778.101, 828.086	
	778.761, 828.251	
	786.101, 830.086	
	793.117, 831.84	
	793.125, 831.842	
	794.101, 832.086	
	795.089, 832.333	
	802.101, 834.086	
	808.438, 835.67	
	810.101, 836.086	
	811.81, 836.513	
	818.101, 838.086	
	819.843, 838.521	
	826.101, 840.086	
	833.041, 841.821	
	834.101, 842.086	
	835.202, 842.361	
	842.101, 844.086	
	849.167, 845.852	
	850.101, 846.086	
	851.073, 846.329	
	858.101, 848.086	
	859.116, 848.34	
	866.101, 850.086	
	867.161, 850.351	
	874.101, 852.086	
	880.995, 853.809	
	882.101, 854.086	
	883.256, 854.375	
	884.146, 854.597	
	890.101, 856.086	
	895.862, 857.526	
	898.101, 858.086	
	904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112
Material Boundary	4447.57, 739.873 4456.92, 738 4461.97, 736.994

Material Boundary	4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602	Assigned to: Wadsworth Till

	608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32		

Water Table	970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679		

	1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516		

	4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054		
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013		

	366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291		

	929.213, 679.332		
	930.561, 679.392		
	932.042, 679.457		
	934.813, 679.981		
	940.841, 680.61		
	945.459, 681.092		
	948.634, 682.055		
	953.372, 683.186		
	964.682, 686.266		
	968.611, 687.32		
	970.51, 687.807		
	973.537, 688.568		
	983.137, 690.678		
	992.201, 692.586		
	995.001, 693.111		
	1005.88, 695.316		
	1015.48, 697.262		
	1026.16, 698.595		
	1029.95, 699.071		
	1037.13, 700.174		
	1049.53, 700.993		
	1053.89, 701.352		
	1060.67, 701.77		
	1068.84, 701.86		
	1069.64, 701.862		
	1072.74, 701.68		
	1077.4, 701.408		
	1085.39, 700.951		
	1093.76, 700.535		
	1103.93, 699.206		
	1105.21, 699.039		
	1108.51, 698.705		
	1108.62, 698.694		
	1115.88, 697.749		
	1119.27, 697.117		
	1126.35, 695.778		
	1134.85, 694.035		
	1143.12, 692.32		
	1144.75, 691.993		
	1145.42, 691.857		
	1146.43, 691.649		
	1147.98, 691.316		
	1148.3, 691.248		
	1149.18, 691.068		
	1151.08, 690.719		
	1156.36, 689.409		
	1157.27, 689.184		
	1163.63, 687.532		
	1180.77, 687.159		
	1199.14, 687		
	1219.87, 686.821		
	1247.6, 686.53		
	1274.47, 687.001		
	1354.82, 688.409		
	1380.15, 687.893		
	1449.6, 687		
	1461.71, 687		
	1495.01, 687		
Drawdown Line	1500.34, 687		

Drawdown Line	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624		

	3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721		

	4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703		

	1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439		

Piezoline	1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408		

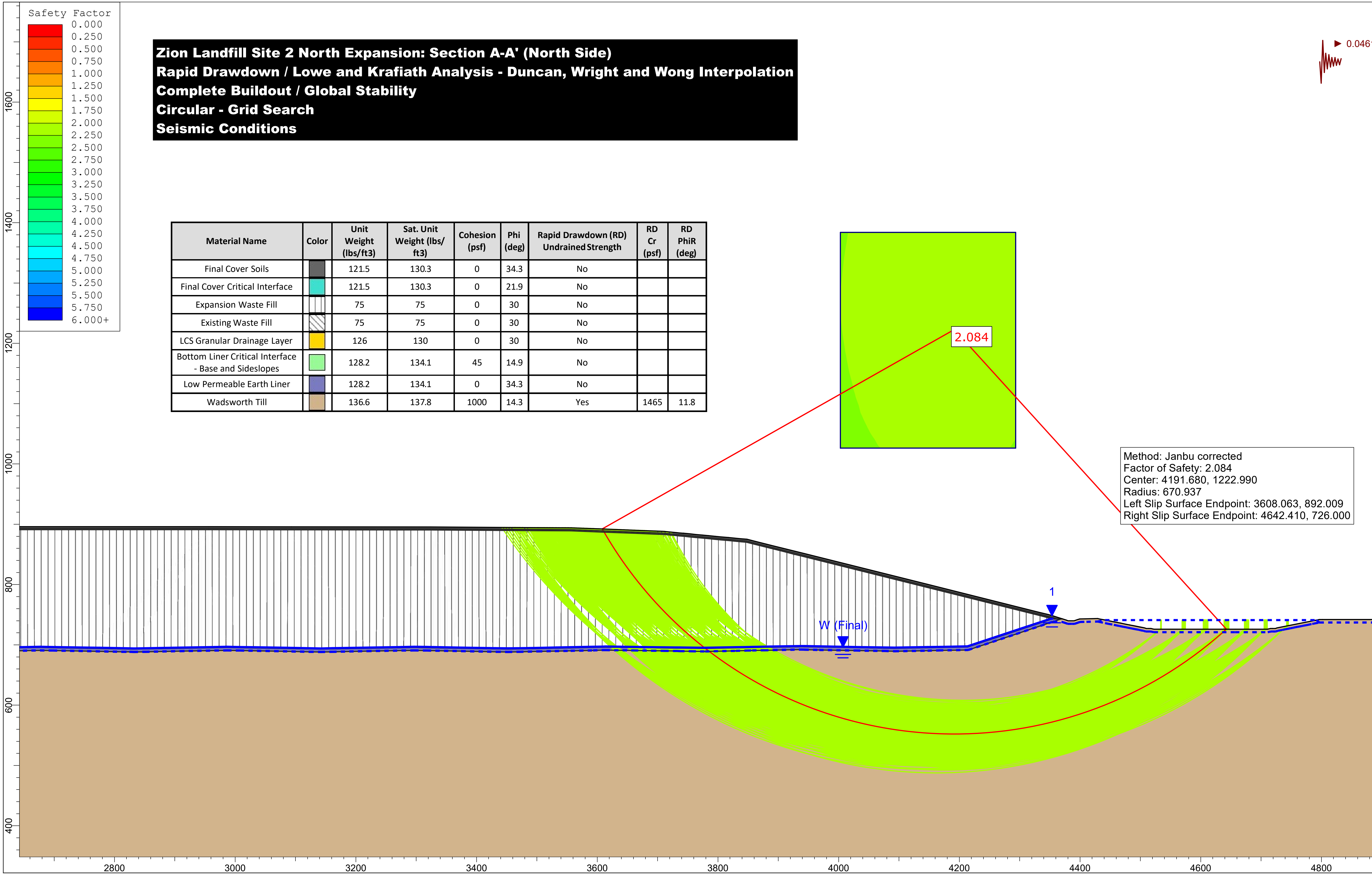
	2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453		

	3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	
Focus Search Window	4434.16, 724.452 4762.52, 724.452 4762.52, 752 4434.16, 742.558	

SLOPE STABILITY
SECTION **A-A**' – HORIZONTAL EXPANSION

RAPID DRAWDOWN GLOBAL STABILITY
LOWE AND KARAFIATH ANALYSIS
DUNCAN, WRIGHT AND WONG INTERPOLATION

COMPLETE BUILDOUT LANDFORM
CIRCULAR ANALYSIS
(ROTATIONAL SLOPE FAILURE)



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:51.498s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Lowe and Karafiath (1960)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb

Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1

Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.176140
Center:	4206.199, 1384.008
Radius:	791.103
Left Slip Surface Endpoint:	3586.032, 892.850
Right Slip Surface Endpoint:	4645.367, 726.000
Resisting Moment:	3.97539e+09 lb-ft
Driving Moment:	1.82681e+09 lb-ft
Total Slice Area:	155518 ft2
Surface Horizontal Width:	1059.34 ft
Surface Average Height:	146.807 ft

Method: janbu corrected

FS	2.084050
Center:	4191.680, 1222.990
Radius:	670.937
Left Slip Surface Endpoint:	3608.063, 892.009
Right Slip Surface Endpoint:	4642.410, 726.000
Resisting Horizontal Force:	5.43033e+06 lb
Driving Horizontal Force:	2.60566e+06 lb
Total Slice Area:	183710 ft2
Surface Horizontal Width:	1034.35 ft
Surface Average Height:	177.61 ft

Method: spencer

FS	2.162260
Center:	4206.199, 1384.008
Radius:	809.494
Left Slip Surface Endpoint:	3562.038, 893.766
Right Slip Surface Endpoint:	4677.693, 726.000
Resisting Moment:	4.4931e+09 lb-ft
Driving Moment:	2.07797e+09 lb-ft
Resisting Horizontal Force:	5.10144e+06 lb
Driving Horizontal Force:	2.35931e+06 lb
Total Slice Area:	178308 ft2
Surface Horizontal Width:	1115.65 ft
Surface Average Height:	159.823 ft

Method: gle/morgenstern-price

FS	2.162260
Center:	4220.718, 1366.117
Radius:	768.610
Left Slip Surface Endpoint:	3615.990, 891.707
Right Slip Surface Endpoint:	4646.173, 726.000
Resisting Moment:	3.63711e+09 lb-ft
Driving Moment:	1.68209e+09 lb-ft
Resisting Horizontal Force:	4.36218e+06 lb
Driving Horizontal Force:	2.01742e+06 lb
Total Slice Area:	145661 ft2
Surface Horizontal Width:	1030.18 ft
Surface Average Height:	141.394 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4830
Number of Invalid Surfaces:	21

Error Codes

Error Code -103 reported for 21 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4830
Number of Invalid Surfaces:	21

Error Codes

Error Code -103 reported for 21 surfaces

Method: spencer

Number of Valid Surfaces:	4830
Number of Invalid Surfaces:	21

Error Codes

Error Code -103 reported for 21 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4830
Number of Invalid Surfaces:	21

Error Codes

Error Code -103 reported for 21 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

Entity Information

L&K - DWW

Shared Entities

Type	Coordinates (x,y)
	4801.68, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4459.97, 737.393 4456.92, 738 4451.39, 739.108 4447.57, 739.873 4442.27, 740.935

	4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354	

	1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851	

External Boundary	1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208

	921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851

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Material Boundary	1142.34, 912.771 1154.62, 914 1162.34, 914.771 1174.62, 916 1192.75, 917.813 1194.62, 918 1197.86, 918.324 1201.41, 918.634 1212.31, 919.573 1219.93, 920 1223.74, 920 1239.2, 920 1244.03, 920 1247.58, 920 1263.68, 918.668 1271.3, 918 1275.76, 917.645 1278.49, 917.476 1298.75, 916 1308.11, 915.255 1313.82, 914.902 1326.21, 914 1340.45, 912.866 1349.16, 912.328 1353.66, 912 1372.8, 910.476 1380.25, 910 1385.65, 908.845 1388.91, 908.035 1388.92, 908.035 1389.06, 908 1389.1, 907.991 1397.13, 906 1397.26, 905.969 1405.2, 904 1405.41, 903.947 1413.27, 902 1414.27, 901.754 1414.27, 901.754 1421.35, 900 1427.95, 898.364 1427.95, 898.363 1429.42, 898 1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773

	1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135 1629.72, 848 1631.84, 847.469 1637.72, 846 1639.9, 845.455 1645.72, 844 1647.95, 843.442 1653.72, 842 1658.44, 840.82 1658.45, 840.818 1661.72, 840 1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385	

	1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424 1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033	

	1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969 1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582 1965.72, 764 1967.39, 763.583 1973.7, 762 1977.57, 761.034 1977.58, 761.033 1981.71, 760 1985.9, 758.959 1985.9, 758.958 1989.74, 758 1991.4, 757.584 1997.72, 756 1999.4, 755.58 2005.72, 754 2007.48, 753.558 2013.7, 752 2017.55, 751.04 2017.56, 751.039 2021.71, 750 2025.87, 748.959 2025.88, 748.958 2029.73, 748 2032.55, 747.298 2037.73, 746 2040.08, 745.405 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482

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	4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273
Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858

	608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657 1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366	

Material Boundary	1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279 1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276

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	2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054 3660.7, 695.468 3690.86, 695.09 3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558	

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	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242

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Material Boundary	1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693	

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	1461.71, 693	
	1495.01, 693	
	1500.48, 693	
	1516.31, 692.277	
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	1905.79, 699.433	
	1905.84, 699.433	
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	1911.83, 701.431	
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	1958.54, 717	
	1959.76, 717.419	

	1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721	
	714.148, 811.94	
	715.036, 812.162	
	715.044, 812.164	
	722.148, 813.94	
	726.812, 815.109	
	730.137, 815.94	
	734.845, 817.117	
	738.137, 817.94	
	742.878, 819.125	
	746.137, 819.94	
	753.204, 821.707	
	753.211, 821.709	
	754.137, 821.94	
	755.071, 822.174	
	755.079, 822.176	
	762.137, 823.94	
	766.923, 825.137	
	770.137, 825.94	
	777.722, 827.837	
	777.725, 827.837	
	778.137, 827.94	
	778.797, 828.105	
	786.137, 829.94	
	793.153, 831.694	
	793.161, 831.696	
	794.137, 831.94	
	795.126, 832.187	
	802.137, 833.94	
	808.474, 835.525	
	810.137, 835.94	
	811.847, 836.368	
	818.137, 837.94	
	819.879, 838.376	
	826.137, 839.94	
	833.077, 841.675	
	834.137, 841.94	
	835.239, 842.216	
	842.137, 843.94	
	849.204, 845.707	
	850.137, 845.94	
	851.109, 846.183	
	858.137, 847.94	
	859.153, 848.194	
	866.137, 849.94	
	867.198, 850.205	
	874.137, 851.94	
	881.031, 853.664	
	882.137, 853.94	
	883.293, 854.229	
	884.182, 854.452	
	890.137, 855.94	
	895.898, 857.381	
	898.137, 857.94	
	904.884, 859.627	
	906.137, 859.94	
	912.782, 861.602	
	914.137, 861.94	
	915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112

Material Boundary	4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602	Assigned to: Wadsworth Till

	608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32		

Water Table	970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679		

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	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013		

	366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291		

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Drawdown Line			

Drawdown Line	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624		

	3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721		

	4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054	
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

	515.347, 716.4		
	519.551, 715		
	521.35, 714.401		
	525.559, 713		
	529.162, 711.807		
	537.749, 709		
	539.827, 708.301		
	543.591, 707		
	545.694, 706.3		
	549.599, 705		
	551.706, 704.298		
	555.606, 703		
	560.534, 701.359		
	567.615, 699		
	570.071, 698.182		
	573.623, 697		
	577.692, 695.645		
	579.631, 695		
	583.706, 693.643		
	583.706, 693.643		
	585.639, 693		
	594.551, 690.033		
	597.655, 689		
	599.571, 688.362		
	603.662, 687		
	608.129, 685.513		
	609.67, 685		
	618.233, 685		
	628.127, 685.241		
	628.175, 685.242		
	700.514, 687		
	768.454, 688.654		
	835.534, 687		
	874.622, 687		
	885.02, 687		
	885.837, 687		
	914.501, 685.056		
	914.512, 685.056		
	916.783, 685		
	918.713, 684.952		
	920.67, 685		
	922.861, 685.058		
	931.35, 685.433		
	933.943, 685.923		
	944.266, 687		
	947.065, 687.849		
	951.886, 689		
	965.137, 692.608		
	966.644, 693		
	967.06, 693.116		
	971.617, 694.286		
	974.456, 694.923		
	974.842, 695		
	982.543, 696.691		
	984.141, 697		
	990.827, 698.433		
	993.853, 699		
	1011.96, 702.672		
	1013.62, 703		

	1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439		

Piezoline	1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408		

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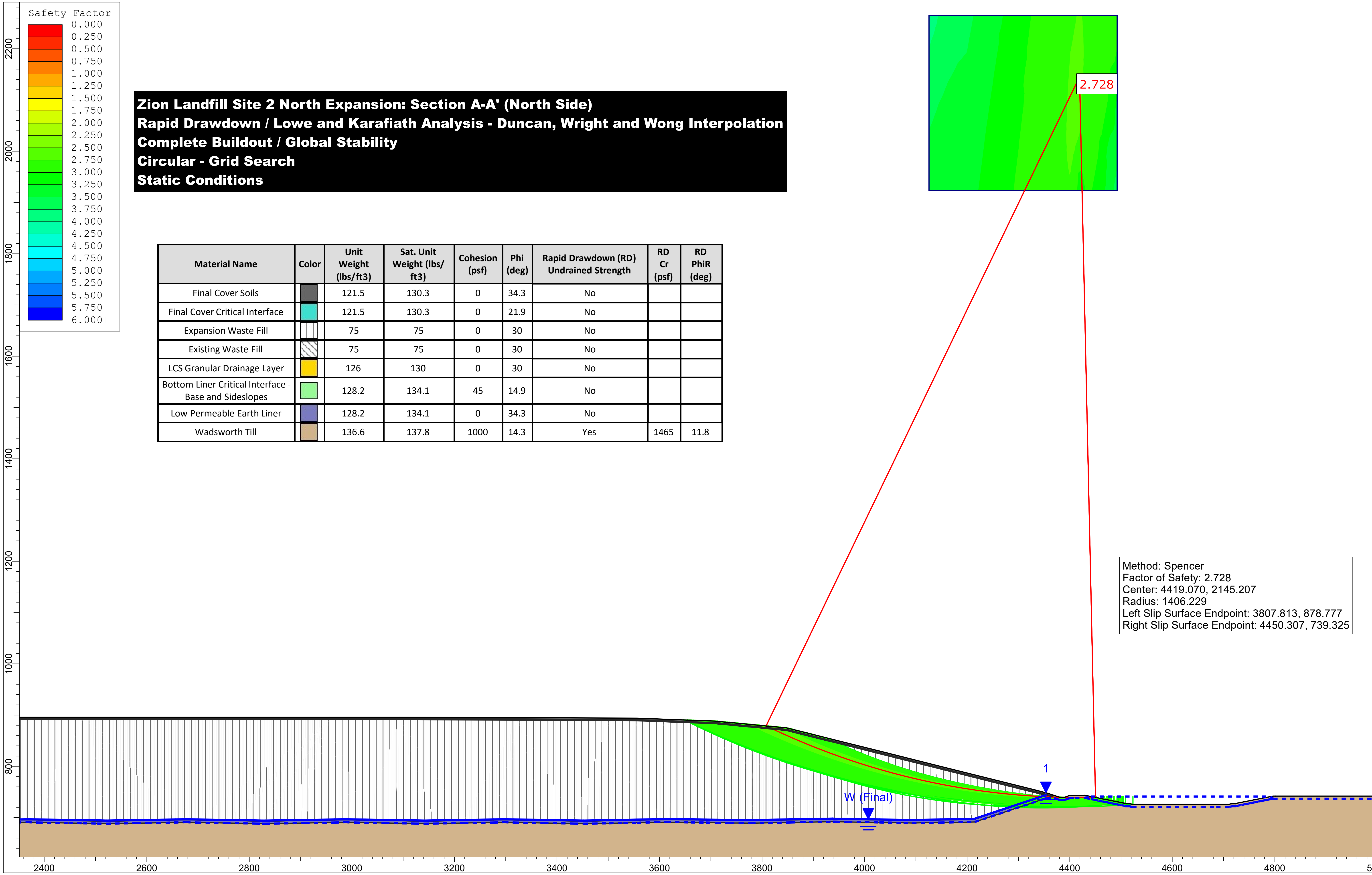
Focus Search Window	4434.16, 722.071 4762.52, 722.071 4762.52, 752 4434.16, 742.558	



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:48.633s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Lowe and Karafiath (1960)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.736430
Center:	4419.070, 2162.269
Radius:	1423.276
Left Slip Surface Endpoint:	3803.003, 879.235
Right Slip Surface Endpoint:	4450.260, 739.334
Resisting Moment:	1.15196e+09 lb-ft
Driving Moment:	4.20973e+08 lb-ft
Total Slice Area:	15149.8 ft2
Surface Horizontal Width:	647.257 ft
Surface Average Height:	23.4062 ft

Method: janbu corrected

FS	2.769900
Center:	4419.070, 2145.207
Radius:	1406.229
Left Slip Surface Endpoint:	3807.813, 878.777
Right Slip Surface Endpoint:	4450.307, 739.325
Resisting Horizontal Force:	790919 lb
Driving Horizontal Force:	285541 lb
Total Slice Area:	14800 ft2
Surface Horizontal Width:	642.493 ft
Surface Average Height:	23.0352 ft

Method: spencer

FS	2.727560
Center:	4419.070, 2145.207
Radius:	1406.229
Left Slip Surface Endpoint:	3807.813, 878.777
Right Slip Surface Endpoint:	4450.307, 739.325
Resisting Moment:	1.11277e+09 lb-ft
Driving Moment:	4.07972e+08 lb-ft
Resisting Horizontal Force:	768557 lb
Driving Horizontal Force:	281775 lb
Total Slice Area:	14800 ft2
Surface Horizontal Width:	642.493 ft
Surface Average Height:	23.0352 ft

Method: gle/morgenstern-price

FS	2.732350
Center:	4419.070, 2145.207
Radius:	1406.229
Left Slip Surface Endpoint:	3807.813, 878.777
Right Slip Surface Endpoint:	4450.307, 739.325
Resisting Moment:	1.11472e+09 lb-ft
Driving Moment:	4.07972e+08 lb-ft
Resisting Horizontal Force:	769737 lb
Driving Horizontal Force:	281712 lb
Total Slice Area:	14800 ft2
Surface Horizontal Width:	642.493 ft
Surface Average Height:	23.0352 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4532
Number of Invalid Surfaces:	319

Error Codes
Error Code -110 reported for 86 surfaces
Error Code -118 reported for 233 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4532
Number of Invalid Surfaces:	319

Error Codes
Error Code -110 reported for 86 surfaces
Error Code -118 reported for 233 surfaces

Method: spencer

Number of Valid Surfaces:	4532
Number of Invalid Surfaces:	319

Error Codes
Error Code -110 reported for 86 surfaces
Error Code -118 reported for 233 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4532
Number of Invalid Surfaces:	319
Error Codes	
Error Code -110 reported for 86 surfaces	
Error Code -118 reported for 233 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

-118 = Surface does not pass through the search focus

Entity Information

L&K - DWW

Shared Entities

Type	Coordinates (x,y)
	4801.68, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4459.97, 737.393 4456.92, 738

	4451.39, 739.108	
	4447.57, 739.873	
	4442.27, 740.935	
	4431.95, 743	
	4429.16, 743.558	
	4410.47, 743.103	
	4399.15, 742.903	
	4395.49, 741.691	
	4390.15, 739.897	
	4386.69, 739.881	
	4380.14, 739.897	
	4377.03, 740.918	
	4371.14, 742.896	
	4365, 744.839	
	4354.12, 748.427	
	4347.22, 750.154	
	4333.51, 753.581	
	4307.9, 760	
	4147.28, 800.154	
	4034.9, 828.248	
	3943.28, 851.154	
	3927.9, 855	
	3907.85, 860.012	
	3887.89, 865	
	3862.48, 871.353	
	3847.89, 875	
	3838.52, 875.876	
	3826.49, 877	
	3817.3, 877.874	
	3805.47, 879	
	3795.83, 879.918	
	3784.45, 881	
	3774.39, 881.957	
	3763.43, 883	
	3753.28, 883.966	
	3743.06, 884.939	
	3742.72, 884.971	
	3742.42, 885	
	3736.08, 885.603	
	3731.91, 886	
	3712.33, 887.896	
	3711.25, 888	
	3660.7, 890	
	3608.3, 892	
	3555.9, 894	
	3501.92, 894.208	
	3324.04, 895.343	
	3093.34, 895.755	
	2956.54, 896	
	2486.56, 896	
	2475.13, 896	
	2234.57, 896	
	2195.59, 896	
	2181.65, 896	
	2141.81, 896	
	2127.47, 896	
	1858.87, 896	
	1616.33, 896	
	1495.01, 896	

	1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604

External Boundary	1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851

	935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047 761.409, 826.851 754.352, 825.086 754.344, 825.084 753.409, 824.851 752.484, 824.619 752.476, 824.617 745.409, 822.851 742.15, 822.036 737.409, 820.851 734.118, 820.028 729.409, 818.851 726.082, 818.019 721.42, 816.851	

	714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85	

	492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054
	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732

	470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654 835.534, 686 874.622, 686 885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688	

	965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692 1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278	

Material Boundary	1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722	

	1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458

	3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896
	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614

	475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81	

	968.205, 687.206
	968.611, 687.32
	973.02, 688.452
	975.698, 689.053
	976.071, 689.127
	983.756, 690.815
	985.339, 691.121
	992.008, 692.55
	995.001, 693.111
	1013.14, 696.789
	1014.83, 697.123
	1015.48, 697.262
	1029.86, 699.057
	1037.13, 700.174
	1049.88, 701.017
	1054.93, 701.439
	1061.13, 701.796
	1067.32, 701.858
	1069.64, 701.862
	1084.22, 701.009
	1093.76, 700.535
	1105.21, 699.039
	1108.62, 698.694
	1113.85, 698.014
	1115.88, 697.749
	1118.7, 697.239
	1119.27, 697.117
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	1129.45, 695.129
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	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891

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	1158.74, 695
	1164.46, 693.516
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Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
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Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

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Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423	

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112

Material Boundary	4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602	Assigned to: Wadsworth Till

	608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32		

Water Table	970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679		

	1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516		

	4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054		
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013		

	366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291		

	929.213, 679.332		
	930.561, 679.392		
	932.042, 679.457		
	934.813, 679.981		
	940.841, 680.61		
	945.459, 681.092		
	948.634, 682.055		
	953.372, 683.186		
	964.682, 686.266		
	968.611, 687.32		
	970.51, 687.807		
	973.537, 688.568		
	983.137, 690.678		
	992.201, 692.586		
	995.001, 693.111		
	1005.88, 695.316		
	1015.48, 697.262		
	1026.16, 698.595		
	1029.95, 699.071		
	1037.13, 700.174		
	1049.53, 700.993		
	1053.89, 701.352		
	1060.67, 701.77		
	1068.84, 701.86		
	1069.64, 701.862		
	1072.74, 701.68		
	1077.4, 701.408		
	1085.39, 700.951		
	1093.76, 700.535		
	1103.93, 699.206		
	1105.21, 699.039		
	1108.51, 698.705		
	1108.62, 698.694		
	1115.88, 697.749		
	1119.27, 697.117		
	1126.35, 695.778		
	1134.85, 694.035		
	1143.12, 692.32		
	1144.75, 691.993		
	1145.42, 691.857		
	1146.43, 691.649		
	1147.98, 691.316		
	1148.3, 691.248		
	1149.18, 691.068		
	1151.08, 690.719		
	1156.36, 689.409		
	1157.27, 689.184		
	1163.63, 687.532		
	1180.77, 687.159		
	1199.14, 687		
	1219.87, 686.821		
	1247.6, 686.53		
	1274.47, 687.001		
	1354.82, 688.409		
	1380.15, 687.893		
	1449.6, 687		
	1461.71, 687		
	1495.01, 687		
Drawdown Line	1500.34, 687		

Drawdown Line	1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624		

	3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534 4521.95, 721 4656.84, 721 4685.73, 721		

	4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054	
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner

	515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703		

	1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439		

Piezoline	1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408		

	2006.55, 733		
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	2580.01, 695.119		
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	2756.78, 695.419		
	2775.37, 695.097		
	2824.98, 694.239		
	2831.93, 694.119		
	2870.81, 694.793		
	2896.34, 695.236		
	2908.97, 695.455		
	2965.96, 696.443		
	2986.93, 696.807		
	3005.86, 696.479		
	3026.7, 696.119		
	3084.07, 695.126		
	3141.93, 694.125		
	3160.86, 694.454		
	3218.92, 695.461		
	3276.16, 696.453		

	3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	
Focus Search Window	4435.31, 725.666 4762.52, 725.666 4762.52, 752 4451.39, 739.111	

SLOPE STABILITY

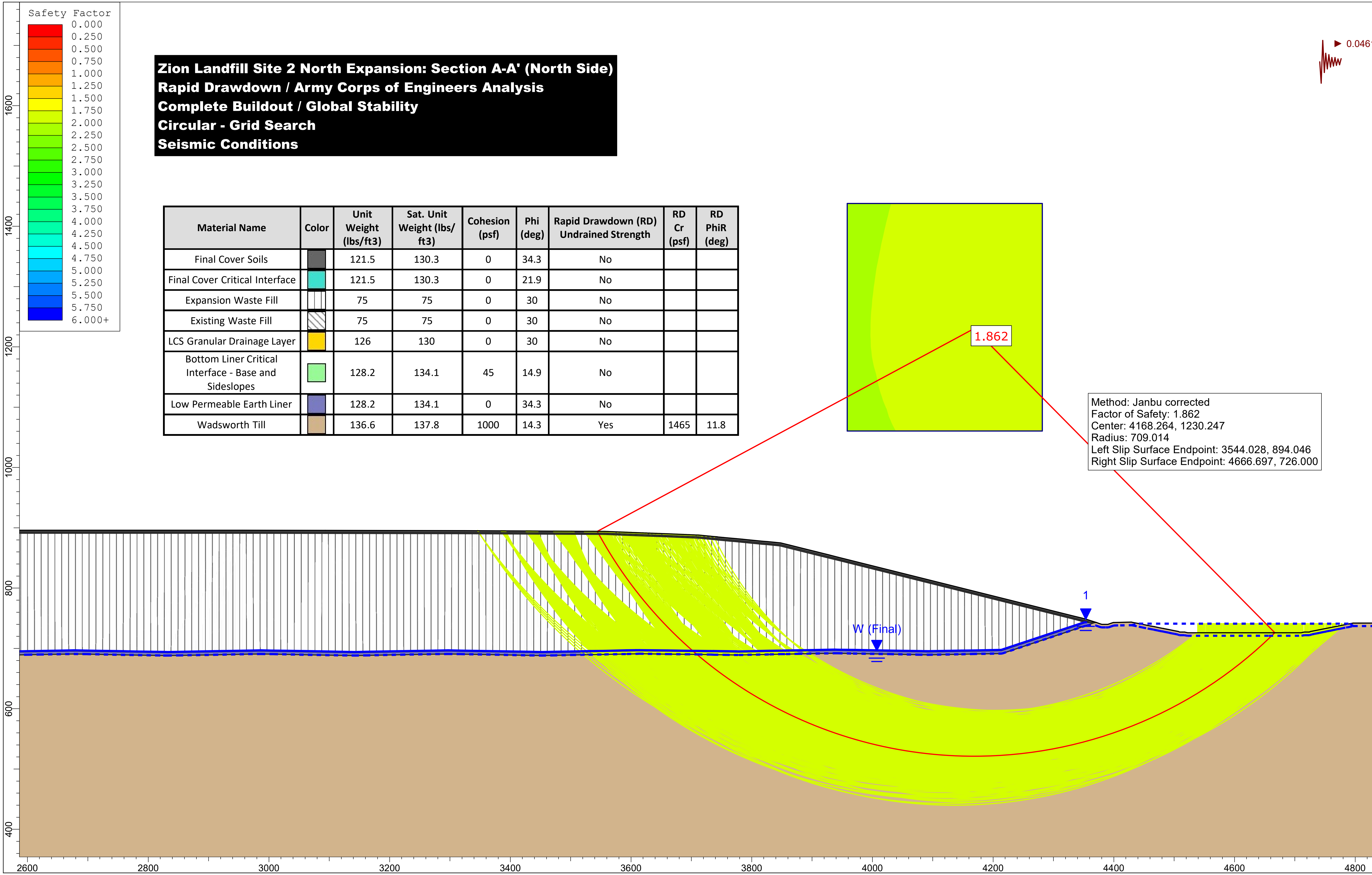
SECTION **A-A**' – HORIZONTAL EXPANSION

RAPID DRAWDOWN GLOBAL STABILITY
ARMY CORPS OF ENGINEERS ANALYSIS

COMPLETE BUILDOUT LANDFORM
CIRCULAR ANALYSIS
(ROTATIONAL SLOPE FAILURE)

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Army Corps of Engineers Analysis
Complete Buildout / Global Stability
Circular - Grid Search
Seismic Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8



A-A_final_north_LT.slmd APTIM

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:54.451s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Army Corp. Eng. 2 Stage (1970)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.0461

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb

Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1

Wadsworth Till	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	1.946360
Center:	4184.420, 1437.806
Radius:	892.478
Left Slip Surface Endpoint:	3476.469, 894.371
Right Slip Surface Endpoint:	4724.747, 727.480
Resisting Moment:	5.41796e+09 lb-ft
Driving Moment:	2.78364e+09 lb-ft
Total Slice Area:	228821 ft2
Surface Horizontal Width:	1248.28 ft
Surface Average Height:	183.31 ft

Method: janbu corrected

FS	1.861990
Center:	4168.264, 1230.247
Radius:	709.014
Left Slip Surface Endpoint:	3544.028, 894.046
Right Slip Surface Endpoint:	4666.697, 726.000
Resisting Horizontal Force:	5.70822e+06 lb
Driving Horizontal Force:	3.06566e+06 lb
Total Slice Area:	228088 ft2
Surface Horizontal Width:	1122.67 ft
Surface Average Height:	203.166 ft

Method: spencer

FS	1.936550
Center:	4200.577, 1400.068
Radius:	840.687
Left Slip Surface Endpoint:	3529.194, 894.103
Right Slip Surface Endpoint:	4702.958, 726.000
Resisting Moment:	4.59285e+09 lb-ft
Driving Moment:	2.37167e+09 lb-ft
Resisting Horizontal Force:	5.00113e+06 lb
Driving Horizontal Force:	2.5825e+06 lb
Total Slice Area:	201231 ft2
Surface Horizontal Width:	1173.76 ft
Surface Average Height:	171.441 ft

Method: gle/morgenstern-price

FS	1.935160
Center:	4200.577, 1400.068
Radius:	840.687
Left Slip Surface Endpoint:	3529.194, 894.103
Right Slip Surface Endpoint:	4702.958, 726.000
Resisting Moment:	4.58955e+09 lb-ft
Driving Moment:	2.37167e+09 lb-ft
Resisting Horizontal Force:	5.0066e+06 lb
Driving Horizontal Force:	2.58717e+06 lb
Total Slice Area:	201231 ft2
Surface Horizontal Width:	1173.76 ft
Surface Average Height:	171.441 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4645
Number of Invalid Surfaces:	206

Error Codes

Error Code -103 reported for 123 surfaces
Error Code -110 reported for 83 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4645
Number of Invalid Surfaces:	206

Error Codes

Error Code -103 reported for 123 surfaces
Error Code -110 reported for 83 surfaces

Method: spencer

Number of Valid Surfaces:	4645
Number of Invalid Surfaces:	206

Error Codes

Error Code -103 reported for 123 surfaces
Error Code -110 reported for 83 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4645
Number of Invalid Surfaces:	206
Error Codes	
Error Code -103 reported for 123 surfaces	
Error Code -110 reported for 83 surfaces	

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-110 = The water table or a piezoline does not span the slip region for a given slip surface, when Water Surfaces is specified as the method of pore pressure calculation. If this error occurs, check that the water table or piezoline(s) span the appropriate soil cells.

Entity Information

Army

Shared Entities

Type	Coordinates (x,y)
	4805.88, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732 4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736

	4464.44, 736.5 4461.97, 736.994 4461.41, 737.105 4456.92, 738 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208 3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896	

	1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302 1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006	

External Boundary	1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111 998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554 961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811

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	729.409, 818.851 726.082, 818.019 721.42, 816.851 714.316, 815.075 714.308, 815.073 713.42, 814.851 712.543, 814.631 712.535, 814.629 705.42, 812.851 701.994, 811.994 697.42, 810.851 692.873, 809.714 689.42, 808.851 684.906, 807.722 681.42, 806.851 674.27, 805.063 674.262, 805.061 673.422, 804.851 672.586, 804.643 665.409, 802.851 661.711, 801.926 657.419, 800.851 653.685, 799.917 649.422, 798.851 645.167, 797.79 641.409, 796.851 634.21, 795.051 633.409, 794.851 632.619, 794.653 625.409, 792.851 621.53, 791.881 617.419, 790.851 613.503, 789.872 609.419, 788.851 605.466, 787.862 601.421, 786.851 594.16, 785.039 593.415, 784.852 592.654, 784.664 585.393, 782.851 581.342, 781.838 577.393, 780.851 573.314, 779.831 569.392, 778.851 565.288, 777.824 561.39, 776.85 554.142, 775.035 553.404, 774.85 552.668, 774.665 545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673	

	505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054
	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088 426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734

	462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654 835.534, 686 874.622, 686 885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923	

	944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692 1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688	

Material Boundary	1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422 1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720

	1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482 2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443

	2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896
	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458

	464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681 885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092

	948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206 968.611, 687.32 973.02, 688.452 975.698, 689.053 976.071, 689.127 983.756, 690.815 985.339, 691.121 992.008, 692.55 995.001, 693.111 1013.14, 696.789 1014.83, 697.123 1015.48, 697.262 1029.86, 699.057 1037.13, 700.174 1049.88, 701.017 1054.93, 701.439 1061.13, 701.796 1067.32, 701.858 1069.64, 701.862 1084.22, 701.009 1093.76, 700.535 1105.21, 699.039 1108.62, 698.694 1113.85, 698.014 1115.88, 697.749 1118.7, 697.239 1119.27, 697.117 1127.39, 695.581 1129.45, 695.129 1135.37, 693.93 1139.13, 693.125 1145.94, 691.753 1148.93, 691.114 1151.08, 690.719 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209	

	1848.18, 681.312 1853.09, 679.599 1854.88, 679 1856.55, 679 1858.87, 679 1862.97, 679 1868.47, 680.801 1869.31, 681.074 1870.05, 681.322 1870.29, 681.404 1875.39, 683 1875.45, 683 1877.69, 683.747 1881.46, 685 1881.51, 685	
Material Boundary	1883.75, 685.747 1888.43, 687.308 1893.13, 688.871 1894.47, 689.319 1894.81, 689.435 1894.82, 689.435 1900.47, 691.319 1900.8, 691.434 1900.81, 691.434 1906.47, 693.319 1906.8, 693.432 1906.81, 693.432 1912.47, 695.319 1912.79, 695.431 1912.81, 695.431 1918.47, 697.32 1918.79, 697.429 1918.8, 697.429 1924.47, 699.32 1924.78, 699.428 1924.8, 699.428 1930.47, 701.32 1930.78, 701.426 1930.79, 701.426 1936.47, 703.32 1936.78, 703.425 1936.79, 703.425 1942.47, 705.32 1942.77, 705.423 1942.78, 705.423 1948.47, 707.319 1948.77, 707.422 1948.78, 707.422 1954.47, 709.318 1954.77, 709.42 1954.78, 709.42 1960.47, 711.317 1960.76, 711.419 1960.77, 711.419 1966.47, 713.316 1966.76, 713.417 1966.77, 713.417 1972.46, 715.315 1972.76, 715.416	

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	3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4368.61, 742.832 4369.04, 742.975
	435.797, 740.289 442.642, 742 450.278, 743.909 450.642, 744 450.968, 744.081 454.639, 745 458.633, 746 461.959, 746.833 466.624, 748 473.939, 749.826 474.634, 750 475.332, 750.174 482.633, 752 487.141, 753.127 490.599, 754 494.12, 754.873 498.626, 756 502.131, 756.883

	506.599, 758 513.901, 759.821 514.625, 760 515.336, 760.179 522.606, 762 526.229, 762.906 530.606, 764 538.599, 765.995 538.618, 766 538.622, 766 538.64, 766.005 546.622, 768 553.883, 769.815 554.619, 770 555.355, 770.184 562.605, 772 566.5, 772.974 570.605, 774 574.527, 774.98 578.605, 776 582.554, 776.987 586.606, 778 593.858, 779.811 594.624, 780 595.376, 780.19 602.632, 782 606.678, 783.012 610.632, 784 614.715, 785.021 618.632, 786 622.745, 787.031 626.622, 788 633.831, 789.802 634.622, 790 635.422, 790.2 642.622, 792 646.38, 792.939 650.632, 794 654.898, 795.067 658.632, 796 662.927, 797.076 666.622, 798 673.797, 799.792 674.632, 800 675.475, 800.211 675.482, 800.213 682.633, 802 686.119, 802.872 690.633, 804 694.086, 804.863 698.633, 806 703.206, 807.143 706.633, 808 713.748, 809.779 713.756, 809.781 714.633, 810 715.521, 810.222 715.529, 810.224 722.633, 812	

	727.298, 813.169 730.622, 814 735.33, 815.177 738.622, 816 743.363, 817.185 746.622, 818 753.689, 819.767 753.697, 819.769 754.622, 820 755.557, 820.234 755.564, 820.236 762.622, 822 767.408, 823.196 770.622, 824 777.968, 825.837 777.971, 825.837 778.622, 826 779.282, 826.165 786.622, 828 793.638, 829.754 793.646, 829.756 794.622, 830 795.611, 830.247 802.622, 832 808.959, 833.584 810.622, 834 812.332, 834.427 818.622, 836 820.364, 836.436 826.622, 838 833.562, 839.735 834.622, 840 835.724, 840.275 842.622, 842 849.689, 843.767 850.622, 844 851.594, 844.243 858.622, 846 859.638, 846.254 866.622, 848 867.683, 848.265 874.622, 850 881.516, 851.724 882.622, 852 883.778, 852.289 884.667, 852.511 890.622, 854 896.384, 855.44 898.622, 856 905.369, 857.687 906.622, 858 913.267, 859.661 914.622, 860 916.042, 860.355 922.622, 862 924.05, 862.357 930.622, 864 936.682, 865.515 938.622, 866	

	945.083, 867.615 945.703, 867.77 946.463, 867.96 946.622, 868 948.807, 868.546 950.282, 868.915 951.413, 869.198 952.09, 869.367 954.622, 870 959.165, 871.136 960.758, 871.534 962.622, 872 965.435, 872.703 970.622, 874 974.464, 874.96 978.622, 876 983.295, 877.168 986.622, 878 987.722, 878.275 989.579, 878.739 989.696, 878.768 990.941, 879.08 994.622, 880 999.548, 881.232 999.665, 881.261 1001.52, 881.725 1002.62, 882 1002.75, 882.031 1003.06, 882.11 1003.09, 882.116 1003.45, 882.208 1010.62, 884 1016.85, 885.557 1018.62, 886 1024.91, 887.573 1026.62, 888 1032.44, 889.455 1032.46, 889.459 1034.62, 890 1036.95, 890.581 1036.96, 890.585 1042.62, 892 1044.19, 892.392 1050.62, 894 1052.12, 894.375 1058.62, 896 1065.26, 897.659 1066.62, 898 1071.96, 899.334 1071.97, 899.337 1074.62, 900 1077.51, 900.722 1077.53, 900.726 1082.62, 902 1089.48, 903.714 1090.62, 904 1097.56, 905.733 1098.62, 906 1105.63, 907.753

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Material Boundary	1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890

1467.34, 888.591
1467.35, 888.589
1469.71, 888
1470.53, 887.793
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1478.61, 885.773
1485.71, 884
1489.39, 883.08
1490.59, 882.778
1492.56, 882.287
1493.71, 882
1494.64, 881.766
1495.01, 881.674
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1509.71, 878
1515.42, 876.572
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1533.89, 871.955
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1585.54, 859.044
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1607.67, 853.51
1613.72, 852
1618.11, 850.901
1618.12, 850.899
1621.72, 850
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1625.18, 849.135
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1631.84, 847.469
1637.72, 846
1639.9, 845.455
1645.72, 844
1647.95, 843.442
1653.72, 842
1658.44, 840.82
1658.45, 840.818
1661.72, 840

	1664.88, 839.211 1664.88, 839.209 1669.72, 838 1672.15, 837.393 1677.72, 836 1680.18, 835.385 1685.72, 834 1688.19, 833.383 1693.72, 832 1698.69, 830.759 1701.72, 830 1707.44, 828.57 1709.72, 828 1715.32, 826.602 1717.72, 826 1723.24, 824.622 1725.72, 824 1728.35, 823.345 1733.73, 822 1736.41, 821.33 1741.73, 820 1744.46, 819.317 1749.73, 818 1752.51, 817.305 1757.73, 816 1760.55, 815.294 1765.72, 814 1770.89, 812.708 1773.72, 812 1778.85, 810.716 1781.7, 810 1784.68, 809.261 1789.73, 808 1792.72, 807.252 1797.73, 806 1803.91, 804.456 1805.73, 804 1811.94, 802.447 1813.73, 802 1817.77, 800.99 1817.78, 800.988 1821.73, 800 1825.74, 798.998 1825.75, 798.997 1829.73, 798 1835.99, 796.436 1837.73, 796 1844, 794.433 1845.73, 794 1852.02, 792.43 1853.73, 792 1857.65, 791.022 1857.65, 791.02 1858.87, 790.716 1861.74, 790 1865.84, 788.973 1865.85, 788.971 1869.74, 788 1876.04, 786.424

	1877.74, 786 1879.43, 785.576 1885.74, 784 1887.43, 783.577 1893.72, 782 1897.59, 781.033 1897.6, 781.031 1901.71, 780 1905.83, 778.97 1905.84, 778.969 1909.7, 778 1911.41, 777.573 1917.72, 776 1924.02, 774.424 1925.72, 774 1932, 772.424 1933.69, 772 1937.57, 771.035 1937.58, 771.034 1941.71, 770 1945.85, 768.964 1945.86, 768.963 1949.7, 768 1956.05, 766.417 1957.71, 766 1959.39, 765.582 1965.72, 764 1967.39, 763.583 1973.7, 762 1977.57, 761.034 1977.58, 761.033 1981.71, 760 1985.9, 758.959 1985.9, 758.958 1989.74, 758 1991.4, 757.584 1997.72, 756 1999.4, 755.58 2005.72, 754 2007.48, 753.558 2013.7, 752 2017.55, 751.04 2017.56, 751.039 2021.71, 750 2025.87, 748.959 2025.88, 748.958 2029.73, 748 2032.55, 747.298 2037.73, 746 2040.08, 745.405 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791	

	2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028	

	3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273
Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
	425.659, 739.946 435.798, 740.139 440.577, 740.139 447.422, 737.858 449.985, 737.003 453.422, 735.858 454.591, 735.468 456.865, 734.711 459.427, 733.858 461.976, 733.009 465.456, 731.85 465.458, 731.85 470.521, 730.164 477.448, 727.858 479.983, 727.014 483.458, 725.858 485.987, 725.016 489.466, 723.858 493.653, 722.465 495.477, 721.858 499.113, 720.647 507.488, 717.858 509.297, 717.255 513.496, 715.858 515.3, 715.257 519.504, 713.858 521.302, 713.259 525.512, 711.858 529.115, 710.665 537.702, 707.858 539.778, 707.159 543.543, 705.858 545.647, 705.157 549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499

	583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85 1094.28, 705.366 1105.88, 703.851 1109.29, 703.506 1114.6, 702.815 1116.78, 702.531 1119.83, 701.979 1120.42, 701.853 1128.56, 700.313 1130.66, 699.853 1136.57, 698.657	

	1140.32, 697.853 1147.12, 696.481 1150.07, 695.853 1152.31, 695.44 1158.71, 693.855 1164.44, 692.366 1180.86, 692.008 1199.19, 691.85 1219.92, 691.671 1247.58, 691.38 1274.37, 691.85 1354.83, 693.26 1380.25, 692.742 1449.64, 691.85 1461.71, 691.85 1495.01, 691.85 1500.47, 691.85 1516.31, 691.127 1637.27, 689.85 1692.85, 689.85 1719.06, 688.987 1781.17, 688.246 1807.13, 687.85 1816.05, 687.85 1826.74, 687.85 1846.44, 687.02 1850.04, 685.858 1854.98, 684.136 1855.83, 683.85 1856.55, 683.85 1858.87, 683.85 1862.03, 683.85 1866.66, 685.364 1867.48, 685.63 1868.16, 685.858 1868.45, 685.959 1874.49, 687.85 1874.5, 687.85 1875.84, 688.298 1880.52, 689.85 1880.56, 689.85 1881.9, 690.297 1886.58, 691.858 1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284 1899.86, 696.284 1904.59, 697.858 1905.81, 698.283 1905.86, 698.283 1910.59, 699.858 1911.81, 700.281 1911.86, 700.281 1916.59, 701.858 1917.8, 702.279 1917.85, 702.279
Material Boundary	

	1922.59, 703.858 1923.8, 704.278 1923.85, 704.278 1928.59, 705.858 1929.79, 706.276 1929.84, 706.276 1934.59, 707.858 1935.79, 708.275 1935.84, 708.275 1940.59, 709.858 1941.79, 710.273 1941.84, 710.273 1946.59, 711.858 1947.78, 712.272 1947.83, 712.272 1952.59, 713.858 1953.78, 714.27 1953.83, 714.27 1958.59, 715.858 1959.78, 716.269 1959.82, 716.269 1964.59, 717.858 1965.78, 718.267 1965.82, 718.267 1970.59, 719.858 1971.78, 720.266 1971.81, 720.266 1976.59, 721.858 1977.78, 722.264 1977.81, 722.264 1982.59, 723.858 1987.36, 725.447 1988.54, 725.85 1988.57, 725.85 1993.36, 727.448 1994.54, 727.85 1994.57, 727.85 1995.77, 728.26 1995.8, 728.26 2000.59, 729.858 2001.77, 730.258 2001.79, 730.258 2006.59, 731.858 2007.76, 732.256 2007.79, 732.256 2012.59, 733.858 2013.76, 734.255 2013.79, 734.255 2018.59, 735.858 2019.75, 736.253 2019.78, 736.253 2024.59, 737.858 2025.75, 738.252 2025.78, 738.252 2030.6, 739.858 2031.77, 740.258 2036.57, 741.858 2041.91, 743.585 2059.95, 737.591	

	2072.84, 733.29 2127.43, 715.114 2173.33, 699.858 2195, 692.649 2195.09, 692.619 2195.24, 692.621 2195.59, 692.628 2366.91, 695.626 2388.56, 695.255 2447.68, 694.242 2475.12, 693.771 2503.22, 693.285 2521.93, 692.962 2580.02, 693.969 2600.94, 694.332 2620.04, 694.663 2676.93, 695.65 2698.12, 695.283 2754.86, 694.302 2812.83, 693.299 2824.98, 693.089 2831.93, 692.969 2851.01, 693.299 2908.98, 694.305 2965.96, 695.293 2986.93, 695.657 3007.83, 695.295 3064.91, 694.308 3122.94, 693.304 3141.93, 692.975 3160.86, 693.304 3218.93, 694.311 3276.17, 695.303 3296.93, 695.663 3317.62, 695.306 3374.97, 694.314 3433.1, 693.308 3451.93, 692.982 3470.71, 693.308 3501.92, 693.849 3529.72, 694.395 3555.9, 694.909 3593.09, 695.644 3608.3, 695.945 3613.84, 696.054 3660.7, 695.468 3690.86, 695.09 3711.25, 694.834 3731.91, 694.546 3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784	

	3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362

	603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697
Material Boundary	1152.34, 696.587 1158.74, 695

	1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422	

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Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086 702.685, 809.229 706.111, 810.086 713.227, 811.865 713.234, 811.867 714.111, 812.086 714.999, 812.308 715.007, 812.31 722.112, 814.086 726.775, 815.254 730.101, 816.086 734.809, 817.263 738.101, 818.086 742.842, 819.271 746.101, 820.086 753.167, 821.852 753.175, 821.854 754.101, 822.086 755.035, 822.319 755.043, 822.321 762.101, 824.086 766.886, 825.282 770.101, 826.086 777.704, 827.987 777.707, 827.987 778.101, 828.086 778.761, 828.251 786.101, 830.086 793.117, 831.84 793.125, 831.842 794.101, 832.086 795.089, 832.333 802.101, 834.086 808.438, 835.67 810.101, 836.086 811.81, 836.513 818.101, 838.086 819.843, 838.521 826.101, 840.086 833.041, 841.821 834.101, 842.086 835.202, 842.361 842.101, 844.086 849.167, 845.852 850.101, 846.086 851.073, 846.329 858.101, 848.086 859.116, 848.34 866.101, 850.086 867.161, 850.351 874.101, 852.086 880.995, 853.809 882.101, 854.086 883.256, 854.375 884.146, 854.597 890.101, 856.086 895.862, 857.526 898.101, 858.086 904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423	

1074.1, 902.086
1076.99, 902.808
1077.01, 902.812
1082.1, 904.086
1088.96, 905.8
1090.1, 906.086
1097.03, 907.819
1098.1, 908.086
1105.11, 909.839
1106.1, 910.086
1110.71, 911.237
1110.72, 911.241
1114.25, 912.124
1131.8, 913.879
1134.41, 914.139
1142.12, 914.911
1154.41, 916.139
1162.12, 916.911
1174.41, 918.139
1192.53, 919.952
1194.41, 920.139
1197.66, 920.465
1201.22, 920.776
1212.16, 921.718
1219.87, 922.15
1223.74, 922.15
1239.2, 922.15
1244.03, 922.15
1247.67, 922.15
1263.87, 920.811
1271.48, 920.143
1275.91, 919.79
1278.63, 919.622
1298.92, 918.144
1308.26, 917.4
1313.97, 917.047
1326.37, 916.144
1340.6, 915.011
1349.31, 914.473
1353.82, 914.144
1372.95, 912.621
1380.54, 912.136
1386.13, 910.94
1389.43, 910.122
1389.43, 910.122
1389.57, 910.087
1389.61, 910.077
1397.65, 908.087
1397.77, 908.056
1405.72, 906.087
1405.93, 906.034
1413.79, 904.087
1414.78, 903.841
1414.79, 903.84
1421.86, 902.087
1428.46, 900.451
1428.47, 900.45
1429.93, 900.087
1430.39, 899.974

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112

Material Boundary	4481.94, 733 4481.94, 733 4484.34, 732.521 4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Seismic
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347	Assigned to: Wadsworth Till

	439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141 925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055		

Water Table	953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683		

	1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24 3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214		

	3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054		
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727		

	334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347 439.628, 735.289 488.131, 719.138 522.779, 707.602 608.698, 679 618.307, 679 629.067, 679.262 642.777, 679.595 647.559, 679.711 660.405, 680.023 675.999, 680.402 689.108, 680.721 700.659, 681.002 711.292, 681.261 721.531, 681.51 724.458, 681.581 731.21, 681.745 742.989, 682.032 746.542, 682.118 760.228, 682.452 768.453, 682.652 775.361, 682.481 785.608, 682.229 792.858, 682.05 834.445, 681.025 836.108, 681 839.229, 681 842.442, 681 846.403, 681 851.249, 681 853.768, 681 858.565, 681 861.768, 681 864.838, 681 868.722, 681 876.123, 681 879.684, 681 882.824, 681 885.634, 681 888.824, 680.784 905.654, 679.642 913.684, 679.098 914.27, 679.058 916.598, 679.003 918.712, 678.951 920.654, 678.998 921.208, 679.012 921.899, 679.03 923.072, 679.061 924.878, 679.141		

	925.393, 679.164 926.99, 679.234 928.274, 679.291 929.213, 679.332 930.561, 679.392 932.042, 679.457 934.813, 679.981 940.841, 680.61 945.459, 681.092 948.634, 682.055 953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687		

Drawdown Line	1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24		

	3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534		

	4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433		

	993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44		

Piezoline	1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707 1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41		

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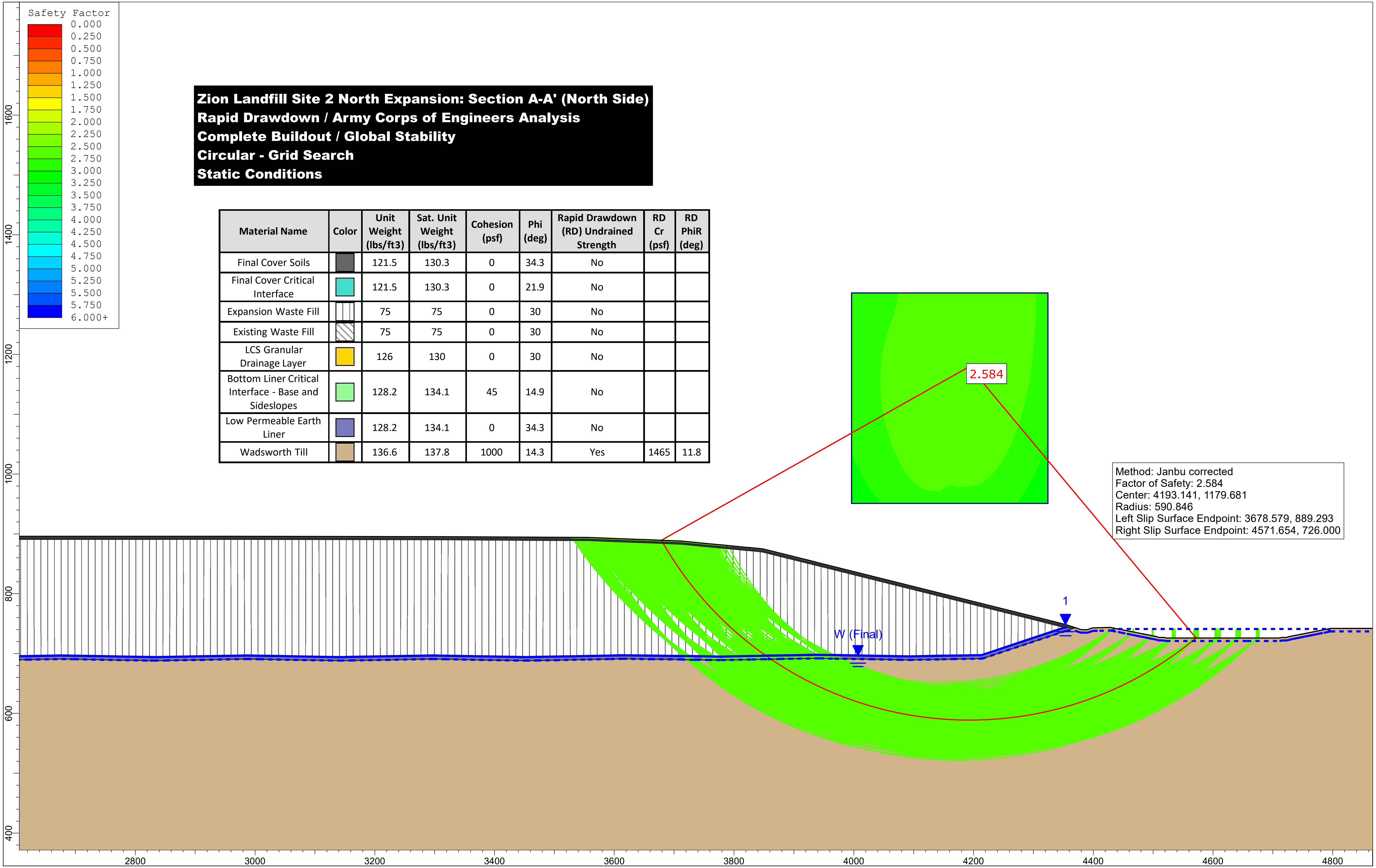
	3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239 3711.25, 695.984 3731.91, 695.696 3736.97, 695.63 3774.17, 695.144 3778.84, 695.083 3829.52, 696.079 3847.89, 696.44 3856.62, 696.594 3891.54, 697.211 3937.75, 698.028 3943.28, 697.934 3967.87, 697.514 4028.8, 696.473 4092.79, 695.38 4147.28, 696.336 4168.34, 696.706 4213.55, 697.499 4302.23, 727.041 4347.22, 741.988 4350.55, 743.096 4352.88, 743.177 4354.12, 743.273	

Zion Landfill Site 2 North Expansion: Section A-A' (North Side)
Rapid Drawdown / Army Corps of Engineers Analysis
Complete Buildout / Global Stability
Circular - Grid Search
Static Conditions

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)	Rapid Drawdown (RD) Undrained Strength	RD Cr (psf)	RD PhiR (deg)
Final Cover Soils		121.5	130.3	0	34.3	No		
Final Cover Critical Interface		121.5	130.3	0	21.9	No		
Expansion Waste Fill		75	75	0	30	No		
Existing Waste Fill		75	75	0	30	No		
LCS Granular Drainage Layer		126	130	0	30	No		
Bottom Liner Critical Interface - Base and Sideslopes		128.2	134.1	45	14.9	No		
Low Permeable Earth Liner		128.2	134.1	0	34.3	No		
Wadsworth Till		136.6	137.8	1000	14.3	Yes	1465	11.8



A-A_final_north_LT.slmd

APTIM

Slide Analysis Information

A-A_final_north_LT

Project Summary

File Name:	A-A_final_north_LT.slmd
Slide Modeler Version:	9.006
Compute Time:	00h:00m:48.916s
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	1/30/2020, 11:59:15 AM

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Bishop simplified
	GLE/Morgenstern-Price with interslice force function (Half Sine)
	Janbu corrected
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	Rapid Drawdown
Rapid Drawdown Method:	Army Corp. Eng. 2 Stage (1970)

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:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	6
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Final Cover Soils	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5
Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	None
Ru Value	0
Final Cover Critical Interface	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	121.5

Saturated Unit Weight [lbs/ft3]	130.3
Cohesion [psf]	0
Friction Angle [deg]	21.9
Water Surface	None
Ru Value	0
Expansion Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
Existing Waste Fill	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	75
Saturated Unit Weight [lbs/ft3]	75
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	None
Ru Value	0
LCS Granular Drainage Layer	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	126
Saturated Unit Weight [lbs/ft3]	130
Cohesion [psf]	0
Friction Angle [deg]	30
Water Surface	Piezometric Line 1
Hu Value	1
Bottom Liner Critical Interface - Base and Sideslopes	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	45
Friction Angle [deg]	14.9
Water Surface	Piezometric Line 1
Hu Value	1
Low Permeable Earth Liner	
Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	128.2
Saturated Unit Weight [lbs/ft3]	134.1
Cohesion [psf]	0
Friction Angle [deg]	34.3
Water Surface	Piezometric Line 1
Hu Value	1
Wadsworth Till	

Color	
Strength Type	Mohr-Coulomb
Unsaturated Unit Weight [lbs/ft3]	136.6
Saturated Unit Weight [lbs/ft3]	137.8
Cohesion [psf]	1000
Friction Angle [deg]	14.3
Water Surface	Water Table
Hu Value	1
Rapid Drawdown Undrained Behaviour	Yes
RD Shear Strength Envelope Properties	CR: 1465PhiR: 11.8

Global Minimums

Method: bishop simplified

FS	2.710510
Center:	4193.141, 1302.816
Radius:	690.297
Left Slip Surface Endpoint:	3639.275, 890.818
Right Slip Surface Endpoint:	4572.341, 726.000
Resisting Moment:	2.69843e+09 lb-ft
Driving Moment:	9.95543e+08 lb-ft
Total Slice Area:	125458 ft2
Surface Horizontal Width:	933.066 ft
Surface Average Height:	134.458 ft

Method: janbu corrected

FS	2.584430
Center:	4193.141, 1179.681
Radius:	590.846
Left Slip Surface Endpoint:	3678.579, 889.293
Right Slip Surface Endpoint:	4571.654, 726.000
Resisting Horizontal Force:	3.84059e+06 lb
Driving Horizontal Force:	1.48605e+06 lb
Total Slice Area:	134572 ft2
Surface Horizontal Width:	893.075 ft
Surface Average Height:	150.684 ft

Method: spencer

FS	2.685010
Center:	4193.141, 1302.816
Radius:	690.297
Left Slip Surface Endpoint:	3639.275, 890.818
Right Slip Surface Endpoint:	4572.341, 726.000
Resisting Moment:	2.67304e+09 lb-ft
Driving Moment:	9.95543e+08 lb-ft
Resisting Horizontal Force:	3.53824e+06 lb
Driving Horizontal Force:	1.31778e+06 lb
Total Slice Area:	125458 ft2
Surface Horizontal Width:	933.066 ft
Surface Average Height:	134.458 ft

Method: gle/morgenstern-price

FS	2.687780
Center:	4209.540, 1302.816
Radius:	681.949
Left Slip Surface Endpoint:	3666.922, 889.754
Right Slip Surface Endpoint:	4573.323, 726.000
Resisting Moment:	2.46897e+09 lb-ft
Driving Moment:	9.18592e+08 lb-ft
Resisting Horizontal Force:	3.31284e+06 lb
Driving Horizontal Force:	1.23256e+06 lb
Total Slice Area:	114203 ft2
Surface Horizontal Width:	906.401 ft
Surface Average Height:	125.996 ft

Valid and Invalid Surfaces

Method: bishop simplified

Number of Valid Surfaces:	4774
Number of Invalid Surfaces:	77

Error Codes

Error Code -103 reported for 77 surfaces

Method: janbu corrected

Number of Valid Surfaces:	4768
Number of Invalid Surfaces:	83

Error Codes

Error Code -103 reported for 77 surfaces
Error Code -108 reported for 1 surface
Error Code -200 reported for 5 surfaces

Method: spencer

Number of Valid Surfaces:	4766
Number of Invalid Surfaces:	85

Error Codes

Error Code -103 reported for 77 surfaces
Error Code -108 reported for 3 surfaces
Error Code -200 reported for 5 surfaces

Method: gle/morgenstern-price

Number of Valid Surfaces:	4767
Number of Invalid Surfaces:	84

Error Codes

Error Code -103 reported for 77 surfaces
Error Code -108 reported for 2 surfaces
Error Code -200 reported for 5 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-103 = Two surface / slope intersections, but one or more surface / nonslope external polygon intersections lie between them. This usually occurs when the slip surface extends past the bottom of the soil region, but may also occur on a benched slope model with two sets of Slope Limits.

-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).

-200 = Factor of Safety <= min iteration value. Could mean 0 Normal/Shear resistance along part of the slip surface

Entity Information

Army

Shared Entities

Type	Coordinates (x,y)
	4805.88, 742.054 4796.47, 742.054 4726.05, 728 4724.43, 727.354 4723.55, 727 4718.38, 727 4715.55, 727 4712.32, 726.355 4710.54, 726 4685.73, 726 4656.84, 726 4522.44, 726 4520.26, 726.437 4517.44, 727 4513.9, 727 4509.44, 727 4508.31, 727.451 4506.94, 728 4486.94, 732 4486.94, 732

	4484.34, 732.521 4481.94, 733 4481.87, 733 4479.43, 733.489 4476.94, 734 4476.94, 734 4473.66, 734.657 4466.94, 736 4466.94, 736 4466.94, 736 4464.44, 736.5 4461.97, 736.994 4461.41, 737.105 4456.92, 738 4447.57, 739.873 4442.27, 740.935 4431.95, 743 4429.16, 743.558 4410.47, 743.103 4399.15, 742.903 4395.49, 741.691 4390.15, 739.897 4386.69, 739.881 4380.14, 739.897 4377.03, 740.918 4371.14, 742.896 4365, 744.839 4354.12, 748.427 4347.22, 750.154 4333.51, 753.581 4307.9, 760 4147.28, 800.154 4034.9, 828.248 3943.28, 851.154 3927.9, 855 3907.85, 860.012 3887.89, 865 3862.48, 871.353 3847.89, 875 3838.52, 875.876 3826.49, 877 3817.3, 877.874 3805.47, 879 3795.83, 879.918 3784.45, 881 3774.39, 881.957 3763.43, 883 3753.28, 883.966 3743.06, 884.939 3742.72, 884.971 3742.42, 885 3736.08, 885.603 3731.91, 886 3712.33, 887.896 3711.25, 888 3660.7, 890 3608.3, 892 3555.9, 894 3501.92, 894.208	

	3324.04, 895.343 3093.34, 895.755 2956.54, 896 2486.56, 896 2475.13, 896 2234.57, 896 2195.59, 896 2181.65, 896 2141.81, 896 2127.47, 896 1858.87, 896 1616.33, 896 1495.01, 896 1458.28, 896 1456.86, 896.353 1456.85, 896.354 1454.84, 896.853 1447.37, 898.703 1446.76, 898.853 1439.22, 900.721 1438.69, 900.853 1431.08, 902.74 1430.62, 902.853 1429.15, 903.217 1429.15, 903.218 1422.55, 904.853 1415.47, 906.607 1415.47, 906.607 1414.48, 906.853 1406.62, 908.801 1406.4, 908.853 1398.46, 910.822 1398.33, 910.853 1390.3, 912.844 1390.26, 912.853 1390.12, 912.889 1390.12, 912.889 1386.77, 913.717 1380.94, 914.966 1373.16, 915.464 1354.04, 916.986 1349.5, 917.317 1340.81, 917.854 1326.59, 918.986 1314.16, 919.891 1308.46, 920.243 1299.13, 920.986 1278.82, 922.465 1276.11, 922.633 1271.72, 922.983 1264.11, 923.65 1247.79, 925 1244.03, 925 1239.2, 925 1223.74, 925 1219.79, 925 1211.96, 924.561 1200.98, 923.615 1197.39, 923.302	

	1194.12, 922.975 1192.25, 922.788 1174.12, 920.975 1161.84, 919.746 1154.12, 918.975 1141.84, 917.746 1134.12, 916.975 1131.52, 916.714 1113.76, 914.939 1110.03, 914.006 1110.01, 914.002 1105.41, 912.851 1104.42, 912.604 1097.41, 910.851 1096.34, 910.584 1089.41, 908.851 1088.27, 908.565 1081.41, 906.851 1076.31, 905.577 1076.3, 905.573 1073.41, 904.851 1070.76, 904.188 1070.74, 904.184 1065.41, 902.851 1064.04, 902.51 1057.41, 900.851 1050.91, 899.226 1049.41, 898.851 1042.98, 897.243 1041.41, 896.851 1035.75, 895.435 1035.73, 895.432 1033.41, 894.851 1031.24, 894.309 1031.23, 894.306 1025.41, 892.851 1023.7, 892.424 1017.41, 890.851 1015.64, 890.407 1009.41, 888.851 1002.24, 887.059 1001.87, 886.967 1001.85, 886.96 1001.53, 886.882 1001.41, 886.851 1000.31, 886.576 998.452, 886.111
External Boundary	998.336, 886.082 993.409, 884.851 989.728, 883.93 988.483, 883.619 988.367, 883.59 986.509, 883.126 985.409, 882.851 982.082, 882.019 977.409, 880.851 973.251, 879.811 969.409, 878.851 964.222, 877.554

	961.409, 876.851 959.545, 876.385 957.953, 875.986 953.409, 874.851 950.878, 874.218 950.2, 874.048 949.069, 873.766 947.594, 873.397 945.409, 872.851 945.25, 872.811 944.49, 872.621 943.871, 872.466 937.409, 870.851 935.469, 870.366 929.409, 868.851 922.837, 867.208 921.409, 866.851 914.83, 865.206 913.409, 864.851 912.054, 864.512 905.409, 862.851 904.157, 862.538 897.409, 860.851 895.171, 860.291 889.409, 858.851 883.455, 857.362 882.565, 857.14 881.409, 856.851 880.304, 856.574 873.409, 854.851 866.47, 853.116 865.409, 852.851 858.425, 851.105 857.409, 850.851 850.382, 849.094 849.409, 848.851 848.476, 848.617 841.409, 846.851 834.511, 845.126 833.409, 844.851 832.349, 844.586 825.409, 842.851 819.152, 841.286 817.409, 840.851 811.119, 839.278 809.409, 838.851 807.747, 838.435 801.409, 836.851 794.398, 835.098 793.409, 834.851 792.434, 834.607 792.426, 834.605 785.409, 832.851 778.07, 831.016 777.409, 830.851 777.357, 830.838 777.354, 830.838 769.409, 828.851 766.195, 828.047	

	761.409, 826.851	
	754.352, 825.086	
	754.344, 825.084	
	753.409, 824.851	
	752.484, 824.619	
	752.476, 824.617	
	745.409, 822.851	
	742.15, 822.036	
	737.409, 820.851	
	734.118, 820.028	
	729.409, 818.851	
	726.082, 818.019	
	721.42, 816.851	
	714.316, 815.075	
	714.308, 815.073	
	713.42, 814.851	
	712.543, 814.631	
	712.535, 814.629	
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	701.994, 811.994	
	697.42, 810.851	
	692.873, 809.714	
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	684.906, 807.722	
	681.42, 806.851	
	674.27, 805.063	
	674.262, 805.061	
	673.422, 804.851	
	672.586, 804.643	
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	661.711, 801.926	
	657.419, 800.851	
	653.685, 799.917	
	649.422, 798.851	
	645.167, 797.79	
	641.409, 796.851	
	634.21, 795.051	
	633.409, 794.851	
	632.619, 794.653	
	625.409, 792.851	
	621.53, 791.881	
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	609.419, 788.851	
	605.466, 787.862	
	601.421, 786.851	
	594.16, 785.039	
	593.415, 784.852	
	592.654, 784.664	
	585.393, 782.851	
	581.342, 781.838	
	577.393, 780.851	
	573.314, 779.831	
	569.392, 778.851	
	565.288, 777.824	
	561.39, 776.85	
	554.142, 775.035	
	553.404, 774.85	
	552.668, 774.665	

	545.409, 772.851 538.007, 771 538.003, 771 537.388, 770.846 529.393, 768.851 525.016, 767.756 521.392, 766.85 514.117, 765.028 513.413, 764.851 512.696, 764.673 505.386, 762.851 500.914, 761.732 497.408, 760.85 492.912, 759.725 489.386, 758.851 485.922, 757.977 481.42, 756.851 474.122, 755.025 473.423, 754.851 472.728, 754.677 465.411, 752.851 460.744, 751.683 457.419, 750.85 453.425, 749.85 449.755, 748.932 449.43, 748.851 449.065, 748.76 441.43, 746.851 411.625, 739.4 408.752, 739.647 407.707, 739.78 399.328, 740 391.535, 740.576 375.004, 740.361 356.331, 740.013 351.947, 740 351.399, 739.824 347.109, 738 345.31, 737.207 342.499, 736 338.762, 734.381 337.91, 734 333.865, 732.219 333.374, 732 331.196, 732 314.988, 732 314.081, 732.094 284.972, 732.744 267.961, 732.886 0, 728.896 1.137e-13, 646.588 -5.68e-14, 330.891 5009.05, 330.891 5009.05, 649.333 5009.05, 742.054
	411.625, 739.4 415.074, 739.104 419.682, 740 425.234, 740.088

	426.201, 740.106 426.87, 740.119 435.797, 740.289 440.602, 740.289 447.47, 738 450.033, 737.146 453.47, 736 454.639, 735.61 456.913, 734.853 459.474, 734 462.023, 733.151 465.481, 732 465.482, 732 470.568, 730.307 477.496, 728 480.031, 727.156 483.505, 726 486.035, 725.158 489.513, 724 493.701, 722.607 495.524, 722 499.16, 720.79 507.535, 718 509.344, 717.398 513.543, 716 515.347, 715.4 519.551, 714 521.35, 713.401 525.559, 712 529.162, 710.807 537.749, 708 539.827, 707.301 543.591, 706 545.694, 705.3 549.599, 704 551.706, 703.298 555.606, 702 560.534, 700.359 567.615, 698 570.071, 697.182 573.623, 696 577.692, 694.645 579.631, 694 583.706, 692.643 583.706, 692.643 585.639, 692 594.551, 689.033 597.655, 688 599.571, 687.362 603.662, 686 608.129, 684.513 609.67, 684 618.233, 684 628.127, 684.241 628.175, 684.242 700.514, 686 768.454, 687.654 835.534, 686 874.622, 686	

	885.02, 686 885.837, 686 914.501, 684.056 914.512, 684.056 916.783, 684 918.713, 683.952 920.67, 684 922.861, 684.058 931.35, 684.433 933.943, 684.923 944.266, 686 947.065, 686.849 951.886, 688 965.137, 691.608 966.644, 692 967.06, 692.116 971.617, 693.286 974.456, 693.923 974.842, 694 982.543, 695.691 984.141, 696 990.827, 697.433 993.853, 698 1011.96, 701.672 1013.62, 702 1014.48, 702.184 1029.03, 704 1036.48, 705.144 1049.43, 706 1054.51, 706.425 1060.93, 706.795 1067.29, 706.858 1069.81, 706.862 1084.55, 706 1094.3, 705.515 1105.9, 704 1109.31, 703.655 1114.62, 702.964 1116.8, 702.68 1119.86, 702.126 1120.45, 702 1128.59, 700.46 1130.69, 700 1136.6, 698.804 1140.35, 698 1147.15, 696.628 1150.1, 696 1152.34, 695.587 1158.74, 694 1164.46, 692.516 1180.87, 692.158 1199.19, 692 1219.93, 691.821 1247.58, 691.53 1274.37, 692 1354.83, 693.411 1380.25, 692.892 1449.64, 692 1461.71, 692	

Material Boundary	1495.01, 692 1500.48, 692 1516.31, 691.277 1637.28, 690 1692.86, 690 1719.06, 689.137 1781.17, 688.396 1807.13, 688 1816.05, 688 1826.74, 688 1846.47, 687.169 1850.09, 686 1855.02, 684.278 1855.86, 684 1856.55, 684 1858.87, 684 1862.01, 684 1866.61, 685.507 1867.43, 685.773 1868.11, 686 1868.4, 686.102 1874.47, 688 1874.47, 688 1875.79, 688.44 1880.49, 690 1880.54, 690 1881.86, 690.439 1886.54, 692 1891.23, 693.563 1892.54, 694 1893.8, 694.436 1893.84, 694.436 1898.54, 696 1899.79, 696.434 1899.84, 696.434 1904.54, 698 1905.79, 698.433 1905.84, 698.433 1910.54, 700 1911.78, 700.431 1911.83, 700.431 1916.54, 702 1917.78, 702.43 1917.83, 702.429 1922.54, 704 1923.77, 704.428 1923.82, 704.428 1928.54, 706 1929.77, 706.426 1929.82, 706.426 1934.54, 708 1935.76, 708.425 1935.82, 708.425 1940.54, 710 1941.76, 710.423 1941.81, 710.423 1946.54, 712 1947.76, 712.422 1947.81, 712.422	

	1952.54, 714 1953.76, 714.42 1953.8, 714.42 1958.54, 716 1959.76, 716.419 1959.8, 716.419 1964.54, 718 1965.76, 718.417 1965.79, 718.417 1970.54, 720 1971.76, 720.416 1971.79, 720.416 1976.54, 722 1977.76, 722.414 1977.79, 722.414 1982.54, 724 1987.31, 725.589 1988.52, 726 1988.54, 726 1993.32, 727.59 1994.52, 728 1994.54, 728 1995.75, 728.41 1995.77, 728.41 2000.55, 730 2001.74, 730.408 2001.77, 730.408 2006.55, 732 2007.74, 732.406 2007.77, 732.406 2012.55, 734 2013.73, 734.405 2013.76, 734.405 2018.55, 736 2019.73, 736.403 2019.76, 736.403 2024.55, 738 2025.72, 738.402 2025.75, 738.402 2030.55, 740 2031.73, 740.4 2036.53, 742 2041.91, 743.743 2060, 737.734 2072.88, 733.432 2127.47, 715.257 2173.38, 700 2195.04, 692.792 2195.11, 692.769 2195.24, 692.771 2195.59, 692.778 2366.91, 695.776 2388.56, 695.405 2447.68, 694.392 2475.13, 693.921 2503.22, 693.435 2521.93, 693.112 2580.01, 694.119 2600.94, 694.482	

	2620.04, 694.813 2676.93, 695.8 2698.12, 695.433 2754.87, 694.452 2812.84, 693.449 2824.98, 693.239 2831.93, 693.119 2851.01, 693.449 2908.97, 694.455 2965.96, 695.443 2986.93, 695.807 3007.83, 695.445 3064.92, 694.458 3122.95, 693.454 3141.93, 693.125 3160.85, 693.454 3218.92, 694.461 3276.17, 695.453 3296.93, 695.814 3317.63, 695.456 3374.97, 694.464 3433.1, 693.458 3451.93, 693.132 3470.7, 693.458 3501.92, 693.999 3529.71, 694.545 3555.9, 695.059 3593.08, 695.794 3608.3, 696.095 3613.84, 696.204 3660.7, 695.618 3690.86, 695.24 3711.25, 694.984 3731.91, 694.696 3737.4, 694.624 3756.25, 694.378 3778.84, 694.083 3829.53, 695.079 3847.89, 695.44 3856.61, 695.594 3876.56, 695.947 3891.57, 696.212 3937.75, 697.028 3943.28, 696.934 3967.86, 696.515 4028.78, 695.474 4075.88, 694.669 4092.79, 694.38 4147.28, 695.336 4168.47, 695.708 4213.72, 696.502 4287.75, 721.165 4347.22, 740.972 4354.12, 743.273 4360.73, 743.124 4361.26, 743.112 4363.81, 743.055 4369.04, 742.975 4371.14, 742.896

	425.234, 740.088 425.659, 739.946 439.628, 735.289 445.572, 733.308 448.135, 732.454 451.572, 731.308 452.741, 730.918 455.017, 730.16 457.579, 729.307 460.127, 728.458 464.508, 727 464.51, 727 468.673, 725.614 475.6, 723.307 478.136, 722.463 481.611, 721.307 484.14, 720.465 487.618, 719.307 491.807, 717.914 493.629, 717.307 497.265, 716.097 505.64, 713.307 507.449, 712.705 511.648, 711.307 513.452, 710.707 517.656, 709.307 519.455, 708.708 523.669, 707.306 527.287, 706.108 535.86, 703.305 537.89, 702.622 541.663, 701.318 543.799, 700.607 547.704, 699.307 549.811, 698.606 553.711, 697.307 558.639, 695.666 565.718, 693.308 568.176, 692.49 571.728, 691.307 575.797, 689.953 577.736, 689.307 582.052, 687.87 582.052, 687.87 583.743, 687.307 592.656, 684.34 595.759, 683.307 597.676, 682.669 601.767, 681.307 606.234, 679.82 608.698, 679 618.307, 679 628.226, 679.242 628.274, 679.242 700.659, 681.002 768.453, 682.652 835.46, 681 874.622, 681 885.02, 681	

	885.634, 681 914.27, 679.058 914.411, 679.057 916.635, 679.002 918.712, 678.951 920.822, 679.002 923.072, 679.061 932.042, 679.457 934.813, 679.981 945.459, 681.092 948.634, 682.055 953.372, 683.186 966.68, 686.81 968.205, 687.206 968.611, 687.32 973.02, 688.452 975.698, 689.053 976.071, 689.127 983.756, 690.815 985.339, 691.121 992.008, 692.55 995.001, 693.111 1013.14, 696.789 1014.83, 697.123 1015.48, 697.262 1029.86, 699.057 1037.13, 700.174 1049.88, 701.017 1054.93, 701.439 1061.13, 701.796 1067.32, 701.858 1069.64, 701.862 1084.22, 701.009 1093.76, 700.535 1105.21, 699.039 1108.62, 698.694 1113.85, 698.014 1115.88, 697.749 1118.7, 697.239 1119.27, 697.117 1127.39, 695.581 1129.45, 695.129 1135.37, 693.93 1139.13, 693.125 1145.94, 691.753 1148.93, 691.114 1151.08, 690.719 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687	

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Material Boundary	

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Material Boundary	1429.87, 897.887 1437.49, 896 1438.02, 895.868 1445.56, 894 1446.17, 893.85 1453.63, 892 1455.65, 891.501 1455.65, 891.5 1457.67, 891 1461.71, 890 1467.34, 888.591 1467.35, 888.589 1469.71, 888 1470.53, 887.793 1477.71, 886 1478.61, 885.773 1485.71, 884 1489.39, 883.08 1490.59, 882.778 1492.56, 882.287 1493.71, 882 1494.64, 881.766 1495.01, 881.674 1501.71, 880 1508.76, 878.237 1509.71, 878 1515.42, 876.572 1517.71, 876 1524.27, 874.359 1525.71, 874 1533.07, 872.159 1533.71, 872 1533.89, 871.955 1541.71, 870 1547.85, 868.466 1549.71, 868 1549.77, 867.986 1557.71, 866 1565.54, 864.043 1565.71, 864 1566.26, 863.863 1573.71, 862 1577.71, 861 1577.72, 860.999 1581.71, 860 1585.53, 859.045 1585.54, 859.044 1589.71, 858 1591.56, 857.539 1597.71, 856 1599.62, 855.525 1605.71, 854 1607.67, 853.51 1613.72, 852 1618.11, 850.901 1618.12, 850.899 1621.72, 850 1625.17, 849.136 1625.18, 849.135

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	2040.08, 745.405 2041.91, 744.8 2060.85, 738.545 2075.51, 733.686 2122.09, 718.246 2127.47, 716.441 2149.16, 709.179 2175.38, 700.392 2176.55, 700 2195.21, 693.791 2195.27, 693.772 2195.49, 693.776 2195.5, 693.776 2195.59, 693.778 2208.3, 694 2235.83, 694.482 2276.51, 695.194 2295.76, 695.531 2313.04, 695.833 2322.59, 696 2366.91, 696.776 2387.58, 696.422 2475.13, 694.921 2521.93, 694.112 2580.01, 695.119 2599.02, 695.449 2655.66, 696.431 2676.93, 696.8 2698.12, 696.433 2756.78, 695.419 2775.37, 695.097 2824.98, 694.239 2831.93, 694.119 2870.81, 694.793 2896.34, 695.236 2908.97, 695.455 2965.96, 696.443 2986.93, 696.807 3005.86, 696.479 3026.7, 696.119 3084.07, 695.126 3141.93, 694.125 3160.86, 694.454 3218.92, 695.461 3276.16, 696.453 3296.93, 696.814 3315.7, 696.489 3373.9, 695.482 3431.21, 694.491 3451.93, 694.132 3472.59, 694.49 3501.92, 694.999 3532.41, 695.598 3555.9, 696.059 3592.57, 696.784 3608.3, 697.095 3613.84, 697.204 3660.7, 696.618 3690.91, 696.239	

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Material Boundary	2041.9, 738.472 2041.91, 743.585 2041.91, 743.743 2041.91, 744.8
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	549.551, 703.858 551.659, 703.156 555.559, 701.858 560.487, 700.217 567.567, 697.858 570.023, 697.04 573.575, 695.858 577.645, 694.503 579.583, 693.858 583.665, 692.499 583.665, 692.499 585.591, 691.858 594.504, 688.891 597.607, 687.858 599.524, 687.22 603.615, 685.858 608.082, 684.371 609.646, 683.85 618.235, 683.85 628.13, 684.091 628.178, 684.092 700.517, 685.85 768.454, 687.503 835.532, 685.85 874.622, 685.85 885.02, 685.85 885.832, 685.85 914.495, 683.906 914.51, 683.906 916.779, 683.85 918.713, 683.802 920.674, 683.85 922.866, 683.908 931.367, 684.283 933.965, 684.774 944.296, 685.852 947.104, 686.704 951.924, 687.855 965.176, 691.463 966.683, 691.855 967.099, 691.971 971.652, 693.14 974.487, 693.776 974.873, 693.853 982.574, 695.544 984.171, 695.853 990.856, 697.286 993.882, 697.853 1011.99, 701.525 1013.65, 701.853 1014.51, 702.036 1029.05, 703.851 1036.5, 704.995 1049.44, 705.85 1054.52, 706.275 1060.93, 706.645 1067.29, 706.708 1069.81, 706.712 1084.54, 705.85	

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Material Boundary	1891.28, 693.421 1892.59, 693.858 1893.82, 694.286 1893.87, 694.286 1898.59, 695.858 1899.82, 696.284	

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3731.91, 694.546

	3737.39, 694.474 3756.25, 694.228 3778.84, 693.933 3829.53, 694.929 3847.89, 695.29 3856.62, 695.444 3876.56, 695.797 3891.57, 696.062 3937.75, 696.878 3943.28, 696.784 3967.86, 696.365 4028.78, 695.324 4075.88, 694.519 4092.79, 694.23 4147.28, 695.186 4168.47, 695.558 4213.74, 696.352 4287.8, 721.022 4347.26, 740.829 4354.15, 743.122 4363.81, 742.905 4368.61, 742.832
	440.602, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79 507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699

	570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433 993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68	

Material Boundary	1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44 1880.49, 691 1880.54, 691 1881.86, 691.439 1886.54, 693 1891.23, 694.563 1892.54, 695 1893.8, 695.436 1893.84, 695.436 1898.54, 697 1899.79, 697.434 1899.84, 697.434 1904.54, 699 1905.79, 699.433 1905.84, 699.433 1910.54, 701 1911.78, 701.431 1911.83, 701.431 1916.54, 703 1917.78, 703.43 1917.83, 703.429 1922.54, 705 1923.77, 705.428 1923.82, 705.428 1928.54, 707

	1929.77, 707.426 1929.82, 707.426 1934.54, 709 1935.76, 709.425 1935.82, 709.425 1940.54, 711 1941.76, 711.423 1941.81, 711.423 1946.54, 713 1947.76, 713.422 1947.81, 713.422 1952.54, 715 1953.76, 715.42 1953.8, 715.42 1958.54, 717 1959.76, 717.419 1959.8, 717.419 1964.54, 719 1965.76, 719.417 1965.79, 719.417 1970.54, 721 1971.76, 721.416 1971.79, 721.416 1976.54, 723 1977.76, 723.414 1977.79, 723.414 1982.54, 725 1987.31, 726.589 1988.52, 727 1988.54, 727 1993.32, 728.59 1994.52, 729 1994.54, 729 1995.75, 729.41 1995.77, 729.41 2000.55, 731 2001.74, 731.408 2001.77, 731.408 2006.55, 733 2007.74, 733.406 2007.77, 733.406 2012.55, 735 2013.73, 735.405 2013.76, 735.405 2018.55, 737 2019.73, 737.403 2019.76, 737.403 2024.55, 739 2025.72, 739.402 2025.75, 739.402 2030.55, 741 2031.73, 741.4 2036.53, 743 2041.91, 744.8

Material Boundary	1457.67, 891 1495.01, 891 1616.33, 891 1858.87, 891 2127.47, 891 2141.81, 891 2181.65, 891 2195.59, 891 2234.57, 891 2475.13, 891 2486.56, 891 2956.54, 891 3093.33, 890.755 3324.02, 890.343 3501.89, 889.208 3555.79, 889 3608.11, 887.004 3660.51, 885.004 3710.91, 883.01 3711.85, 882.919 3731.43, 881.023 3735.61, 880.625 3741.94, 880.022 3742.25, 879.993 3742.58, 879.961 3752.81, 878.988 3762.96, 878.022 3773.92, 876.98 3783.98, 876.022 3795.35, 874.94 3804.99, 874.022 3816.83, 872.896 3826.02, 872.022 3838.05, 870.897 3847.04, 870.057 3861.26, 866.502 3886.68, 860.149 3906.63, 855.161 3926.68, 850.149 3942.07, 846.303 4033.69, 823.397 4146.07, 795.303 4306.68, 755.149 4332.29, 748.731 4346, 745.303 4352.73, 743.621 4354.12, 743.273
	426.87, 740.119 442.157, 743.94 449.793, 745.849 450.157, 745.94 450.483, 746.022 454.153, 746.94 458.147, 747.94 461.473, 748.773 466.139, 749.94 473.455, 751.767 474.149, 751.941 474.848, 752.114

	482.148, 753.94 486.653, 755.067 490.114, 755.94 493.637, 756.814 498.139, 757.94 501.644, 758.823 506.113, 759.94 513.419, 761.762 514.14, 761.94 514.848, 762.119 522.12, 763.94 525.743, 764.846 530.121, 765.94 538.115, 767.936 538.372, 768 538.376, 768 546.137, 769.94 553.397, 771.755 554.133, 771.94 554.87, 772.124 562.119, 773.94 566.015, 774.914 570.12, 775.94 574.042, 776.921 578.12, 777.94 582.069, 778.927 586.121, 779.94 593.377, 781.753 594.14, 781.941 594.889, 782.13 602.147, 783.941 606.193, 784.952 610.147, 785.94 614.23, 786.961 618.147, 787.94 622.259, 788.971 626.137, 789.94 633.346, 791.743 634.137, 791.94 634.937, 792.14 642.137, 793.94 645.894, 794.88 650.148, 795.941 654.413, 797.007 658.147, 797.94 662.44, 799.016 666.137, 799.94 673.312, 801.732 674.148, 801.941 674.99, 802.151 674.997, 802.153 682.148, 803.94 685.634, 804.812 690.148, 805.94 693.601, 806.804 698.148, 807.94 702.721, 809.084 706.148, 809.94 713.263, 811.719	

	713.271, 811.721 714.148, 811.94 715.036, 812.162 715.044, 812.164 722.148, 813.94 726.812, 815.109 730.137, 815.94 734.845, 817.117 738.137, 817.94 742.878, 819.125 746.137, 819.94 753.204, 821.707 753.211, 821.709 754.137, 821.94 755.071, 822.174 755.079, 822.176 762.137, 823.94 766.923, 825.137 770.137, 825.94 777.722, 827.837 777.725, 827.837 778.137, 827.94 778.797, 828.105 786.137, 829.94 793.153, 831.694 793.161, 831.696 794.137, 831.94 795.126, 832.187 802.137, 833.94 808.474, 835.525 810.137, 835.94 811.847, 836.368 818.137, 837.94 819.879, 838.376 826.137, 839.94 833.077, 841.675 834.137, 841.94 835.239, 842.216 842.137, 843.94 849.204, 845.707 850.137, 845.94 851.109, 846.183 858.137, 847.94 859.153, 848.194 866.137, 849.94 867.198, 850.205 874.137, 851.94 881.031, 853.664 882.137, 853.94 883.293, 854.229 884.182, 854.452 890.137, 855.94 895.898, 857.381 898.137, 857.94 904.884, 859.627 906.137, 859.94 912.782, 861.602 914.137, 861.94 915.557, 862.295	

Material Boundary	922.137, 863.94 923.565, 864.297 930.137, 865.94 936.197, 867.455 938.137, 867.94 944.598, 869.556 945.218, 869.71 945.978, 869.9 946.137, 869.94 948.322, 870.486 949.797, 870.855 950.928, 871.138 951.605, 871.307 954.137, 871.94 958.68, 873.076 960.273, 873.474 962.137, 873.94 964.95, 874.643 970.137, 875.94 973.979, 876.901 978.137, 877.94 982.81, 879.109 986.137, 879.94 987.237, 880.215 989.094, 880.68 989.211, 880.709 990.456, 881.02 994.137, 881.94 999.063, 883.172 999.18, 883.201 1001.04, 883.665 1002.14, 883.94 1002.26, 883.971 1002.58, 884.05 1002.6, 884.057 1002.97, 884.148 1010.14, 885.94 1016.36, 887.497 1018.14, 887.94 1024.43, 889.513 1026.14, 889.94 1031.96, 891.396 1031.97, 891.399 1034.14, 891.94 1036.46, 892.522 1036.48, 892.525 1042.14, 893.94 1043.71, 894.333 1050.14, 895.94 1051.64, 896.316 1058.14, 897.94 1064.77, 899.599 1066.14, 899.94 1071.47, 901.274 1071.49, 901.277 1074.14, 901.94 1077.03, 902.663 1077.04, 902.666 1082.14, 903.94	

	1088.99, 905.655 1090.14, 905.94 1097.07, 907.674 1098.14, 907.94 1105.15, 909.693 1106.14, 909.94 1110.74, 911.092 1110.76, 911.095 1114.28, 911.976 1131.82, 913.729 1134.42, 913.99 1142.14, 914.761 1154.42, 915.99 1162.14, 916.761 1174.42, 917.99 1192.55, 919.803 1194.42, 919.99 1197.67, 920.315 1201.24, 920.626 1212.17, 921.569 1219.87, 922 1223.74, 922 1239.2, 922 1244.03, 922 1247.67, 922 1263.85, 920.661 1271.47, 919.993 1275.9, 919.64 1278.62, 919.472 1298.9, 917.994 1308.25, 917.25 1313.96, 916.898 1326.36, 915.994 1340.59, 914.861 1349.3, 914.323 1353.81, 913.994 1372.94, 912.471 1380.52, 911.987 1386.1, 910.794 1389.4, 909.977 1389.4, 909.977 1389.54, 909.941 1389.58, 909.932 1397.61, 907.941 1397.74, 907.91 1405.68, 905.941 1405.89, 905.889 1413.75, 903.941 1414.75, 903.696 1414.75, 903.695 1421.83, 901.941 1428.43, 900.306 1428.43, 900.305 1429.9, 899.941 1430.35, 899.828 1437.97, 897.941 1438.5, 897.809 1446.04, 895.941 1446.65, 895.791	

	1454.11, 893.941 1456.13, 893.442 1456.13, 893.441 1457.91, 893 1495.01, 893 1616.33, 893 1858.87, 893 2127.47, 893 2141.81, 893 2181.65, 893 2195.59, 893 2234.57, 893 2475.13, 893 2486.56, 893 2956.54, 893 3093.33, 892.755 3324.03, 892.343 3501.9, 891.208 3555.83, 891 3608.19, 889.002 3660.59, 887.002 3711.05, 885.006 3712.04, 884.91 3731.62, 883.014 3735.8, 882.616 3742.13, 882.013 3742.44, 881.984 3742.77, 881.952 3753, 880.979 3763.15, 880.013 3774.11, 878.971 3784.17, 878.013 3795.54, 876.931 3805.18, 876.013 3817.02, 874.887 3826.2, 874.013 3838.24, 872.889 3847.38, 872.034 3861.75, 868.443 3887.16, 862.09 3907.12, 857.102 3927.17, 852.09 3942.55, 848.243 4034.18, 825.338 4146.55, 797.243 4307.17, 757.09 4332.78, 750.671 4346.49, 747.243 4353.22, 745.561 4353.3, 745.541 4360.73, 743.124
	426.201, 740.106 442.121, 744.086 449.756, 745.995 450.121, 746.086 450.446, 746.167 454.117, 747.086 458.111, 748.086 461.436, 748.919

	466.102, 750.086 473.419, 751.912 474.113, 752.086 474.811, 752.26 482.112, 754.086 486.617, 755.213 490.077, 756.086 493.601, 756.959 498.102, 758.085 501.607, 758.968 506.077, 760.086 513.383, 761.907 514.104, 762.086 514.812, 762.264 522.084, 764.086 525.707, 764.991 530.085, 766.086 538.079, 768.081 538.353, 768.15 538.357, 768.15 546.101, 770.086 553.36, 771.901 554.096, 772.086 554.833, 772.27 562.083, 774.086 565.979, 775.06 570.084, 776.086 574.006, 777.066 578.084, 778.086 582.033, 779.073 586.085, 780.086 593.341, 781.898 594.104, 782.086 594.853, 782.275 602.111, 784.086 606.157, 785.097 610.11, 786.086 614.194, 787.107 618.11, 788.086 622.223, 789.116 626.101, 790.086 633.31, 791.888 634.101, 792.086 634.901, 792.286 642.101, 794.086 645.858, 795.025 650.112, 796.086 654.377, 797.152 658.111, 798.086 662.404, 799.162 666.101, 800.086 673.276, 801.878 674.112, 802.086 674.953, 802.296 674.961, 802.298 682.111, 804.086 685.598, 804.957 690.111, 806.086 693.564, 806.949	

	698.111, 808.086	
	702.685, 809.229	
	706.111, 810.086	
	713.227, 811.865	
	713.234, 811.867	
	714.111, 812.086	
	714.999, 812.308	
	715.007, 812.31	
	722.112, 814.086	
	726.775, 815.254	
	730.101, 816.086	
	734.809, 817.263	
	738.101, 818.086	
	742.842, 819.271	
	746.101, 820.086	
	753.167, 821.852	
	753.175, 821.854	
	754.101, 822.086	
	755.035, 822.319	
	755.043, 822.321	
	762.101, 824.086	
	766.886, 825.282	
	770.101, 826.086	
	777.704, 827.987	
	777.707, 827.987	
	778.101, 828.086	
	778.761, 828.251	
	786.101, 830.086	
	793.117, 831.84	
	793.125, 831.842	
	794.101, 832.086	
	795.089, 832.333	
	802.101, 834.086	
	808.438, 835.67	
	810.101, 836.086	
	811.81, 836.513	
	818.101, 838.086	
	819.843, 838.521	
	826.101, 840.086	
	833.041, 841.821	
	834.101, 842.086	
	835.202, 842.361	
	842.101, 844.086	
	849.167, 845.852	
	850.101, 846.086	
	851.073, 846.329	
	858.101, 848.086	
	859.116, 848.34	
	866.101, 850.086	
	867.161, 850.351	
	874.101, 852.086	
	880.995, 853.809	
	882.101, 854.086	
	883.256, 854.375	
	884.146, 854.597	
	890.101, 856.086	
	895.862, 857.526	
	898.101, 858.086	
	904.848, 859.773	

Material Boundary	906.101, 860.086 912.746, 861.747 914.101, 862.086 915.521, 862.441 922.101, 864.086 923.528, 864.443 930.101, 866.086 936.16, 867.601 938.101, 868.086 944.562, 869.701 945.181, 869.856 945.941, 870.046 946.101, 870.086 948.285, 870.632 949.761, 871.001 950.891, 871.283 951.569, 871.453 954.101, 872.086 958.644, 873.222 960.237, 873.62 962.101, 874.086 964.913, 874.789 970.101, 876.086 973.942, 877.046 978.101, 878.086 982.774, 879.254 986.101, 880.086 987.201, 880.361 989.058, 880.825 989.174, 880.854 990.419, 881.165 994.101, 882.086 999.027, 883.317 999.144, 883.347 1001, 883.811 1002.1, 884.086 1002.22, 884.117 1002.54, 884.195 1002.57, 884.202 1002.93, 884.294 1010.1, 886.086 1016.33, 887.642 1018.1, 888.086 1024.39, 889.659 1026.1, 890.086 1031.92, 891.541 1031.94, 891.544 1034.1, 892.086 1036.43, 892.667 1036.44, 892.671 1042.1, 894.086 1043.67, 894.478 1050.1, 896.086 1051.6, 896.461 1058.1, 898.086 1064.74, 899.745 1066.1, 900.086 1071.43, 901.419 1071.45, 901.423	

	1074.1, 902.086 1076.99, 902.808 1077.01, 902.812 1082.1, 904.086 1088.96, 905.8 1090.1, 906.086 1097.03, 907.819 1098.1, 908.086 1105.11, 909.839 1106.1, 910.086 1110.71, 911.237 1110.72, 911.241 1114.25, 912.124 1131.8, 913.879 1134.41, 914.139 1142.12, 914.911 1154.41, 916.139 1162.12, 916.911 1174.41, 918.139 1192.53, 919.952 1194.41, 920.139 1197.66, 920.465 1201.22, 920.776 1212.16, 921.718 1219.87, 922.15 1223.74, 922.15 1239.2, 922.15 1244.03, 922.15 1247.67, 922.15 1263.87, 920.811 1271.48, 920.143 1275.91, 919.79 1278.63, 919.622 1298.92, 918.144 1308.26, 917.4 1313.97, 917.047 1326.37, 916.144 1340.6, 915.011 1349.31, 914.473 1353.82, 914.144 1372.95, 912.621 1380.54, 912.136 1386.13, 910.94 1389.43, 910.122 1389.43, 910.122 1389.57, 910.087 1389.61, 910.077 1397.65, 908.087 1397.77, 908.056 1405.72, 906.087 1405.93, 906.034 1413.79, 904.087 1414.78, 903.841 1414.79, 903.84 1421.86, 902.087 1428.46, 900.451 1428.47, 900.45 1429.93, 900.087 1430.39, 899.974	

	1438.01, 898.087 1438.54, 897.955 1446.08, 896.087 1446.69, 895.936 1454.15, 894.087 1456.17, 893.588 1456.17, 893.587 1457.93, 893.15 1495.01, 893.15 1616.33, 893.15 1858.87, 893.15 2127.47, 893.15 2141.81, 893.15 2181.65, 893.15 2195.59, 893.15 2234.57, 893.15 2475.13, 893.15 2486.56, 893.15 2956.54, 893.15 3093.33, 892.905 3324.03, 892.493 3501.9, 891.358 3555.84, 891.15 3608.19, 889.152 3660.59, 887.152 3711.06, 885.155 3712.05, 885.059 3731.64, 883.163 3735.81, 882.765 3742.15, 882.163 3742.45, 882.134 3742.79, 882.102 3753.01, 881.129 3763.16, 880.163 3774.12, 879.12 3784.18, 878.163 3795.56, 877.08 3805.2, 876.163 3817.03, 875.037 3826.22, 874.163 3838.25, 873.038 3847.41, 872.183 3861.79, 868.588 3887.2, 862.235 3907.15, 857.247 3927.2, 852.235 3942.59, 848.389 4034.21, 825.483 4146.59, 797.389 4307.21, 757.235 4332.82, 750.816 4346.52, 747.389 4353.25, 745.706 4353.34, 745.686 4361.26, 743.112

Material Boundary	4481.94, 733 4481.94, 733 4484.34, 732.521 4486.94, 732 4491.68, 731.051 4496.94, 730 4498.1, 729.768 4499.44, 729.5 4500.79, 729.23 4501.94, 729 4504.67, 728.454 4506.94, 728

Scenario-based Entities

Type	Coordinates (x,y)	Static
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727 334.438, 727 352.838, 735.003 356.385, 735.013 366.425, 735.2 372.719, 735.318 379.181, 735.415 391.383, 735.573 399.078, 735.005 407.323, 734.789 412.029, 734.347	Assigned to: Wadsworth Till

	439.628, 735.289		
	488.131, 719.138		
	522.779, 707.602		
	608.698, 679		
	618.307, 679		
	629.067, 679.262		
	642.777, 679.595		
	647.559, 679.711		
	660.405, 680.023		
	675.999, 680.402		
	689.108, 680.721		
	700.659, 681.002		
	711.292, 681.261		
	721.531, 681.51		
	724.458, 681.581		
	731.21, 681.745		
	742.989, 682.032		
	746.542, 682.118		
	760.228, 682.452		
	768.453, 682.652		
	775.361, 682.481		
	785.608, 682.229		
	792.858, 682.05		
	834.445, 681.025		
	836.108, 681		
	839.229, 681		
	842.442, 681		
	846.403, 681		
	851.249, 681		
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	858.565, 681		
	861.768, 681		
	864.838, 681		
	868.722, 681		
	876.123, 681		
	879.684, 681		
	882.824, 681		
	885.634, 681		
	888.824, 680.784		
	905.654, 679.642		
	913.684, 679.098		
	914.27, 679.058		
	916.598, 679.003		
	918.712, 678.951		
	920.654, 678.998		
	921.208, 679.012		
	921.899, 679.03		
	923.072, 679.061		
	924.878, 679.141		
	925.393, 679.164		
	926.99, 679.234		
	928.274, 679.291		
	929.213, 679.332		
	930.561, 679.392		
	932.042, 679.457		
	934.813, 679.981		
	940.841, 680.61		
	945.459, 681.092		
	948.634, 682.055		

Water Table	953.372, 683.186 964.682, 686.266 968.611, 687.32 970.51, 687.807 973.537, 688.568 983.137, 690.678 992.201, 692.586 995.001, 693.111 1005.88, 695.316 1015.48, 697.262 1026.16, 698.595 1029.95, 699.071 1037.13, 700.174 1049.53, 700.993 1053.89, 701.352 1060.67, 701.77 1068.84, 701.86 1069.64, 701.862 1072.74, 701.68 1077.4, 701.408 1085.39, 700.951 1093.76, 700.535 1103.93, 699.206 1105.21, 699.039 1108.51, 698.705 1108.62, 698.694 1115.88, 697.749 1119.27, 697.117 1126.35, 695.778 1134.85, 694.035 1143.12, 692.32 1144.75, 691.993 1145.42, 691.857 1146.43, 691.649 1147.98, 691.316 1148.3, 691.248 1149.18, 691.068 1151.08, 690.719 1156.36, 689.409 1157.27, 689.184 1163.63, 687.532 1180.77, 687.159 1199.14, 687 1219.87, 686.821 1247.6, 686.53 1274.47, 687.001 1354.82, 688.409 1380.15, 687.893 1449.6, 687 1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683		

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	3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4441.57, 741.074 4791.53, 741.074 4796.96, 737.054 5009.05, 737.054		
	-9e-16, 723.896 0.809461, 723.908 1.15168, 723.913 1.45658, 723.917 1.93345, 723.924 4.30816, 723.96 12.6281, 724.084 24.2881, 724.257 113.381, 725.584 150.125, 726.131 251.754, 727.644 262.684, 727.807 264.857, 727.839 267.412, 727.877 267.74, 727.882 267.83, 727.883 268.093, 727.885 268.368, 727.882 269.061, 727.877 272.624, 727.847 281.529, 727.773 284.508, 727.748 284.959, 727.743 286.557, 727.708 289.734, 727.637 295.936, 727.498 301.316, 727.378 309.904, 727.186 313.768, 727.1 314.73, 727 317.794, 727 322.428, 727 327.892, 727		

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	925.393, 679.164		
	926.99, 679.234		
	928.274, 679.291		
	929.213, 679.332		
	930.561, 679.392		
	932.042, 679.457		
	934.813, 679.981		
	940.841, 680.61		
	945.459, 681.092		
	948.634, 682.055		
	953.372, 683.186		
	964.682, 686.266		
	968.611, 687.32		
	970.51, 687.807		
	973.537, 688.568		
	983.137, 690.678		
	992.201, 692.586		
	995.001, 693.111		
	1005.88, 695.316		
	1015.48, 697.262		
	1026.16, 698.595		
	1029.95, 699.071		
	1037.13, 700.174		
	1049.53, 700.993		
	1053.89, 701.352		
	1060.67, 701.77		
	1068.84, 701.86		
	1069.64, 701.862		
	1072.74, 701.68		
	1077.4, 701.408		
	1085.39, 700.951		
	1093.76, 700.535		
	1103.93, 699.206		
	1105.21, 699.039		
	1108.51, 698.705		
	1108.62, 698.694		
	1115.88, 697.749		
	1119.27, 697.117		
	1126.35, 695.778		
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	1144.75, 691.993		
	1145.42, 691.857		
	1146.43, 691.649		
	1147.98, 691.316		
	1148.3, 691.248		
	1149.18, 691.068		
	1151.08, 690.719		
	1156.36, 689.409		
	1157.27, 689.184		
	1163.63, 687.532		
	1180.77, 687.159		
	1199.14, 687		
	1219.87, 686.821		
	1247.6, 686.53		
	1274.47, 687.001		
	1354.82, 688.409		
	1380.15, 687.893		
	1449.6, 687		

Drawdown Line	1461.71, 687 1495.01, 687 1500.34, 687 1516.14, 686.278 1637.24, 685 1692.76, 685 1718.93, 684.138 1781.09, 683.397 1807.08, 683 1816.05, 683 1826.62, 683 1845.4, 682.209 1854.88, 679 1862.97, 679 1893.13, 688.871 1989.22, 720.9 2041.9, 738.472 2194.18, 687.752 2229.99, 688.38 2366.91, 690.776 2388.53, 690.405 2447.68, 689.392 2475.13, 688.921 2503.25, 688.435 2521.93, 688.112 2580.04, 689.12 2600.94, 689.482 2620.01, 689.813 2676.93, 690.8 2698.09, 690.434 2754.87, 689.452 2812.87, 688.448 2824.98, 688.239 2831.93, 688.119 2850.97, 688.449 2908.97, 689.455 2965.99, 690.443 2986.93, 690.807 3007.8, 690.446 3064.92, 689.458 3122.98, 688.453 3141.93, 688.125 3160.82, 688.453 3218.92, 689.461 3276.19, 690.454 3296.93, 690.814 3317.6, 690.456 3374.97, 689.464 3433.13, 688.457 3451.93, 688.132 3470.67, 688.457 3501.92, 688.999 3529.71, 689.545 3555.9, 690.059 3593.11, 690.795 3608.3, 691.095 3613.84, 691.204 3660.7, 690.618 3690.85, 690.24	

	3711.25, 689.984 3731.91, 689.696 3737.4, 689.624 3756.29, 689.378 3778.84, 689.083 3829.56, 690.08 3847.89, 690.44 3856.6, 690.594 3876.52, 690.946 3891.68, 691.214 3937.75, 692.028 3943.28, 691.934 3967.79, 691.516 4028.7, 690.475 4075.88, 689.669 4092.79, 689.38 4147.28, 690.336 4166.21, 690.668 4214.57, 691.517 4293.87, 717.935 4347.22, 735.704 4355, 738.297 4369.59, 738.142 4375.46, 736.173 4379.34, 734.899 4386.69, 734.881 4390.98, 734.901 4397.07, 736.947 4400, 737.917 4410.58, 738.104 4428.73, 738.546 4430.97, 738.097 4441.29, 736.032 4446.59, 734.97 4455.94, 733.097 4460.99, 732.09 4463.46, 731.597 4465.14, 731.261 4465.96, 731.097 4472.68, 729.754 4475.95, 729.1 4478.43, 728.588 4481.38, 728 4481.45, 728 4483.36, 727.618 4485.96, 727.097 4490.7, 726.149 4495.96, 725.097 4497.12, 724.865 4498.46, 724.597 4499.81, 724.327 4500.96, 724.097 4503.69, 723.551 4505.51, 723.187 4506.46, 722.809 4508.48, 722 4513.9, 722 4516.95, 722 4519.28, 721.534		

	4521.95, 721 4656.84, 721 4685.73, 721 4711.04, 721 4713.3, 721.452 4716.04, 722 4718.38, 722 4724.51, 722 4726.29, 722.711 4727.48, 723.187 4728.79, 723.45 4732.03, 724.097 4732.91, 724.274 4734.53, 724.597 4735.41, 724.773 4737.03, 725.097 4740.55, 725.801 4747.03, 727.097 4748.79, 727.448 4752.03, 728.097 4753.78, 728.448 4757.03, 729.097 4760.53, 729.797 4763.5, 730.39 4767.03, 731.097 4767.91, 731.272 4769.54, 731.598 4771.42, 731.978 4774.43, 732.582 4776.5, 733 4776.53, 733 4784.64, 734.61 4786.11, 734.902 4786.67, 735.014 4787.93, 735.263 4795.37, 736.738 4795.62, 736.787 4796.96, 737.054 5009.05, 737.054		
	435.797, 740.289 443.602, 740.289 447.47, 739 450.033, 738.146 453.47, 737 454.639, 736.61 456.913, 735.853 459.474, 735 462.023, 734.151 465.481, 733 465.482, 733 470.568, 731.307 477.496, 729 480.031, 728.156 483.505, 727 486.035, 726.158 489.513, 725 493.701, 723.607 495.524, 723 499.16, 721.79	Assigned to: LCS Granular Drainage Layer Bottom Liner Critical Interface - Base and Sideslopes Low Permeable Earth Liner	

	507.535, 719 509.344, 718.398 513.543, 717 515.347, 716.4 519.551, 715 521.35, 714.401 525.559, 713 529.162, 711.807 537.749, 709 539.827, 708.301 543.591, 707 545.694, 706.3 549.599, 705 551.706, 704.298 555.606, 703 560.534, 701.359 567.615, 699 570.071, 698.182 573.623, 697 577.692, 695.645 579.631, 695 583.706, 693.643 583.706, 693.643 585.639, 693 594.551, 690.033 597.655, 689 599.571, 688.362 603.662, 687 608.129, 685.513 609.67, 685 618.233, 685 628.127, 685.241 628.175, 685.242 700.514, 687 768.454, 688.654 835.534, 687 874.622, 687 885.02, 687 885.837, 687 914.501, 685.056 914.512, 685.056 916.783, 685 918.713, 684.952 920.67, 685 922.861, 685.058 931.35, 685.433 933.943, 685.923 944.266, 687 947.065, 687.849 951.886, 689 965.137, 692.608 966.644, 693 967.06, 693.116 971.617, 694.286 974.456, 694.923 974.842, 695 982.543, 696.691 984.141, 697 990.827, 698.433		

	993.853, 699 1011.96, 702.672 1013.62, 703 1014.48, 703.184 1029.03, 705 1036.48, 706.144 1049.43, 707 1054.51, 707.425 1060.93, 707.795 1067.29, 707.858 1069.81, 707.862 1084.55, 707 1094.3, 706.515 1105.9, 705 1109.31, 704.655 1114.62, 703.964 1116.8, 703.68 1119.86, 703.126 1120.45, 703 1128.59, 701.46 1130.69, 701 1136.6, 699.804 1140.35, 699 1147.15, 697.628 1150.1, 697 1152.34, 696.587 1158.74, 695 1164.46, 693.516 1180.87, 693.158 1199.19, 693 1219.93, 692.821 1247.58, 692.53 1274.37, 693 1354.83, 694.411 1380.25, 693.892 1449.64, 693 1461.71, 693 1495.01, 693 1500.48, 693 1516.31, 692.277 1637.28, 691 1692.86, 691 1719.06, 690.137 1781.17, 689.396 1807.13, 689 1816.05, 689 1826.74, 689 1846.47, 688.169 1846.65, 688.162 1850.41, 686.948 1855.35, 685.225 1856.02, 685 1856.55, 685 1858.87, 685 1861.85, 685 1868.81, 687.228 1874.47, 689 1874.47, 689 1875.79, 689.44	

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Focus Search Window	4434.16, 725.451 4762.52, 725.451 4762.52, 752 4434.16, 742.558	

J.2-E Summary of Shear Strength Values

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: SUMMARY OF ACCEPTABLE SHEAR STRENGTH VALUES

Problem Statement

Summarize the acceptable peak shear strength values for interface friction angles of the liner/leachate collection system and final cover components for the landfill based on previous calculations in this appendix.

Given

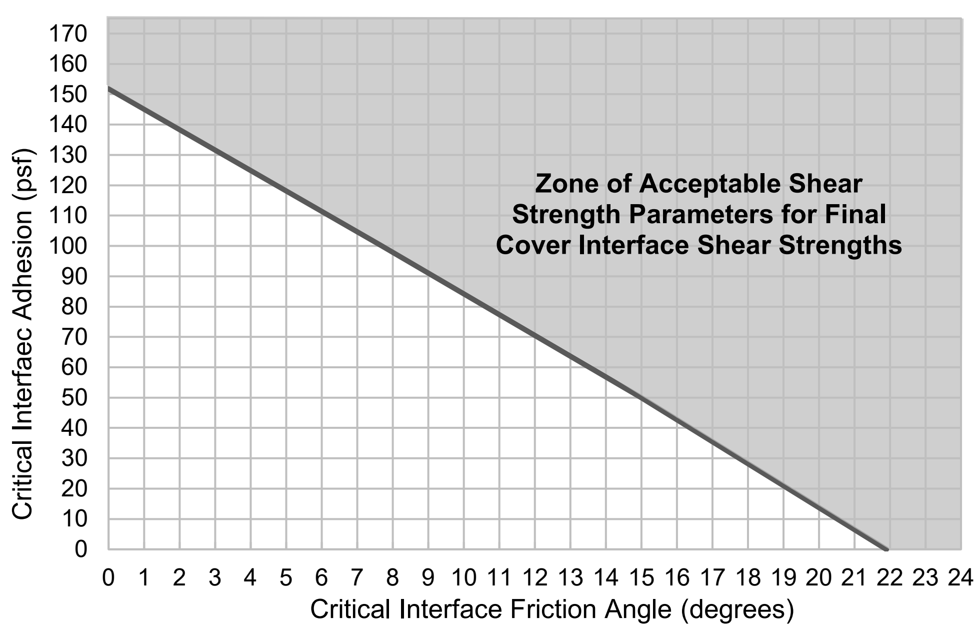
- ❑ **Appendix J.2-A**: Shear Strength Evaluation of Final Cover
- ❑ **Appendix J.2-B**: Shear Strength Evaluation of Liner / Leachate Collection System Prior to Waste Placement
- ❑ **Appendix J.2-C**: Shear Strength Evaluation of Liner / Leachate Collection System After Waste Placement (Global Stability Analyses)
- ❑ **Appendix J.2-D**: Shear Strength Evaluation of Wadsworth Till During Rapid Drawdown of Detention Basin (Global Stability Analysis)

Results

Final Cover

Interfaces of the final cover system shall be evaluated as described in the CQA Plan to ensure that the interface peak shear strength friction angle and adhesion values are within the acceptable range shown below. These interfaces include the following:

- ❑ Protective soil cover to geocomposite;
- ❑ Geocomposite to textured geomembrane; or
- ❑ Textured geomembrane to low permeable soil layer.



Client:	Zion Landfill, Inc.
Project:	Zion Landfill – Site 2 North Expansion
Project #:	631020105
Calculated By: ORC	Date: 05/2022
Checked by: DAM	Date: 05/2022

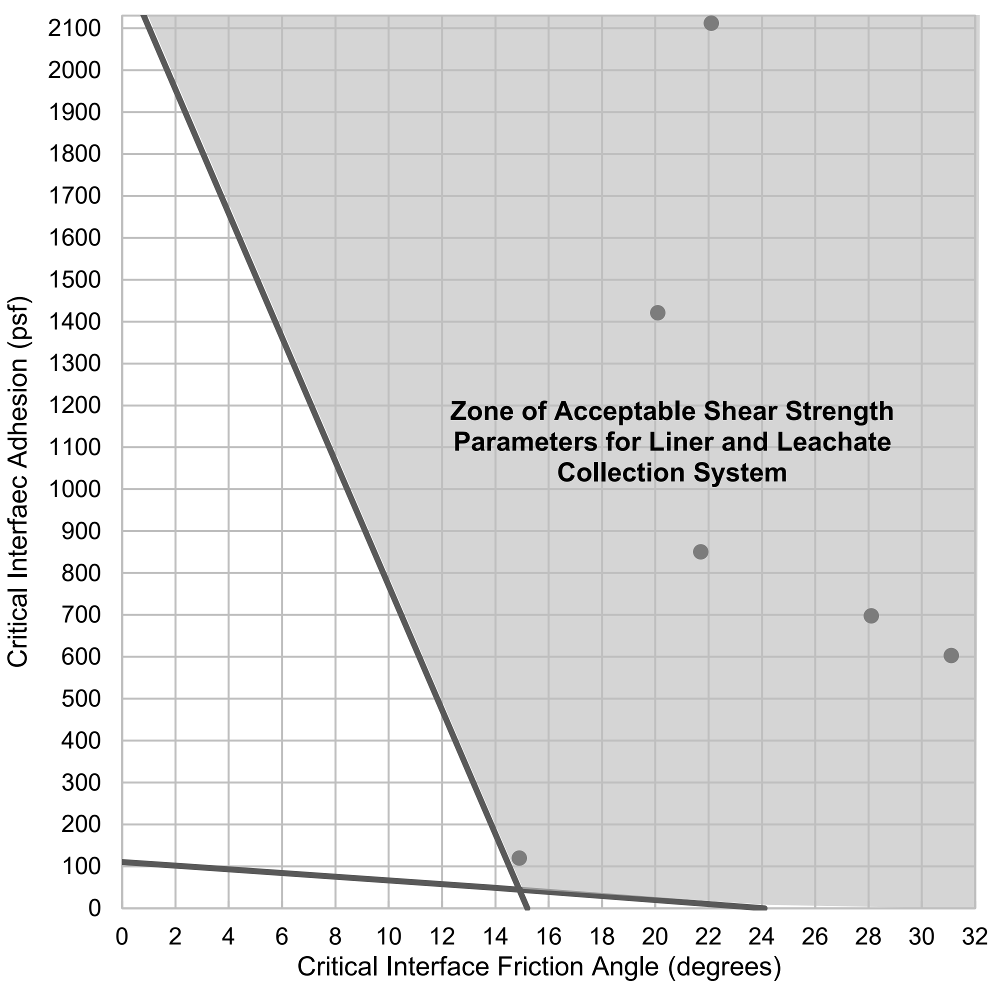
TITLE: SUMMARY OF ACCEPTABLE SHEAR STRENGTH VALUES

Liner and Leachate Collection System

Interfaces of the liner and leachate collection shall be evaluated as described in the CQA Plan to ensure that the interface peak shear strength friction angle and adhesion values are within the acceptable range shown below. These interfaces include the following:

- Geotextile to granular drainage layer;
- Geotextile to textured geomembrane; or
- Textured geomembrane to low permeable earth liner.

Laboratory reported peak shear strengths for the bottom liner critical interfaces in Cells 9 and 10 of Zion Landfill are shown as points below (see lab test results also in **Appendix J.1**). It should be noted that the interface results from the constructed bottom liner fall within the acceptable window developed for the Site 2 North Expansion.



J.3 – Foundation Evaluations

APTIM

J.3-A Hydrostatic Uplift

APTIM

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Proj. #: 631020105

Calculated By: ORC Date: 05/2022

Checked By: DAM Date: 05/2022

TITLE: STABILITY AGAINST HYDROSTATIC UPLIFT

Problem Statement

Determine the stability against hydrostatic uplift of the excavation during construction activities by estimating the greatest anticipated hydrostatic uplift forces that may act on the bottom of excavation.

Given

- ❑ **Appendix J.1** "Summary of Geotechnical Design Parameters" contained in this application.
- ❑ Excavation grades included in the design drawings contained in this application.
- ❑ A minimum factor of safety of 1.0 will be maintained against hydrostatic uplift by maintaining the potentiometric

Assumptions

- ❑ Potentiometric levels for the Wadsworth Till are assumed to be 5-feet below the existing ground surface and once the liner system is constructed it is assumed to be in contact with the bottom of the low permeability earth liner layer along the base and sideslopes. This represents the worst-case scenario for groundwater.
- ❑ The approximate maximum excavation depth will occur in the eastern end of Cell 11. At this location:

Existing ground level* (avg)	= El. 743 feet MSL
Assumed Potentiometric level	= El. 738 feet MSL
Top of leachate collection system (min)	= El. 689 feet MSL
Top of liner (min)	= El. 688 feet MSL
Liner thickness	= 5 feet
Bottom of excavation	= El. 683 feet MSL

* Note: The existing ground level is the approximate average existing ground level in the proposed horizontal expansion. The top of the leachate collection system is the minimum elevation of the leachate collection system in the proposed horizontal expansion.

- ❑ The following material properties are assumed:

γ_{water} (γ_w)	= 62.4 pcf
γ_{LCS}	= 130.0 pcf
γ_{liner}	= 134.1 pcf
γ_{waste}	= 75 pcf

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Proj. #: 631020105

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TITLE: STABILITY AGAINST HYDROSTATIC UPLIFT

- Because of the backfill/liner is considered an engineered, very low permeable layer (relatively impermeable); the hydrostatic uplift forces are assumed to act on the base of the backfill/liner at the bottom of the excavation.
- The hydrostatic uplift is calculated by multiplying the difference of the excavation elevation and potentiometric elevation by the unit weight of water.
- The factor of safety (FS) against hydrostatic uplift after excavation is assumed equal to 1.2 and is calculated as:

$$FS = \frac{\text{counter pressure}}{\text{hydrostatic uplift}}$$

Calculations

The factor of safety against hydrostatic uplift is calculated as follows:

Hydrostatic uplift $= (\text{El. } 743 - \text{El. } 683)\gamma_w = (60 \text{ feet})(62.4 \text{ pcf}) = 3{,}744 \text{ psf}$

Counter pressure $= H_{Waste}\gamma_{Waste} + H_{LCS}\gamma_{LCS} + H_{Liner}\gamma_{Liner}$

$= H_{Waste}(75 \text{ pcf}) + (1 \text{ ft})(130.0 \text{ pcf}) + (5 \text{ ft})(134.1 \text{ pcf})$

$= 75 \times H_{Waste} + 800.5$

$$FS = \frac{\text{counter pressure}}{\text{hydrostatic uplift}} = \frac{800.5 + 75 \times H_{Waste}}{3{,}744} = 1.2$$

$H_{Waste} = 49.2$ feet

Results

Based on the worst anticipated conditions at the site and conservative assumptions, the liner system will be stable with respect to hydrostatic uplift once waste is placed to an initial height of approximately 49.2 feet in the horizontal expansion. Before the waste reaches this height, stability will be achieved by dewatering of the till using the gradient control system. It is recognized that this calculation conservatively represents the worst-case scenario at the site.

J.3-B Foundation Settlement

Client:	Zion Landfill, Inc.
Project:	Zion Landfill – Site 2 North Expansion
Project #:	631020105
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TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF LEACHATE COLLECTION SYSTEM

Problem Statement

Differential settlement is a measure of the difference in settlement that occurs between different locations based on location-specific loads. Differential settlement has the potential to impact landfills when the variation of settlement is greater than the design slopes of design features. This calculation determines the maximum settlement that is anticipated to occur at multiple locations within the underlying foundation to ensure that the leachate collection system will maintain a positive slope.

Note: A differential settlement of the waste mass is considered in a subsequent calculation to determine whether the final cover will maintain positive drainage after settlement occurs.

Given

- ❑ Drawings of the “Final Landform Grades” and “Excavation Grades” contained in this Application.
- ❑ Section 2.2, Hydrogeologic Report, in this Application.
- ❑ **Appendix J.1** “Summary of Geotechnical Parameters” contained in this Application.
- ❑ Microsoft Excel settlement calculation spreadsheets (refer to attached pages).
- ❑ Yee, K., Menard Geosystems Sdn Bhd, Lumpur, K., Ugrading of Existing Landfills by Dynamic Consolidation - A Geotechnical Aspect, Master Builders Journal, September, 1999 (Refer to attached pages).
- ❑ Personal Communication, Research Reference Notes, Craig H. Benson, University of Wisconsin-Madison, 2009.
- ❑ Budhu, Muni, Foundations and Earth Retaining Structures (refer to attached pages).

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
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TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF LEACHATE COLLECTION SYSTEM

Background

Consolidation of materials that will lead to settlement is divided into two categories:

1. Primary Consolidation Settlement
   Occurs in saturated cohesive soils occurs due to the expulsion of water in response to an increase in effective stress. Primary settlement is determined using the following equation for normally consolidated soils.

$$S_P = \left((C_c) \left(\frac{H_o}{1+e_o} \right) \log \left(\frac{\sigma'_{v_f}}{\sigma'_{v_o}} \right) \right)$$

Where,

S_p = Primary Settlement, feet
C_c = Compression Index
H = Thickness of the layer, feet
e_o = Initial void ratio = $n/(1-n)$
σ'_{vf} = Final vertical effective stress, psf
σ'_{vo} = Initial vertical effective stress, psf

2. Secondary Consolidation Settlement
   Occurs only in saturated cohesive soils and is the result of the plastic adjustment of soil fabrics. Secondary consolidation is calculated using the following equation.

$$S_S = \left(\left(\frac{C_\alpha}{1+e_p} \right) H \log \left(\frac{T_2}{T_1} \right) \right)$$

Where:

S_S = Secondary settlement, feet
C_α = Secondary compression index
H = Thickness of Layer, feet
e_p = Void Ratio at end of primary consolidation
= e_o (to be conservative)
T_1 = Time at start of secondary compression, 30 years
T_2 = Time at end of observation period, 60 years

Note: The Wadsworth Till soils have an overconsolidation ratio (OCR) ranging from 0.82 to 1.52 (average value of 1.11, see Appendix J.1) and are therefore normally consolidated to slightly overconsolidated. To be conservative, it is assumed in this calculation that the Wadsworth Till will be normally consolidated.

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Assumptions and Calculations – Liner System/Foundation Settlement

The leachate collection system (LCS) grades will settle as the low permeable earth liner and underlying foundation soils settle due to the weight of the overlying landfill. Differential settlement has been evaluated to ensure that the LCS will continue to drain after compression of the underlying compressible soils occurs. The compressible layers beneath the LCS include the low permeable earth liner and the Wadsworth Till.

The minimum slopes of the LCS is along the pipe runs. Therefore, the maximum potential differential settlement was evaluated along the pipe runs considered the most likely to be impacted by differential settlement in the horizontal and vertical expansions. **Table 1** provides the elevations and thicknesses of layers prior to landfill development. **Table 2** provides the thicknesses of the relevant landfill system layers after landfill development.

Vertical Expansion Locations Analyzed for Liner System / Foundation Settlement

The LCS pipes in the permitted landfill were analyzed to ensure that they will continue to perform as intended after additional loading from the vertical expansion. For the purpose of this evaluation, the right LCS pipe in Cell 7 (1.0% slope down pipe run and 33.33% slope in the LCS sump) and the left LCS pipe in Cell 9 (slope 0.5%) were analyzed. Both of these pipes underlie the vertical expansion area. Points S1, S2, and S3 are used to analyze the Cell 7 LCS pipe and points S4 and S5 are used to analyze the Cell 9 LCS pipe.

The base liner system underlying the vertical expansion has already been constructed. This calculation conservatively evaluates differential settlement at the vertical expansion analysis points due to the weight of the landfill only, rather than evaluating the weight of the landfill less the initial overburden loading. The result of this approach conservatively over-estimates settlement at these locations.

The LCS pipe in Cell 7 was analyzed as it contains the maximum waste thickness overlying a pipe in the vertical expansion area (Point S1). Point S1 is also located in the sump area. Point S2 represents the transition from the sump area (slope 33.33%) to the highest point in the LCS pipe (slope 1%) under the vertical expansion (Point S3). Point S3 is also the maximum till thickness under this pipe.

The LCS pipe in Cell 9 was analyzed because it is the lowest slope of any LCS pipe in either the horizontal or vertical expansion (0.5%). Point S4 represents the maximum waste thickness to overly this specific pipe. Point S5 is the highest point in the LCS pipe that is still under the vertical expansion.

The horizontal distance (used to determine differential settlement between the points are as follows:

- S1 to S2: 39 ft
- S1 to S3: 366 ft
- S2 to S3: 327 ft
- S4 to S5: 141 ft

Horizontal Expansion Locations Analyzed for Liner System / Foundation Settlement

The leachate pipe that is considered the most likely to be impacted by differential settlement in the horizontal expansion area is the pipe running through the center of Cell 11, for the following reasons:

1. The maximum waste thickness and elevation in the horizontal expansion is located over the LCS pipe in this Cell, which provides the greatest loading that may drive differential settlement.

2. The Wadsworth Till is thicker and more consistently thick under Cell 11 than in any other Cell.

3. The leachate collection pipe exhibits a shallow slope of 1.0%, which provides the potential impact due to differential settlement.

Point S6 represents the lowest point in the LCS pipe for Cell 11. The maximum waste thickness and elevation in the horizontal expansion overlies the LCS pipe in Cell 11 and is located at Point S8. The maximum till thickness beneath the LCS pipe is approximately 40.5 feet and is represented as Point S10. Points S7 and S9 represent the transition points from the final cover plateau to the sideslopes immediately above the Cell 11 pipe.

The horizontal distance (used to determine differential settlement between the points are as follows:

- S6 to S7: 345 ft
- S6 to S8: 464 ft
- S6 to S9: 581 ft
- S6 to S10: 979 ft
- S7 to S8: 119 ft
- S7 to S9: 236 ft
- S7 and S10: 635 ft
- S8 and S9: 117 ft
- S8 to S10: 516 ft
- S9 to S10: 399 ft

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TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF LEACHATE COLLECTION SYSTEM

Table 1 – Layer Thicknesses for Analysis by Point
Liner System / Foundation Settlement

Location / Point	Existing Ground Elevation (ft MSL)	Base of Excavation Elevation (ft (MSL)	Bottom of Wadsworth Till Elevation (ft MSL)	Thickness of Wadsworth Till to be Removed (ft)	Thickness of Wadsworth Till to Remain (ft)*
Vertical Expansion Area					
S1	748.0	675.3	652.8	0	22.5
S2	748.0	683.0	652.7	0	30.3
S3	766.6	687.0	652.6	0	34.4
S4	748.6	677.4	652.6	0	24.8
S5	747.2	678.4	652.3	0	26.1
Horizontal Expansion Area					
S6	738.2	683.5	649.1	54.7	34.4
S7	744.2	686.7	652.8	57.5	33.9
S8	744.8	687.8	654.0	57.0	33.8
S9	741.2	689.2	654.2	52.0	35.0
S10	745.3	693.4	652.9	51.9	40.5

* Note: Wadsworth Till will not be removed from the vertical expansion area due to the liner already being constructed. The upper five feet of Wadsworth Till to be removed from the horizontal expansion area is assumed to be unsaturated. The remaining thickness is assumed to be saturated.

Table 2 – Layer Thicknesses for Analysis by Point
Liner System / Foundation Settlement

Location / Point	Final Cover Thickness (ft)	Waste Thickness (ft)	LCS Drainage Layer Thickness (ft)	Low Permeable Earth Liner Thickness (ft)	Saturated Wadsworth Till Thickness (ft)
Vertical Expansion Area					
S1	5	206.0	1	5	22.5
S2	5	198.4	1	5	30.3
S3	5	193.7	1	5	34.4
S4	5	170.2	1	5	24.8
S5	5	168.1	1	5	26.1
Horizontal Expansion Area					
S6	5	103.8	1	5	34.4
S7	5	187.2	1	5	33.9
S8	5	198.0	1	5	33.8
S9	5	185.1	1	5	35.0
S10	5	81.4	1	5	40.5

Initial Conditions

For each point, the thickness of the Wadsworth Till (separated by saturated and unsaturated thicknesses) is considered to allow a comparison of pre-development and post-development stress concentrations for each compressible unit. The bottom liner under the vertical expansion has already been constructed, so no excavation will be required. The groundwater level under the vertical expansion is conservatively assumed to be in contact with the base of the liner. A groundwater elevation of 5 feet below ground surface is conservatively assumed at each location in the horizontal expansion for initial conditions. Unit weights of each material is based on summaries provided in **Appendix J.1**.

The equations presented on the previous pages were used to estimate the foundation settlement at each point:

> Initial Effective Stress. The initial effective stress of the in-situ materials is the average effective stress prior to excavation and waste placement. The initial effective stress for the low permeable earth liner was calculated as its self-weight. Please see the attached spreadsheets for calculations. The effective stress values for initial conditions are summarized in **Table 3** below.
>
> Final Effective Stress. The final effective stress is the effective stress following final cover placement. The final effective stress is calculated at the center of the low permeable earth liner. Please see attached spreadsheets for calculations. The effective stress values for final conditions are summarized in **Table 3**.

As previously noted, the base liner system underlying the vertical expansion has already been constructed. This calculation conservatively evaluates differential settlement at the vertical expansion analysis points due to the weight of the landfill only, rather than evaluating the weight of the landfill less the initial overburden loading. The result of this approach conservatively over-estimates settlement at these locations.

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Table 3 – Layer Stresses by Point
Liner System / Foundation Settlement

Location / Point	Layer Description	Unit Thickness (ft)	Initial Mid-Layer Stress (psf)	Final Mid-Layer Stress (psf)
Vertical Expansion Area				
S1	Earth Liner	5	335.3	16,566.8
	Saturated Till (To Remain in Place)	22.5	848.3	17,750.3
S2	Earth Liner	5	335.3	15,996.8
	Saturated Till (To Remain in Place)	30.3	1,142.3	17,474.3
S3	Earth Liner	5	335.3	15,644.3
	Saturated Till (To Remain in Place)	34.4	1,296.9	17,276.4
S4	Earth Liner	5	335.3	13,881.8
	Saturated Till (To Remain in Place)	24.8	935.0	15,152.0
S5	Earth Liner	5	335.3	13,724.3
	Saturated Till (To Remain in Place)	26.1	984.0	15,043.5
Horizontal Expansion Area				
S6	Earth Liner	5	335.3	8,901.8
	Saturated Till (To Remain in Place)	34.4	5,733.3	10,533.9
S7	Earth Liner	5	335.3	15,156.8
	Saturated Till (To Remain in Place)	33.9	5,925.5	16,770.0
S8	Earth Liner	5	335.3	15,966.8
	Saturated Till (To Remain in Place)	33.8	5,884.1	17,576.3
S9	Earth Liner	5	335.3	14,999.3
	Saturated Till (To Remain in Place)	35.0	5,552.3	16,654.0
S10	Earth Liner	5	335.3	7,221.8
	Saturated Till (To Remain in Place)	40.5	5,752.1	9,083.9

TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF LEACHATE COLLECTION SYSTEM

Primary and Secondary Consolidation Settlement

Table 4 below summarizes the results of calculations completed in spreadsheets that are attached at the end of this section.

Table 4 – Settlement by Point
Liner System / Foundation Settlement

Location / Point	Layer Description	Primary Settlement (ft)	Secondary Settlement (ft)	Total Settlement (ft)	Total Settlement at Point (ft)
Vertical Expansion Area					
S1	Earth Liner	0.5	0.003	0.5	2.2
	Saturated Till	1.7	0.015	1.7	
S2	Earth Liner	0.5	0.003	0.5	2.5
	Saturated Till	2.0	0.020	2.0	
S3	Earth Liner	0.5	0.003	0.5	2.7
	Saturated Till	2.2	0.023	2.2	
S4	Earth Liner	0.5	0.003	0.5	2.1
	Saturated Till	1.7	0.017	1.7	
S5	Earth Liner	0.5	0.003	0.5	2.2
	Saturated Till	1.7	0.018	1.7	
Horizontal Expansion Area					
S6	Earth Liner	0.4	0.003	0.4	0.9
	Saturated Till	0.5	0.023	0.5	
S7	Earth Liner	0.5	0.003	0.5	1.3
	Saturated Till	0.9	0.023	0.9	
S8	Earth Liner	0.5	0.003	0.5	1.4
	Saturated Till	0.9	0.023	0.9	
S9	Earth Liner	0.5	0.003	0.5	1.4
	Saturated Till	0.9	0.024	1.0	
S10	Earth Liner	0.4	0.003	0.4	0.9
	Saturated Till	0.4	0.027	0.5	

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Differential Settlement

The differential settlement between points are calculated as follows:

$$S_{diff} = \frac{|S_{S1}-S_{S2}|}{Distance_{S1\ to\ S2}} \times 100\%$$

Table 5 – Differential Settlement Between Points Liner System / Foundation Settlement							
Point 1	**Point 2**	**Settlement 1 (ft)**	**Settlement 2 (ft)**	**Distance Between Points (ft)**	**Differential Settlement (%)**	**Initial Pipe Slope (%)**	**Pipe Slope After Settlement (%)**
Vertical Expansion Area							
S1	S2	2.2	2.5	39	**0.89**	33.33	**32.44**
S1	S3	2.2	2.7	366	**0.14**	1.00	**0.86**
S2	S3	2.5	2.7	327	0.05	1.00	0.95
S4	S5	2.1	2.2	141	**0.04**	0.50	**0.46**
Horizontal Expansion Area							
S6	S7	0.9	1.3	345	0.12	1.00	0.88
S6	S8	0.9	1.4	464	0.10	1.00	0.90
S6	S9	0.9	1.4	581	0.09	1.00	0.91
S6	S10	0.9	0.9	979	0.01	1.00	0.99
S7	S8	1.3	1.4	119	0.04	1.00	0.96
S7	S9	1.3	1.4	236	0.03	1.00	0.97
S7	S10	1.3	0.9	635	0.08	1.00	0.92
S8	S9	1.4	1.4	117	0.02	1.00	0.98
S8	S10	1.4	0.9	516	0.10	1.00	0.90
S9	S10	1.4	0.9	399	**0.14**	1.00	**0.86**

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Summary of Results

The leachate collection system pipe slope in Cell 7 of the vertical expansion was designed with a nominal slope of 1.0% and 33.33% in the sump area. The maximum differential settlement along the LCS pipe is 0.14% and in the sump area it is 0.89%. Therefore, the LCS pipe slope is anticipated to be reduced to 0.86% and in the sump area 32.44%. Both slopes are acceptable, as the pipe will remain free-draining.

The leachate collection system pipe slope in Cell 9 of the vertical expansion was designed with a nominal slope of 0.5%. The maximum differential settlement along this line is anticipated to be 0.04%. Therefore, the pipe slope is anticipated to be reduced to 0.46%. This slope is acceptable, as the pipe will remain free-draining.

The leachate collection system pipe slope in Cell 11 of the horizontal expansion is designed with a nominal slope of 1.0%. The maximum differential settlement along this line is anticipated to be 0.14%, located between points S9 and S10. Therefore, the pipe slope is anticipated to be reduced to 0.86%. This slope is acceptable, as the pipe will remain free-draining.

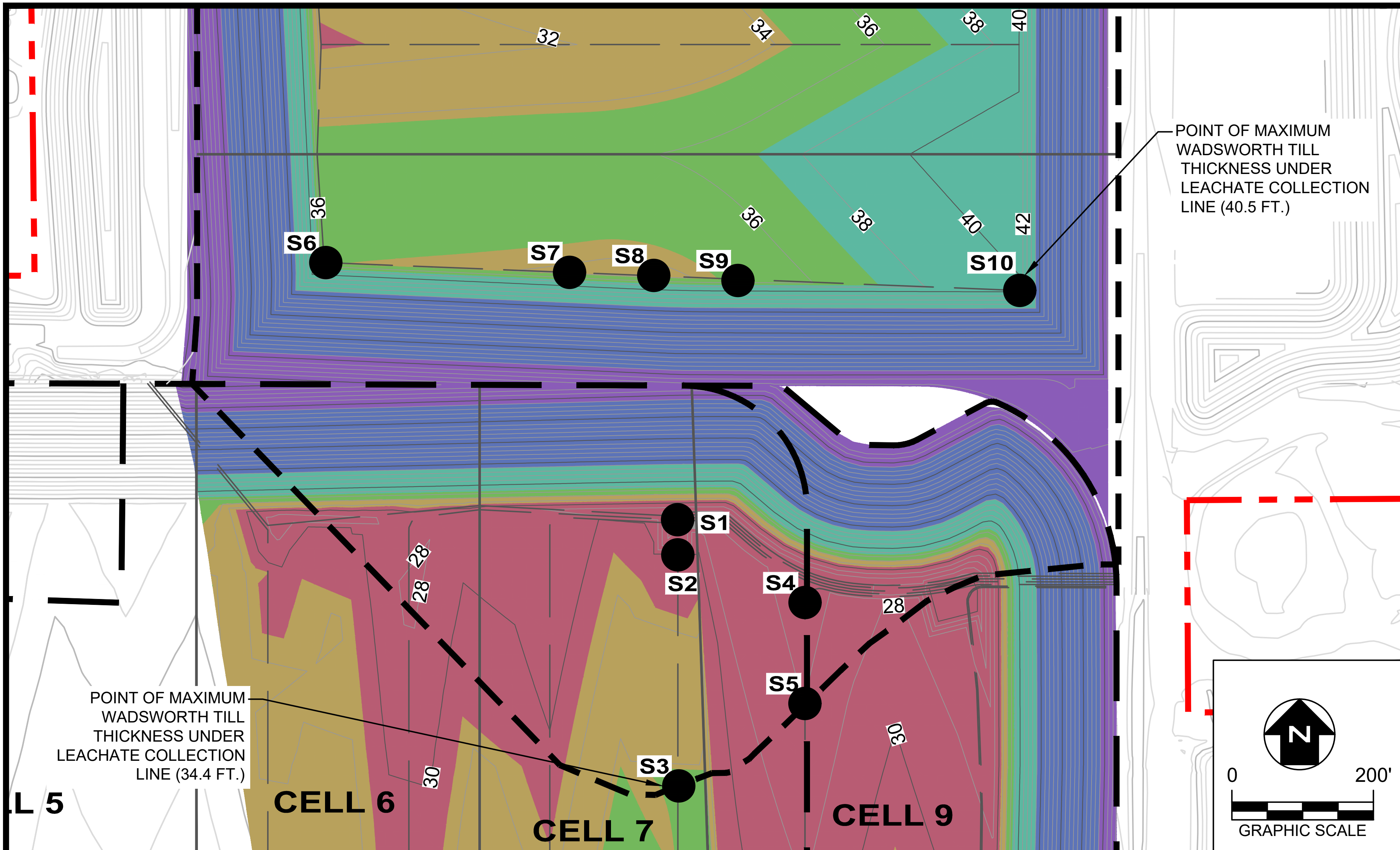

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FIGURE 1
LOCATION OF FOUNDATION SETTLEMENT ANALYSIS POINTS
THICKNESS OF WADSWORTH TILL TO REMAIN IN PLACE

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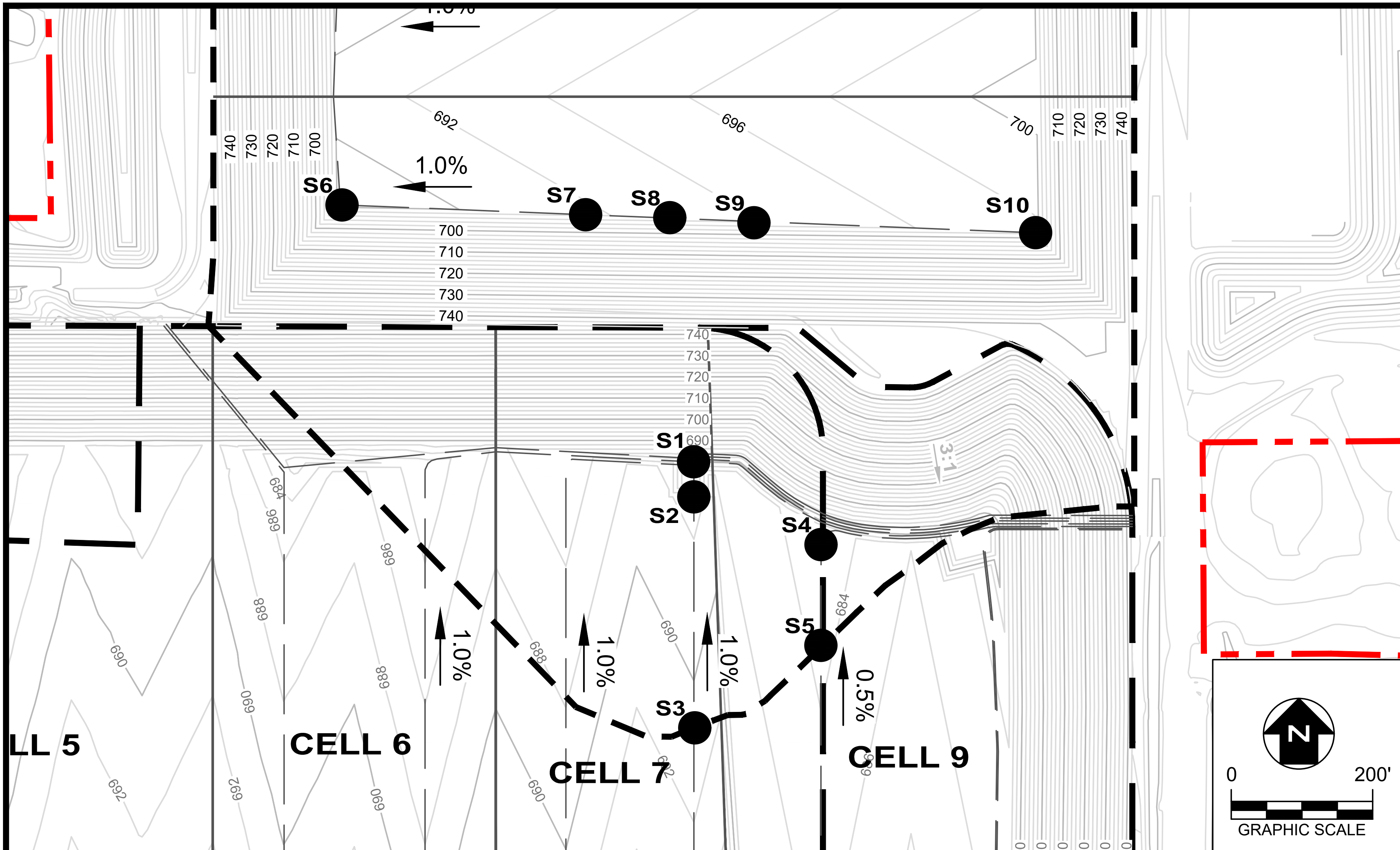

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FIGURE 2
LOCATION OF FOUNDATION SETTLEMENT ANALYSIS POINTS
TOP OF LINER

DRAWN BY: ORC	APPROVED BY: RDS	PROJ. NO.: 003211	DATE: FEBRUARY 2020

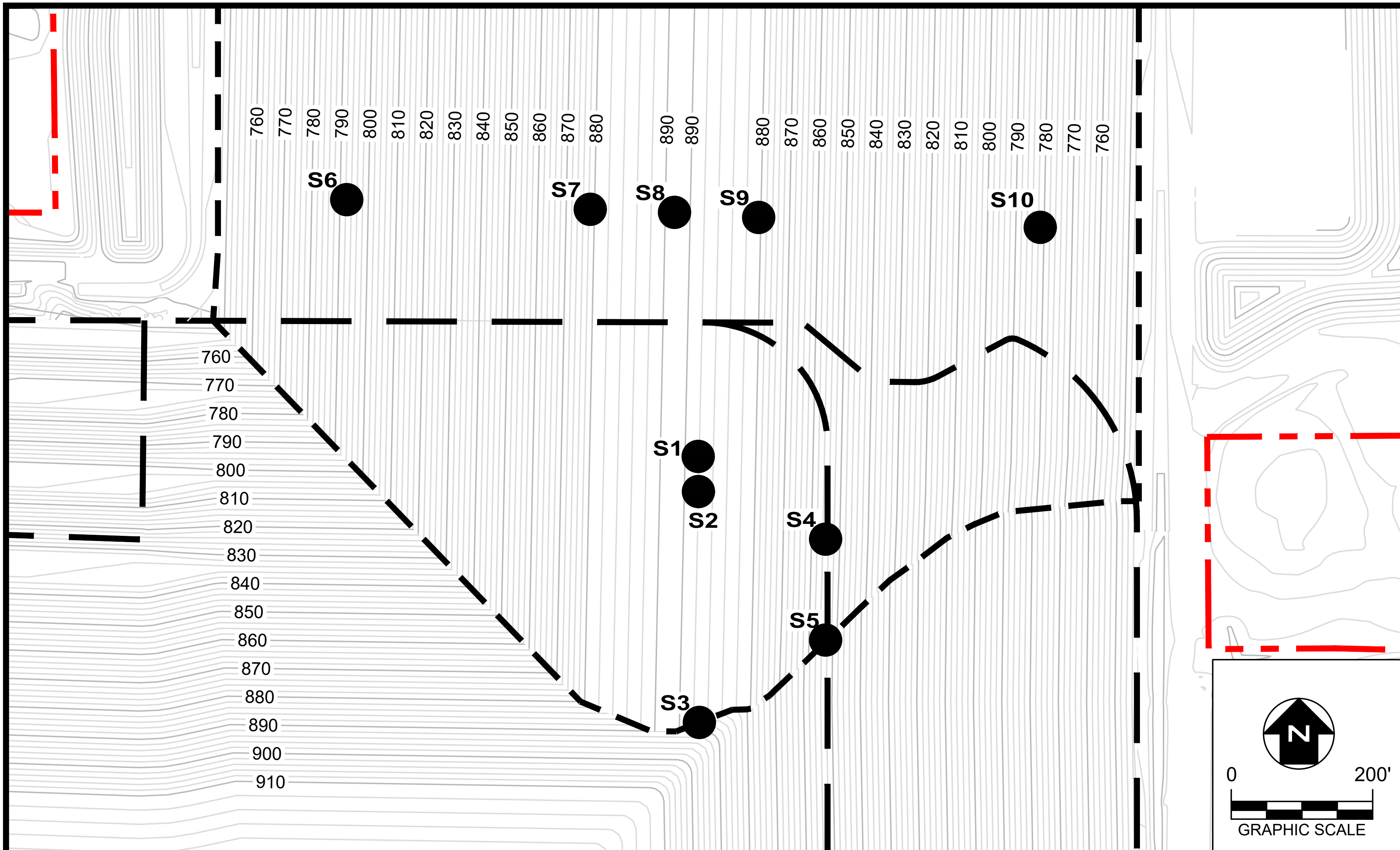

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FIGURE 3
LOCATION OF FOUNDATION SETTLEMENT ANALYSIS POINTS
TOP OF WASTE

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Settlement Points for Leachate Collection Layer Initial Stresses by Geologic Layer						
Location / Point	Layer Description	Unit Thickness (ft)	Unit Weight (pcf)	Bottom Layer Stress (psf) (Individual)	Mid Layer Stress (psf) (Individual)	Mid Layer Stress (psf) (Individual + Overlying)
VERTICAL EXPANSION						
S1	Unsaturated Till (To Be Excavated)	0.0	137.8	0.0	0.0	0.0
	Saturated Till (To Be Excavated)	0.0	75.4	0.0	0.0	0.0
	Saturated Till (To Remain in Place)	22.5	75.4	1,696.5	848.3	**848.3**
S2	Unsaturated Till (To Be Excavated)	0.0	137.8	0.0	0.0	0.0
	Saturated Till (To Be Excavated)	0.0	75.4	0.0	0.0	0.0
	Saturated Till (To Remain in Place)	30.3	75.4	2,284.6	1,142.3	**1,142.3**
S3	Unsaturated Till (To Be Excavated)	0.0	137.8	0.0	0.0	0.0
	Saturated Till (To Be Excavated)	0.0	75.4	0.0	0.0	0.0
	Saturated Till (To Remain in Place)	34.4	75.4	2,593.8	1,296.9	**1,296.9**
S4	Unsaturated Till (To Be Excavated)	0.0	137.8	0.00	0.00	0.0
	Saturated Till (To Be Excavated)	0.0	75.4	0.0	0.0	0.0
	Saturated Till (To Remain in Place)	24.8	75.4	1,869.9	935.0	**935.0**
S5	Unsaturated Till (To Be Excavated)	0.0	137.8	0.00	0.00	0.0
	Saturated Till (To Be Excavated)	0.0	75.4	0.0	0.0	0.0
	Saturated Till (To Remain in Place)	26.1	75.4	1,967.9	984.0	**984.0**
HORIZONTAL EXPANSION						
S6	Unsaturated Till (To Be Excavated)	5.0	137.8	689.00	344.50	344.50
	Saturated Till (To Be Excavated)	49.7	75.4	3,747.4	1,873.7	2,562.7
	Saturated Till (To Remain in Place)	34.4	75.4	2,593.8	1,296.9	**5,733.3**
S7	Unsaturated Till (To Be Excavated)	5.0	137.8	689.00	344.50	344.50
	Saturated Till (To Be Excavated)	52.5	75.4	3,958.5	1,979.3	2,668.3
	Saturated Till (To Remain in Place)	33.9	75.4	2,556.1	1,278.0	**5,925.5**
S8	Unsaturated Till (To Be Excavated)	5.0	137.8	689.00	344.50	344.50
	Saturated Till (To Be Excavated)	52.0	75.4	3,920.8	1,960.4	2,649.4
	Saturated Till (To Remain in Place)	33.8	75.4	2,548.5	1,274.3	**5,884.1**
S9	Unsaturated Till (To Be Excavated)	5.0	137.8	689.00	344.50	344.50
	Saturated Till (To Be Excavated)	47.0	75.4	3,543.8	1,771.9	2,460.9
	Saturated Till (To Remain in Place)	35.0	75.4	2,639.0	1,319.5	**5,552.3**
S10	Unsaturated Till (To Be Excavated)	5.0	137.8	689.00	344.50	344.50
	Saturated Till (To Be Excavated)	46.9	75.4	3,536.3	1,768.1	2,457.1
	Saturated Till (To Remain in Place)	40.5	75.4	3,053.7	1,526.9	**5,752.1**

Settlement Points for Leachate Collection Layer Final Stresses by Geologic Layer						
Location / Point	Layer Description	Unit Thickness (ft)	Unit Weight (pcf)	Bottom Layer Stress (psf) (Individual)	Mid Layer Stress (psf) (Individual)	Mid Layer Stress (psf) (Individual + Overlying)
VERTICAL EXPANSION						
S1	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	206.0	75.0	15,450.0	7,725.0	8,376.5
	LCS Drainage Layer	1.0	130.0	130.0	65.0	16,166.5
	Earth Liner	5.0	134.1	670.5	335.3	**16,566.8**
	Saturated Till (To Remain in Place)	22.5	75.4	1,696.5	848.3	**17,750.3**
S2	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	198.4	75.0	14,880.0	7,440.0	8,091.5
	LCS Drainage Layer	1.0	130.0	130.0	65.0	15,596.5
	Earth Liner	5.0	134.1	670.5	335.3	**15,996.8**
	Saturated Till (To Remain in Place)	30.3	75.4	2,284.6	1,142.3	**17,474.3**
S3	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	193.7	75.0	14,527.5	7,263.8	7,915.3
	LCS Drainage Layer	1.0	130.0	130.0	65.0	15,244.0
	Earth Liner	5.0	134.1	670.5	335.3	**15,644.3**
	Saturated Till (To Remain in Place)	34.4	75.4	2,593.8	1,296.9	**17,276.4**
S4	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	170.2	75.0	12,765.0	6,382.5	7,034.0
	LCS Drainage Layer	1.0	130.0	130.0	65.0	13,481.5
	Earth Liner	5.0	134.1	670.5	335.3	**13,881.8**
	Saturated Till (To Remain in Place)	24.8	75.4	1,869.9	935.0	**15,152.0**
S5	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	168.1	75.0	12,607.5	6,303.8	6,955.3
	LCS Drainage Layer	1.0	130.0	130.0	65.0	13,324.0
	Earth Liner	5.0	134.1	670.5	335.3	**13,724.3**
	Saturated Till (To Remain in Place)	26.1	75.4	1,967.9	984.0	**15,043.5**
HORIZONTAL EXPANSION						
S6	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	103.8	75.0	7,785.0	3,892.5	4,544.0
	LCS Drainage Layer	1.0	130.0	130.0	65.0	8,501.5
	Earth Liner	5.0	134.1	670.5	335.3	**8,901.8**
	Saturated Till (To Remain in Place)	34.4	75.4	2,593.8	1,296.9	**10,533.9**
S7	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	187.2	75.0	14,040.0	7,020.0	7,671.5
	LCS Drainage Layer	1.0	130.0	130.0	65.0	14,756.5
	Earth Liner	5.0	134.1	670.5	335.3	**15,156.8**
	Saturated Till (To Remain in Place)	33.9	75.4	2,556.1	1,278.0	**16,770.0**
S8	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	198.0	75.0	14,850.0	7,425.0	8,076.5
	LCS Drainage Layer	1.0	130.0	130.0	65.0	15,566.5
	Earth Liner	5.0	134.1	670.5	335.3	**15,966.8**
	Saturated Till (To Remain in Place)	33.8	75.4	2,548.5	1,274.3	**17,576.3**
S9	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	185.1	75.0	13,882.5	6,941.3	7,592.8
	LCS Drainage Layer	1.0	130.0	130.0	65.0	14,599.0
	Earth Liner	5.0	134.1	670.5	335.3	**14,999.3**
	Saturated Till (To Remain in Place)	35.0	75.4	2,639.0	1,319.5	**16,654.0**
S10	Final Cover	5.0	130.3	651.5	325.8	325.8
	Waste	81.4	75.0	6,105.0	3,052.5	3,704.0
	LCS Drainage Layer	1.0	130.0	130.0	65.0	6,821.5
	Earth Liner	5.0	134.1	670.5	335.3	**7,221.8**
	Saturated Till (To Remain in Place)	40.5	75.4	3,053.7	1,526.9	**9,083.9**

Settlement Points for Leachate Collection Layer Calculated Settlement Values by Layer and Point Location								
Location / Point	**Layer Description**	**Unit Thickness (ft)**	**Initial Mid-Layer Stress (psf)**	**Final Mid-Layer Stress (psf)**	**Primary Settlement (ft)**	**Secondary Settlement (ft)**	**Total Settlement (ft)**	**Total Settlement at Point (ft)**
VERTICAL EXPANSION								
S1	Earth Liner	5.0	335.3	16,566.8	0.5	0.003	0.5	2.2
	Saturated Till (To Remain in Place)	22.5	848.3	17,750.3	1.7	0.015	1.7	
S2	Earth Liner	5.0	335.3	15,996.8	0.5	0.003	0.5	2.5
	Saturated Till (To Remain in Place)	30.3	1,142.3	17,474.3	2.0	0.020	2.0	
S3	Earth Liner	5.0	335.3	15,644.3	0.5	0.003	0.5	2.7
	Saturated Till (To Remain in Place)	34.4	1,296.9	17,276.4	2.2	0.023	2.2	
S4	Earth Liner	5.0	335.3	13,881.8	0.5	0.003	0.5	2.1
	Saturated Till (To Remain in Place)	24.8	935.0	15,152.0	1.7	0.017	1.7	
S5	Earth Liner	5.0	335.3	13,724.3	0.5	0.003	0.5	2.2
	Saturated Till (To Remain in Place)	26.1	984.0	15,043.5	1.7	0.018	1.7	
HORIZONTAL EXPANSION								
S6	Earth Liner	5.0	335.3	8,901.8	0.4	0.003	0.4	0.9
	Saturated Till (To Remain in Place)	34.4	5,733.3	10,533.9	0.5	0.023	0.5	
S7	Earth Liner	5.0	335.3	15,156.8	0.5	0.003	0.5	1.3
	Saturated Till (To Remain in Place)	33.9	5,925.5	16,770.0	0.9	0.023	0.9	
S8	Earth Liner	5.0	335.3	15,966.8	0.5	0.003	0.5	1.4
	Saturated Till (To Remain in Place)	33.8	5,884.1	17,576.3	0.9	0.023	0.9	
S9	Earth Liner	5.0	335.3	14,999.3	0.5	0.003	0.5	1.4
	Saturated Till (To Remain in Place)	35.0	5,552.3	16,654.0	0.9	0.024	1.0	
S10	Earth Liner	5.0	335.3	7,221.8	0.4	0.003	0.4	0.9
	Saturated Till (To Remain in Place)	40.5	5,752.1	9,083.9	0.4	0.027	0.5	

Differential Settlement for Leachate Collection Layer							
Point 1	**Point 2**	**Settlement 1 (ft)**	**Settlement 2 (ft)**	**Distance Between Points (ft)**	**Differential Settlement (%)**	**Initial Pipe Slope (%)**	**Final Pipe Slope (%)**
VERTICAL EXPANSION							
S1	S2	2.2	2.5	39	**0.89**	33.33	32.44
S1	S3	2.2	2.7	366	**0.14**	1.00	0.86
S2	S3	2.5	2.7	327	0.05	1.00	0.95
S4	S5	2.1	2.2	141	**0.04**	0.50	0.46
HORIZONTAL EXPANSION							
S6	S7	0.9	1.3	345	0.12	1.00	0.88
S6	S8	0.9	1.4	464	0.10	1.00	0.90
S6	S9	0.9	1.4	581	0.08	1.00	0.92
S6	S10	0.9	0.9	979	0.01	1.00	0.99
S7	S8	1.3	1.4	119	0.04	1.00	0.96
S7	S9	1.3	1.4	236	0.03	1.00	0.97
S7	S10	1.3	0.9	635	0.08	1.00	0.92
S8	S9	1.4	1.4	117	0.02	1.00	0.98
S8	S10	1.4	0.9	516	0.10	1.00	0.90
S9	S10	1.4	0.9	399	**0.14**	1.00	0.86

Assumed Consolidation Parameters:	
Void Ratio	0.432
Compression Index	0.08
Secondary Compression Index	0.0032

UPGRADING OF EXISTING LANDFILLS BY DYNAMIC CONSOLIDATION A GEOTECHNICAL ASPECT

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ABSTRACT: In recent years, the scarcity of land space available for new urban development has prompted a renewed interest from local authorities in the end use of various landfills or in the extension of the life of existing landfills. Rehabilitation of closed landfills for urban developments has received considerable interest. Likewise, the extension of landfill life to allow for more waste storage is also receiving equal attention. In both cases, ground improvement is required.

Dynamic consolidation (also known as dynamic compaction) is a ground improvement technique. The process involves dropping heavy weights (15ton - 20tons) on to the surface of the fill from a considerable height (15m - 20m) following a selected grid pattern. These high-energy impacts produce sufficient compaction effort to reduce void space, increase density and reduce long-term settlement of the fill. By increasing the density, it increases the storage capacity of the landfill. Beside, it also increases the bearing capacity. Reducing the long-term settlement, roads, parking bays and lighter structures can be designed on shallow foundations on closed landfills.

In this paper, the subject of settlement of waste fills is addressed. A case study concerning a housing development over a landfill is also presented.

1.0 INTRODUCTION

Landfilling is one of the most economic and feasible means of disposing municipal solid waste in Malaysia and other countries in Southeast Asia. In the past, the disposal of waste fills was carried out by uncontrolled dumping into ex-mining ponds and low-lying areas close to housing estates. With increasing scarcity of land in urban areas, it is increasingly difficult to find new landfill sites for future dumping. This has prompted the local authorities and privatized companies (operators of landfill) to find solution to extend the life of the landfill to allow for more waste storage.

Typical landfills may occupy an area ranging from several acres to hundreds of acres. Settlement estimation is a topic of concern. From the operator's viewpoint, landfill capacity will be increased if most settlement occurs during the stage of filling. Unfortunately, the landfill settlement continues over an extended period of time with a final settlement that can be as large as 30%-40% of the initial fill height (H.I.Ling, et.al. 1998). Hence, it is imperative that a solution is needed to increase the rate of settlement to recover the additional space.

Dynamic consolidation is a good method of compacting refuse and waste fill. This technique involves dropping heavy weights (15 – 20 tons) on to the surface of the fill from a height of 10 to 20m following a selected grid pattern. The high-energy impacts produce shock waves that propagate to great depths (figure 1). As a result, the density of the waste fill is increased and hence, the storage capacity of the landfill is also increased.

With the increase in the density of the waste fill, the overall bearing capacity is improved. The long-term settlement is reduced and hence, the differential settlement is also reduced which is important for the integrity of the cover system when the landfill is closed. In the past such landfills have been considered suitable only for green areas. With the increasing scarcity of land in urban areas, it is making it necessary to build structures above such fills. Charles et.al. (1981) report several case histories of construction on old refuse tips, which include construction of a 2-storey hospital, roads and highways. Welsh (1983) cites a roadway site with 6m to 12m of waste fills. Mènard (1984) cites a case for a warehouse designed with floor loads of 20 kN/m^2 and spread footing with 145 kN/m^2 with 6m to 17m of refuse waste. There are many other recorded and published case studies on such developments (e.g. Aziz & Mohd. Raihan (992), Downie & Treharne (1979), Faisal, K.Yee & Varaksin (1997), Fryman & Baker (1987), Lewis & Langer (1994), Mappleback & Fraser (1993), Steinberg & Lukas (1984), etc.).

In this paper, the subject of settlement of waste fills and rehabilitation of landfill for housing development is presented. Only the geotechnical aspect is covered. The related environmental issue has been intentionally left out due to space constraint.

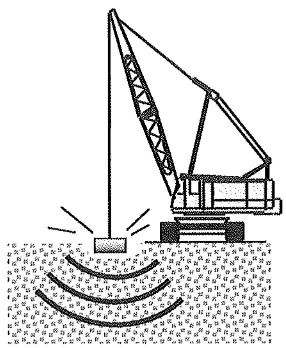

Figure 1

2.0 COMPOSITION OF LANDFILL

Most landfills are heterogeneous and they exhibit anisotropic material properties that are difficult to characterize. Typically, a landfill consists of food and garden wastes, paper products, plastics and rubber, textiles, wood, ashes and the soils used as cover material. Table 1 shows the various components of waste fills with their range of unit weights. The unit weight and void ratio vary with the types of waste, composition, depth, method of compaction and the rate of decomposition, among other factors. The rate of decomposition is further complicated by several factors including the effects of time, temperature and environmental conditions. In short, it is a combination of all of the problems of soft clay, uncompacted fill, organic consolidation and decomposition and even collapse of cavities and erosion of soil into cavities. It is as heterogeneous as the modern industrial-urban complex that produces it. Hence, its composition varies from community to community and from nation to nation. Thus, the waste properties can be considered as site-specific.

Two different forms of landfill can be defined. The uncontrolled dump is of random composition, dumped loosely from trucks, accumulated without control or compaction, and sometimes covered with a thin layer of soil when it reached its capacity (see figure 2a). At the other end, it is the well-managed sanitary landfill. The materials are spread in layers and compacted by bulldozers and compactors. In some cases, certain wastes such as tires are segregated from others (see figure 2b). Most of the old landfills are the uncontrolled dumps. Until recently, through privatization scheme the landfill operation follows the engineered landfill scheme. Thus, it is expected that developments over old landfills will require more engineering effort.

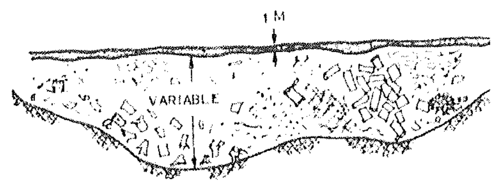

Figure 2(a)
Uncontrolled Landfill (No controlled placement and no compaction)

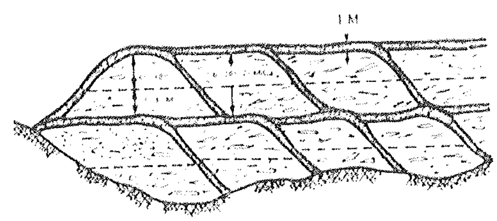

Figure 2(b)
Controlled Sanitary Landfill (Spread and compacted in layers of 2-3m thick; encapsulated with soil in cells of 2-6m thick)

3.0 SETTLEMENT CHARACTERISTICS

Settlement is the major problem with landfills. Sowers (1972) cites a case of a small shopping center built over a landfill. The buildings are on piles driven through the waste fills. The building walls and roof have remained intact. However, floor slabs supported directly on the fill surface have settled as much as 75mm. The floor slabs were connected to the pile-supported exterior grade beams, but was not connected to the interior columns. As a result, the floor drapes downward from the exterior walls toward the interior of the building. Small interior partitions resting directly on the floor have cracked badly and doorframes have been wrecked out of shape.

Table 1 (source: After Tchobanoglous et. al. 1977)

Waste Component	Uncompacted Unit Weight (kN/m^3)	Water Content	Ratio of Compacted to Uncompacted Unit Weight	
			Normal Compaction	Well Compacted
Food waste	1.3 – 4.7	50 – 80	2.9	3.0
Paper / paper board	0.3 – 1.3	4 – 10	4.5	6.2
Plastics	0.3 – 1.3	1 – 4	6.7	10
Textiles	0.3 – 0.9	6 – 15	5.6	6.7
Rubber and leather	0.9 – 2.5	1 – 12	3.3	3.3
Yard waste	0.6 – 2.2	30 – 80	4	5
Wood	1.3 – 3.1	15 – 40	3.3	3.3
Glass	1.6 – 4.7	1 – 4	1.7	2.5
Metals	0.5 – 11.0	2 – 6	4.3	5.3
Ash, brick, dirt	3.1 – 9.4	6 - 12	1.2	1.3

Furthermore, settlement has increased since then, probably due to a change in the moisture environment from leaking sewers in the fill.

There are two possible approaches to the assessment of settlement:

(a) Extrapolation of monitored data obtained specifically for the given fill
  1) By graphical method
  2) By analytical method

(b) Estimation from existing published data on similar type of fills
  1) By graphical method
  2) By analytical method

Method (a) is the most reliable but requires time for monitoring. This method relies on the approximately linear relationship between settlement and logarithm of time elapsed since placement of waste fill. Method (b) relies on published data for other fills of similar type, and gives approximate answers quickly. However, the results are less dependable since the published data are rarely likely to apply exactly to a specific given fill. Preliminary estimates obtained by method (b) should be checked by monitoring. We shall address the different categories of settlement as follow:

3.1 Settlement Under Self-Weight

One of the contributing factors to the overall settlement is caused by the self-weight of the fill. The time-settlement relationship under self-weight is analogous to the secondary compression of soils after a short period of pseudo-primary settlement, typically, 1 to 4 months long. Measurements taken from past records indicate a coefficient of secondary compression ranging from 0.1 to 0.4 (NAVFAC, 1983). Thus, settlement of the waste fills under its self-weight after completion of filling can be estimated by equation (1) below.

$$(\Delta H)_{sw} = H\, C_{\alpha} \log (t_2 / t_1) \quad \text{.........} \quad (1)$$

where

$(\Delta H)_{sw}$ = self-weight settlement at time t_2 (m)
H = thickness of waste fill (m)
t_1 = time pseudo-primary settlement to occur after completion of fill (years)
t_2 = time after completion of fill (years)
C_{α} = coefficient of secondary compression

Table 2 below suggests typical self-weight settlements. According to Leach & Goodger (1991), a good compaction can reduce the self-weight settlement potential by between 50% and 75%.

Typical unit weights for municipal waste are summarized in Table 3.

Table 4 below shows the unit weights obtained from various landfills sites.

3.2 Settlement Under External Loads

The time-settlement behavior of an old waste fills under an applied load is analogous to the behavior of peat. As load is placed large primary (mechanical) settlements occur rapidly with little or no pore pressure build up. This is followed by secondary compression, which occurs over a long period of time.

The relation of the imposed stress to settlement can be expressed as follow:

$$(\Delta H)_p = H\, C_r \log (\{\sigma'_o + \Delta\sigma'\} / \sigma'_o) \quad \text{.......} \quad (2)$$

where

$(\Delta H)_p$ = primary (or mechanical) settlement (m)
H = thickness of waste fill (m)
e_o = initial void ratio

Table 2 (Source: Leach & Goodger (1991) – CIRIA Special Publication 78)

Material	Potential Self-Weight Settlement (expressed as % of depth of fill)
Well-compacted, well-graded sand and gravel	0.5
Well-compacted shale and rockfill	0.5
Medium-compacted rockfill	1
Well-compacted clay	0.5
Lightly compacted clay	1.5
Lightly compacted clay placed in deep layers	1 – 2
Nominally compacted opencast backfill	1.2
Uncompacted sand	3.5
Uncompacted (pumped) clay	12
Well-compacted mixed refuse (waste fill)	30
Well-controlled domestic refuse (waste fill) placed in layers and well compacted	10

Table 3

Description	Average Total Unit Weight γ_T (kN/m^3)	Source
Sanitary Landfill		
• Poor compaction	2.8 – 4.7	Tchobanoglous et.al. (1977)
• Moderate to good compaction	4.7 – 7.1	
• Good to excellent compaction	7.1 – 9.4	
• Baled waste	5.5 – 10.5	
• Shredded and compacted	6.4 – 10.5	
• In situ density	5.5 – 6.9	
Active landfill with leachate mound	6.6	
Household Trash Can	1.1	NAVFAC (1983)
Delivery Truck	2.4	
Sanitary Landfill		
(a) Not shredded		
• Poor compaction	3.1	
• Good compaction	6.3	
• Best compaction	9.4	
Shredded	8.6	
Sanitary Landfill		
• In a landfill	6.9 – 7.5	NSWMA (1985)
After degradation and settlement	9.9 – 11.0	

Table 4

Landfill Sites	Waste Density (kN/m^3)
Old Klang Road, Kuala Lumpur	7.0
Kelana Jaya, Kuala Lumpur	6.0
Merrylands, Sydney[1]	9.4
Thornleigh, Sydney[1]	8.4
Lucas Heights, Sydney[1]	11.3
Albany, New York[2]	7 – 16
Fayetteville, Arkansas[3]	4.8
Richmond, California[4]	7.2

Note: 1 – data obtained from Hausmann et.al (1993)
2 – data obtained from Gifford et.al. (1992)
Note: This is a construction and demolition debris landfill
3 – data obtained from Welsh (1983)
4 – data obtained from Sharma et.al. (1989)

σ'_o = effective overburden pressure (kN/m^2)
$\Delta\sigma'$ = effective imposed stress (kN/m^2)
C_r = compression ratio (= $C_c/1+e_0$)
C_c = compression index

NAVFAC (1983) reports that the primary compression ratio (C_r) ranges from 0.1 to 0.4. Sowers (1972) reports that the compression index (C_c) is related to the initial void ratio as shown in figure 3. The relation can be expressed as follow:

For fills low in organic matters $C_c = 0.15e_o$
For fills high in organic matters $C_c = 0.55e_o$

It is interesting to note that the maximum Cc for peat is about one-third greater than the maximum observed for waste fills.

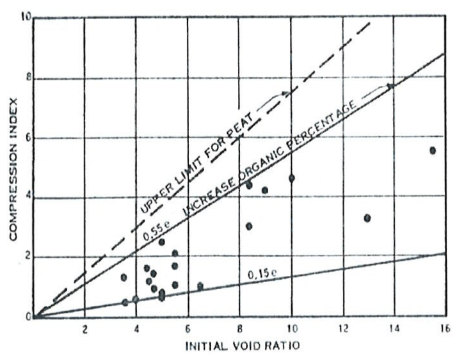

Figure 3

Environmental conditions as well as the composition of the waste fills determine the amount of long-term settlement. This long-term settlement is a combination of mechanical secondary compression, physico-chemical action, and bio-chemical decay. When there is no drastic change in the environment the settlement-log time relationship is more or less linear, similar to secondary compression of soils. The settlement can be expressed by the same equation (1) above. NAVFAC(1983) reported the coefficient of secondary compression (C_α) ranged from 0.02 to 0.07. These values are for fills, which have undergone decomposition for about 10-15 years. Higher compressibility is usually associated with high organic content. It is also true for advanced degree of decomposition.

Sowers (1972) introduces a factor "α" for the long-term settlement. He suggested "α" as a function of the initial void ratio (e_o). This "α" value is high if the organic content subject to decay is large and the environment is favorable (i.e. warm and moist, with fluctuating water table that pumps fresh air into the fill). This value is low for more inert materials and under non-favorable environments. Nonetheless, for any given void ratio there is a large range of values for "α" (see figure 4). The relation can be expressed as follow:

For favorable condition to decay $\alpha = 0.03e_o$
For unfavorable condition to decay $\alpha = 0.09e_o$

This "α" value can be translated to the classical C_α by dividing "α" by $\{1+e_0\}$ i.e. $C_\alpha = \alpha/\{1+e_0\}$.

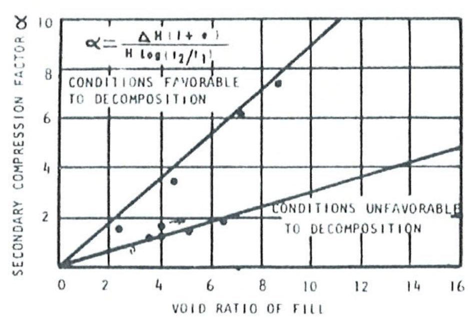

Figure 4

Other calculation methods include the use of a rheological model as presented in the Gibson and Lo theory or the power creep law. The power creep law provides a better representation of the field measured settlement data than the rheological model. However, the rheological model has parameters that can be assigned physical meaning and reflect the effects of certain refuse placement conditions. The details are not presented in this paper.

4.0 DIFFERENTIAL SETTLEMENT & DESIGN MEASURES

There are too many uncertainties for accurate prediction of differential settlement on waste fills. In this case, recourse should be made to the generally accepted rule in engineering practice that, in uniform ground, differential movement will not exceed 75% of the total overall

NOTES ON PRIMARY/INITIAL COMPRESSION OF MSW

Settlement of MSW generally occurs in three phases: initial compression, primary compression, and secondary compression. Initial and primary compression occur rapidly due to the open structure and high hydraulic conductivity of MSW (10^{-3} to 10^{-5} cm/s) and are difficult to separate. Consequently, initial and primary compression usually are grouped together. Secondary compression occurs over longer time frames and is caused by mechanical creep and biological decay. From the perspective of operations and maintenance planning after closure, secondary compression is the most important settlement process. Sowers (1973) indicates that primary compression is normally complete within 30 d and Sharma and De (2007) indicate that 3-4 months is typically assumed in practice. Bjarngard and Edgers (1990) analyzed 24 case histories and reported that primary compression was complete within the first two days following loading.

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FOUNDATIONS AND EARTH RETAINING STRUCTURES

MUNI BUDHU

Layer 2

$$E_u \text{ at top of layer} = 10{,}000\,\text{kPa},\ E_u \text{ at bottom of layer} = 30{,}000\,\text{kPa}$$

$$(E_u)_{avg} = \frac{10{,}000 + 30{,}000}{2} = 20{,}000\,\text{kPa}$$

Step 3: Find weighted harmonic mean E_u.

$$E_u = \frac{2(6000) + 1(20{,}000)}{3} = 10{,}667\,\text{kPa}$$

Step 4: Find shape parameter $\frac{A_b}{L_1^2}$.

$$A_b = (3 \times 4) + (8 \times 6) + (3 \times 4) = 72\,\text{m}^2, \quad \frac{A_b}{L_1^2} = \frac{72}{12^2} = 0.5$$

Step 5: Find shape, embedment, and wall factors.

$$\mu_s = 0.45(0.5)^{-0.38} = 0.59, \quad \mu_{emb} = 1 - 0.08\frac{4}{10}\left(1 + \frac{4}{3} \times 0.5\right) = 0.94$$

$$A_w = \text{perimeter} \times \text{depth} = (3+4+3+4+4+3+4+5+6+8) \times 4 = 176\,\text{m}$$

$$\frac{A_w}{A_b} = \frac{172}{72} = 2.44, \quad \mu_{wall} = 1 - 0.16(2.44)^{0.54} = 0.74$$

Step 6: Calculate immediate settlement.

$$\rho_e = \frac{2Q_a}{E_u L_1}\left(1 - v_u^2\right)\mu_s \mu_{emb} \mu_{wall} = \frac{2 \times 5000}{10667 \times 12}(1 - 0.45^2) \times 0.59 \times 0.94 \times 0.74 = 0.026\,\text{m} = 26\,\text{mm}.$$

■

7.7.2 Primary Consolidation Settlement

Primary consolidation settlement for fine-grained soils is normally estimated from parameters deduced from the one-dimensional consolidation test. In using the parameters from the one-dimensional consolidation test, you are assuming (1) vertical uniform strain only (lateral strain is zero), (2) no settlement occurs from shear stresses, (3) saturated soil, (4) the initial excess porewater pressure is equal to the change in applied stress at the instant the load is applied, and (5) excess porewater pressures are dissipated only vertically. In practice, lateral strains are significant except when the ratio of the layer thickness to lateral dimension of the loaded area is small (approaches zero). Shear stresses also cause settlement and excess porewater pressures can dissipate not only in the vertical but in any direction.

The initial excess porewater pressure is equal to the change in vertical stress at the instant the vertical stress is applied is possible only if the lateral stresses are equal to the vertical stresses. If the lateral strains are zero, then under undrained conditions (at the instant the load is applied), the vertical settlement is zero.

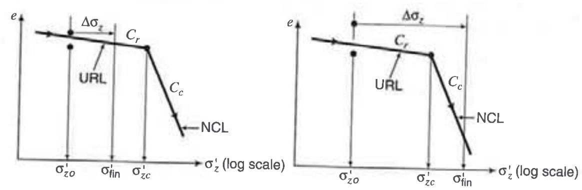
Normally Consolidated Clays The primary consolidation settlement for normally consolidated soils (OCR = 1) occurs solely along the compression line (NCL) and is given as

$$\rho_{pc} = H\frac{\Delta e}{1 + e_o} = \frac{H}{1 + e_o}C_c \log\frac{\sigma'_{fin}}{\sigma'_{zo}}; \quad \text{OCR} = 1 \tag{7.49}$$

where H is the thickness of the soil layer, $\Delta e = C_c \log\frac{\sigma'_{fin}}{\sigma'_{zo}}$, C_c is the compression index, $e_o(e_o = wG_s)$ is the initial void load ratio, $\sigma'_{fin} = \sigma'_{zo} + \Delta\sigma_z$, σ'_{zc} is the preconsolidation vertical effective stress, and $\Delta\sigma_z$ is the increase in vertical stress at the center of the layer.

Overconsolidated Clays If the soil were overconsolidated, we would have to consider two cases depending on the magnitude of $\Delta\sigma_z$ (Fig. 7.16). In the first case (Fig. 7.16a), the increase in $\Delta\sigma_z$ is such that $\sigma'_{fin} = \sigma'_{zo} + \Delta\sigma_z$ is less than the preconsolidation vertical effective stress, σ'_{zc}. In this case, consolidation occurs along the *unloading reloading line* (URL), and

$$\rho_{pc} = \frac{H}{1 + e_o}C_r \log\frac{\sigma'_{fin}}{\sigma'_{zo}}; \quad \sigma'_{fin} < \sigma'_{zc} \tag{7.50}$$



(*a*) Case 1: $\sigma'_{zo} + \Delta\sigma_z < \sigma'_{zc}$ (*b*) Case 2: $\sigma'_{zo} + \Delta\sigma_z > \sigma'_{zc}$

FIGURE 7.16 Two cases to consider for calculating primary consolidation settlement of overconsolidated soils.

In case 2 (Fig. 7.16b), the increase in $\Delta\sigma_z$ is such that $\sigma'_{fin} = \sigma'_{zo} + \Delta\sigma'_z$ is greater than σ'_{zc}. In this case, we have to consider two components of settlement—one along the URL and the other along the NCL. The primary consolidation for this case is

$$\rho_{pc} = \frac{H}{1 + e_o}\left(C_r \log\frac{\sigma'_{zc}}{\sigma'_{zo}} + C_c \log\frac{\sigma'_{fin}}{\sigma'_{zc}}\right); \quad \sigma'_{fin} > \sigma'_{zc} \tag{7.51}$$

or

$$\rho_{pc} = \frac{H}{1 + e_o}\left\{C_r \log(\text{OCR}) + C_c \log\frac{\sigma'_{fin}}{\sigma'_{zc}}\right\}; \quad \sigma'_{fin} > \sigma'_{zc} \tag{7.52}$$

Primary Consolidation Settlement Using m_v You can also calculate the primary consolidation settlement using the modulus of compressibility, m_v. However, unlike C_c, which is constant, m_v varies with vertical effective stress levels. You should compute an average value of m_v over the stress range σ'_{zo}

J.3-C Bearing Capacity

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Proj. #: 631020105

Calculated By: ORC Date: 05/2022

Checked By: DAM Date: 05/2022

TITLE: BEARING CAPACITY OF LANDFILL FOUNDATION

Problem Statement

Determine the factor of safety against bearing capacity failure of the landfill foundation. 35 Ill. Admin. Code Section 811.304 (c) requires that "the solid waste disposal unit shall be designed to achieve a safety factor against bearing capacity failure of at least: 2.0 under static conditions and 1.5 under seismic loadings.

Given

- ❑ Coduto, Donald P*, Foundation Design Principles and Practices*, Second Edition (refer to the attached pages).
- ❑ Caterpillar Product Information, 836K, Landfill Compactor (refer to attached pages).
- ❑ **Appendix J.1** - "Summary of Geotechnical Parameters" contained in this Application.
- ❑ Hydrogeologic Report contained in this Application.
- ❑ Landfill design specifications for layer types, thicknesses, and material properties (please refer to **Appendix J.1**).
- ❑ Design grades for the mass liner grades and final landform shown on respective plan drawings contained in this Application.

Assumptions

Scenarios Analyzed:

The following four scenarios were analyzed for the proposed Landfill Expansion:

1. Low Permeable Earth Liner bearing capacity for the final landform at the point of maximum waste thickness (long term conditions). The long term analysis is conservatively based on consolidated undrained tri-axial shear strength test results for effective stress conditions.
2. Low Permeable Earth Liner bearing capacity under vehicle loading (short term, undrained conditions).
3. Wadsworth Till foundation bearing capacity for the final landform at the point of maximum waste thickness (long term conditions). The long term analysis is conservatively based on consolidated undrained tri-axial shear strength test results for total stress conditions.
4. Wadsworth Till foundation bearing capacity under vehicle loading (short term, undrained conditions).

Client: **Zion Landfill, Inc.**

Project: **Zion Landfill – Site 2 North Expansion**

Proj. #: **631020105**

Calculated By: **ORC** Date: **05/2022**

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TITLE: BEARING CAPACITY OF LANDFILL FOUNDATION

Landfill and Foundation Material Properties:

- ❑ The following saturated unit weights were conservatively assumed in the bearing capacity calculations for the Final Cover Soils, Leachate Collection System (LCS) Granular Drainage Layer and Waste Fill (please refer to **Appendix J.1** for detailed discussion):
  - Final Cover Soils, γ_{sat}= 130.3 pcf
  - LCS Granular Drainage Layer, γ_{sat}= 130 pcf
  - Waste Fill, γ_{sat}= 75 pcf

- ❑ Low Permeable Earth Liner. The Low Permeable Earth Liner lies directly on top of the Wadsworth Till Foundation and beneath the LCS Granular Drainage Layer. The following material properties were conservatively assumed in the bearing capacity calculations (please refer to **Appendix J.1** for detailed discussion).

  Unit Weights:
  - Total unit weight, γ_{total}= 128.2 pcf
  - Saturated unit weight, γ_{sat} = 134.1 pcf

  Short Term / Undrained Conditions:
  - Friction angle, φ' = 11.8°
  - Cohesion, c' = 1,465 psf

  Long Term / Drained Conditions:
  - Friction angle, φ' = 34.3°
  - Cohesion, c' = 0 psf

- ❑ Wadsworth Till Foundation. The Wadsworth Till beneath the base liner varies in thickness across the site. Beneath the proposed final landform 10H:1V plateau (which varies in elevation between 885 feet MSL and 896 feet MSL) - where the largest waste column thicknesses occur - the thickness of Wasdsworth Till will range in thickness from approximately 29 to 87 feet in the horizontal expansion area, and from approximately 23 to 84 feet in the vertical expansion area. The thickness of Wadsworth Till beneath the maximum waste column of 206-feet (vertical expansion) is approximately 26.4 feet. For the purpose of this calculation it was assumed to be approximately 27-feet thick. The following material properties for the Wadsworth Till Foundation were based on laboratory test results (please refer to **Appendix J.1** for data source):

  Unit Weights:
  - Total unit weight, γ_{total}= 136.6 pcf
  - Saturated unit weight, γ_{sat} = 137.8 pcf

  Short Term / Undrained Conditions:
  - Friction angle, φ' = 11.8°

- Cohesion, c’ = 1,465 psf

Long Term / Undrained Conditions:
- Friction angle, φ’ = 14.3°
- Cohesion, c’ = 1,000 psf

- ❑ The maximum waste thickness of **206 feet** occurs in Cell 7 of the vertical expansion area, just south of the horizontal expansion waste boundary. The maximum waste thickness of **198 feet** occurs in the horizontal expansion area in Cell 11. The elevations and thicknesses of the landfill layers corresponding to the proposed expansion maximum waste column are summarized in the table below.

Summary of Average Thickness of Landfill Layers		
Layer	**Top Elevation (ft. MSL)**	**Thickness (ft.)**
Final Cover System	896	5
Waste	891	206
LCS Granular Drainage Layer	685	1
Low Permeable Earth Liner	684	5
Wadsworth Till (Foundation Soil)	679	27
Shallow Drift Aquifer	652	-
	Total =	244

- ❑ <u>Landfill Cell Dimensions</u>. The length and width of the landfill cell coinciding with the maximum waste column in the vertical expansion (Cell 7) location is approximately **940 feet (L) by 307 feet (B),** respectively.

- ❑ <u>Potentiometric Surface</u>. The groundwater potentiometric surface is assumed to be 5 feet below the existing ground surface and in contact with the base of the landfill liner system. Therefore the Wadsworth Till underlying the landfill is assumed to be below the groundwater potentiometric surface (saturated conditions).

- ❑ <u>Horizontal Acceleration</u>. The maximum horizontal acceleration is approximately 0.0461g (refer to **Appendix J.1**).

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TITLE: BEARING CAPACITY OF LANDFILL FOUNDATION

Bearing Capacity Equation for Static Conditions:

- Karl Terzaghi's bearing capacity equation for square footings is used to calculate bearing capacity of landfill foundation for static conditions. The bearing capacity factor values for N_c, N_q, and N_γ are selected from Table 6.1 of Coduto (refer to attached pages). Due to the size and depth of the landfill, the equation is overly conservative for landfills.

$$q_{ult}=1.3c'N_c+\sigma'_{zD}N_q+0.4\gamma'BN_\gamma$$

Where,

q_{ult}	= Ultimate bearing capacity, psf
c, c'	= Soil cohesion (total and effective), psf
σ'_{zD}	= Vertical effective stress, psf
γ'	= Effective unit weight of soil, pcf
B	= Width of foundation, feet
N_c, N_q, N_γ	= Non-dimensional factors, functions of φ
φ, φ'	= Soil friction angle (total, effective), degrees

For Low Permeable Earth Liner – Short Term Loading Conditions:

$\phi' = 11.8° \approx 12° \rightarrow N_c = 10.8, N_q = 3.3, N_\gamma = 1.4$

For Low Permeable Earth Liner – Long Term Loading Conditions:

$\phi' = 34.3° \approx 34° \rightarrow N_c = 52.6, N_q = 36.5, N_\gamma = 39.6$

For Wadsworth Till Foundation – Short Term Loading Conditions:

$\phi' = 11.8° \approx 12° \rightarrow N_c = 10.8, N_q = 3.3, N_\gamma = 1.4$

For Wadsworth Till Foundation – Long Term Loading Conditions:

$\phi' = 14.3° \approx 14° \rightarrow N_c = 12.1, N_q = 4.0, N_\gamma = 1.9$

Client: Zion Landfill, Inc.

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TITLE: BEARING CAPACITY OF LANDFILL FOUNDATION

Bearing Capacity Equation for Seismic Conditions:

- For seismic conditions, the total stress on the landfill foundation is equal to the effective overburden stress and the increase in stress due to overturning moment, σ_M, which is calculated using the following equation.

$$\sigma_m = \frac{Mc}{I}$$

$$M = B \times L \times H \times \gamma\left(\frac{H}{2}\right)(\text{Horiz. Accel.})$$

$$I = \frac{LB^3}{12}$$

Where,

M = Overturning moment
c = Distance from center
I = Moment of Inertia
B = Width of foundation
L = Length of foundation
H = Height of landfill

Factor of Safety:

- For both static and seismic conditions, the factor of safety, FS, is calculated using the following equation:

$$FS = \left(\frac{q_{ult}}{\sigma'_v}\right)$$

Calculations

Calculate ultimate bearing capacity, q_{ult} on the Low Permeable Earth Liner and the Wadsworth Till Foundation. The vertical effective stress (σ'_{zD}) was conservatively assumed equal to zero.

Low Permeable Earth Liner – Short Term Loading Conditions:

(ϕ' = 11.8°, c' = 1,465 psf)

$q_{ult} = 1.3c'N_c + \sigma'_{zd}N_q + 0.4\gamma' BN_\gamma$

q_{ult} = (1.3)(1,465 psf)(10.8) + (0.0 psf)(3.3) + (0.4)(134.1-62.4 pcf)(307 ft)(1.4)

q_{ult} = 32,895 psf

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Low Permeable Earth Liner – Long Term Loading Conditions:

$\phi' = 34.3°$, $c' = 0$ psf
$q_{ult} = 1.3c'N_c + \sigma'_{zd}N_q + 0.4\gamma'BN_\gamma$
q_{ult} = (1.3)(0 psf)(52.6) + (0.0 psf)(36.5) + (0.4)(134.1-62.4 pcf)(307 ft)(39.6)
q_{ult} = 348,668 psf

Wadsworth Till Foundation – Short Term Loading Conditions:

$\phi' = 11.8°$, c' = 1,465 psf
$q_{ult} = 1.3c'N_c + \sigma'_{zd}N_q + 0.4\gamma'BN_\gamma$
q_{ult} = (1.3)(1,465 psf)(10.8) + (0.0 psf)(3.3) + (0.4)(137.8-62.4 pcf)(307 ft)(1.4)
q_{ult} = 33,531 psf

Wadsworth Till Foundation – Long Term Loading Conditions:

$\phi' = 14.3°$, c' = 1,000 psf
$q_{ult} = 1.3c'N_c + \sigma'_{zd}N_q + 0.4\gamma'BN_\gamma$
q_{ult} = (1.3)(1,000 psf)(12.1) + (0.0 psf)(4.0) + (0.4)(137.8-62.4 pcf)(307 ft)(1.9)
q_{ult} = 33,322 psf

Bearing Capacity under Final Landform Loading:

Calculate the effective overburden stress (σ'_v) due to waste and soil load for the worst case final conditions.

Low Permeable Earth Liner:

Effective Overburden Stress, σ'v,, on the Low Permeable Earth Liner From Final Landform			
Layer	**Thickness, t (ft)**	**Density, γ (pcf)**	**σ'v = (t) x (γ) (psf)**
Final Cover System	5	130.3	651.5
Waste	206	75.0	15,450
LCS Granular Drainage Layer	1	130.0	130
Total Thickness =	**212**	**Σ(σ'v) =**	**16,231.5**
Weighted Average γ'v = 76.6			

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Wadsworth Till Foundation:

Effective Overburden Stress, σ'v,, on the Wadsworth Till Foundation From Final Landform			
Layer	**Thickness, t (ft)**	**Density, γ (pcf)**	**σ'v = (t) x (γ) (psf)**
Final Cover System	5	130.3	651.5
Waste	206	75.0	15,450
LCS Granular Drainage Layer	1	130.0	130
Low Permeable Earth Liner	5	134.1	670.5
Total Thickness =	**217**	**Σ(σ'v) =**	**16,902**
Weighted Average γ'v = 77.9			

Static Conditions

Factor of Safety, FS, against bearing capacity failure at final landform height under long term static conditions (conservatively based on consolidated undrained tri-axial shear strength test results):

Low Permeable Earth Liner: $FS = \frac{q_{ult}}{\sigma'_v} = \frac{348{,}668 \text{ psf}}{16{,}231.5 \text{ psf}} = 21.5$

Wadsworth Till Foundation: $FS = \frac{q_{ult}}{\sigma'_v} = \frac{33{,}322 \text{ psf}}{16{,}902 \text{ psf}} = 2.0$

Seismic Conditions

First, calculate the increase in stress due to the overturning moment, σ_M.

Low Permeable Earth Liner:

$$M = BLH\gamma_{weighted}\left(\frac{H}{2}\right)(\text{Horiz. Accel.})$$

$$M = (307 \text{ ft})(940 \text{ ft})(206 \text{ ft})(76.6 \text{ pcf})\left(\frac{206 \text{ ft}}{2}\right)(0.0461) = 2.16 \times 10^{10} \text{ lb-ft}$$

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$$c = \frac{B}{2} = \frac{307\text{ ft}}{2} = 153.5\text{ ft}$$

$$I = \frac{LB^3}{12} = \frac{(940\text{ ft})(307\text{ ft})^3}{12} = 2.27 \times 10^9\text{ ft}^4$$

$$\sigma_m = \frac{Mc}{I} = \frac{(2.16 \times 10^{10}\text{ lb-ft})(153.5\text{ ft})}{2.27 \times 10^9\text{ lb-ft}} = 1{,}461\text{ psf}$$

Wadsworth Till Foundation:

$$M = BLH\gamma_{weighted}\left(\frac{H}{2}\right)(\text{Horiz. Accel.})$$

$$M = (307\text{ ft})(940\text{ ft})(206\text{ ft})(77.9\text{ pcf})\left(\frac{206\text{ ft}}{2}\right)(0.0461) = 2.20 \times 10^{10}\text{ lb-ft}$$

$$c = \frac{B}{2} = \frac{307\text{ ft}}{2} = 153.5\text{ ft}$$

$$I = \frac{LB^3}{12} = \frac{(940\text{ ft})(307\text{ ft})^3}{12} = 2.27 \times 10^9\text{ ft}^4$$

$$\sigma_m = \frac{Mc}{I} = \frac{(2.20 \times 10^{10}\text{ lb-ft})(153.5\text{ ft})}{2.27 \times 10^9\text{ lb-ft}} = 1{,}488\text{ psf}$$

Factor of Safety, FS, against bearing capacity failure, at final landform height, under long term, seismic conditions (conservatively based on consolidated undrained tri-axial shear strength test results):

Low Permeable Earth Liner: $FS = \frac{q_{ult}}{\sigma'_v + \sigma_m} = \frac{348{,}668\text{ psf}}{16{,}231.5\text{ psf} + 1{,}461\text{ psf}} = 19.7$

Wadsworth Till Foundation: $FS = \frac{q_{ult}}{\sigma'_v + \sigma_m} = \frac{33{,}322\text{ psf}}{16{,}902\text{ psf} + 1{,}488\text{ psf}} = 1.8$

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TITLE: BEARING CAPACITY OF LANDFILL FOUNDATION

Bearing Capacity under Vehicle Loading

Calculate the effective overburden stress (σ'_v) due to the placement of the leachate collection system, Low Permeable Earth Liner and loading by a vehicle (compactor). Conservatively assume that the vehicle load does not attenuate with depth.

Assume loading by CAT 836K compactor (Caterpillar Product Information)

Weight of the Vehicle (W_{eq}) = 123,319 lb

Contact Pressure (P) =

$$P = \frac{123{,}319 \text{ lb}}{(4 \text{ drums} \times \text{Area}_{contact})}$$

$$P = \frac{123{,}319 \text{ lb}}{(4 \text{ drums} \times (4.67 \text{ ft} \times \frac{1}{3} \times 5.83 \text{ ft}))}$$

$$P = 3{,}397 \text{ psf}$$

Effective Overburden Stress, σ'v,, on Low Permeable Earth Liner from Vehicle Load			
Layer	Thickness, t (ft)	Density, γ (pcf)	σ'v = (t) x (γ) (psf)
Vehicle Load	-	3,397	3,397
LCS Granular Drainage Layer	1	130	130
Total Thickness =	**1**	**Σ (σ'v) =**	**3,527**

Effective Overburden Stress, σ'v,, on Wadsworth Till Foundation from Vehicle Load			
Layer	Thickness, t (ft)	Density, γ (pcf)	σ'v = (t) x (γ) (psf)
Vehicle Load	-	3,397	3,397
LCS Granular Drainage Layer	1	130	130
Low Permeable Earth Liner	5	134.1	670.5
Total Thickness =	**6**	**Σ (σ'v) =**	**4,197.5**

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Factor of Safety against bearing capacity failure, vehicle loading, FS:

Low Permeable Earth Liner: $FS = \frac{q_{ult}}{\sigma'_v} = \frac{32{,}895 \text{ psf}}{3{,}527 \text{ psf}} = 9.3$

Wadsworth Till Foundation: $FS = \frac{q_{ult}}{\sigma'_v} = \frac{33{,}531 \text{ psf}}{4{,}197.5 \text{ psf}} = 8.0$

Results

The proposed design will achieve a minimum factor of safety against bearing capacity failure of 2.0 under static conditions and 1.5 under seismic conditions in accordance with 35 Ill. Admin. Code Section 811.304 (c). A summary of the determined factors of safety against bearing capacity failure of the landfill foundation layers are presented in the following table.

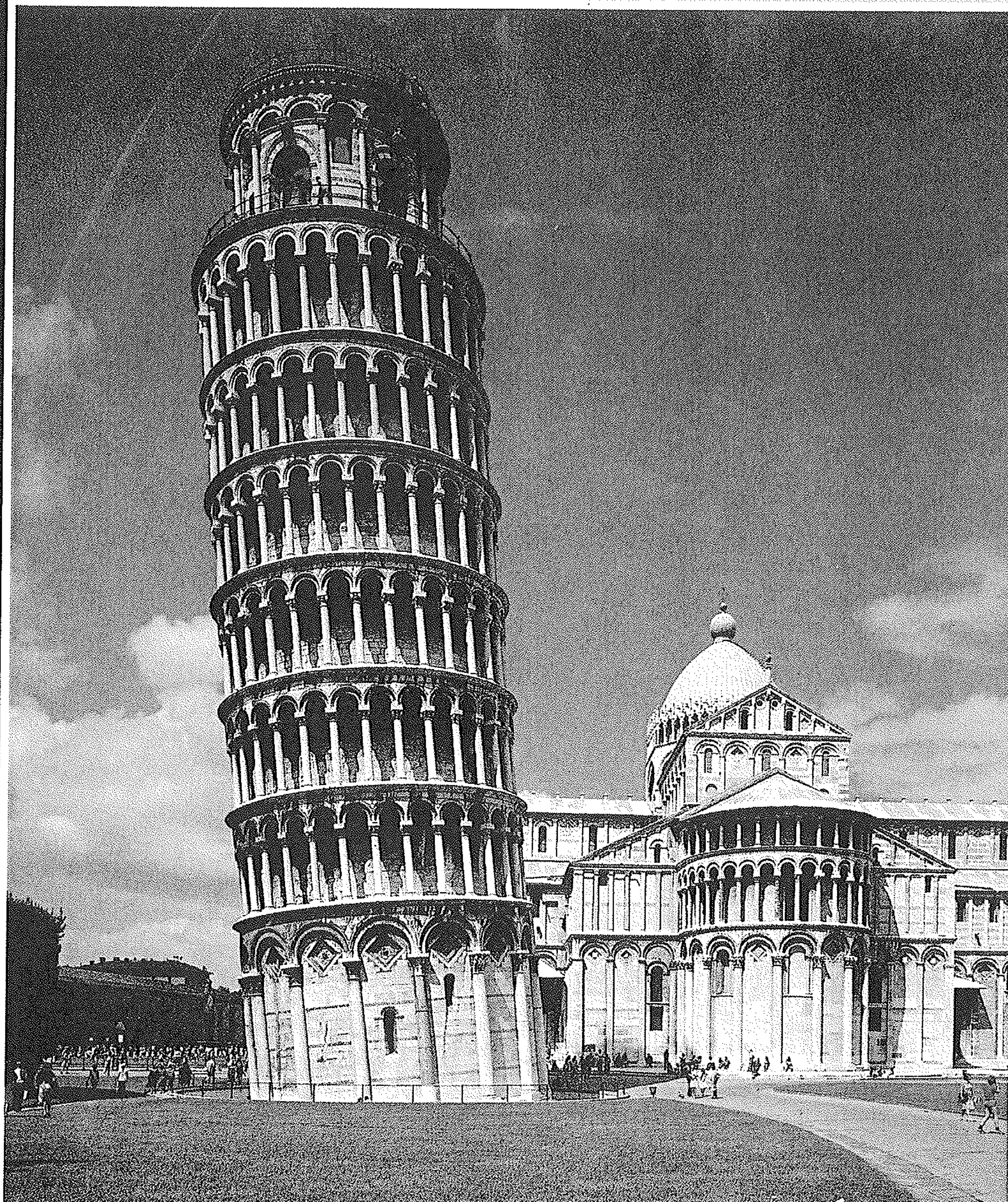
Factors of Safety Against Bearing Capacity Failure			
Conditions	**Calculated FS**	**Required FS**	**Compliance**
Landfill Expansion Design – Low Permeable Earth Liner (Max. Waste Height of 206 feet):			
Static	21.5	2.0	✓
Seismic	19.7	1.5	✓
Vehicle Loading	9.3	2.0	✓
Landfill Expansion Design – Wadsworth Till Foundation (Max. Waste Height of 206 feet):			
Static	2.0	2.0	✓
Seismic	1.8	1.5	✓
Vehicle Loading	8.0	2.0	✓

Published Technical References

SECOND EDITION

FOUNDATION DESIGN

Principles and Practices



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proper scaling factors. However, the advent of centrifuge model tests has partially overcome this problem.

Limit equilibrium analyses are the dominant way to assess bearing capacity of shallow foundations. These analyses define the shape of the failure surface, as shown in Figure 6.1, then evaluate the stresses and strengths along this surface. These methods of analysis have their roots in Prandtl's studies of the punching resistance of metals (Prandtl, 1920). He considered the ability of very thick masses of metal (i.e., not sheet metal) to resist concentrated loads. Limit equilibrium analyses usually include empirical factors developed from model tests.

Occasionally, geotechnical engineers perform more detailed bearing capacity analyses using numerical methods, such as the finite element method (FEM). These analyses are more complex, and are justified only on very critical and unusual projects.

We will consider only limit equilibrium methods of bearing capacity analyses, because these methods are used on the overwhelming majority of projects.

Simple Bearing Capacity Formula

The limit equilibrium method can be illustrated by considering the continuous footing shown in Figure 6.4. Let us assume this footing experiences a bearing capacity failure, and that this failure occurs along a circular shear surface as shown. We will further assume the soil is an undrained clay with a shear strength s_u. Finally, we will neglect the shear strength between the ground surface and a depth D, which is conservative. Thus, the soil in this zone is considered to be only a surcharge load that produces a vertical total stress of $\sigma_{zD} = \gamma D$ at a depth D.

The objective of this derivation is to obtain a formula for the *ultimate bearing capacity*, q_{ult}, which is the bearing pressure required to cause a bearing capacity failure. By

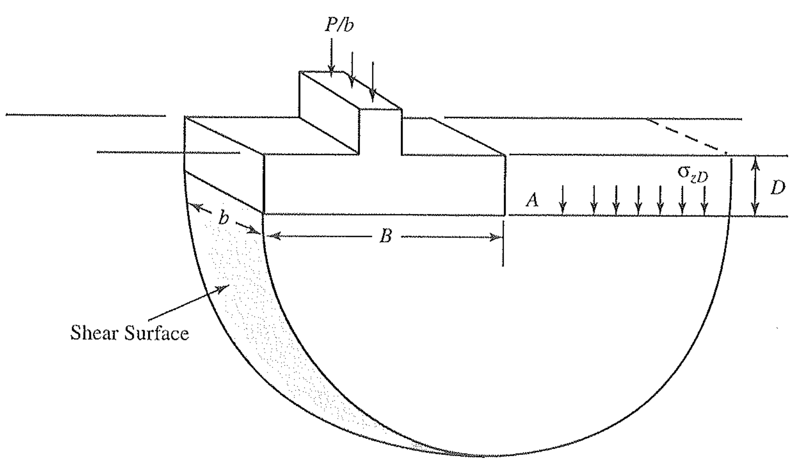


Figure 6.4 Bearing capacity analysis along a circular failure surface.

considering a slice of the foundation of length b and taking moments about Point A, we obtain the following:

$$M_A = (q_{ult}Bb)(B/2) - (s_u \pi Bb)(B) - \sigma_{zD}Bb(B/2) \tag{6.1}$$

$$q_{ult} = 2\,\pi\, s_u + \sigma_{zD} \tag{6.2}$$

It is convenient to define a new parameter, called a *bearing capacity factor*, N_c, and rewrite Equation 6.2 as:

$$\boxed{q_{ult} = N_c s_u + \sigma_{zD}} \tag{6.3}$$

Equation 6.3 is known as a *bearing capacity formula*, and could be used to evaluate the bearing capacity of a proposed foundation. According to this derivation, $N_c = 2\pi = 6.28$.

This simplified formula has only limited applicability in practice because it considers only continuous footings and undrained soil conditions ($\phi = 0$), and it assumes the foundation rotates as the bearing capacity failure occurs. However, this simple derivation illustrates the general methodology required to develop more comprehensive bearing capacity formulas.

Terzaghi's Bearing Capacity Formulas

Various limit equilibrium methods of computing bearing capacity of soils were advanced in the first half of the twentieth century, but the first one to achieve widespread acceptance was that of Terzaghi (1943). His method includes the following assumptions:

- The depth of the foundation is less than or equal to its width ($D \leq B$).
- The bottom of the foundation is sufficiently rough that no sliding occurs between the foundation and the soil.
- The soil beneath the foundation is a homogeneous semi-infinite mass (i.e., the soil extends for a great distance below the foundation and the soil properties are uniform throughout).
- The shear strength of the soil is described by the formula $s = c' + \sigma' \tan \phi'$.
- The general shear mode of failure governs.
- No consolidation of the soil occurs (i.e., settlement of the foundation is due only to the shearing and lateral movement of the soil).
- The foundation is very rigid in comparison to the soil.
- The soil between the ground surface and a depth D has no shear strength, and serves only as a surcharge load.
- The applied load is compressive and applied vertically to the centroid of the foundation and no applied moment loads are present.

Terzaghi considered three zones in the soil, as shown in Figure 6.5. Immediately beneath the foundation is a *wedge zone* that remains intact and moves downward with the

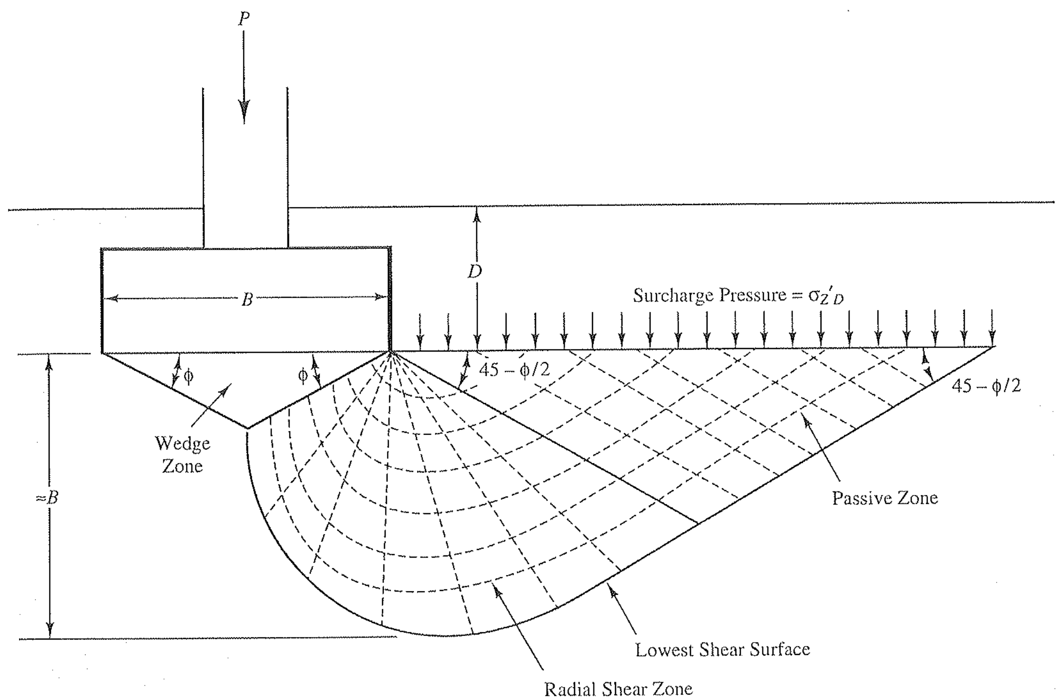


Figure 6.5 Geometry of failure surface for Terzaghi's bearing capacity formulas.

foundation. Next, a *radial shear zone* extends from each side of the wedge, where he took the shape of the shear planes to be logarithmic spirals. Finally, the outer portion is the *linear shear zone* in which the soil shears along planar surfaces.

Since Terzaghi neglected the shear strength of soils between the ground surface and a depth D, the shear surface stops at this depth and the overlying soil has been replaced with the surcharge pressure σ_{zD}'. This approach is conservative, and is part of the reason for limiting the method to relatively shallow foundations ($D \leq B$).

Terzaghi developed his theory for continuous foundations (i.e., those with a very large L/B ratio). This is the simplest case because it is a two-dimensional problem. He then extended it to square and round foundations by adding empirical coefficients obtained from model tests and produced the following bearing capacity formulas:

For square foundations:

$$\boxed{q_{ult} = 1.3\,c'N_c + \sigma_{zD}'N_q + 0.4\gamma'BN_\gamma} \tag{6.4}$$

For continuous foundations:

$$\boxed{q_{ult} = c'N_c + \sigma_{zD}'N_q + 0.5\gamma'BN_\gamma} \tag{6.5}$$

For circular foundations:

$$\boxed{q_{ult} = 1.3\, c'N_c + \sigma'_{zD}N_q + 0.3\gamma' BN_\gamma} \tag{6.6}$$

Where:

q_{ult} = ultimate bearing capacity
c' = effective cohesion for soil beneath foundation
ϕ' = effective friction angle for soil beneath foundation
σ_{zD}' = vertical effective stress at depth D below the ground surface ($\sigma_{zD}' = \gamma\, D$ if depth to groundwater table is greater than D)
γ' = effective unit weight of the soil ($\gamma = \gamma'$ if groundwater table is very deep; see discussion later in this chapter for shallow groundwater conditions)
D = depth of foundation below ground surface
B = width (or diameter) of foundation
N_c, N_q, N_γ = Terzaghi's bearing capacity factors $= f(\phi')$ (See Table 6.1 or Equations 6.7–6.12.)

Because of the shape of the failure surface, the values of c' and ϕ' only need to represent the soil between the bottom of the footing and a depth B below the bottom. The soils between the ground surface and a depth D are treated simply as overburden.

Terzaghi's formulas are presented in terms of effective stresses. However, they also may be used in a total stress analyses by substituting c_T, ϕ_T, and σ_D for c', ϕ', and σ_D'. If saturated undrained conditions exist, we may conduct a total stress analysis with the shear strength defined as $c_T = s_u$ and $\phi_T = 0$. In this case, $N_c = 5.7$, $N_q = 1.0$, and $N_c = 0.0$.

The Terzaghi bearing capacity factors are:

$$\boxed{N_q = \frac{a_\theta^2}{2\cos^2(45 + \phi'/2)}} \tag{6.7}$$

$$a_\theta = e^{\pi(0.75 - \phi'/360)\tan\phi'} \tag{6.8}$$

$$\boxed{N_c = 5.7} \qquad \text{for } \phi' = 0 \tag{6.9}$$

$$\boxed{N_c = \frac{N_q - 1}{\tan\phi'}} \qquad \text{for } \phi' > 0 \tag{6.10}$$

$$N_\gamma = \frac{\tan\phi'}{2}\left(\frac{K_{p\gamma}}{\cos^2\phi'} - 1\right) \tag{6.11}$$

These bearing capacity factors are also presented in tabular form in Table 6.1. Notice that Terzaghi's N_c of 5.7 is smaller than the value of 6.28 derived from the simple bearing capacity analysis. This difference the result of using a circular failure surface in the simple method and a more complex geometry in Terzaghi's method.

TABLE 6.1 BEARING CAPACITY FACTORS

ϕ' (deg)	Terzaghi (for use in Equations 6.4–6.6)			Vesić (for use in Equation 6.13)		
	N_c	N_q	N_γ	N_c	N_q	N_γ
0	5.7	1.0	0.0	5.1	1.0	0.0
1	6.0	1.1	0.1	5.4	1.1	0.1
2	6.3	1.2	0.1	5.6	1.2	0.2
3	6.6	1.3	0.2	5.9	1.3	0.2
4	7.0	1.5	0.3	6.2	1.4	0.3
5	7.3	1.6	0.4	6.5	1.6	0.4
6	7.7	1.8	0.5	6.8	1.7	0.6
7	8.2	2.0	0.6	7.2	1.9	0.7
8	8.6	2.2	0.7	7.5	2.1	0.9
9	9.1	2.4	0.9	7.9	2.3	1.0
10	9.6	2.7	1.0	8.3	2.5	1.2
11	10.2	3.0	1.2	8.8	2.7	1.4
12	10.8	3.3	1.4	9.3	3.0	1.7
13	11.4	3.6	1.6	9.8	3.3	2.0
14	12.1	4.0	1.9	10.4	3.6	2.3
15	12.9	4.4	2.2	11.0	3.9	2.6
16	13.7	4.9	2.5	11.6	4.3	3.1
17	14.6	5.5	2.9	12.3	4.8	3.5
18	15.5	6.0	3.3	13.1	5.3	4.1
19	16.6	6.7	3.8	13.9	5.8	4.7
20	17.7	7.4	4.4	14.8	6.4	5.4
21	18.9	8.3	5.1	15.8	7.1	6.2
22	20.3	9.2	5.9	16.9	7.8	7.1
23	21.7	10.2	6.8	18.0	8.7	8.2
24	23.4	11.4	7.9	19.3	9.6	9.4
25	25.1	12.7	9.2	20.7	10.7	10.9
26	27.1	14.2	10.7	22.3	11.9	12.5
27	29.2	15.9	12.5	23.9	13.2	14.5
28	31.6	17.8	14.6	25.8	14.7	16.7
29	34.2	20.0	17.1	27.9	16.4	19.3
30	37.2	22.5	20.1	30.1	18.4	22.4
31	40.4	25.3	23.7	32.7	20.6	26.0
32	44.0	28.5	28.0	35.5	23.2	30.2
33	48.1	32.2	33.3	38.6	26.1	35.2
34	52.6	36.5	39.6	42.2	29.4	41.1
35	57.8	41.4	47.3	46.1	33.3	48.0
36	63.5	47.2	56.7	50.6	37.8	56.3
37	70.1	53.8	68.1	55.6	42.9	66.2
38	77.5	61.5	82.3	61.4	48.9	78.0
39	86.0	70.6	99.8	67.9	56.0	92.2
40	95.7	81.3	121.5	75.3	64.2	109.4
41	106.8	93.8	148.5	83.9	73.9	130.2

836K

Landfill Compactor

Engine		
Engine Model	Cat® C18 ACERT™	
Emissions	Tier 4 Final/Stage IV	
Gross (SAE J1349)	419 kW	562 hp

Operating Specifications		
Maximum Operating Weight – Multiple Blade and Wheel Offerings	55 927 kg	123,319 lb

836K Landfill Compactor Specifications

Engine

Engine Model	C18 ACERT	
Emissions	U.S. EPA Tier 4 Final and EU Stage IV	
Rated Power (Lab)	414 kW	555 hp
Rated Power (Net ISO 14396)	412 kW	553 hp
Gross (SAE J1349)	419 kW	562 hp
Net Power – SAE J1349		
Direct Drive – Gross Power	370 kW	496 hp
Direct Drive – Torque Rise	52%	
Converter Drive – Gross Power	370 kW	496 hp
Converter Drive – Torque Rise	52%	
Maximum Gross Torque @ 1,300 rpm	3085 N·m	2,275 lbf-ft
Maximum Altitude without Derating	2286 m	7,500 ft
Bore	145 mm	5.71 in
Stroke	183 mm	7.2 in
Displacement	18.1 L	1,104.5 in^3
High Idle Speed	2,120 rpm	
Low Idle Speed	750 rpm	

Operating Specifications

Operating Weight with Full Tank Capacities and U-blade	55 927 kg	123,319 lb

Transmission

Transmission Type	Planetary – Powershift – ECPC	
Travel Speeds		
Forward – Converter 1st	6.2 km/h	3.9 mph
Forward – Lockup 1st	6.5 km/h	4 mph
Forward – Converter 2nd	10.9 km/h	6.8 mph
Forward – Lockup 2nd	11.7 km/h	7.3 mph
Reverse – Converter 1st	6.5 km/h	4 mph
Reverse – Lockup 1st	6.9 km/h	4.3 mph
Reverse – Converter 2nd	10.4 km/h	6.5 mph
Reverse – Lockup 2nd	12.3 km/h	7.6 mph

Hydraulic System

Hydraulic System	Flow Sharing Implement	
Maximum Supply Pressure	32 000 kPa	4,640 psi
Main Relief Pressure	24 100 kPa	3,495 psi
Pump Flow at 2,006 rpm	250 L/min	66 gal/min
Steering System	Double Acting – End Mounted	
Bore	127 mm	5 in
Stroke	740 mm	29.1 in
Vehicle Articulation Angle	86°	
Lift System	Double Acting Cylinder	
Bore	137.9 mm	5.5 in
Stroke	1021 mm	40.2 in

Service Refill Capacities

Fuel Tank	793 L	209 gal
Cooling System	107 L	28 gal
Crankcase	60 L	16 gal
Diesel Engine Fluid Tank	32.8 L	9 gal
Transmission	120 L	32 gal
Differentials and Final Drives – Front	186 L	49 gal
Differentials and Final Drives – Rear	190 L	50 gal
Hydraulic System (tank only)	240 L	63 gal

- All non-road Tier 4 Final/Stage IV, and Japan (MLIT) Step 4 diesel engines are required to use:
  - Ultra Low Sulfur Diesel (ULSD) fuels containing 15 ppm (mg/kg) sulfur or less. Biodiesel blends up to B20 are acceptable when blended with 15 ppm (mg/kg) sulfur or less ULSD and when the biodiesel feedstock meets ASTM D7467 specifications.
  - Cat DEO-ULS™ or oils that meet the Cat ECF-3, API CJ-4, and ACEA E9 specifications are required.

Axles

Front	Planetary – Fixed
Rear	Planetary – Oscillating
Oscillation Angle	13°

Brakes

Control System	Full Hydraulic Split Circuit
Parking Brake	Spring Applied, Hydraulic Released

Cab

	Standard	Suppression
Interior Sound Level	72 dB(A)	71 dB(A)
Exterior Sound Level	111 dB(A)	109 dB(A)

Hydraulic System – Steering

Steering System – Circuit	Steering Double Acting – End Mounted	
Steering System – Pump	Piston – Variable Displacement	
Maximum Flow @ × rpm	52 L/min @ 2,006 rpm	
Steering Pressure Limited	24 100 kPa	3,495 psi
Total Steering Angle	86 degrees	

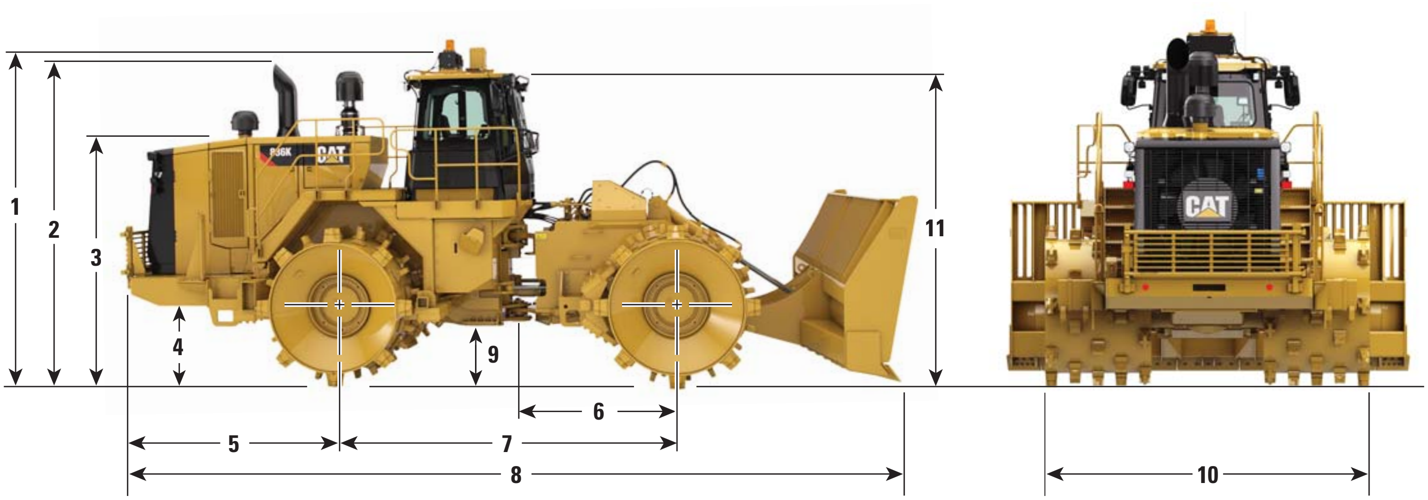
Wheels and Tips

Drum Width	1400 mm	4 ft 8 in
Drum Diameter	1770 mm	5 ft 10 in
Diameter with Tips	2125 mm	7 ft 0 in
Tips per Wheel	40	

836K Landfill Compactor Specifications

Dimensions

All dimensions are approximate.



1	Height to Top of Cab with A/C	4655 mm	15 ft 3 in
2	Height to Top of Exhaust Pipe	4608 mm	15 ft 1 in
3	Height to Top of Hood	3421 mm	11 ft 3 in
4	Ground Clearance to Bumper	1029 mm	3 ft 5 in
5	Center Line of Rear Axle to Edge of Counterweight	3187 mm	10 ft 5 in
6	Hitch to Center Line of Front Axle	2275 mm	7 ft 6 in
7	Wheelbase	4550 mm	14 ft 11 in
8	Length with Blade on Ground (straight blade)	10 182 mm	33 ft 5 in
9	Ground Clearance	632 mm	2 ft 1 in
10	Width over Wheels	4280 mm	14 ft 1 in
11	Height to ROPS/Canopy	4284 mm	14 ft 1 in
	Height to Top of Cab with Strobe	4845 mm	15 ft 11 in
Turning Radius – Inside of Wheels		3635 mm	11 ft 11 in

Blade Selection

	Straight Blade		Semi U-blade		U-blade	
Width – Moldboard Length	4990 mm	16 ft 4 in	5238 mm	17 ft 2 in	5172 mm	17 ft
Width Over End Bits	5193 mm	17 ft	5311 mm	17 ft 5 in	5258 mm	17 ft 3 in
Height with Cutting Edge and Screen	2236 mm	7 ft 4 in	2215 mm	7 ft 3 in	2210 mm	7 ft 3 in
Height with Cutting Edge, No Screen	1217 mm	4 ft	1253 mm	4 ft 1 in	1255 mm	4 ft 1 in
Maximum Depth of Cut	364 mm	1 ft 2 in	362 mm	1 ft 2 in	934 mm	3 ft 1 in
Maximum Lift above Ground	1730 mm	5 ft 8 in	1735 mm	5 ft 8 in	1198 mm	3 ft 11 in
Cutting Edges, Reversible						
Length, Each End Section (3 edges)	1408.2 mm	4 ft 7 in	816.6 mm	2 ft 8 in	2 @ 779.1 mm and 1 @ 856 mm	2 @ 2 ft 7 in and 1 @ 2 ft 10 in
Length, Each End Section (2 edges)	NA		988 mm	3 ft 3 in	1094.4 mm	3 ft 7 in
Width × Thickness	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in
End Bits (2), Self-sharpening						
Length, Each	472 mm	1 ft 7 in	472 mm	1 ft 7 in	472 mm	1 ft 7 in
Width × Thickness	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in
Capacity, Rated	19.3 m^3	25.9 yd^3	22.4 m^3	29.3 yd^3	9.74 m^3	13 yd^3
Turning Diameter, Outside Corner of Blade at 43° ART	8737 mm	28 ft 8 in	8823 mm	28 ft 11 in	8795 mm	28 ft 10 in
Overall Machine Length	10 182 mm	33 ft 5 in	10 379 mm	34 ft 1 in	10 272 mm	33 ft 8 in

J.4 – Liner/LCS Evaluations

APTIM

J.4-A Anchor Trench

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: ANCHOR TRENCH / RUNOUT

Problem Statement:

The geosynthetics to be used as part of the Expansion design provide sufficient friction angles that they are anticipated to hold themselves in place after installation. However, anchor trenches are proposed to be used along the perimeter of the waste boundary to bury the edge of geosynthetic materials. This is completed in order to protect the edges and provide protection from wind uplift.

In the unlikely event that a geosynthetic is subjected to sufficient force to pull it from its installed location, it is important that the anchor trench is designed to allow the geosynthetic material to be pulled out prior to tearing or damaging the geosynthetic. This calculation determines the maximum acceptable anchor trench dimensions that will ensure a "pull-out" condition.

Given:

- ❑ Coduto, D.P., *Foundation Design, Principles and Practices*. Prentice Hall, Second Edition (refer to attached pages).
- ❑ Koerner, R.M., Designing with Geosynthetics. Prentice Hall, Fifth Edition (refer to attached pages).
- ❑ Sharma, Hari and Lewis Sangeeta, Waste containment Systems, Waste Stabilization, and Landfills Design and Evaluation, John Wiley and Sons, Inc., 1994 (refer to attached pages).
- ❑ Poly-Flex (Manufacturer) product information for 60-mil textured HDPE geomembrane (refer to attached pages).
- ❑ Appendix J.1 "Summary of Geotechnical Design Parameters" contained in this Application.
- ❑ Design detail of liner termination, including slope of geomembrane liner runout.
- ❑ Cross sectional diagrams of liner termination (refer to attached pages).

Assumptions

- ❑ Anchor trenches will line the perimeter of the landfill in order to protect the geosynthetic edges and prevent wind uplift.
- ❑ Holding capacity (resistance) to pull-out should not exceed the ultimate material strength of the geomembrane. The geomembrane will tear if a force greater than the ultimate strength is applied to the geomembrane. The holding capacity should be slightly less than the ultimate tensile strength to be anchored (see attached Sharma and Lewis reference).

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- The equations for anchor trenches developed by Koerner (refer to attached pages) were modified to account for the 3H:1V slope of the geomembrane liner runout (refer to attached sketches).

$$\Sigma F_x = 0$$

$$(T_{allow})(\cos\beta) = F_{U\sigma} + F_{L\sigma} + F_{LT} - P_A + P_P$$

Therefore:

$$(T_{allow}) = \frac{F_{U_\sigma} + F_{L_\sigma} + F_{LT} - P_A + P_P}{\cos\beta}$$

Where,

$$F_{U\sigma} = (\sigma_n)(\tan\delta)(L_{RO}) = 0 \text{ (negligible)}$$

$$F_{L\sigma} = (\sigma_n)(\tan\delta)(L_{RO})$$

$$F_{LT} = (T_{allow})(\sin\beta)(\tan\delta)$$

$$P_a = \left[\left(\frac{\gamma_{AT} * d_{AT}^2 * K_a}{2}\right) - \left(2c * d_{AT}\sqrt{K_a}\right) + \left(\frac{2c^2}{\gamma_{AT}}\right)\right]$$

$$K_a = \left(\tan^2\left(45° - \frac{\phi}{2}\right)\right)$$

$$P_p = \left[\left(\frac{\gamma_{AT} * d_{AT}^2 * K_p}{2}\right) + \left(2c * d_{AT}\sqrt{K_p}\right)\right]$$

$$K_p = \left(\tan^2\left(45° + \frac{\phi}{2}\right)\right)$$

Note: Equations for active and passive earth pressures were modified to account for soil cohesion (see attached pages). Variables used above are defined on the following page.

Note: Variables used above are defined on the next page.
Where,

T_{allow}	=	Allowable force in geomembrane
β	=	Side slope angle (degrees)
$F_{U\sigma}$	=	Shear force above geomembrane due to cover soil (note, that for thin cover soils tensile cracking will occur and this value will be negligible)
$F_{L\sigma}$	=	Shear force below geomembrane due to cover soil
F_{LT}	=	Shear force below geomembrane due to vertical component of T_{allow}
P_A	=	Active earth pressure against the backfill side of the anchor trench

P_P	=	Passive earth pressure against the in-situ side of the anchor trench
K_A	=	Coefficient of active earth pressure
K_P	=	Coefficient of passive earth pressure
σ_n	=	Applied normal stress from cover soil = $(d_{cs})(\gamma_{cs})$
d_{CS}	=	Depth of cover soil overlying runout for the “no anchor trench scenario”
$d_{CS\text{-}AT}$	=	Depth of cover soil overlying runout for the “with anchor trench scenario”
γ_{cs}	=	Unit weight of cover soil
δ	=	Angle of shearing resistance (interface friction angle) between geomembrane and soil
L_{RO}	=	Length of geomembrane runout
d_{AT}	=	Depth of anchor trench
γ_{AT}	=	Unit weight of backfill soil in anchor trench
φ	=	Angle of shearing resistance (friction angle) of backfill soil
c	=	Cohesion of backfill soil

- ❑ Assumed geomembrane yield strength (allowable geomembrane stress), T_{allow} = 126 lb/in = 1,512 lb/ft (see product information).

- ❑ Interface friction angle (δ) for earth liner soil to textured geomembrane = 14.9 degrees (refer to **Appendix J.2-C** and **J.2-D**).

- ❑ Backfill and cover soils to be recompacted cohesive soil for which the unit weight (γ_{cs}) was conservatively estimated to be 134.1 pcf (saturated unit weight).

- ❑ Assumed a 2.0-foot thick cover soil over runout, for which γ_{cs} = 134.1 pcf.

- ❑ Assumed the offset distance of the anchor trench (horizontal runout, L_{RO}) to be 2-feet from the top of slope, for which backfill γ_{AT} = 134.1 pcf.

- ❑ The depth of anchor trench (d_{AT}) was solved for using the equations provided on page 2 (unit weight of backfill soil: γ_{AT} = 134.1 pcf).

- ❑ Assumed undrained conditions: friction angle of backfill soil (φ) = 11.8 degrees and a cohesion value of backfill soil (c) = 1,465 psf, to be conservative.

- ❑ Liner side slope angle, β = 18.43 degrees.

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

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TITLE: ANCHOR TRENCH / RUNOUT

Calculations

Determine the maximum depth of the anchor trench (d_{AT}) by trial and error.

$$(T_{actual}) = \frac{F_{U\sigma} + F_{L\sigma} + F_{LT} - P_A + P_P}{\cos(\beta)}$$

$F_{U\sigma} = 0$ (negligible)

$$F_{L\sigma} = (\sigma_n)(\tan\delta)(L_{RO}) = (2.0\text{ ft} \times 134.1\text{ pcf})(\tan 14.9°)(2\text{ ft})$$

$$= 142.7\text{ lb / ft}$$

$$F_{LT} = (T_{allow})(\sin\beta)(\tan\delta) = (1{,}512\text{ lb/ft})(\sin 18.43°)(\tan 14.9°)$$

$$= 127.2\text{ lb / ft}$$

$$P_a = \left[\left(\frac{\gamma_{AT} \times d_{AT}^2 \times K_a}{2}\right) - \left(2c \times d_{AT}\sqrt{K_a}\right) + \left(\frac{2c^2}{\gamma_{AT}}\right)\right]$$

$$K_a = \left(\tan^2\left(45° - \frac{\varphi}{2}\right)\right) = \left(\tan^2\left(45° - \frac{11.8°}{2}\right)\right) = 0.7$$

$$P_a = \left[\left(\frac{134.1\text{ pcf} \times (d_{AT})^2 \times 0.7}{2}\right) - \left(2 \times 1{,}465\text{ psf} \times d_{AT}\sqrt{0.7}\right) + \left(\frac{2(1{,}465\text{ psf})^2}{134.1\text{ pcf}}\right)\right]$$

$$= \left[46.9 d_{AT}^2 - 2{,}451 d_{AT} + 32{,}009\right]\text{ lb / ft}$$

$$P_P = \left[\left(\frac{\gamma_{AT} \times d_{AT}^2 \times K_p}{2}\right) + \left(2c \times d_{AT}\sqrt{K_p}\right)\right]$$

$$K_P = \left(\tan^2\left(45° - \frac{\varphi}{2}\right)\right) = \left(\tan^2\left(45° + \frac{11.8°}{2}\right)\right) = 1.5$$

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$$P_P = \left[\left(\frac{134.1\text{ pcf} \times (d_{AT})^2 \times 1.5}{2}\right) + \left(2 \times 1{,}465\text{ psf} \times d_{AT}\sqrt{1.5}\right)\right]$$

$$= \left[100.6 d_{AT}^2 + 3{,}589 d_{AT}\right]\text{ lb / ft}$$

$$(T_{actual}) = \frac{F_{U\sigma} + F_{L\sigma} + F_{LT} - P_A + P_P}{\cos(\beta)}$$

$$= \left(\frac{0 + 142.7 + 127.2}{\cos(18.43)}\right)\text{ lb/ft} - \left(\frac{46.9 d_{AT}^2 - 2{,}451 d_{AT} + 32{,}009}{\cos(18.43)}\right)\text{ lb/ft} + \left(\frac{100.6 d_{AT}^2 + 3{,}589 d_{AT}}{\cos(18.43)}\right)\text{ lb/ft}$$

$$(T_{actual}) = \left(\frac{53.7 d_{AT}^2 + 6{,}040 d_{AT} - 31{,}739.1}{\cos(18.43)}\right)\text{ lb/ft}$$

Set T_{actual} to 1,512 lb/ft and solve for $d_{AT} \rightarrow d_{AT} = 5.2$ ft.

Results

Based on the strength properties of geomembranes, the depth of the anchor trench should not exceed 5.2-feet in order to ensure that the geomembrane will not be damaged in the unlikely event that it is subjected to significant forces. The proposed design depth for each anchor trench is 2.0-feet. Therefore, the proposed anchor trench design is considered appropriate.

Client: Zion Landfill, Inc.

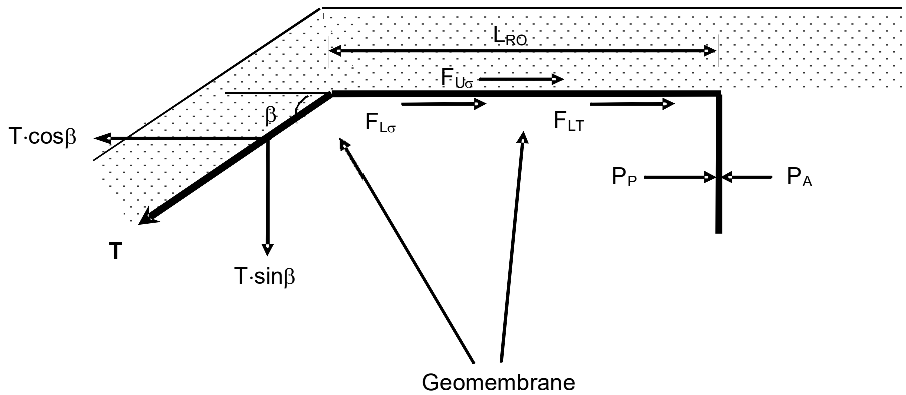
Project: Zion Landfill – Site 2 North Expansion

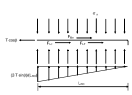
Project #: 631020105

Calculated By: ORC **Date:** 05/2022

Checked by: DAM **Date:** 05/2022

TITLE: ANCHOR TRENCH / RUNOUT





Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

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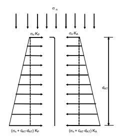
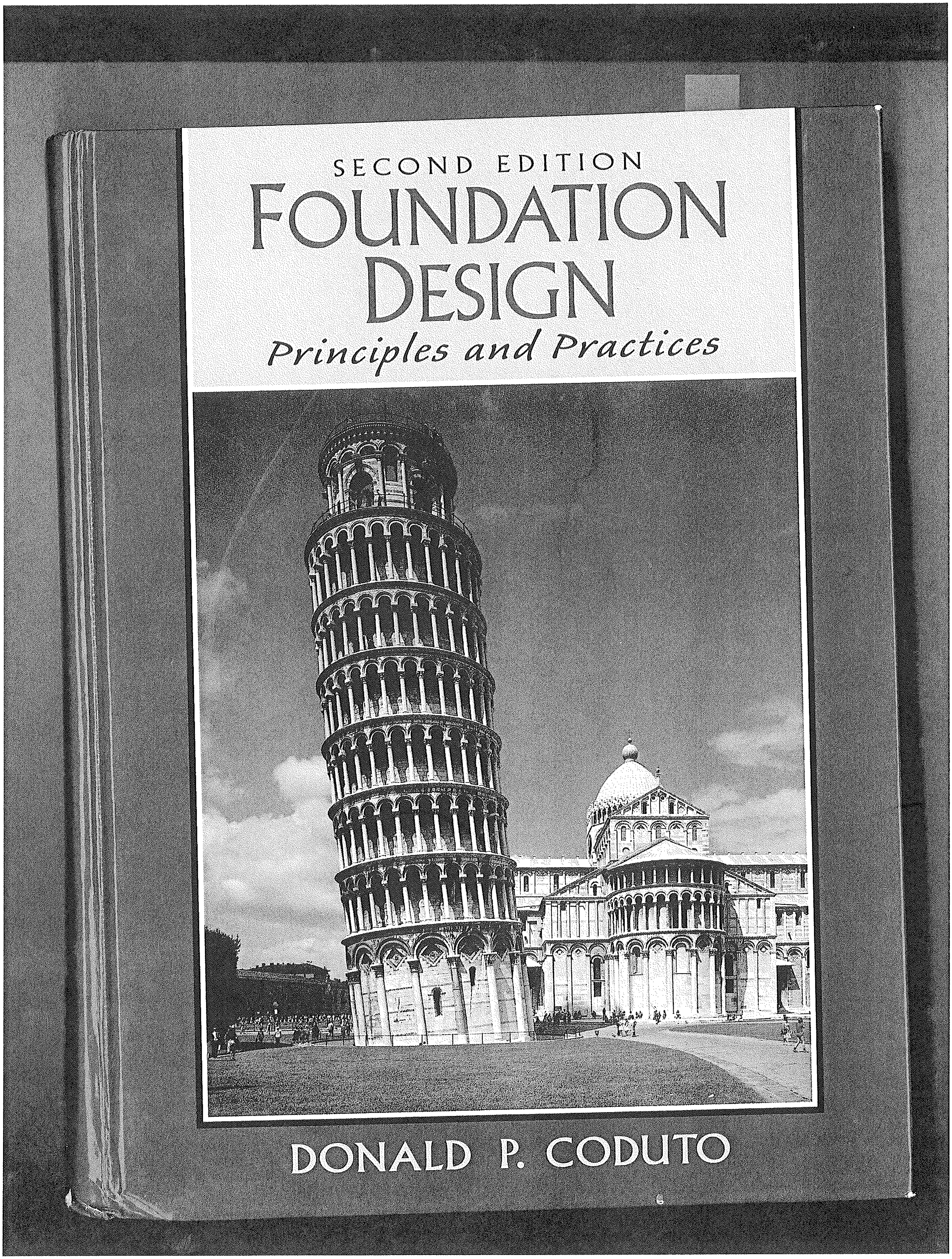
TITLE: ANCHOR TRENCH / RUNOUT



Published Technical References


SECOND EDITION
FOUNDATION DESIGN
Principles and Practices
DONALD P. CODUTO

23.3 A basement is to be built using 2.5-m tall masonry walls. These walls will be backfilled with a silty sand that has $c' = 0$, $\phi' = 35°$, and $\gamma = 19.7$ kN/m^3. Assuming the at-rest conditions will exist and using an overconsolidation ratio of 2, compute the normal force per meter acting on the back of this wall. Also, draw a pressure diagram and indicate the lateral earth pressure acting at the bottom of the wall.

23.4 A 10-ft tall concrete wall with a vertical back is to be backfilled with a silty sand that has a unit weight of 122 lb/ft^3, an effective cohesion of 0, and an effective friction angle of 32°. The ground behind the wall will be level. Using Rankine's method, compute the normal force per foot acting on the back of the wall. Assume the wall moves sufficiently to develop the active condition in the soil.

23.5 The wall described in Problem 23.4 has a foundation that extends from the ground surface to a depth of 2 ft. As the wall moves slightly away from the backfill soils to create the active condition, the footing moves into the soils below the wall, creating the passive condition as shown in Figure 23.9. Compute the ultimate passive pressure acting on the front of the foundation.

23.6 A 12-ft tall concrete wall with a vertical back is to be backfilled with a clean sand that has a unit weight of 126 lb/ft^3, an effective cohesion of 0, and an effective friction angle of 36°. The ground behind the wall will be inclined at a slope of 2 horizontal to 1 vertical. Using Rankine's method, compute the normal and shear forces per foot acting on the back of the wall. Assume the wall moves sufficiently to develop the active condition in the soil.

23.7 Repeat Problem 23.6 using Coulomb's method.

23.3 LATERAL EARTH PRESSURES IN SOILS WITH $c \geq 0$ AND $\phi \geq 0$

Rankine did not address lateral earth pressures in soils with cohesion ($c \geq 0$ and $\phi \geq 0$) and Coulomb did not address passive pressures. However, later investigators developed complete formulas for cohesive soils. Bell (1915) was among those who contributed.

Theoretical Behavior

Soils with cohesion can stand vertically to a height of no more than the *critical height*, H_c:

$$\boxed{H_c = \frac{2c}{\gamma\sqrt{K_a}}} \tag{23.20}$$

In other words, if $H < H_c$ the earth will stand vertically without a wall. In practice we would apply some factor of safety to H_c (perhaps 1.5 to 2) before deciding not to build a wall. An engineer also would want to consider the potential for surface erosion and other modes of failure.

If $H > H_c$, the theoretical pressure distribution is as shown in Figure 23.14.

conditions.

d basement wall?

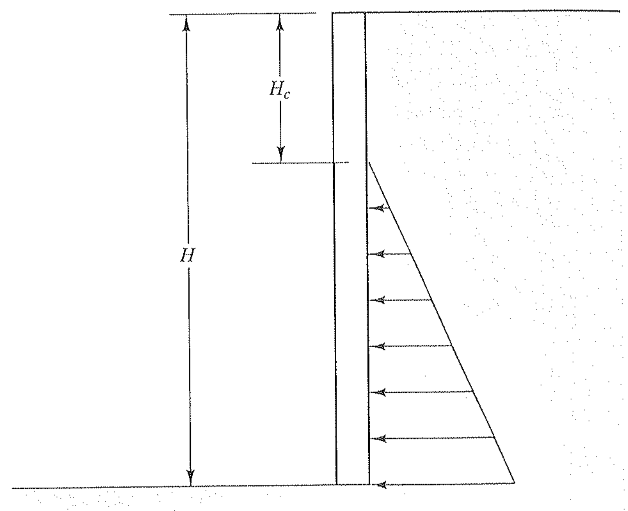


Figure 23.14 Theoretical active pressure distribution in soils with cohesion ($c \geq 0$, $\phi \geq 0$).

Equations 23.5 and 23.6 then become:

$$P_a/b = \left(\frac{\gamma H^2 K_a}{2} - 2cH\sqrt{K_a} + \frac{2c^2}{\gamma}\right)\cos\beta \geq 0 \tag{23.21}$$

$$V_a/b = \left(\frac{\gamma H^2 K_a}{2} - 2cH\sqrt{K_a} + \frac{2c^2}{\gamma}\right)\sin\beta \geq 0 \tag{23.22}$$

These formulas often are incorrectly stated without the $2c^2/\gamma$ term. This term must be present to account for the lack of tensile forces between the wall and the soil at depths shallower than H_c.

The Rankine equations for passive conditions in soils with cohesion are as follows:

$$P_p/b = \left(\frac{\gamma H^2 K_p}{2} + 2cH\sqrt{K_p}\right)\cos\beta \tag{23.23}$$

$$V_p/b = \left(\frac{\gamma H^2 K_p}{2} + 2cH\sqrt{K_p}\right)\sin\beta \tag{23.24}$$

The theoretical shape of the passive pressure distribution is shown in Figure 23.15.

Actual Behavior

The theoretical behavior may be approximately correct for sandy soils that develop cohesive strength from cementing agents, such as calcium carbonate or iron oxide. However, it is not a good indicator of lateral earth pressures in clays, and may produce unconservative

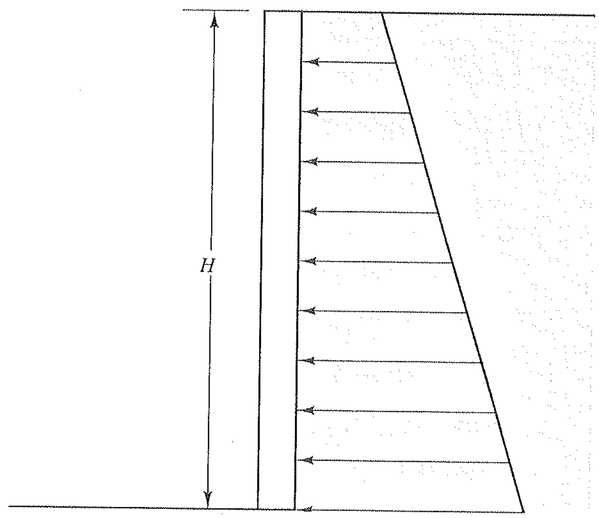


Figure 23.15 Theoretical distribution of passive earth pressure in soils with cohesion ($c \geq 0$, $\phi \geq 0$).

designs. This discrepancy occurs because the earth pressure theories do not consider the following aspects of clay behavior:

Creep

When the shear stresses in a clayey soil are a large percentage of the shear strength, a phenomenon known as *creep* can occur. The soil slowly shears and never reaches complete equilibrium unless the shear stresses become sufficiently small. When this occurs behind a retaining wall, the failure wedge slowly moves toward the wall, so it is impossible to maintain the active condition (which demands high shear stresses) for long periods. Therefore, design cantilever walls backfilled with clay using something higher than the active pressure.

Expansiveness

Another potentially more significant problem is that clayey soils may be expansive (see Chapter 19). An expanding backfill places very large loads on the wall, far greater than the computed active or at-rest pressure. The exact magnitude of lateral pressures caused by expansive soils is difficult to predict, but the passive pressure would be an upper bound.

The cyclic expansion and contraction cycles in expansive soils further aggravate this situation and could cause the following scenario:

1. The soil expands and the retaining wall moves outward.
2. The soil shrinks and moves slightly downhill, thus remaining in intimate contact with the wall. Cracks form.

3. Loose debris falls into the cracks, preventing them from closing.
4. The soil expands again and moves the wall farther out.

This process could continue indefinitely, moving the wall much farther than would a single cycle of expansion.

A slightly cohesive soil, such as an SC, would probably not pose any serious problems, but highly cohesive soils, such as a CH, could produce large movements or even failure.

Many of the preventive measures described in Chapter 19 are also appropriate for reducing the potential for expansion behind a retaining wall.

Poor Drainage

Clays have a low hydraulic conductivity, and thus obstruct drainage. Therefore, groundwater may become trapped behind the wall, producing hydrostatic pressures.

Design Guidelines

The best procedure is to avoid backfilling any wall with clay, especially in regions with adverse climates. It is often possible to bring in other soils from on-site or off-site to use for backfill material. However, if clay is used, the design must reflect their presence. Jennings (1973) described the South African practice of designing such walls using at-rest pressures with a K_0 of 0.8 to 1.0 and making them as flexible as possible. Terzaghi and Peck's design values, described in Section 23.5, also provide lateral earth pressures for walls supporting clay.

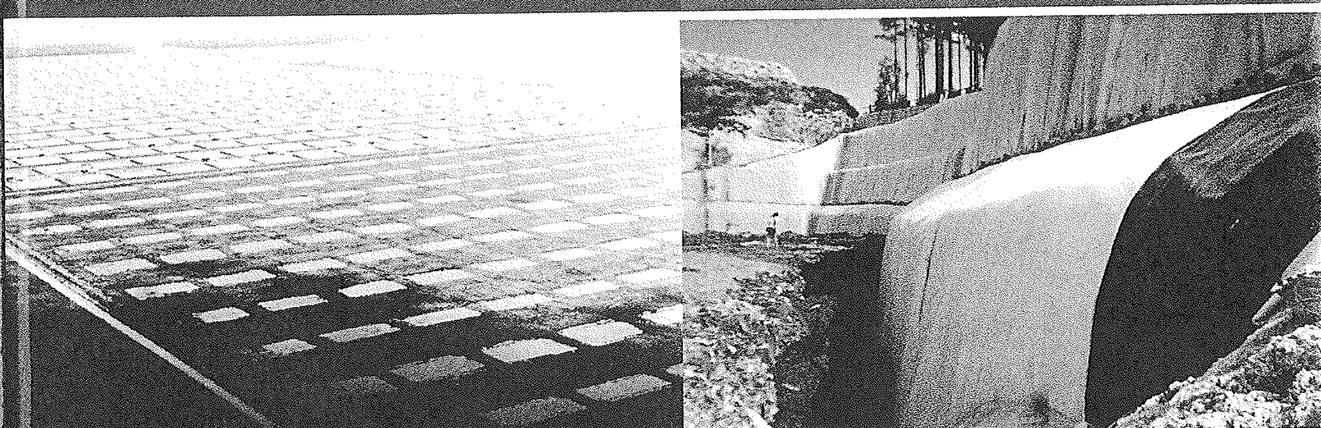
23.4 EQUIVALENT FLUID METHOD

As discussed earlier, the theoretical distribution of lateral earth pressure acting on a wall backfilled with a cohesionless soil is triangular. This is the same shape as the pressure distribution that would be imposed if the wall was backfilled with a fluid instead of soil. Furthermore, if this fluid had the proper unit weight, the magnitude of the lateral pressure also would be equal to that from the soil. Engineers often use this similarity when expressing lateral earth pressures for design purposes. Instead of quoting K values, we can describe the lateral earth pressure using the *equivalent fluid density*, G_h, which is the unit weight of a fictitious fluid that would impose the same horizontal pressures on the wall as the soil. The vertical component of the lateral earth pressure also can be expressed using a similar value, G_v. Thus, the normal and shear forces acting on the wall may then be expressed as:

$$\boxed{P_a/b = \frac{G_h H^2}{2}} \tag{23.25}$$

DESIGNING WITH GEOSYNTHETICS

FIFTH EDITION



ROBERT M. KOERNER

$$c = (N_A \tan \delta + C_a) \sin \beta \sin\left(\frac{\omega + \beta}{2}\right) \tan \phi$$

$$= (370 \tan 22 + 0) \sin 18.4 \sin\left(\frac{16 + 18.4}{2}\right) \tan 30$$

$$= 8.07 \text{ kN/m}$$

$$\text{FS} = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{62.8 + \sqrt{(-62.8)^2 - 4(37.2)(8.07)}}{2(37.2)}$$

$$\text{FS} = 1.55 \text{ (vs. 1.25 for the constant thickness cross section)}$$

Example 5.12 has also been extended to a set of design curves, as seen in Figure 5.26b. The anticipated trends are again noted, as is the agreement with the worked out example. Clearly, this type of stabilizing solution can be used if space at the toe of the slope is available. Often it is not or it occupies valuable air space and then geosynthetic reinforcement as discussed in Chapter 3 is the alternative solution.

5.3.6 Runout and Anchor Trench Design

As shown in Figure 5.18 and the profile sections of geomembrane-lined reservoirs, the liner coming up from the bottom of the excavation, covers the side slopes, and then runs over the top a short distance. It often terminates vertically down into an anchor trench. This anchor trench is typically dug by a small backhoe or trenching machine; the liner is draped over the edge, and then the trench is backfilled with the same soil that was there originally. The backfilled soil should be compacted in layers as the backfilling proceeds. Although concrete has been used as an anchorage block, it is rarely justified, at least on the basis of calculations, as will be seen in this section.

Regarding design, two separate cases will be analyzed: one with geomembrane runout only and no anchor trench at all (as is often used with canal liners), and the other as described above, with both runout and anchor trench considerations (as with reservoirs and landfills). Figure 5.27 defines the first situation, together with the forces and stresses involved. Note that the cover soil applies normal stress due to its weight but does not contribute frictional resistance above the geomembrane. This is due to the fact that the soil moves along with the geomembrane as it deforms and undoubtedly cracks, thereby losing its integrity.

From Figure 5.27, the following horizontal force summation results, which leads to the appropriate design equation:

$$\Sigma F_x = 0$$

$$T_{\text{allow}} \cos \beta = F_{U\sigma} + F_{L\sigma} + F_{LT}$$

$$= \sigma_n \tan \delta_U(L_{RO}) + \sigma_n \tan \delta_L(L_{RO}) + 0.5\left(\frac{2T_{\text{allow}} \sin \beta}{L_{RO}}\right)(L_{RO}) \tan \delta_L$$

$$L_{RO} = \frac{T_{\text{allow}}(\cos \beta - \sin \beta \tan \delta_L)}{\sigma_n(\tan \delta_U + \tan \delta_L)} \tag{5.25}$$

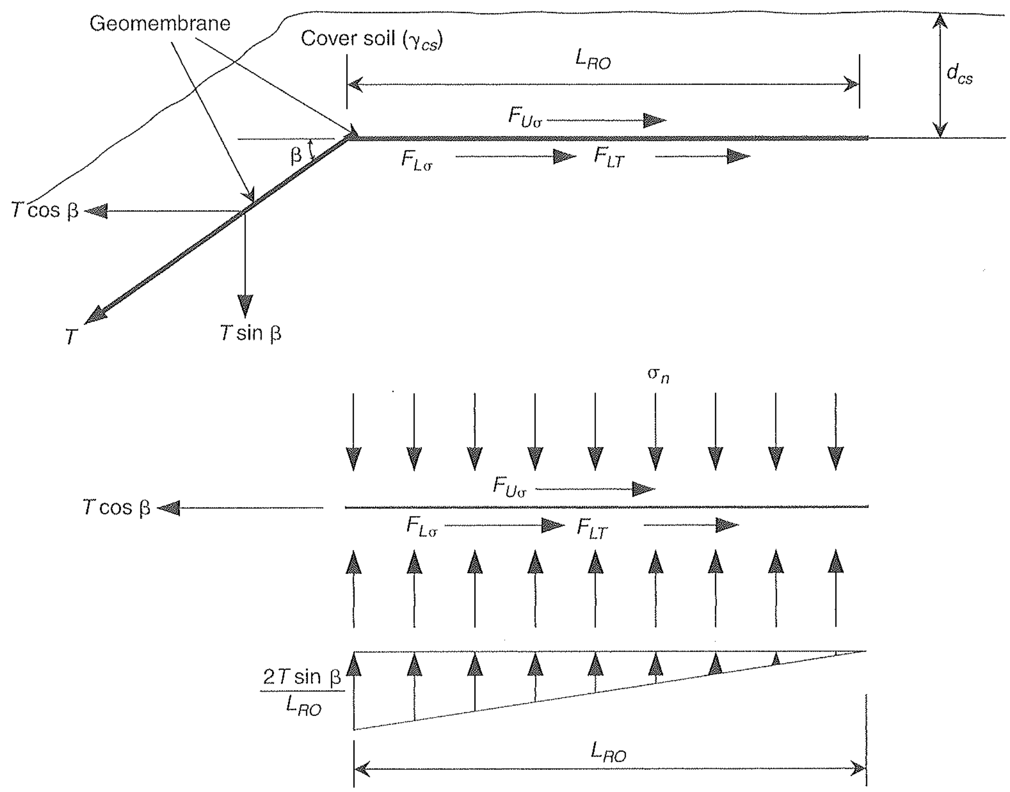


Figure 5.27 Cross section of geomembrane runout section and related stresses and forces involved.

where

T_{allow} = allowable force in geomembrane = $\sigma_{\text{allow}}\, t$, where
σ_{allow} = allowable stress in geomembrane, and
t = thickness of geomembrane;
β = side slope angle;
$F_{U\sigma}$ = shear force above geomembrane due to cover soil (note that for thin cover soils tensile cracking will occur and this value will be negligible);
$F_{L\sigma}$ = shear force below geomembrane due to cover soil;
F_{LT} = shear force below geomembrane due to vertical component of T_{allow};
σ_n = applied normal stress from cover soil;
δ = angle of shearing resistance between geomembrane and adjacent material (i.e., soil or geotextile); and
L_{RO} = length of geomembrane runout.

Example 5.13 illustrates the use of the concept and equations just developed.

Example 5.13

Consider a 1.0 mm thick LLDPE geomembrane with a mobilized allowable stress of 7000 kPa, which is on a 3(H) to 1(V) side slope. Determine the required runout length to resist this stress without use of a vertical anchor trench. In this analysis use 300 mm of cover soil weighing 16.5 kN/m^3 and a friction angle of 30° with the geomembrane.

Solution: From the design equations just presented,

$$\begin{aligned} T_{\text{allow}} &= \sigma_{\text{allow}}\, t \\ &= (7000)(0.001) \\ T_{\text{allow}} &= 7.0 \text{ kN/m} \end{aligned}$$

and

$$\begin{aligned} L_{RO} &= \frac{T_{\text{allow}}(\cos\beta - \sin\beta\tan\delta_L)}{\sigma_n(\tan\delta_U + \tan\delta_L)} \\ &= \frac{(7.0)[\cos 18.4 - (\sin 18.4)(\tan 30)]}{(16.5)(0.30)[\tan 0 + \tan 30]} \\ &= \frac{5.37}{2.86} \\ L_{RO} &= 1.9 \text{ m} \end{aligned}$$

Note that this value is strongly dependent on the value of mobilized allowable stress used in the analysis. To mobilize the failure strength of the geomembrane would require a longer runout length or embedment in an anchor trench. This, however, might not be desirable. Pullout without geomembrane failure might be a preferable phenomenon. It is a site-specific situation left up to the designer.

The situation with an anchor trench at the end of the runout section is illustrated in Figure 5.28. The configuration requires some important assumptions regarding the state of stress within the anchor trench and its resistance mechanism. In order to provide lateral resistance, the vertical portion within the anchor trench has lateral forces acting upon it. More specifically, an active earth pressure (P_A) is tending to destabilize the situation, whereas a passive earth pressure (P_P) is tending to resist pullout. As will be shown, this passive earth pressure is very effective in providing a resisting force (see Holtz and Kovacs [48]). Using the free-body diagram of Figure 5.28,

$$\Sigma F_x = 0$$
$$T_{\text{allow}}\cos\beta = F_{U\sigma} + F_{L\sigma} + F_{LT} - P_A + P_P \tag{5.26}$$

where

- T_{allow} = allowable force in geomembrane = $\sigma_{\text{allow}}\, t$, where
- σ_{allow} = allowable stress in geomembrane, and
- t = thickness of geomembrane;
- β = side slope angle;
- $F_{U\sigma}$ = shear force above geomembrane due to cover soil (note that for thin cover soils, tensile cracking will occur, and this value will be negligible);

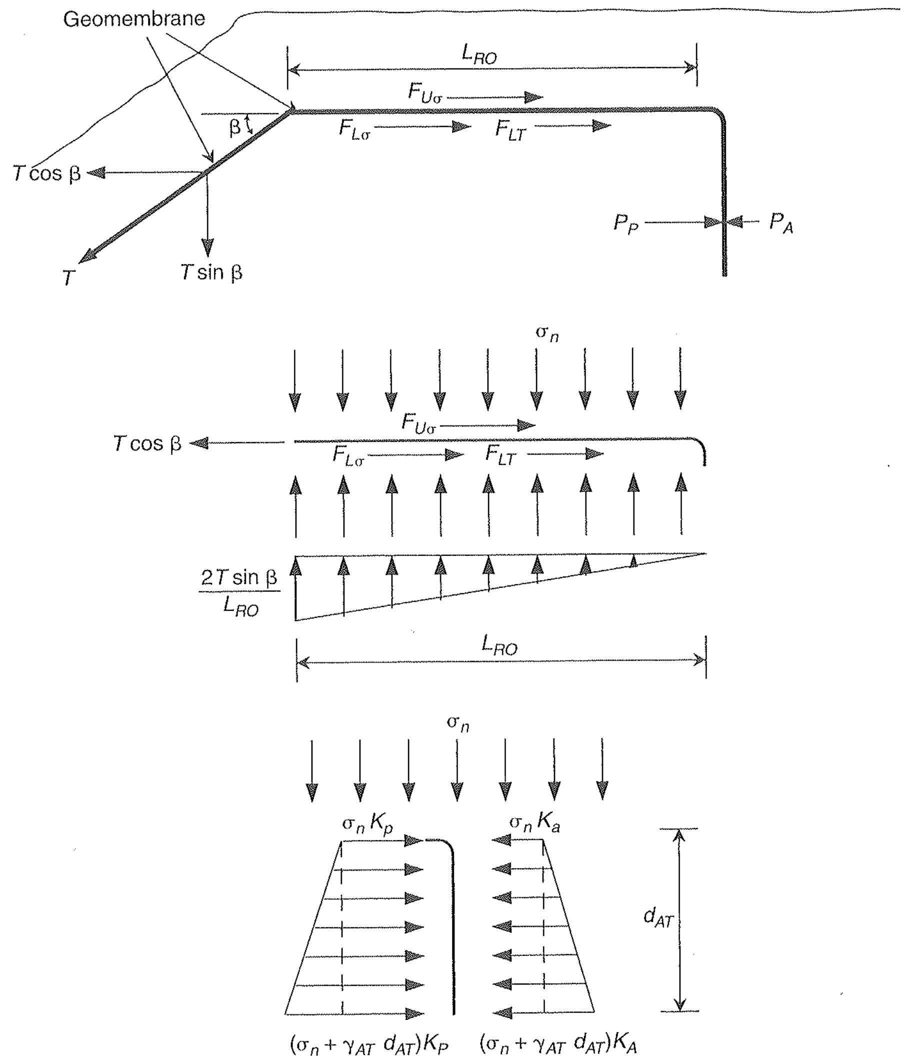


Figure 5.28 Cross section of geomembrane runout section with anchor trench and related stresses and forces involved.

$F_{L\sigma}$ = shear force below geomembrane due to cover soil
F_{LT} = shear force below geomembrane due to vertical component of T_{allow};
P_A = active earth pressure against the backfill side of the anchor trench; and
P_P = passive earth pressure against the in-situ side of the anchor trench.

The values of $F_{U\sigma}$, $F_{L\sigma}$, and F_{LT} have been defined previously. The values of P_A and P_P require the use of lateral earth pressure theory.

$$P_A = \frac{1}{2}(\gamma_{AT} d_{AT}) K_A d_{AT} + (\sigma_n) K_A d_{AT}$$

$$P_A = (0.5\gamma_{AT} d_{AT} + \sigma_n) K_A d_{AT} \tag{5.27}$$

$$P_P = (0.5\gamma_{AT} d_{AT} + \sigma_n) K_P d_{AT} \tag{5.28}$$

where

γ_{AT} = unit weight of soil in anchor trench,
d_{AT} = depth of the anchor trench,
σ_n = applied normal stress from cover soil,
K_A = coefficient of active earth pressure = $\tan^2(45 - \phi/2)$,
K_P = coefficient of passive earth pressure = $\tan^2(45 + \phi/2)$, and
ϕ = angle of shearing resistance of respective soil.

This situation results in one equation with two unknowns; thus a choice of either L_{RO} or d_{AT} is necessary to calculate the other. As with the previous situation, the factor of safety is placed on the geomembrane force T, which is used as an allowable value, T_{allow}. Example 5.14 illustrates the procedure.

Example 5.14

Consider a 1.5 mm thick HDPE geomembrane extending out of a facility as shown in Figure 5.28. What depth anchor trench is needed if the runout distance is limited to 1.0 m? In the solution, use a geomembrane allowable stress of 16,000 kPa on a 3(H) to 1(V) side slope. Cover soil at 16.5 kN/m^3 and 300 mm thick is placed over the geomembrane runout and anchor trench (this is also the unit weight of the anchor trench soil). The friction angle of the geomembrane to the soil is 30° (although assume 0° for the top of the geomembrane under a soil-cracking assumption) and the soil itself is 35°. Also, develop a design chart for this example assuming that the runout length is not limited to 1.0 m.

Solution: Using the previously developed design equations based on Figure 5.28,

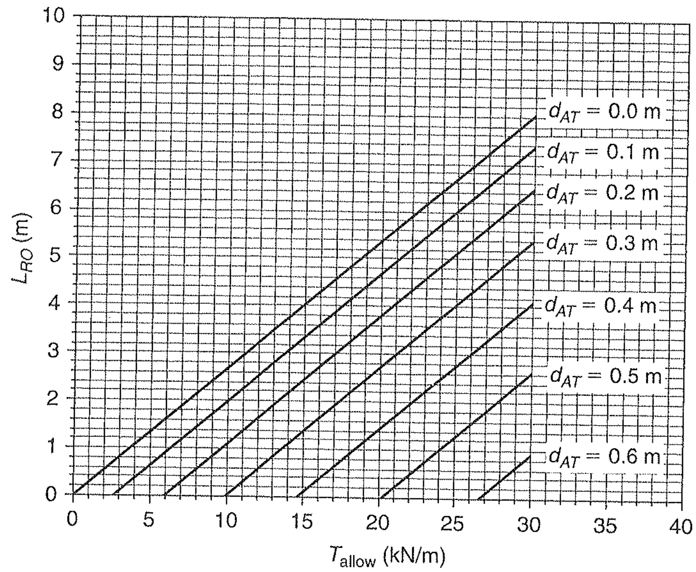
$$\begin{aligned} T_{allow} &= \sigma_{allow} t \\ &= 16000(0.0015) \\ &= 24.0 \text{ kN/m} \end{aligned}$$

and

$$\begin{aligned} F_{U\sigma} &= \sigma_n \tan \delta_U (L_{RO}) \\ &= (0.3)(16.5) \tan 0 (L_{RO}) \\ &= 0 \end{aligned}$$

$$\begin{aligned} F_{L\sigma} &= \sigma_n \tan \delta_L (L_{RO}) \\ &= (0.3)(16.5) \tan 30 (L_{RO}) \\ &= 2.86 L_{RO} \end{aligned}$$

$$\begin{aligned} F_{LT} &= T_{allow} \sin \beta \tan \delta_L \\ &= (24.0) \sin 18.4 \tan 30 \\ &= 4.37 \text{ kN/m} \end{aligned}$$



$$
\begin{aligned}
P_A &= (0.5\gamma_{AT}d_{AT} + \sigma_n)K_A d_{AT} \\
&= [(0.5)(16.5)d_{AT} + (0.3)(16.5)]\tan^2(45 - 35/2)d_{AT} \\
&= [8.25d_{AT} + 4.95](0.271)d_{AT} \\
&= 2.24d_{AT}^2 + 1.34d_{AT}
\end{aligned}
$$

$$
\begin{aligned}
P_P &= (0.5\gamma_{AT}d_{AT} + \sigma_n)K_P d_{AT} \\
&= [(0.5)(16.5)d_{AT} + (0.3)(16.5)]\tan^2(45 + 35/2)d_{AT} \\
&= [8.25d_{AT} + 4.95](3.69)d_{AT} \\
&= 30.4d_{AT}^2 + 18.3d_{AT}
\end{aligned}
$$

This is substituted into the general force equation (5.26) to arrive at the solution in terms of the two variables L_{RO} and d_{AT}:

$$
\begin{aligned}
T_{\text{allow}}\cos\beta &= F_{U\sigma} + F_{L\sigma} + F_{LT} - P_A + P_P \\
(24.0)\cos 18.4 &= 0 + 2.86\,L_{RO} + 4.37 - 2.24d_{AT}^2 \\
&\quad - 1.34d_{AT} + 30.4d_{AT}^2 + 18.3d_{AT} \\
18.4 &= 2.86L_{RO} + 17.0d_{AT} + 28.2d_{AT}^2
\end{aligned}
$$

Since L_{RO} = 1.0 m, the equation can be solved for the unknown d_{AT}.

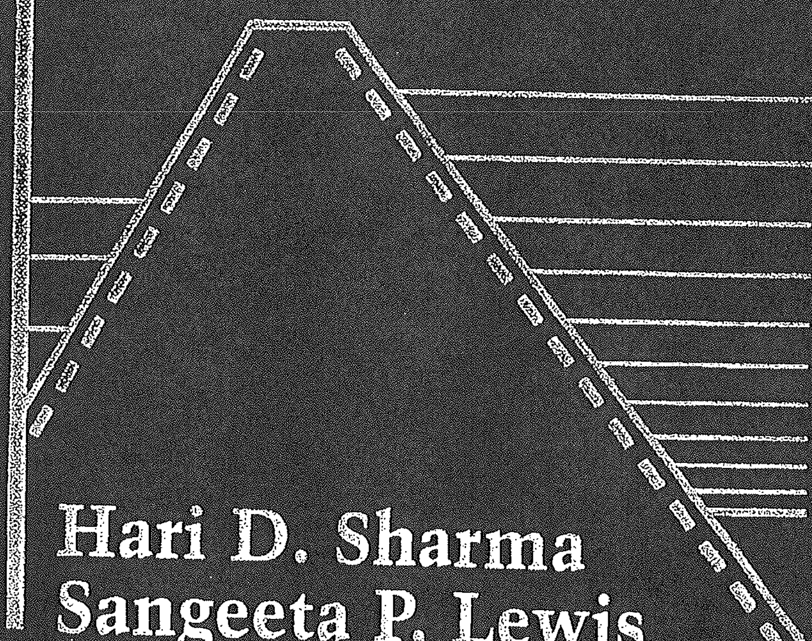
$$d_{AT} = 0.50\text{ m}$$

Using this formulation, we can develop a *design chart* for a wide range of geomembranes and thicknesses as characterized by different values of T_{allow}. For the specific conditions of Example 5.14, we obtain

$$
\begin{aligned}
\beta &= 18.4°\text{, which is } 3(H) \text{ to } 1(V) \\
\sigma_n &= d_{cs}\gamma_{cs} \\
&= (0.30)(16.5) \\
&= 4.95\text{ kN/m}^2
\end{aligned}
$$

Waste Containment Systems, Waste Stabilization, and Landfills

Design and Evaluation



Hari D. Sharma
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since creases in the geomembrane caused by sharp corners may lead to environmental stress cracking.

8.3.3.6 Placement of Soils over Geomembranes. As discussed in Section 8.3.3.2, soil should be "floated" over geomembranes such that a minimum 12 inches of this material exists between the construction equipment and the geomembrane at all times. This minimizes the possibility of geomembrane puncture and impact damage since the effective stress exerted by the construction equipment is reduced and the soil is not dumped on top of the geomembrane.

Soil placement over polyethylene geomembranes should occur in the early morning when there is adequate lighting and the geomembrane is contracted. By midday, wrinkles often develop in polyethylene geomembranes, making soil placement difficult. On days where the temperature exceeds 100°F, the wrinkles can be as large as 1 to 2 feet high. Even in the morning, 6-inch-high wrinkles can easily develop. If it cannot be avoided, soils may be placed over geomembrane wrinkles by placing the soil directly on top of the wrinkle such that it forms two smaller wrinkles. By continuously placing soil directly above the wrinkle, the wrinkle will eventually work itself out. Therefore, if possible, the geomembrane should not be permanently anchored until the soil overlying the geomembrane has been placed. In no situation should the geomembrane wrinkle be allowed to fold over under the weight of the overlying soil. These folds will crease the geomembrane and provide a preferential location for stress cracking and eventual leakage.

Placement of soils over geomembranes on slopes should occur from the bottom of slope upward. This will minimize the stresses on the geomembrane from construction equipment. Soils should be placed over geomembranes as soon as possible following geomembrane installation. This prevents UV degradation of the geomembrane and damage from ongoing construction activities, and also provides for good contact between the geomembrane and underlying material.

8.3.4 Structural Details

8.3.4.1 Anchorage. Anchor trenches are used at the top of side-slope liners to hold installed geosynthetics in place against applied loads and to prevent potential tears caused by wind intrusion beneath the geosynthetics. As shown in Figure 8.19, anchor trenches can generally be classified as flat, rectangular, or V-shaped. Selection of the appropriate anchor trench configuration for any particular site depends on the required holding capacity, access considerations, dimensional constraints, and available construction equipment. Often, a contractor may request that the anchor trench configuration be modified based on the equipment available. All such modifications should be checked and approved by the designer.

The holding capacity of anchor trenches is developed by the applied normal load of the soil placed above the geosynthetics, which creates frictional resistance between the geosynthetics and the underlying soil; there is minimal friction resistance developed between the upper soil and the geosynthetic since the soil above the

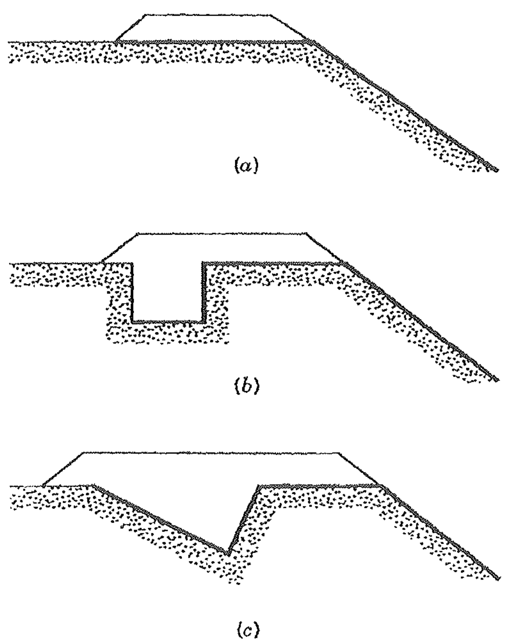


Figure 8.19 Typical anchor trench configurations: (*a*) flat anchor; and (*b*) rectangular anchor; and (*c*) V-shaped anchor.

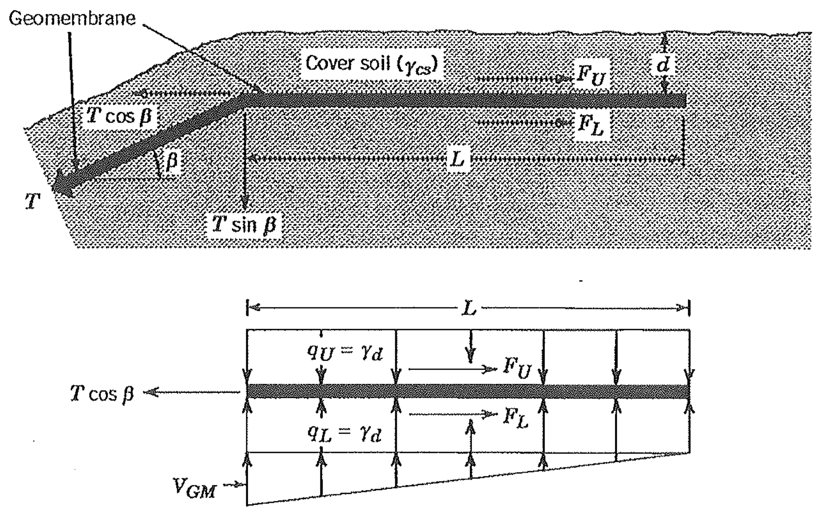
geosynthetic is likely to move with the geosynthetic. The soil depth, type of soil or other material underlying the geosynthetics, and geosynthetic anchorage length are therefore the key factors in developing the required anchor trench holding capacity.

The easiest anchor trench configuration to analyze is the flat anchor. The free-body diagram for the flat anchor and the development of equation (8.14) for anchorage length is shown in Figure 8.20.

$$L = \frac{T \cos \beta - T \sin \beta \tan \delta_L}{\gamma d \tan \delta_L} \tag{8.14}$$

There is no ideal solution for rectangular or V trenches. Koerner (1990) recommends that the problem be solved using imaginary, frictionless pulleys, as shown in Figure 8.21.

The anchor trench should be designed to resist pullout loads (T) caused by the self-weight of the geosynthetics. For geomembranes that may be exposed to severe temperature and wind loading conditions, stresses caused by these forces should also be evaluated. Ideally, the anchor trench should be designed to allow the geosynthetics to pull out slightly rather than cause tearing of the geosynthetics. The reasoning for this is that even if complete pullout occurred, it would usually be easier to replace pulled-out materials than to repair torn geosynthetics. The maxi-



$F_U = q_U \tan \delta_U (L)$ [neglected since cover soil moves with geomembrane]

$$F_L = q_L + 0.5\, v_{GM} \tan \delta_L (L)$$

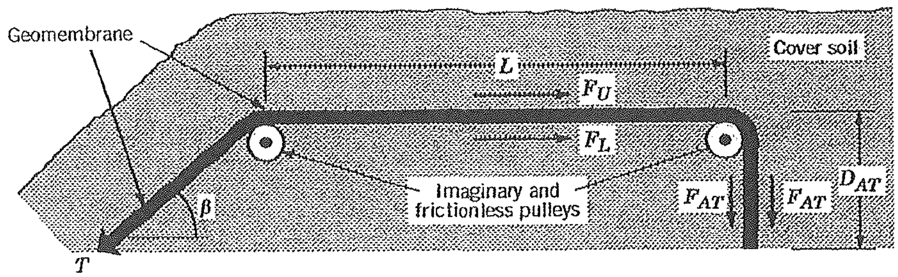
$$= \left[q_U + 0.5 \left(\frac{2\,T \sin \beta}{L} \right) \right] \tan \delta_L (L)$$

$$T \cos \beta = q_L \tan \delta_L (L) + T \sin \beta \tan \delta_L$$

$$L = \frac{T \cos \beta - T \sin \beta \tan \delta_L}{\gamma_d \tan \delta_L}$$

Where: V_{GM} = vertical force due to geomembrane
F_U = friction force above geomembrane
F_L = friction force below geomembrane
q_U = stress above geomembrane due to cover soil weight
q_L = stress below geomembrane due to cover soil weight
T = tensile force in geomembrane
β = slope angle
d =
= unit weight of cover soil
δ = interface fraction angle

Figure 8.20 Design of a flat anchor. (From Koerner, 1990.)



$T = F_U + F_L + 2F_{AT}$

Where: T = tensile stress in geomembrane

F_U = friction force above geomembrane (assumed to be negligible since cover soil likely moves with geomembrane)

$F_L = q \tan \delta(L)$

q = surcharge pressure = γ_d

d = depth of cover soil

γ = unit weight of cover soil

δ = interface friction angle

L = runout length

$F_{AT} = (\sigma_h \text{ ave}) \tan \delta (d_{AT})$

σ_h = average horizontal stress in anchor trench

$= k_o \sigma_V$

$\sigma_V = \gamma$ Have

Have = average depth of anchor trench (requires an estimate)

$k_o = 1 - \sin \phi$

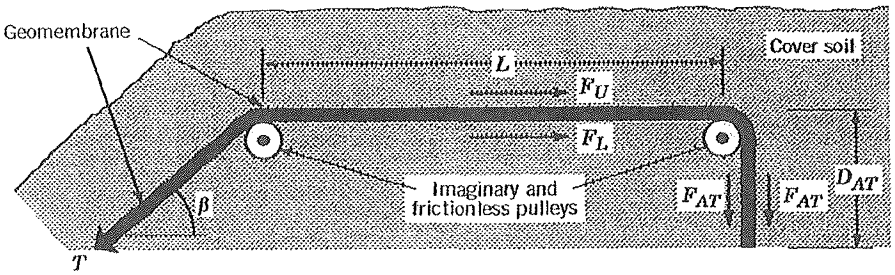
ϕ = angle of shearing resistance of backfill soil

D_{AT} = depth of anchor trench (unknown)

Figure 8.21 Design of a rectangular and V anchor trenches. (From Koerner, 1990.)

mum holding capacity of the anchor trench should therefore be slightly less than the ultimate tensile strength of the geosynthetic to be anchored, irrespective of the applied loads. If the applied loads are greater than the tensile strength of the geosynthetics, measures should be taken to reduce the applied loads or higher-strength geosynthetics should be used.

If soil materials are placed above side-slope geosynthetics, the load caused by soil, seepage forces, and construction equipment should be assessed. Often, a high-strength reinforcing geotextile or geogrid is required to hold the soil on the slopes. Druschel and Underwood (1993) used a force equilibrium method to assess the required anchorage force for these high-strength materials. The free-body and force vector diagram for this method are illustrated in Figures 8.22 and 8.23, respectively. As shown, the items[4] to be evaluated include the toe buttress resistance, soil



$T = F_U + F_L + 2F_{AT}$

Where: T = tensile stress in geomembrane

F_U = friction force above geomembrane (assumed to be negligible since cover soil likely moves with geomembrane)

$F_L = q \tan \delta(L)$

q = surcharge pressure = γ_d

d = depth of cover soil

γ = unit weight of cover soil

δ = interface friction angle

L = runout length

$F_{AT} = (\sigma_h \text{ ave}) \tan \delta (d_{AT})$

σ_h = average horizontal stress in anchor trench

$= k_o \sigma_V$

$\sigma_V = \gamma$ Have

Have = average depth of anchor trench (requires an estimate)

$k_o = 1 - \sin \phi$

ϕ = angle of shearing resistance of backfill soil

D_{AT} = depth of anchor trench (unknown)

Figure 8.21 Design of a rectangular and V anchor trenches. (From Koerner, 1990.)

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If soil materials are placed above side-slope geosynthetics, the load caused by soil, seepage forces, and construction equipment should be assessed. Often, a high-strength reinforcing geotextile or geogrid is required to hold the soil on the slopes. Druschel and Underwood (1993) used a force equilibrium method to assess the required anchorage force for these high-strength materials. The free-body and force vector diagram for this method are illustrated in Figures 8.22 and 8.23, respectively. As shown, the items[4] to be evaluated include the toe buttress resistance, soil

TEXTURED HDPE GEOMEMBRANE
ENGLISH UNITS

POLY-FLEX®
POLYETHYLENE GEOMEMBRANES

Property	Test Method	Minimum Average Values 40 mil	60 mil	80 mil	100 mil
Thickness, mils	ASTM D 5994				
minimum average		38	57	76	95
lowest individual of 8 of 10 readings		36	54	72	90
lowest individual of 10 readings		34	51	68	85
Asperity Height[1], mils	ASTM D 7466	10	10	10	10
Sheet Density, g/cc	ASTM D 1505/D 792	0.940	0.940	0.940	0.940
Tensile Properties[2]	ASTM D 6693				
1. Yield Strength, lb/in		84	126	168	210
2. Break Strength, lb/in		60	90	120	150
3. Yield Elongation, %		12	12	12	12
4. Break Elongation, %		100	100	100	100
Tear Resistance, lb	ASTM D 1004	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	60	90	120	150
Stress Crack Resistance[3], hrs	ASTM D 5397 (App.)	300	300	300	300
Carbon Black Content[4], %	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	--Note 5--			
Oxidative Induction Time (OIT) Standard OIT, minutes	ASTM D 3895	100	100	100	100
Oven Aging at 85°C	ASTM D 5721				
High Pressure OIT - % retained after 90 days	ASTM D 5885	80	80	80	80
UV Resistance[6]	ASTM D 7238				
High Pressure OIT[7] - % retained after 1600 hrs	ASTM D 5885	50	50	50	50
Roll Dimensions					
1. Width (feet):		23	23	23	23
2. Length (feet)		750	500	375	300
3. Area (square feet):		17,250	11,500	8,625	6,900
4. Gross weight (pounds, approx.)		3,500	3,500	3,470	3,470

1 Of 10 readings; 8 must be ≥ 7 mils and lowest individual reading must be ≥ 5 mils.
2 Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches; Break elongation is calculated using a gauge length of 2.0 inches.
3 The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.
4 Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
5 Carbon black dispersion for 10 different views: Nine in Categories 1 and 2 with one allowed in Category 3.
6 The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
7 UV resistance is based on percent retained value regardless of the original HP-OIT value.

J.4-B Wheel Loading on Geomembrane

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Proj. #: 631020105

Calculated By: ORC Date: 05/2022

Checked By: DAM Date: 05/2022

TITLE: WHEEL LOADING ON GEOMEMBRANE

Problem Statement

Calculate the wheel loading of construction equipment acting on the geomembrane.

Given

- **Appendix J.1** "Summary of Geotechnical Design Parameters" contained in this application.
- Caterpillar Product Information, 836K, Landfill Compactor (refer to attached pages).
- Product information for 60-mil HDPE geomembrane (refer to attached page).

Assumptions

- Total weight of compactor is 123,319 lb (reference Caterpillar).
- Wheel load assumed to act on 1.0 foot of leachate drainage layer material plus 5 feet of initial waste placement, for a total height of 6.0 feet above the geomembrane liner.
- Unit weight of leachate drainage layer material assumed to be 130 pcf.
- Density of waste assumed to be 75 pcf.
- Allowable stress for the 60 mil HDPE geomembrane assumed to be 2,200 psi (reference PolyFlex specifications).

Calculations

Calculate the wheel loading of the construction equipment, conservatively assuming that the vehicle load does not attenuate with depth:

$$\text{Contact Pressure (P)} = \frac{\text{Weight of the Vehicle}}{\text{(No. of Drums)(Contact Area of Drums)}}$$

$$P = \frac{123{,}319 \text{ lb}}{(4 \text{ Drums x Contact Area of Drums})} = \frac{123{,}319 \text{ lb}}{(4 \text{ Drums x } ((4.67 \text{ ft}) \text{ x } (1/3) \text{ x } (5.83 \text{ ft})))}$$

$$P = 3{,}397 \text{ psf} = 23.6 \text{ psi}$$

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Proj. #: 631020105

Calculated By: ORC Date: 05/2022

Checked By: DAM Date: 05/2022

TITLE: WHEEL LOADING ON GEOMEMBRANE

Assume dynamic load is 1.5 times static load:

1.5 (23.6 psi) = 35.4 psi

Calculate load due to overlying materials:

Waste: (5 ft)(75 pcf) = 375 psf = 2.6 psi

Drainage Layer: (1.0 ft)(130 pcf) = 130 psf = 0.9 psi

Total all loads on geomembrane liner:

σ_{total} = 35.4 psi + 2.6 psi + 0.9 psi = 38.9 psi

Calculate Factor of Safety:

$$FS = \frac{\sigma_{allow}}{\sigma_{total}} = \frac{2{,}200 \text{ psi}}{38.9 \text{ psi}} = 56.6$$

Results

The calculated Factor of Safety of 56.6 indicates that the geomembrane can withstand the wheel loading of the construction equipment.

Published Technical References

836K

Landfill Compactor

Engine		
Engine Model	Cat® C18 ACERT™	
Emissions	Tier 4 Final/Stage IV	
Gross (SAE J1349)	419 kW	562 hp

Operating Specifications		
Maximum Operating Weight – Multiple Blade and Wheel Offerings	55 927 kg	123,319 lb

836K Landfill Compactor Specifications

Engine

Engine Model	C18 ACERT	
Emissions	U.S. EPA Tier 4 Final and EU Stage IV	
Rated Power (Lab)	414 kW	555 hp
Rated Power (Net ISO 14396)	412 kW	553 hp
Gross (SAE J1349)	419 kW	562 hp
Net Power – SAE J1349		
Direct Drive – Gross Power	370 kW	496 hp
Direct Drive – Torque Rise	52%	
Converter Drive – Gross Power	370 kW	496 hp
Converter Drive – Torque Rise	52%	
Maximum Gross Torque @ 1,300 rpm	3085 N·m	2,275 lbf-ft
Maximum Altitude without Derating	2286 m	7,500 ft
Bore	145 mm	5.71 in
Stroke	183 mm	7.2 in
Displacement	18.1 L	1,104.5 in^3
High Idle Speed	2,120 rpm	
Low Idle Speed	750 rpm	

Operating Specifications

Operating Weight with Full Tank Capacities and U-blade	55 927 kg	123,319 lb

Transmission

Transmission Type	Planetary – Powershift – ECPC	
Travel Speeds		
Forward – Converter 1st	6.2 km/h	3.9 mph
Forward – Lockup 1st	6.5 km/h	4 mph
Forward – Converter 2nd	10.9 km/h	6.8 mph
Forward – Lockup 2nd	11.7 km/h	7.3 mph
Reverse – Converter 1st	6.5 km/h	4 mph
Reverse – Lockup 1st	6.9 km/h	4.3 mph
Reverse – Converter 2nd	10.4 km/h	6.5 mph
Reverse – Lockup 2nd	12.3 km/h	7.6 mph

Hydraulic System

Hydraulic System	Flow Sharing Implement	
Maximum Supply Pressure	32 000 kPa	4,640 psi
Main Relief Pressure	24 100 kPa	3,495 psi
Pump Flow at 2,006 rpm	250 L/min	66 gal/min
Steering System	Double Acting – End Mounted	
Bore	127 mm	5 in
Stroke	740 mm	29.1 in
Vehicle Articulation Angle	86°	
Lift System	Double Acting Cylinder	
Bore	137.9 mm	5.5 in
Stroke	1021 mm	40.2 in

Service Refill Capacities

Fuel Tank	793 L	209 gal
Cooling System	107 L	28 gal
Crankcase	60 L	16 gal
Diesel Engine Fluid Tank	32.8 L	9 gal
Transmission	120 L	32 gal
Differentials and Final Drives – Front	186 L	49 gal
Differentials and Final Drives – Rear	190 L	50 gal
Hydraulic System (tank only)	240 L	63 gal

- All non-road Tier 4 Final/Stage IV, and Japan (MLIT) Step 4 diesel engines are required to use:
  - Ultra Low Sulfur Diesel (ULSD) fuels containing 15 ppm (mg/kg) sulfur or less. Biodiesel blends up to B20 are acceptable when blended with 15 ppm (mg/kg) sulfur or less ULSD and when the biodiesel feedstock meets ASTM D7467 specifications.
  - Cat DEO-ULS™ or oils that meet the Cat ECF-3, API CJ-4, and ACEA E9 specifications are required.

Axles

Front	Planetary – Fixed
Rear	Planetary – Oscillating
Oscillation Angle	13°

Brakes

Control System	Full Hydraulic Split Circuit
Parking Brake	Spring Applied, Hydraulic Released

Cab

	Standard	Suppression
Interior Sound Level	72 dB(A)	71 dB(A)
Exterior Sound Level	111 dB(A)	109 dB(A)

Hydraulic System – Steering

Steering System – Circuit	Steering Double Acting – End Mounted	
Steering System – Pump	Piston – Variable Displacement	
Maximum Flow @ × rpm	52 L/min @ 2,006 rpm	
Steering Pressure Limited	24 100 kPa	3,495 psi
Total Steering Angle	86 degrees	

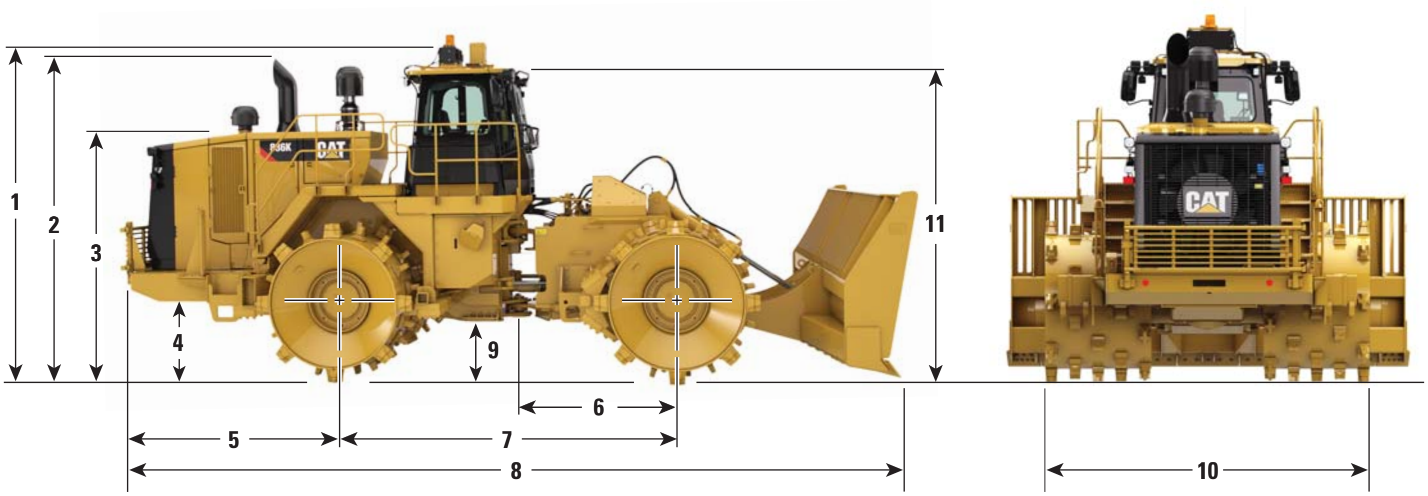
Wheels and Tips

Drum Width	1400 mm	4 ft 8 in
Drum Diameter	1770 mm	5 ft 10 in
Diameter with Tips	2125 mm	7 ft 0 in
Tips per Wheel	40	

836K Landfill Compactor Specifications

Dimensions

All dimensions are approximate.



1	Height to Top of Cab with A/C	4655 mm	15 ft 3 in
2	Height to Top of Exhaust Pipe	4608 mm	15 ft 1 in
3	Height to Top of Hood	3421 mm	11 ft 3 in
4	Ground Clearance to Bumper	1029 mm	3 ft 5 in
5	Center Line of Rear Axle to Edge of Counterweight	3187 mm	10 ft 5 in
6	Hitch to Center Line of Front Axle	2275 mm	7 ft 6 in
7	Wheelbase	4550 mm	14 ft 11 in
8	Length with Blade on Ground (straight blade)	10 182 mm	33 ft 5 in
9	Ground Clearance	632 mm	2 ft 1 in
10	Width over Wheels	4280 mm	14 ft 1 in
11	Height to ROPS/Canopy	4284 mm	14 ft 1 in
	Height to Top of Cab with Strobe	4845 mm	15 ft 11 in
Turning Radius – Inside of Wheels		3635 mm	11 ft 11 in

Blade Selection

	Straight Blade		Semi U-blade		U-blade	
Width – Moldboard Length	4990 mm	16 ft 4 in	5238 mm	17 ft 2 in	5172 mm	17 ft
Width Over End Bits	5193 mm	17 ft	5311 mm	17 ft 5 in	5258 mm	17 ft 3 in
Height with Cutting Edge and Screen	2236 mm	7 ft 4 in	2215 mm	7 ft 3 in	2210 mm	7 ft 3 in
Height with Cutting Edge, No Screen	1217 mm	4 ft	1253 mm	4 ft 1 in	1255 mm	4 ft 1 in
Maximum Depth of Cut	364 mm	1 ft 2 in	362 mm	1 ft 2 in	934 mm	3 ft 1 in
Maximum Lift above Ground	1730 mm	5 ft 8 in	1735 mm	5 ft 8 in	1198 mm	3 ft 11 in
Cutting Edges, Reversible						
Length, Each End Section (3 edges)	1408.2 mm	4 ft 7 in	816.6 mm	2 ft 8 in	2 @ 779.1 mm and 1 @ 856 mm	2 @ 2 ft 7 in and 1 @ 2 ft 10 in
Length, Each End Section (2 edges)	NA		988 mm	3 ft 3 in	1094.4 mm	3 ft 7 in
Width × Thickness	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in
End Bits (2), Self-sharpening						
Length, Each	472 mm	1 ft 7 in	472 mm	1 ft 7 in	472 mm	1 ft 7 in
Width × Thickness	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in	254 mm × 25 mm	10 in × 1 in
Capacity, Rated	19.3 m^3	25.9 yd^3	22.4 m^3	29.3 yd^3	9.74 m^3	13 yd^3
Turning Diameter, Outside Corner of Blade at 43° ART	8737 mm	28 ft 8 in	8823 mm	28 ft 11 in	8795 mm	28 ft 10 in
Overall Machine Length	10 182 mm	33 ft 5 in	10 379 mm	34 ft 1 in	10 272 mm	33 ft 8 in

TEXTURED HDPE GEOMEMBRANE
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Property	Test Method	Minimum Average Values 40 mil	60 mil	80 mil	100 mil
Thickness, mils	ASTM D 5994				
minimum average		38	57	76	95
lowest individual of 8 of 10 readings		36	54	72	90
lowest individual of 10 readings		34	51	68	85
Asperity Height[1], mils	ASTM D 7466	10	10	10	10
Sheet Density, g/cc	ASTM D 1505/D 792	0.940	0.940	0.940	0.940
Tensile Properties[2]	ASTM D 6693				
1. Yield Strength, lb/in		84	126	168	210
2. Break Strength, lb/in		60	90	120	150
3. Yield Elongation, %		12	12	12	12
4. Break Elongation, %		100	100	100	100
Tear Resistance, lb	ASTM D 1004	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	60	90	120	150
Stress Crack Resistance[3], hrs	ASTM D 5397 (App.)	300	300	300	300
Carbon Black Content[4], %	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	--Note 5--			
Oxidative Induction Time (OIT) Standard OIT, minutes	ASTM D 3895	100	100	100	100
Oven Aging at 85°C High Pressure OIT - % retained after 90 days	ASTM D 5721 ASTM D 5885	80	80	80	80
UV Resistance[6] High Pressure OIT[7] - % retained after 1600 hrs	ASTM D 7238 ASTM D 5885	50	50	50	50
Roll Dimensions					
1. Width (feet):		23	23	23	23
2. Length (feet)		750	500	375	300
3. Area (square feet):		17,250	11,500	8,625	6,900
4. Gross weight (pounds, approx.)		3,500	3,500	3,470	3,470

1 Of 10 readings; 8 must be ≥ 7 mils and lowest individual reading must be ≥ 5 mils.
2 Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches; Break elongation is calculated using a gauge length of 2.0 inches.
3 The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.
4 Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
5 Carbon black dispersion for 10 different views: Nine in Categories 1 and 2 with one allowed in Category 3.
6 The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
7 UV resistance is based on percent retained value regardless of the original HP-OIT value.

These data are provided for informational purposes only and are not intended as a warranty or guarantee. Poly-America, L.P. assumes no responsibility in connection with the use of these data. Suitablility for a particular use shall be determined by and is the sole responsibility of the end user. These values are subject to change without notice. REV. 03/14

POLY-FLEX®
POLYETHYLENE GEOMEMBRANES

INHERENT PROPERTIES OF POLYETHYLENE LINERS

The properties listed in the table below are primarily inherent to the resin type used to produce the liner or are directly proportional to the thickness of the liner and less dependent on the manufacturing method. Therefore, these properties will not change from roll to roll or even lot to lot. Hence, they should not be included as part of routine quality control testing. The exception to this is Oxidative Induction Time. This test is a measurement of the amount of anti-oxidant added to the resin to produce the finished sheet. This test can function both as a performance test and a quality control test. As a quality control test it is desirable to run the test at high temperatures to keep the test duration short. This test is routinely run at the time of manufacture. As a performance test it is desirable to run the test at lower temperatures. Testing at lower temperatures cannot be done for quality control purposes.

The information given below is based on nominal values. Individual test results may vary from these values depending upon the reproducibility of the test.

NOMINAL PROPERTIES

TEST DESCRIPTION	TEST METHOD	UNITS	HDPE	LLDPE
Modulus of Elasticity	ASTM D 6693	lb/in^2	110,000	45,000
Secant Modulus	ASTM D 5323	lb/in^2	60,000	45,000
Volatile Loss	ASTM D 1203	%	0.1	0.1
Dimensional Stability	ASTM D 1204	%	+/- 0.5	+/- 1.0
Water Absorption (24 hr @ 23 °C)	ASTM D 570	% change	0.1	0.1
Coefficient of Linear Thermal Expansion	ASTM D 696	(cm/cm • °c)	1.2×10^{-4}	1.4×10^{-4}
Moisture Vapor Transmission Rate (100 °F and 100% relative humidity)	ASTM E 96	$g/m^2 \cdot day$		
		100 mil	0.17	—
		80 mil	0.20	0.25
		60 mil	0.26	0.33
		40 mil	0.39	0.45
		30 mil	0.50	0.57
Low Temperature Brittleness	ASTM D 746	°F	<-112	<-112
Oxidative Induction Time	ASTM D 3895	minutes @ 200 °C	100	100
Multi-Axial Tension	ASTM D 5617	stress, lb/in^2	2200	1200
		strain, %	18	40+

J.4-C Puncture Resistance of Geosynthetics

Client:	**Zion Landfill, Inc.**
Project:	**Zion Landfill – Site 2 North Expansion**
Proj.#:	**631020105**
Calculated By:	**ORC** Date: **05/2022**
Checked by:	**DAM** Date: **05/2022**

TITLE: PUNCTURE RESISTANCE OF GEOSYNTHETICS

Problem Statement

Confirm that the geosynthetics used in the leachate collection system (LCS) are appropriately sized to resist puncture from the LCS aggregate materials that are in direct contact with them. These geosynthetics include both the geotextiles and geomembrane proposed to be used both across the floor, sideslopes and within the leachate collection trench areas.

Given

- A laboratory evaluation was conducted for Orchard Hills Landfill in 2019 when both Orchard Hills Landfill and Zion Landfill were under the common ownership of Advanced Disposal Services to replicate the puncture resistance of the in-place LCS geosynthetics at the Orchard Hills Landfill. LCS configuration evaluated in the laboratory evaluation is the same LCS configuration that was constructed in Cells 7 and 9 of Zion Landfill. This laboratory report is used to demonstrate the existing LCS in Cells 7 and 9 of Zion Landfill will not puncture. This approach is used because the existing LCS configuration in these cells is not described in the charts referenced in this calculation methodology (see attached). The results of the laboratory testing found that the existing leachate collection system did not puncture under the loading conditions that will result from the proposed vertical expansion. The report is attached to this calculation.

- Cell 6 underlies a small portion of the vertical expansion. The Cell 6 LCS was not analyzed for puncture as the addition of the vertical expansion will not increase the maximum waste thickness within Cell 6 and therefore the potential for puncture is not increased.

- **Appendix J.1** "Summary of Geotechnical Design Parameters" contained in this application.

- Koerner, R.M., *Designing with Geosynthetics*. Prentice Hall, Fifth Edition (refer to attached pages).

- Koerner, R.M, *GRI White Paper #14, Modification to the "GRI-Method" for the RFCF-Factor Used in the Design of Geotextiles for Puncture Protection of Geomembranes*, November 24, 2008 (see attached pages).

- Narejo,D., Corcoran, G., *GSE® Geomembrane Protection Design Manual*, First Addition (see attached page).

- Product information for geosynthetics (refer to attached pages).

Assumptions

- The relevant landfill system layers will include the following in the Horizontal Expansion area (listed from top to bottom):
  - Leachate Collection System / Liner System on Floor and Sideslopes:
    - 8-oz/yd^2 non-woven geotextile filter
    - 1-foot granular drainage layer (d < 1.0 inch)
    - 12-oz/yd^2 non-woven geotextile cushion (or equivalent)
    - 60-mil HDPE textured geomembrane
    - 5-foot low permeable earth liner
  - Main - Leachate Collection Pipe Trench / Liner System:
    - 8-oz/yd^2 non-woven geotextile filter
    - 24-inches coarse aggregate pipe bedding (D $\leq$ 1.5 inches)
    - 12-oz/yd^2 non-woven geotextile cushion *(*or equivalent)
    - 60-mil HDPE textured geomembrane
    - 5-foot low permeable earth liner
- A saturated density of 130.3 pcf (21 kN/m^3) for the final cover soils and a saturated density of 130.0 (21 kN/m^3) for the leachate collection system (LCS) drainage layer were assumed.
- Density of waste assumed to be 75 pcf (12 kN/m^3).
- The maximum waste thickness for the horizontal component of the landfill expansion was determined to be **198 feet**. This waste thickness was used to calculate the maximum loading anticipated on the main LCS in the horizontal expansion. The corresponding elevations, layer thicknesses, and material unit weights used in these calculations are summarized in **Table J.4C-1**.

APTIM

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Proj.#: 631020105
Calculated By: ORC **Date:** 05/2022
Checked by: DAM **Date:** 05/2022

TITLE: PUNCTURE RESISTANCE OF GEOSYNTHETICS

Table J.4C-1 - Summary of Landfill Layers at Point of Maximum Waste Thickness

Layer	Top Elevation (ft. MSL)	Thickness (ft)	Unit Weights (pcf)
Horizontal Expansion – Floor and Sideslopes			
Final Cover System	896	5	130.3
Waste	891	198	75
LCS Drainage Layer	693	1	130
Horizontal Expansion – LCS Pipe Trench			
Final Cover System	896	5	130.3
Waste	891	198	75
LCS Drainage Layer	693	1	130
Coarse Aggregate (pipe bedding)	692	2	130

❑ Puncture resistance for the geosynthetic materials based on project specifications are as follow:

- 8 oz/yd^2 Nonwoven Geotextile = 120 lb (see Note below)
- 12 oz/yd^2 Nonwoven Geotextile = 190 lb (see Note below)
- 60-mil HDPE Geomembrane = 90 lb

Note: The puncture resistance for the geotextiles may be met or exceeded by using multiple layers of thinner geotextiles, provided that a total of 8 oz/yd^2 or 12 oz/yd^2 is achieved (e.g. overlying three 4 oz/yd^2 geotextiles will provide equivalent or greater protection than a 12 oz/yd^2 geotextile).

❑ The particle size for the various leachate collection system drainage materials which will come into contact with the geotextiles are presented in **Table J.4C-2** below. The maximum LCS particle protrusion height (H) is also presented in **Table J.4C-2**. The maximum protrusion height was assumed equal to ½ of the maximum particle size (D) and is based on the GSE / N.D. Corcoran reference presented in the attached pages.

Table J.4C-2 - Leachate Collection System (LCS) Materials and Particle Size

LCS Material	Location of LCS Material	Maximum LCS Particle Diameter "D"		Maximum LCS Particle Protrusion Height "H" (H = 1/2 x D)	
		inches	mm	inches	mm
LCS Drainage Layer	Landfill floor & sideslopes	1.0	12.7	0.25	6.35
Washed Gravel	LCS pipe collection trench	1.5	38.1	0.75	19.05

APTIM

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Proj.#: 631020105

Calculated By: ORC **Date:** 05/2022

Checked by: DAM **Date:** 05/2022

TITLE: PUNCTURE RESISTANCE OF GEOSYNTHETICS

- **Calculation No. 1:** The evaluation of LCS geotextiles for puncture resistance was performed for the area under the greatest waste column (maximum load) within the horizontal expansion. The following formula is to be used to evaluate whether the LCS geotextiles are appropriately sized to resist puncture from the materials that will come into direct contact with them (see first Koerner reference in attached pages):

$$FS = \frac{F_{allowable}}{F_{actual}}$$

$$F_{actual} = p' \, d_a^2 \, S_1 \, S_2 \, S_3$$

Where,

p' = Pressure exerted on the geotextile (psi)
d_a^2 = Average diameter of the puncturing aggregate/object (in)
S_1 = Protrusion factor of the puncturing object
S_2 = Scale factor to adjust for actual shape of puncturing object
S_3 = Shape factor to adjust for actual shape of puncturing object

Simplify and rearrange equation to solve for the average particle size, or diameter "d_a":

$$FS = \frac{F_{allowable}}{p' \, d_a^2 \, S_1 \, S_2 \, S_3}$$

$$d_a = \left(\frac{F_{allowable}}{(FS) \, p' \, S_1 S_2 \, S_3} \right)^{1/2}$$

APTIM

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Proj.#: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: PUNCTURE RESISTANCE OF GEOSYNTHETICS

- **Calculation No. 2**: Adequate geotextile size is verified in Calculation No. 2, for the maximum load in the horizontal expansion. The following formula is to be used to determine the factor of safety against geomembrane puncture based on the level of protection provided by the overlying geotextile (see second Koerner reference in attached pages):

$$FS = \frac{P_{allowable}}{P_{required}}$$

$$P_{allowable} = \left(50 + 0.00045\frac{M}{H^2}\right)\left[\frac{1}{MF_S x MF_{PD} x MF_A}\right]\left[\frac{1}{RF_{CR}\ x\ RF_{CBD}}\right]$$

Where,

$P_{required}$ = required pressure due to the landfill
$P_{allowable}$ = allowable pressure
M = geotextile mass per unit area
H = protrusion height (see GSE reference in attached pages)
MF_S = modification factor for protrusion shape
MF_{PD} = modification factor for packing density
MF_A = modification factor for arching in solids
RF_{CR} = reduction factor for long-term creep
RF_{CBD} = reduction factor for long-term chemical/biological degradation

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Proj.#: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: PUNCTURE RESISTANCE OF GEOSYNTHETICS

Calculation No. 1 – *Evaluate LCS Geotextiles for Sizing and Puncture Resistance in the Horizontal Expansion*

In the horizontal expansion LCS pipe trench and floor, the 8-oz/yd^2 geotextile will have the pressure of the overlying waste and final cover material on it and it will be in contact with the granular drainage layer below (d < 1.0 inches). The 12-oz/yd^2 geotextile (or equivalent) on the floor will be overlain by the granular drainage layer (d < 1.0 inches), the waste, and the final cover. The 12-oz/yd^2 geotextile (or equivalent) in the LCS pipe trench will be overlain by the coarse aggregate (d ≤ 1.5 inches), the waste, and the final cover. Below are the calculations for the total pressure on each geotextile from the final landform:

8 – oz / yd^2 geotextile above granular drainage layer on floor and sideslopes:

[(5 ft)(130.3 pcf) + (198 ft)(75 pcf)] = 15,501.5 psf = 107.6 psi

8 – oz / yd^2 geotextile above coarse aggregate within the LCS pipe trench:

[(5 ft)(130.3 pcf) + (198 ft)(75 pcf)] = 15,501.5 psf = 107.6 psi

12 – oz / yd^2 geotextile (or equivalent) beneath granular drainage layer on floor or sidslopes:

[(5 ft)(130.3 pcf) + (198 ft)(75 pcf) + (1 ft)(130 pcf)] = 15,631.5 psf = 108.6 psi

12 – oz / yd^2 geotextile (or equivalent) beneath coarse aggregate in the LCS pipe trench:

[(5 ft)(130.3 pcf) + (198 ft)(75 pcf) + (2 ft)(130 pcf)] = 15,761.5 psf = 109.5 psi

The particle shape of the granular drainage layer materials will be sub-angular/sub-rounded to rounded. The following puncture factors will be used for the granular drainage layer (refer to Table 2.13 in the first Koerner reference, in attached pages):

- ❑ Protrusion Factor, S_1 = 0.55
- ❑ Scale Factor, S_2 = 0.5
- ❑ Shape Factor, S_3 = 0.55

The following puncture factors will be used for the coarse aggregate (refer to Table 2.13 in the first Koerner reference, in attached pages):

- ❑ Protrusion Factor, S_1 = 0.7
- ❑ Scale Factor, S_2 = 0.6
- ❑ Shape Factor, S_3 = 0.6

Assume a safety factor of 2.0, and calculate the average diameter ("d_a") for materials to be placed in direct contact with the following geotextiles: 8 oz/yd^2 and 12 oz/yd^2 (or equivalent(s)).

APTIM

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Proj.#: 631020105
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TITLE: PUNCTURE RESISTANCE OF GEOSYNTHETICS

8 – oz / yd² geotextile above granular drainage layer on floor and sideslopes:

$$d_a = \left(\frac{F_{allowable}}{(FS)p'S_1S_2S_3}\right)^{1/2} = \left(\frac{120\text{ lb}}{(1.5)(107.6\text{ psi})(0.55)(0.5)(0.55)}\right)^{1/2} = 2.22\text{ inches}$$

8 – oz / yd² geotextile above coarse aggregate within the LCS pipe trench:

$$d_a = \left(\frac{F_{allowable}}{(FS)p'S_1S_2S_3}\right)^{1/2} = \left(\frac{120\text{ lb}}{(1.5)(107.6\text{ psi})(0.7)(0.6)(0.6)}\right)^{1/2} = 1.72\text{ inches}$$

12 – oz / yd² geotextile (or equivalent) beneath granular drainage layer of floor and sideslopes:

$$d_a = \left(\frac{F_{allowable}}{(FS)p'S_1S_2S_3}\right)^{1/2} = \left(\frac{190\text{ lb}}{(1.5)(108.6\text{ psi})(0.55)(0.5)(0.55)}\right)^{1/2} = 2.78\text{ inches}$$

12 – oz / yd² geotextile (or equivalent) beneath coarse aggregate in LCS pipe trench:

$$d_a = \left(\frac{F_{allowable}}{(FS)p'S_1S_2S_3}\right)^{1/2} = \left(\frac{190\text{ lb}}{(1.5)(109.5\text{ psi})(0.7)(0.6)(0.6)}\right)^{1/2} = 2.14\text{ inches}$$

Next, the maximum LCS material particle sizes (D) are compared to the calculated average diameters (d_a) for the various geotextiles to confirm they are all below the average diameter (d_a) and therefore appropriately sized. **Table J.4C-3** on the following page presents the results of this comparison.

Table J.4C-3 – Comparison of LCS Material Particle Size (D) to Calculated Average Diameter (d_a) – Horizontal Expansion

LCS - Layer Material and Particle Size		Geotextile Location, Size, and Average Particle Size			
LCS Layer Material And Location	**LCS Material Maximum Particle Size "D" (inches)**	**Geotextile Location w/ Respect to LCS Layer**	**Geotextile Size**	**Calculated Average Particle Size "d_a" (inches)**	**Is $D < d_a$?**
Located on Floor and Sideslope:					
Granular Drainage Layer	< 1.0	Above	8 oz/yd²	2.22	yes
		Below[1]	12 oz/yd²	2.78	yes
Located in Main - LCS Pipe Trench:					
Coarse Aggregate	≤ 1.5	Above	8 oz/yd²	1.72	yes
		Below[1]	12 oz/yd²	2.14	yes

Notes:
1. Denotes a geotextile that directly overlies the 60-mil textured geomembrane liner.

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Proj.#: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: PUNCTURE RESISTANCE OF GEOSYNTHETICS

Calculation No. 2 - *Verify Geotextile Size Will Safeguard Against Geomembrane Punctures in the Horizontal Expansion*

The LCS pipe trench configuration for the proposed horizontal components of the Site 2 North Expansion of the Zion Landfill incorporates a 24-inches of coarse aggregate pipe bedding with a diameter less than or equal to 1.5 inches ($D \leq 1.5$), over a 12 oz/yd^2 geotextile which is overlying a 60-mil textured geomembrane.

A laboratory evaluation was conducted for Orchard Hills Landfill in 2019 when both Orchard Hills Landfill and Zion Landfill were under the common ownership of Advanced Disposal Services to replicate the puncture resistance of the in-place LCS geosynthetics at the Orchard Hills Landfill. The LCS configuration tested includes: a layer of coarse aggregate pipe bedding with a diameter less than 1.5 inches ($D < 1.5$), over a 12 oz/yd^2 geotextile which is overlying a 60-mil smooth geomembrane. This is the same configuration as what is proposed for the pipe trench of the horizontal component of the Site 2 North Expansion at Zion Landfill. Therefore, this laboratory report (see attached) is being used to demonstrate that the proposed LCS pipe trench configuration in the horizontal component of the Site 2 North Expansion at Zion Landfill will not puncture the 60-mil textured geomembrane. This approach is being used because the proposed configuration in the horizontal component of the Site 2 North Expansion is not described in the charts referenced in this calculation methodology (see attached). The results of the laboratory testing found that the existing leachate collection system at Orchard Hills did not puncture under a nearly identical LCS configuration and under loading conditions that are greater than what will result from the horizontal component of the Site 2 North Expansion at Zion Landfill. The laboratory report is attached to this calculation.

Conclusion

The geotextiles to be used in the proposed leachate collection system of the Site 2 North Expansion at Zion Landfill all demonstrate sufficient safety factors against puncture from the LCS granular drainage layer and coarse aggregate materials in the horizontal expansion area. Similarly, the geomembrane liners used in the LCS pipe trenches, within the horizontal expansion area provide sufficient safety factors against puncture at the point of maximum waste thickness. Therefore, the geosynthetics are appropriate for the proposed horizontal expansion design.

Published Technical References

Geomembrane Puncture Resistance Studies

July 30, 2019

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by

TRI Environmental, Inc.
9063 Bee Cave Road
Austin, Texas, USA 78733

Executive Summary

TRI is pleased to submit this final report for laboratory testing.

This report details bench-scale, large-scale, and accelerated testing performed to determine the affect of compressive loading on a geomembrane lined leachate collection trench system. Specifically, the puncture resistance of the HDPE geomembrane barrier in the system was of interest.

All testing was intended to evaluate geomembrane puncture resistance based on use of site specific materials utilized in previously constructed areas of the Orchard Hills landfill which is owned and operated by Advanced Disposal Services, Inc. The site specific materials used in testing are listed below.

Geosynthetic Test Material	Manufacturer
60 mil Smooth HDPE Geomembrane	AGRU America
12 OSY Nonwoven Cushion Geotextile	Skaps
HDPE Drainage Pipe	Advanced Drainage Systems
Clay	Site Specific
Leachate Collection Rock (Site specific aggregate used in existing constructed cells)	D < 1.5 inches
Granular Drainage Layer (Site specific aggregate used in existing constructed cells)	D < 1.0 inches

Table 1: Test Materials

The testing performed involved three distinct evaluations, each with a specific measurement objective as detailed below.

Test	Standard Reference	Objective
1) Bench-Scale Puncture Resistance	ASTM D5514	To evaluate the shorter term puncture resistance of the geomembane using site specific materials (detailed in Appendix A)
Description: TRI performed conventional puncture testing of the Orchard Hills geomembrane using site specific materials. The testing was performed in accordance with ASTM D5514, *Standard Test Method for Large-Scale Hydrostatic Puncture Testing of Geosynthetics*.		

Test	Standard Reference	Objective
2) Large-Scale Puncture Resistance	ASTM D5514, using large-scale modeling of trench system	To evaluate the longer term puncture resistance of the geomembrane using site specific materials under approximated equilibrium conditions (detailed in Appendix B)
Description: Large-scale puncture resistance testing was performed in modified accordance with ASTM D5514 by using a large out-door test box able to accommodate a more site-specific quantity of test materials.		
3) Accelerated Bench-Scale Puncture Resistance	ASTM D7361, Modified using model of trench cross section	To evaluate the time-dependent loss of geomembrane thickness and potential for puncture under site specific profile stresses. (detailed in Appendix C)
Description: In order to determine the time-dependent loss of geomembrane thickness and potential for puncture of the geomembrane in the Orchard Hills leachate collection trench, a series of accelerated compression creep tests were performed using ASTM D 7361, *Standard Test Method for Accelerated Compressive Creep of Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method*. In simple terms, the stepped isotherm method (SIM) test is designed to simulate long periods of time during an accelerated test duration through the use of temperature increases.		

Table 2: Tests and Measurement Objectives

Conclusion

The Orchard Hills geomembrane was evaluated for both short term and long term resistance to puncture. All evaluations performed resulted in an observation of no geomembrane puncture occurring.

All individual tests performed and their associated details and conclusions are detailed in the Appendices.

TRI is pleased to be of service to ADS and trusts the reporting herein is useful for evaluation of the puncture resistance of the geomembrane. Please contact me if you have any questions of if I may provide any additional information.

Sincerely,

Sam Allen
Vice President

Appendix A: Bench-Scale Puncture Resistance Testing

Appendix B: Large-Scale Puncture Resistance Testing

Appendix C: Accelerated Bench-Scale Puncture Resistance and Geomembrane Compressive Creep Testing

Appendix A

Bench-Scale Puncture Resistance
ASTM D5514

December 5, 2017

Tim Curry
Advanced Disposal Services, Inc. – Orchard Hills Landfill
8290 Highway 251
David Junction IL 61020
United States of America
Tim.curry@advanceddisposal.com

CC: Mark Sieracke <msieracke@wcgrp.com>
Jay Warzinski <jay.warzinski@advanceddisposal.com>
Chris Peters <Chris.Peters@Cornerstoneeg.com>

Subject: Bench-Scale Hydrostatic Puncture Resistance
Project: Orchard Hills Landfill
Log #: 32368
Test #: 1

Dear Mr. Curry,

TRI is pleased to submit hydrostatic puncture testing results for Orchard Hills Landfill. This report documents the laboratory testing conducted by TRI Environmental (TRI) for a hydrostatic testing conducted from Friday, November 3rd through Monday, November 20th. in accordance ASTM D5514, Standard Test Method for Large Scale Hydrostatic Puncture Testing of Geosynthetics.

We appreciate the opportunity to work with you on this project and look forward to providing additional services in the future. Please contact us if you have any questions, comments, or requests.

Sincerely,

Jeffrey A. Kuhn, Ph.D., P.E.
Director of the Geotechnical Laboratory

Sam Allen
Vice President

SAMPLE RECEIPT, HANDLING, AND STORAGE

Samples of site-specific aggregate and clay were provided to TRI in a shipment received on September 20th, 2017. The standard disposal of samples occurs thirty day following final reporting. Otherwise, direction should be provided to TRI as to alternative arrangements for the disposal or return of samples.

1. TEST SETUP

Apparatus

A 24 inch diameter pressure vessel rated for a maximum pressure of 500 psi was used for testing. An air-activated hydraulic pump is used in combination with a servo-mechanical air regulator to apply a fixed ramp rate.

Configuration

The profile of material used in the testing program is presented in Figure 1. The first layer of material place into the pressure vessel was site-specific clay that was processed, conditioned, and remolded to 90 percent of the maximum dry density and 3.5 percent wet of the optimum water content as determined by ASTM D1557 modified Proctor testing (see ASTM D1557 test results in Attachment to Appendix A). The clay was then covered with a 1 mil thick sheet of aluminum foil to assist in post-test deformation determination. Next, a 60 mil sheet of smooth HDPE liner was placed and was followed by a 12 oz/yd^2 nonwoven geotextile. Finally, the geotextile was overlain by 12 inches of leachate collection rock (see gradation test results in Attachment to Appendix A) which was tamped into place. The application of a normal stress to this profile was achieved through the use of a membrane overlain by pressurized water.

Component	**Materials**	**Description/Placement**
Upper Chamber	Pressurized Water	500 psi Max Pressure
	Stress Application Membrane	Test Apparatus
Lower Chamber	Leachate Collection Rock	Tamp in Place
	Skaps 12 oz/yd^2 nonwoven geotextile	Roll #48413.7
	GSE 60 mil smooth HDPE geomembrane	Roll #102184955
	1 mil Aluminum Foil	Deformation Measurement (in addition to per-location thickness measurements)
	11 inches of compacted clay	90% & +3.5% of ASTM D1557 Maximum Density (w=14.9%, γd = 115.7 pcf)

Figure 1 – Test profile

2. TEST PROCEDURE

Material Conditioning/Processing

Images of the as-received clay and rock are presented below. Prior to testing, the clay was air-dried, broken down, and moisture-conditioned. The provided five five-gallon buckets of rock and eight five-gallon buckets of clay were sufficient for conducting this test method. No virgin material remains for additional testing. Images of the clay and rock samples are shown in Figure 2.


(a) Clay


(b) Rock

Figure 2 – Supplied Soils

Compression Test Initiation

Following placement of the testing profile, the vessel was pressurized at a rate of 1 psi/min up to a pressure of 130 psi. Due to compression/consolidation of the underlying materials, the stress application membrane ruptured at the edges of the vessel. Styrofoam and geotextile padding were added to the top of the profile, above the rock, and the vessel was re-pressurized at a rate of 1 psi/min up to a pressure of 130 psi. The target pressure of 130 psi was held for 10 days.

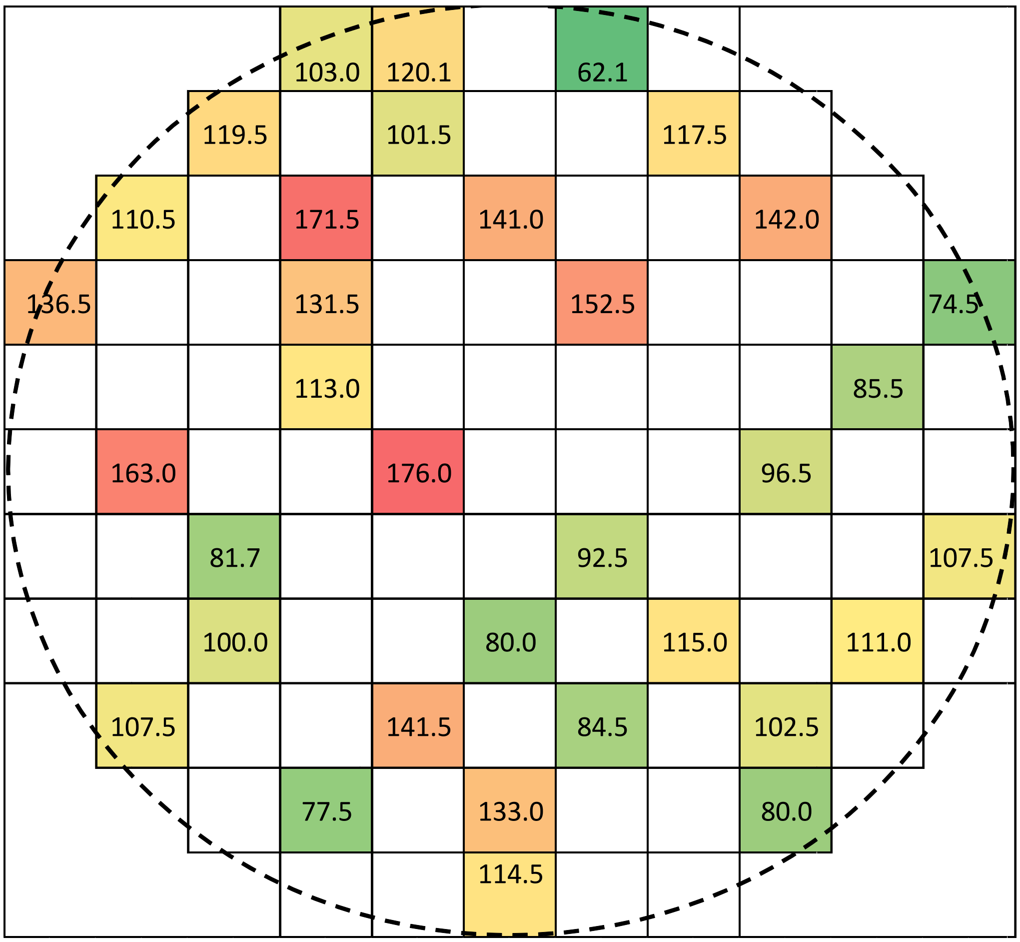
Post-test Examination / Breakdown

Following the 10 day hold period, the chamber was de-pressurized and the profile was exhumed for post-test examination. Photographs were obtained during exhumation and post-test evaluations of the geomembrane deformation, geomembrane thickness, and soil density were obtained.

3. Post-Test Measurements

Geomembrane Deformation

No geomembrane punctures were identified post-test. Post test high-to-low deformation measurements were taken across the geomembrane. A plot of the deformations over the surface area of the tested geomembrane is shown in Figure 3.



	Deformation (mils)
Min	62.1
Max	176
Mean	113.1
Median	110.8
Stdev	28.4

Figure 3 – Post-test Geomembrane Deformation Measurements

Aluminum foil (versus lead sheet or thicker aluminum flashing) with a thickness of 1 mil was used for the testing program in order to minimize interference with potential geomembrane deformation and/or puncture. The condition of the aluminum sheet following testing was such that its use for post-test deformation measurements could not be achieved. Instead, post-test geomembrane deformations were determined via direct measurements.

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Geomembrane Thickness

The geomembrane was cut into 2 inch strips and the thickness was measured via single point observations of the minimal thickness per each 2 inch x 2 inch area. The resulting post-test geomembrane deformations are presented in Figure 4 along with pre-test measurements.

			63.2	64.2	63.3	63.7	62.8			
		65.7	63.7	61.2	62.3	64.6	62.2	65.7		
	61.4	65.1	64.1	62.0	62.8	63.5	61.6	63.9	63.5	
64.7	60.8	63.4	64.1	62.5	63.2	63.5	62.6	63.3	64.5	64.7
65.3	62.3	62.8	64.0	63.2	64.0	62.9	67.5	63.7	65.9	62.5
65.2	62.9	61.0	65.2	63.6	61.6	65.1	64.8	63.3	65.1	63.2
64.1	64.3	60.6	65.3	63.8	62.4	63.3	63.9	63.5	64.2	63.5
66.7	64.2	61.7	61.2	65.8	63.3	62.9	61.4	66.6	61.8	66.2
	63.1	64.7	61.3	64.2	64.4	63.0	63.7	63.3	63.0	
		63.5	61.6	66.8	65.6	61.8	61.3	64.1		
			61.3	61.6	65.9	64.3	63.8			

	Thickness (mils) Pre-Test
1	67.6
2	63.3
3	63.5
4	69.5
5	68.6
6	68.2
7	67.8
8	67.3
9	66.4
10	65.6

	Thickness (mils)	
	Pre-Test	Post-Test
Min	63.3	60.6
Max	69.5	67.5
Mean	66.8	63.5
Median	67.5	63.5
Stdev	2.1	1.5

Figure 4 – Post-test Geomembrane Thickness Measurements

Clay Dry Density

A thin-walled sampling tube was pushed through the center of the compacted clay as a means of evaluating the post-test dry density of the compacted clay. A plot of the measured dry density is presented in Figure 5 with respect to the post-test clay height. The densification of material in the upper portion of the clay profile is notable.

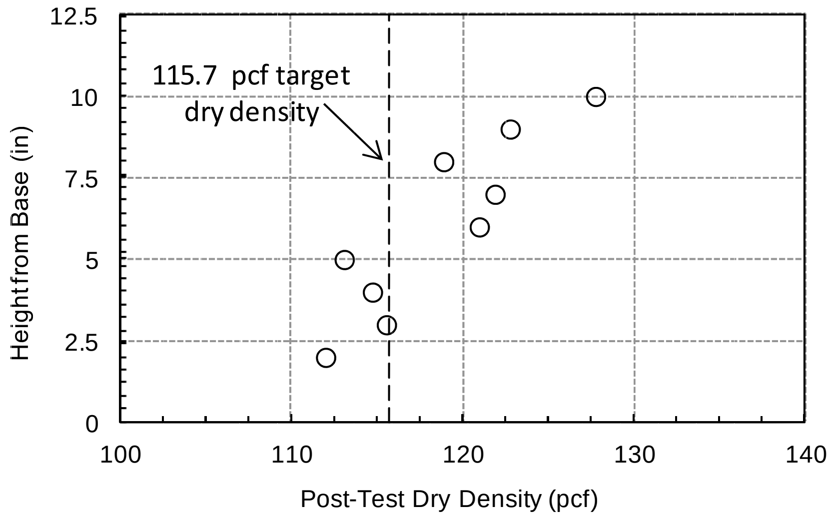


Figure 5 – Post-Test Dry Density Measurements

4. POST-TEST IMAGES

Photographs were obtained during exhumation of the testing profile. The following is a photo lot of the exhumation.

Rock: 12 in (Top)

Rock: 12 in - Fractured Particles

Rock: 10 in

Rock: 10 in Fractured particles adjacent to sidewall

Rock: 8 in

Rock: 6 in

Rock: 6 in

Rock: 6 in

Rock: 4 in

Rock: 2 in

Rock: 1 in

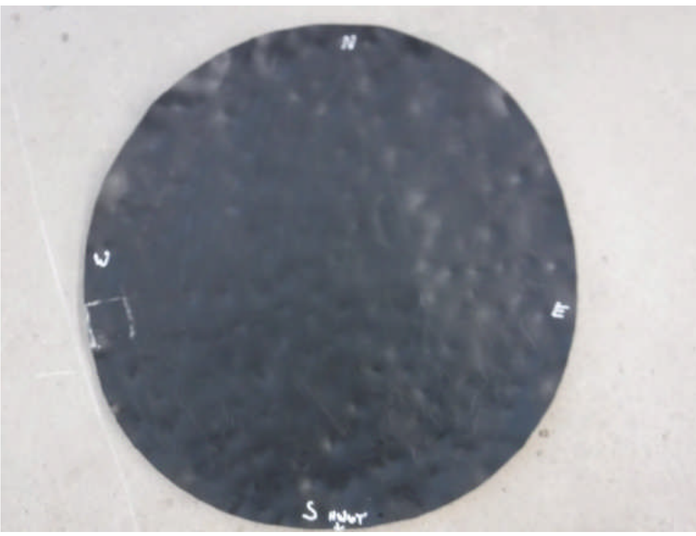
Geotextile

Geomembrane

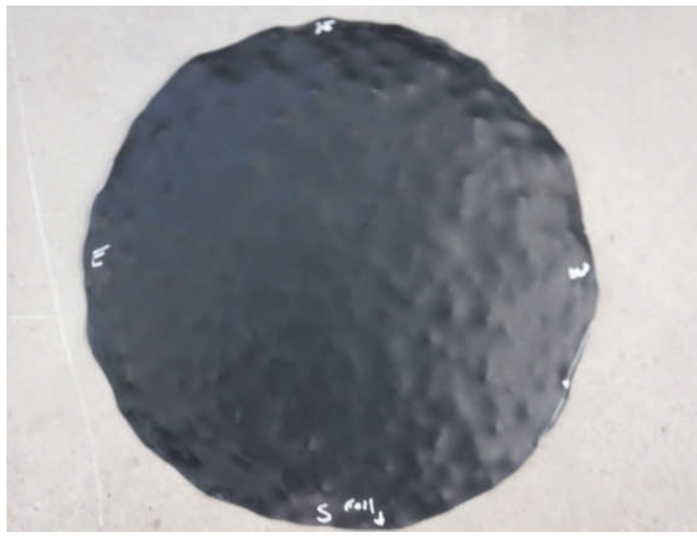
Aluminum foil

Clay sampling

Clay Sampling

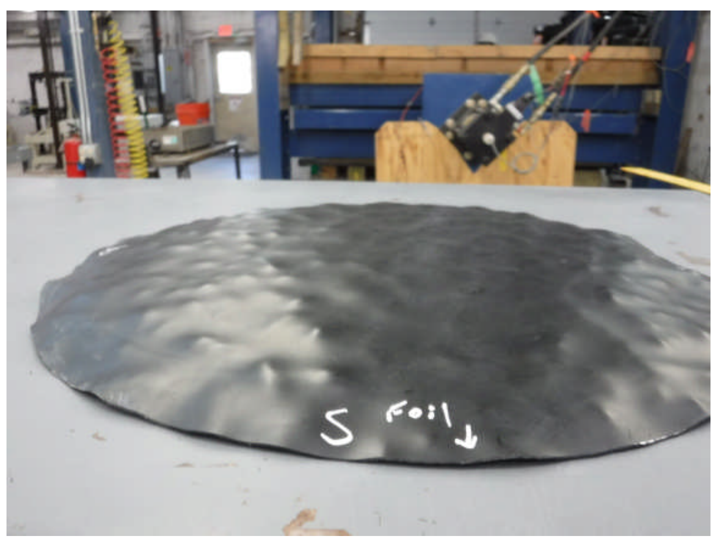


Geomembrane Top

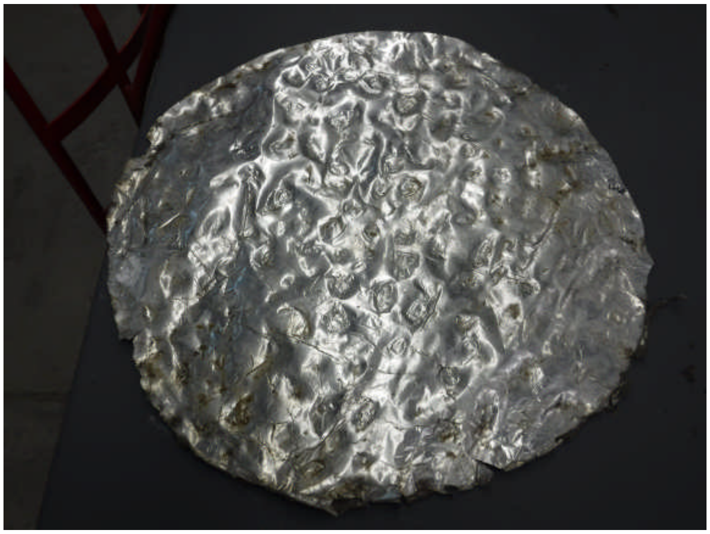


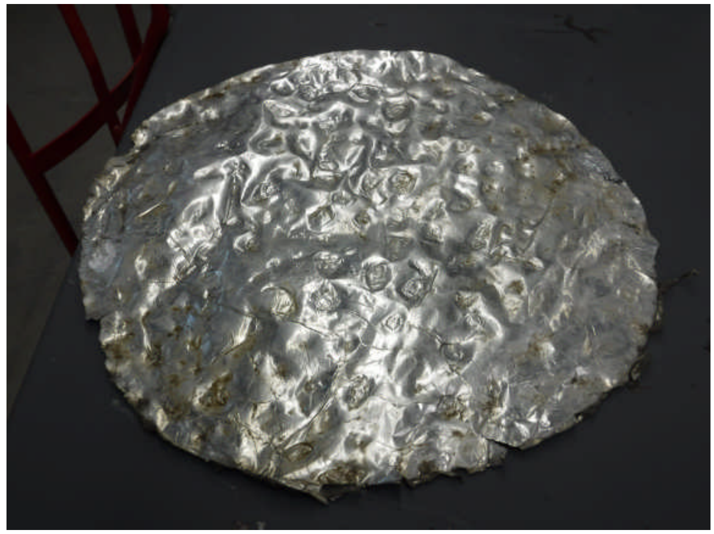
Geomembrane Bottom

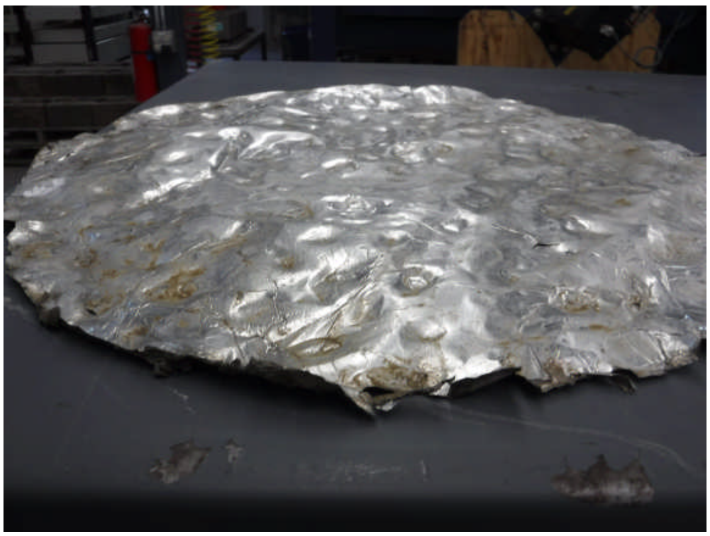
Geomembrane Top



Geomembrane Bottom


Aluminum foil Top

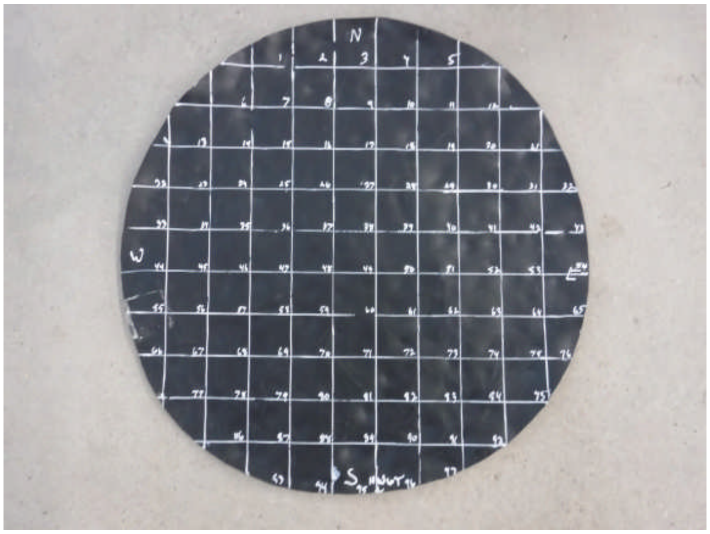

Aluminum foil Bottom


Aluminum foil Top


Aluminum foil Bottom

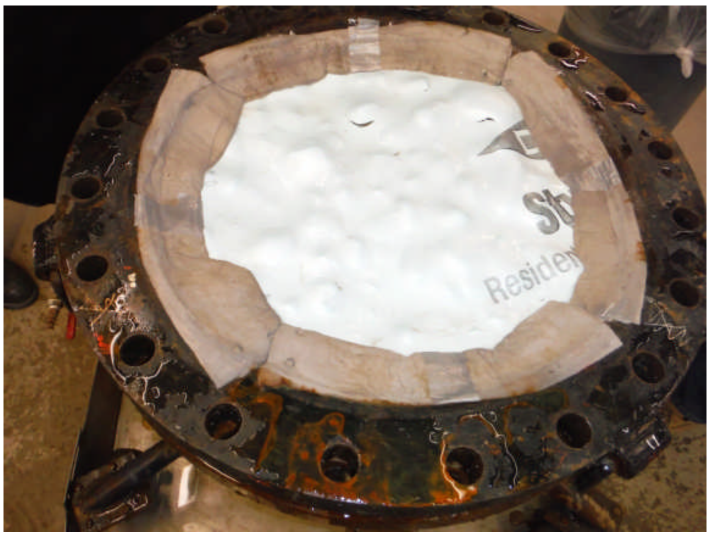

Aluminum foil


Aluminum foil



Geomembrane – 2 inch Square Deliniation

Styrofoam padding (Device)



Geotextile Padding (Device)

Stress Application Membrane (Device)

5. CONCLUDING REMARKS

A hydrostatic puncture test was performed on a profile consisting of leachate collection rock, nonwoven cushion geotextile, geomembrane and clay. The soils, clay and rock, were site-specific. The profile was subjected to a load of 130 psi for a maximum duration of 10 days. Photographs were obtained during exhumation and post-test measurements of the geomembrane deformation, geomembrane thickness, and soil density were performed. No geomembrane punctures were identified during post-test geomembrane inspection.

Attachments

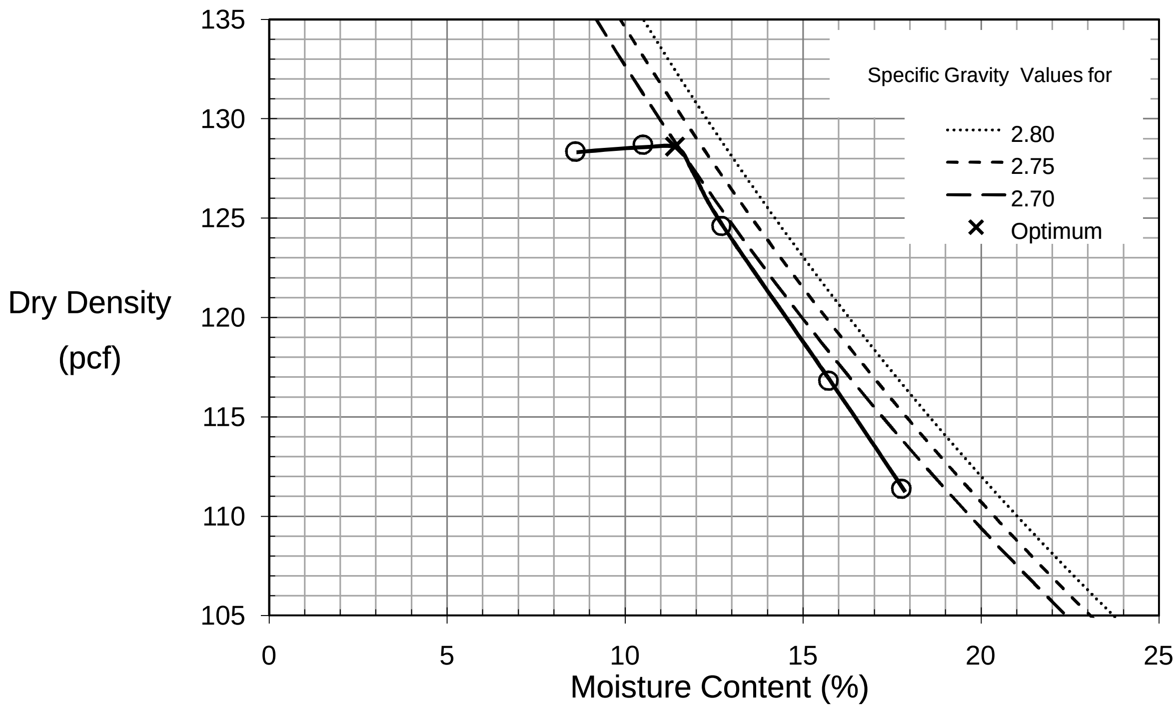
A.1 Clay and Aggregate Characteristics

Laboratory Compaction Characteristics of Soil Using Modified Effort (ASTM D1557)

Client: Advances Disposal Services   TRI Log #: 32368.2
Project: Orchard Hills Landfill
Sample ID: Clay

Compaction Effort	-	Modified
Method	-	A
Rammer Type	-	Automatic
Maximum Dry Density	pcf	128.6
Optimum Water Content	%	11.4

Oversize Particle / "Rock" Correction (ASTM D4718)		
Oversized Particles	%	- -
Maximum Dry Density	pcf	- -
Optimum Water Content	%	- -



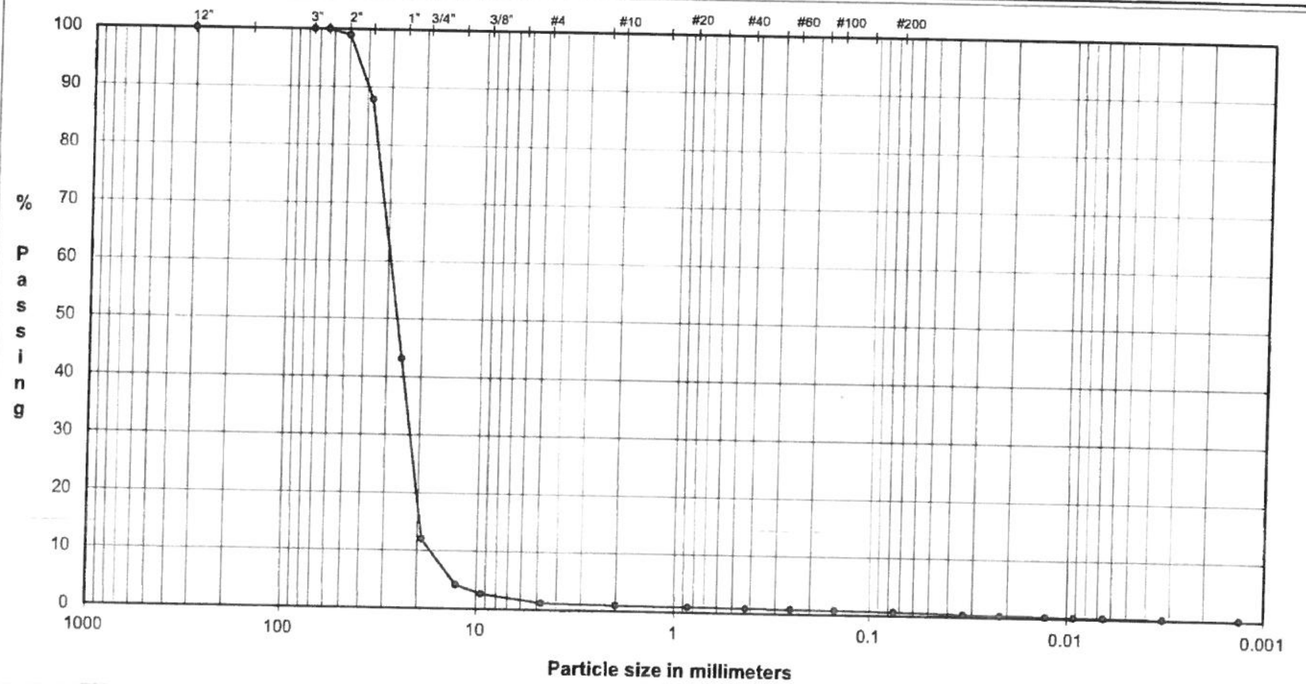
Jeffrey A. Kuhn, Ph.D, P.E., 7/17/2019
Quality Review / Date

1657191

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: WEAVER/ORCHARD HILLS- PHASE X/IL
SAMPLE ID: PB-1 - Depth: -
TYPE: Bulk



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

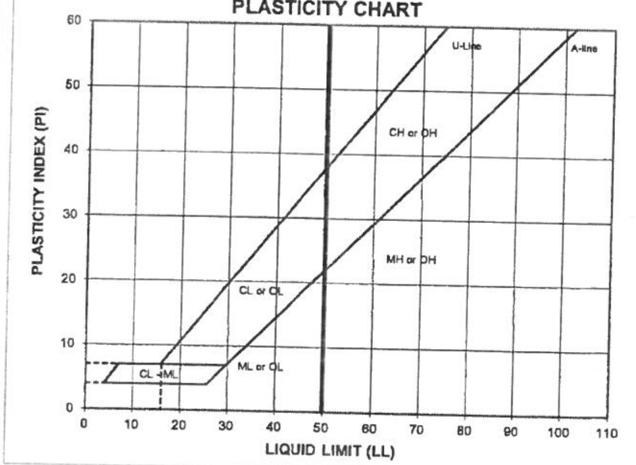
U.S. Standard Sieves Sizes and Numbers

Sieve	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0	Cobbles	0.0
3.0"	75.0	100.0		
2.5"	63.5	100.0	Coarse Gravel	88.0
2.0"	50.0	98.9		
1.5"	37.5	87.9		
1.0"	25.0	43.2		
0.75"	19.0	12.0		
0.50"	12.7	4.1	Fine Gravel	10.8
0.375"	9.5	2.6		
#4	4.8	1.2		
#10	2.00	1.0	Coarse Sand	0.2
#20	0.85	0.9	Medium Sand	0.1
#40	0.43	0.9		
#60	0.25	0.8	Fine Sand	0.2
#100	0.15	0.8		
#200	0.075	0.7		

Hydrometer Analysis

(mm)	%Finer	Classification	Percentage
0.033	0.5	Fines Silt or Clay	0.7
0.022	0.4		
0.013	0.3		
0.0092	0.2		
0.0065	0.2		
0.0033	0.2		
0.0013	0.1		

PLASTICITY CHART



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
-				

LL (oven-dried)
< 0.75 = ORGANIC (OL/OH)

DESCRIPTION: GRAVEL, fine to coarse, trace sand, trace fines; yellow, red, and gray.

USCS: GP

TECH	WD
DATE	7/11/16
CHECK	
REVIEW	[signature]
APPROVE	

Golder Associates Inc.

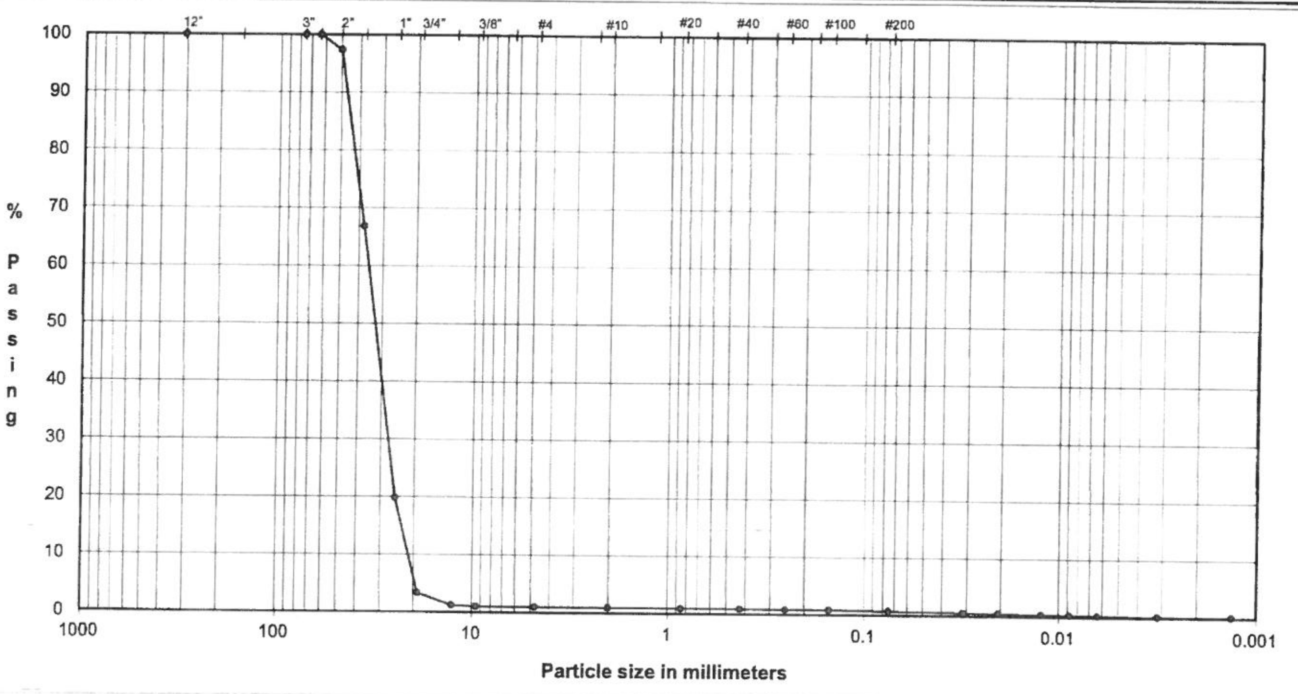
JULY 2016

1657191

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: WEAVER/ORCHARD HILLS- PHASE X/IL
SAMPLE ID: PB-2 - Depth: -
TYPE: Bulk



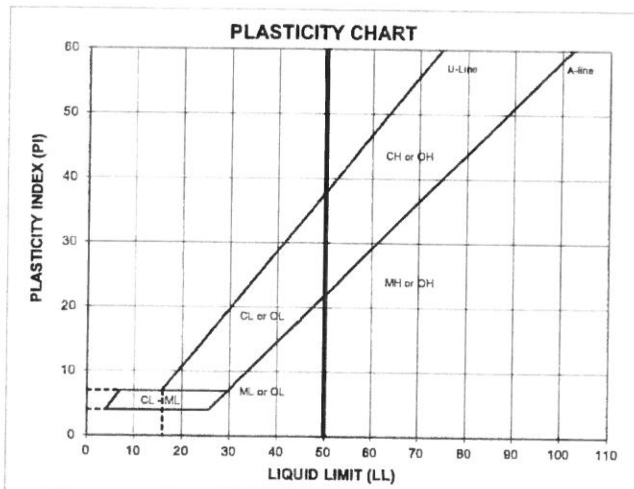
COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	97.3		
1.5"	37.5	66.9		
1.0"	25.0	19.8		
0.75"	19.0	3.3	Coarse Gravel	96.7
0.50"	12.7	1.2		
0.375"	9.5	1.0		
#4	4.8	1.0	Fine Gravel	2.4
#10	2.00	0.9	Coarse Sand	0.0
#20	0.85	0.9		
#40	0.43	0.9	Medium Sand	0.0
#60	0.25	0.9		
#100	0.15	0.8		
#200	0.075	0.8	Fine Sand	0.1

Hydrometer Analysis

(mm)	%Finer		
0.031	0.6		
0.021	0.4		
0.012	0.4		
0.0088	0.3	Fines Silt or Clay	0.8
0.0063	0.2		
0.0032	0.2		
0.0013	0.2		



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
-				

LL (oven-dried)
< 0.75 = ORGANIC (OL/OH)

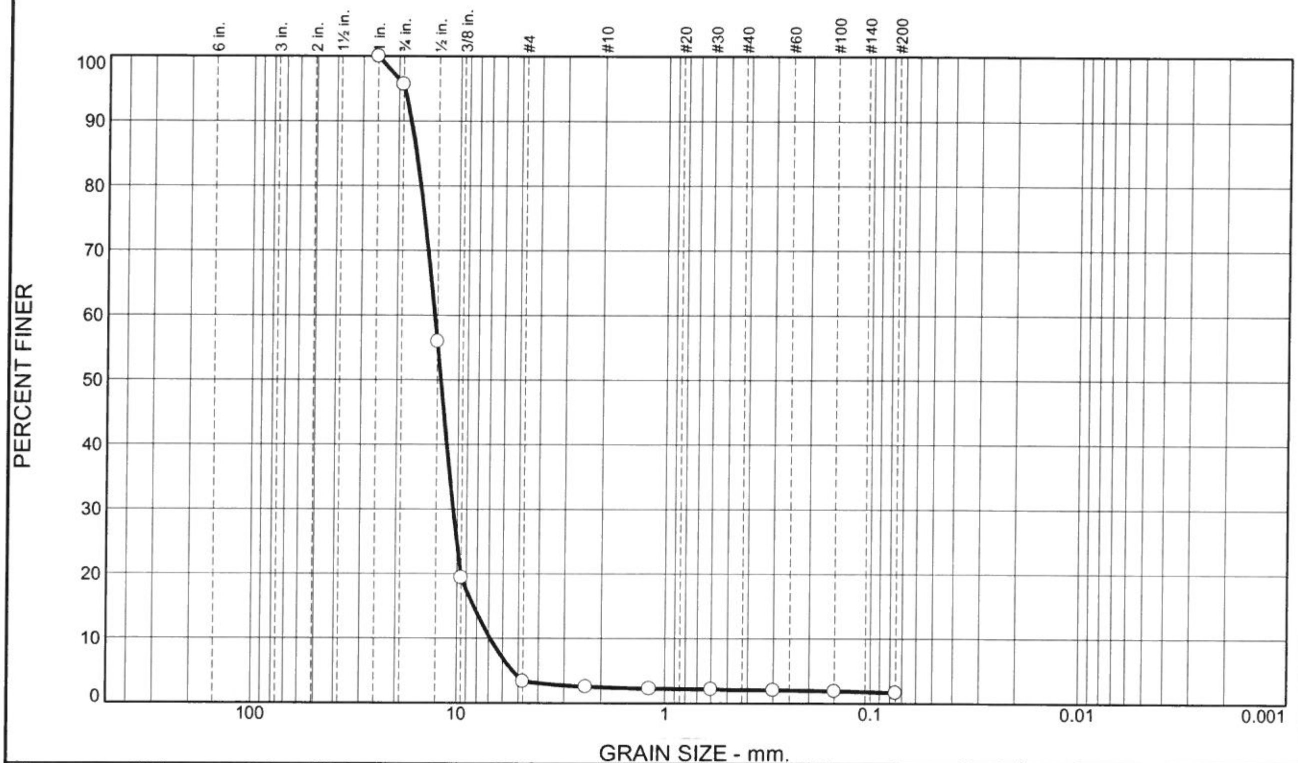
DESCRIPTION: GRAVEL, fine to coarse, trace sand, trace fines; yellow, red, and gray.

USCS: GP

TECH	AT/TB
DATE	7/14/16
CHECK	JDM
REVIEW	[signature]
APPROVE	

Golder Associates Inc.

Particle Size Distribution Report ASTM D 422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.3	92.4	0.9	0.3	0.4	1.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	95.7		
1/2"	55.9		
3/8"	19.4		
#4	3.3		
#8	2.5		
#16	2.3		
#30	2.2		
#50	2.0		
#100	1.9		
#200	1.7		

* (no specification provided)

Soil Description

Poorly Graded GRAVEL

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 17.3634 D_{85}= 16.3462 D_{60}= 13.0978
D_{50}= 12.1575 D_{30}= 10.4657 D_{15}= 8.2952
D_{10}= 6.8790 C_u= 1.90 C_c= 1.22

Classification

USCS= GP AASHTO=

Remarks

Sample Received 5-25-2018

Source of Sample: Drainage Layer
Sample Number: DL-01

Date: 6-1-2018

Weaver Consultants Group

Granger, Indiana

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project No: 0306-303-16-02 **Figure**

Tested By: en **Checked By:** jjw

GRAIN SIZE DISTRIBUTION TEST DATA

6/1/2018

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project Number: 0306-303-16-02
Location: Drainage Layer
Sample Number: DL-01
Material Description: Poorly Graded GRAVEL
Date: 6-1-2018
USCS Classification: GP
Testing Remarks: Sample Received 5-25-2018
Tested by: en **Checked by:** jjw

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 6167.80
Tare Wt. = 1205.60
Minus #200 from wash = 1.5%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
6244.70	1205.60	1"	0.00	0.00	100.0
		3/4"	218.30	0.00	95.7
		1/2"	2002.90	0.00	55.9
		3/8"	1840.40	0.00	19.4
		#4	808.80	0.00	3.3
		#8	41.56	0.00	2.5
		#16	13.30	0.00	2.3
		#30	5.40	0.00	2.2
		#50	5.80	0.00	2.0
		#100	6.90	0.00	1.9
		#200	11.70	0.00	1.7

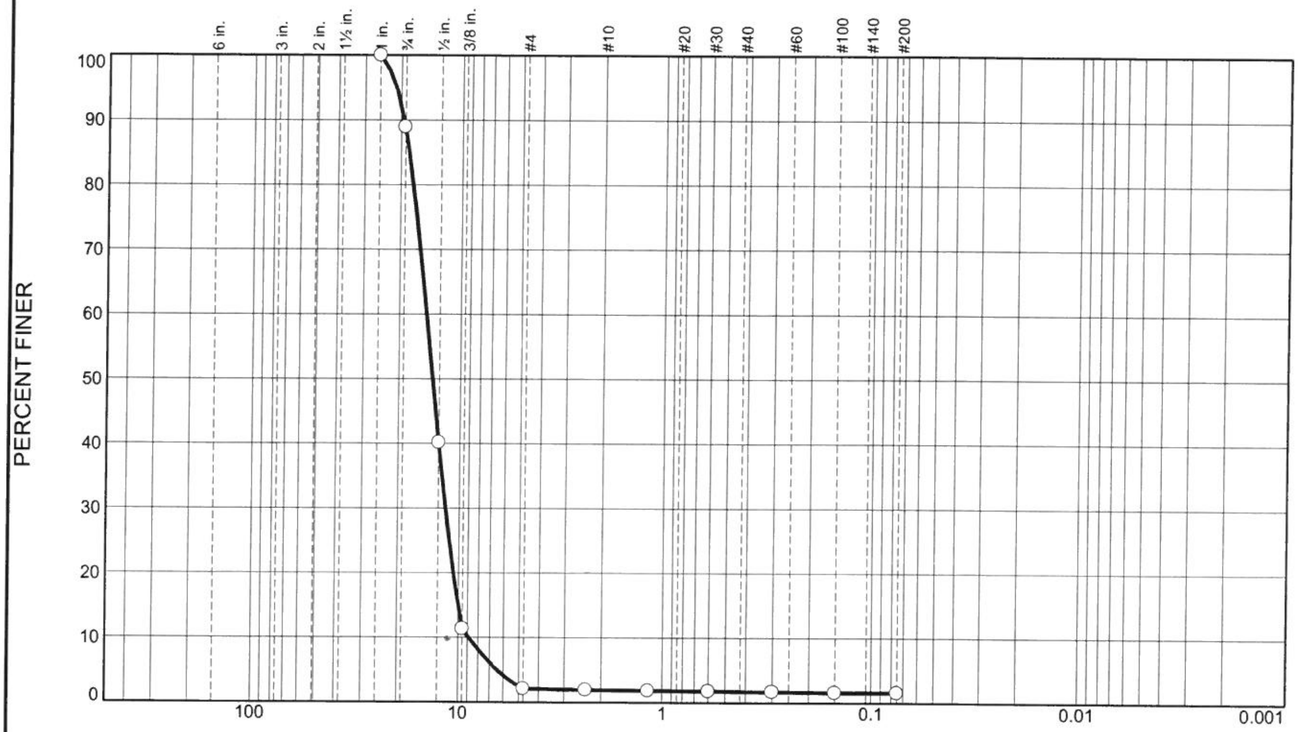
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	4.3	92.4	96.7	0.9	0.3	0.4	1.6			1.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
5.3448	6.8790	8.2952	9.5827	10.4657	11.2996	12.1575	13.0978	15.5213	16.3462	17.3634	18.7916

Fineness Modulus	C_u	C_c
6.71	1.90	1.22

Particle Size Distribution Report ASTM D 422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.1	86.8	0.2	0.2	0.1	1.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	88.9		
1/2"	40.2		
3/8"	11.4		
#4	2.1		
#8	1.9		
#16	1.8		
#30	1.8		
#50	1.7		
#100	1.6		
#200	1.6		

* (no specification provided)

Soil Description

Poorly Graded GRAVEL

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 19.3312 D_{85}= 18.1948 D_{60}= 14.7430
D_{50}= 13.6894 D_{30}= 11.6696 D_{15}= 10.0032
D_{10}= 8.8751 C_u= 1.66 C_c= 1.04

Classification

USCS= GP AASHTO=

Remarks

Source of Sample: Drainage Layer
Sample Number: DL-02

Date: 6-1-2018

Weaver Consultants Group

Granger, Indiana

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project No: 0306-303-16-02 **Figure**

Tested By: en **Checked By:** jjw

GRAIN SIZE DISTRIBUTION TEST DATA

6/1/2018

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project Number: 0306-303-16-02
Location: Drainage Layer
Sample Number: DL-02
Material Description: Poorly Graded GRAVEL
Date: 6-1-2018
USCS Classification: GP
Tested by: en
Checked by: jjw

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 5879.30
Tare Wt. = 1219.20
Minus #200 from wash = 1.4%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
5945.10	1219.20	1"	0.00	0.00	100.0
		3/4"	523.70	0.00	88.9
		1/2"	2304.40	0.00	40.2
		3/8"	1361.30	0.00	11.4
		#4	437.00	0.00	2.1
		#8	8.10	0.00	1.9
		#16	4.60	0.00	1.8
		#30	3.10	0.00	1.8
		#50	4.00	0.00	1.7
		#100	5.00	0.00	1.6
		#200	1.00	0.00	1.6

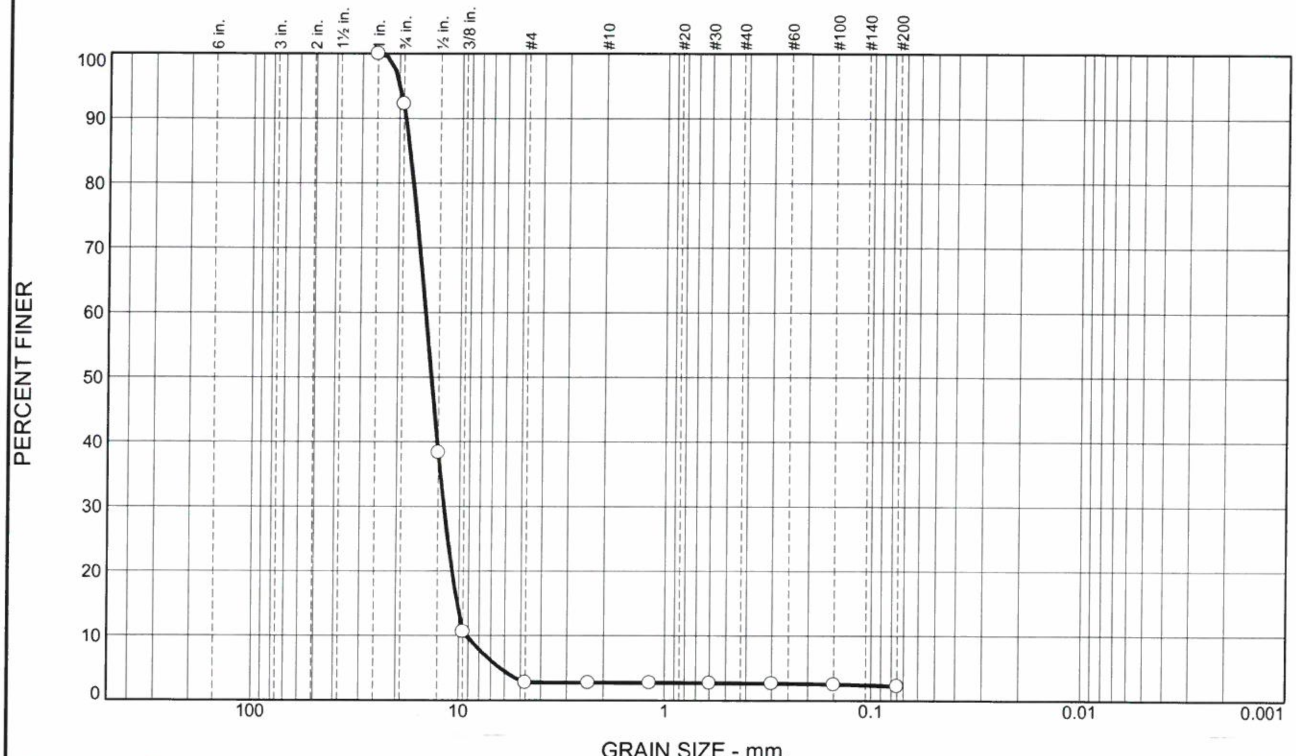
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	11.1	86.8	97.9	0.2	0.2	0.1	0.5			1.6

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
6.4210	8.8751	10.0032	10.5943	11.6696	12.6842	13.6894	14.7430	17.3180	18.1948	19.3312	21.1382

Fineness Modulus	C_u	C_c
6.89	1.66	1.04

Particle Size Distribution Report ASTM D 422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.8	89.4	0.1	0.0	0.5	2.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	92.2		
1/2"	38.3		
3/8"	10.6		
#4	2.8		
#8	2.7		
#16	2.7		
#30	2.7		
#50	2.6		
#100	2.5		
#200	2.2		

* (no specification provided)

Soil Description

Poorly Graded GRAVEL

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 18.5572 D_{85}= 17.6762 D_{60}= 14.7358
D_{50}= 13.7875 D_{30}= 11.8750 D_{15}= 10.1516
D_{10}= 9.1754 C_u= 1.61 C_c= 1.04

Classification

USCS= GP AASHTO=

Remarks

Source of Sample: Drainage Layer
Sample Number: DI-03

Date: 6-1-2018

Weaver Consultants Group

Granger, Indiana

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project No: 0306-303-16-02 **Figure**

Tested By: pl **Checked By:** jjw

GRAIN SIZE DISTRIBUTION TEST DATA

6/1/2018

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project Number: 0306-303-16-02
Location: Drainage Layer
Sample Number: Dl-03
Material Description: Poorly Graded GRAVEL
Date: 6-1-2018
USCS Classification: GP
Tested by: pl **Checked by:** jjw

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 6652.00
Tare Wt. = 1198.50
Minus #200 from wash = 2.1%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
6770.20	1198.50	1"	0.00	0.00	100.0
		3/4"	432.70	0.00	92.2
		1/2"	3002.50	0.00	38.3
		3/8"	1544.70	0.00	10.6
		#4	438.10	0.00	2.8
		#8	1.20	0.00	2.7
		#16	0.90	0.00	2.7
		#30	1.40	0.00	2.7
		#50	3.50	0.00	2.6
		#100	7.20	0.00	2.5
		#200	14.20	0.00	2.2

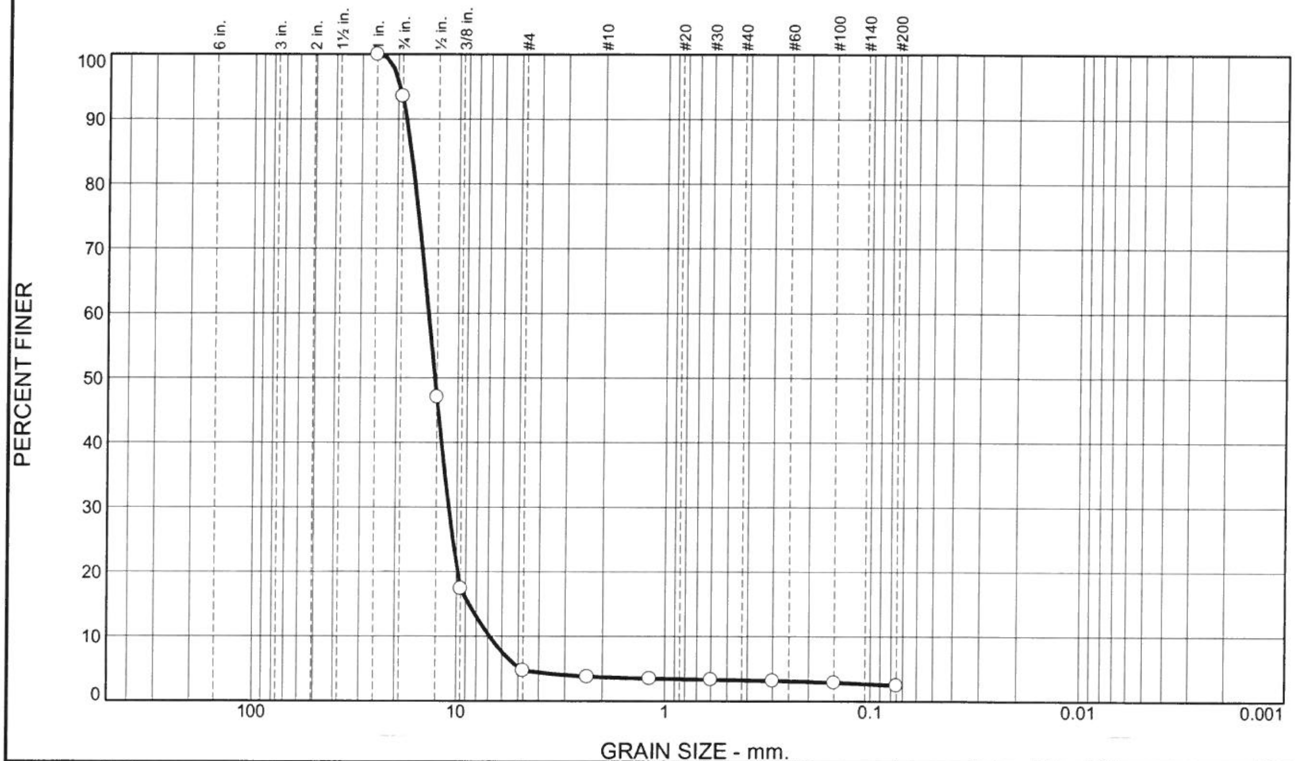
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	7.8	89.4	97.2	0.1	0.0	0.5	0.6			2.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
6.2956	9.1754	10.1516	10.7774	11.8750	12.8569	13.7875	14.7358	16.9578	17.6762	18.5572	19.8404

Fineness Modulus	C_u	C_c
6.81	1.61	1.04

Particle Size Distribution Report ASTM D 422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	6.5	88.8	1.0	0.5	0.7	2.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	93.5		
1/2"	47.0		
3/8"	17.4		
#4	4.7		
#8	3.8		
#16	3.5		
#30	3.3		
#50	3.2		
#100	2.9		
#200	2.5		

* (no specification provided)

Soil Description

Poorly Graded GRAVEL

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 18.1624 D_{85}= 17.2096 D_{60}= 14.0200
D_{50}= 12.9962 D_{30}= 10.9692 D_{15}= 8.6696
D_{10}= 6.8808 C_u= 2.04 C_c= 1.25

Classification

USCS= GP AASHTO=

Remarks

Source of Sample: Drainage Layer
Sample Number: DL-04

Date: 6-1-2018

Weaver Consultants Group

Granger, Indiana

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project No: 0306-303-16-02 **Figure**

Tested By: en **Checked By:** jjw

GRAIN SIZE DISTRIBUTION TEST DATA

6/1/2018

Client: Advanced Disposal
Project: Orchard Hills Landfill Phase X South
Project Number: 0306-303-16-02
Location: Drainage Layer
Sample Number: DL-04
Material Description: Poorly Graded GRAVEL
Date: 6-1-2018
USCS Classification: GP
Tested by: en **Checked by:** jjw

Sieve Test Data

Post #200 Wash Test Weights (grams): **Dry Sample and Tare =** 5853.50
Tare Wt. = 1182.20
Minus #200 from wash = 2.1%

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer
5951.80	1182.20	1"	0.00	0.00	100.0
		3/4"	308.20	0.00	93.5
		1/2"	2217.80	0.00	47.0
		3/8"	1413.30	0.00	17.4
		#4	606.50	0.00	4.7
		#8	43.80	0.00	3.8
		#16	14.20	0.00	3.5
		#30	7.30	0.00	3.3
		#50	8.20	0.00	3.2
		#100	11.90	0.00	2.9
		#200	21.00	0.00	2.5

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	6.5	88.8	95.3	1.0	0.5	0.7	2.2			2.5

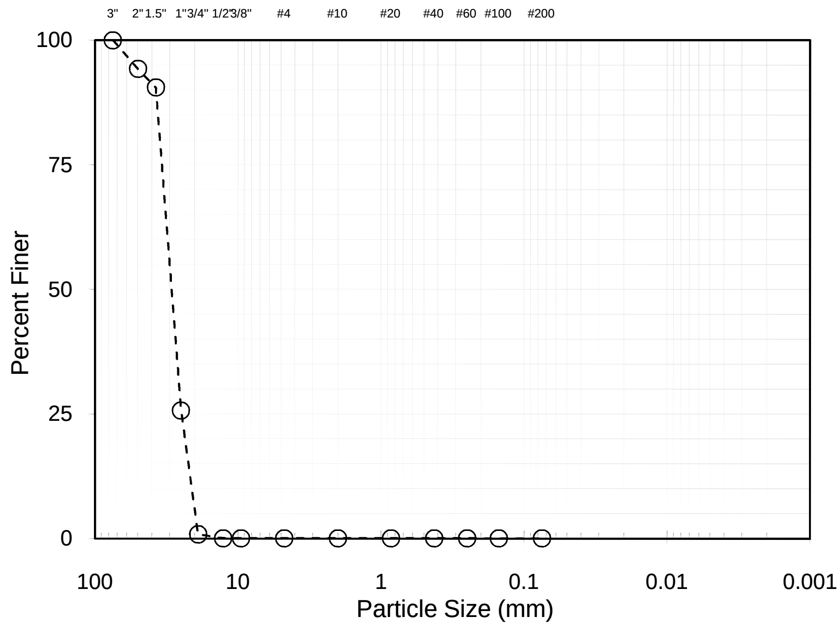
D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
4.8957	6.8808	8.6696	9.8506	10.9692	11.9950	12.9962	14.0200	16.4294	17.2096	18.1624	19.5276

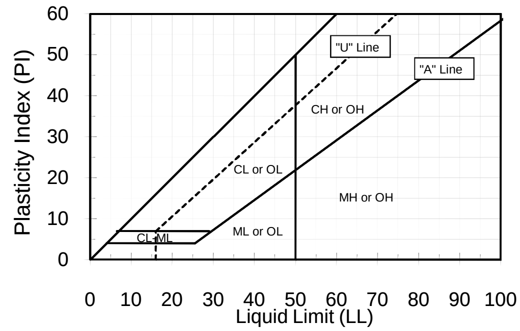
Fineness Modulus	C_u	C_c
6.68	2.04	1.25

Particle Size, Atterberg Limit, and USCS Analyses for Soils

Client: Advanced Disposal Services
Project: Orchard Hills Landfill
Sample ID: DL-1

TRI Log #: 34773.2





Atterberg Limits	
(ASTM D4318, Method A : Multipoint, Air Dried)	
Liquid Limit	- -
Plastic Limit	- -
Plastic Index	- -
(NL = No Liquid Limit, NP = No Plastic Limit)	

Mechanical Sieve (ASTM D422)		
Sieve Designation		Percent Passing
-	mm	
3 in.	76.2	100.0
2 in.	50.8	94.3
1.5 in.	38.1	90.5
1 in.	25.4	25.7
3/4 in.	19.0	0.9
1/2 in.	12.7	0.1
3/8 in.	9.51	0.1
No. 4	4.76	0.1
No. 10	2.00	0.1
No. 20	0.841	0.1
No. 40	0.420	0.1
No. 60	0.250	0.1
No. 100	0.149	0.1
No. 200	0.074	0.1

Hydrometer Analysis (ASTM D422)	
Particle Size	Percent Passing
mm	
- -	- -
- -	- -
- -	- -
- -	- -
- -	- -
- -	- -
- -	- -

Log-Linear Interpolation	
Particle Size	Percent Passing
mm	
0.005	- -
0.002	- -

D_X (mm), Log-Linear Interpolation			
10	30	50	60
21.01	25.68	29.10	30.98

Cu	Cc
1.47	1.01

USCS Classification (ASTM D2487)	
Poorly-graded gravel (GP)	
Moisture Content (%) (ASTM D2216)	
0.2	
Angularity (Percent by Mass*) (ASTM D2488)	
Angular	15.9
Subangular	31.1
Subrounded	46.2
Rounded	6.7

*110 C oven-dried material retained on a No. 4 Sieve

Jeffrey A. Kuhn, Ph.D., P.E., 7/17/2019
Analysis & Quality Review/Date

Particle Size, Atterberg Limit, and USCS Analyses for Soils

Client: Advanced Disposal Services TRI Log #: 34773.2
Project: Orchard Hills Landfill
Sample ID: DL-1

Image 1 of 5 (> No.4 Sieve)

Sub-Specimen for Angularity Evaluation

Particle Size, Atterberg Limit, and USCS Analyses for Soils

Client:	Advanced Disposal Services	TRI Log #:	34773.2
Project:	Orchard Hills Landfill		
Sample ID:	DL-1		

Image 2 of 5 (> No.4 Sieve)

Angular

Particle Size, Atterberg Limit, and USCS Analyses for Soils

Client: Advanced Disposal Services TRI Log #: 34773.2
Project: Orchard Hills Landfill
Sample ID: DL-1

Image 3 of 5 (> No.4 Sieve)
Subangular

Particle Size, Atterberg Limit, and USCS Analyses for Soils

Client:	Advanced Disposal Services	TRI Log #:	34773.2
Project:	Orchard Hills Landfill		
Sample ID:	DL-1		

Image 4 of 5 (> No.4 Sieve)

Subrounded

Particle Size, Atterberg Limit, and USCS Analyses for Soils

Client: Advanced Disposal Services
Project: Orchard Hills Landfill
Sample ID: DL-1

TRI Log #: 34773.2

Image 5 of 5 (> No.4 Sieve)
Rounded

Appendix B

Large-Scale Puncture Resistance Testing
ASTM D5514, Modified using Large-Scale Test Cell

26 February 2019

Timothy D. Curry
Advanced Disposal
232 Vance Road, Suite 208
Valley Park, Missouri 63088
Phone: 636 529 1974
tim.curry@advanceddisposal.com

RE: Large-Scale Puncture Resistance Testing

Dear Mr. Curry,

Large-scale puncture resistance testing was performed in modified accordance with ASTM D5514 by using a large out-door test box able to accommodate a more site-specific quantity of test materials.

TRI employed a large scale reinforced concrete test box with inside dimensions of 10 feet square by 8 feet tall. The box was used to construct and contain a model of the leachate collection trench used at Orchard Hills landfill.

Figure 1: TRI Accelerated-Loading Test Box

The trench was constructed of pipe, geomembrane, clay and rock materials acquired directly from Orchard Hills landfill via product rolls and container bulk bags. The cushion geotextile was acquired from Skaps, the manufacturing facility which supplies geotextiles for the Orchard Hills Landfill.

Figure 2 presents the construction plan followed. Importantly, plate load cells were used to monitor and verify the applied surcharge load. In addition, settlement plate gauges were used to monitor the consolidation of the constructed clay liner after loading.

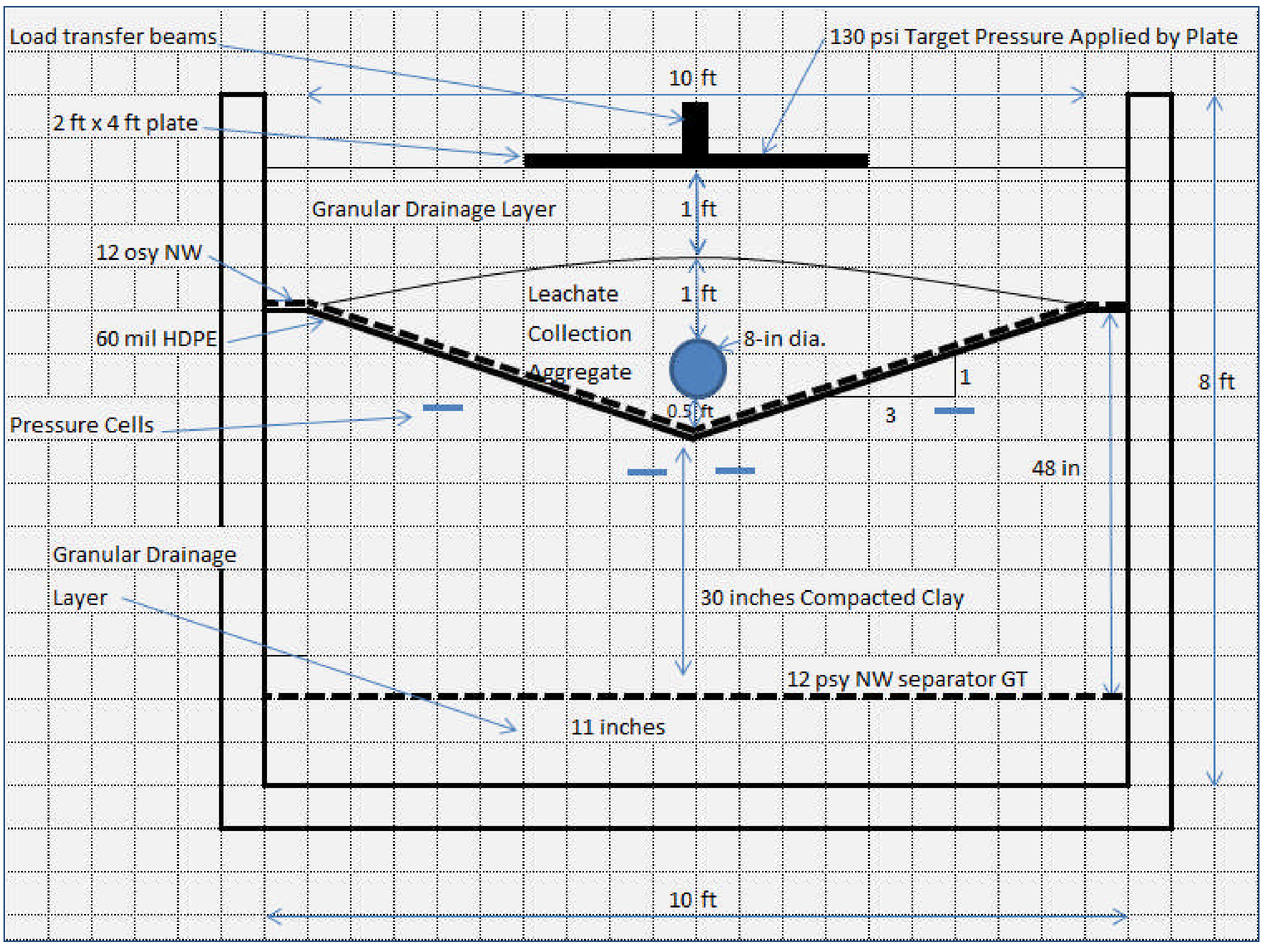


Figure 2: Cross Section of Test Profile

The test plan included the monitoring of the clay liner with plate consolidation meters for primary consolidation with a goal of determining when the test profile would approach an equilibrium thickness. That is, no other primary consolidation would take place as all non-clay materials would have already experienced ductile compressive deformation by the time the clay had consolidated.

The clay was tested for consolidation rate in accordance with ASTM D2435 (*Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading*) consolidation tests on a saturated clay. This test results are included as an attachment to this report. Table 1 outlines predicted consolidation times.

Average Degree of Consolidation (%)	T*	Clay Layer Thickness (ft)							
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
		Height of Drainage (ft)							
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
		Time (days), Cv = 31 ft^2/yr, Single-Sided Drainage							
50	**0.20**	0.6	2.3	5.3	9.4	15	21	29	38
60	**0.29**	0.9	3.4	7.7	14	21	31	42	55
70	**0.41**	1.2	4.8	11	19	30	43	58	76
80	**0.56**	1.7	6.6	15	26	41	60	81	110
90	**0.83**	2.4	9.7	22	39	61	88	120	160
95	**1.12**	3.3	13	30	53	82	120	160	210

*Trapezoidal "T" values after Hansen 1961.

Table 1: Time-Dependent Clay Consolidation Based on ASTM D2435 Testing

Based on a 30 inch clay liner thickness layer and laboratory testing, the clay sample was anticipated to require approximately 40-60 days to reach primary consolidation. The field test exposure plan called for real-time monitoring of the clay liner to determine the end-of-primary-consolidation. This would then initiate a post-consolidation waiting period of 30 days before consideration of load removal and subsequent geomembrane evaluation would begin.

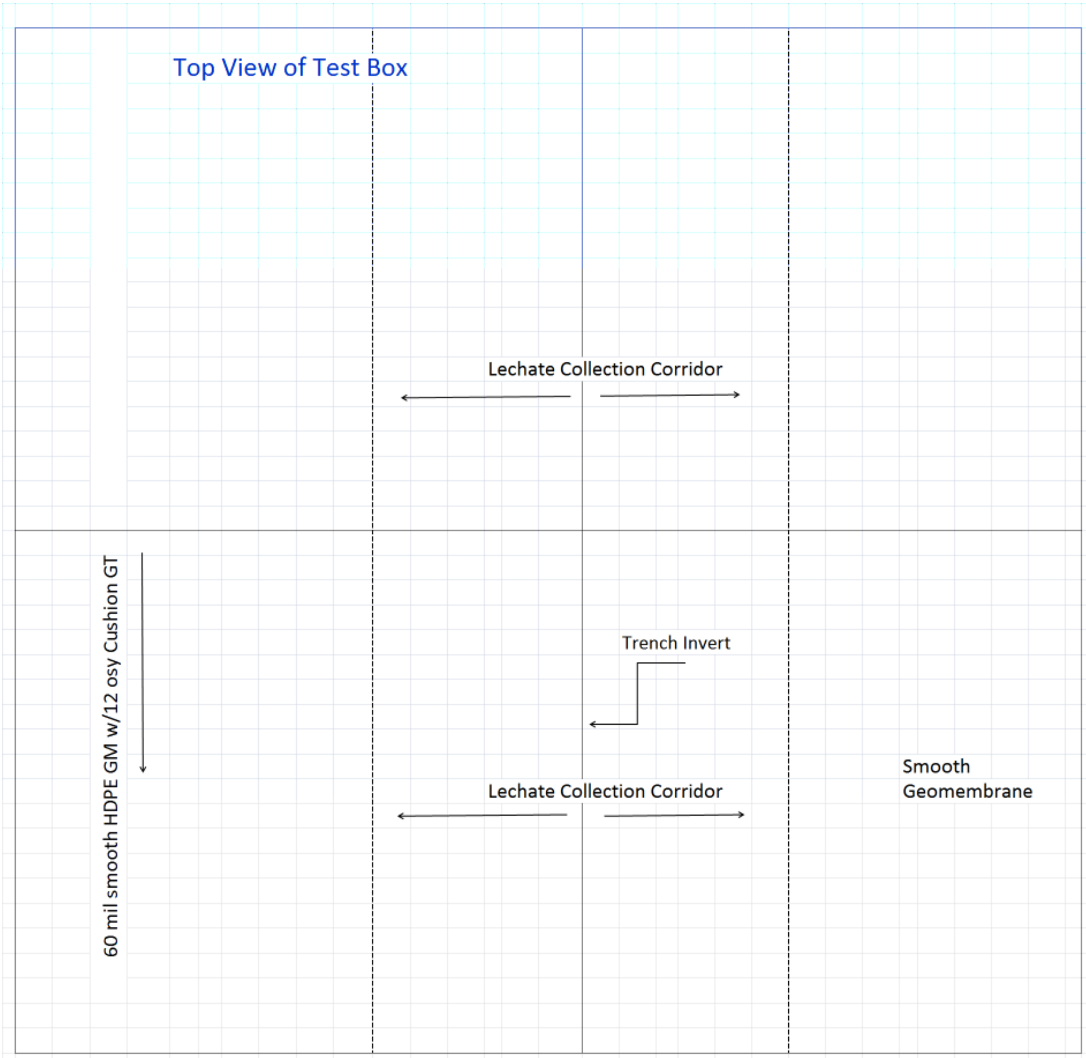


Figure 3: Test Plan (Top View)

The exposure plan for the geomembrane and cushion geotextile materials is presented in Figure 3. In addition, a 10 mil low-modulus aluminum alloy plate was included to record the localized geomembrane out-of-plane deformation under load. The geomembrane was also marked for any features that looked non-homogenous (gels, creases, scrapes). These same locations would be inspected carefully post-exposure.

Upon completion of the installation of all layers of the test profile, test materials and instrumentation, 1/6 of the total planned load was applied per 24 hour time period until a total surcharge load of 130 psi was achieved. Accordingly, the entire 130 psi compressive load was applied over 6 days. Continual monitoring of the clay liner was performed. Attachments to this report include photos of the construction of the test cell and post exposure inspection of the geomembrane.

TEST RESULTS:

Interpretation of the consolidation plate data was performed by TRI and APTIM Environmental & Infrstructure, LLC engineers to determine the conclusion of primary consolidation and initiation of a steady-state consolidation state. Figure 3 shows the consolidation plot of the compacted clay liner at the bottom of the Orchard Hills test box.

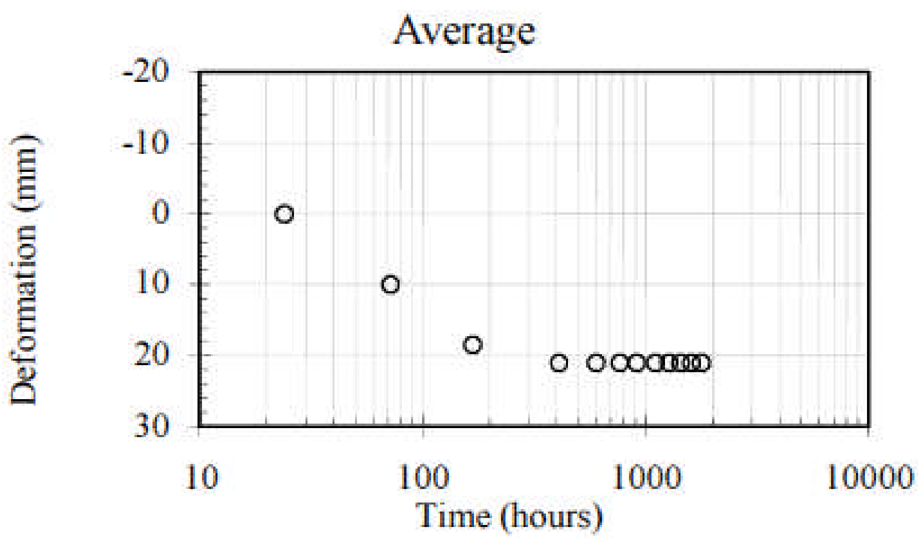


Figure 4: Consolidation of Orchard Hills Compacted Clay Liner

The first of six compressive loading blocks was loaded on July 23, 2018. The designed 130 psi surcharge load was achieved on July 30, 2018. This was maintained until December 3, 2018 at which time surcharge load was removed. The double lever loading system and overburden materials were then removed early December 4, 2018 leaving only the cushion geotextile, pipe and 1 inch of the leachate collection aggregate.

At 10:00 am on December 4, 2018, representatives of the client's project team arrived to witness the geomembrane exhumation and geomembrane inspection. After removal of remaining aggregate and cushion geotextile, the geomembrane test panels were removed from the test box and laid to rest on the surrounding ground. Clean cotton cloths were used to wipe the geomembranes and remove the wet clay residuals concealing surface features.

After cleaning, the geomembranes were visually inspected by the project team with the following observations:

i) The geomembrane did not show visible puncture.
ii) Both the geomemrbrane panels showed out-of-plane deformation.
iii) The very small defects (scrapes, scratches) noted on the as-installed geomembrane test panels did not demonstrate any unique features post exposure, that is, they did not correspond to increased out-of-plane deformation nor did they look thinner than adjacent locations.

Because not all punctures caused by aggregate are readily detected with the naked eye, after visual examination, TRI also performed a leak location test in accordance with ASTM D7953, *Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Arc Testing Method*. The principle of this electrical leak location method is to introduce a high voltage between a leak detection test probe and the conductive medium underneath the geomembrane, in this case, the moist ground. The geomembrane surface area is then swept with a test probe to locate points where the current completes the circuit through a leak. A visible electrical arc is formed when the current completes the circuit and the current flow is also converted into an alarm (audible, visual or other), which confirms leak detection and location. A test hole was made to confirm operating conditions, and the test confirmed that no ruptures, tears, pinholes or punctures resulted from exposure.

Finally, the three aluminum alloy plates that served to lock-in and preserve out-of-plane deformation under load, some of which would have been otherwise lost upon removal of loading, were scanned and mapped. This approach allows measurement of strain across a section of surface area of the geomembrane and provides a very accurate assessment of the maximum out-of-plane strain developed.

When the aluminum plate is mapped with a scanner, all points are assigned an x, y and z component based on their location (x and y) and their height (z). Because the monitoring sheet is initially flat prior to analysis, ie, z=0, the difference in height at each point (Δz) can be calculated post-analysis using the deformed height. To calculate the strain between any two points, the initial distance between them and the deformed distance between them is determined. To calculate the initial distance, the distances between the central cell and each neighboring cell are determined as depicted below.

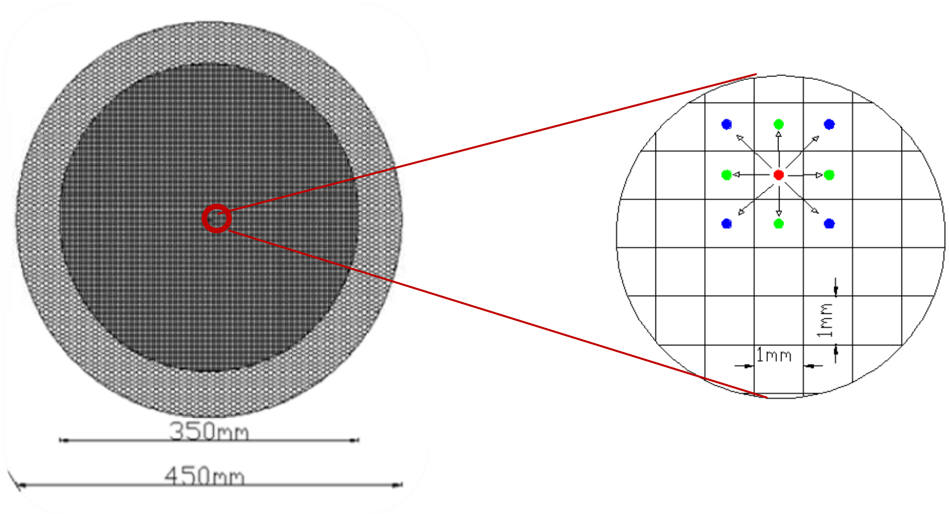
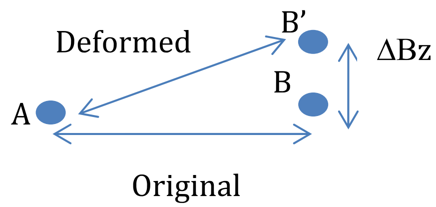


Figure 5: Determination of Out-of-Plane Strain

The distance between the red and green points is 1; however the distance between the red and blue points along a diagonal is √2. For every given location (except edges), a point will have 4 linear neighbors (green) and 4 diagonal neighbors (blue). To calculate the deformed distance between any two points, the Δz value of each point is determined using a laser measuring device.



To calculate the strain as a percentage of the original length;

$$\varepsilon\,(\%) = \left[\frac{Deformed}{Original} - 1\right] \times 100$$

However, since the laser only calculates the Δz value and not the absolute length between any two points this is converted as follows;

$$\varepsilon\,(\%) = \left[\frac{\sqrt{Original^2 + \Delta Bz^2}}{Original} - 1\right] \times 100$$

This is repeated for all 8 neighboring points. The connecting neighbor that has the highest strain value is recorded as the maximum value of strain for that cell while the other 7 points of information are discarded.

For this evaluation, a range of strain envelopes were assessed in 0.25% increments from 0.0% to 22.5%. The results presented represent the % strain that has occurred over the sample within the limits of the testing duration. The relative performance of the geotextile protection layer in conjunction with the leachate collection aggregate stone profile and deformation variances is provided below.

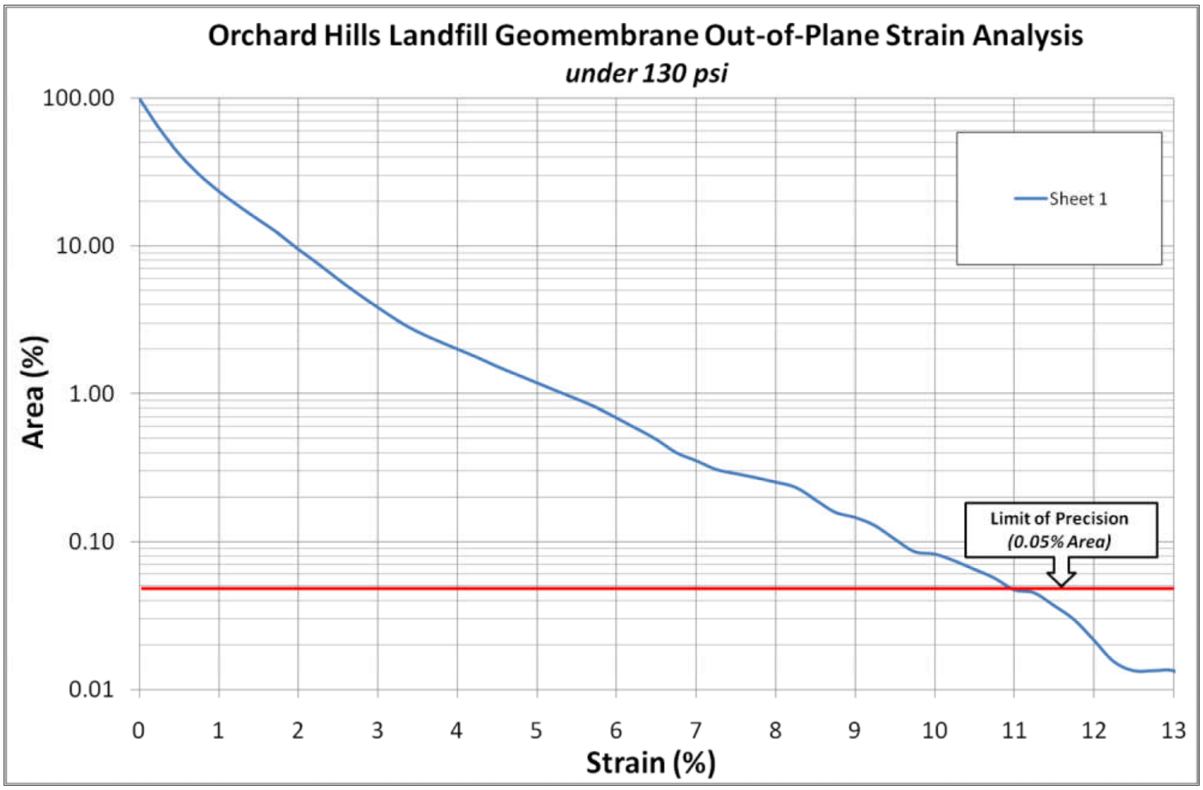
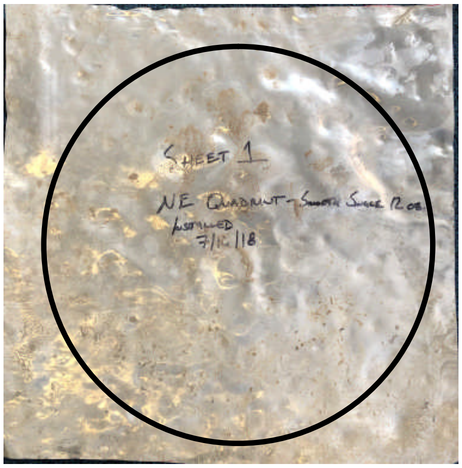
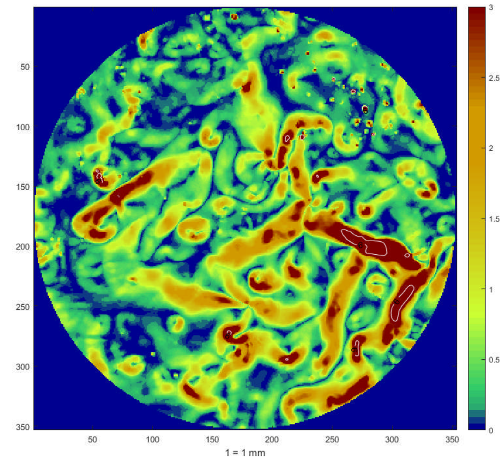


Figure 6: Smooth Geomembrane out-of-plane strain measurements



0.3mm Aluminium sheet



Strain Distribution

Sheet 1: beneath the cushion GT/smooth geomembrane

Figure 7: 3-dimensional mapping of out-of-plane strain measurements

Though the geomembrane test panels experienced out-of-plane strain, visual inspection did not indicate an associated high degree of, or significant, geomembrane thinning, even at the locations having the largest out-of-plane strain. The predicted geomembrane thinning, or thickness reduction over its service life, is covered under a separate report.

Attachments

B.1 One-Dimensional Consolidation Test Results
ASTM D2435, Method B

and

B.2 Photos of Test Cell Construction
Photos of Geomembrane Exumation

May 24, 2018

Tim Curry
Advanced Disposal Services, Inc. – Orchard Hills Landfill
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David Junction IL 61020
United States of America
Tim.curry@advanceddisposal.com

CC: Mark Sieracke <msieracke@wcgrp.com>
Jay Warzinski <jay.warzinski@advanceddisposal.com>
Chris Peters <Chris.Peters@Cornerstoneeg.com>

Subject: Laboratory Evaluation of the Clay Time Rate of Settlement
Project: Orchard Hills Landfill
Log #: 32368

Dear Mr. Curry,

TRI is pleased to submit the results of a laboratory evaluation of the time rate of settlement of the clay soil in support of field-scale puncture resistance testing for Orchard Hills Landfill. This report documents the laboratory testing conducted by TRI Environmental (TRI) and provides the expected time rate of settlement, magnitude of settlement, and proposed duration of the field test based on the results from laboratory testing and a baseline analysis with regards to the anticipated time-rate of settlement of the subject clay layer,

Based on the results of laboratory testing and a time rate of consolidation calculations for single sided drainage, TRI recommends a total compacted clay liner thickness of 2.5 feet in order that approximately ninety percent of settlement is achieved in a period of 60-88 days. A series of settlement plates will be utilized in the field installation in order to evaluate the time rate of settlement in the field.

We appreciate the opportunity to work with you on this project and look forward to providing additional services in the future. Please contact us if you have any questions, comments, or requests.

Sincerely,

Jeffrey A. Kuhn, Ph.D., P.E.
Director of the Geotechnical Laboratory

Sam Allen
Vice President

1. INTRODUCTION/BACKGROUND

In preparation for the initiation of field-scale compression testing, an inquiry was placed by the design engineer with regards to the time rate of settlement of the compacted clay layer. Upon review of the 2003 permit modification response from STS Consultants, it was determined that laboratory-determined relationships between effective stress and settlement were utilized but that the coefficient of consolidation value utilized for time rate of settlement calculations did not originate from laboratory testing but rather from a reference source. In order that the time rate of settlement of the clay could be evaluated, TRI initiated one-dimensional consolidation testing of a specimen of remolded clay from the site. The testing procedure utilized and the measured consolidation properties are presented in this report. These properties are compared to those utilized by STS in their 2003 application and recommendations are made with respect to the duration of field-scale compression testing.

2. SAMPLE RECEIPT, HANDLING, AND STORAGE

Samples of site-specific aggregate and clay were provided to TRI in a shipment received on September 20th, 2017. The standard disposal of samples occurs thirty day following final reporting. TRI is currently holding samples until, at a minimum, the field-scale compression testing has been completed in order that any additional supporting geotechnical laboratory testing might be performed upon request.

3. TEST SETUP AND PROCEDURE

Material Conditioning/Processing

A 2.5 inch diameter consolidation cell was used in combination with a stepper-motor equipped load frame in order to perform one-dimensional consolidation testing in accordance with ASTM D2435 procedures. In preparation for remolding, the soil was air dried and passed through a No. 8 sieve to eliminate any over sized particles. The soil was then moisture conditioned, allowed to equilibrate, and then adjusted according to the target gravimetric moisture content based on an oven dried moisture content. The moisture conditioned site-specific clay was then remolded to 90 percent of the maximum dry density and 3.5 percent wet of the optimum water content as determined by ASTM D1557 modified Proctor testing. These are the same placement conditions utilized in Bench-Scale Hydrostatic Puncture testing as reported on 12/5/2017.

Consolidation Testing

Following remolding, the specimen was tested in accordance with ASTM D2435 test method B which utilized 24 hour increments between loads. The test was performed with a stepper-motor equipped load frame equipped with a load cell. Following placement of a seating load, the specimen was inundated and the height of the specimen was fixed. A swell pressure of less than 100 psf was measured following inundation. The test was then advanced utilizing a loading increment ratio of two and an unload-reload cycle (ie. Rebound cycle, hysteresis loop) was performed at a stress of 16,000 psf utilizing a loading increment ratio of four (twice as large as that used in load application). A maximum applied stress of 64,000 psf was utilized for testing. Following application of the maximum applied stress, final unloading of the specimen was performed.

4. Post-Test Evaluation

Magnitude of Settlement

Tabular values and a plot of the void ratio versus the log of the effective stress are shown in Figure 4. The Casagrande Construction technique, includes utilizes the void ratio – effective stress, e-log(σ') curve in semi-log space to calculate a preconsolidation pressure of 8,600 psf through a series of geometric constructions (see ASTM D2435 report for details). Other semi-log-linear constructions included the use of the reloading portion of the unload-reload cycle to determine a recompression index of 0.010 and the virgin compression portion of the e-log(σ') curve was utilized to determine a recompression index of 0.079.

σ'_v (psf)	e (-)	Strain, ε (%)
Initial	0.448	0.0
250	0.413	2.4
500	0.405	2.9
1,000	0.392	3.8
2,000	0.380	4.7
4,000	0.368	5.5
8,000	0.353	6.5
16,000	0.336	7.7
8,000	0.337	7.7
4,000	0.340	7.5
8,000	0.338	7.6
16,000	0.334	7.9
32,000	0.315	9.2
64,000	0.291	10.8
16,000	0.294	10.6
4,000	0.305	9.9

Table 1 - Void Ratio vs. Effective Stress

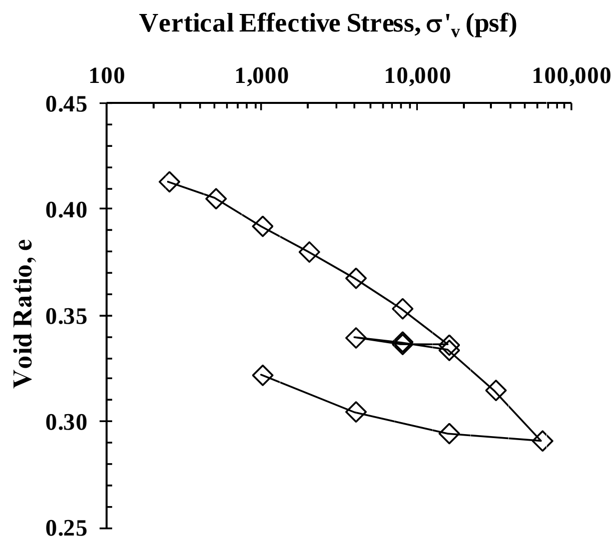


Figure 1 –Void Ratio vs. Effective Stress

Time Rate of Settlement

The time rate of settlement of the clay was evaluated via the square root of time and log-time methods. The measure relationship between the coefficient of consolidation and effective stress is presented in tabular and graphical form in Table 2 and Figure 2, respectively. The log-time method was only utilized for an effective stress of 32,000 psf where a clear inflection / t_{100} could be determined. The root-time method was used for normal stresses in which a clear root-time linear relationship was present. Time-settlement curves are available in the stand-alone separate consolidation report transmitted at the time of submission of this report.

σ'_v	C_v (ft^2/year)	
(psf)	Log Time	Root Time
Initial	-	-
250	-	-
500	-	-
1,000	-	68
2,000	-	40
4,000	-	36
8,000	-	18
16,000	-	26
8,000	-	-
4,000	-	-
8,000	-	13
16,000	-	31
32,000	15	24
64,000	-	29
16,000	-	-
4,000	-	-

Table 2 - Coefficient of Consolidation vs. Effective Stress

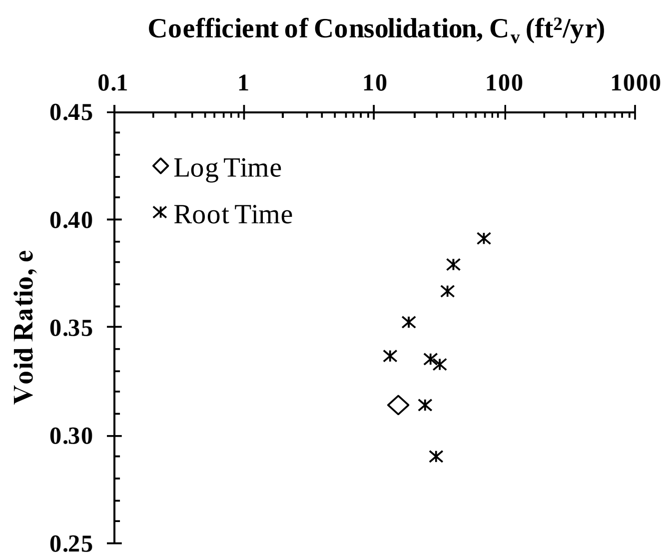


Figure 2 – Coefficient of Consolidation vs. Effective Stress

Regarding Partially Saturated Soils

Please note that consolidation testing was performed on a specimen which was submerged during testing in accordance with ASTM D2435. The results of this testing will be used to estimate the time rate of consolidation for field testing but do not directly evaluate the time rate of consolidation of a partially saturated soil. This will be best achieved in the field through the use of field instrumentation (e.g. settlement plates).

5. COMPARISON WITH ASTM D5514C TESTING AND 2002 PERMIT DATA

ASTM D5514C Post-Test Dry Densities and Saturations

Bench-Scale Puncture Resistance testing, as reported on 12/5/2017, included the application of a 130 psi load for a time period of ten days. At the end of ten days, a thin-walled sampling tube was pushed through the center of the compacted clay as a means of evaluating the post-test dry density. A plot of the measured dry densities is presented in Figure 3. A semi-log interpolation of the results from one-dimensional consolidation tests results in a calculated void ratio of 0.330 which corresponds to a dry density of 129.0 pcf assuming a specific gravity 2.75. Despite consolidation testing being conducted on an inundated soil specimen and hydrostatic compression testing being conducted on a partially-saturated material / non-inundated, the post test dry densities indicate that the upper portion of the clay had reached a dry density of approximately 129 pcf. In order to further evaluate the post-test measurements from hydrostatic compression testing, the saturation of the material can be evaluated through assuming a specific gravity value. A plot of the calculated saturation of the post-test material is presented in Figure 4. Please note that two of the nine calculated values of saturation were greater than 100 percent given the assumed specific gravity value of 100 percent. Albeit the compression and consolidation of the field test profile is not being performed in a flooded environment, the planned applied stress is high enough to bring the clay liner to a state of approximate saturation.

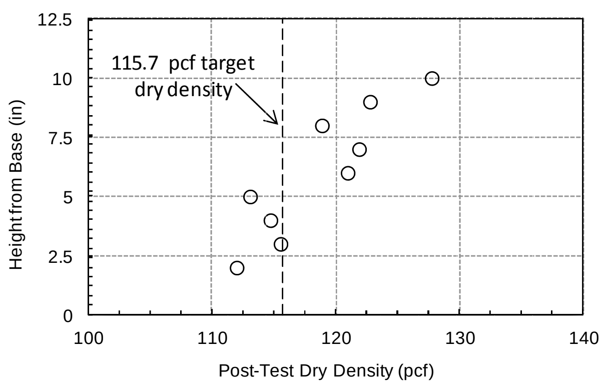


Figure 3 – Bench-Scale Puncture Resistance Testing:

Post-Test Dry Density

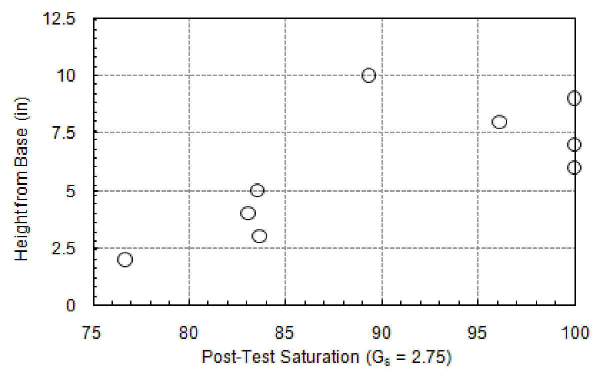


Figure 4 – Bench-Scale Puncture Resistance Testing:

Post-Test Saturation

Consolidation Testing

Tabular consolidation properties utilized by STS are compared to those determined from laboratory testing in Table 3. The laboratory determined values of the preconsolidation pressure, compression index, and recompression index were in good agreement between 2003 and current testing. The 2003 coefficient of consolidation utilized in time rate of settlement calculations, and obtained via a reference, was, however, approximately twice as large as the coefficient of consolidation as determined from laboratory testing under the 8,000 to 32,000 psf load increment and was comparable to the value obtained for the 500 to 1,000 psf load increment.

Table 3 – 2003 STS Values and 2018 Laboratory-Determined Values

	Preconsolidation Pressure	C_c	C_r	C_v
	-	-	-	ft^2/year
STS Consultants (2003)	≈ 10,400 to 12,400	0.07	0.014	55
TRI ASTM D2435 Testing (TRI Log #32368)	≈ 8,600	0.079	0.01	31

6. IMPLICATIONS ON AND RECOMMENDATIONS FOR FIELD TESTING

The calculated time requirements with single-sided drainage to achieve varying degrees of consolidation for different clay layer thickness are presented in Table 4 utilizing a coefficient of consolidation of 31 ft^2/yr. The estimated time frame for 90 percent consolidation of a 2.5 thick section of liner with single-sided drainage is 61 days.

Table 4 – Time - Degree of Consolidation Dependency, Single-Sided Drainage

Average Degree of Consolidation (%)	T*	**Clay Layer Thickness (ft)**							
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
		Height of Drainage (ft)							
		0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
		Time (days), Cv = 31 ft^2/yr, Single-Sided Drainage							
50	0.20	0.6	2.3	5.3	9.4	15	21	29	38
60	0.29	0.9	3.4	7.7	14	21	31	42	55
70	0.41	1.2	4.8	11	19	30	43	58	76
80	0.56	1.7	6.6	15	26	41	60	81	110
90	0.83	2.4	9.7	22	39	61	88	120	160
95	1.12	3.3	13	30	53	82	120	160	210

*Trapezoidal "T" values after Hansen 1961.

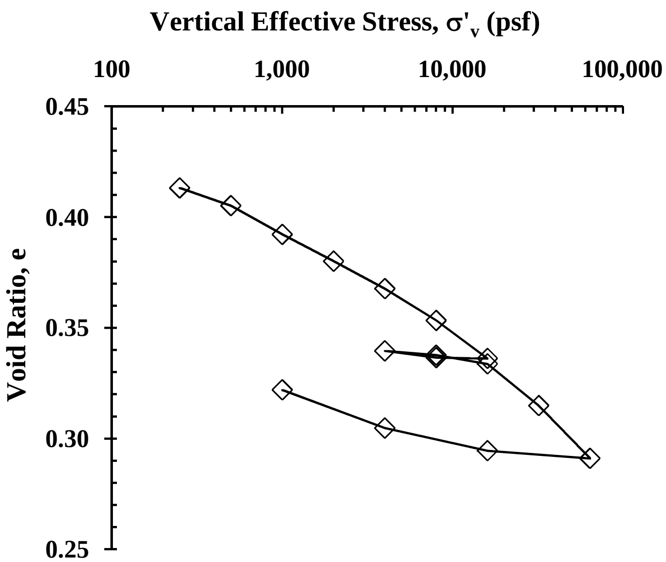
One-Dimensional Consolidation Properties of Soil

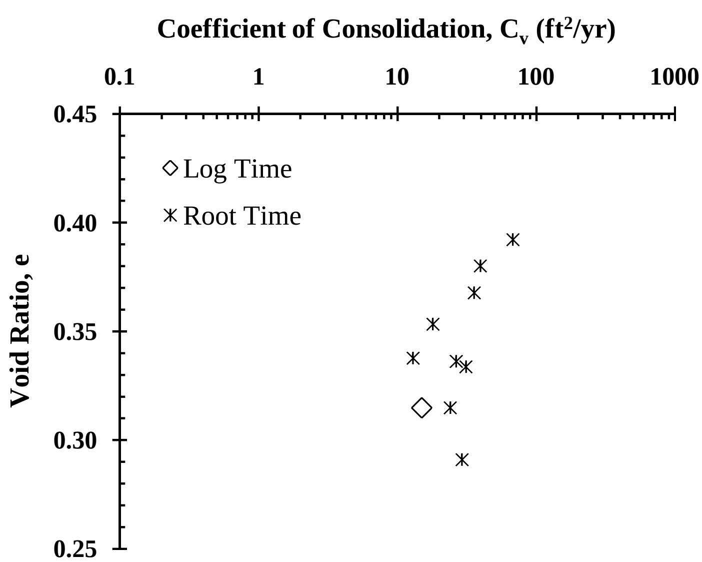
Client: Advanced Disposal Services
Project: Orchard Hills Landfill
Specimen: Clay

TRI Log No.: 32368.2
Test Method: ASTM D 2435, Method B

Soil Specimen Properties	
Initial Specimen Water Content (%)	14.8
Final Specimen Water Content (%)	13.2
Specimen Diameter (in)	2.495
Initial Specimen Height (in)	0.998
Final Specimen Height (in)	0.928
Final Differential Height (in)	0.069
Initial Dry Unit Weight, γ_o lb_f/ft^3	114.2
Final Dry Unit Weight, γ_f lb_f/ft^3	125.1
Initial Void Ratio, e_o	0.448
Final Void Ratio, e_f	0.322
Initial Degree of Saturation (%)	87.4
Preconsolidation Pressure (psf)	≈8600
Swell Pressure (psf), Maximum Measured	<100
Compression Index, C_c	0.079
Recompression Index, C_r	0.010

σ'_v	e	Strain, ε	C_v (ft^2/year)	
(psf)	(-)	(%)	Log Time	Root Time
Initial	0.448	0.0	-	-
250	0.413	2.4	-	-
500	0.405	2.9	-	-
1,000	0.392	3.8	-	68
2,000	0.380	4.7	-	40
4,000	0.368	5.5	-	36
8,000	0.353	6.5	-	18
16,000	0.336	7.7	-	26
8,000	0.337	7.7	-	-
4,000	0.340	7.5	-	-
8,000	0.338	7.6	-	13
16,000	0.334	7.9	-	31
32,000	0.315	9.2	15	24
64,000	0.291	10.8	-	29
16,000	0.294	10.6	-	-
4,000	0.305	9.9	-	-





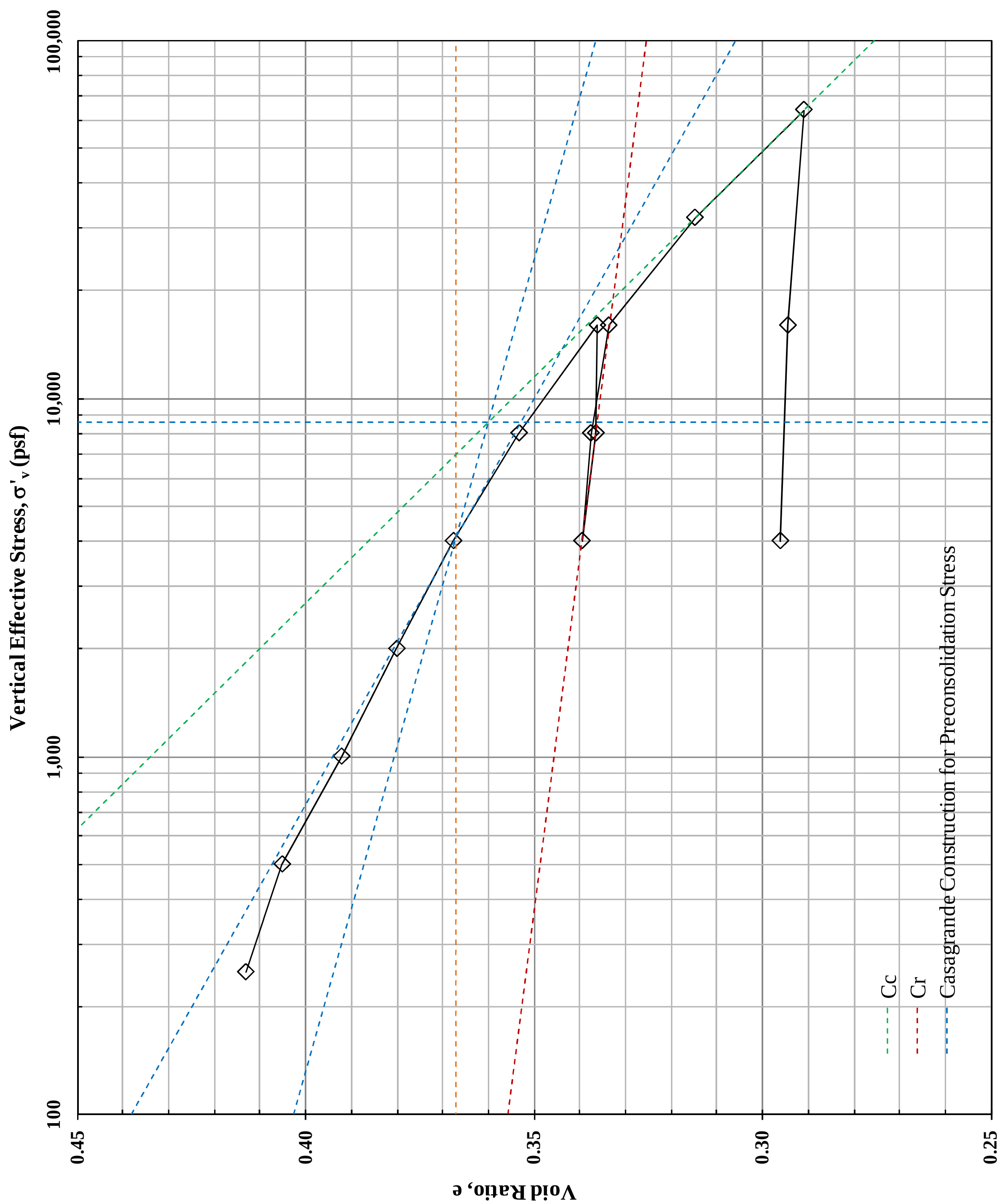
Note: The soil was air dried and passed through a No. 8 sieve to eliminate any over sized particles. The soil was moisture conditioned, allowed to equilibrate, and then adjusted according to the target gravimetric moisture content based on an oven dried moisture content. The specimen was then remolded into a known volume to achieve the target density. A specific gravity of 2.75 was assumed for weight-volume calculations. Calculations include machine deflections measured at each loading step. The preconsolidation pressure was determined using the Casagrande construction technique.

Jeffrey A. Kuhn, Ph.D., P.E., 5/24/2018
Quality Review/Date

One-Dimensional Consolidation Properties of Soil

Client: Advanced Disposal Services
Project: Orchard Hills Landfill
Specimen: Clay

TRI Log No.: 32368.2
Test Method: ASTM D 2435, Method B



One-Dimensional Consolidation Properties of Soil

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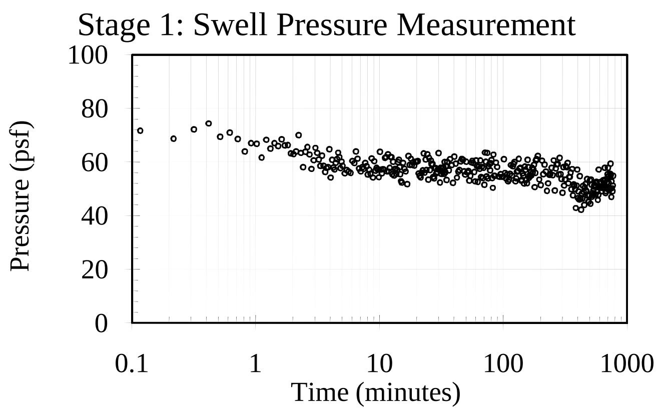
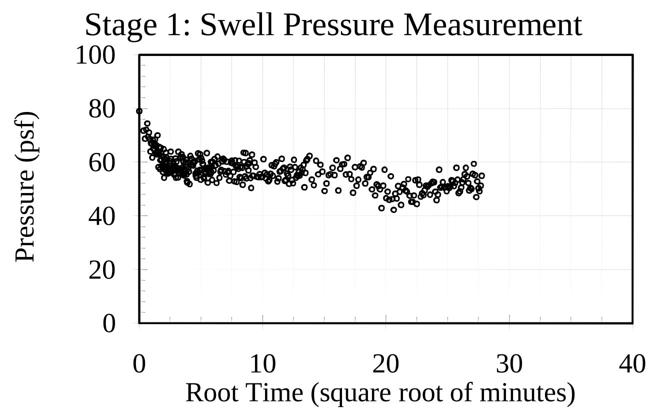
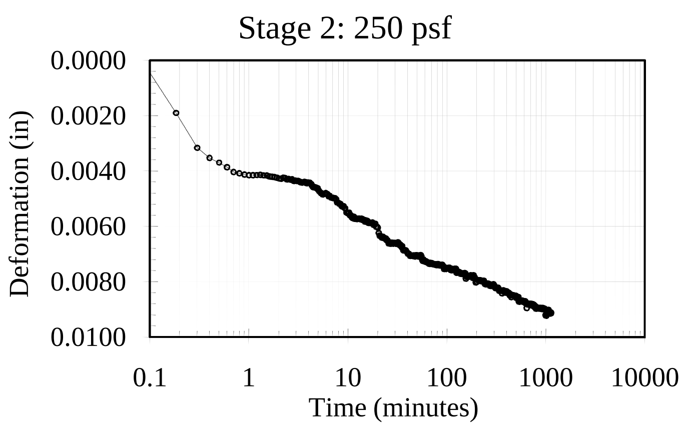
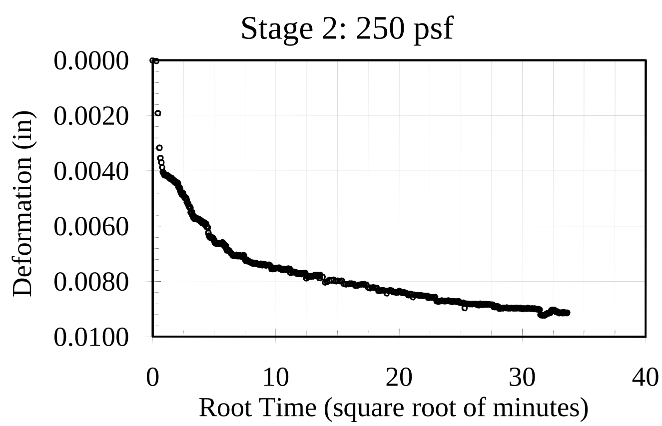
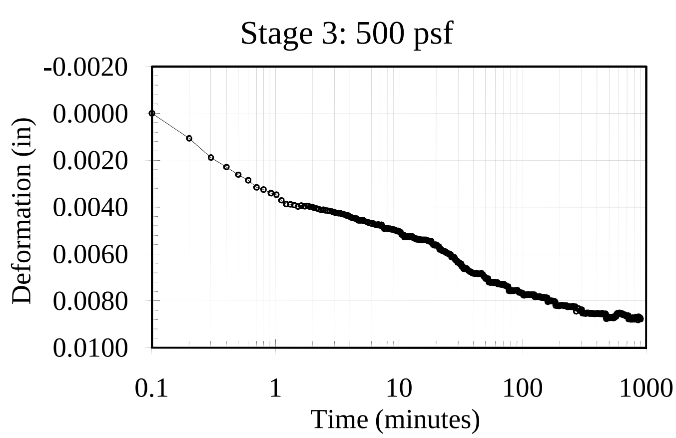
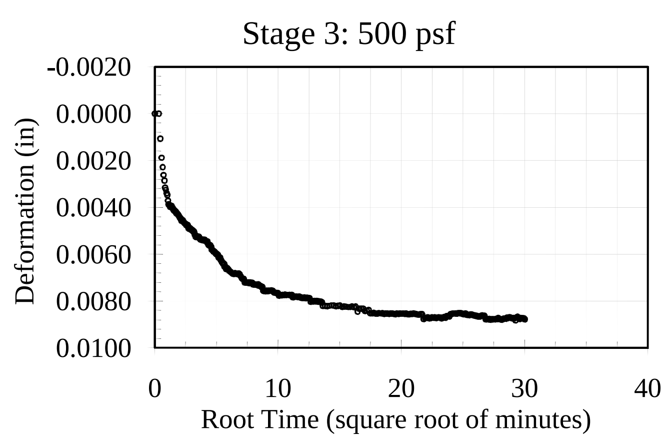








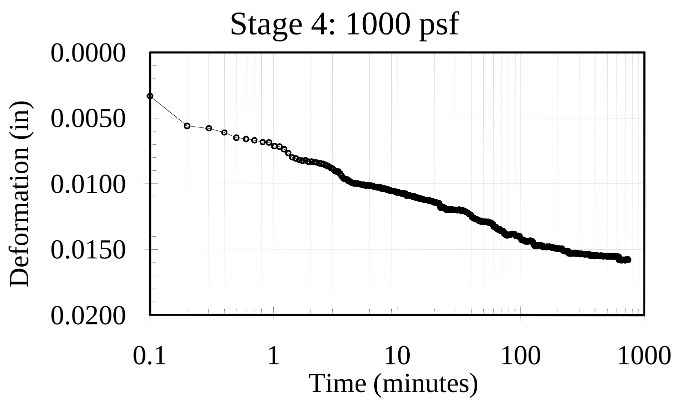


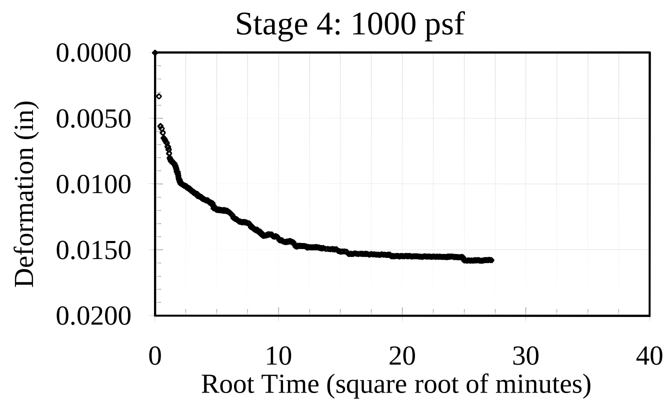


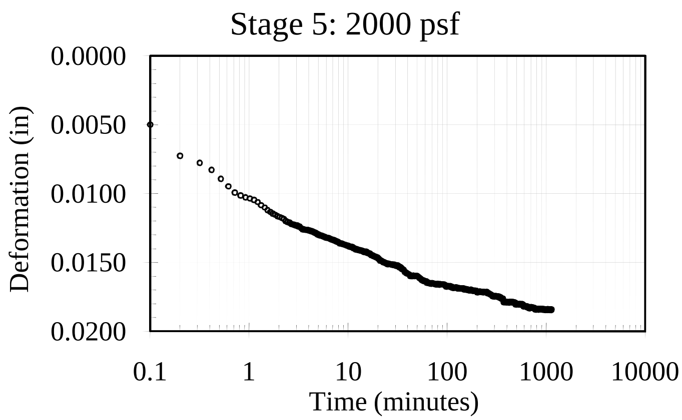
One-Dimensional Consolidation Properties of Soil

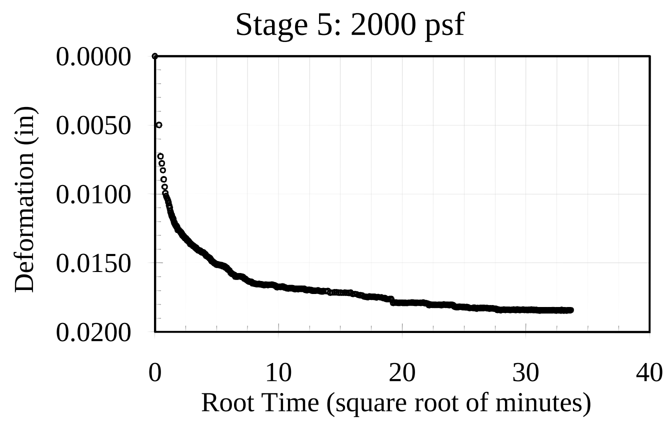
Client: Advanced Disposal Services
Project: Orchard Hills Landfill
Specimen: Clay

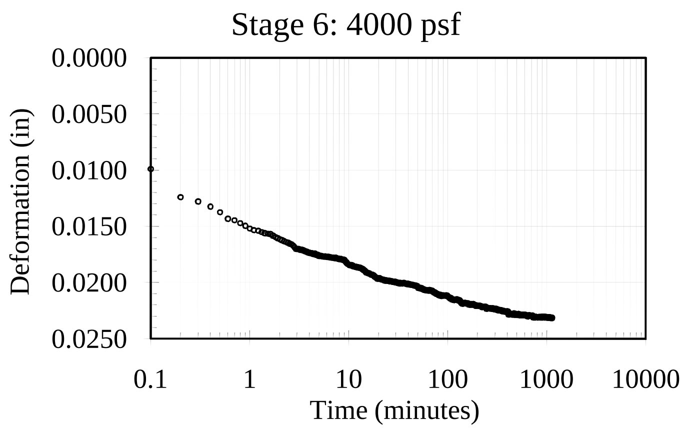
TRI Log No.: 32368.2
Test Method: ASTM D 2435, Method B

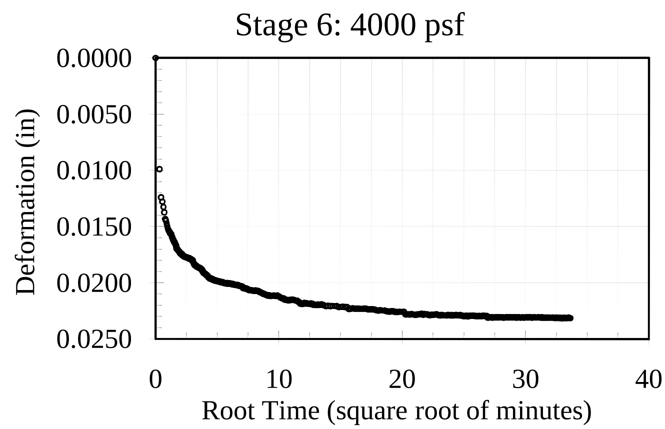












One-Dimensional Consolidation Properties of Soil

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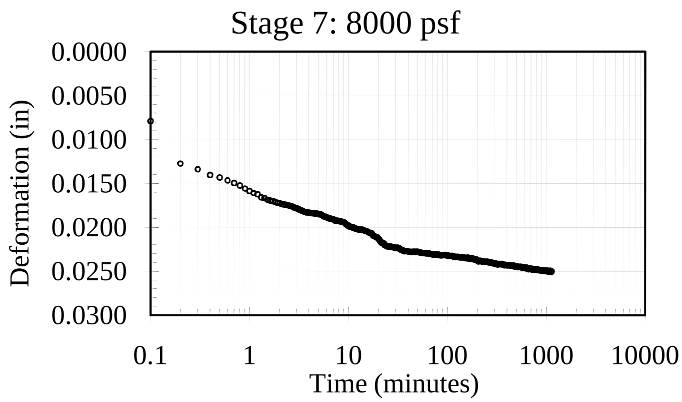

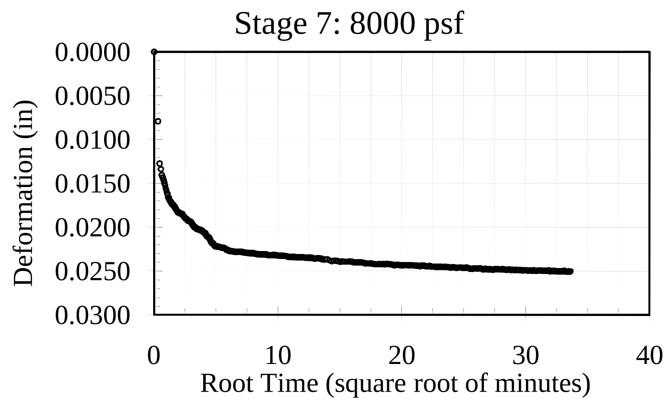

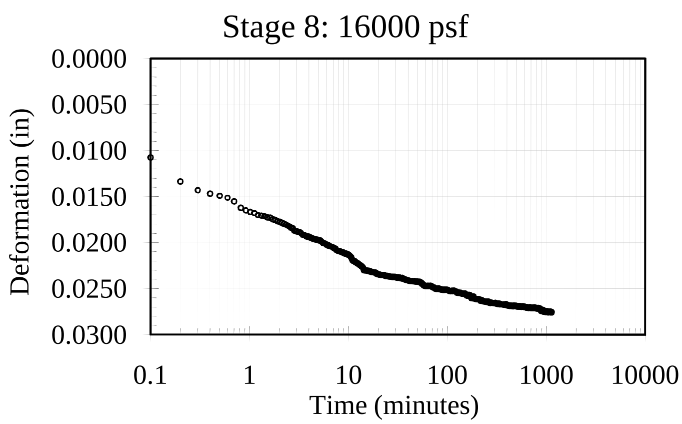

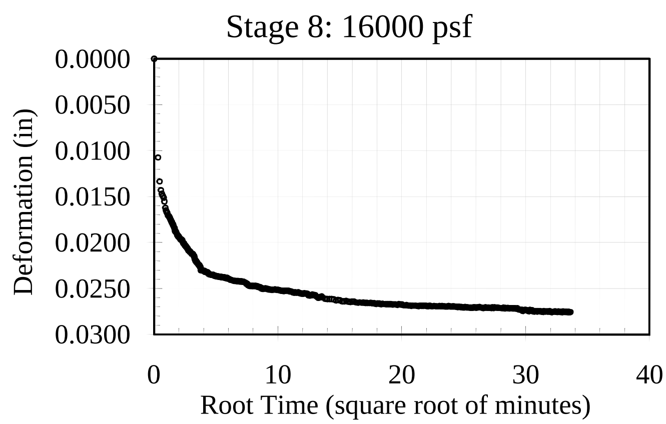

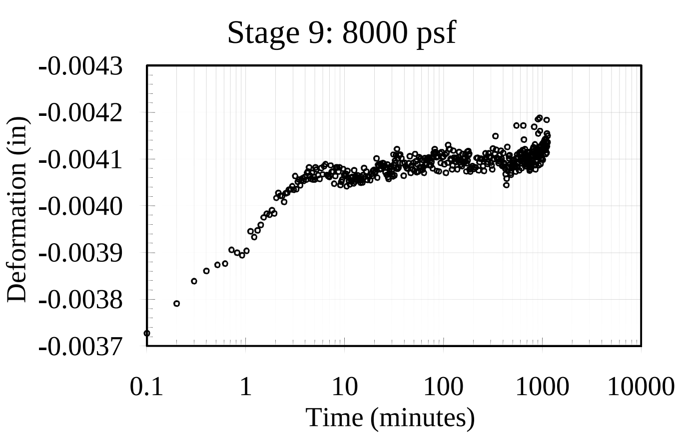

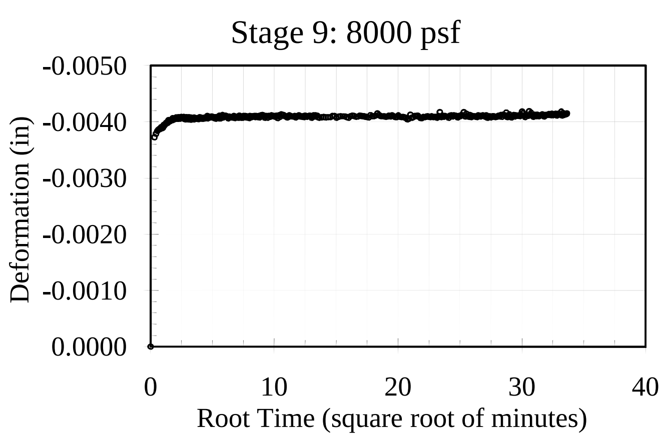

One-Dimensional Consolidation Properties of Soil

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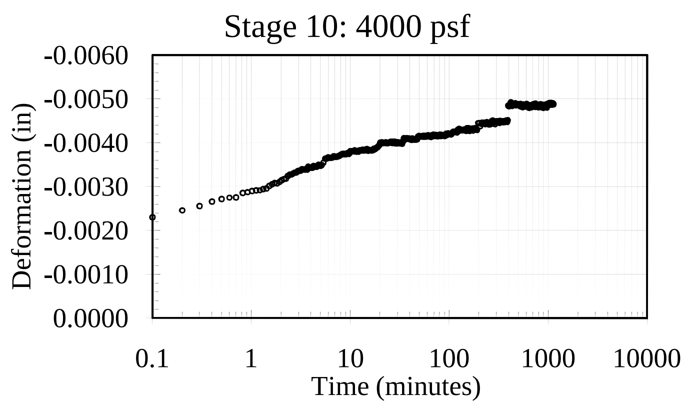

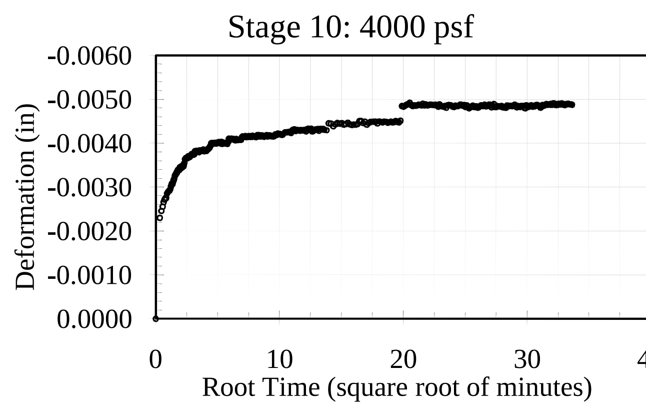

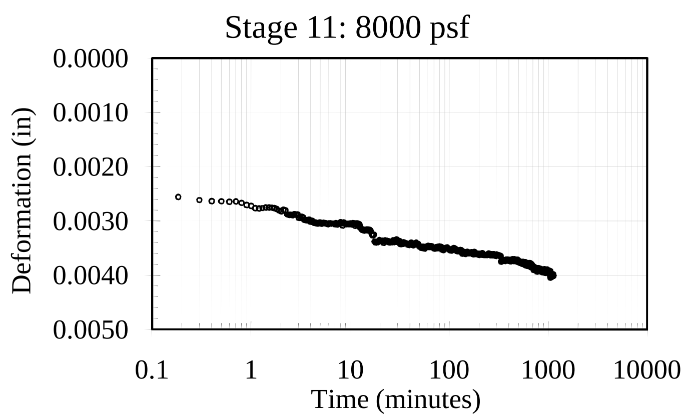

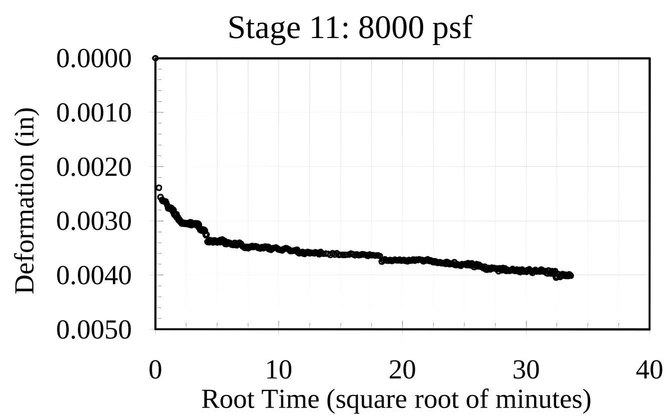

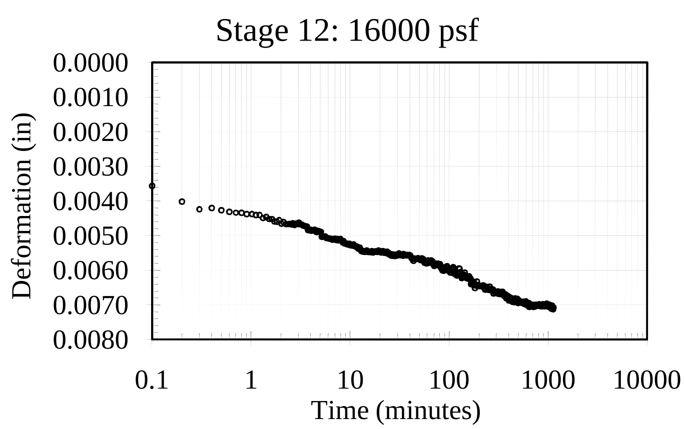

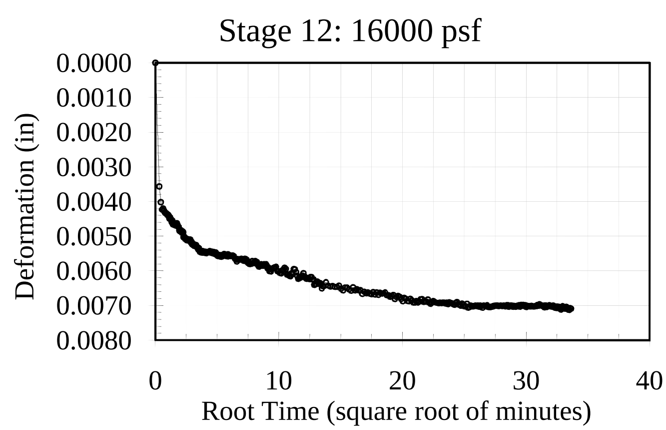

One-Dimensional Consolidation Properties of Soil

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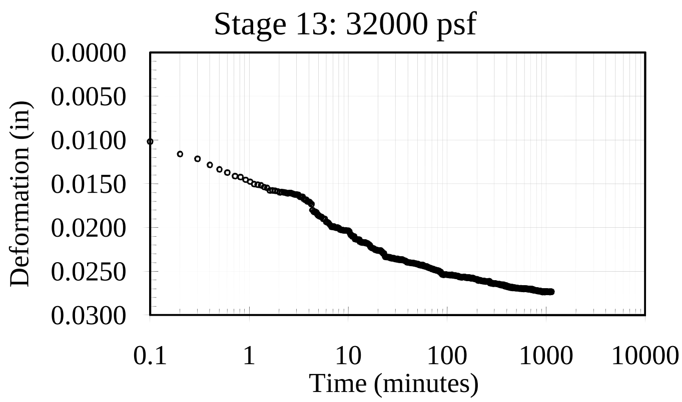

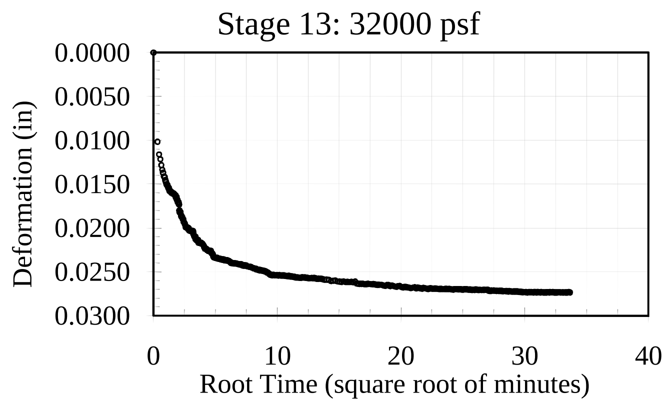

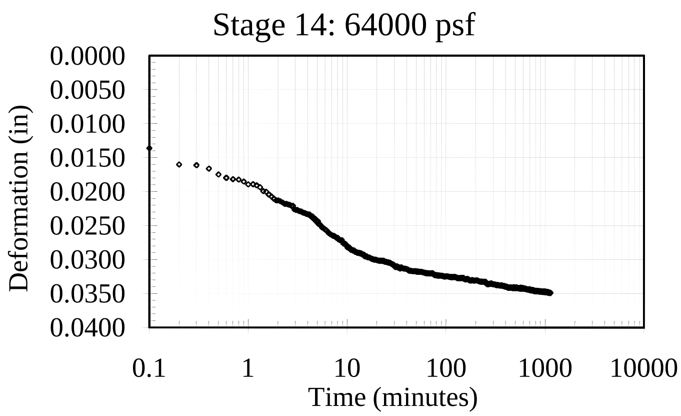

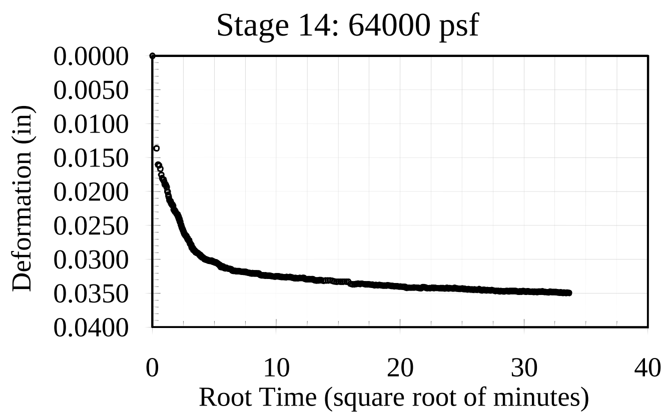

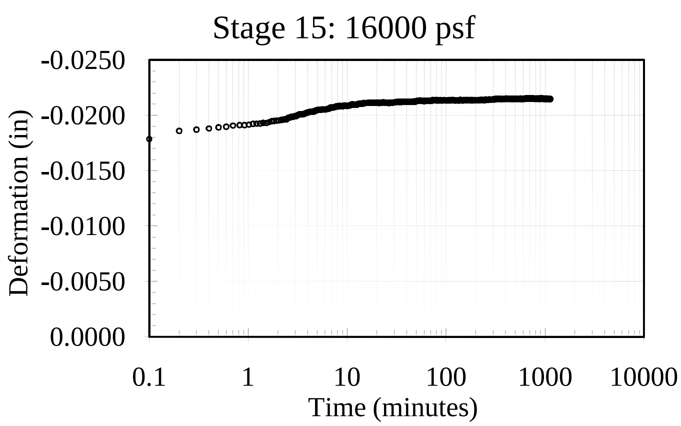

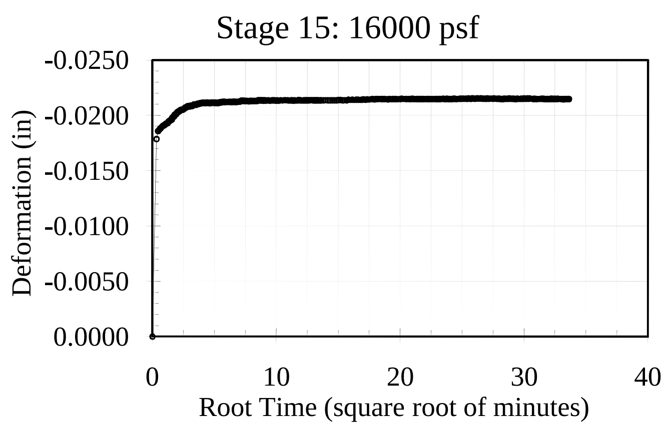

One-Dimensional Consolidation Properties of Soil

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Project: Orchard Hills Landfill
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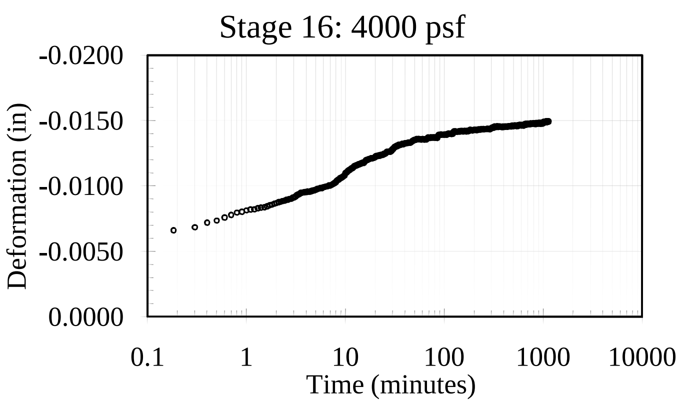
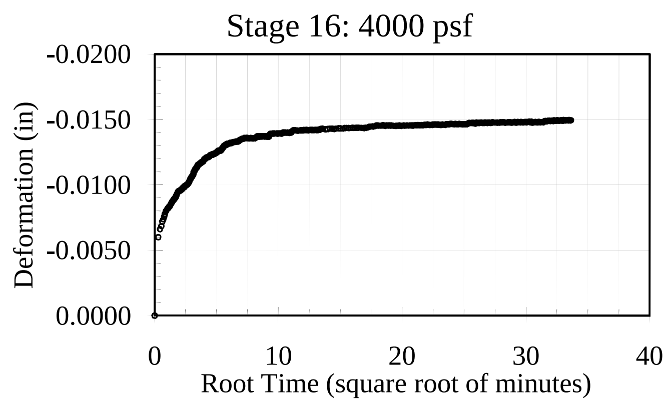
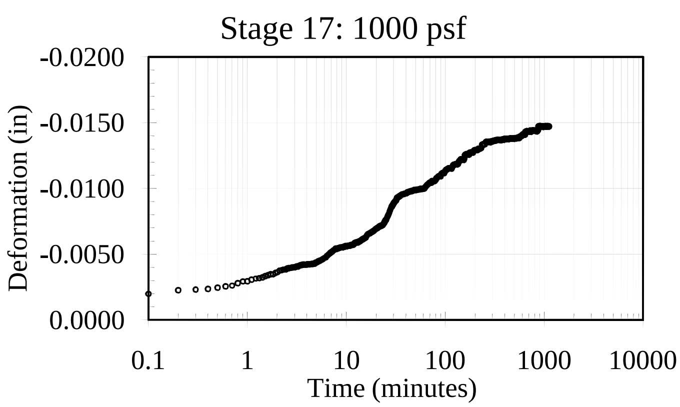
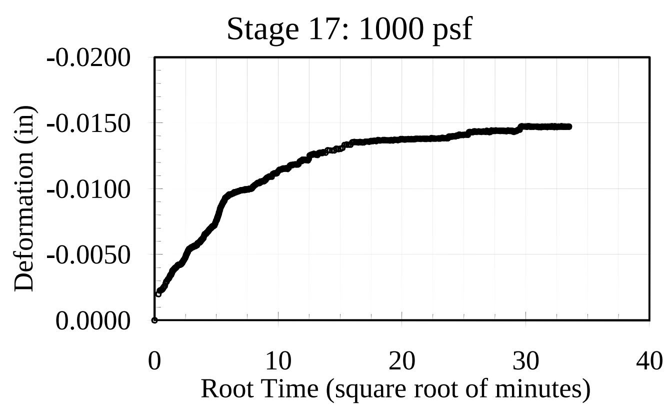
TRI Log No.: 32368.2
Test Method: ASTM D 2435, Method B









ADS Large Scale Puncture Resistance Study

Representative Cell Construction Pictures

Compaction of clay liner

Compaction of clay liner

Installation of plate load cells

Coring of clay liner for compaction verification
(white PVC pipe is sleeve for consolidation meter(s))

Coring of clay liner for compaction verification

TRI ENVIRONMENTAL

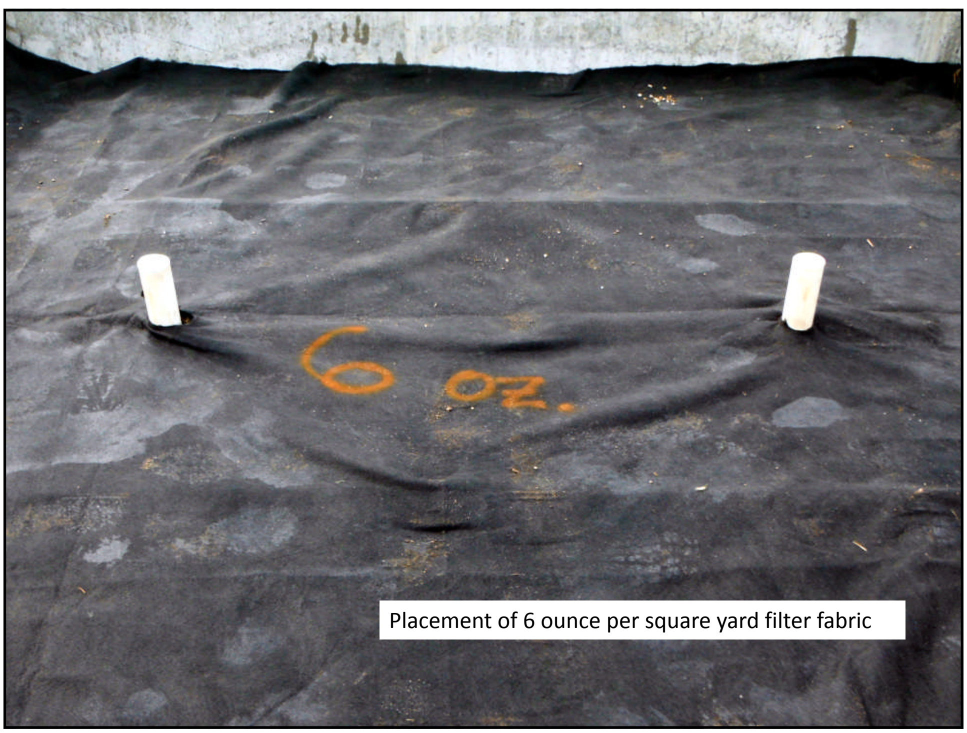
Placement of geomembrane panels

Placement of 12 ounce per square yard nonwoven cushion geotextile

Placement of pipe and leachate collection stone

Placement of granular drainage layer

Placement of granular drainage layer



Placement of 6 ounce per square yard filter fabric

Placement of welded wire fabric

Placement of foundation loading beams and supports

Completed test box prior to loading

Completed test box fully loaded

ADS Large Scale Puncture Resistance Study

Representative Geomembrane Exhuming / Inspection Pictures

Removal of leachate collection rock


Removal of nonwoven cushion geotextile


Exposed geomembrane panels
12/04/2018 10:08

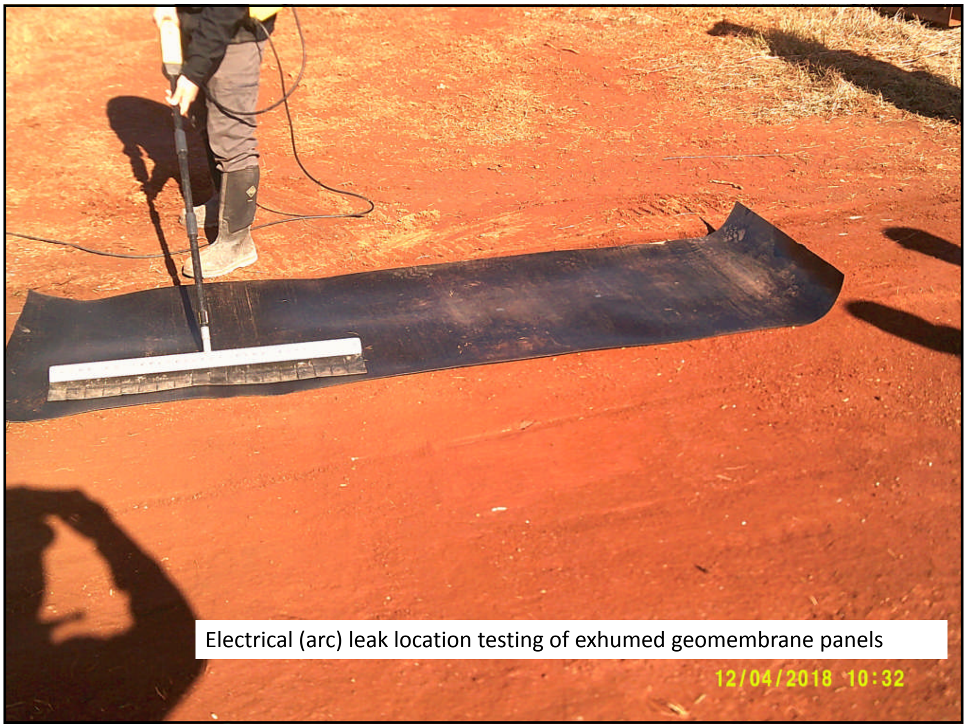

Exposed geomembrane panels


Cleaning the exhumed smooth and textured geomembrane panels

![TRI Environmental]

Exhumed geomembrane panels

Electrical (arc) leak location testing of exhumed geomembrane panels



Electrical (arc) leak location testing of exhumed geomembrane panels

Electrical (arc) leak location testing of exhumed geomembrane panels

Appendix C

Accelerated Bench-Scale Puncture Resistance and
Geomembrane Compressive Creep Testing
ASTM D7361, Modified (using site-specific sample profile)

26 February 2019

Timothy D. Curry
Advanced Disposal
232 Vance Road, Suite 208
Valley Park, Missouri 63088
Phone: 636 529 1974
tim.curry@advanceddisposal.com

RE: Geomembrane Protection Study: Accelerated "Bench Scale" Puncture Resistance Testing

Dear Mr. Curry,

Thank you for consulting TRI Environmental, Inc. (TRI) for your geosynthetics testing and research needs. TRI is pleased to submit this final report for laboratory testing. This report details accelerated testing to determine the affect of long-term loading of a geomembrane lined leachate collection trench system. Specifically, the impact on the puncture resistance of the HDPE geomembrane barrier in the system was of interest.

All testing was intended to evaluate the geomembrane puncture resistance based on site specific materials from Orchard Hills landfill (detailed in TRI report 32368) which is owned and operated by Advanced Disposal. Please find below details of the tests and analysis carried out.

Accelerated "Bench Scale" Puncture Resistance Testing

In order to determine the time-dependent loss of geomembrane thickness and potential for puncture of the geomembrane in the Orchard Hills leachate collection trench, a series of compression creep tests were performed using ASTM D 7361, *Standard Test Method for Accelerated Compressive Creep of Geosynthetic Materials Based on Time-Temperature Superposition Using the Stepped Isothermal Method*. In simple terms, the stepped isotherm method (SIM) test, developed by TRI and standardized through ASTM International, is a way to quickly perform what would otherwise be an exhaustive, very long test effort by using a much faster methodology of accelerated testing. The test involved taking a single test specimen, or in this case, a test profile, and loading it at a starting or initial temperature while monitoring it for thickness change. At some test duration, the load is kept constant but the temperature is changed to affect a new test environment. This creates a new rate of thickness change, or creep response, which in turn is measured and recorded. This same procedure is followed for several more temperature steps, each generating a unique compression creep response specific to the new test temperature.

The resulting complete thickness vs time data is collected and then shifted based on time-temperature-superposition (TTS) theory. This involves first re-plotting the strain (or thickness) vs time data for each temperature step in log time. The strain data is then shifted in log time until the creep rate observed at the very end of any individual temperature step matches the creep rate at the next, adjacent temperature step. This slope matching exercise results in a single master curve that can be expressed at a single reference temperature, in this case, 20°C. Instead of performing numerous creep tests, each at a single temperature for subsequent TTS shifting, a SIM test serves to visit a portion of each creep curve using a single specimen. This testing technology is now used throughout the geosynthetic reinforcement and geosynthetic drainage industries,.

The SIM test performed for this project was modified using a test box to hold representative site materials to be included with the geomembrane in the evaluation. Specifically the leachate collection rock was used in the test to present the puncture challenge to the geomembrane/cushion geotextile composite test specimen. A smooth geomembrane material was used to represent the most conservative, puncture challenged, case.

The first effort in this test was to establish the relationship between temperature steps and shifted time to determine what acceleration could be achieved at each elevated temperature step. For this effort a geomembrane was tested between two steel loading platens to determine the temperature response profile of the geomembrane and to determine the highest test temperature subsequent tests could accommodate.

Next, a compressive SIM test was performed on a profile consisting of a loading platen/neoprene (to represent clay)/HDPE geomembrane/nonwoven geotextile/ /drainage rock/platen). The test was performed to include five temperature steps equating to, in shifted time, 2,958,012 hours (337 years). After each SIM test, geomembrane thickness (5 readings) was measured to determine the maximum deformation resulting from the test. Additional SIM tests then conducted but were terminated after 2, 3 and 4 temperature steps which equated to shifted times of 37, 489 and 7499 hours (0.004, 0.06 and 0.86 years). Five geomembrane thickness measurements were recorded each time at the minimum thickness location taken at the end of each test. In this way a plot of minimum thickness vs time was developed and a loss of thickness per unit time could be articulated. All thickness measurements secured post testing were performed immediately upon test disassembly or within approximately 45 seconds of load removal.

Test Results:

The smooth HDPE geomembrane material was used in the testing as this presented the most conservative case (most susceptible to out-of-plane strain and perhaps time-dependent thinning to rupture. SIM testing was performed under a compressive load of 130 psi. As referenced earlier the first effort was to establish the relationship between temperature steps and shifted time. The results of this test are presented in Figure 1.

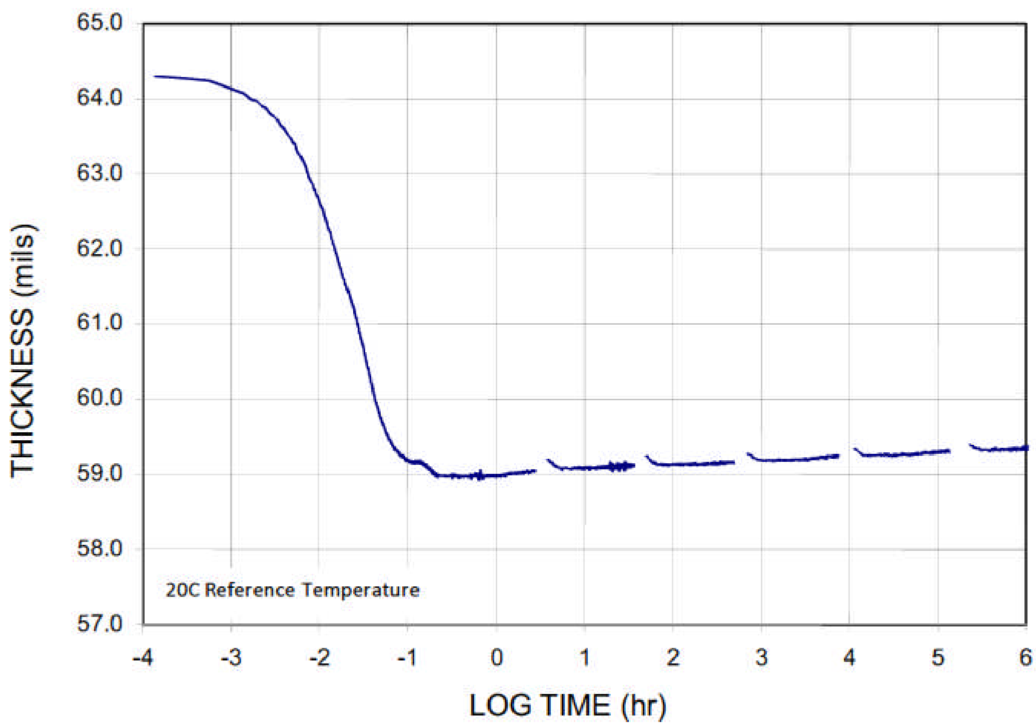


Figure 1: Compressive creep curve of geomembrane thickness

This plot shows a time-temperature shifted data plot of thickness vs log time. It also shows that a reference temperature of 20° C was used and that five temperature steps were employed during testing after test initiation at 20°C. The slight “increase” in thickness between Log 0 and Log 6 hours is believed to be related to test system expansion during testing. The time “reach” of this test via TTS shifting of the five temperature steps was over 300 years. As the test was performed between two heated platens no out-of-plane deformation was observed in the geomembrane during post-test inspection. The next SIM test was performed on an inverted representative profile of the leachate collection trench materials. The geomembrane, leachate collection gravel and nonwoven cushion geotextile materials were all site specific. The clay was represented by a closed cell soft neoprene pad.

Leachate collection aggregate in SIM test box

Cushion GT over aggregate

Neoprene Pad to simulate clay

Full test set-up with materials inside box

Figure 2: SIM test set-up with site materials and synthetic clay (neoprene pad)

Cushion GT after SIM test

Geomembrane after SIM test

Figure 3: Post test geotextile and geomembrane

The geomembrane again demonstrated out-of-plane strain, however, the thickness of the geomembrane, after losing some thickness upon loading, reached steady state. Specific test results are as follows.

Log Time (hr)	Shifted Time (hr)	Shifted time (yrs)	Thickness (mils)					Average	Min
-3	0	0	68.6	67.6	67.7	66.9	67.6	**67.7**	**66.9**
1.564	37	0.004	59.0	62.6	61.0	63.1	64.2	**62.0**	**59.0**
2.689	489	0.06	58.5	61.6	63.2	63.3	60.7	**61.5**	**58.5**
3.875	7499	0.86	58.0	60.5	63.1	63.2	61.2	**61.2**	**58.0**
6.471	2958012	337	57.7	62.2	63.0	62.9	63.8	**61.9**	**57.7**

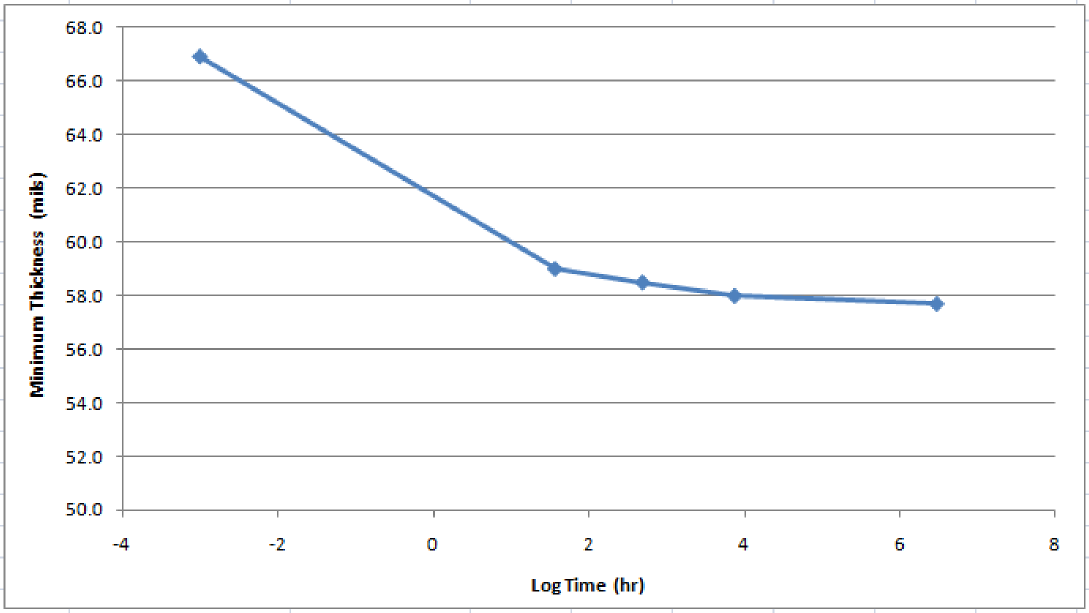


Figure 4: Geomembrane thickness reduction vs log time for site-profile SIM tests.

The thicknesses recorded were measured at the locations of highest out-of-plane deformation. Note that the first data point in the figure 4 graph at log time -3 along the x-axis represents initial pre-test geomembrane thickness. The last 4 data points are minimum thickness measurements recorded during post test inspection of the geomembrane as described above.

Conclusion

The SIM tests performed indicate the geomembrane thickness at the location of maximum deformation lost a total of 0.092 inches of thickness over 2,958,012 hours ($10^{6.471}$ = 337 years) shifted time, or 2.73 E^{-4} inches per year under 130 psi loading in the test profile.

TRI is pleased to be of service to ADS Waste and trusts the reporting herein is useful for liner system evaluations. Please contact me if you have any questions of if I may provide any additional information.

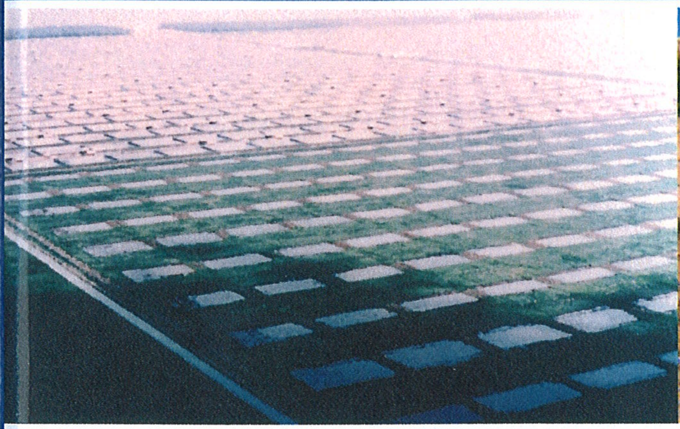
Sincerely,

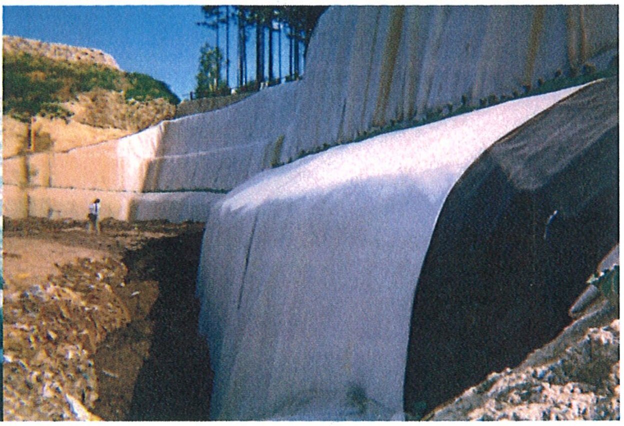
Sam R. Allen

Sam Allen
Vice President

DESIGNING WITH GEOSYNTHETICS

FIFTH EDITION





ROBERT M. KOERNER

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(2.29)

b = width of stone void, and
y = deformation into stone void.

Example 2.9

Given a truck with 700 kPa tire inflation pressure on a stone base course consisting of 50 mm maximum-sized stone with a geotextile beneath it, calculate **(a)** the required grab tensile stress on the geotextile, and **(b)** the factor of safety for a geotextile whose maximum grab strength is 500 N with cumulative reduction factors of 2.5. Use a value of $f(\epsilon) = 0.52$.

Solution: (a) Using an empirical relationship that $d_v = 0.33\, d_a$ and the value of $f(\epsilon) = 0.52$, the required grab tensile strength is as follows:

$$
\begin{aligned}
T_{\text{reqd}} &= p'(d_v)^2(0.52) \\
&= p'(0.33\, d_a)^2(0.52) \\
&= 0.057 p' d_a^2 \\
&= 0.057(700)(1000)(0.050)^2 \\
T_{\text{reqd}} &= 100\ N
\end{aligned}
$$

(b) The factor of safety on a 500 N maximum grab tensile geotextile with reduction factors of 2.5, is as follows:

$$
\begin{aligned}
FS &= \frac{T_{\text{allow}}}{T_{\text{reqd}}} \\
&= \frac{500/2.5}{100} \\
FS &= 2.0, \text{ which is acceptable.}
\end{aligned}
$$

2.5.4 Puncture Resistance

The geotextile must always survive the installation process. This is not just related to the roadway separation function; indeed, fabric survivability is critical in all types of applications; without it the best of designs are futile (recall Figure 2.20). In this regard, sharp stones, tree stumps, roots, miscellaneous debris, and other items, either on the ground surface beneath the geotextile or placed above it, could puncture through the geotextile during backfilling and when traffic loads are imposed. The design method suggested for this situation is shown schematically in Figure 2.32. For these conditions, the vertical force exerted on the geotextile (which is gradually tightening around the protruding object) is as follows:

$$F_{\text{reqd}} = p' d_a^2 S_1 S_2 S_3 \tag{2.30}$$

where

F_{reqd} = required vertical puncturing force to be resisted,
d_a = average diameter of the puncturing aggregate or sharp object,

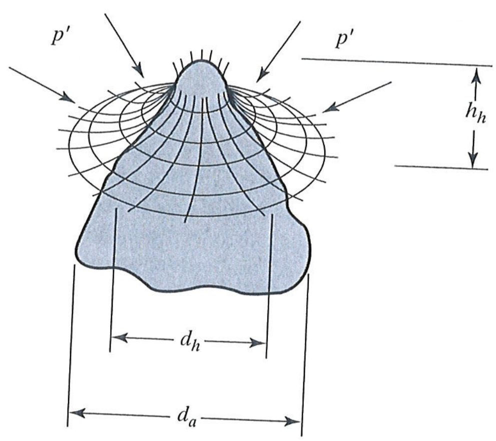

Figure 2.32 Visualization of a stone puncturing a geotextile as pressure is applied from above.

p' = pressure exerted on the geotextile (approximately 100% of tire inflation pressure at the ground surface for thin covering thicknesses),

S_1 = protrusion factor of the puncturing object (see Table 2.13),

S_2 = scale factor to adjust the ASTM D4833 puncture test value that uses a 8.0 mm diameter puncture probe to the actual puncturing object (see Table 2.13), and

S_3 = shape factor to adjust the ASTM D4833 flat puncture probe to the actual shape of the puncturing object (see Table 2.13).

Example 2.10

What is the factor of safety against puncture of a geotextile from a subrounded 25 mm diameter stone on the ground surface mobilized by a loaded truck with tire inflation pressure of 550 kPa traveling on the surface of the base course? The geotextile has an ultimate puncture strength of 300 N according to ASTM D4833.

TABLE 2.13 RECOMMENDED VALUES FOR FACTORS USED IN PUNCTURE ANALYSIS (DIMENSIONLESS)

Puncturing Object	S_1	S_2	S_3
Angular and relatively large	0.9	0.8	0.9
Angular and relatively small	0.6	0.6	0.7
Subrounded and relatively large	0.7	0.6	0.6
Subrounded and relatively small	0.4	0.4	0.5
Rounded and relatively large	0.5	0.4	0.4
Rounded and relatively small	0.2	0.2	0.3

S_1 = protrusion factor
S_2 = scale factor
S_3 = shape factor
} see equation (2.30)

Sec. 2.5

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2.5.5 Impa

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a subrounded 25 mm di-
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geotextile has an ultimate

S USED

S_3
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0.7
0.6
0.5
0.4
0.3

Solution: Using the full stress on the geotextile of 550 kPa and factors from Table 2.13 of 0.55, 0.50, and 0.55 for S_1, S_2, and S_3 respectively, we see that

$$F_{\text{reqd}} = p' d_a^2 S_1 S_2 S_3$$
$$= (550)(1000)(25 \times 0.001)^2(0.55)(0.50)(0.55)$$
$$F_{\text{reqd}} = 52 \text{ N}$$

Assuming that the cumulative reduction factors are 2.0, the factor of safety is as follows:

$$\text{FS} = \frac{F_{\text{allow}}}{F_{\text{reqd}}}$$
$$= \frac{300/2.0}{52}$$
$$\text{FS} = 2.9, \text{ which is acceptable}$$

2.5.5 Impact (Tear) Resistance

As with the puncture requirement just described, the resistance of a geotextile to impact is as much a survivability criterion as it is a separation function. Yet in many instances of separation the geotextile must resist the impact of various objects. The most obvious one is that of a rock falling on it, but there are also situations in which construction equipment and materials can cause or contribute to impact damage on geotextiles.

The problem addresses the energy mobilized by a free-falling object of known weight and height of drop. Rarely will an object be intentionally impelled onto an exposed geotextile with additional force, so only gravitational energy will be assumed.

To develop a design procedure, we assume a free-falling rock of specific gravity of 2.60, varying in diameter from 25 to 600 mm and falling from heights of 0.5 to 5 m. Using this data, the design curves in Figure 2.33 are developed. The relationship used is as follows:

$$E = mgh$$
$$= (V \times \rho)gh$$
$$= [V \times (\rho_w G_s)]gh$$
$$= \left(\frac{\pi(d_a/1000)^3}{6}\right)\left(\frac{1000\ kg}{m^3}\right)(2.6)(9.81)h$$
$$E = 13.35 \times 10^{-6}\, d_a^{\,3} h \tag{2.31}$$

where

E = energy developed (Joules),
m = mass of the falling object (kg),
g = acceleration due to gravity (m/sec^2),

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GRI White Paper #14

Modification to the "GRI-Method" for the RF_{CR}-Factor Used in the Design of Geotextiles for Puncture Protection of Geomembranes

by

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GRI White Paper #14

Modification to the "GRI-Method" for the RF_{CR}-Factor Used in the Design of Geotextiles for Puncture Protection of Geomembranes

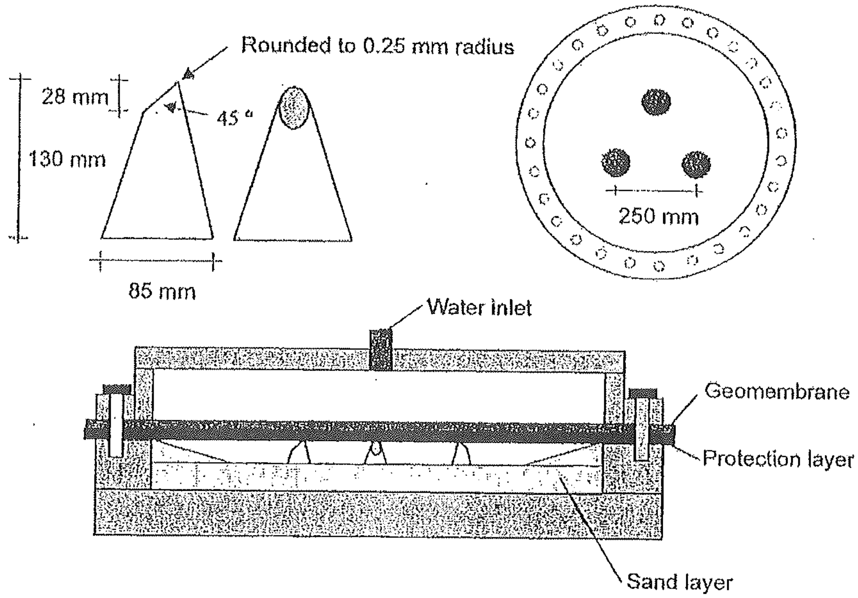
1.0 Background

In 1991, we published our first paper eventually leading to a geotextile design method for protecting geomembranes against puncture. Through the work of a number of colleagues (George Koerner, Grace Hsuan, Ragui Wilson-Fahmy) and graduate students (Don Hullings, Dhani Narejo, Mike Montelone, Bao-Lin Hwu) this method has been used worldwide for such geotextile design for about twelve-years.

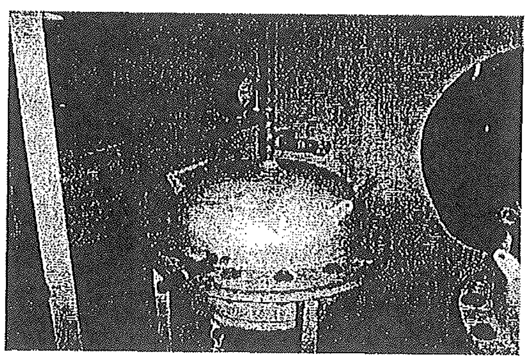
The data from which the method was developed, however, was based on short-term laboratory testing. To extend it into a long-term prediction, tables for biological/chemical degradation and long-term creep were presented largely on the basis of intuition rather than by experiments. Of these two mechanisms, creep is by far the more important. Now, after ten-years of creep puncture testing we are in a position of verifying, or not, the originally proposed table. This verification issue is the focus of this White Paper.

2.0 The "GRI-Method" for Designing Geotextiles to Prevent Geomembrane Puncture

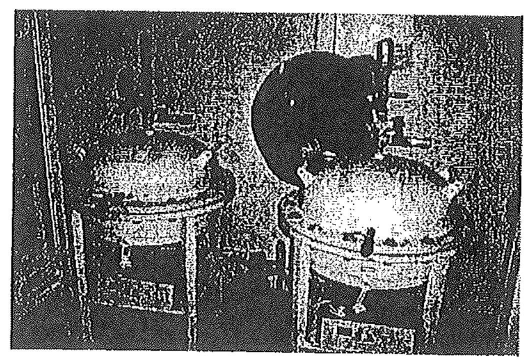
Figure 1 shows details of the truncated plastic cones used as worst-case puncturing objects to a geomembrane. The containment vessels are used to apply hydrostatic pressure to the geomembrane test specimen (1.5 mm smooth HDPE was used throughout the various studies), in turn to the protection geotextile (the "variable" in all tests), and then onto the stationary array of three cones. A well graded concrete sand was used to backfill portions of the cones allowing for a known height-of-cone to be evaluated.



(a) Sketches of truncated cones, their arrangement, and test vessel cross section



(b) Single pressure vessel



(c) Two of four identical pressure vessels with readout boxes

Fig. 1. Geosynthetic Research Institute (GRI) test vessel(s) used to evaluate geotextile protection materials; one vessel was used in the short-term tests, four were used for the long-term tests.

While many theses and technical papers have been written using this experimental test setup, a series of three papers captures the entire program; Wilson-Fahmy, et al. (1997), Narejo, et al. (1997) and Koerner, et al. (1997). The resulting design formula uses a conventional factor of safety as follows:

$$FS = p_{allow} / p_{act} \tag{1}$$

where

FS = factor of safety (against geomembrane puncture),

p_{act} = actual pressure due to the applied normal stress, e.g., landfill contents or surface impoundments, and

p_{allow} = allowable pressure using different types of geotextiles and site-specific conditions

Based on the experimental test results an empirical relationship for "p_{allow}" was obtained. It is given as Equation 2. Its use, however, requires the use of modification factors and reduction factors as given in Table 1. Note that in this table, all MF values ≤ 1.0 and all RF values ≥ 1.0.

$$p_{allow} = \left(50 + 0.00045\frac{M}{H^2}\right)\left[\frac{1}{MF_s \times MF_{PD} \times MF_A}\right]\left[\frac{1}{RF_{CBD} \times RF_{CR}}\right] \tag{2}$$

where

p_{allow} = allowable pressure (kPa),

M = geotextile mass per unit area (g/m^2),

H = protrusion height (m),

MF_S = modification factor for protrusion shape,

MF_{PD} = modification factor for packing density,

MF_A = modification factor for arching in solids,

RF_{CBD} = reduction factor for long-term chemical/biological degradation, and

RF_{CR} = reduction factor for long-term creep.

Table 1. Modification factors and reduction factors for geotextile protection material design using Equation 2, i.e., the "GRI-Method".

(a) Modification factors (all ≤ 1.0)

MF_S		MF_{PD}		MF_A	
Angular	1.0	Isolated	1.0	Hydrostatic	1.0
Subrounded	0.5	Dense, 38 mm	0.83	Geostatic, shallow	0.75
Rounded	0.25	Dense, 25 mm	0.67	Geostatic, mod.	0.50
		Dense, 12 mm	0.50	Geostatic, deep	0.25

(b) Reduction factors (all ≥ 1.0)

		RF_{CR}			
		Mass per unit area	Protrusion height (mm)		
RF_{CBD}		(gm/m^2)	38	25	12
Mild leachate	1.1	Geomembrane alone	N/R	N/R	N/R
Moderate leachate	1.3	270	N/R	N/R	>1.5
Harsh leachate	1.5	550	N/R	1.5	1.3
		1100	1.3	1.2	1.1
		>1100	≅ 1.2	≅ 1.1	≅ 1.0

Abbreviation: N/R = Not recommended

The design situation can be approached by using a given mass per unit area geotextile to determine the unknown FS-value, or from using a given FS-value to determine the unknown mass per unit area geotextile. Koerner (2005) gives numeric examples, and Valero and Austin (1999) present design charts for the many variables contained in the design equation. It might be noted that this method is the only design method that allows for direct selection of a geotextile protection material without the need for large scale trail-and-error experimental testing.

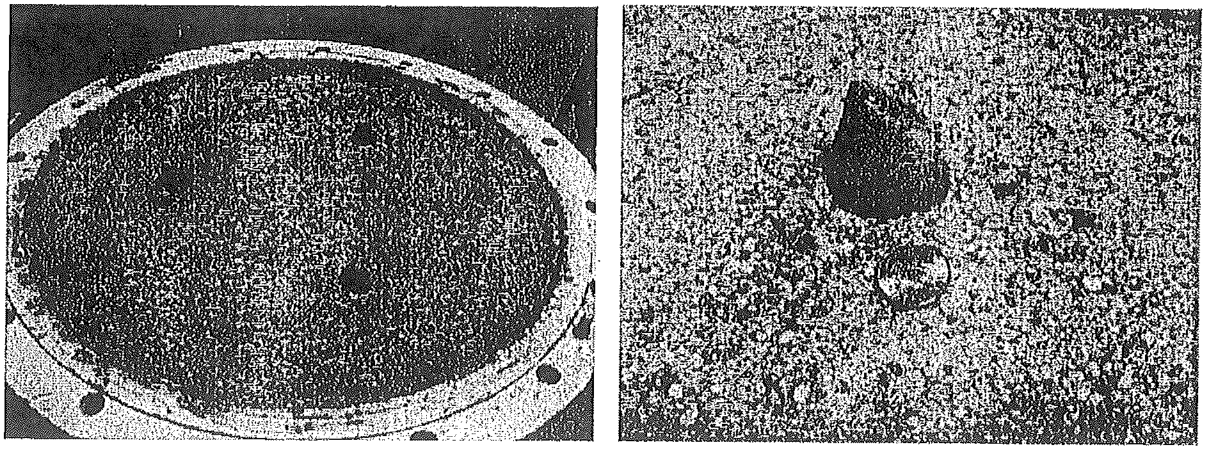
In Equation 2 the two terms "RF_{CBD}" and "RF_{CR}" are intended to extend the short term test results into a simulated long term performance behavior. Since HDPE is quite resistant to chemical and biological degradation, the term RF_{CBD} is comparatively small. The term RF_{CR}, however, is not small and in many cases a "not recommended" decision is suggested. Due to its importance in the overall design, a series of long term creep tests using this same methodology, i.e,. truncated cones, has been undertaken for the past ten years. This White Paper presents these new results which will be seen to lead to a revised table for the RF_{CR}-values.

3.0 Creep Puncture Results After Ten-Years

There are four identical test vessels used in this creep study, each containing three identical truncated cones shaped and configured as shown in Figure 1. In all cases the geomembranes being evaluated are 1.5 mm nominal thickness smooth HDPE which conform to the GRI-GM13 specification insofar as their physical, mechanical, and endurance properties are concerned. Also common to all four setups is the geotextile cushioning materials. They consisted of three layers of 200 g/m^2 needle-punched nonwoven (continuous filament) polyester geotextiles. They will be collectively referred to as 600 g/m^2 protection materials.

The differences in the four test vessels are the heights of the truncated cones causing the puncture to occur and the applied hydrostatic pressures.

Regarding the cone heights, sand is placed and compacted in the vessels leaving a protrusion height rising above the sand level; see Figure 2. As placed, two vessels had initial cone heights of 12 mm and the other two had initial cone heights of 38 mm. It was recognized that 38 mm was unacceptable, e.g., in Table 1b, "not recommended" is listed, but this limit was in need of being verified. Regarding the 12 mm cone heights, Table 1b indicates that it should be acceptable providing a $FS_{CR} = 1.3$ is used in the design procedure of Equation 2. This, of course, had to be verified as well.



(a) Array of three cones rising above sand level (b) An individual cone height of 38 mm

Fig 2. Photographs indicating the truncated cone protrusions producing the puncturing action.

Regarding the applied hydrostatic pressure, there was considerable uncertainty. The design procedure using Eqs. 1 and 2 does not address a maximum pressure. As a result high hydrostatic pressures were used for the two 12 mm cone heights (430 and 580 kPa) and low hydrostatic pressures were used for the two 38 mm cone heights (52 and 34 kPa). It is worth mentioning that hydrostatic pressure represents surface impoundment (liquid) stresses but overestimates solid waste stresses due to the arching that occurs within the solid waste as deformation occurs. The MF_A-term in Table 1a attempts to take such geostatic stresses into account.

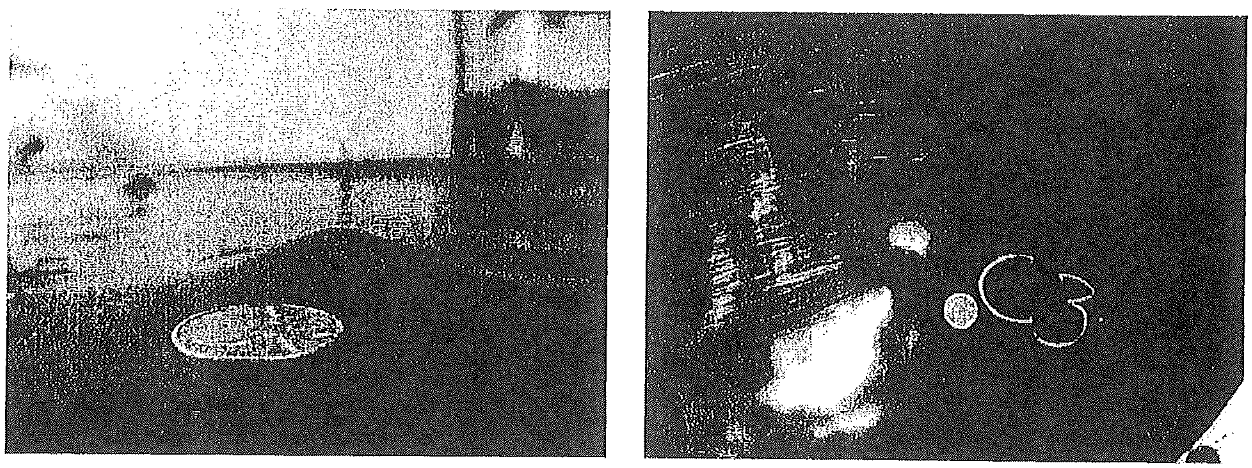
Table 2 presents the results of this creep puncture study. Note that the cone heights varied somewhat due to shifting sand as pressure was applied and maintained. It should also be mentioned that the applied hydrostatic pressure represent 10 to 28% of the short-term failure stresses. As noted, all twelve of the truncated cones experienced yield in the geomembranes, with one having an actual break. The thickness reductions in the yield regions are also noted with the 38 mm cone heights resulting in the greatest reductions.

:ated Cone Ten-Year Creep Puncture Tests
'W-PET geotextile protecting a 1.5 mm smooth HDPE geomembrane)

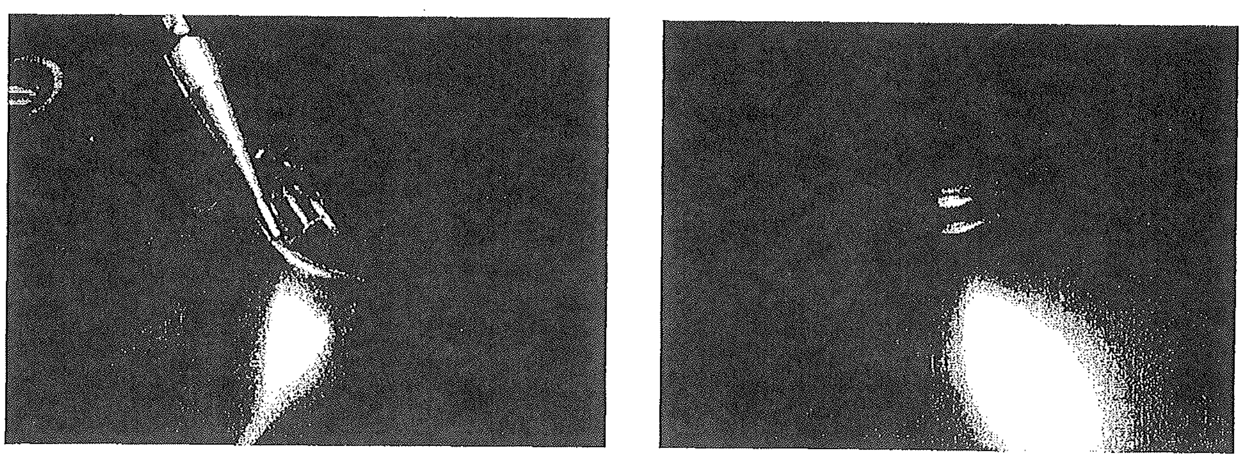
l Cone Heights[1]		Applied Puncture Stress[3]		Final Description of Geomembrane[5]	
ı)	Final (mm)[2]	(kPa)	(%)[4]	Visual	Thickness (mm)[6]
	12.1	430	23	3-subtile yields – no breaks	1.16 (30% reduction)
	11.5	580	28	3-subtile yields – no breaks	0.80 (52% reduction)
	29.7	52	15	3-pronounced yields; one break	0.32 (80% reduction)
	31.1	34	10	3-pronounced yields; no breaks	0.34 (78% reduction)

ad three identical truncated cones beneath the geomembrane; see Figure 4.
nged during, or after, pressurization due to movement of the initially placed sand layers. i.e, the sand was
around the stationary cones.
plied to geomembrane; beneath which is the geotextile and then the three puncturing cones.
erm failure stress using Equation 2 for the calculations.
ıne response after ten-years of hydrostatic stress.
ninimum geomembrane thickness above the cone tips.

Regarding the type and amount of yield it was very subtle for the 12 mm cone heights and very pronounced for the 38 mm cone heights (there was a small break in the yield zone for one of the six cones); see Figure 3. An analytic analyses of the resulting geomembrane strains in the yield regions was attempted but the crescent moon shape of the yield regions was not amendable to standard tensile strain calculations. On the other hand thickness strains were tractable and Table 2 gives these results; see Koerner, et al. (2009) for complete details.



(a) Deformations from 12 mm cone heights; Vessels No. 1 and 2



(b) Deformation from 38 mm cone heights; Vessels No. 3 and 4

Fig. 3. Photographs of several of the yield zones caused by truncated cone deformations of geomembrane test specimens.

4.0 Summary and Conclusions

The need for geomembrane protection against puncture by objects such as stones and gravel has been apparent for many years. Commonly used for this purpose are relatively thick needle-punched nonwoven geotextiles. In essence, such geotextiles provide a cushion in blunting the inherent aggressiveness of the puncturing object against the geomembrane. Even further, geomembranes used as liner materials beneath solid waste landfills are commonplace and for large landfills the normal stresses on such geomembranes are very high, i.e., the puncture situation is greatly exacerbated.

The type of geomembrane is also an issue. By virtue of its good chemical resistance and long anticipated lifetime, HDPE geomembranes are routinely used to line solid waste landfills. Many countries even sole source this type of geomembrane. That said, HDPE is (other than scrim reinforced geomembranes) the most sensitive geomembrane type to out-of-plane deformation, as is the situation arising from a puncturing stone located above or below the geomembrane; Nosko and Touze-Folz (2000).

As a result of the above issues, several approaches toward selecting a proper geotextile protection material are in the literature. This White Paper has focused on the "GRI-Method" which was the result of a large short-term testing project that has been published and widely used for about twelve-years. Needed, however, is the projection of the short-term testing results into long-term behavior. This was done in the past using empirical tables for both degradation (RF_{CBD}) and creep (RF_{CR}) reduction factors; recall Equation 2. The degradation by chemical and biological agents is the lesser of the two reduction factors and, as a result, this present effort is focused entirely on the validity of the RF_{CR}-values. The original values are given in Table 1b. To verify or refute the given values, this ten-year creep study of HDPE geomembranes and their associated geotextile protection materials against puncture has been concluded and this White Paper presents the results.

The same type of pressure vessel and truncated puncturing cones as used in the short-term tests were used for these long-term tests. In all cases, 1.5 mm thick smooth HDPE geomembranes were used and protected by 600 g/m^2 needle-punched nonwoven PET geotextiles. Three truncated cones were used in each of four pressure vessels, the differences being the protruding cone heights (six at $\simeq$ 12 mm and six at $\simeq$ 38 mm) and applied hydrostatic pressures (varying from 34 to 580 kPa).

After ten-years of pressurization the vessels were dismantled and it was found that all six of the high cone heights ($\simeq$ 38 mm) had pronounced yield zones in the geomembranes and one of the six had a small break within its yield zone. Clearly, such high cone heights with this type of geotextile are unacceptable. *The entry in Table 1b in this regard mentions "not recommended" and this comment is hereby substantiated.*

However, the creep test results at low cone heights ($\simeq$ 12 mm) provide a different conclusion. Table 1b indicates that a 12 mm cone height with a 550 g/m^2 protection geotextile is acceptable with a RF_{CR} = 1.3. Since all six of these cases resulted in geomembrane yield (albeit small yields in comparison to the higher cone heights), *the Table 1b values must be changed and made more conservative in their design guidance.*

To be noted in Table 1b for RF_{CR}, a not recommended (N/R) comment exists for the various protrusion heights in descending order as the cone heights decrease and the protection geotextile mass increases. By virtue of these long-term creep test results, the N/R comments must be extended. Thus, our conclusion as a result of this creep testing program is to replace the existing RF_{CR}-values with Table 3 following:

Table 3. Revised values for "RF_{CR}" to be used in Equation 2 for geotextile protection materials design.

Mass per unit area (g/m^2)	"RF_{CR}"-Values Protrusion Height (mm)		
	38	25	12
Geomembrane alone	N/R	N/R	N/R
270	N/R	N/R	N/R
550	N/R	N/R	>1.5
1100	N/R	1.5	1.3
>1100	1.3	1.2	1.1

Abbreviation: N/R = Not recommended

Lastly, the entry of ">1.5" for a 12 mm cone height associated with a 550 g/m^2 geotextile is felt to be appropriate considering the following items.

- The geotextiles used at present are made from polypropylene fibers versus the tested geotextiles which were made from polyester fibers. Since the specific gravity of PP is 0.91 and that of PET is between 1.22 and 1.38, one has from 25% to 34% more filaments in an equivalent mass per unit area geotextile using polypropylene fibers. This provides for considerably greater protection capability.
- The area of yield for the six $\simeq$ 12 mm cone heights was extremely small and the thicknesses of the remaining geomembrane was such that considerable deformation could still be sustained before break is even close to occurring.
- The ">1.5" recommendation is precisely for additional conservatism and safety and if a designer wishes to be more conservative than the new recommended table suggests he/she is free to do so.

5.0 References

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GSE®

Geomembrane Protection
Design Manual

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and
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GeoSyntec Consultants, Inc.

First Edition

Chapter 2
DESIGN VARIABLES

2.1 Effective Protrusion Height

The effective protrusion height is the maximum dimension of the largest soil, aggregate, or any other object, to which a geomembrane liner may be exposed. The effective protrusion height depends, primarily, on two factors: size and arrangement. Two types of arrangements are possible for objects in the vicinity of a geomembrane: isolated and grouped. Each of these scenarios is discussed in detail in the following sections.

2.1.1 Isolated Protrusions

Isolated protrusions act more or less alone when interacting with a geomembrane in the puncture mode. An example is a stone underlying a geomembrane placed on a relatively level surface as indicated in Figure 2.1. The full exposed size of the stone in this case can challenge the geomembrane. The effective protrusion height, H', in this case is equal to the maximum exposed object dimension as indicated in the figure. Conservatively, H' may be assumed to be equal to the diameter of the largest size particle in the subgrade as determining the exposed dimensions of particles over the life of a project may be difficult.

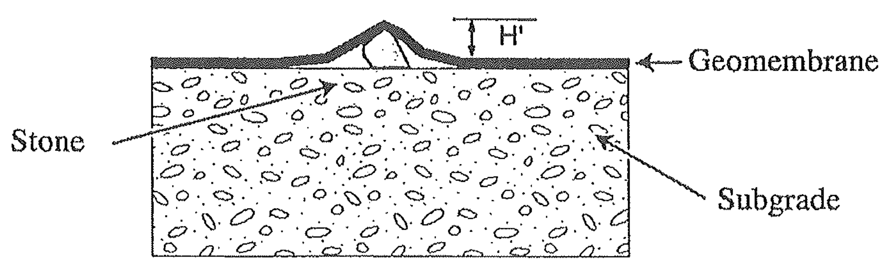

Figure 2.1 Effective Protrusion Height for the Case of Isolated Objects.

2.1.2 Grouped Protrusions

Grouped objects are close enough to interact with each other when challenging a geomembrane. An example is a drainage aggregate layer placed on top of a geomembrane. In such cases only a limited part of the full size of a particle can interact with the geomembrane because of the proximity of the surrounding particles. Practically, the adjoining particles "hide" part of each other. This is explained graphically in Figure 2.2. For the case of grouped particles, the effective protrusion height, H', is approximated as half of the maximum particle size. This approximation is based on performance puncture testing with isolated and grouped protrusions. Particle size analysis according to ASTM Method D 422 can be used to determine the maximum dimensions of protrusions.

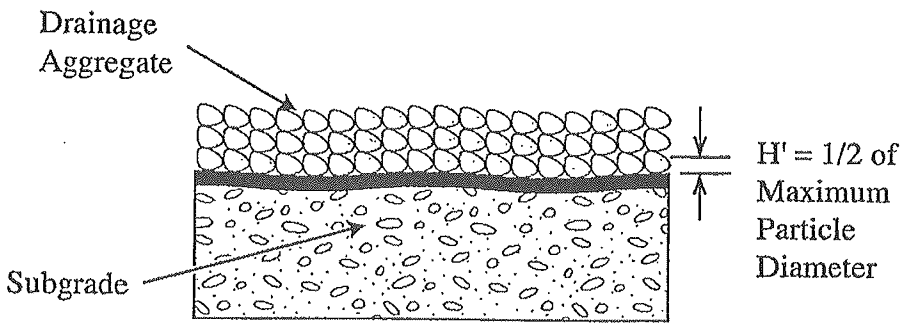

Figure 2.2 Effective Protrusion Height in the Case of Grouped Objects.

2.2 Protrusion Shape

For the purpose of geomembrane puncture protection, particle shape can be described by angularity. Angularity is a measure of sharpness of corners of a particle. Although a quantitative measurement of angularity is possible (Krumbein, 1941), for the design method presented here it is adequate to obtain a qualitative description as provided in Figure 2.3.

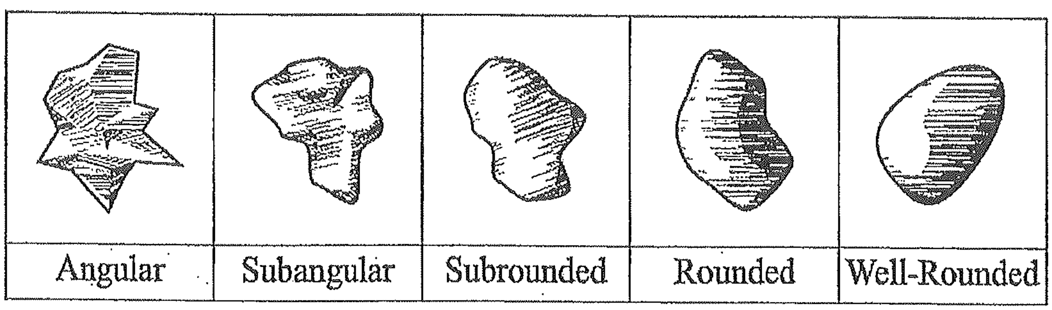

Figure 2.3 Angularity of Soil Particles (Sowers, 1979).

On the basis of the effect of shape on geomembrane protection requirements, soil particles can be placed into the following three categories:

Group I – Angular

Group II – Subangular and Subrounded

Group III – Rounded and Well Rounded

The design engineer should consider the angularity carefully as well rounded aggregate may become angular during installation, handling or excavation. When in doubt, it may be desirable to perform the calculations assuming angular stone.

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Product Data Sheet

GSE Nonwoven "Heavyweight" Geotextile

GSE Nonwoven "Heavyweight" Geotextile is a family of staple fiber needlepunched geotextiles. The geotextile is manufactured using an advanced manufacturing and quality system to produce the most uniform and consistent nonwoven needlepunched geotextile currently available in the industry. GSE combines a fiber selection and approval system with in-line quality control and a state-of-the-art laboratory to ensure that every roll shipped meets customer specifications and for various applications.

Product Specifications *These product specifications meet or exceed GRI GT12 and AASHTO M288*

TESTED PROPERTY	TEST METHOD	FREQUENCY	MINIMUM AVERAGE VALUE			
			NW20	NW24	NW28	NW32
Mass per Unit Area, oz/yd² (g/m²)	ASTM D 5261	90,000 ft²	20 (675)	24 (810)	28 (950)	32 (1,080)
Grab Tensile Strength, lb (N)	ASTM D 4632	90,000 ft²	450 (1,980)	500 (2,200)	550 (2,420)	600 (2,640)
Grab Elongation, %	ASTM D 4632	90,000 ft²	50	50	50	50
Puncture Strength, lb (N)	ASTM D 4833	90,000 ft²	200 (880)	250 (1,100)	300 (1,320)	350 (1,540)
Trapezoidal Tear Strength, lb (N)	ASTM D 4533	90,000 ft²	125 (550)	200 (880)	250 (1,100)	270 (1,190)
UV Resistance (% retained after 500 hours)	ASTM D 4355	per formulation	70	70	70	70
NOMINAL ROLL DIMENSIONS						
Roll Length[(1)], ft (m)			200 (61)	200 (61)	150 (45.7)	150 (45.7)
Roll Width[(1)], ft (m)			15 (4.6)	15 (4.6)	15 (4.6)	15 (4.6)
Roll Area, ft² (m²)			3,000 (281)	3,000 (281)	2,250 (209)	2,250 (209)

NOTES:
- The property values listed are in weaker principal direction. All values listed are Minimum Average Values except UV resistance which is a typical value.
- [(1)]Roll lengths and widths have a tolerance of ±1%.

DS12NWHW R10/11/10

TEXTURED HDPE GEOMEMBRANE
ENGLISH UNITS

POLY-FLEX®
POLYETHYLENE GEOMEMBRANES

Property	Test Method	40 mil	60 mil	80 mil	100 mil
		Minimum Average Values			
Thickness, mils	ASTM D 5994				
minimum average		38	57	76	95
lowest individual of 8 of 10 readings		36	54	72	90
lowest individual of 10 readings		34	51	68	85
Asperity Height[1], mils	ASTM D 7466	10	10	10	10
Sheet Density, g/cc	ASTM D 1505/D 792	0.940	0.940	0.940	0.940
Tensile Properties[2]	ASTM D 6693				
1. Yield Strength, lb/in		84	126	168	210
2. Break Strength, lb/in		60	90	120	150
3. Yield Elongation, %		12	12	12	12
4. Break Elongation, %		100	100	100	100
Tear Resistance, lb	ASTM D 1004	28	42	56	70
Puncture Resistance, lb	ASTM D 4833	60	90	120	150
Stress Crack Resistance[3], hrs	ASTM D 5397 (App.)	300	300	300	300
Carbon Black Content[4], %	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596	--Note 5--			
Oxidative Induction Time (OIT) Standard OIT, minutes	ASTM D 3895	100	100	100	100
Oven Aging at 85°C High Pressure OIT - % retained after 90 days	ASTM D 5721 ASTM D 5885	80	80	80	80
UV Resistance[6] High Pressure OIT[7] - % retained after 1600 hrs	ASTM D 7238 ASTM D 5885	50	50	50	50
Roll Dimensions					
1. Width (feet):		23	23	23	23
2. Length (feet)		750	500	375	300
3. Area (square feet):		17,250	11,500	8,625	6,900
4. Gross weight (pounds, approx.)		3,500	3,500	3,470	3,470

1 Of 10 readings; 8 must be ≥ 7 mils and lowest individual reading must be ≥ 5 mils.
2 Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Yield elongation is calculated using a gauge length of 1.3 inches; Break elongation is calculated using a gauge length of 2.0 inches.
3 The yield stress used to calculate the applied load for the SP-NCTL test should be the mean value via MQC testing.
4 Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
5 Carbon black dispersion for 10 different views: Nine in Categories 1 and 2 with one allowed in Category 3.
6 The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
7 UV resistance is based on percent retained value regardless of the original HP-OIT value.

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Product Data Sheet

GSE Nonwoven Geotextile

GSE Nonwoven Geotextile is a family of staple fiber needlepunched geotextiles. The geotextile is manufactured using an advanced manufacturing and quality system, to produce the most uniform and consistent nonwoven needlepunched geotextile currently available in the industry. GSE combines a fiber selection and approval system with in-line quality control and a state-of-the-art laboratory to ensure that every roll shipped meets customer specifications and for various applications.

Product Specifications *These product specifications meet or exceed GRI GT12, GRI GT13 and AASHTO M288.*

TESTED PROPERTY	TEST METHOD	FREQUENCY	MINIMUM AVERAGE VALUE					
			NW4	NW6	NW8	NW10	NW12	NW16
AASHTO M288 Class			3	2	1	>1	>>1	>>>1
Mass per Unit Area, oz/yd² (g/m²)	ASTM D 5261	90,000 ft²	4 (135)	6 (200)	8 (270)	10 (335)	12 (405)	16 (540)
Grab Tensile Strength, lb (N)	ASTM D 4632	90,000 ft²	120 (530)	160 (710)	220 (975)	260 (1,155)	320 (1,420)	390 (1,735)
Grab Elongation, %	ASTM D 4632	90,000 ft²	50	50	50	50	50	50
Puncture Strength, lb (N)	ASTM D 4833	90,000 ft²	60 (265)	90 (395)	120 (525)	165 (725)	190 (835)	240 (1,055)
Trapezoidal Tear Strength, lb (N)	ASTM D 4533	90,000 ft²	50 (220)	65 (290)	90 (395)	100 (445)	125 (555)	150 (665)
Apparent Opening Size, Sieve No. (mm)	ASTM D 4751	540,000 ft²	70 (0.212)	70 (0.212)	80 (0.180)	100 (0.150)	100 (0.150)	100 (0.150)
Permittivity, sec^{-1}	ASTM D 4491	540,000 ft²	1.80	1.50	1.30	1.00	0.80	0.60
Water Flow Rate, gpm/ft² (l/min/m²)	ASTM D 4491	540,000 ft²	135 (5,495)	110 (4,480)	95 (3,865)	75 (3,050)	60 (2,440)	45 (1,830)
UV Resistance (% retained after 500 hours)	ASTM D 4355	per formulation	70	70	70	70	70	70
NOMINAL ROLL DIMENSIONS								
Roll Length[1], ft (m)			850 (259)	850 (259)	600 (182)	500 (152)	400 (122)	300 (91)
Roll Width[1], ft (m)			15 (4.5)	15 (4.5)	15 (4.5)	15 (4.5)	15 (4.5)	15 (4.5)
Roll Area, ft² (m²)			12,750 (1,185)	12,750 (1,185)	9,000 (836)	7,500 (698)	6,000 (557)	4,500 (418)

NOTES:
- The property values listed are in weaker principal direction. All values listed are Minimum Average Values except apparent opening size in mm and UV resistance. Apparent opening size (mm) is a Maximum Value. UV is a typical value.
- [1]Roll lengths and widths have a tolerance of ±1%.

DS12NW R10/11/10

J.5 – Final Cover Evaluations

J.5-A	Waste Settlement
J.5-B	Final Cover Geomembrane Strain
J.5-C	Final Cover Geocomposite Transmissivity
J.5-D	Toe Drain Capacity
J.5-E	Terrace Berms

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J.5-A Waste Settlement

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF WASTE MASS

Problem Statement

Differential settlement is a measure of the difference in settlement that occurs between different locations based on location-specific loads. Differential settlement has the potential to impact landfills when the variation of settlement is greater than the design slopes of design features. This calculation determines the maximum settlement that is anticipated to occur within the waste mass at multiple locations to ensure that the plateau area of the final cover will maintain positive drainage after settlement occurs.

Note: The maximum differential settlement of the foundation was previously determined in a calculation in Appendix J.3-B and is incorporated into this calculation.

Given

- ❑ Drawings of the "Final Landform Grades" and "Excavation Grades" contained in this Application.
- ❑ **Section 2.2**, Hydrogeologic Report, in this Application.
- ❑ **Appendix J.1** "Summary of Geotechnical Parameters" contained in this Application.
- ❑ Microsoft Excel settlement calculation spreadsheets (refer to attached pages).
- ❑ Yee, K., Menard Geosystems Sdn Bhd, Lumpur, K., Ugrading of Existing Landfills by Dynamic Consolidation - A Geotechnical Aspect, Master Builders Journal, September, 1999 (Refer to attached pages).
- ❑ Personal Communication, Research Reference Notes, Craig H. Benson, University of Wisconsin-Madison, 2009.
- ❑ Budhu, Muni, Foundations and Earth Retaining Structures (refer to attached pages).

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Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
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TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF WASTE MASS

Background

Consolidation of materials that will lead to settlement is divided into two categories:

1. Primary Consolidation Settlement
   Occurs in saturated cohesive soils occurs due to the expulsion of water in response to an increase in effective stress. Primary settlement is determined using the following equation for normally consolidated soils.

$$S_P = \left((C_c) \left(\frac{H_o}{1+e_o} \right) \log \left(\frac{\sigma'_{v_o} + \Delta\sigma_v}{\sigma'_{v_o}} \right) \right)$$

Where,

S_p = Primary Settlement, feet
C_c = Compression Index
H = Thickness of the layer, feet
e_o = Initial void ratio = n/(1-n)
$\Delta\sigma'_v$ = Change in vertical effective stress, psf
σ'_{v_o} = Initial vertical effective stress, psf

2. Secondary Consolidation Settlement
   Occurs only in saturated cohesive soils and is the result of the plastic adjustment of soil fabrics. Secondary consolidation is calculated using the following equation.

$$S_S = \left(\left(\frac{C_\propto}{1+e_p} \right) H \log \left(\frac{T_2}{T_1} \right) \right)$$

Where:

S_S = Secondary settlement, feet
C_α = Secondary compression index
H = Thickness of Layer, feet
e_p = Void Ratio at end of primary consolidation
= e_o (to be conservative)
T_1 = Time at start of secondary compression, years
T_2 = Time at end of observation period, years

Waste does not experience primary consolidation in the manner of a saturated soil. Waste will undergo initial and primary compression. Both types of compression occur rapidly and are grouped together.

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TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF WASTE MASS

Assumptions and Calculations – Final Cover / Waste Settlement

In addition to foundation settlement, the waste mass will also settle under its weight. Therefore, the differential settlement of the waste mass is also analyzed to ensure that the final cover maintains positive drainage after settlement. For the purpose of this analysis, the maximum differential settlement is determined for the plateau (top) of the landfill in the horizontal and vertical expansions. The design of the plateau is 10H:1V (5.71 degrees).

Three points were selected for the waste settlement analysis, as described below:

- W1: This point represents the thickest waste column in the horizontal expansion and the maximum waste height in the horizontal expansion (located in Cell 11).
- W2: This point represents the thickest waste column in the vertical expansion area and the maximum waste height in the vertical expansion (located in Cell 7).
- W3: This point represents the thickest waste column in the vertical expansion area over an LCS pipe (located in Cell 7).
- W4: This point represents the thinnest waste column in the horizontal and vertical expansion, the minimum waste elevation on the plateau, and the mid-point between W1 and W2/W3 (located between Cell 7 and Cell 11).
- W5: This point represents the thinnest waste column in the horizontal and vertical expansion, the minimum waste elevation on the plateau, and the mid-point between W1 and W2/W3 (located between Cell 7 and Cell 11).

The locations of the waste settlement points are presented on **Figures 1-3** (see attached pages). **Table J.5A-1** below provides the elevations of the settlement points, and elevations and thicknesses of the landfill system layers.

Table J.5A-1 - Layer Thicknesses for Analysis by Point
Final Cover / Waste Settlement

Location / Point	Final Cover Thickness (ft)	Waste Thickness (ft)	LCS Drainage Layer Thickness (ft)	Low Permeable Earth Liner Thickness (ft)	Wadsworth Till Thickness (ft)
W1	5	198	1	5	33.8
W2	5	206	1	5	26.3
W3	5	206	1	5	22.5
W4	5	136.7	1	5	85.1
W5	5	136.7	1	5	83.7

The distances between each point are as follows:

- ❑ W1 to W2: 338 ft
- ❑ W1 to W3: 346 ft
- ❑ W1 to W4: 196 ft

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TITLE: DIFFERENTIAL SETTLEMENT EVALUATION OF WASTE MASS

- W1 to W5: 193 ft
- W2 to W3: 44 ft
- W2 to W4: 214 ft
- W2 to W5: 220 ft
- W3 to W4: 245 ft
- W3 to W5: 205 ft
- W4 to W5: 235 ft

For the purpose of this calculation, settlement is calculated incrementally for 15-ft thick fill lifts of waste and one lift for the final cover placement for one landfill cell. It is assumed that each lift of waste will take 3 months to complete. The time of primary compression is estimated to be completed within 2 to 30 days following loading (Benson, see the attached reference). From this calculation, it is assumed that the final cover will only be subjected to the primary settlement from the final lift of the landfill plus secondary settlement that will occur during post-construction.

The secondary settlement considers secondary settlement that occurs by the self-weight of each fill lift based on Terzaghi's time-settlement relationship. Secondary settlement is calculated for each lift individually, and then summed to provide a total value for secondary settlement.

The attached spreadsheets show the results of each waste settlement location, which are also summarized in **Table J.5A-2**.

Table J.5A-2 - Waste Settlement by Point
Final Cover / Waste Settlement

Point	Incremental Primary Settlement of Last Lift (ft)	Secondary Settlement (ft)	Total Settlement (ft)
W1	2.01	23.93	25.94
W2	1.93	24.89	26.82
W3	1.93	24.89	26.82
W4	1.76	16.56	18.32
W5	1.76	16.56	18.32

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Differential Settlement

The differential settlement between points are calculated as follows:

$$S_{diff} = \frac{|S_{S1}-S_{S2}|}{Distance_{S1\ to\ S2}} \times 100\%$$

Table J.5A-3 - Differential Settlement Between Points Final Cover / Waste Settlement					
Point 1	**Point 2**	**Settlement 1 (ft)**	**Settlement 2 (ft)**	**Distance Between Points (ft)**	**Differential Settlement (%)**
W1	W2	25.94	26.82	338	0.26%
W1	W3	25.94	26.82	346	0.26%
W1	W4	25.94	18.32	196	3.89%
W1	W5	25.94	18.32	193	3.95%
W2	W3	26.82	26.82	44	0.00%
W2	W4	26.82	18.32	214	3.97%
W2	W5	26.82	18.32	220	3.87%
W3	W4	26.82	18.32	245	3.47%
W3	W5	26.82	18.32	205	**4.15%**
W4	W5	18.32	18.32	235	0.00%

In addition to the waste settlement calculated above, the foundation soils have been determined to experience a maximum differential settlement along the foundation of approximately 0.89% (**Appendix J.3-B**). Therefore, the cumulative impact of foundation and waste settlement is estimated to be 5.04% (4.15% + 0.89%).

Resulting Slopes of Final Cover System After Differential Settlement

The maximum differential settlement across the expansion's plateau is calculated to be approximately 5.04 percent (located in the vertical expansion). The design slope of the plateau is 10H:1V (approximately 5.71 degrees). Therefore, the resulting slope after differential settlement is anticipated to be approximately 0.67 degrees. This slope is acceptable, as the final cover will maintain positive drainage.

Summary of Results

The leachate collection layer in both the horizontal expansion area and vertical expansion area will remain free draining, even after differential settlement occurs. The final cover of the plateau area will remain positive drainage, even after differential settlement occurs. Therefore, the proposed expansion is appropriately designed with respect to differential settlement.

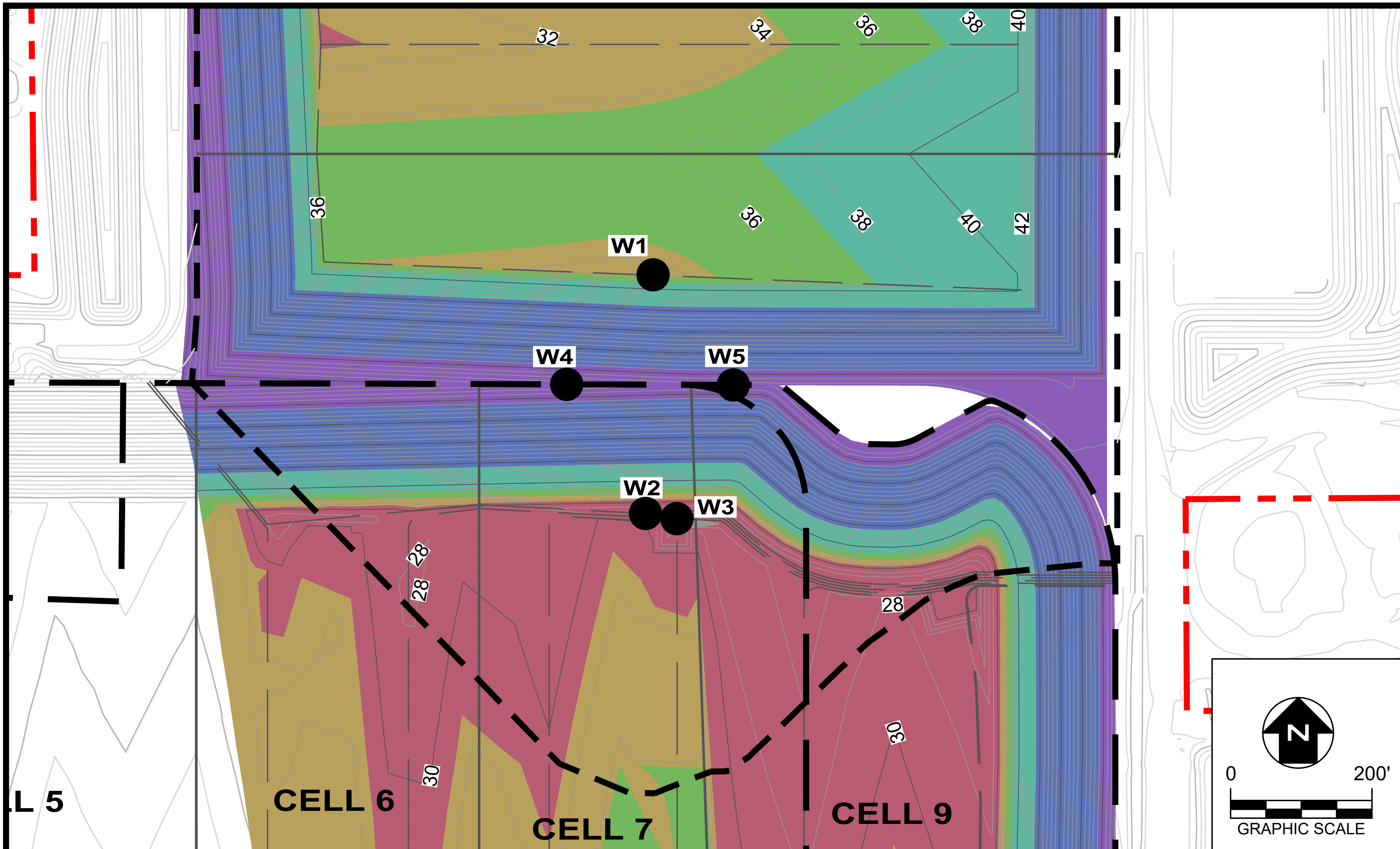

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FIGURE 1
LOCATION OF WASTE SETTLEMENT ANALYSIS POINTS
THICKNESS OF WADSWORTH TILL TO REMAIN IN PLACE

DRAWN BY: ORC	APPROVED BY: RDS	PROJ. NO.: 003211	DATE: FEBRUARY 2020

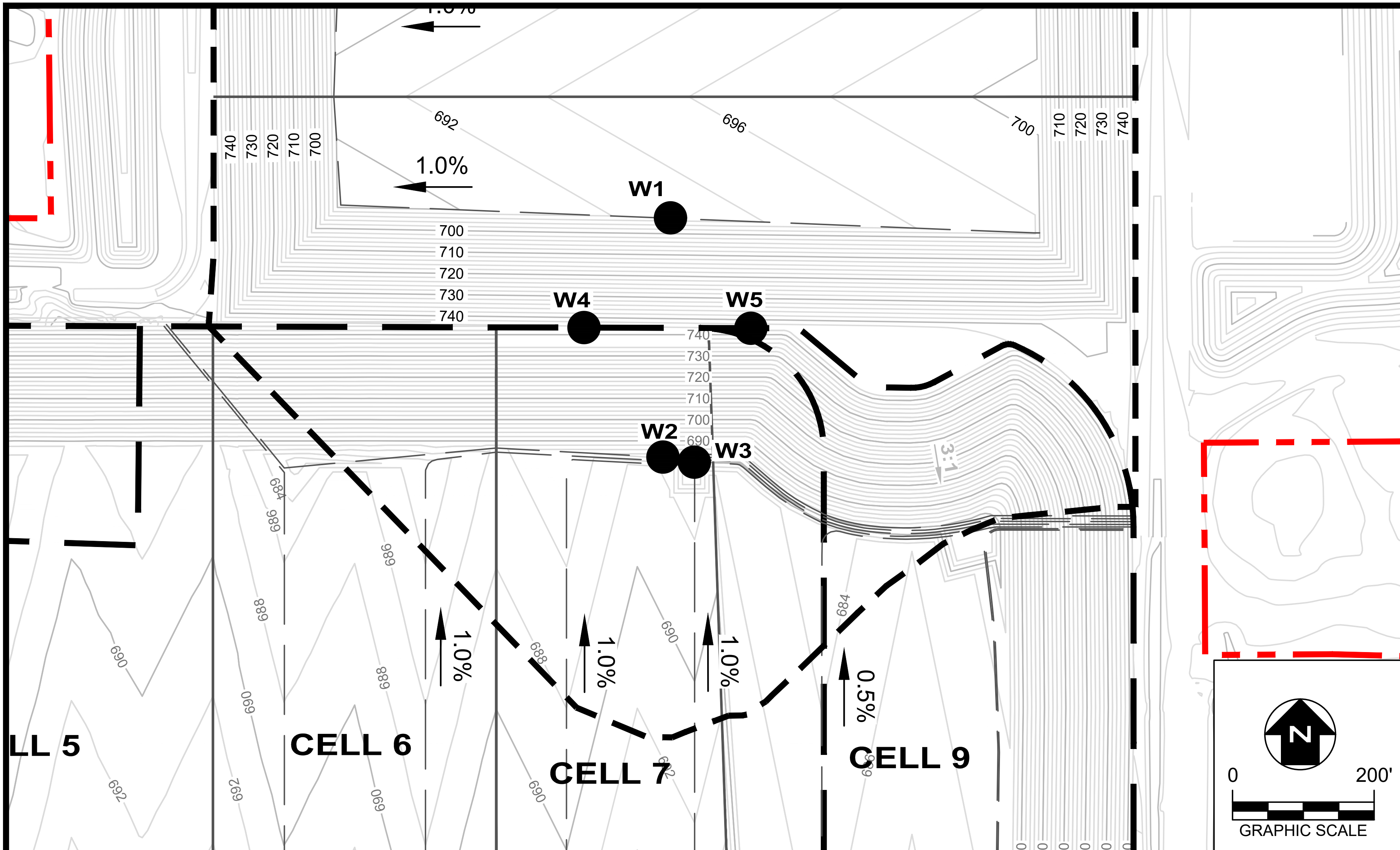

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FIGURE 2
LOCATION OF WASTE SETTLEMENT ANALYSIS POINTS
TOP OF LINER

DRAWN BY: ORC	APPROVED BY: RDS	PROJ. NO.: 003211	DATE: FEBRUARY 2020

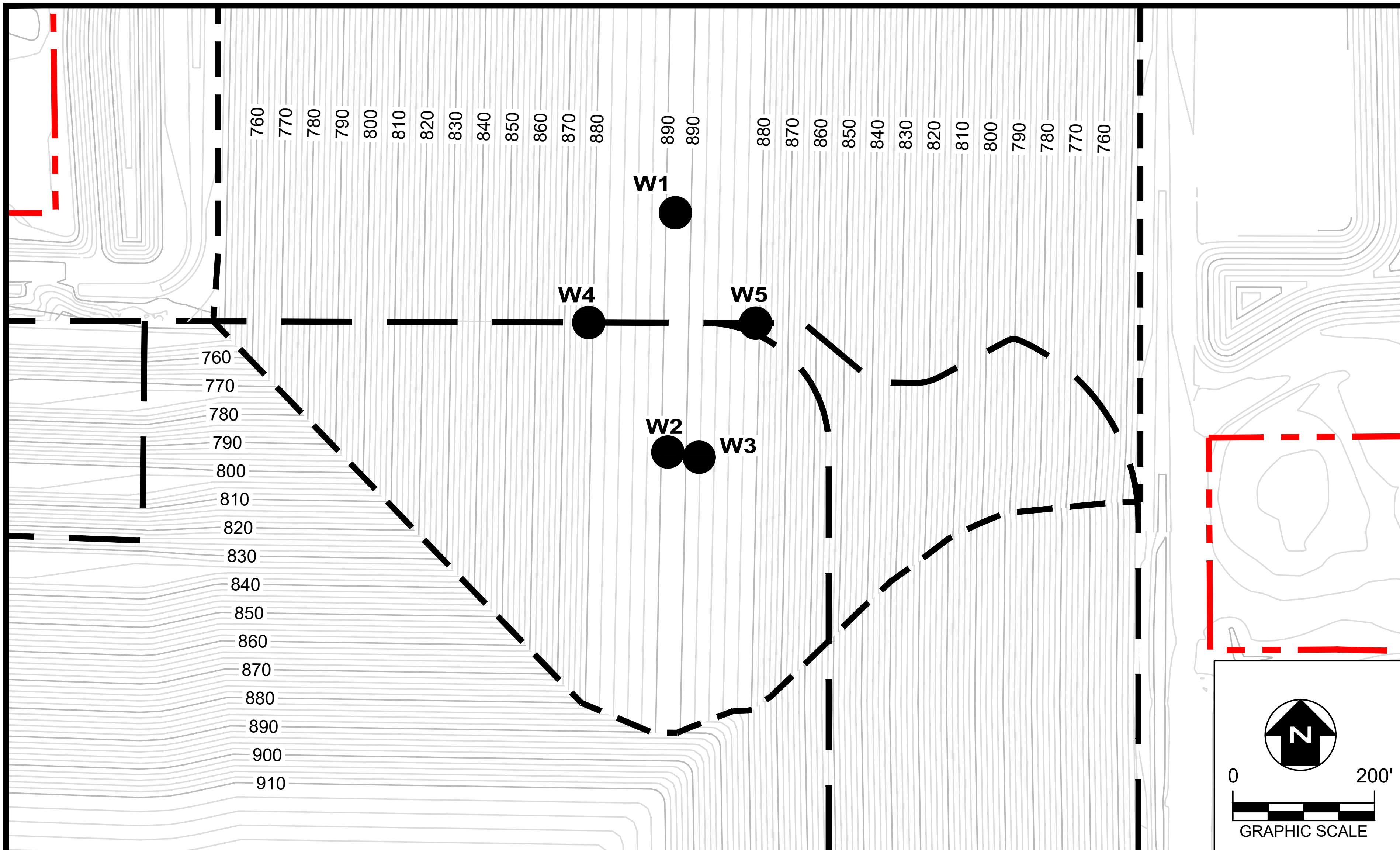

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FIGURE 3
LOCATION OF WASTE SETTLEMENT ANALYSIS POINTS
TOP OF WASTE

DRAWN BY: ORC	APPROVED BY: RDS	PROJ. NO.: 003211	DATE: FEBRUARY 2020

Zion Landfill - Site 2 North Expansion - Primary Settlement at Point "W1"
May 2022

Given:	
Primary Settlement Eqtn.	$S_p = [H \times C_c(\log(\sigma'_{zo} + \sigma'_{zf}) / \sigma'_{zo}))] / (1+e_o)$
	$C_c' = C_c/(1+e_o)$ $C_c' =$ 0.172 H_{waste} = height of waste fill lift Maximum waste height = 198 feet Cell is divided into fourteen (14) waste lifts: 13-lifts at 15-ft ea., and 14th lift at 3-ft $\gamma_{waste\ (pcf)}$ = 75 Each lift takes 3 months to complete
Final Cover	$H_{final\ cover}$ (ft) = 5 $\gamma_{final\ cover}$ (pcf) = 130.3 Assume 3 months to complete construction of final cover
Stresses	σ'_{zo} = initial effective stress (psf) σ'_{zf} = final effective stress (psf)
Other Information	Each lift takes 3 months to complete (conservative) Life of landfill is assumed to be 30 years

Placement of Lift (mos.)	Lift No.	Depth of Waste Fill Lift (ft)	Total Depth of Waste Fill (ft)	Mid-Lift Stresses (psf) Lift 1		Lift 2		Lift 3		Lift 4		Lift 5		Lift 6		Lift 7		Lift 8		Lift 9		Lift 10		Lift 11		Lift 12		Lift 13		Lift 14		Final Cover		Total Primary Settlement "S_p" (ft)	Incremental Primary Settlement "S_p" (ft)
				σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}		
3	1	15	15	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
6	2	15	30	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	0.78 ft
9	3	15	45	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.01	1.23 ft
12	4	15	60	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.56	1.55 ft
15	5	15	75	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.36	1.80 ft
18	6	15	90	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.37	2.01 ft
21	7	15	105	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.55	2.18 ft
24	8	15	120	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.88	2.33 ft
27	9	15	135	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	14.34	2.46 ft
30	10	15	150	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	16.92	2.58 ft
33	11	15	165	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	19.61	2.69 ft
36	12	15	180	563	6,750	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	22.40	2.78 ft
39	13	15	195	563	7,313	563	6,750	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	25.27	2.87 ft
41	14	3	198	563	7,425	563	6,863	563	6,300	563	5,738	563	5,175	563	4,613	563	4,050	563	3,488	563	2,925	563	2,363	563	1,800	563	1,238	563	675	113	113	0	0	25.95	0.68 ft
44	final cover	5	203	563	7,751	563	7,188	563	6,626	563	6,063	563	5,501	563	4,938	563	4,376	563	3,813	563	3,251	563	2,688	563	2,126	563	1,563	563	1,001	113	438	326	326	27.96	2.01 ft
																																			(Σ Sp = 27.96 ft)

Notes:
Primary settlement equation and methodology taken from reference below.
Incremental settlement is the difference of the total primary settlement number and the previous total primary settlement number.

Reference:

Coduto, D.P., *Geotechnical Engineering Principles and Practices*, 1998, pp.435-446.

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Zion Landfill - Site 2 North Expansion - Secondary Settlement at Point "W1"
May 2022

Given:	
Waste	**Secondary Settlement Eqtn: $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))]$** $C_\alpha' = C_\alpha / (1+e_o) = 0.051$, and $e_0 = 0.650$ $C_\alpha' = 0.051$ Maximum waste height = 198 ft. (waste) + 5 ft. (cover) = 203 ft. Cell is divided into fourteen (14) lifts: 13-lifts at 15-ft and 1-lift at 3-ft H_o = height of lifts 1-13 = 15 ft. lift 14 = 3.0 ft. Assume 3 months to complete each lift: t_1 = 0.25 yrs
Final Cover	**Secondary Settlement Eqtn: $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))]$** $e_o = 0.432$ $C_\alpha = 0.0032$ H_o = height of final cover = 5 feet Assume 3 months to complete construction of final cover
Other Information	Landfill life conservatively assumed = 30 years Post Closure monitoring period = 30 years t_1 = time of pseudo-primary settlement to occur after completion of fill (years) t_2 = time after placed fill and post-closure (years) = (30 + 30 - (Σ t_x))

Lift No.	(A) Total Time in Months to Complete Filling of Lifts	(B) Total Time in Years to Complete Filling of Lifts (Σt_x)	(C) t_1 (yrs)	(D) t_2 (yrs)	t_2 / t_1	S_s (ft)
1	3	0.25	0.25	59.75	239	1.819
2	6	0.50	0.25	59.50	238	1.818
3	9	0.75	0.25	59.25	237	1.817
4	12	1.00	0.25	59.00	236	1.815
5	15	1.25	0.25	58.75	235	1.814
6	18	1.50	0.25	58.50	234	1.812
7	21	1.75	0.25	58.25	233	1.811
8	24	2.00	0.25	58.00	232	1.810
9	27	2.25	0.25	57.75	231	1.808
10	30	2.50	0.25	57.50	230	1.807
11	33	2.75	0.25	57.25	229	1.805
12	36	3.00	0.25	57.00	228	1.804
13	39	3.25	0.25	56.75	227	1.802
14	42	3.50	0.25	56.50	226	0.360
final cover	45	3.75	0.25	56.25	225	0.026
					ΣS_s =	**23.93 ft**

Notes:

(A) = 3 months + time for filling previous lifts
(B) = Col.(A) / 12
(C) = (3 mos.) x (1 yr./12mos.) = 0.25
(D) = 30 + 30 - Col.(B)

Secondary settlement equation for waste taken from reference below.
Values for final cover "c_α" and e_o determined from laboratory test data.

Reference:

Yee, K., Menard Geosystems, Lumpur, K., *Upgrading of Existing Landfills by Dynamic Consolidation - A Geotechnical Aspect*, Technical Paper in Master Builders Journal, Sept.1999.

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Zion Landfill - Site 2 North Expansion - Primary Settlement at Point "W2"
May 2022

Given:	
Primary Settlement Eqtn.	$S_p = [H \times C_c(\log(\sigma'_{zo} + \sigma'_{zf}) / \sigma'_{zo}))] / (1+e_o)$
	$C_c' = C_c/(1+e_o)$ $C_c' =$ **0.172** H_{waste} = height of waste fill lift Maximum waste height = 206 feet Cell is divided into fourteen (14) waste lifts: 13-lifts at 15-ft ea., and 14th lift at 11-ft $\gamma_{waste\ (pcf)}$ = 75 Each lift takes 3 months to complete
Final Cover	$H_{final\ cover}$ (ft) = 5 $\gamma_{final\ cover}$ (pcf) = 130.3 Assume 3 months to complete construction of final cover
Stresses	σ'_{zo} = initial effective stress (psf) σ'_{zf} = final effective stress (psf)
Other Information	Each lift takes 3 months to complete (conservative) Life of landfill is assumed to be 30 years

Placement of Lift (mos.)	Lift No.	Depth of Waste Fill Lift (ft)	Total Depth of Waste Fill (ft)	Mid-Lift Stresses (psf): Lift 1		Lift 2		Lift 3		Lift 4		Lift 5		Lift 6		Lift 7		Lift 8		Lift 9		Lift 10		Lift 11		Lift 12		Lift 13		Lift 14		Final Cover		Total Primary Settlement "S_p" (ft)	Incremental Primary Settlement "S_p" (ft)
				σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}		
3	1	15	15	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
6	2	15	30	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	0.78 ft
9	3	15	45	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.01	1.23 ft
12	4	15	60	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.56	1.55 ft
15	5	15	75	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.36	1.80 ft
18	6	15	90	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.37	2.01 ft
21	7	15	105	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.55	2.18 ft
24	8	15	120	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.88	2.33 ft
27	9	15	135	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	14.34	2.46 ft
30	10	15	150	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	16.92	2.58 ft
33	11	15	165	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	19.61	2.69 ft
36	12	15	180	563	6,750	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	22.40	2.78 ft
39	13	15	195	563	7,313	563	6,750	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	25.27	2.87 ft
41	14	11	206	563	7,725	563	7,163	563	6,600	563	6,038	563	5,475	563	4,913	563	4,350	563	3,788	563	3,225	563	2,663	563	2,100	563	1,538	563	975	413	413	0	0	27.53	2.26 ft
44	final cover	5	211	563	8,051	563	7,488	563	6,926	563	6,363	563	5,801	563	5,238	563	4,676	563	4,113	563	3,551	563	2,988	563	2,426	563	1,863	563	1,301	413	738	326	326	29.46	1.93 ft (Σ Sp = 29.46 ft)

Notes:
Primary settlement equation and methodology taken from reference below.
Incremental settlement is the difference of the total primary settlement number and the previous total primary settlement number.

Reference:
Coduto, D.P., *Geotechnical Engineering Principles and Practices,* 1998, pp.435-446.

APTIM

Zion Landfill - Site 2 North Expansion - Secondary Settlement at Point "W2"
May 2022

Given:	
Waste	**Secondary Settlement Eqtn: $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log(t_2 / t_1))$** $C_\alpha' = C_\alpha / (1+e_o) = 0.051$, and $e_0 = 0.650$ $C_\alpha' = 0.051$ Maximum waste height = 206 ft. (waste) + 5 ft. (cover) = 211 ft. Cell is divided into fourteen (14) lifts: 13-lifts at 15-ft and 1-lift at 11-ft H_o = height of lifts 1-13 = 15 ft. lift 14 = 11.0 ft. Assume 3 months to complete each lift: t_1 = 0.25 yrs
Final Cover	**Secondary Settlement Eqtn: $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log(t_2 / t_1))$** e_o = 0.432 C_α = 0.0032 H_o = height of final cover = 5 feet Assume 3 months to complete construction of final cover
Other Information	Landfill life conservatively assumed = 30 years Post Closure monitoring period = 30 years t_1 = time of pseudo-primary settlement to occur after completion of fill (years) t_2 = time after placed fill and post-closure (years) = (30 + 30 - (Σ t_x))

Lift No.	(A) Total Time in Months to Complete Filling of Lifts	(B) Total Time in Years to Complete Filling of Lifts (Σt_x)	(C) t_1 (yrs)	(D) t_2 (yrs)	t_2 / t_1	S_s (ft)
1	3	0.25	0.25	59.75	239	1.819
2	6	0.50	0.25	59.50	238	1.818
3	9	0.75	0.25	59.25	237	1.817
4	12	1.00	0.25	59.00	236	1.815
5	15	1.25	0.25	58.75	235	1.814
6	18	1.50	0.25	58.50	234	1.812
7	21	1.75	0.25	58.25	233	1.811
8	24	2.00	0.25	58.00	232	1.810
9	27	2.25	0.25	57.75	231	1.808
10	30	2.50	0.25	57.50	230	1.807
11	33	2.75	0.25	57.25	229	1.805
12	36	3.00	0.25	57.00	228	1.804
13	39	3.25	0.25	56.75	227	1.802
14	42	3.50	0.25	56.50	226	1.321
final cover	45	3.75	0.25	56.25	225	0.026
					ΣS_s =	**24.89 ft**

Notes:

(A) = 3 months + time for filling previous lifts
(B) = Col.(A) / 12
(C) = (3 mos.) x (1 yr./12mos.) = 0.25
(D) = 30 + 30 - Col.(B)

Secondary settlement equation for waste taken from reference below.
Values for final cover "c_α" and e_o determined from laboratory test data.

Reference:

Yee, K., Menard Geosystems, Lumpur, K., *Upgrading of Existing Landfills by Dynamic Consolidation - A Geotechnical Aspect*, Technical Paper in Master Builders Journal, Sept.1999.

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Zion Landfill - Site 2 North Expansion - Primary Settlement at Point "W3"
May 2022

Given:	
Primary Settlement Eqtn.	$S_p = [H \times C_c(\log(\sigma'_{zo} + \sigma'_{zf}) / \sigma'_{zo}))] / (1+e_o)$
	$C_c' = C_c/(1+e_o)$ $C_c' =$ 0.172 H_{waste} = height of waste fill lift Maximum waste height = 206 feet Cell is divided into fourteen (14) waste lifts: 13-lifts at 15-ft ea., and 14th lift at 11-ft $\gamma_{waste\ (pcf)}$ = 75 Each lift takes 3 months to complete
Final Cover	$H_{final\ cover}$ (ft) = 5 $\gamma_{final\ cover}$ (pcf) = 130.3 Assume 3 months to complete construction of final cover
Stresses	σ'_{zo} = initial effective stress (psf) σ'_{zf} = final effective stress (psf)
Other Information	Each lift takes 3 months to complete (conservative) Life of landfill is assumed to be 30 years

Placement of Lift (mos.)	Lift No.	Depth of Waste Fill Lift (ft)	Total Depth of Waste Fill (ft)	Mid-Lift Stresses (psf) Lift 1 σ'_{zo}	Lift 1 σ'_{zf}	Lift 2 σ'_{zo}	Lift 2 σ'_{zf}	Lift 3 σ'_{zo}	Lift 3 σ'_{zf}	Lift 4 σ'_{zo}	Lift 4 σ'_{zf}	Lift 5 σ'_{zo}	Lift 5 σ'_{zf}	Lift 6 σ'_{zo}	Lift 6 σ'_{zf}	Lift 7 σ'_{zo}	Lift 7 σ'_{zf}	Lift 8 σ'_{zo}	Lift 8 σ'_{zf}	Lift 9 σ'_{zo}	Lift 9 σ'_{zf}	Lift 10 σ'_{zo}	Lift 10 σ'_{zf}	Lift 11 σ'_{zo}	Lift 11 σ'_{zf}	Lift 12 σ'_{zo}	Lift 12 σ'_{zf}	Lift 13 σ'_{zo}	Lift 13 σ'_{zf}	Lift 14 σ'_{zo}	Lift 14 σ'_{zf}	Final Cover σ'_{zo}	Final Cover σ'_{zf}	Total Primary Settlement "S_p" (ft)	Incremental Primary Settlement "S_p" (ft)
3	1	15	15	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
6	2	15	30	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	0.78 ft
9	3	15	45	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.01	1.23 ft
12	4	15	60	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.56	1.55 ft
15	5	15	75	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.36	1.80 ft
18	6	15	90	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.37	2.01 ft
21	7	15	105	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.55	2.18 ft
24	8	15	120	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.88	2.33 ft
27	9	15	135	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	14.34	2.46 ft
30	10	15	150	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	16.92	2.58 ft
33	11	15	165	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	19.61	2.69 ft
36	12	15	180	563	6,750	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	22.40	2.78 ft
39	13	15	195	563	7,313	563	6,750	563	6,188	563	5,625	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	25.27	2.87 ft
41	14	11	206	563	7,725	563	7,163	563	6,600	563	6,038	563	5,475	563	4,913	563	4,350	563	3,788	563	3,225	563	2,663	563	2,100	563	1,538	563	975	413	413	0	0	27.53	2.26 ft
44	final cover	5	211	563	8,051	563	7,488	563	6,926	563	6,363	563	5,801	563	5,238	563	4,676	563	4,113	563	3,551	563	2,988	563	2,426	563	1,863	563	1,301	413	738	326	326	29.46	1.93 ft
																																			(Σ Sp = 29.50 ft)

Notes:
Primary settlement equation and methodology taken from reference below.
Incremental settlement is the difference of the total primary settlement number and the previous total primary settlement number.

Reference:
Coduto, D.P., *Geotechnical Engineering Principles and Practices,* 1998, pp.435-446.

Zion Landfill - Site 2 North Expansion - Secondary Settlement at Point "W3"
May 2022

Given:	
Waste	**Secondary Settlement Eqtn:** $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))]$ $C_\alpha' = C_\alpha / (1+e_o) = 0.051$, and $e_0 = 0.650$ $C_\alpha' = 0.051$ Maximum waste height = 206 ft. (waste) + 5 ft. (cover) = 211 ft. Cell is divided into fourteen (14) lifts: 13-lifts at 15-ft and 1-lift at 14-ft H_o = height of lifts 1-13 = 15 ft. lift 14 = 11.0 ft. Assume 3 months to complete each lift: t_1 = 0.25 yrs
Final Cover	**Secondary Settlement Eqtn:** $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))]$ $e_o = 0.432$ $C_\alpha = 0.0032$ H_o = height of final cover = 5 feet Assume 3 months to complete construction of final cover
Other Information	Landfill life conservatively assumed = 30 years Post Closure monitoring period = 30 years t_1 = time of pseudo-primary settlement to occur after completion of fill (years) t_2 = time after placed fill and post-closure (years) = (30 + 30 - (Σ t_x))

Lift No.	(A) Total Time in Months to Complete Filling of Lifts	(B) Total Time in Years to Complete Filling of Lifts (Σt_x)	(C) t_1 (yrs)	(D) t_2 (yrs)	t_2 / t_1	S_s (ft)
1	3	0.25	0.25	59.75	239	1.819
2	6	0.50	0.25	59.50	238	1.818
3	9	0.75	0.25	59.25	237	1.817
4	12	1.00	0.25	59.00	236	1.815
5	15	1.25	0.25	58.75	235	1.814
6	18	1.50	0.25	58.50	234	1.812
7	21	1.75	0.25	58.25	233	1.811
8	24	2.00	0.25	58.00	232	1.810
9	27	2.25	0.25	57.75	231	1.808
10	30	2.50	0.25	57.50	230	1.807
11	33	2.75	0.25	57.25	229	1.805
12	36	3.00	0.25	57.00	228	1.804
13	39	3.25	0.25	56.75	227	1.802
14	42	3.50	0.25	56.50	226	1.321
final cover	45	3.75	0.25	56.25	225	0.026
					ΣS_s =	**24.89 ft**

Notes:

(A) = 3 months + time for filling previous lifts

(B) = Col.(A) / 12

(C) = (3 mos.) x (1 yr./12mos.) = 0.25

(D) = 30 + 30 - Col.(B)

Secondary settlement equation for waste taken from reference below.

Values for final cover "c_α" and e_o determined from laboratory test data.

Reference:

Yee, K., Menard Geosystems, Lumpur, K., *Upgrading of Existing Landfills by Dynamic Consolidation - A Geotechnical Aspect*, Technical Paper in Master Builders Journal, Sept.1999.

Zion Landfill - Site 2 North Expansion - Primary Settlement at Point "W4"
May 2022

Given:	
Primary Settlement Eqtn.	$S_p = [H \times C_c(\log(\sigma'_{zo} + \sigma'_{zf}) / \sigma'_{zo}))] / (1+e_o)$
	$C_c' = C_c/(1+e_o)$ $C_c' = 0.172$ H_{waste} = height of waste fill lift Maximum waste height = 136.7 feet Cell is divided into ten (10) waste lifts: 9-lifts at 15-ft ea., and 10th lift at 1.7-ft $\gamma_{waste\ (pcf)}$ = 75 Each lift takes 3 months to complete
Final Cover	$H_{final\ cover}$ (ft) = 5 $\gamma_{final\ cover}$ (pcf) = 130.3 Assume 3 months to complete construction of final cover
Stresses	σ'_{zo} = initial effective stress (psf) σ'_{zf} = final effective stress (psf)
Other Information	Each lift takes 3 months to complete (conservative) Life of landfill is assumed to be 30 years

Placement of Lift (mos.)	Lift No.	Depth of Waste Fill Lift (ft)	Total Depth of Waste Fill (ft)	Mid-Lift Stresses (psf) Lift 1		Lift 2		Lift 3		Lift 4		Lift 5		Lift 6		Lift 7		Lift 8		Lift 9		Lift 9		Final Cover		Total Primary Settlement "S_p" (ft)	Incremental Primary Settlement "S_p" (ft)
				σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}	σ'_{zo}	σ'_{zf}		
3	1	15	15	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
6	2	15	30	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	0.78 ft
9	3	15	45	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.01	1.23 ft
12	4	15	60	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.56	1.55 ft
15	5	15	75	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	5.36	1.80 ft
18	6	15	90	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	7.37	2.01 ft
21	7	15	105	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	9.55	2.18 ft
24	8	15	120	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	11.88	2.33 ft
27	9	15	135	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	14.34	2.46 ft
30	10	1.7	136.7	563	5,126	563	4,564	563	4,001	563	3,439	563	2,876	563	2,314	563	1,751	563	1,189	563	626	64	64	0	0	14.69	0.35 ft
33	final cover	5	141.7	563	5,452	563	4,890	563	4,327	563	3,765	563	3,202	563	2,640	563	2,077	563	1,515	563	952	64	390	326	326	16.46	1.76 ft (Σ Sp = 16.46ft)

Notes:
Primary settlement equation and methodology taken from reference below.
Incremental settlement is the difference of the total primary settlement number and the previous total primary settlement number.

Reference:
Coduto, D.P., *Geotechnical Engineering Principles and Practices,* 1998, pp.435-446.

APTIM

Zion Landfill - Site 2 North Expansion - Secondary Settlement at Point "W4"
May 2022

Given:	
Waste	**Secondary Settlement Eqtn: $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))$**
	$C_\alpha' = C_\alpha / (1+e_o) = 0.051$, and $e_0 = 0.650$
	$C_\alpha' = 0.051$
	Maximum waste height = 136.7 ft. (waste) + 5 ft. (cover) = 141.7 ft.
	Cell is divided into ten (10) lifts: 9-lifts at 15-ft and 1-lift at 1.7-ft
	H_o = height of lifts 1-9 = 15 ft. lift 10 = 1.7 ft.
	Assume 3 months to complete each lift: t_1 = 0.25 yrs
Final Cover	**Secondary Settlement Eqtn: $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))$**
	e_o = 0.432
	C_α = 0.0032
	H_o = height of final cover = 5 feet
	Assume 3 months to complete construction of final cover
Other Information	Landfill life conservatively assumed = 30 years
	Post Closure monitoring period = 30 years
	t_1 = time of pseudo-primary settlement to occur after completion of fill (years)
	t_2 = time after placed fill and post-closure (years) = (30 + 30 - ($\sum t_x$))

Lift No.	(A) Total Time in Months to Complete Filling of Lifts	(B) Total Time in Years to Complete Filling of Lifts ($\sum t_x$)	(C) t_1 (yrs)	(D) t_2 (yrs)	t_2 / t_1	S_s (ft)
1	3	0.25	0.25	59.75	239	1.819
2	6	0.50	0.25	59.50	238	1.818
3	9	0.75	0.25	59.25	237	1.817
4	12	1.00	0.25	59.00	236	1.815
5	15	1.25	0.25	58.75	235	1.814
6	18	1.50	0.25	58.50	234	1.812
7	21	1.75	0.25	58.25	233	1.811
8	24	2.00	0.25	58.00	232	1.810
9	27	2.25	0.25	57.75	231	1.808
10	30	2.50	0.25	57.50	230	0.205
final cover	33	2.75	0.25	57.25	229	0.026
					$\sum S_s$ =	**16.56 ft**

Notes:

(A) = 3 months + time for filling previous lifts

(B) = Col.(A) / 12

(C) = (3 mos.) x (1 yr./12mos.) = 0.25

(D) = 30 + 30 - Col.(B)

Secondary settlement equation for waste taken from reference below.

Values for final cover "c✂" and e_o determined from laboratory test data.

Reference:

Yee, K., Menard Geosystems, Lumpur, K., *Upgrading of Existing Landfills by Dynamic Consolidation - A Geotechnical Aspect* , Technical Paper in Master Builders Journal, Sept.1999.

Zion Landfill - Site 2 North Expansion - Primary Settlement at Point "W5"
May 2022

Given:	
Primary Settlement Eqtn.	$S_p = [H \times C_c(\log(\sigma'_{zo} + \sigma'_{zf}) / \sigma'_{zo}))] / (1+e_o)$
	$C_c' = C_c/(1+e_o)$ $C_c' =$ **0.172** $H_{waste} =$ height of waste fill lift Maximum waste height = 136.7 feet Cell is divided into ten (10) waste lifts: 9-lifts at 15-ft ea., and 10th lift at 1.7-ft $\gamma_{waste\ (pcf)} = 75$ Each lift takes 3 months to complete
Final Cover	$H_{final\ cover}$ (ft) = 5 $\gamma_{final\ cover}$ (pcf) = 130.3 Assume 3 months to complete construction of final cover
Stresses	σ'_{zo} = initial effective stress (psf) σ'_{zf} = final effective stress (psf)
Other Information	Each lift takes 3 months to complete (conservative) Life of landfill is assumed to be 30 years

Placement of Lift (mos.)	Lift No.	Depth of Waste Fill Lift (ft)	Total Depth of Waste Fill (ft)	Mid-Lift Stresses (psf) Lift 1 σ'_{zo}	Lift 1 σ'_{zf}	Lift 2 σ'_{zo}	Lift 2 σ'_{zf}	Lift 3 σ'_{zo}	Lift 3 σ'_{zf}	Lift 4 σ'_{zo}	Lift 4 σ'_{zf}	Lift 5 σ'_{zo}	Lift 5 σ'_{zf}	Lift 6 σ'_{zo}	Lift 6 σ'_{zf}	Lift 7 σ'_{zo}	Lift 7 σ'_{zf}	Lift 8 σ'_{zo}	Lift 8 σ'_{zf}	Lift 9 σ'_{zo}	Lift 9 σ'_{zf}	Lift 10 σ'_{zo}	Lift 10 σ'_{zf}	Final Cover σ'_{zo}	Final Cover σ'_{zf}	Total Primary Settlement "S_p" (ft)	Incremental Primary Settlement "S_p" (ft)
3	1	15	15	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
6	2	15	30	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.78	0.78 ft
9	3	15	45	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.01	1.23 ft
12	4	15	60	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.56	1.55 ft
15	5	15	75	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	0	0	5.36	1.80 ft
18	6	15	90	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	0	0	7.37	2.01 ft
21	7	15	105	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	0	0	9.55	2.18 ft
24	8	15	120	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	0	0	11.88	2.33 ft
27	9	15	135	563	5,063	563	4,500	563	3,938	563	3,375	563	2,813	563	2,250	563	1,688	563	1,125	563	563	0	0	0	0	14.34	2.46 ft
30	10	1.7	136.7	563	5,126	563	4,564	563	4,001	563	3,439	563	2,876	563	2,314	563	1,751	563	1,189	563	626	64	64	0	0	14.69	0.35 ft
39	final cover	5	141.7	563	5,452	563	4,890	563	4,327	563	3,765	563	3,202	563	2,640	563	2,077	563	1,515	563	952	64	390	326	326	16.46	1.76 ft
																											(Σ Sp = 16.46 ft)

Notes:
Primary settlement equation and methodology taken from reference below.
Incremental settlement is the difference of the total primary settlement number and the previous total primary settlement number.

Reference:
Coduto, D.P., *Geotechnical Engineering Principles and Practices,* 1998, pp.435-446.

APTIM

Zion Landfill - Site 2 North Expansion - Secondary Settlement at Point "W5"
May 2022

Given:	
Waste	**Secondary Settlement Eqtn:** $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))$ $C_\alpha' = C_\alpha / (1+e_o) = 0.051$, and $e_0 = 0.650$ $C_\alpha' = 0.051$ Maximum waste height = 136.7 ft. (waste) + 5 ft. (cover) = 141.7 ft. Cell is divided into ten (10) lifts: 9-lifts at 15-ft and 1-lift at 1.7-ft H_o = height of lifts 1-9 = 15 ft. lift 10 = 1.7 ft. Assume 3 months to complete each lift: t_1 = 0.25 yrs
Final Cover	**Secondary Settlement Eqtn:** $S_s = [(C_\alpha) / (1+e_o)] * (H_o) * (\log (t_2 / t_1))$ $e_o = 0.432$ $C_\alpha = 0.0032$ H_o = height of final cover = 5 feet Assume 3 months to complete construction of final cover
Other Information	Landfill life conservatively assumed = 30 years Post Closure monitoring period = 30 years t_1 = time of pseudo-primary settlement to occur after completion of fill (years) t_2 = time after placed fill and post-closure (years) = (30 + 30 - ($\sum t_x$))

Lift No.	(A) Total Time in Months to Complete Filling of Lifts	(B) Total Time in Years to Complete Filling of Lifts ($\sum t_x$)	(C) t_1 (yrs)	(D) t_2 (yrs)	t_2 / t_1	S_s (ft)
1	3	0.25	0.25	59.75	239	1.819
2	6	0.50	0.25	59.50	238	1.818
3	9	0.75	0.25	59.25	237	1.817
4	12	1.00	0.25	59.00	236	1.815
5	15	1.25	0.25	58.75	235	1.814
6	18	1.50	0.25	58.50	234	1.812
7	21	1.75	0.25	58.25	233	1.811
8	24	2.00	0.25	58.00	232	1.810
9	27	2.25	0.25	57.75	231	1.808
10	30	2.50	0.25	57.50	230	0.205
final cover	33	2.75	0.25	57.25	229	0.026
					$\sum S_s$ =	**16.56 ft**

Notes:

(A) = 3 months + time for filling previous lifts

(B) = Col.(A) / 12

(C) = (3 mos.) x (1 yr./12mos.) = 0.25

(D) = 30 + 30 - Col.(B)

Secondary settlement equation for waste taken from reference below.

Values for final cover "c✂" and e_o determined from laboratory test data.

Reference:

Yee, K., Menard Geosystems, Lumpur, K., *Upgrading of Existing Landfills by Dynamic Consolidation - A Geotechnical Aspect* , Technical Paper in Master Builders Journal, Sept.1999.

Published Technical References

UPGRADING OF EXISTING LANDFILLS BY DYNAMIC CONSOLIDATION A GEOTECHNICAL ASPECT

Ir Kenny Yee, Menard Geosystems Sdn Bhd, Kuala Lumpur

ABSTRACT: In recent years, the scarcity of land space available for new urban development has prompted a renewed interest from local authorities in the end use of various landfills or in the extension of the life of existing landfills. Rehabilitation of closed landfills for urban developments has received considerable interest. Likewise, the extension of landfill life to allow for more waste storage is also receiving equal attention. In both cases, ground improvement is required.

Dynamic consolidation (also known as dynamic compaction) is a ground improvement technique. The process involves dropping heavy weights (15ton - 20tons) on to the surface of the fill from a considerable height (15m - 20m) following a selected grid pattern. These high-energy impacts produce sufficient compaction effort to reduce void space, increase density and reduce long-term settlement of the fill. By increasing the density, it increases the storage capacity of the landfill. Beside, it also increases the bearing capacity. Reducing the long-term settlement, roads, parking bays and lighter structures can be designed on shallow foundations on closed landfills.

In this paper, the subject of settlement of waste fills is addressed. A case study concerning a housing development over a landfill is also presented.

1.0 INTRODUCTION

Landfilling is one of the most economic and feasible means of disposing municipal solid waste in Malaysia and other countries in Southeast Asia. In the past, the disposal of waste fills was carried out by uncontrolled dumping into ex-mining ponds and low-lying areas close to housing estates. With increasing scarcity of land in urban areas, it is increasingly difficult to find new landfill sites for future dumping. This has prompted the local authorities and privatized companies (operators of landfill) to find solution to extend the life of the landfill to allow for more waste storage.

Typical landfills may occupy an area ranging from several acres to hundreds of acres. Settlement estimation is a topic of concern. From the operator's viewpoint, landfill capacity will be increased if most settlement occurs during the stage of filling. Unfortunately, the landfill settlement continues over an extended period of time with a final settlement that can be as large as 30%-40% of the initial fill height (H.I.Ling, et.al. 1998). Hence, it is imperative that a solution is needed to increase the rate of settlement to recover the additional space.

Dynamic consolidation is a good method of compacting refuse and waste fill. This technique involves dropping heavy weights (15 – 20 tons) on to the surface of the fill from a height of 10 to 20m following a selected grid pattern. The high-energy impacts produce shock waves that propagate to great depths (figure 1). As a result, the density of the waste fill is increased and hence, the storage capacity of the landfill is also increased.

With the increase in the density of the waste fill, the overall bearing capacity is improved. The long-term settlement is reduced and hence, the differential settlement is also reduced which is important for the integrity of the cover system when the landfill is closed. In the past such landfills have been considered suitable only for green areas. With the increasing scarcity of land in urban areas, it is making it necessary to build structures above such fills. Charles et.al. (1981) report several case histories of construction on old refuse tips, which include construction of a 2-storey hospital, roads and highways. Welsh (1983) cites a roadway site with 6m to 12m of waste fills. Mènard (1984) cites a case for a warehouse designed with floor loads of 20 kN/m^2 and spread footing with 145 kN/m^2 with 6m to 17m of refuse waste. There are many other recorded and published case studies on such developments (e.g. Aziz & Mohd. Raihan (992), Downie & Treharne (1979), Faisal, K.Yee & Varaksin (1997), Fryman & Baker (1987), Lewis & Langer (1994), Mappleback & Fraser (1993), Steinberg & Lukas (1984), etc.).

In this paper, the subject of settlement of waste fills and rehabilitation of landfill for housing development is presented. Only the geotechnical aspect is covered. The related environmental issue has been intentionally left out due to space constraint.

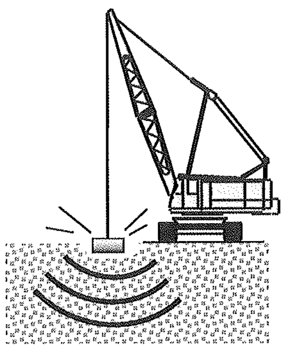

Figure 1

2.0 COMPOSITION OF LANDFILL

Most landfills are heterogeneous and they exhibit anisotropic material properties that are difficult to characterize. Typically, a landfill consists of food and garden wastes, paper products, plastics and rubber, textiles, wood, ashes and the soils used as cover material. Table 1 shows the various components of waste fills with their range of unit weights. The unit weight and void ratio vary with the types of waste, composition, depth, method of compaction and the rate of decomposition, among other factors. The rate of decomposition is further complicated by several factors including the effects of time, temperature and environmental conditions. In short, it is a combination of all of the problems of soft clay, uncompacted fill, organic consolidation and decomposition and even collapse of cavities and erosion of soil into cavities. It is as heterogeneous as the modern industrial-urban complex that produces it. Hence, its composition varies from community to community and from nation to nation. Thus, the waste properties can be considered as site-specific.

Two different forms of landfill can be defined. The uncontrolled dump is of random composition, dumped loosely from trucks, accumulated without control or compaction, and sometimes covered with a thin layer of soil when it reached its capacity (see figure 2a). At the other end, it is the well-managed sanitary landfill. The materials are spread in layers and compacted by bulldozers and compactors. In some cases, certain wastes such as tires are segregated from others (see figure 2b). Most of the old landfills are the uncontrolled dumps. Until recently, through privatization scheme the landfill operation follows the engineered landfill scheme. Thus, it is expected that developments over old landfills will require more engineering effort.

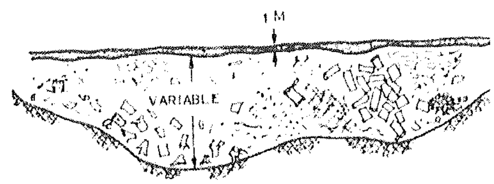

Figure 2(a)
Uncontrolled Landfill (No controlled placement and no compaction)

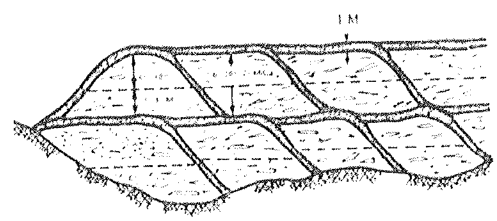

Figure 2(b)
Controlled Sanitary Landfill (Spread and compacted in layers of 2-3m thick; encapsulated with soil in cells of 2-6m thick)

3.0 SETTLEMENT CHARACTERISTICS

Settlement is the major problem with landfills. Sowers (1972) cites a case of a small shopping center built over a landfill. The buildings are on piles driven through the waste fills. The building walls and roof have remained intact. However, floor slabs supported directly on the fill surface have settled as much as 75mm. The floor slabs were connected to the pile-supported exterior grade beams, but was not connected to the interior columns. As a result, the floor drapes downward from the exterior walls toward the interior of the building. Small interior partitions resting directly on the floor have cracked badly and doorframes have been wrecked out of shape.

Table 1 (source: After Tchobanoglous et. al. 1977)

Waste Component	Uncompacted Unit Weight (kN/m^3)	Water Content	Ratio of Compacted to Uncompacted Unit Weight	
			Normal Compaction	Well Compacted
Food waste	1.3 – 4.7	50 – 80	2.9	3.0
Paper / paper board	0.3 – 1.3	4 – 10	4.5	6.2
Plastics	0.3 – 1.3	1 – 4	6.7	10
Textiles	0.3 – 0.9	6 – 15	5.6	6.7
Rubber and leather	0.9 – 2.5	1 – 12	3.3	3.3
Yard waste	0.6 – 2.2	30 – 80	4	5
Wood	1.3 – 3.1	15 – 40	3.3	3.3
Glass	1.6 – 4.7	1 – 4	1.7	2.5
Metals	0.5 – 11.0	2 – 6	4.3	5.3
Ash, brick, dirt	3.1 – 9.4	6 - 12	1.2	1.3

Furthermore, settlement has increased since then, probably due to a change in the moisture environment from leaking sewers in the fill.

There are two possible approaches to the assessment of settlement:

(a) Extrapolation of monitored data obtained specifically for the given fill
  1) By graphical method
  2) By analytical method

(b) Estimation from existing published data on similar type of fills
  1) By graphical method
  2) By analytical method

Method (a) is the most reliable but requires time for monitoring. This method relies on the approximately linear relationship between settlement and logarithm of time elapsed since placement of waste fill. Method (b) relies on published data for other fills of similar type, and gives approximate answers quickly. However, the results are less dependable since the published data are rarely likely to apply exactly to a specific given fill. Preliminary estimates obtained by method (b) should be checked by monitoring. We shall address the different categories of settlement as follow:

3.1 Settlement Under Self-Weight

One of the contributing factors to the overall settlement is caused by the self-weight of the fill. The time-settlement relationship under self-weight is analogous to the secondary compression of soils after a short period of pseudo-primary settlement, typically, 1 to 4 months long. Measurements taken from past records indicate a coefficient of secondary compression ranging from 0.1 to 0.4 (NAVFAC, 1983). Thus, settlement of the waste fills under its self-weight after completion of filling can be estimated by equation (1) below.

$$(\Delta \mathbf{H})_{sw} = \mathbf{H}\, \mathbf{C}_{\alpha} \log (t_2 / t_1) \quad \ldots\ldots\ldots \quad (1)$$

where

$(\Delta H)_{sw}$ = self-weight settlement at time t_2 (m)
H = thickness of waste fill (m)
t_1 = time pseudo-primary settlement to occur after completion of fill (years)
t_2 = time after completion of fill (years)
C_{α} = coefficient of secondary compression

Table 2 below suggests typical self-weight settlements. According to Leach & Goodger (1991), a good compaction can reduce the self-weight settlement potential by between 50% and 75%.

Typical unit weights for municipal waste are summarized in Table 3.

Table 4 below shows the unit weights obtained from various landfills sites.

3.2 Settlement Under External Loads

The time-settlement behavior of an old waste fills under an applied load is analogous to the behavior of peat. As load is placed large primary (mechanical) settlements occur rapidly with little or no pore pressure build up. This is followed by secondary compression, which occurs over a long period of time.

The relation of the imposed stress to settlement can be expressed as follow:

$$(\Delta \mathbf{H})_{p} = \mathbf{H}\, \mathbf{C}_{r} \log (\{\sigma'_{o} + \Delta\sigma'\} / \sigma'_{o}) \quad \ldots\ldots. \quad (2)$$

where

$(\Delta H)_p$ = primary (or mechanical) settlement (m)
H = thickness of waste fill (m)
e_o = initial void ratio

Table 2 (Source: Leach & Goodger (1991) – CIRIA Special Publication 78)

Material	Potential Self-Weight Settlement (expressed as % of depth of fill)
Well-compacted, well-graded sand and gravel	0.5
Well-compacted shale and rockfill	0.5
Medium-compacted rockfill	1
Well-compacted clay	0.5
Lightly compacted clay	1.5
Lightly compacted clay placed in deep layers	1 – 2
Nominally compacted opencast backfill	1.2
Uncompacted sand	3.5
Uncompacted (pumped) clay	12
Well-compacted mixed refuse (waste fill)	30
Well-controlled domestic refuse (waste fill) placed in layers and well compacted	10

Table 3

Description	Average Total Unit Weight γ_T (kN/m^3)	Source
Sanitary Landfill		
• Poor compaction	2.8 – 4.7	Tchobanoglous et.al. (1977)
• Moderate to good compaction	4.7 – 7.1	
• Good to excellent compaction	7.1 – 9.4	
• Baled waste	5.5 – 10.5	
• Shredded and compacted	6.4 – 10.5	
• In situ density	5.5 – 6.9	
Active landfill with leachate mound	6.6	
Household Trash Can	1.1	NAVFAC (1983)
Delivery Truck	2.4	
Sanitary Landfill		
(a) Not shredded		
• Poor compaction	3.1	
• Good compaction	6.3	
• Best compaction	9.4	
Shredded	8.6	
Sanitary Landfill		
• In a landfill	6.9 – 7.5	NSWMA (1985)
After degradation and settlement	9.9 – 11.0	

Table 4

Landfill Sites	Waste Density (kN/m^3)
Old Klang Road, Kuala Lumpur	7.0
Kelana Jaya, Kuala Lumpur	6.0
Merrylands, Sydney[1]	9.4
Thornleigh, Sydney[1]	8.4
Lucas Heights, Sydney[1]	11.3
Albany, New York[2]	7 – 16
Fayetteville, Arkansas[3]	4.8
Richmond, California[4]	7.2

Note: 1 – data obtained from Hausmann et.al (1993)
2 – data obtained from Gifford et.al. (1992)
Note: This is a construction and demolition debris landfill
3 – data obtained from Welsh (1983)
4 – data obtained from Sharma et.al. (1989)

σ'_o = effective overburden pressure (kN/m^2)
$\Delta\sigma'$ = effective imposed stress (kN/m^2)
C_r = compression ratio (= $C_c/1+e_0$)
C_c = compression index

NAVFAC (1983) reports that the primary compression ratio (C_r) ranges from 0.1 to 0.4. Sowers (1972) reports that the compression index (C_c) is related to the initial void ratio as shown in figure 3. The relation can be expressed as follow:

For fills low in organic matters $C_c = 0.15e_o$
For fills high in organic matters $C_c = 0.55e_o$

It is interesting to note that the maximum Cc for peat is about one-third greater than the maximum observed for waste fills.

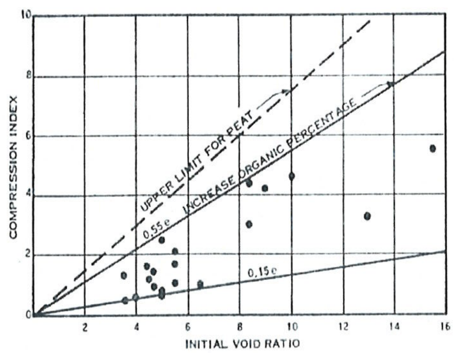

Figure 3

Environmental conditions as well as the composition of the waste fills determine the amount of long-term settlement. This long-term settlement is a combination of mechanical secondary compression, physico-chemical action, and bio-chemical decay. When there is no drastic change in the environment the settlement-log time relationship is more or less linear, similar to secondary compression of soils. The settlement can be expressed by the same equation (1) above. NAVFAC(1983) reported the coefficient of secondary compression (C_α) ranged from 0.02 to 0.07. These values are for fills, which have undergone decomposition for about 10-15 years. Higher compressibility is usually associated with high organic content. It is also true for advanced degree of decomposition.

Sowers (1972) introduces a factor "α" for the long-term settlement. He suggested "α" as a function of the initial void ratio (e_o). This "α" value is high if the organic content subject to decay is large and the environment is favorable (i.e. warm and moist, with fluctuating water table that pumps fresh air into the fill). This value is low for more inert materials and under non-favorable environments. Nonetheless, for any given void ratio there is a large range of values for "α" (see figure 4). The relation can be expressed as follow:

For favorable condition to decay $\alpha = 0.03e_o$
For unfavorable condition to decay $\alpha = 0.09e_o$

This "α" value can be translated to the classical C_α by dividing "α" by $\{1+e_0\}$ i.e. $C_\alpha = \alpha/\{1+e_0\}$.

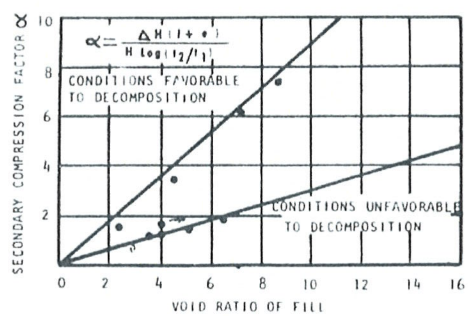

Figure 4

Other calculation methods include the use of a rheological model as presented in the Gibson and Lo theory or the power creep law. The power creep law provides a better representation of the field measured settlement data than the rheological model. However, the rheological model has parameters that can be assigned physical meaning and reflect the effects of certain refuse placement conditions. The details are not presented in this paper.

4.0 DIFFERENTIAL SETTLEMENT & DESIGN MEASURES

There are too many uncertainties for accurate prediction of differential settlement on waste fills. In this case, recourse should be made to the generally accepted rule in engineering practice that, in uniform ground, differential movement will not exceed 75% of the total overall

NOTES ON PRIMARY/INITIAL COMPRESSION OF MSW

Settlement of MSW generally occurs in three phases: initial compression, primary compression, and secondary compression. Initial and primary compression occur rapidly due to the open structure and high hydraulic conductivity of MSW (10^{-3} to 10^{-5} cm/s) and are difficult to separate. Consequently, initial and primary compression usually are grouped together. Secondary compression occurs over longer time frames and is caused by mechanical creep and biological decay. From the perspective of operations and maintenance planning after closure, secondary compression is the most important settlement process. Sowers (1973) indicates that primary compression is normally complete within 30 d and Sharma and De (2007) indicate that 3-4 months is typically assumed in practice. Bjarngard and Edgers (1990) analyzed 24 case histories and reported that primary compression was complete within the first two days following loading.

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FOUNDATIONS AND EARTH RETAINING STRUCTURES

MUNI BUDHU

Layer 2

$$E_u \text{ at top of layer} = 10{,}000\,\text{kPa},\ E_u \text{ at bottom of layer} = 30{,}000\,\text{kPa}$$

$$(E_u)_{avg} = \frac{10{,}000 + 30{,}000}{2} = 20{,}000\,\text{kPa}$$

Step 3: Find weighted harmonic mean E_u.

$$E_u = \frac{2(6000) + 1(20{,}000)}{3} = 10{,}667\,\text{kPa}$$

Step 4: Find shape parameter $\frac{A_b}{L_1^2}$.

$$A_b = (3 \times 4) + (8 \times 6) + (3 \times 4) = 72\,\text{m}^2, \quad \frac{A_b}{L_1^2} = \frac{72}{12^2} = 0.5$$

Step 5: Find shape, embedment, and wall factors.

$$\mu_s = 0.45(0.5)^{-0.38} = 0.59, \quad \mu_{emb} = 1 - 0.08\frac{4}{10}\left(1 + \frac{4}{3} \times 0.5\right) = 0.94$$

$$A_w = \text{perimeter} \times \text{depth} = (3+4+3+4+4+3+4+5+6+8) \times 4 = 176\,\text{m}$$

$$\frac{A_w}{A_b} = \frac{172}{72} = 2.44, \quad \mu_{wall} = 1 - 0.16(2.44)^{0.54} = 0.74$$

Step 6: Calculate immediate settlement.

$$\rho_e = \frac{2Q_a}{E_u L_1}\left(1 - \nu_u^2\right)\mu_s\mu_{emb}\mu_{wall} = \frac{2 \times 5000}{10667 \times 12}(1 - 0.45^2) \times 0.59 \times 0.94 \times 0.74 = 0.026\,\text{m} = 26\,\text{mm}.$$ ■

7.7.2 Primary Consolidation Settlement

Primary consolidation settlement for fine-grained soils is normally estimated from parameters deduced from the one-dimensional consolidation test. In using the parameters from the one-dimensional consolidation test, you are assuming (1) vertical uniform strain only (lateral strain is zero), (2) no settlement occurs from shear stresses, (3) saturated soil, (4) the initial excess porewater pressure is equal to the change in applied stress at the instant the load is applied, and (5) excess porewater pressures are dissipated only vertically. In practice, lateral strains are significant except when the ratio of the layer thickness to lateral dimension of the loaded area is small (approaches zero). Shear stresses also cause settlement and excess porewater pressures can dissipate not only in the vertical but in any direction.

The initial excess porewater pressure is equal to the change in vertical stress at the instant the vertical stress is applied is possible only if the lateral stresses are equal to the vertical stresses. If the lateral strains are zero, then under undrained conditions (at the instant the load is applied), the vertical settlement is zero.

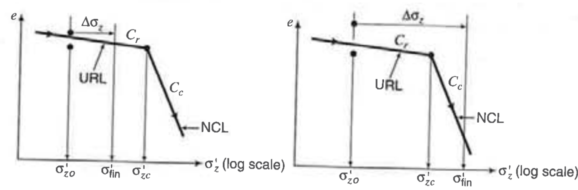
Normally Consolidated Clays The primary consolidation settlement for normally consolidated soils (OCR = 1) occurs solely along the compression line (NCL) and is given as

$$\rho_{pc} = H\frac{\Delta e}{1 + e_o} = \frac{H}{1 + e_o}C_c \log\frac{\sigma'_{fin}}{\sigma'_{zo}}; \quad \text{OCR} = 1 \tag{7.49}$$

where H is the thickness of the soil layer, $\Delta e = C_c \log\frac{\sigma'_{fin}}{\sigma'_{zo}}$, C_c is the compression index, $e_o(e_o = wG_s)$ is the initial void load ratio, $\sigma'_{fin} = \sigma'_{zo} + \Delta\sigma_z$, σ'_{zc} is the preconsolidation vertical effective stress, and $\Delta\sigma_z$ is the increase in vertical stress at the center of the layer.

Overconsolidated Clays If the soil were overconsolidated, we would have to consider two cases depending on the magnitude of $\Delta\sigma_z$ (Fig. 7.16). In the first case (Fig. 7.16a), the increase in $\Delta\sigma_z$ is such that $\sigma'_{fin} = \sigma'_{zo} + \Delta\sigma_z$ is less than the preconsolidation vertical effective stress, σ'_{zc}. In this case, consolidation occurs along the *unloading reloading line* (URL), and

$$\rho_{pc} = \frac{H}{1 + e_o}C_r \log\frac{\sigma'_{fin}}{\sigma'_{zo}}; \quad \sigma'_{fin} < \sigma'_{zc} \tag{7.50}$$



(*a*) Case 1: $\sigma'_{zo} + \Delta\sigma_z < \sigma'_{zc}$

(*b*) Case 2: $\sigma'_{zo} + \Delta\sigma_z > \sigma'_{zc}$

FIGURE 7.16 Two cases to consider for calculating primary consolidation settlement of overconsolidated soils.

In case 2 (Fig. 7.16b), the increase in $\Delta\sigma_z$ is such that $\sigma'_{fin} = \sigma'_{zo} + \Delta\sigma'_z$ is greater than σ'_{zc}. In this case, we have to consider two components of settlement—one along the URL and the other along the NCL. The primary consolidation for this case is

$$\rho_{pc} = \frac{H}{1 + e_o}\left(C_r \log\frac{\sigma'_{zc}}{\sigma'_{zo}} + C_c \log\frac{\sigma'_{fin}}{\sigma'_{zc}}\right); \quad \sigma'_{fin} > \sigma'_{zc} \tag{7.51}$$

or

$$\rho_{pc} = \frac{H}{1 + e_o}\left\{C_r \log(\text{OCR}) + C_c \log\frac{\sigma'_{fin}}{\sigma'_{zc}}\right\}; \quad \sigma'_{fin} > \sigma'_{zc} \tag{7.52}$$

Primary Consolidation Settlement Using m_v You can also calculate the primary consolidation settlement using the modulus of compressibility, m_v. However, unlike C_c, which is constant, m_v varies with vertical effective stress levels. You should compute an average value of m_v over the stress range σ'_{zo}

J.5-B Final Cover Geomembrane Strain

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Proj. #: 631020105
Calculated By: ORC Date: 05/2022
Checked By: DAM Date: 05/2022

TITLE: FINAL COVER GEOMEMBRANE STRAIN

Problem Statement:

Determine whether the final cover geomembrane has the required strength to withstand the normal stresses imposed by the waste stabilization process as required by 35 Ill. Admin. Code Section 811.314(b)(3)(B)(ii).

Given:

- ❑ The final cover system design includes slopes of 4H:1V and 10H:1V slopes.
- ❑ Poly-Flex (Manufacturer) product information for 40-mil textured LLDPE geomembrane (refer to attached pages).

Assumptions:

- ❑ The allowable strain for the final cover geomembrane is 30% (manufacturer's specifications).

Calculations:

AutoCAD 2018 was used to determine the maximum differential settlement dimensions that occur based on the initial design final cover slopes and maximum 30% allowable strain. The maximum allowable strain was then calculated using the following equation:

$$\text{Strain } (\varepsilon) = \frac{|\Delta H|}{L_O}$$

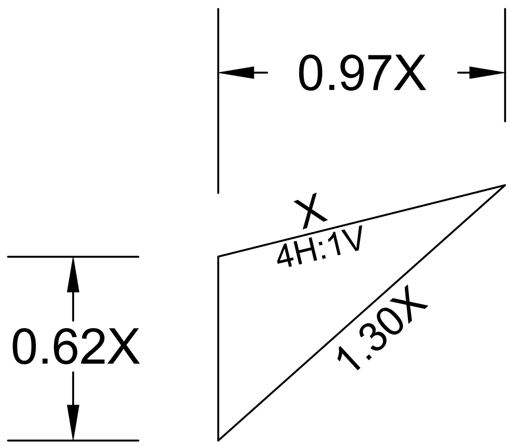
Please see the attached page for the supporting calculations.

Results:

The results indicate that the geomembrane can accommodate a differential settlement of 64% for 4H:1V slopes before reaching its allowable strain limit. A differential settlement of 64% far exceeds the maximum differential settlement that was calculated for the final cover slopes due to waste settlement (please refer to **Appendix J.5-A**). However, the final cover will be routinely observed for differential settlement. The geomembrane will be evaluated for over-stressing in locations where differential settlement exceeds 64%.

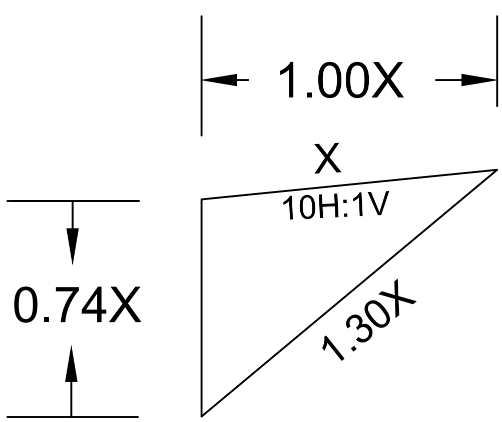
INITIAL 4H:1V SLOPE

MAXIMUM DIFFERENTIAL SETTLEMENT:
dH/dL * 100% = (0.62X) / (0.97X) * 100% = 64%



INITIAL 10H:1V SLOPE

MAXIMUM DIFFERENTIAL SETTLEMENT:
dH/dL * 100% = (0.74X) / (1.00X) * 100% = 74%



NOTES

MAXIMUM DIFFERENTIAL SETTLEMENT IS CALCULATED ASSUMING A MAXIMUM ALLOWABLE GEOMEMBRANE STRAIN OF 30% THIS VALUE IS BASED ON MANUFACTURER'S RECOMMENDATIONS.

APTIM

APTIM Environmental & Infrastructure, LLC

GFL EVERGLADES HOLDINGS, LLC
ZION LANDFILL - SITE 2 NORTH

MAX. ALLOWABLE DIFFERENTIAL SETTLEMENT
BASED ON ALLOWABLE GEOMEMBRANE STRAIN

APPROVED BY:	RDS	PROJ. NO.:	003211	DATE:	FEB. 2020

Published Technical References

TEXTURED LLDPE GEOMEMBRANE
ENGLISH UNITS

POLY·FLEX®
POLYETHYLENE GEOMEMBRANES

Property	Test Method	Minimum Average Values 40 Mil	60 Mil	80 Mil
Thickness, mils	ASTM D 5994			
minimum average		38	57	76
lowest individual of 8 of 10 readings		36	54	72
lowest individual of 10 readings		34	51	68
Asperity Height[1], mils	ASTM D 7466	10	10	10
Sheet Density, g/cc (max.)	ASTM D 1505/D 792	0.939	0.939	0.939
Tensile Properties[2]	ASTM D 6693			
1. Break Strength, lb/in		60	90	120
2. Break Elongation, %		250	250	250
2% Modulus, lb/in^2 (max.)	ASTM D 5323	60,000	60,000	60,000
Tear Resistance, lb	ASTM D 1004	22	33	44
Puncture Resistance, lb	ASTM D 4833	44	66	88
Axi-Symetric Break Strain, %	ASTM D 5617	30	30	30
Carbon Black Content[3], %	ASTM D 1603	2.0 - 3.0	2.0 - 3.0	2.0 - 3.0
Carbon Black Dispersion	ASTM D 5596		--Note 4--	
Oxidative Induction Time (OIT)				
Standard OIT, minutes	ASTM D 3895	100	100	100
Oven Aging at 85°C	ASTM D 5721			
High Pressure OIT - % retained after 90 days	ASTM D 5885	60	60	60
UV Resistance[5]	ASTM D 7238			
High Pressure OIT[6] - % retained after 1600 hrs	ASTM D 5885	35	35	35
Roll Dimensions				
1. Width (feet):		23	23	23
2. Length (feet):		750	500	375
3. Area (square feet):		17,250	11,500	8,625
4. Gross weight (pounds, approx.):		3,465	3,465	3,435

1 Of 10 readings; 8 must be ≥ 7 mils and lowest individual reading must be ≥ 5 mils.
2 Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction. Break elongation is calculated using a gauge length of 2.0 inches.
3 Other methods such as ASTM D 4218 or microwave methods are acceptable if an appropriate correlation can be established.
4 Carbon black dispersion for 10 different views: Nine in Categories 1 and 2 with one allowed in Category 3.
5 The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
6 UV resistance is based on percent retained value regardless of the original HP-OIT value.

J.5-C Final Cover Geocomposite Transmissivity

Client:	Zion Landfill, Inc.		
Project:	Zion Landfill – Site 2 North Expansion		
Project #:	631020105		
Calculated By:	ORC	Date:	05/2022
Checked By:	DAM	Date:	05/2022

TITLE: FINAL COVER GEOCOMPOSITE TRANSMISSIVITY

Problem Statement

Determine whether the 6-oz/yd^2 final cover geocomposite will remain free-draining based on stormwater impingement rates through the final cover.

Given

- ❑ Qian, Xuede et. al, Geotechnical Aspects of Landfill Design and Construction. (Refer to attached pages).
- ❑ Product information sheet from GSE FabriNet 200-mil Geocomposite. (Refer to attached pages).
- ❑ Hydrogeologic Evaluation of Landfill Performance (HELP) model. (see **Appendix K**).
- ❑ Landfill design specifications for layer types and thicknesses.

Assumptions

- ❑ The final cover system includes the following components, from top to bottom:
  - 3-foot protective soil cover (6-inch vegetative soil layer and 2.5-foot protective soil layer)
  - 6-oz/yd^2 double-sided geocomposite drainage layer
  - 40-mil textured LLDPE geomembrane
  - 2-foot final cover barrier soil ($k \leq 1 \times 10^{-5}$ cm/sec)
- ❑ The minimum slope of final landform is 10H:1V (0.10 ft/ft)
- ❑ The maximum daily peak head within final cover over geomembrane is 0.075 in, or 0.00625 ft (see HELP model results for Model 3: 70-years after post-closure care period).
- ❑ The hydraulic conductivity of the final cover soils is assumed to be 4.2×10^{-5} cm/sec (see HELP).
- ❑ The transmissivity of the geocomposite is 0.5 gal/(min*ft) (see attached pages)
- ❑ The total final cover thickness above the geocomposite is 3 feet.
- ❑ Flow rate is determined using Darcy's Law:

$$Q_{FC}=k_s(i)(A)$$

where:
Q_{FC} = flow rate through the final cover soils, ft^3/sec
k_s = hydraulic conductivity of the final cover, ft/sec
i = hydraulic gradient = $(h + D) / D$
h = head of final cover

D = thickness of the final cover above the geocomposite
A = area over which flow occurs, ft^2 (unit area = 1 ft^2)

- Assume that the final cover is saturated and there is no soil suction. Then hydraulic gradient is given by:

$$i = (h + D) / D$$

where:
i = hydraulic gradient
h = head within final cover above geocomposite
D = thickness of the final cover soils above the geocomposite

- The flow rate of the geocomposite may be lower than manufacturer specifications due to clogging and deformation.

$$Q_{allow} = \frac{Q_{GC}}{RF_{IN} * RF_{CR} * RF_{CC} * RF_{BC}}$$

Where:

Q_{allow} = Allowable flow rate after reduction factors
Q_{GC} = Calculated geocomposite flow rate from above rate
RF_{IN} = Reduction factor for elastic deformation
RF_{CR} = reduction factor for creep deformation
RF_{CC} = reduction factor for chemical clogging
RF_{BC} = Reduction factor for biological clogging

The following reduction factors are assumed (RF_{IN} = 1.5, RF_{CR} = 1.4, RF_{CC} = 1.2, and RF_{BC} = 1.5). These value are the upper end values based on testing on geocomposites under normal stresses.

Calculations

1. Determine maximum flow rate through final cover:

$$Q_{FC} = k_s(i)(A) = \frac{k_s A(h+D)}{D} = \frac{(4.2\text{x}10^{-5}\ \text{cm/sec x } 0.033\ \text{ft/cm})(1\ \text{ft}^2)(0.00625\ \text{ft} + 3\ \text{ft})}{3\ \text{ft}} = 1.4\text{x}10^{-6}\ \text{ft}^3/\text{sec}$$

2. Convert transmissivity of geocomposite to ft^3/sec:

$$\text{Transmissivity} = \frac{0.5\ \text{gal}}{\text{min*ft}} \text{x} \frac{1\ \text{ft}^3}{7.48\ \text{gal}} \text{x} \frac{1\ \text{min}}{60\ \text{sec}} = 0.001\ \frac{\text{ft}^2}{\text{sec}}$$

3. Determine maximum flow rate through the geocomposite based on manufacturer data:

$$Q_{GC} = k_{GC}(i)(A) = k_{GC}(i)(wt) = (k_{GC}t)(i)(w) = \Theta_{GC} iw$$

Client:	**Zion Landfill, Inc.**		
Project:	**Zion Landfill – Site 2 North Expansion**		
Project #:	**631020105**		
Calculated By:	**ORC**	**Date:**	**05/2022**
Checked By:	**DAM**	**Date:**	**05/2022**

TITLE: FINAL COVER GEOCOMPOSITE TRANSMISSIVITY

$$Q_{GC} = \Theta_{GC}(i)(A) = (0.001\frac{ft^2}{sec})\ (0.10\frac{ft}{ft})(1ft) = 1.0x10^{-4}\ ft^3/sec$$

where:

Q_{GC} = flow rate through the geocomposite, cm^3/sec
k_{GC} = hydraulic conductivity of the geocomposite, cm/sec
Θ_{GC} = Transmissivity of Geocomposite
i = hydraulic gradient based on slope (ft/ft)
w = flow width (unit width = 1 ft)

4. Apply reduction factors to determine allowable field geocomposite flow rate:

$$Q_{allow} = \frac{Q_{GC}}{RF_{IN}*RF_{CR}*RF_{CC}*RF_{BC}}$$

$$Q_{allow} = \frac{1.0\ x10^{-4}\ ft^3/sec}{1.5\ *1.4\ *\ 1.2\ *1.5} = 2.6x10^{-5}\ ft^3/sec$$

5. Verify that geocomposite has a higher flow rate than the impingement rate through the final cover:

If $Q_{FC} < Q_{allow}$ → Free draining conditions

$1.4x10^{-6}\ ft^3/sec < 2.6x10^{-5}\ ft^3/sec$ → Free draining conditions

Results

The GSE 6 oz/yd^2 double-sided Fabrinet 200-mil Geocomposite will remain free-draining based on the maximum impingement rates through the final cover.

Published Technical References

GEOTECHNICAL ASPECTS *of* LANDFILL DESIGN *and* CONSTRUCTION

Xuede Qian • Robert M. Koerner • Donald H. Gray

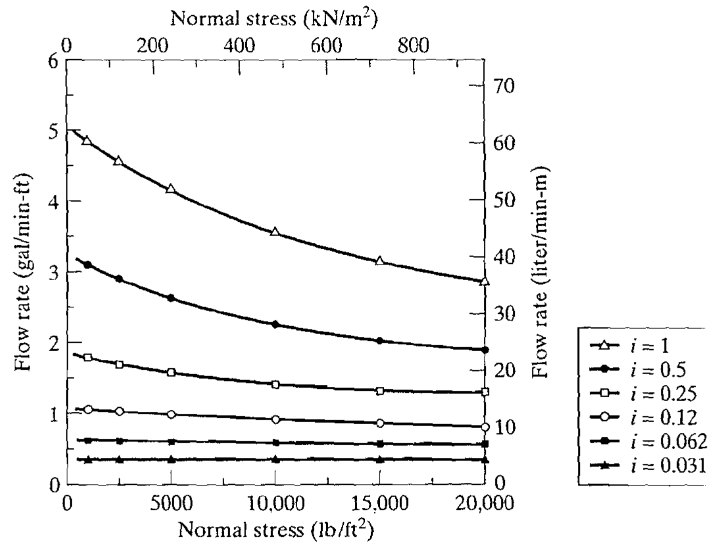


FIGURE 8.10 Flow Rate Behavior of a 0.25-inch (6.3-mm) Geonet Sandwiched between a 16-oz/yd^2 (540-g/m^2) Nonwoven Needle-Punched Geotextile with Clay above and a 60-mil (1.5-mm) HDPE Geomembrane below (USEPA, 1989)

geotextile-geonet system also must be capable of sustaining these loads over time, suggesting that long-term tests (or reduction factors) be required to adequately assess such situations as well.

8.4.3 Allowable Geonet Flow Rate

An allowable flow rate must be extracted from hydraulic testing of the type just described. Accordingly, it is necessary to assess how realistic the test setup is in contrast to the actual field conditions. If it does not model site-specific conditions adequately, then some adjustments to the laboratory value must be made. This is often the case. As mentioned previously, the laboratory-generated index value is treated as an ultimate value, which means that when using ASTM D4716 for flow rate determination, the value must be reduced before used in design. In other words,

$$q_{\text{allowable}} < q_{\text{ultimate}}$$

The recommended way of doing this is to prescribe reduction factors on each of the items not assessed adequately in the laboratory test. For example (Koerner, 1998),

$$q_{\text{allow}} = \frac{q_{\text{ult}}}{RF_{\text{IN}} \times RF_{\text{CR}} \times RF_{\text{CC}} \times RF_{\text{BC}}} \tag{8.17}$$

where q_{ult} = ultimate flow rate determined from ASTM D4716 for short-term index tests between solid plates using water as the transported liquid under laboratory test temperatures;

q_{allow} = allowable flow rate for final design purposes;

TABLE 8.7 Flow Rates and Reduction from Curves of Figures 8.9 and 8.10 (modified from Koerner, 1994)

Normal Stress	Cross Section		Hydraulic Gradient (i)					
			0.03	0.06	0.12	0.25	0.50	1.00
1,000 lb/ft² (48 kN/m²)	HDPE (both sides)	gal/min-m	0.5	0.9	1.5	2.5	4.4	7.5
		liter/min-m	6.2	11.2	18.6	31.1	54.6	93.2
	GT/Clay (one side)	gal/min-m	0.4	0.7	1.1	1.8	3.2	5.0
		liter/min-m	5.0	8.7	13.7	22.4	39.7	62.1
	Difference	gal/min-m	0.1	0.2	0.4	0.7	1.2	2.5
		liter/min-m	1.2	2.5	4.9	8.7	14.9	31.1
	Reduction		20%	22%	30%	28%	28%	33%
5,000 lb/ft² (240 kN/m²)	HDPE (both sides)	gal/min-m	0.5	0.8	1.4	2.3	3.9	6.2
		liter/min-m	6.2	9.9	17.4	28.6	48.4	77.0
	GT/Clay (one side)	gal/min-m	0.4	0.6	1.0	1.6	2.7	4.3
		liter/min-m	5.0	7.5	12.4	19.9	33.5	53.4
	Difference	gal/min-m	0.1	0.2	0.4	0.7	1.2	1.9
		liter/min-m	1.2	2.4	5.0	8.7	14.9	23.6
	Reduction		20%	25%	29%	30%	31%	31%
10,000 lb/ft² (480 kN/m²)	HDPE (both sides)	gal/min-m	0.4	0.8	1.3	2.2	3.8	5.7
		liter/min-m	5.0	9.9	16.1	27.3	47.2	70.8
	GT/Clay (one side)	gal/min-m	0.3	0.6	0.9	1.4	2.3	3.6
		liter/min-m	3.7	7.5	11.2	17.4	28.6	44.7
	Difference	gal/min-m	0.1	0.2	0.4	0.8	1.5	2.1
		liter/min-m	1.3	2.4	4.9	9.9	18.6	26.1
	Reduction		25%	25%	31%	36%	39%	37%
20,000 lb/ft² (960 kN/m²)	HDPE (both sides)	gal/min-m	0.4	0.6	0.9	1.6	2.7	4.3
		liter/min-m	5.0	7.5	11.2	19.9	33.5	53.4
	GT/Clay (one side)	gal/min-m	0.3	0.5	0.8	1.3	1.9	2.8
		liter/min-m	3.7	6.2	9.9	16.1	23.6	34.8
	Difference	gal/min-m	0.1	0.1	0.1	0.3	0.8	1.5
		liter/min-m	1.3	1.3	1.3	3.8	9.9	18.6
	Reduction		25%	17%	11%	19%	30%	35%

RF_{IN} = reduction factor for elastic deformation, or intrusion, of the adjacent geosynthetics into the geonet's core space;
RF_{CR} = reduction factor for creep deformation of the geonet and adjacent geosynthetics into geonet's core space;
RF_{CC} = reduction factor for chemical clogging and/or precipitation of chemicals in the geonet's core space; and
RF_{BC} = reduction factor for biological clogging in the geonet's core space.

Some guidelines as to various reduction factors to be used in different situations are given in Table 8.8. Note that these values are based on preliminary and relatively sparse information. Other reduction factors, such as installation damage, viscosity effects and temperature effects, could also have been incorporated. If needed, they can be included on a site-specific basis. An example problem follows, which illustrates the use of geonets and points out that high factors of safety are warranted in critical situations.

EXAMPLE 8.2

What is the allowable geonet flow rate to be used in the design of a secondary leachate collection (i.e., leak detection) system? Assume that laboratory testing at proper design load and proper hydraulic gradient gave a short-term between-rigid-plate index value of 1.2 gal/min-ft (14.9 liter/min-m).

Solution: Average values from Table 8.8 are used (however, note the large resulting reduction):

$$q_{allow} = \frac{q_{ult}}{RF_{IN} \times RF_{CR} \times RF_{CC} \times RF_{BC}} \tag{8.17}$$

$$= \frac{1.2}{1.75 \times 1.7 \times 1.75 \times 1.75}$$

$$= \frac{1.2}{9.11} = 0.13 \text{ gal/min-ft } (1.6 \text{ liter/min-m})$$

TABLE 8.8 Recommended Preliminary Reduction Factors for Determining Allowable Flow Rate or Transmissivity of Biplanar Geonets (Koerner, 1998)

Application Area	Reduction Factor Values			
	RF_{IN}	RF_{CR}*	RF_{CC}	RF_{BC}
Sport fields	1.0 to 1.2	1.0 to 1.5	1.0 to 1.2	1.1 to 1.3
Capillary break	1.1 to 1.3	1.0 to 1.2	1.1 to 1.5	1.1 to 1.3
Roof and plaza decks	1.2 to 1.4	1.0 to 1.2	1.0 to 1.2	1.1 to 1.3
Retaining walls, seeping rock and soil slopes	1.3 to 1.5	1.2 to 1.4	1.1 to 1.5	1.0 to 1.5
Drainage blankets	1.3 to 1.5	1.2 to 1.4	1.0 to 1.2	1.0 to 1.2
Surface water drains for landfill caps	1.3 to 1.5	1.1 to 1.4	1.0 to 1.2	1.2 to 1.5
Secondary leachate collection (landfill)	1.5 to 2.0	1.4 to 2.0	1.5 to 2.0	1.5 to 2.0
Primary leachate collection (landfill)	1.5 to 2.0	1.4 to 2.0	1.5 to 2.0	1.5 to 2.0

*These values are sensitive to the density of the resin used in the geonet's manufacture. The higher the density, the lower the reduction factor. Creep of the covering geotextile(s) is a product-specific issue.

8.4.4 Designing with Geonets for Drainage

Several design problems and their solutions are presented in this section. The necessary theory for proper understanding of the example problems is summarized at the beginning.

8.4.4.1 Flow Rate Factor of Safety. "Design by Function" requires the formulation of a factor of safety as follows:

$$FS = \frac{\text{Allowable (test) value}}{\text{Required (design) value}}$$

For geonets serving as a drainage medium, the targeted value is flow rate and the above equation can be written as

$$FS = q_{\text{allow}}/q_{\text{reqd}} \qquad (8.18)$$

where q_{allow} = the allowable flow rate; and
q_{reqd} = the required flow rate.

8.4.4.2 Transmissivity. For saturated systems under laminar flow conditions, Darcy's formula can be used to arrive at an alternative to flow rate, namely, the transmissivity. Darcy's formula states that

$$Q = k \cdot i \cdot A = k \cdot i \cdot (w \cdot t) \qquad (8.19)$$

$$Q = (k \cdot t) \cdot i \cdot w = \theta \cdot i \cdot w \text{ and} \qquad (8.20)$$

$$\theta = k \cdot t = Q/(i \cdot w) \qquad (8.21)$$

where Q = the volumetric flow rate, cm^3/sec;
k = the coefficient of permeability, cm/sec;
i = the hydraulic gradient,
A = the flow cross-sectional area, cm^2;
θ = the transmissivity, cm^2/sec;
w = the width, cm; and
t = the thickness, cm.

In a similar manner as the preceding, a factor of safety can be formulated using transmissivity (viz., $FS = \theta_{\text{allow}}/\theta_{\text{reqd}}$). Thus, Q/w and transmissivity carry the same units and are directly related to one another by means of the hydraulic gradient i. At a hydraulic gradient of 1.0, they are numerically identical. At other values of hydraulic gradient, they are not equal. Also note that the system must be saturated and flow must be laminar in order to use transmissivity. When in doubt, it is usually best to use flow rate per unit width.

8.4.4.3 Required Flow Rate. The required flow rate for the leachate drainage layer can be calculated from the equations

$$q_{\text{reqd}} = (r \cdot w \cdot L_{\text{H}})/w \quad \text{(suitable only for square or rectangular cell)} \qquad (8.22)$$

and

$$q_{\text{reqd}} = [r \cdot (L_{\text{H}})_{\max} \cdot dw]/dw \qquad (8.23)$$

PRODUCT DATA SHEET

GSE FabriNet 200 mil Geocomposite

GSE FabriNet geocomposite consists of a 200 mil thick GSE HyperNet geonet heat-laminated on one or both sides with a GSE nonwoven needle-punched geotextile. The geotextile is available in mass per unit area range of 6 oz/yd² to 16 oz/yd². The geocomposite is designed and formulated to perform drainage function under a range of anticipated site loads, gradients and boundary conditions.

[*]

AT THE CORE:
A 200 mil thick HyperNet geonet heat-laminated on one or both sides with a nonwoven needlepunched geotextile.

Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value(1)		
Geocomposite			6 oz/yd²	8 oz/yd²	10 oz/yd²
Transmissivity(2), gal/min/ft, (m²/sec) Double-Sided Composite Single-Sided Composite	ASTM D 4716	1/540,000 ft²	0.5 (1x10⁻⁴) 4.8 (1x10⁻³)	0.5 (1x10⁻⁴) 4.8 (1x10⁻³)	0.4 (9x10⁻⁵) 4.3 (9x10⁻⁴)
Ply Adhesion, lb/in	ASTM D 7005	1/50,000 ft²	1.0	1.0	1.0
Geonet Core(1,3) – GSE HyperNet					
Geonet Core Thickness, mil	ASTM D 5199	1/50,000 ft²	200	200	200
Transmissivity(2), gal/min/ft (m²/sec)	ASTM D 4716		9.6 (2 x 10⁻³)	9.6 (2 x 10⁻³)	9.6 (2 x 10⁻³)
Density, g/cm³	ASTM D 1505	1/50,000 ft²	0.94	0.94	0.94
Tensile Strength (MD), lb/in	ASTM D 7179	1/50,000 ft²	45	45	45
Carbon Black Content, %	ASTM D 4218	1/50,000 ft²	2.0	2.0	2.0
Geotextile(1,3)					
Mass per Unit Area, oz/yd²	ASTM D 5261	1/90,000 ft²	6	8	10
Grab Tensile Strength, lb	ASTM D 4632	1/90,000 ft²	160	220	260
Grab Elongation	ASTM D 4632	1/90,000 ft²	50%	50%	50%
CBR Puncture Strength, lb	ASTM D 6241	1/540,000 ft²	435	575	725
Trapezoidal Tear Strength, lb	ASTM D 4533	1/90,000 ft²	65	90	100
AOS, US sieve(1), (mm)	ASTM D 4751	1/540,000 ft²	70 (0.212)	80 (0.180)	100 (0.150)
Permittivity, sec⁻¹	ASTM D 4491	1/540,000 ft²	1.5	1.3	1.0
Water Flow Rate, gpm/ft²	ASTM D 4491	1/540,000 ft²	110	95	75
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	per formulation	70	70	70
NOMINAL ROLL DIMENSIONS(4)					
Roll Width, ft			14.75	14.75	14.75
Roll Length, ft	Double-Sided Composite Single-Sided Composite		270 300	260 300	230 290
Roll Area, ft²	Double-Sided Composite Single-Sided Composite		3,982 4,425	3,835 4,425	3,392 4,277

NOTES:
- (1) All geotextile properties are minimum average roll values except AOS which is maximum average roll value and UV resistance is typical value. Geonet core thickness is nominal value.
- (2) Gradient of 0.1, normal load of 10,000 psf, water at 70˚F between steel plates for 15 minutes. Contact GSE for performance transmissivity value for use in design.
- (3) Component properties prior to lamination.
- (4) Roll widths and lengths have a tolerance of ±1%.

J.5-D Toe Drain Capacity

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: TOE DRAIN CAPACITY

Problem Statement

Determine whether the 4-inch toe drains (discharge pipe) are sized to drain water that percolates through the final cover and is transmitted downslope through the 6-oz geocomposite.

Given

- ❑ Toe drains are 4-inch diameter polyethylene pipes with smooth interior, sloped at 3%.
- ❑ The toe drains are spaced at 200-foot intervals at the toe of the final cover slope (see **Design Drawings**).
- ❑ The geocomposite is a 6-oz/yd² double-sided geocomposite.
- ❑ Product information sheet from GSE FabriNet 200-mil Geocomposite. (Refer to attached pages).

Assumptions

- ❑ The toe drains (smooth pipes) have a Manning's coefficient of 0.012.
- ❑ The geocomposite has a transmissivty of 0.5 gal/(min*ft) (see attached product information sheet).
- ❑ No flow reduction factors due to deformation of clogging will be applied to the geocomposite (conservative assumption).

Calculations

1) Calculate the maximum flow rate converging on the toe drain based on manufacturer transmissivity values, assuming that flow across the 200-foot wide spacing converges at the same time:

$$\text{Transmissivity} = \frac{0.5\ \text{gal}}{\text{min*ft}} \times \frac{1\ \text{ft}^3}{7.48\ \text{gal}} \times \frac{1\ \text{min}}{60\ \text{sec}} = 0.001\ \frac{\text{ft}^2}{\text{sec}}$$

$$\text{Max Flow Rate} = 200\ \text{ft} \times 0.001\ \frac{\text{ft}^2}{\text{sec}} = 0.20\ \frac{\text{ft}^3}{\text{sec}}$$

2) Determine maximum flow rate with the full flow capacity rate for the 4-inch pipes:

Cross Sectional Area of the 4" diameter pipe: $A = \pi\left(\frac{D^2}{4}\right) = \pi\left(\frac{\left(\frac{4\ \text{inches}}{12\ \text{inches/ft}}\right)^2}{4}\right) = 0.09\ \text{ft}^2$

Wetted Perimeter of pipe: $P = 2\pi\left(\frac{D}{2}\right) = 2\pi\left(\frac{\frac{4\ \text{inches}}{12\ \text{inches/ft}}}{2}\right) = 1.05\ \text{ft}$

Hydraulic Radius: $R_h = \frac{A}{P} = \frac{0.09\ \text{ft}^2}{1.05\ \text{ft}} = 0.09\ \text{ft}$

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: TOE DRAIN CAPACITY

Cross Sectional Velocity (Manning Equation):

$$v = \left(\frac{k_n}{n}\right)(R_h)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where,
k_n = 1.49 for English units
n = Manning's Coefficient of Roughness, 0.012 for a smooth pipe
S = slope, 0.03 ft/ft

$$v = \left(\frac{1.49}{0.012}\right)(0.09\ \text{ft})^{\frac{2}{3}}(0.03\ \text{ft/ft})^{\frac{1}{2}} = 4.32\ \text{ft/sec}$$

$$Q = vA = (4.32\ \text{ft/sec})(0.09\ \text{ft}^2) = 0.39\ \text{ft}^3/\text{sec}$$

3) Compare the maximum rate of flow converging on the toe drain with the full flow capacity of the pipe.

$$0.20\ \frac{\text{ft}^3}{\text{sec}} < 0.39\ \frac{\text{ft}^3}{\text{sec}}$$

Results

The Zion Landfill Site 2 North Expansion has been designed with a toe drain spacing of approximately 200 feet. The results of this calculation indicate that the toe drains will pass the maximum discharge rate through the geocomposite.

Published Technical References

PRODUCT DATA SHEET

GSE FabriNet 200 mil Geocomposite

GSE FabriNet geocomposite consists of a 200 mil thick GSE HyperNet geonet heat-laminated on one or both sides with a GSE nonwoven needle-punched geotextile. The geotextile is available in mass per unit area range of 6 oz/yd^2 to 16 oz/yd^2. The geocomposite is designed and formulated to perform drainage function under a range of anticipated site loads, gradients and boundary conditions.

[*]

AT THE CORE:
A 200 mil thick HyperNet geonet heat-laminated on one or both sides with a nonwoven needlepunched geotextile.

Product Specifications

Tested Property	Test Method	Frequency	Minimum Average Roll Value[1]		
Geocomposite			6 oz/yd^2	8 oz/yd^2	10 oz/yd^2
Transmissivity[2], gal/min/ft, (m^2/sec) Double-Sided Composite Single-Sided Composite	ASTM D 4716	1/540,000 ft^2	0.5 ($1x10^{-4}$) 4.8 ($1x10^{-3}$)	0.5 ($1x10^{-4}$) 4.8 ($1x10^{-3}$)	0.4 ($9x10^{-5}$) 4.3 ($9x10^{-4}$)
Ply Adhesion, lb/in	ASTM D 7005	1/50,000 ft^2	1.0	1.0	1.0
Geonet Core[1,3] – GSE HyperNet					
Geonet Core Thickness, mil	ASTM D 5199	1/50,000 ft^2	200	200	200
Transmissivity[2], gal/min/ft (m^2/sec)	ASTM D 4716		9.6 (2 x 10^{-3})	9.6 (2 x 10^{-3})	9.6 (2 x 10^{-3})
Density, g/cm^3	ASTM D 1505	1/50,000 ft^2	0.94	0.94	0.94
Tensile Strength (MD), lb/in	ASTM D 7179	1/50,000 ft^2	45	45	45
Carbon Black Content, %	ASTM D 4218	1/50,000 ft^2	2.0	2.0	2.0
Geotextile[1,3]					
Mass per Unit Area, oz/yd^2	ASTM D 5261	1/90,000 ft^2	6	8	10
Grab Tensile Strength, lb	ASTM D 4632	1/90,000 ft^2	160	220	260
Grab Elongation	ASTM D 4632	1/90,000 ft^2	50%	50%	50%
CBR Puncture Strength, lb	ASTM D 6241	1/540,000 ft^2	435	575	725
Trapezoidal Tear Strength, lb	ASTM D 4533	1/90,000 ft^2	65	90	100
AOS, US sieve[1], (mm)	ASTM D 4751	1/540,000 ft^2	70 (0.212)	80 (0.180)	100 (0.150)
Permittivity, sec^{-1}	ASTM D 4491	1/540,000 ft^2	1.5	1.3	1.0
Water Flow Rate, gpm/ft^2	ASTM D 4491	1/540,000 ft^2	110	95	75
UV Resistance, % retained	ASTM D 4355 (after 500 hours)	per formulation	70	70	70
NOMINAL ROLL DIMENSIONS[4]					
Roll Width, ft			14.75	14.75	14.75
Roll Length, ft	Double-Sided Composite Single-Sided Composite		270 300	260 300	230 290
Roll Area, ft^2	Double-Sided Composite Single-Sided Composite		3,982 4,425	3,835 4,425	3,392 4,277

NOTES:
- [1] All geotextile properties are minimum average roll values except AOS which is maximum average roll value and UV resistance is typical value. Geonet core thickness is nominal value.
- [2] Gradient of 0.1, normal load of 10,000 psf, water at 70˚F between steel plates for 15 minutes. Contact GSE for performance transmissivity value for use in design.
- [3] Component properties prior to lamination.
- [4] Roll widths and lengths have a tolerance of ±1%.

J.5-E Terrace Berms

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: STABILITY OF TERRACE BERM

Problem Statement

Determine the factor of safety (FS) against slope failure of the terrace berms on the final cover for static and seismic conditions. 35 Ill. Admin. Code Section 811.304 (d) requires that "the waste disposal unit shall be designed to achieve a factor of safety against slope failure of at least: 1.5 for static conditions and 1.3 under seismic conditions."

Given

- ❑ Das, Braja M., *Principles of Geotechnical Engineering*. PWS-Kent, Second Edition, 1990. (Please see attached pages).
- ❑ Design detail of typical terrace berm and final cover included in the design drawings contained in this application.
- ❑ **Appendix J.1** "Summary of Geotechnical Design Parameters" contained in this Application.

Assumptions

- ❑ Assume berm will typically be constructed from the same materials as the final cover soil, which has the following properties:

<u>*Short-term Conditions*</u>		<u>*Long-term Conditions*</u>	
γ_{soil}	= 130.3 pcf	γ'_{soil}	= 130.3 pcf
Φ	= 11.8 degrees	Φ'	= 34.3 degrees
c	= 1,465 psf	c'	= 0 psf

- ❑ The terrace berms for the proposed final cover typically have a 2H:1V slope and will rise approximately 2-feet above the highest common point of the slope.
- ❑ The slope of the final cover side slopes is 4H:1V, therefore β = 14.04 degrees.
- ❑ The horizontal acceleration is 0.0461g.

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: STABILITY OF TERRACE BERM

Calculations

Volume of Terrace Berm per Unit Width

Refer to the attached diagram of the typical terrace berm for dimensions.

Volume of Terrace = (0.5)(20 ft)(10 ft) - (0.5)(20 ft)(5 ft) - (0.5)(4 ft)(2 ft) - (0.5)(6 ft)(3 ft)

Volume of Terrace = 37.0 ft^3 per foot of berm

$$\text{Weight of Terrace (W)} = 37.0\ \frac{ft^3}{ft}(130.3\ pcf) = 4{,}821.1\ lb/ft$$

Static Conditions: Short-term Conditions

The factor of safety under static conditions using the Culmann's Method.

Normal Force (N):

$$N = W\cos\beta = \left(4{,}821.1\frac{lb}{ft}\right)(\cos 14.04°) = 4{,}677.1\ lb/ft$$

Length of Sliding Surface ($\overline{AB}$):

$$\overline{AB} = \frac{H}{\sin\beta} = \frac{5.0\ ft}{\sin(14.04°)} = 20.6\ ft$$

N per length of sliding surface:

$$N' = \frac{N}{\overline{AB}} = \frac{4{,}677.1\ lb/ft}{20.6\ ft} = 227.0\ psf$$

Resisting Force (F_R):

$$F_R = N' \times \tan(\varphi) + c = (227.0\ psf)(\tan 11.8°) + 1{,}465\ psf = 1{,}512.4\ psf$$

Driving Force (F_D):

$$F_D = \frac{W\sin\beta}{\overline{AB}} = \frac{\left(4{,}821.1\frac{lb}{ft}\right)(\sin 14.04°)}{20.6\ ft} = 56.8\ psf$$

Factor of Safety (F.S.):

$$F.S. = \frac{F_R}{F_D} = \frac{1{,}512.4 \text{ psf}}{56.8 \text{ psf}} = 26.6$$

<u>Static Conditions: Long-term Conditions</u>

The factor of safety under static conditions using the Culmann's Method.

Normal Force (N):

$$N = W \cos\beta = \left(4{,}821.1 \frac{\text{lb}}{\text{ft}}\right)(\cos 14.04°) = 4{,}677.1 \text{ lb/ft}$$

Length of Sliding Surface ($\overline{AB}$):

$$\overline{AB} = \frac{H}{\sin\beta} = \frac{5.0 \text{ ft}}{\sin(14.04°)} = 20.6 \text{ ft}$$

N per length of sliding surface:

$$N' = \frac{N}{\overline{AB}} = \frac{4{,}677.1 \text{ lb/ft}}{20.6 \text{ ft}} = 227.0 \text{ psf}$$

Resisting Force (F_R):

$$F_R = N' \times \tan(\varphi) + c = (227.0 \text{ psf})(\tan 34.3°) + 0 \text{ psf} = 154.8 \text{ psf}$$

Driving Force (F_D):

$$F_D = \frac{W \sin\beta}{\overline{AB}} = \frac{\left(4{,}821.1 \frac{\text{lb}}{\text{ft}}\right)(\sin 14.04°)}{20.6 \text{ ft}} = 56.8 \text{ psf}$$

Factor of Safety (F.S.):

$$F.S. = \frac{F_R}{F_D} = \frac{154.8 \text{ psf}}{56.8 \text{ psf}} = 2.73$$

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

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TITLE: STABILITY OF TERRACE BERM

Seismic Conditions: Short-term Conditions

The factor of safety under seismic conditions using the Culmann's Method.

Normal Force (N):

$$N = W\cos\beta - 0.0461\ W\cos\beta$$
$$N = \left(4{,}821.1\frac{lb}{ft}\right)\cos(14.04°) - 0.0461\left(4{,}821.1\frac{lb}{ft}\right)\cos(14.04°)$$
$$N = 4{,}461.5\ lb/ft$$

N per length of sliding surface:

$$N' = \frac{N}{\overline{AB}} = \frac{4{,}461.5\ lb/ft}{20.6\ ft} = 216.6\ psf$$

Resisting force (F_R):

$$F_R = N'\tan(\varphi) + c = (216.6\ psf)(\tan 11.8°) + 1{,}465\ psf = 1{,}510.3\ psf$$

Driving Force (F_D):

$$F_D = \frac{W\sin\beta + 0.0461\ W\cos\beta}{\overline{AB}}$$
$$F_D = \frac{\left(4{,}821.1\frac{lb}{ft}\right)\sin(14.04°) + 0.0461\left(4{,}821.1\ \frac{lb}{ft}\right)\cos(14.04°)}{20.6\ ft}$$
$$F_D = 67.2\ psf$$

Calculation of Safety Factor (F.S.):

$$F.S. = \frac{F_R}{F_D} = \frac{1{,}510.3\ psf}{67.2\ psf} = 22.5$$

Client: Zion Landfill, Inc.
Project: Zion Landfill – Site 2 North Expansion
Project #: 631020105
Calculated By: ORC Date: 05/2022
Checked by: DAM Date: 05/2022

TITLE: STABILITY OF TERRACE BERM

Seismic Conditions: Long-term Conditions

The factor of safety under seismic conditions using the Culmann's Method.

Normal Force (N):

$$N = W\cos\beta - 0.0461W\cos\beta$$

$$N = \left(4{,}821.1\,\frac{\text{lb}}{\text{ft}}\right)(\cos 14.04°) - 0.0461\left(4{,}821.1\,\frac{\text{lb}}{\text{ft}}\right)(\cos 14.04°)$$

$$N = 4{,}461.5\ \text{lb/ft}$$

N per length of sliding surface:

$$N' = \frac{N}{\overline{AB}} = \frac{4{,}461.5\ \text{lb/ft}}{20.6\ \text{ft}} = 216.6\ \text{psf}$$

Resisting force (F_R):

$$F_R = N'\tan(\varphi) + c = (216.6\ \text{psf})(\tan 34.3°) + 0\ \text{psf} = 147.8\ \text{psf}$$

Driving Force (F_D):

$$F_D = \frac{W\sin\beta + 0.0461W\cos\beta}{\overline{AB}}$$

$$F_D = \frac{\left(4{,}821.1\,\frac{\text{lb}}{\text{ft}}\right)\sin(14.04°) + 0.0461\left(4{,}821.1\,\frac{\text{lb}}{\text{ft}}\right)\cos(14.04°)}{20.6\ \text{ft}}$$

$$F_D = 67.2\ \text{psf}$$

Calculation of Safety Factor (F.S.):

$$F.S. = \frac{F_R}{F_D} = \frac{147.8\ \text{psf}}{67.2\ \text{psf}} = 2.20$$

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

Project #: 631020105

Calculated By: ORC Date: 05/2022

Checked by: DAM Date: 05/2022

TITLE: STABILITY OF TERRACE BERM

Results

The terrace berms have been designed to meet the required factor of safety for both static (at least 1.5) and seismic conditions (at least 1.3). In summary:

FACTORS OF SAFETY	
Short-term Conditions	
Static Conditions	Seismic Conditions
26.6	22.5
Long-term Conditions	
Static Conditions	Seismic Conditions
2.73	2.20

Client: Zion Landfill, Inc.

Project: Zion Landfill – Site 2 North Expansion

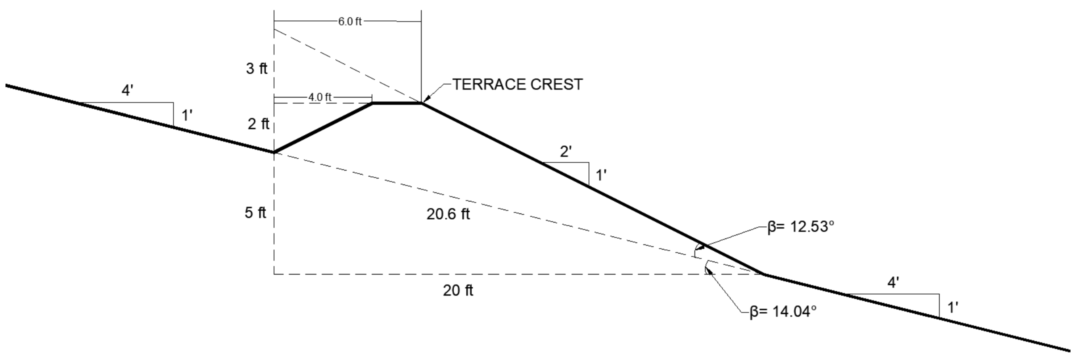
Project #: 631020105

Calculated By: ORC Date: 05/2022

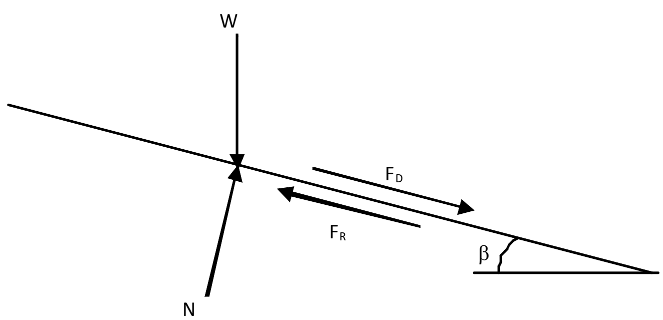
Checked by: DAM Date: 05/2022

TITLE: STABILITY OF TERRACE BERM

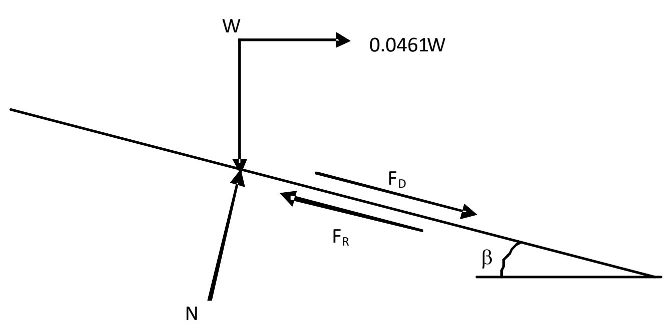
Design Detail for Terrace Berm:



Static Conditions:



Seismic Conditions:

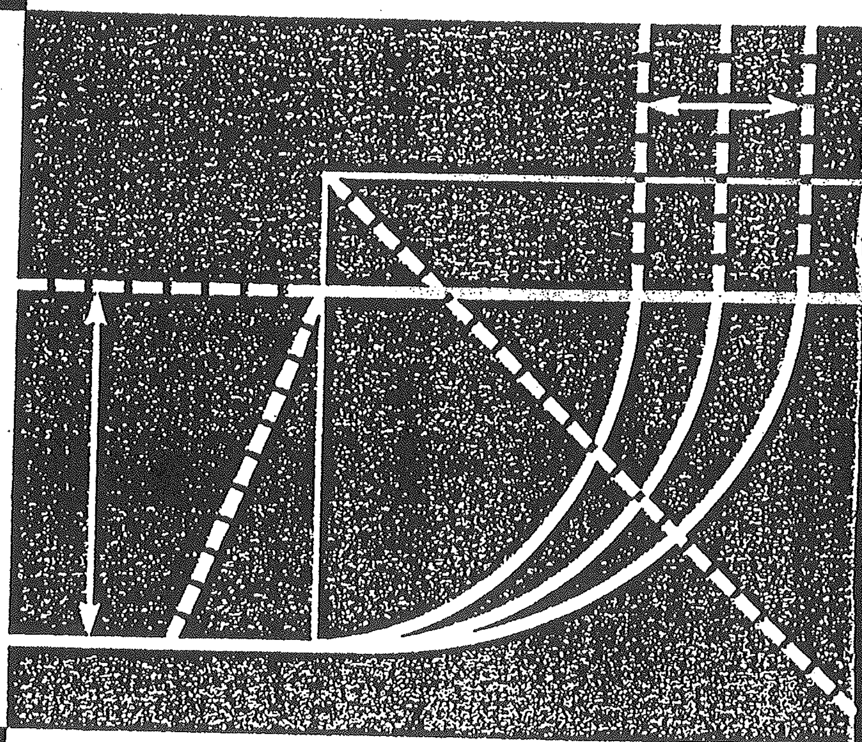


Published Technical References

BRAJA M. DAS

Principles of Geotechnical Engineering

Third Edition



Analysis of Finite Slope with Plane Failure Surface (Culmann's Method)

This analysis is based on the assumption that the failure of a slope occurs along a plane when the average shearing stress tending to cause the slip is more than the shear strength of the soil. Also, the most critical plane is the one that has a minimum ratio of the average shearing stress that tends to cause failure to the shear strength of soil.

Figure 12.5 shows a slope of height H. The slope rises at an angle β with the horizontal. AC is a trial failure plane. Considering a unit length perpendicular to the section of the slope, the weight of the wedge $ABC = W$:

$$W = \frac{1}{2}(H)(\overline{BC})(1)(\gamma)$$

$$= \frac{1}{2}H(H\cot\theta - H\cot\beta)\gamma$$

$$= \frac{1}{2}\gamma H^2\left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right] \tag{12.29}$$

The normal and tangential components of W with respect to the plane AC are as follows:

$$N_a = \text{normal component} = W\cos\theta$$

$$= \frac{1}{2}\gamma H^2\left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right]\cos\theta \tag{12.30}$$

$$T_a = \text{tangential component} = W\sin\theta$$

$$= \frac{1}{2}\gamma H^2\left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right]\sin\theta \tag{12.31}$$

The average normal stress and shear stress on the plane AC may be given by

$$\sigma = \text{average normal stress}$$

$$= \frac{N_a}{(\overline{AC})(1)} = \frac{N_a}{\left(\frac{H}{\sin\theta}\right)}$$

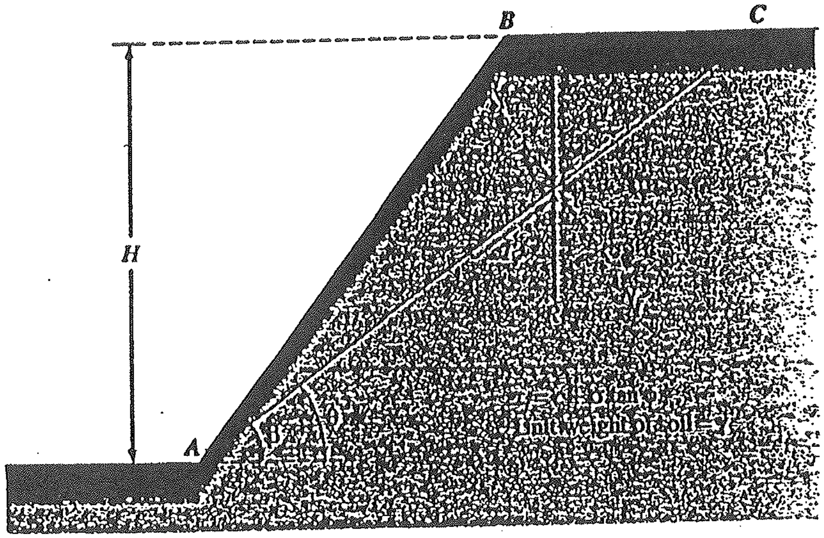
$$= \frac{1}{2}\gamma H\left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right]\cos\theta\sin\theta \tag{12.32}$$

and

$$\tau = \text{average shear stress}$$

$$= \frac{T_a}{(\overline{AC})(1)} = \frac{T_a}{\left(\frac{H}{\sin\theta}\right)}$$

$$= \frac{1}{2}\gamma H\left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right]\sin^2\theta \tag{12.33}$$



▼ **FIGURE 12.5** Finite slope analysis—Culmann's method

The average resistive shearing stress developed along the plane AC may also be expressed as

$$\tau_d = c_d + \sigma \tan \phi_d$$
$$= c_d + \frac{1}{2}\gamma H \left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right]\cos\theta\sin\theta\tan\phi_d \qquad (12.34)$$

Now, from Eqs. (12.33) and (12.34),

$$\frac{1}{2}\gamma H \left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right]\sin^2\theta = c_d + \frac{1}{2}\gamma H \left[\frac{\sin(\beta-\theta)}{\sin\beta\sin\theta}\right]\cos\theta\sin\theta\tan\phi_d \qquad (12.35)$$

or

$$c_d = \frac{1}{2}\gamma H \left[\frac{\sin(\beta-\theta)(\sin\theta - \cos\theta\tan\phi_d)}{\sin\beta}\right] \qquad (12.36)$$

The expression in Eq. (12.36) is derived for the trial failure plane AC. In an effort to determine the critical failure plane, the principle of maxima and minima is used (for a given value of ϕ_d) to find the angle θ where the developed cohesion would be maximum. Thus, the first derivative of c_d with respect to θ is set equal to 0, or

$$\frac{\partial c_d}{\partial \theta} = 0 \qquad (12.37)$$

Since γ, H, and β are constants in Eq. (12.36), we have

$$\frac{\partial}{\partial \theta}\left[\sin(\beta-\theta)(\sin\theta - \cos\theta\tan\phi_d)\right] = 0 \qquad (12.38)$$