Geosyntec consultants

COMPUTATION COVER SHEET

Client: Unisys **Project:** Elmira High School IRM #4 **Project #:** MN0832I **Task #:** 01/01

TITLE OF COMPUTATIONS TEMPORARY SOLDIER PILE RETAINING WALL DESIGN ANALYSIS

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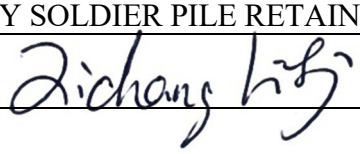
Signature  01/03/2020 DATE
Printed Name and Title: Zichang Li, Engineer

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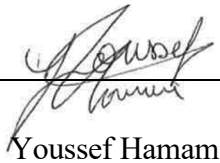
Signature  1/19/2020 DATE
Printed Name and Title: Youssef Hamami, Engineer

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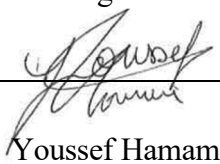
Signature  1/19/2020 DATE
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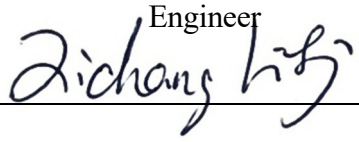
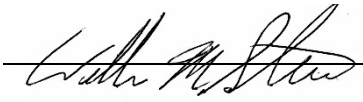
Signature  2/11/2020 DATE
Printed Name and Title: Zichang Li, Engineer

APPROVED BY: (PM or Designate)
Signature  2/12/2020 DATE
Printed Name and Title: William Steier, Senior Engineer

APPROVAL NOTES:

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

TEMPORARY SOLDIER PILE RETAINING WALL DESIGN ANALYSIS

ELMIRA HIGH SCHOOL, ELMIRA, NEW YORK
INTERIM REMEDIAL MEASURE #4 REMEDIAL DESIGN

PURPOSE

The purpose of this calculation package is to provide the design basis and engineering analysis for the soldier pile (and lagging) retaining walls for the Interim Remedial Measure (IRM) #4 remedial design at the Elmira High School (EHS), Elmira, New York. The shoring will provide temporary excavation support during the excavation from the area between the EHS building and the football field to the north. A schematic showing the location and depth of the proposed excavation is presented in Figure 1. As shown in Figure 1, there are two shoring walls to be installed for IRM #4: (i) Wall 1 is composed of two sections adjacent to the school building; and (ii) Wall 2 is located between the football field and the school building.

INPUT DATA

Soil Stratigraphy

The subsurface stratigraphy used for analysis is based on Cross-Sections A-A', B-B' and C-C' from Geosyntec [2015]. The locations of these cross-sections and the extent of excavation analyzed in this calculation package are presented together in Attachment 1. Table 1 provides a summary of the subsurface profile used for this analysis. The current ground surface in the area of the excavation ranges from approximately elevation (El.) of 855 ft to 856 ft above mean sea level (ft-msl).

Table 1. Subsurface Profile.

Subsurface Layer	Top of Layer Elevation (ft-msl)			Idealized Most Critical Cross-Section (ft-msl)
	A-A'	B-B'	C-C'	
Fill (Well Graded Sand)	855	856	855	856 (highest)
Gravel with Silt and Sand	849	846	849	840 (excavated up to 16 ft deep) 849 (excavated up to 7 ft deep)
Groundwater Elevation	838	839	840	840 (highest near the area)
Silty Clay	816	817	810	817
Bedrock (Weathered Shale)	Approximately 790			Approximately 790

Soil Properties

Design soil parameters are based on Geosyntec's interpretation of the in-situ data and lab test results collected by Earth Tech [2003] and SJB Services, Inc. [2012] for borings MW-15D, B-3,

and B-5. Relevant boring logs and laboratory testing results are provided in Attachment 2. Table 2 provides a summary of the soil parameters used in the analysis.

Moist unit weights are estimated using correlations with the corrected Standard Penetration Blow Count [$(N_1)_{60}$] from CalTrans [2014], as shown in Figure 2. The saturated unit weight for the gravel is calculated assuming a void ratio of 0.6 and a specific gravity of 2.65.

Drained strength parameters for granular soils (fill and gravel layers) are developed using correlations to the Standard Penetration Test (SPT) data from Peck et al. [1974], as shown in Figure 3. Drained strength parameters for cohesive soils (silty clay) are chosen based on correlations with Atterberg Limits from U.S. Dept. of Navy [1986] and Ladd et al. [1977], as shown in Figure 4.

Table 2. Soil Parameters Used for Analyses.

Subsurface Layer	Moist Unit Weight, γ_m (pcf)	Saturated Unit Weight, γ_{sat} (pcf)	Rep. PI (%)	Rep. SPT N-value	Rep. SPT $(N_1)_{60}$	Drained Strength Parameters	
						Effective Angle of Internal Friction, φ' (°)	Effective cohesion, c' (psf)
Fill	127	127	-	17	26	32	0
Gravel	116	125	-	16	10	32	0
Silty Clay	115	115	11	7	5	30	0

Note:

Rep. PI = Representative Plastic Index.

Design Cross Sections

The design cross-sections are selected in order to evaluate maximum excavation depth, as well as various combinations of wall loading and excavation support relevant to the site conditions. The analysis includes five (5) representative cross-sections, as summarized in Table 3. The approximate locations of these sections are shown in the plan view on Figure 1.

Table 3. Representative Cross-Sections Analyzed.

Shoring Wall	Cross-Section	Excavation Depth / Wall Height, ft	Deflection Control (Yes/No)	Wall Support	Loading Condition Remarks
Wall 1	Section 1A	16	Yes	Struts against Sections 1A and 2A on the opposite side, installed at 5 ft-bgs (851 ft-msl)	Building loads, *K*o
	Section 1B	7	Yes	No support	Building loads, *K*o
	Section 1C	16	Yes	Tiebacks, installed at 5 ft-bgs (851 ft-msl)	Building loads, *K*o
Wall 2	Section 2A	16	No	Struts against Sections 2A and 1A on the opposite side, installed at 5 ft-bgs (851 ft-msl)	Equipment surcharge loads, *K*a
	Section 2B	7	No	No support	Equipment surcharge loads, *K*a

Notes:

*K*o = at-rest soil pressure coefficient ; *K*a = active soil pressure coefficient.

Building loads = 1,000 psf; Equipment surcharge loads = 400 psf; conservatively applied directly next to shoring walls.

Feet blow ground surface = ft-bgs.

Sections 1A, 1B and 1C of Wall 1 are located directly next to the school building. To represent the loading from the building, a surcharge load of 1,000 psf, modeled as an infinite load, is modeled directly against the top of the shoring wall. However, based on a review of the building foundation plans, Wall 1 is specified to be installed 5 ft away from the above grade exterior walls of the school building walls.

Sections 2A and 2B of Wall 2 are located north of the school building adjacent to the football field. To represent the loading from haul trucks and other equipment, a surcharge load of 400 psf, modeled as an infinite load, is modeled directly against the top of the wall. The assumed surcharge load of 400 psf is based on the maximum operating weight and dimensions for a Caterpillar model 730 articulated truck [Caterpillar, 2004].

Support Properties

Struts

Lateral support struts at Sections 1A and 2A (16 ft excavation) are modeled at elevation 851 ft-msl (5 ft-bgs). The distance between Walls 1 and 2 is approximately 15 ft. Forces required to resist movement of Section 1A are also applied to Section 2A through the connecting struts. In this analysis the forces necessary to resist deformation of Section 1A are used to determine the forces to be applied in the struts.

Tiebacks

Lateral support is provided by tiebacks (e.g., anchors) at Section 1C. Review of the EHS building drawings indicates that the bottom of the foundation is at 852 ft-msl (vs. ground elevation at 856 ft-msl). Therefore, one layer of tieback is installed at elevation 851 ft-msl (approximately 5 ft-bgs). For analysis, an additional 2 vertical feet of unsupported facing is included below the tiebacks to account for anchor installation. Tiebacks are assumed to have a minimum diameter of 6 inches (0.5 ft) and installed at an angle of 15 degrees down. A diameter of 0.5 ft is assumed to calculate the contact area between the tiebacks and the foundation soils.

Based on these assumed conditions, the design tieback length will be greater than 75 ft (77.5 ft calculated in the Section 1C results). Considering that the head of tieback is at 851 ft-msl (5 ft-bgs) and the installation angel of 15 degrees down, the terminal end of the tieback are approximately 25 ft-bgs, which is within the layer of Gravel with Silt and Sand. As the friction angles of Fill Sand and Gravel with Silt and Sand are both 32 degrees, it is assumed that the bond strength between the tiebacks and the aforementioned two soils are the equivalent. The interface friction angle (δ) between tiebacks and foundation soils is estimated by assuming the interface shear strength to be 80% (reduction factor of 0.8) of that of foundation soils themselves, ϕ, (i.e., $\tan\delta/\tan\phi = 0.8$). As shown in Table 2, ϕ is 32°; therefore, δ is calculated to be 26°.

Results of the analysis indicates that the free length of the tiebacks is approximately 10 ft long (8.8 ft calculated in the results). Considering the 5 ft soils above, the overburden pressure at 10.0 ft from the head of tieback is determined to be 964 psf (= [5 ft + 10 ft × sin15°] × 127 pcf). To calculate the bond strength, the building loads are assumed to be half of the design dead load (i.e., 500 psf). Therefore, the bond strength at 10.0 ft from the head of tieback is estimated to be 714 psf (= [964 psf + 500 psf] × tan 26°).

Similarly, at 75 ft from the head of tieback (e.g., the terminal end of the tieback), the tieback is located at 24.4 ft-bgs (= [5 ft + 75 ft × sin15°). The soil overburden pressure at 75 ft from the head of tieback is estimated to be 3,082 psf (=16 ft × 127 pcf + 8.4 ft × 125 pcf). Building loads being half of the design value (500 psf), the bond strength at 75.0 ft of tieback is estimated to be 1,747 psf (= [3,082 psf + 500 psf] × tan 26°).

As the overburden pressure along the tieback increases linearly, the average bond strength can then be determined to be 1.231 ksf (= [714 psf + 1,747 psf] / 2).

AASHTO Load Distribution

For Sections 1A, 1C and 2A, where the wall support is proposed, the AASHTO load distributions as shown in Attachment 3 are used. One level of anchor or strut is to be installed at 851 ft-msl. Therefore, the control parameters can be determined for the 16-ft shoring walls as listed below:

- Total excavation depth H = 16 ft
- Distance from ground surface to uppermost ground anchor H_1 = 5 ft
- Control depth $(\frac{2}{3}H_1)$ = 3.333 ft
- Control depth $(\frac{2}{3}H_1 + \frac{1}{3}H)$ = 8.667 ft
- At-rest Earth Pressure:

  $K_o = 1 - \sin\phi$ = 1 - sin32° = 0.470

  The maximum ordinate of the pressure diagram $p_o = K_o \times (Unit\ Weight) \times H$ = 0.470 × 127 × 16.0 = 955 lbs/ft^2 = 0.955 kips/ft^2

- Active Earth Pressure:

  $K_a = (1 + \sin\phi)/(1 - \sin\phi)$ = (1 + sin32°)/(1 - sin32°) = 0.470 / 1.530 = 0.307

  The maximum ordinate of the pressure diagram

  $p_a = K_a \times (Unit\ Weight) \times H$ = 0.307 × 127 × 16.0 = 624 lbs/ft^2 = 0.624 kips/ft^2

METHOD OF ANALYSIS

CT Shoring Program

CivilTech Shoring Version 8.16h (CT Shoring) is used to compute earth pressures, shear forces, and wall bending moments. For each analysis "fixed-earth" behavior is assumed for the cantilever pile wall wherein design pressures are computed using simplified distributions without consideration of moment reductions due to flexure, deflection, and stress redistribution. Shoring wall sections are selected assuming deflections will control the design of the wall. In this analysis, drained soil conditions are assumed. The only soil that may exhibit undrained behavior is the silty clay. The silty clay is located below the base of the shoring wall. As such, the effect of the clay on the shoring walls is not significant and therefore only drained soil conditions were analyzed.

CT Shoring follows the "Simplified Method" design procedure presented in the United States Steel (USS) Piling Design Manual [USS, 1984], which is a limit equilibrium approach. Because this method assumes a simplified pressure distribution below the point of contraflexure, CT Shoring increases the required embedment by 20% to account for the simplification and satisfy force equilibrium (refer to CT Shoring output in Attachment 5). Although the added length is not intended to be a factor of safety, the increased embedment is actually a mixture of force equilibrium requirements and an embedment factor of safety. An alternative method of incorporating a factor of safety is to reduce the calculated passive earth pressures. Accordingly, a factor of safety of 1.3 was applied to the earth pressures on the passive side.

It should be noted that for Sections 1A, 1C and 2A where the support is required to minimize deflection, the apparent earth pressure distribution for anchored walls constructed from the top-down in cohesionless soils were applied to the upper section of the shoring wall. The apparent earth pressure distribution was determined following the guideline of AASHTO LRFD Bridge Specifications [AASHTO, 2014], as shown in Attachment 3.

The shoring walls were designed under the following assumptions:

- For Sections 1A, 1B, and 1C, at-rest earth pressures (*K*o) are assumed because these sections are located directly next to the school building and deflections will be minimized.
- For Sections 2A and 2B, active earth pressures (*K*a) are assumed because there are no critical structures near this section and limited deflections are acceptable.
- A wall-to-soil interface friction angle of 10 degrees is considered in the analyses.
- No above grade stickup of the soldier piles is accounted for.

Deflection Control

No firm guidelines exist for acceptable deflection at the top of the shoring walls. NEH [2007] recommends that the deflection be limited to 1 to 3 inches for stream restoration and stabilization projects (long-term conditions). Considering that the shoring walls are for temporary excavation support, an acceptable deflection of Wall 1 (i.e., soldier piles) is set at 1 inch or less and the acceptable deflection of Wall 2 is set at 4 inches or less.

Soldier Pile Selection

Steel H-piles (HP shapes) are most commonly available as ASTM A572 Grade 50 material, having a nominal yield strength of 50 ksi (345 MPa, F_y). HP14 or similar soldier piles are recommended for use by the contractor (e.g., HP14X89, see product data sheet in Attachment 4). In the analysis, a soldier pile of steel grade 50 is proposed with a minimum moment of inertia of 900 inch^4. The

minimum required section modulus and the minimum required shear area per foot of shoring wall are calculated for pile selection.

The required section modulus is calculated using the following relationship:

$$S_{req} = \frac{M_{max}}{F_b} \quad \text{(Eq. 2)}$$

Where: S_{req} = minimum required elastic section modulus
M_{max} = maximum bending moment
F_b = $F_y \times 0.66$
F_y = yield stress (= 50 ksi for steel grade 50 H-piles)

The required shear area is calculated using the following relationship:

$$A_{v,min} = V_{max}/f_v \quad \text{(Eq. 3)}$$

Where: $A_{v,min}$ = minimum required shear area
V_{max} = maximum shear stress
f_v = design shear strength of the pile material, = Fy×0.439

For the soldier piles, a minimum 18 inches diameter hole is used in the analysis. For the combination of materials and construction techniques assumed herein, the analysis indicates that a maximum pile spacing of 6 ft.

Global Stability Consideration

The static global stability of the selected cross-sections is evaluated based on limit equilibrium theory using the method of slices. The computer program SLIDE version 6.0 [Rocscience, 2002] is used to perform the analyses. SLIDE is a two-dimensional slope stability program for evaluating the factor of safety of circular and non-circular (also referred to as block) failure (or slip) surfaces in soils. The procedure used to analyze slope stability of the shoring walls consisted of analyzing numerous potential failure surfaces for each cross-section to find the critical failure surface that renders the minimum factor of safety for the slope. For both circular and non-circular failure surfaces, the Spencer method [Spencer, 1967] is used. In the Spencer method, both force and moment equilibrium are satisfied in each slice and the slopes of the inter slice forces are assumed constant and parallel to each other. Hundreds of potential failure surfaces were analyzed to find the critical failure surface that results in the minimum factor of safety for the slope. The program searched for the most critical surfaces within the entire cross-section to identify a global, not a local minimum, factor of safety was calculated.

Idealized subsurface profile listed in Table 1 and the material parameters listed in Table 2 are used to develop the SLIDE models. The shoring walls are simulated as a 6-inch thick rigid body. As SLIDE is a two-dimensional (2D) modeling program, the wall support loads determined in the CT

Shoring, when present, were converted for unit foot wide (6 ft spacing). The backfill will be compacted sandy soils with an assumed friction angle of 32 degrees.

For typical slope stability analysis, required minimum factors of safety are 1.25 and 1.5 for short- and long-term conditions, respectively. As the excavation is temporary and the area will be backfilled with clean fill shortly after excavation, the required factor of safety is specified to be 1.25 or greater.

CT SHORING RESULTS

CT Shoring earth pressure results, and shear, moment, and deflection results are provided in Attachment 5 for the scenario of minimum required lengths. The summary of the analysis results is present in Table 4.

The minimum required elastic section modulus is

$$S_{req} = \frac{M_{max}}{F_b} = \frac{279.06 kip-ft}{0.66*50 ksi}$$

= 101.48 in^3 per linear foot of wall (in^3/ft) < 131.0 in^3/ft for HP14X89 → Okay!

The minimum required shear area is

$$A_{v,req} = \frac{V_{max}}{f_v} = \frac{80.03\ kip}{0.33*50 ksi} = 4.85\ in^2 < 26.1\ in^2$$ for HP14X89 → Okay!

Table 4. Minimum Required Pile Lengths for IRM #4.

Cross-Section	Minimum Total Pile Length (ft)	Top Deflection (in)	Bottom Deflection (in)	Maximum Shear Force (kip)	Maximum Moment (kip-ft)	Remark
Section 1A (full depth, 16 ft, AASHTO load distribution, *K*o)	**27.28**	-0.27	0.39	61.40	152.08	Strut total force = 95.6 kips
Section 1A (partial depth, 7 ft, triangular load distribution, *K*a)	26.12 (< 27.28, Ok!)	0.85	n/a*	**80.03**	**279.06**	Before strut installation
Section 1B (full depth, 7 ft, triangular load distribution, *K*a)	**26.12**	0.85	n/a*	**80.03**	**279.06**	No support
Section 1C (full depth, 16 ft, AASHTO load distribution, *K*o)	**27.28**	-0.27	0.39	61.40	152.08	Tieback installation at 851 ft-msl; Tieback length (Free / Fixed) = 77.5 (9.3 / 68.2) ft; Tieback total force = 131.9 kips
Section 1C (partial depth, 7 ft, triangular load distribution, *K*a)	26.12 (< 27.28, Ok!)	0.85	n/a*	**80.03**	**279.06**	Before tieback installation

Cross-Section	Minimum Total Pile Length (ft)	Top Deflection (in)	Bottom Deflection (in)	Maximum Shear Force (kip)	Maximum Moment (kip-ft)	Remark
Section 2A** (full depth, 16 ft, AASHTO load distribution, *K*a), for strut checking	**20.04**	-0.02	0.03	18.59	24.31	No equipment surcharge loads; Strut total force = 31.1 kips (< 95.6 kips from Section 1A, Okay!)
Section 2A** (partial depth, 7 ft, triangular load distribution, *K*a)	19.67 (< 24.13, Ok!)	0.21	n/a*	43.49	98.51	Before strut installation, with equipment surcharge loads
Section 2B** (full depth, 7 ft, triangular load distribution, *K*a)	**19.67**	0.21	n/a*	43.49	98.51	No support, with equipment surcharge loads

Notes:

* n/a = not applicable.
** IRM #5 may use Wall 2.
*** Silty Clay at 39 ft-bgs or lower.

GLOBAL STABILITY RESULTS

The results of the SLIDE analysis are presented in Attachment 6 and summarized in Table 5. As shown in Table 5, the overall stability of each cross-section analyzed meets the design criterion (i.e., FS greater than 1.25, for temporary conditions). Therefore, the proposed shoring walls have an adequate factor of safety for global stability of the excavation.

Table 5. Factors of Safety of Global Stability.

Cross-Section	Circular	Non-Circular	Requirement
Section 1A (16 ft with strut)	1.92	1.30	1.25 (temporary conditions, same below)
Section 1B (7 ft)	2.86	1.83	1.25
Section 1C (16 ft with tieback)	2.03	1.31	1.25
Section 2A (16 ft with strut)	2.16	1.56	1.25
Section 2B (7 ft)	2.49	1.59	1.25

SUMMARY

Based on the results presented above, the design of soldier pile walls for IRM #4 are summarized in Table 6 below.

Table 6. Soldier Pile Design for IRM #4.

Scenario	Proposed Pile Length (ft)	Pile Type and Steel Grade	Remarks
Section 1A (full depth, 16 ft)	30	HP14X89, Gr. 50	Strut installed at 5 ft-bgs (851 ft-msl); strut total force = 95.6 kips
Section 1B (full depth, 7 ft)	30	HP14X89, Gr. 50	No support
Section 1C (full depth, 16 ft)	30	HP14X89, Gr. 50	Tieback installed at 5 ft-bgs (851 ft-msl) with a slope of 15 degrees; total tieback length (free) = 80 ft (10.0); tieback force = 131.9 kips
Section 2A (full depth, 16 ft)	30	HP14X89, Gr. 50	Strut installed at 5 ft-bgs (851 ft-msl); strut total force = counterbalanced force determined from Section 1A
Section 2B (full depth, 7 ft)	30	HP14X89, Gr. 50	No support, equipment surcharge loads allowed (up to 400 psf)

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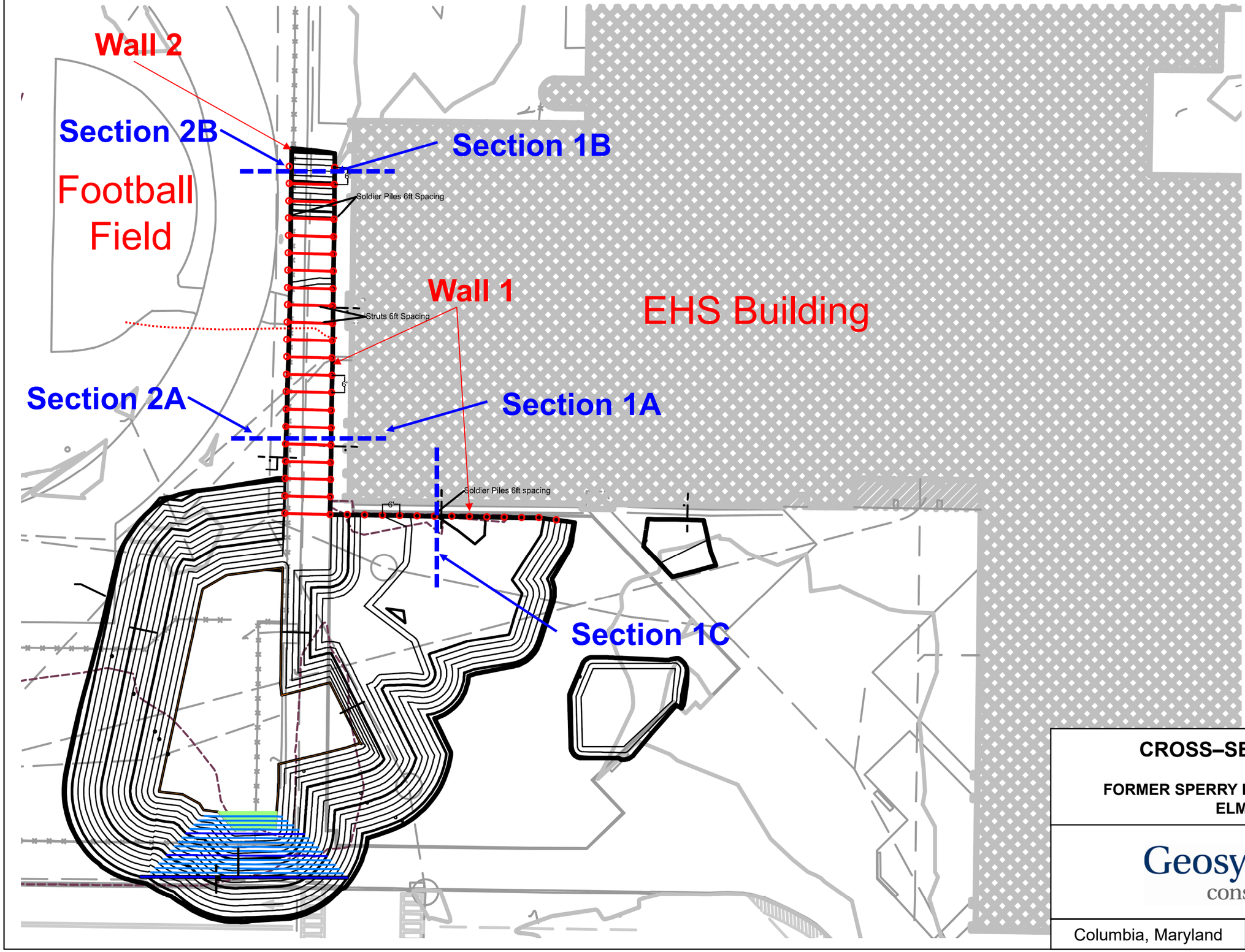
FIGURES



LEGEND

- CULVERT PIPE
- CHAIN LINK FENCE
- WOODEN FENCE
- PROPERTY LINE
- EXISTING CONTOUR LINE
- EDGE OF WATER
- EDGE OF WOODS OR BRUSH
- BURIED ELECTRIC CABLE
- SANITARY SEWER
- STORM SEWER
- NATURAL GAS LINE
- WATER LINE
- TREE
- MANHOLE
- CATCH BASIN
- SANITARY MANHOLE
- METAL POLE
- GATE POST
- SPRINKLER
- STREET LIGHT
- ELECTRIC BOX
- WATER VALVE
- HYDRANT
- MW MONITORING WELL

CROSS–SECTIONS ANALYZED

FORMER SPERRY REMINGTON SITE NORTH (EHS)
ELMIRA, NEW YORK

Geosyntec consultants

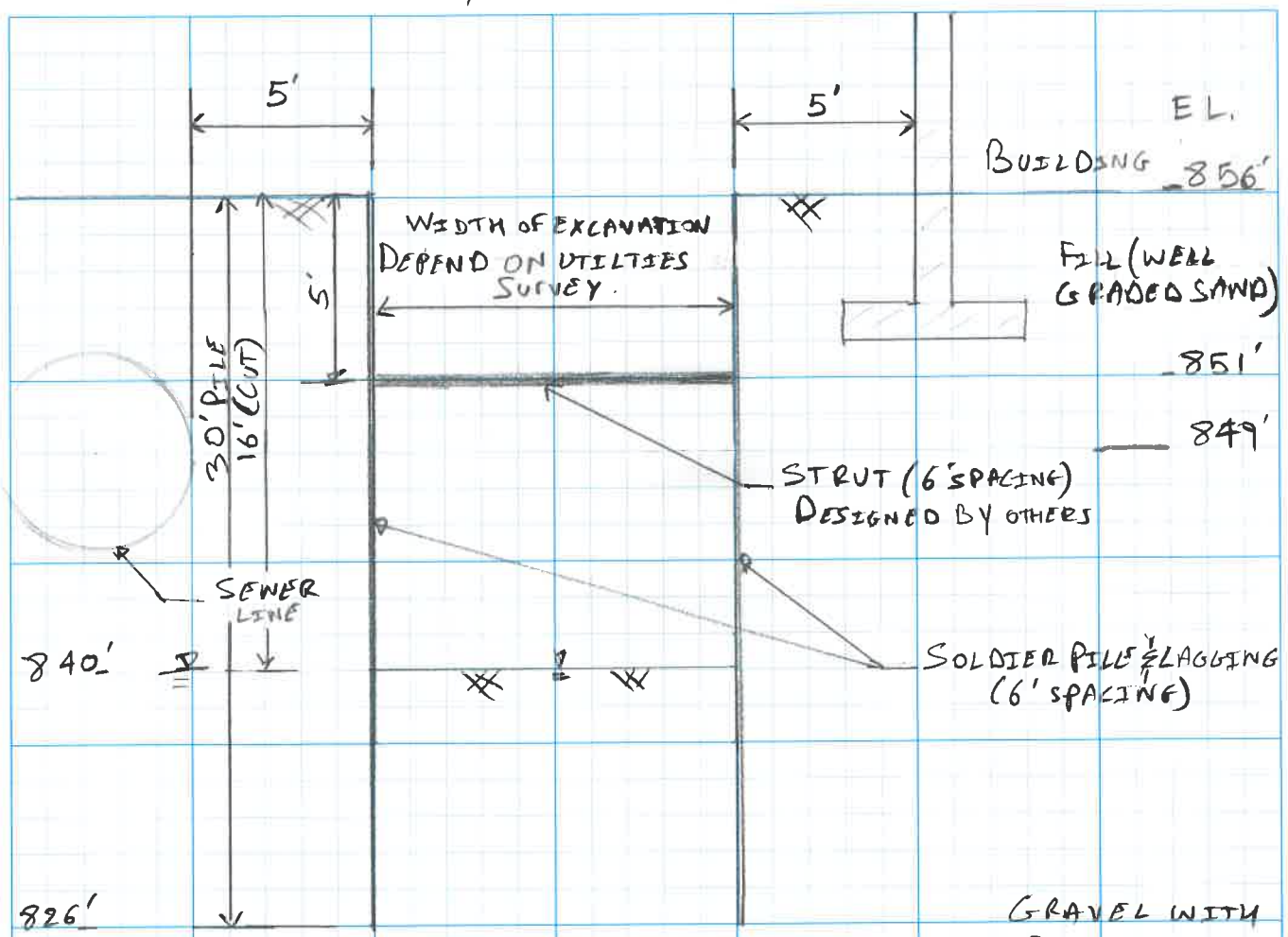
Columbia, Maryland | January 2020

FIGURE
1

Geosyntec consultants

Written by: YOUSSEF MAMMMI Date: 21/01/20 (DD MM YY) Reviewed by: _____ Date: ___/___/___ (DD MM YY)

Client: UNESYS Project: IRM #4 Project/Proposal No. _____ Task No. _____



SECTION 1-A & 2-A

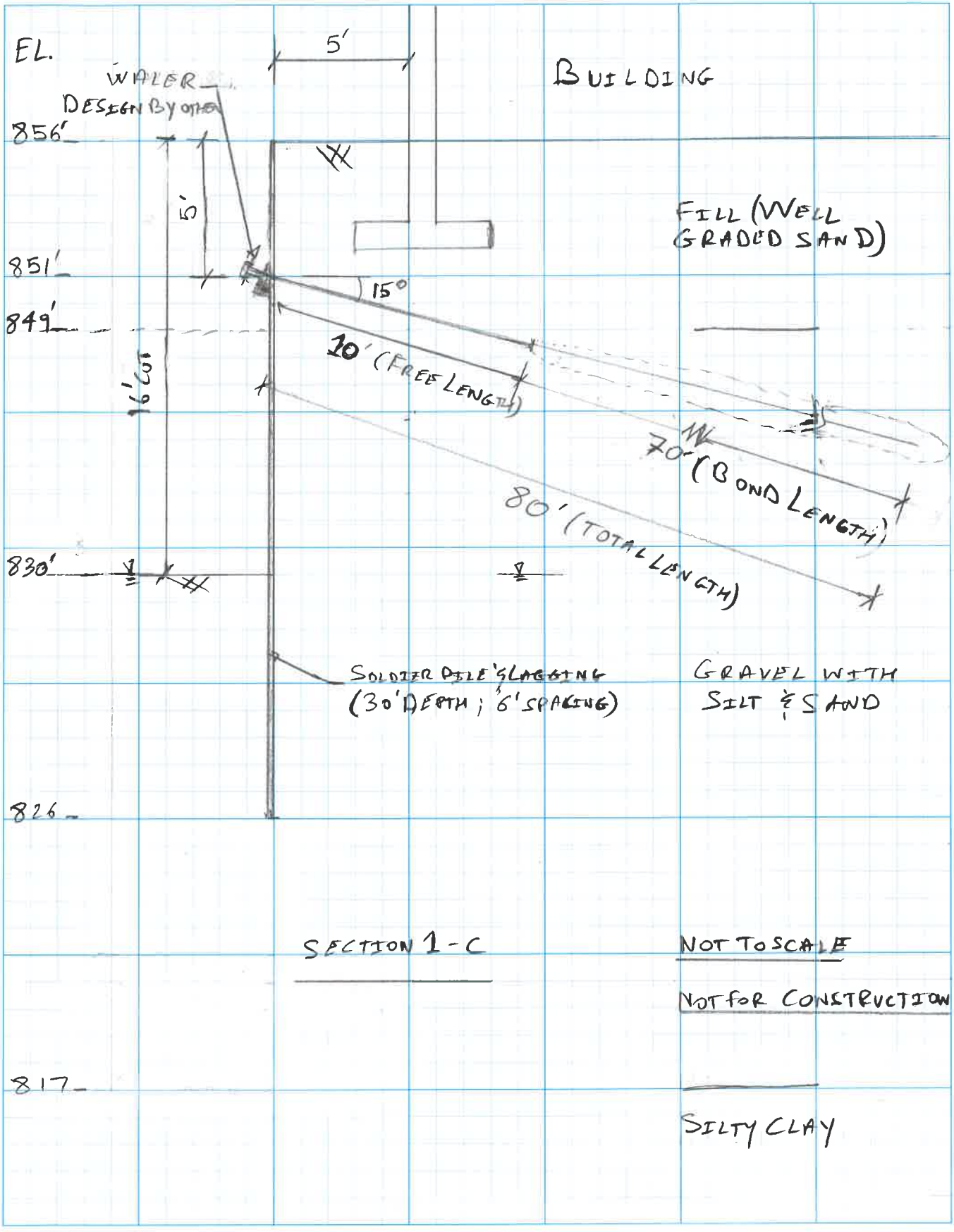
NOT TO SCALE

NOT FOR CONSTRUCTION

Geosyntec consultants

Written by: YOUSSEF HAMMAMI Date: 21/01/20 (DD/MM/YY) Reviewed by: _____ Date: ___/___/___ (DD/MM/YY)

Client: UNISYS Project: IRM # 4 Project/Proposal No. _____ Task No. _____



SECTION 1-C

NOT TO SCALE

NOT FOR CONSTRUCTION

Chart 2: Correlation of SPT $N1_{60}$ with Unit Weight (after Bowles, 1977).

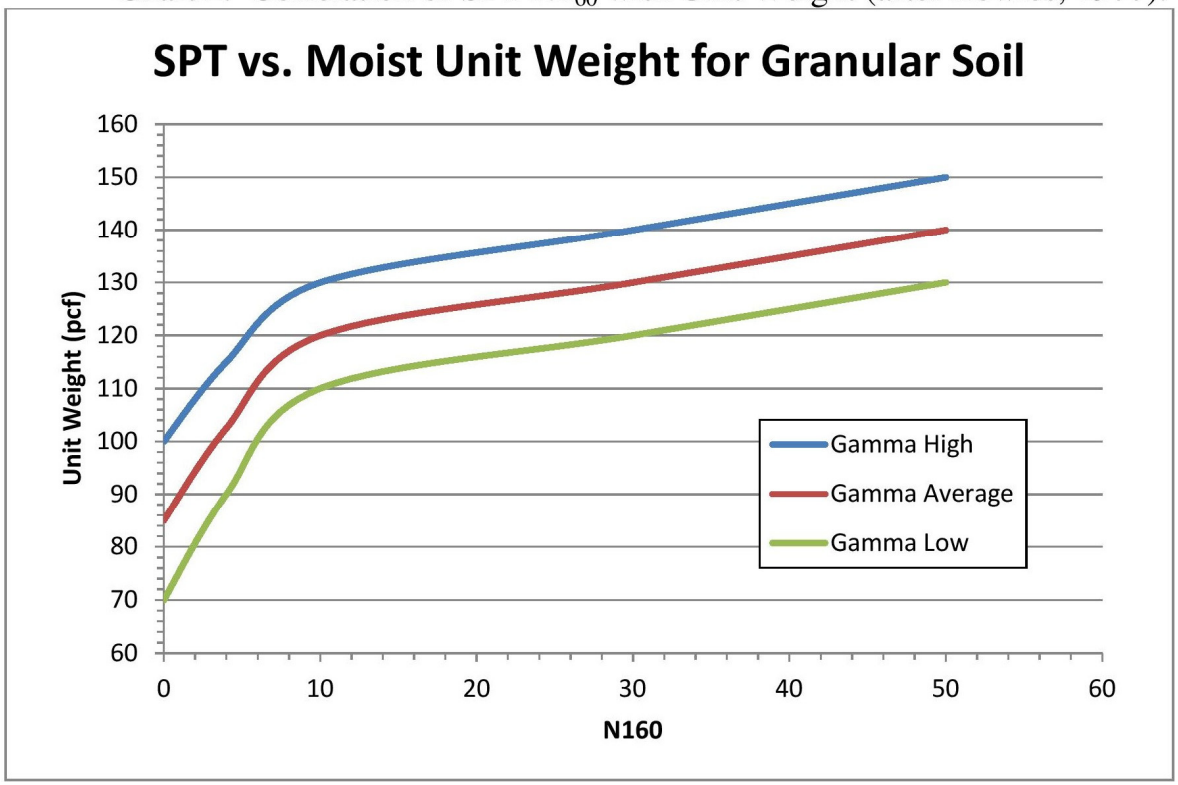
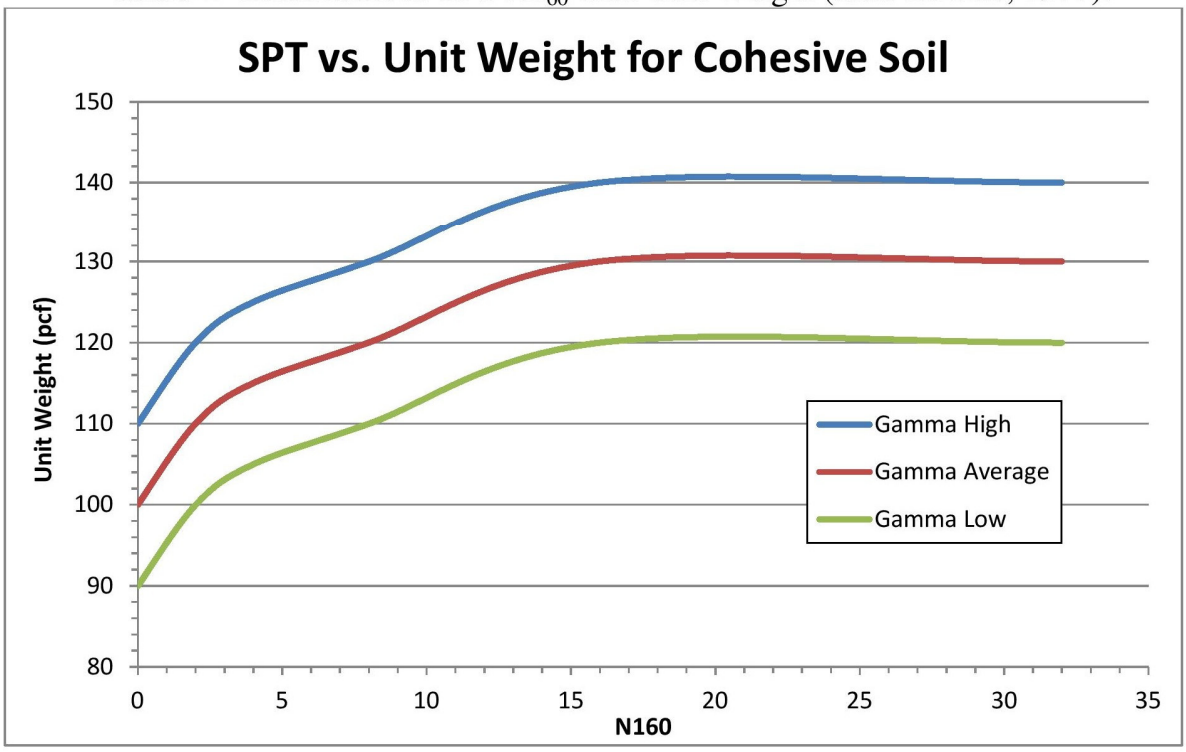


Chart 4: Correlation of SPT $N1_{60}$ with Unit Weight (after Bowles, 1977).



UNIT WEIGHT CORRELATIONS WITH CORRECTED SPT N-VALUE

Former Sperry Remington Site North (EHS)
Elmira, New York

Geosyntec consultants

Columbia, Maryland | December 2019

FIGURE 2

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N Value (blows/ft or 305 mm)	Relative Density	Approximate $\bar{\phi}_{tc}$ (degrees) (a)	(b)
0 to 4	very loose	< 28	< 30
4 to 10	loose	28 to 30	30 to 35
10 to 30	medium	30 to 36	35 to 40
30 to 50	dense	36 to 41	40 to 45
> 50	very dense	> 41	> 45

a - Source: Peck, Hanson, and Thornburn (12), p. 310.
b - Source: Meyerhof (13), p. 17.

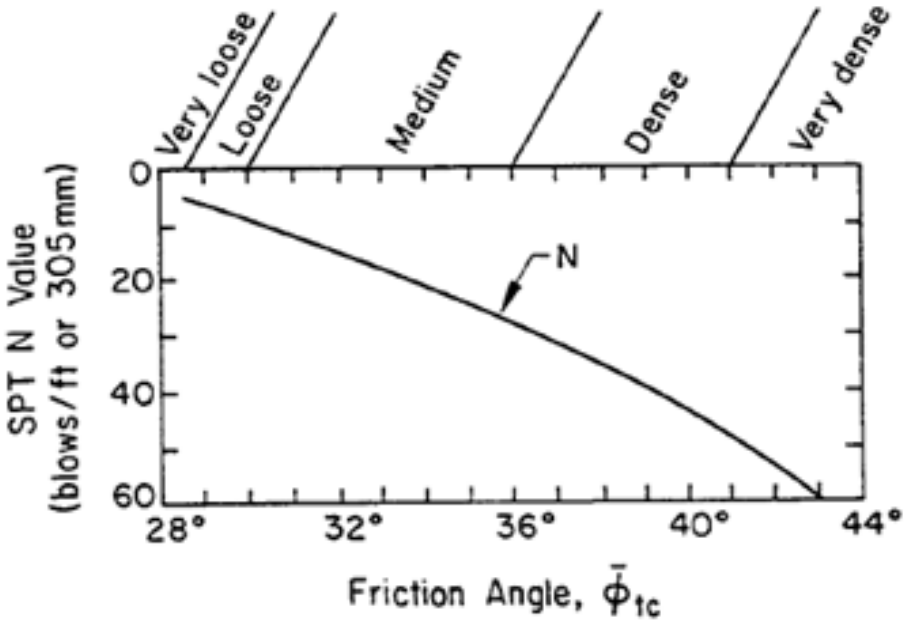

Figure 4-12. N versus $\bar{\phi}_{tc}$

Source: Peck, Hanson, and Thornburn (12), p. 310.

CORRELATIONS OF FRICTION ANGLE WITH SPT N-VALUE

Former Sperry Remington Site North (EHS)
Elmira, New York

Geosyntec consultants

Columbia, Maryland | December 2019

FIGURE 3

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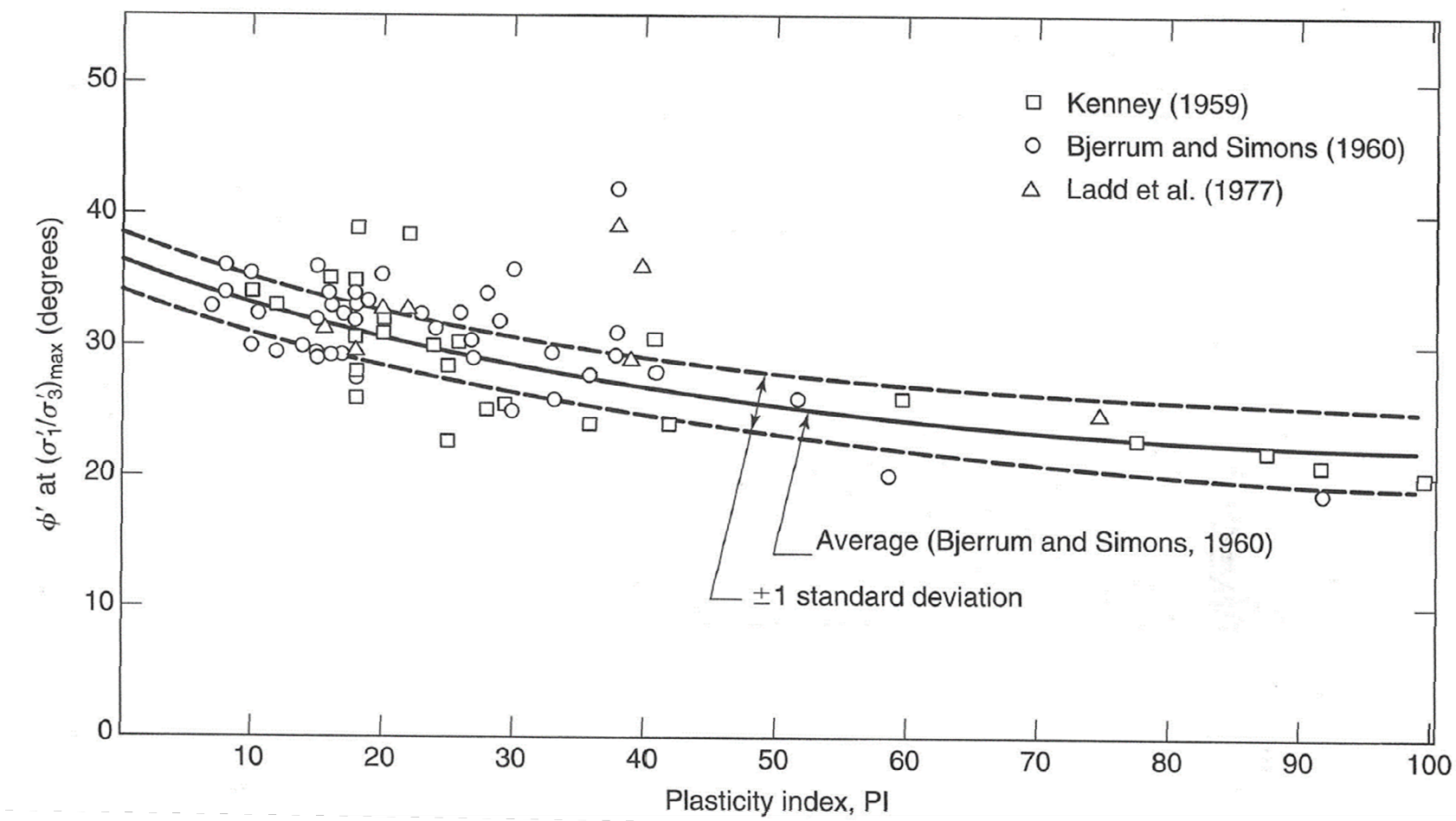


CORRELATIONS OF FRICTION ANGLE WITH PLASTICITY INDEX

Former Sperry Remington Site North (EHS)
Elmira, New York

Geosyntec consultants

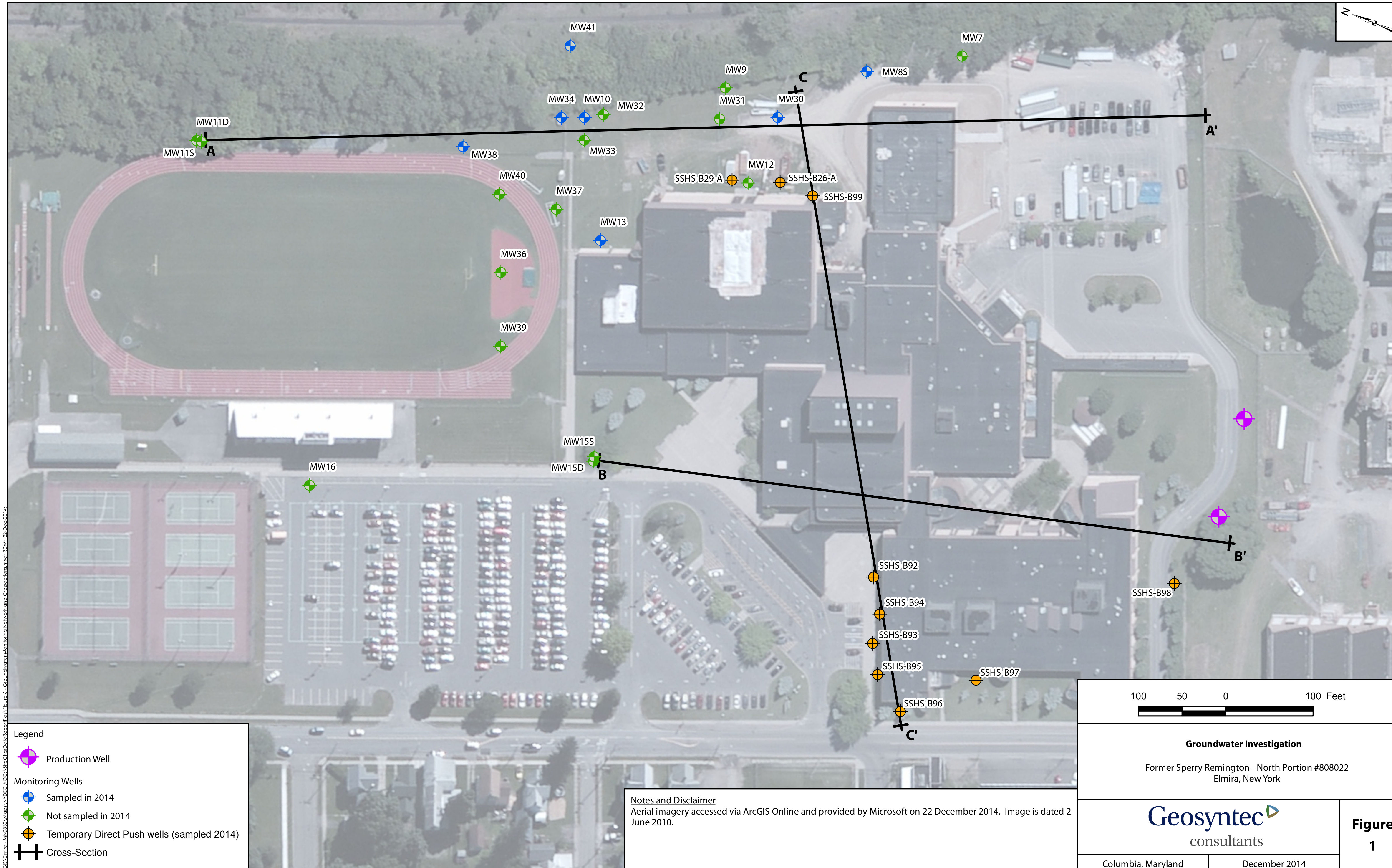
Columbia, Maryland | December 2019

FIGURE 4

C:\Users\sodonnell\Desktop\Elmira\Sheet Pile\Figures\Figure 5 - Phi' cohesive correlation.grf

ATTACHMENT 1

Cross-Sections from Geosyntec [2015]



Legend

Production Well

Monitoring Wells

Sampled in 2014

Not sampled in 2014

Temporary Direct Push wells (sampled 2014)

Cross-Section

Notes and Disclaimer

Aerial imagery accessed via ArcGIS Online and provided by Microsoft on 22 December 2014. Image is dated 2 June 2010.

Groundwater Investigation

Former Sperry Remington - North Portion #808022
Elmira, New York

Geosyntec consultants

Columbia, Maryland | December 2014

Figure 1

A

A'

MW-11S/D

SSHS-MW44

SSHS-MW32

SSHS-MW31

SSHS-MW30

MW-D

SSHS-MW43

SSHS-B101

SSHS-B64

SSHS-MW42

SSHS-B65

BROWN FILL SAND AND GRAVEL AND TRACE MISC. DEBRIS

BLACK FILL SAND WITH GRAVEL AND ASHY LIKE MATERIAL

GRAVEL WITH SILT AND SAND

SILTY CLAY

WEATHERED SHALE BEDROCK

ELEVATION - FEET, MEAN SEA LEVEL

855
850
840
830
820
810
800
790
780
770

LEGEND

- GRAVEL WITH SILT AND SAND
- BROWN FILL SAND AND GRAVEL AND TRACE MISC. DEBRIS
- BLACK FILL SAND WITH GRAVEL AND ASHY LIKE MATERIAL
- SILTY CLAY
- WEATHERED SHALE BEDROCK
- APPROXIMATE GROUNDWATER ELEVATION
- APPROXIMATE CONTACT
- KNOWN CONTACT

0 100’

HORIZONTAL SCALE: 1” = 100’

0 10’

VERTICAL SCALE: 1” = 10’

NOTES:

1. LOCATION OF CROSS SECTION SHOWN ON FIGURE 6.
2. GEOLOGIC CONDITIONS INTERPRETED FROM BORING LOGS PRESENTED IN VARIOUS HISTORICAL REPORTS AND OBSERVATIONS MADE DURING THIS INVESTIGATION.
3. GEOLOGIC CONDITIONS MAY VARY FROM THAT SHOWN.
4. MW-11 S/D ARE SEPARATE COMPLETIONS IN SEPARATE BOREHOLES BUT SHOWN ON ONE WELL SYMBOL FOR CLARITY.

GENERALIZED CROSS-SECTION A-A'

FORMER SPERRY REMINGTON-NORTH PORTION
ELMIRA, NEW YORK

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	MAY 2017
PROJECT NO.	MN0832
DOCUMENT NO.	MD14392
FILE NO.	0832f004–1
FIGURE NO.	7A

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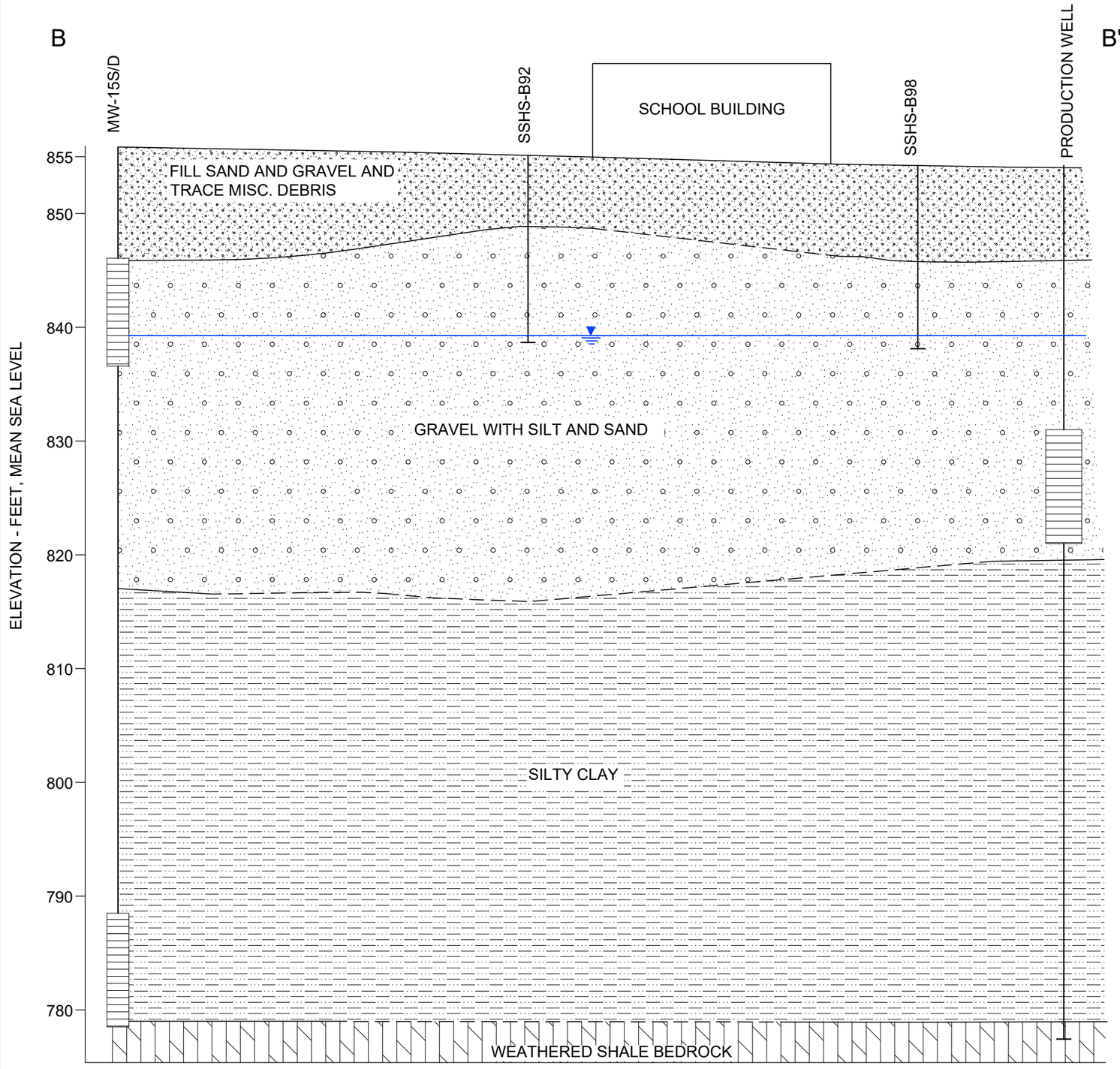

LEGEND

- GRAVEL WITH SILT AND SAND
- FILL SAND AND GRAVEL AND TRACE MISC. DEBRIS
- SILTY CLAY
- WEATHERED SHALE BEDROCK
- APPROXIMATE GROUNDWATER ELEVATION
- APPROXIMATE CONTACT
- KNOWN CONTACT

0 100'

HORIZONTAL SCALE: 1" = 100'

0 10'

VERTICAL SCALE: 1" = 10'

NOTES:

1. LOCATION OF CROSS SECTION SHOWN ON FIGURE 6.
2. GEOLOGIC CONDITIONS INTERPRETED FROM BORING LOGS PRESENTED IN VARIOUS HISTORICAL REPORTS AND OBSERVATIONS MADE DURING THIS INVESTIGATION.
3. GEOLOGIC CONDITIONS MAY VARY FROM THAT SHOWN.
4. MW-15 S/D ARE SEPARATE COMPLETIONS IN SEPARATE BOREHOLES BUT SHOWN ON ONE WELL SYMBOL FOR CLARITY.

GENERALIZED CROSS-SECTION B-B'

FORMER SPERRY REMINGTON-NORTH PORTION
ELMIRA, NEW YORK

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	MAY 2017
PROJECT NO.	MN0832
DOCUMENT NO.	MD14392
FILE NO.	0832f004-1
FIGURE NO.	7B

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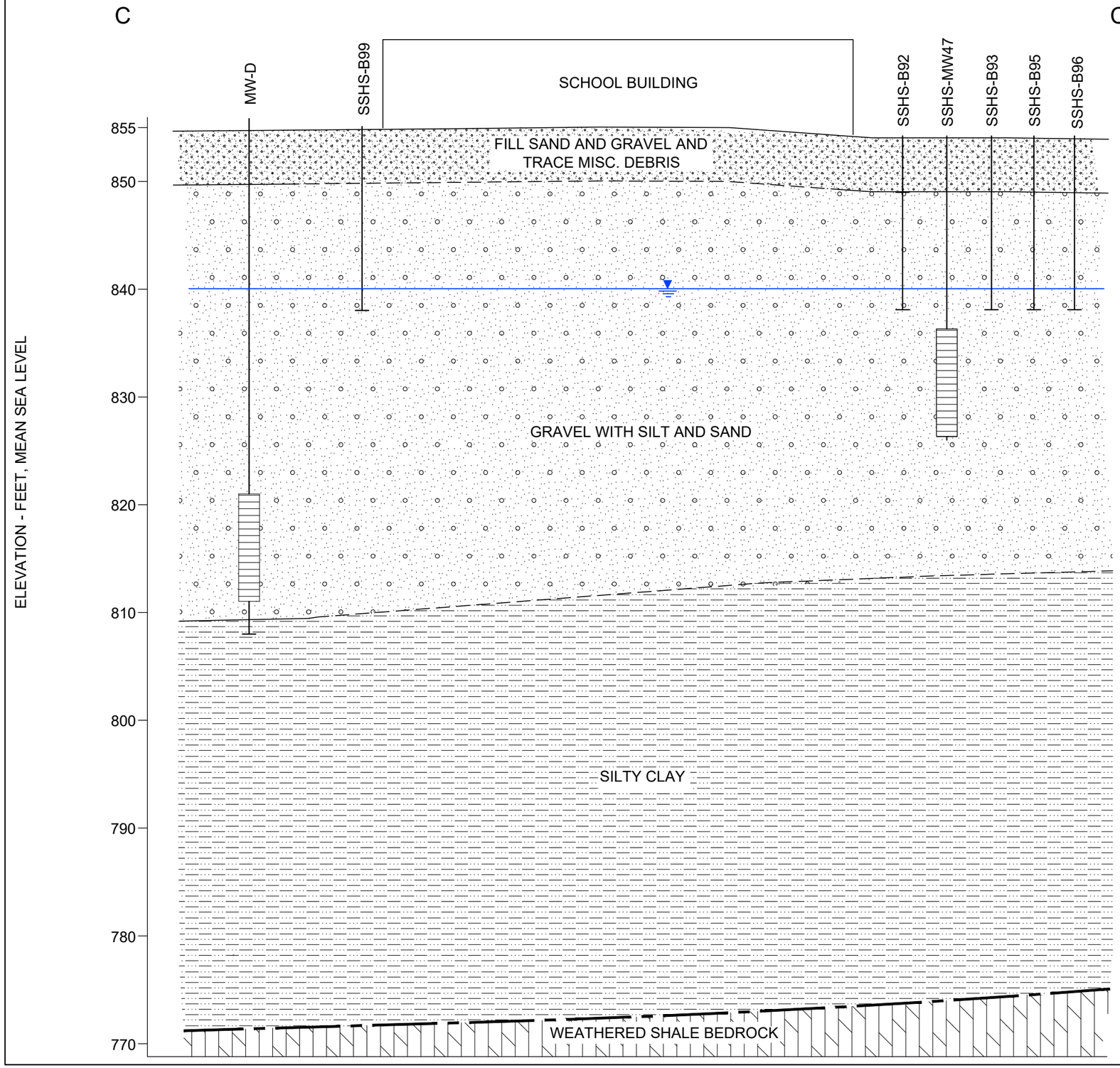

LEGEND

- GRAVEL WITH SILT AND SAND
- FILL SAND AND GRAVEL AND TRACE MISC. DEBRIS
- SILTY CLAY
- WEATHERED SHALE BEDROCK
- APPROXIMATE GROUNDWATER ELEVATION
- APPROXIMATE CONTACT
- KNOWN CONTACT
- INFERRED CONTACT

0 100'

HORIZONTAL SCALE: 1" = 100'

0 10'

VERTICAL SCALE: 1" = 10'

NOTES:

1. LOCATION OF CROSS SECTION SHOWN ON FIGURE 6.
2. GEOLOGIC CONDITIONS INTERPRETED FROM BORING LOGS PRESENTED IN VARIOUS HISTORICAL REPORTS AND OBSERVATIONS MADE DURING THIS INVESTIGATION.
3. GEOLOGIC CONDITIONS MAY VARY FROM THAT SHOWN.

GENERALIZED CROSS-SECTION C-C'

FORMER SPERRY REMINGTON-NORTH PORTION
ELMIRA, NEW YORK

Geosyntec consultants
COLUMBIA, MARYLAND

DATE:	MAY 2017
PROJECT NO.	MN0832
DOCUMENT NO.	MD14392
FILE NO.	0832f004-1
FIGURE NO.	7C

ATTACHMENT 2

Borings and Laboratory Test Data

EARTH TECH	PROJECT:	BORING NUMBER **MW-15D**
40 British American Boulevard Latham, New York 12110	Southside High School Elmira, New York	SHEET 1 OF 4 PROJECT # 66837 FILE

BORING COMPANY	GeoLogic, Inc.	BORING LOCATION	West side of school bldg.
FOREMAN	Scott	GROUND ELEVATION	
EARTH TECH INSPECTOR	Paul Sleasman	DATE STARTED 4/29/03	DATE ENDED 4/30/03

	CASING		SAMPLER		
SIZE	NA	TYPE	2" Split Spoon	OTHER:	
HAMMER	NA	HAMMER	140 lb	4¼" I.D. Augers	
FALL	NA	FALL	30"		

GROUNDWATER READINGS			
DATE	DEPTH	CASING	STABILIZATION TIME
5/7/03 09:00	17.0' Top of Casing	2" PVC	

SAMPLE					SAMPLE DESCRIPTION	STRATA CHANGE AND GENERAL DESCRIPTION	FIELD TESTING OVM (ppm)	EQUIPMENT OR WELL INSTALLED
	NO.	REC.	DEPTH	BLOWS				
0'	1	1.5'	0-2'	4-7-9-10	LOAM, damp. Brown fine(+)-med SAND, some fine-crs Gravel, damp.	0-0.7' 0.7'-1.5'	0	PVC RISER PIPE
	2	0	2'-4'	11-24-8-9	No Recovery.			
5'	3	1.5'	4'-6'	9-6-6-6	Brown fine SAND, and (-) fine-crs Gravel (red brick, concrete – evidence of fill material), damp.	4'-5.5'	0	
	4	0.4'	6'-8'	8-12-9-9	Brown silty-fine SAND, and (-) fine-crs Gravel (red brick, concrete – evidence of fill material), damp.	6'-6.4'	0	
	5	1.1'	8'-10'	14-17-19-19	Brown-black fine(+)-med SAND, some(-) fine-crs Gravel (red brick particles observed), dry-damp.	8'-9.1'	1.3	
10'					(FILL)			
	6	0.9'	10'-12'	8-4-4-5	Red, tan, black fine-crs(+) GRAVEL, and (+) brown-black fine-crs Sand, dry-damp.	10'-10.9'	64	
	7	0.5'	12'-14'	14-16-23-100/0.4'	Red brick. Fine-crs GRAVEL and fine-crs gray-white Sand, some(+) fine-crs gravel, dry-damp.	12'-12.2' 12.2'-12.5'	1.0	
15'	8	0.3'	14'-16'	100/0.3	Black-brown silty-fine SAND, some(+) fine-crs Gravel, moist.	14'-14.3'	0	
	9	1.1'	16'-18'	16-23-27-20	Black-gray fine-crs GRAVEL, little brown silty-fine Sand, wet.	16'-17.1'	0	
	10	0.5'	18'-20'	20-24-17-20	Fine-crs gravel, little brown silty-fine SAND, wet.	18'-18.5'	0	
20'					(GLACIAL OUTWASH)			

WELL CONSTRUCTION LEGEND

BENTONITE, CONCRETE, GROUT, SILICA SAND, NATURAL BACKFILL, BEDROCK

PROPORTIONS USED		PENETRATION RESISTANCE 140 LB WT FALLING 30" ON 2" O.D. SAMPLER			
		COHESIONLESS DENSITY		COHESIVE CONSISTENCY	
TRACE	0 TO 10%	0-4	VERY LOOSE	0-2	VERY SOFT
LITTLE	10 TO 20%	5-9	LOOSE	3-4	SOFT
SOME	20 TO 35%	10-29	MED. DENSE	5-8	M/STIFF
AND	35 TO 50%	30-49	DENSE	9-15	STIFF
		50+	VERY DENSE	16-30	V-STIFF
				31+	HARD

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EARTH TECH	PROJECT:	BORING NUMBER **MW-15D**
40 British American Boulevard Latham, New York 12110	Southside High School Elmira, New York	SHEET 2 OF 4 PROJECT # 66837 FILE

BORING COMPANY	GeoLogic, Inc.	BORING LOCATION	West side of school bldg.
FOREMAN	Scott	GROUND ELEVATION	
EARTH TECH INSPECTOR	Paul Sleasman	DATE STARTED 4/29/03	DATE ENDED 4/30/03

	CASING		SAMPLER		
SIZE	NA	TYPE	2" Split Spoon	OTHER:	
HAMMER	NA	HAMMER	140 lb	4¼" I.D. Augers	
FALL	NA	FALL	30"		

GROUNDWATER READINGS			
DATE	DEPTH	CASING	STABILIZATION TIME
5/7/03 09:00	17.0' Top of Casing	2" PVC	

SAMPLE NO.	REC.	DEPTH	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE AND GENERAL DESCRIPTION	FIELD TESTING OVM (ppm)	EQUIPMENT OR WELL INSTALLED
11	1.0'	20'-22'	30-18-12-15	Fine-crs GRAVEL, little(-) brown fine-crs Sand, wet.	20'-21'	0	PVC RISER PIPE
12	0.3'	22'-24'	23-9-6-9	Brown-black-gray-red fine-crs SAND, and fine-crs Gravel, wet.	22'-22.3'	0	
13	0.7'	24'-26'	12-14-8-8	Brown-black-gray-red fine-crs SAND, and fine-crs Gravel, wet. Brown med SAND, wet.	24'-24.3' 24.3'-24.7'	0 0	
14	0	26'-28'	12-12-10-6	No Recovery.			
15	2.0'	28'-30'	40-27-23-20	Brown med SAND, wet, no odor. Brown fine(+)-crs SAND, some fine-crs Gravel, wet.	28'-28.2' 28.2'-30'	0 0	
16	1.3'	30'-32'	12-6-4-5	Fine-crs GRAVEL, and brown fine-crs Sand (coarsens downward), wet.	30'-31.3'	0	
17	1.4'	32'-34'	12-10-20-11	Brown fine-crs SAND, wet. Brown fine-crs SAND, and (-) fine-crs Gravel, wet.	32'-33.4'	0	
18	0.7'	34'-36'	28-25-15-13	Brown fine-crs SAND, and fine-crs Gravel, wet.	34'-34.7'	0	
19	0.9'	36'-38'	20-18-16-19	Same. (GLACIAL OUTWASH)	36'-36.8'	0	
				Brown Silty CLAY, moist.	36.8'-36.9'	0	
20	0.3'	38'-40'	7-5-5-6	Same.	38'-38.3'	0 0	
21	0.8'	40'-42'	2-3-4-3	Brown-gray Silty CLAY, moist.	40'-40.8'	0	
22	0.9'	42'-44'	2-3-3-2	Gray Silty CLAY, moist. (GLACIO LACUSTRINE)	42'-42.9'	NR	

PROPORTIONS USED

TRACE	0 TO 10%
LITTLE	10 TO 20%
SOME	20 TO 35%
AND	35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY		COHESIVE CONSISTENCY	
0-4	VERY LOOSE	0-2	VERY SOFT
5-9	LOOSE	3-4	SOFT
10-29	MED. DENSE	5-8	M/STIFF
30-49	DENSE	9-15	STIFF
50+	VERY DENSE	16-30	V-STIFF
		31+	HARD

WELL CONSTRUCTION LEGEND

BENTONITE ËËËË CONCRETE ***** GROUT ======

SILICA SAND NATURAL BACKFILL BEDROCK ++++++

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EARTH TECH	PROJECT:	BORING NUMBER **MW-15D**
40 British American Boulevard Latham, New York 12110	Southside High School Elmira, New York	SHEET 3 OF 4 PROJECT # 66837 FILE

BORING COMPANY	GeoLogic, Inc.	BORING LOCATION	West side of school bldg.
FOREMAN	Scott	GROUND ELEVATION	
EARTH TECH INSPECTOR	Paul Sleasman	DATE STARTED 4/29/03	DATE ENDED 4/30/03

	CASING		SAMPLER		
SIZE	NA	TYPE	2" Split Spoon	OTHER:	
HAMMER	NA	HAMMER	140 lb	4¼" I.D. Augers	
FALL	NA	FALL	30"		

GROUNDWATER READINGS			
DATE	DEPTH	CASING	STABILIZATION TIME
5/7/03 09:00	17.0' Top of Casing	2" PVC	

	SAMPLE NO.	REC.	DEPTH	BLOWS	SAMPLE DESCRIPTION	STRATA CHANGE AND GENERAL DESCRIPTION	FIELD TESTING OVM (ppm)	EQUIPMENT OR WELL INSTALLED
45'	23	0.8'	44'-46'	2-2-2-2	Gray Silty CLAY, moist.	44'-44.8'	NR	
	24	1.3'	46'-48'	0-1-2-3	Same.	46'-47.3'	NR	
	25	1.8	48'-50'	1-1-2-3	Same.	48'-49.8'	NR	
50'	26	1.3	50'-52'	0-1-2-2	Same.	50'-51.3'	NR	
	27	2.0'	52'-54'	0-2-2-3	Same.	52'-54'	NR	
	28	1.6	54'-56'	0-0-2-3	Same.	54'-55.6'	NR	
55'	29	2.0'	56'-58'	0-0-3-4	Same.	56'-58'	NR	
	30	2.0'	58'-60'	2-3-4-5	Same.	58'-60'	NR	
60'	31	2.0'	60'-62'	2-3-3-4	Same.	60'-62'	NR	
	32	2.0'	62'-64'	2-3-4-5	Same.	62'-64'	NR	61.6'-
65'	33	2.0'	64'-66'	2-2-3-3	Same.	64'-66'	NR	
	34	2.0'	66'-68'	1-1-3-6	Same.	66'-68'	NR	65.5'- 66.5'-
	35	1.7'	68'-70'	2-2-3-3	Same. (GLACIO LACUSTRINE)	68'-69.7'	NR	

PVC RISER PIPE

WELL CONSTRUCTION LEGEND

BENTONITE, CONCRETE, GROUT, SILICA SAND, NATURAL BACKFILL, BEDROCK

PROPORTIONS USED

TRACE	0 TO 10%
LITTLE	10 TO 20%
SOME	20 TO 35%
AND	35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY		COHESIVE CONSISTENCY	
0-4	VERY LOOSE	0-2	VERY SOFT
5-9	LOOSE	3-4	SOFT
10-29	MED. DENSE	5-8	M/STIFF
30-49	DENSE	9-15	STIFF
50+	VERY DENSE	16-30	V-STIFF
		31+	HARD

EARTH TECH	PROJECT:	BORING NUMBER **MW-15D**
40 British American Boulevard Latham, New York 12110	Southside High School Elmira, New York	SHEET 4 OF 4 PROJECT # 66837 FILE

BORING COMPANY	GeoLogic, Inc.	BORING LOCATION	West side of school bldg.
FOREMAN	Scott	GROUND ELEVATION	
EARTH TECH INSPECTOR	Paul Sleasman	DATE STARTED 4/29/03	DATE ENDED 4/30/03

	CASING		SAMPLER		
SIZE	NA	TYPE	2" Split Spoon	OTHER:	
HAMMER	NA	HAMMER	140 lb	4¼" I.D. Augers	
FALL	NA	FALL	30"		

GROUNDWATER READINGS			
DATE	DEPTH	CASING	STABILIZATION TIME
5/7/03 09:00	17.0' Top of Casing	2" PVC	

	SAMPLE					STRATA CHANGE AND GENERAL DESCRIPTION	FIELD TESTING OVM (ppm)	EQUIPMENT OR WELL INSTALLED
	NO.	REC.	DEPTH	BLOWS	SAMPLE DESCRIPTION			
70'	36	2.0'	70'-72'	3-4-8-5	Gray Silty CLAY, moist.	70'-72'	NR	
	37	1.1'	72'-74'	6-9-15-15	Same. (GLACIO LACUSTRINE)	72'-72.6'	NR	
					Gray SILT and fine-med Sand, and fine-crs gravel, wet.	72.6'-73.1'	NR	
	38	0.8'	74'-76'	35-30-18-90	Gray Silty CLAY, and (+) fine-crs Gravel (abundant shale fragments).	74'-74.8'	NR	
75'	39	0.8'	76'-78'	30-100/0.4'	Gray fine-crs gravel, and Silty Clay. (GLACIAL TILL OR WEATHERED BEDROCK)	76'-76.8'	NR	76.5'-77.0'-
					END OF BORING TOTAL BORING DEPTH = 77.0' 4/30/03 12:15			0-61.6: Grout 61.6'-65.5': Bentonite Seal 65.0'-65.5': #00 Silica Choke Sand 65.5'-77.0': #0 Silica Filter Pack 0-66.5: 2" I.D. PVC Riser Pipe 66.5'-76.5': 2" I.D. PVC Well Screen (0.01" slot)
80'								
85'								
90'								

PROPORTIONS USED

TRACE	0 TO 10%
LITTLE	10 TO 20%
SOME	20 TO 35%
AND	35 TO 50%

PENETRATION RESISTANCE
140 LB WT FALLING 30" ON 2" O.D. SAMPLER

COHESIONLESS DENSITY		COHESIVE CONSISTENCY	
0-4	VERY LOOSE	0-2	VERY SOFT
5-9	LOOSE	3-4	SOFT
10-29	MED. DENSE	5-8	M/STIFF
30-49	DENSE	9-15	STIFF
50+	VERY DENSE	16-30	V-STIFF
		31+	HARD

WELL CONSTRUCTION LEGEND

BENTONITE, CONCRETE, GROUT, SILICA SAND, NATURAL BACKFILL, BEDROCK

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STARTED: 11-11-12
FINISHED: 11-12-12

SJB SERVICES, INC.

SUBSURFACE LOG

HOLE NO. B-3
SURF. ELEV. g.s.
G.W. DEPTH See Notes
SHEET 1 of 2

PROJECT: Southside High School Building Addition
CLIENT: HUNT Engineers, Architects, & Land Surveyors, P.C.
LOCATION: 777 South Main Street, Elmira, New York 14904

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0 6 12 18 24 N	Rec (ft)	SOIL OR ROCK CLASSIFICATION	NOTES
		S-1	- 6 16 20 36	0.8	Fill: Brown-gray GRAVEL and SAND, trace silt (Moist, Compact)	Drillers noted approximately 0.3 feet of concrete at ground surface.
		S-2	16 22 24 16 46	1.4	Fill: Dark brown-black SAND, little Gravel, little Silt, little Clay, trace; ash, cinders, bricks, cement (Moist)	
5		S-3	10 4 2 2 6	1.2	Fill: Reddish brown SILT, little Sand, little Ash, trace gravel, (Moist to Wet, Loose)	S-3 & S-4: slight to some odor.
		S-4	1 3 3 5 6	0.8	Fill: Brown-black SAND and CERAMIC or TILE pieces, little Silt, trace decaying wood (Moist to Wet, Loose)	
		S-5	WH WH WH 6 WH	1.6	FILL: Brown-gray CLAY, little Silt (Moist, Very Soft)	WH: weight of hammer and the drilling rods.
10		S-6	12 6 6 4 12	0.6	Fill: Brown-gray GRAVEL, some Sand, some silty Clay (Moist, Firm)	
		S-7	7 5 3 9 8	0.2	Fill: Brown-gray SAND and GRAVEL, some clayey Silt trace organics (Moist to Wet, Loose)	S-7: poor recovery.
15		S-8	3 5 9 15 14	1.0	Fill: Brown GRAVEL and clayey SILT, little Sand (Moist, Firm)	S-8: contains gray silty sand seam.
		S-9	14 8 4 5 12	0.2	Brown GRAVEL, some Sand, trace silt (Wet, Firm)	S-9: poor recovery. Subangular to angular gravel.
		S-10	4 6 4 6 10	0.5	(Wet, Loose)	S-9 through S-12: slight odor and oil sheen.
20		S-11	4 4 4 3 8	0.3	(Wet to Saturated, Loose)	
		S12	3 2 1 2 3	0.2	(Wet to Saturated, Very Loose)	S-12: poor recovery.
25		S13	4 2 1 2 3	1.0	Brown-gray f.-m. SAND, little Silt (Saturated, Very Loose)	
		S-14	3 4 7 4 11	1.5	Brown-gray GRAVEL and SAND, trace Silt (Wet to Saturated, Firm)	Rounded to subrounded gravel.
		S-15	1 1 2 2 3	0.3	Brown-gray SAND and f. GRAVEL, trace silt (Saturated, Very Loose)	
30		S-16	2 2 2 3 4	0.3	Brown-gray GRAVEL, some SAND, trace silt (Saturated, Loose)	
		S-17	5 4 4 2 8	1.0	Brown GRAVEL, little Sand, trace silt (Wet, Loose)	Subangular to angular gravel.
35		S-18	7 11 12 10 23	0.5	Gray SAND and f. GRAVEL, trace silt (Wet, Firm)	Rounded gravel.
		S-19	3 3 3 6 6	0.5	Brown-gray SAND and GRAVEL, trace silt (Wet, Loose)	
40		S-20	3 4 3 3 7	0.4		

DRILLER: M. Warner / G. Spizzirri
DRILL RIG: CME-850
METHOD OF INVESTIGATION: 4 1/4 inch augers, 2" Split Spoon Sampler (ASTMD1586)
JOB NUMBER: CE-12-42
CLASSIFIED BY: Geotechnical Engineer

STARTED: 11-11-12
FINISHED: 11-12-12

SJB SERVICES, INC.

SUBSURFACE LOG

HOLE NO. B-3
SURF. ELEV. g. s.
G.W. DEPTH See Notes
SHEET 2 of 2

PROJECT: Southside High School Building Addition
CLIENT: HUNT Engineers, Architects, & Land Surveyors, P.C.
LOCATION: 777 South Main Street, Elmira, New York 14904

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0 6	6 12	12 18	18 24	N	Rec (ft)	SOIL OR ROCK CLASSIFICATION	NOTES
		S-21	5	2	4	8	6	1.7	Gray CLAY, trace to little Silt, trace f. sand	Driller noted top of clay at depth of about 40.5 feet.
									(Moist, Medium)	
		S-22	4	4	4	6	8	1.6	Grades to "some" Silt	
45		S-23	4	3	4	6	7	1.8		
		S-24	6	6	6	8	12	1.8		Driller noted gravel at about 46 to 46.5 feet.
									(Wet, Stiff)	
		S-25	4	5	3	5	8	0.4	Contains "little" f. Gravel	
									(Wet, Medium)	
50		S-26	2	2	3	4	5	2.0		
55		S-27	WH	1	2	4	3	2.0		WH: weight of hammer and the drilling rods.
									(Wet, Soft)	
60		S-28	WR	WH	2	3	2	2.0		WR: weight of drilling rods.
65		S-29	WH	2	2	5	4	2.0	Contains "some" Silt	
70		S-30	WH	3	4	5	7	2.0		
									(Wet, Medium)	
		S-31	5	4	5	5	9	2.0		Freestanding water was initially encountered at 15.4 with augers at 18 feet, and at 15.5 feet with augers at 44 feet. Borehole side walls caved-in at about 16 feet after the augers were removed.
									(Wet, Stiff)	
75									Test boring complete at 74 feet.	
80										

DRILLER: M. Warner / G. Spizzirri
DRILL RIG: CME-850
METHOD OF INVESTIGATION: 4 1/4 inch augers, 2" Split Spoon Sampler (ASTMD1586)
JOB NUMBER: CE-12-042
CLASSIFIED BY: Geotechnical Engineer

STARTED: 11-10-12
FINISHED: 11-10-12

SJB SERVICES, INC.

SUBSURFACE LOG

HOLE NO. B-5
SURF. ELEV. g.s.
G.W. DEPTH See Notes
SHEET 1 of 2

PROJECT: Southside High School Building Addition
CLIENT: HUNT Engineers, Architects, & Land Surveyors, P.C.
LOCATION: 777 South Main Street, Elmira, New York 14904

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0-6	6-12	12-18	18-24	N	Rec (ft)	SOIL OR ROCK CLASSIFICATION	NOTES
		S-1	-	4	6	5	11	0.5	Fill: Red BRICK fragments and brown silty SAND with gravel (Moist, Firm)	Drillers noted approximately 0.3 feet of concrete at ground surface.
		S-2	8	8	8	5	16	1.2	Fill: Black SAND and CINDERS, some Gravel (Moist, Firm)	
5		S-3	4	6	6	7	12	1.2	Fill: Brown SAND and GRAVEL, little to some Silt (Moist, Firm)	
		S-4	6	5	4	4	9	1.2	(Moist, Loose)	
		S-5	4	3	2	7	5	0.5	Fill: Brown SILT and CLAY (Moist, Stiff)	S-6 to S-12: Subangular to angular gravel.
10		S-6	6	8	6	7	14	1.0	Fill: Brown GRAVEL, some Sand, little clayey Silt (Moist, Firm)	
		S-7	8	8	9	7	17	0.2		
15		S-8	8	12	12	16	24	1.1	Brown GRAVEL and SAND, little Silt (Moist, Firm)	
		S-9	8	6	3	4	9	0.7	Contains "some" Sand (Wet, Loose)	
		S-10	6	6	6	5	12	0.5	Grades to "little" Sand, "trace" silt (Wet, Firm)	
20		S-11	2	4	4	1	8	0.8	(Wet, Loose)	
		S12	6	2	2	3	4			
25		S13	1	2	2	2	4		Grades to "and" f.-m. SAND	S-13 to S-20: Rounded to subrounded gravel.
		S-14	4	7	4	4	11		(Wet, Firm)	
		S-15	3	3	3	3	6	0.3	(Wet, Loose)	
30		S-16	5	3	2	3	5	0.8		
		S-17	2	3	4	6	7	0.8	Brown f.-m. SAND, some f. Gravel, trace silt (Wet to Saturated, Loose)	
35		S-18	5	3	2	2	5	0.0	No recovery	
		S-19	1	1	5	3	6	0.7		
		S-20	3	2	2	2	4	0.3	Reddish brown, Contains "little" f. Gravel	
40										

DRILLER: M. Warner / G. Spizzirri
DRILL RIG: CME-850
METHOD OF INVESTIGATION: 4 1/4 inch augers, 2" Split Spoon Sampler (ASTMD1586)
JOB NUMBER: CE-12-42
CLASSIFIED BY: Geotechnical Engineer

STARTED: 11-10-12
FINISHED: 11-10-12

SJB SERVICES, INC.

SUBSURFACE LOG

HOLE NO. B-5
SURF. ELEV. g. s.
G.W. DEPTH See Notes
SHEET 2 of 2

PROJECT: Southside High School Building Addition
CLIENT: HUNT Engineers, Architects, & Land Surveyors, P.C.
LOCATION: 777 South Main Street
Elmira, New York 14904

DEPTH-FT.	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0-6	6-12	12-18	18-24	N	Rec (ft)	SOIL OR ROCK CLASSIFICATION	NOTES
		S-21	2	3	3	6	6	1.2	Brown CLAY, trace silt, trace f. sand (Moist, Medium)	Driller noted top of clay at about 40.5 feet.
		S-22	5	5	5	7	10	1.6	Becomes gray (Moist, Stiff)	
45		S-23	2	2	4	5	6	2.0	(Moist, Medium)	
		S-24	5	4	4	5	8	0.5	Brown f.-m. SAND, trace silt (Wet, Loose)	
		S-25	6	5	6	7	11	2.0	Gray CLAY, trace silt, trace gravel (Moist, Stiff)	
50									Test boring complete at 50 feet.	Freestanding water was initially encountered at 15.6 feet with augers at 18 feet, and at 24.6 feet with augers at 44 feet. Borehole side walls caved-in at about 16 feet after the augers were removed.
55										
60										
65										
70										
75										
80										

DRILLER: M. Warner, G. Spizzirri
DRILL RIG: CME-850
METHOD OF INVESTIGATION: 4 1/4 inch augers, 2" Split Spoon Sampler (ASTMD1586)
JOB NUMBER: CE-12-042
CLASSIFIED BY: Geotechnical Engineer

JLT LABORATORIES, INC.
GEOTECHNICAL, GEOSYNTHETIC AND MATERIALS TESTING AND RESEARCH

November 19, 2012
12LS2756.01

Sterling Environmental Engineering, P.C.
24 Wade Road
Latham, NY 12110

Attn: Peter Kelleher

RE: GEOTECHNICAL TEST RESULTS
PROJECT 28014 ELMIRA CSD

Dear Mr. Kelleher:

Submitted herein are the results of geotechnical tests performed on twelve (12) jar samples submitted for testing. As noted on the testing assignment sheet, jar B-3 / S-22 at 42 to 44 ft was combined with jar B-3 / S-3 at 44 to 46 ft resulting in eleven (11) sets of test results. All testing was performed per ASTM Standards while subject to JLT's internal QA / QC and data validation procedures. Testing included:

Gradation per ASTM D-422
Moisture Content per ASTM D-2216
Atterberg Limits per ASTM D-4318

We appreciate the opportunity to provide our services to you and look forward to working with you again. Should you have any questions, comments or require additional information, please do not hesitate to call. Thank you.

Sincerely,

JLT LABORATORIES, INC.

John Boschuk, Jr., P.E., C.F.E.
President

Enclosures
JB/mlb
\wp10\letter\12357
Inv# 5094

938 South Central Avenue • Canonsburg, Pennsylvania 15317 Tel: (724) 746-4441 Fax: (724) 745-4261

GEOTECHNICAL TEST REQUEST AND CHAIN OF CUSTODY

PAGE 1 of 2

Split Spoon, Jar, and Other Samples

CLIENT: Sterling Environmental Engineering, P.C.

JLT JOB No.: 12L2756.01

DATE RECEIVED: 11-15-12

PROJECT ID: 28014 - Elmira CSD

DATE ASSIGNED:

DATE COMPLETED:

BORING AND SAMPLE I.D.	DEPTH (feet)	PHYSICAL PROPERTIES: MC ☐ D2216	SIEVE ☐ D422	HYDROM ☐ D422	LIQUID LIMIT ☐ D4318	PLASTIC LIMIT ☐ D4318	SPEC GRAVITY ☐ D854 ☐ C127	ORG CONT ☐ D2974 ☐ D2974	pH ☐ 4972	CLASS. ☐ D2487 ☐ D3282 ☐ C127			PERMEABILITY (1): PERM ☐ D5084	PERM ☐ D2434	ENGINEERING PROPERTIES (1): CONSOL TEST ☐ D2435	DIRECT SHEAR ☐ D3080	UNCONF TEST ☐ D2166	UU TEST ☐ D4767	CU TEST ☐ D4767	CU w/pp TEST ☐ D4767					
B3-S6	10-12	X	X	X																					
B3-S8	14-16	X	X																						
B3-S14	26-28	X	X																						
B3-S16	30-32	X	X																						
B3-S19	36-38	X	X																						
B3-S22	42-46	X	X	X	X	X																			
B3-S28	60-62	X	X	X	X	X																			

COMPLETE THIS SECTION AND INCLUDE WITH SHIPMENT. ALSO FAX COPY AS PRE-NOTIFICATION

SHIPPER: Empire Geo Services, Inc.

ADDRESS: 60 Miller Street
Cortland, NY 13045

CONTACT: Peter Kelleher (Sterling); Parvis Akbari (Empire)

TEL: 518-456-4900 (Sterling) FAX: 518-456-3532 (Sterling)
607-758-7182 (Empire) 607-758-7188 (Empire)

SHIP TO: JLT Laboratories Inc.
938 South Central Avenue
Canonsburg, PA 15317
Tel: (724) 745-4441
Fax: (724) 745-4261
e-mail: jlt@jltlabs.com or
e-mail: jboschuk@jltlabs.com

NOTES / INSTRUCTIONS
- B3-S22 combine with B3-S23 for sample volume if needed.
- Sieve with C136.
- Samples collected @ Elmira Southside H.S.
- Reference STERLING ENVIRONMENTAL for information regarding (potential) environmentally impacted material.

Relinquished By: WJ Jablonski via Fedex Date: 11/14/2012

Received By: Date:

☑ ASSIGNED TEST

(1) Test parameters to be provided by the Engineer.

JLT GEOTECHNICAL LABORATORY
soilcocjar.wpd

GEOTECHNICAL TEST REQUEST AND CHAIN OF CUSTODY

Split Spoon, Jar, and Other Samples

CLIENT: Sterling Environmental Engineering, P.C.

JLT JOB No.: 12 LS 2756.01

DATE RECEIVED: 11/15/12

PROJECT ID: 28014 - Elmira CSD

DATE ASSIGNED: 11/15/12

DATE COMPLETED:

BORING AND SAMPLE I.D.	DEPTH (feet)	PHYSICAL PROPERTIES											PERMEABILITY [2]		ENGINEERING PROPERTIES [3]																	
		W/C ☐ D2216	SIEVE ☐ D422	HYDRO ☐ D422	LIQUID LIMIT ☐ D4318	PLASTIC LIMIT ☐ D4318	SPEC GRAVITY ☐ D854 ☐ C127	ORG CONT ☐ D2974 ☐ D6258	pH ☐ 4972	CLASS. ☐ D2487 ☐ D2488 ☐ C127			PERM ☐ D5084	PERM ☐ D2434	CONSOL TEST ☐ D2435	DIRECT SHEAR ☐ D3080	UNCONF TEST ☐ D2166	UU TEST ☐ D2850	CU TEST ☐ D4767	CIU w/pp TEST ☐ D4767										
BS-S4	6-8	X	X																												
BS-S9	16-18	X	X																												
BS-S12	22-24	X	X																												
BS-S22	42-44	X	X	X	X	X																									

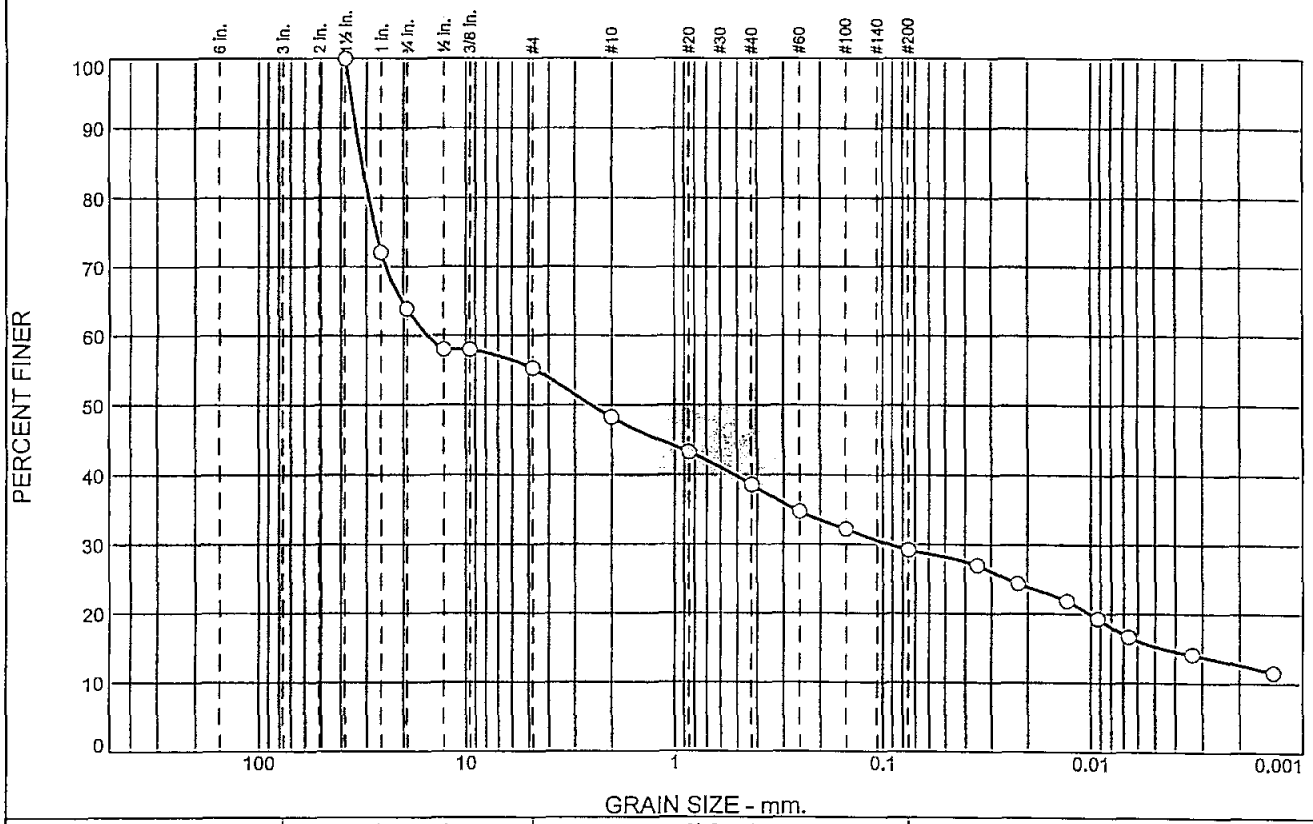
☑ ASSIGNED TEST

8 Sieve
4 Hy
3 Att
1 M/C

(1) Test parameters to be provided by the Engineer.

JLT GEOTECHNICAL LABORATORY
soilcocjar.wpd

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	36.1	8.6	7.0	9.7	9.4	13.9	15.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	72.1		
0.75	63.9		
0.50	57.9		
0.375	57.9		
#4	55.3		
#10	48.3		
#20	43.3		
#40	38.6		
#60	34.7		
#100	32.2		
#200	29.2		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 33.5960 D_{85}= 31.4321 D_{60}= 15.3469
D_{50}= 2.5034 D_{30}= 0.0929 D_{15}= 0.0046
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As-Rec'd M/C = 11.1%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-3 / S-6 Depth: 10-12 Date: 11/19/2012

JLT Laboratories, Inc.

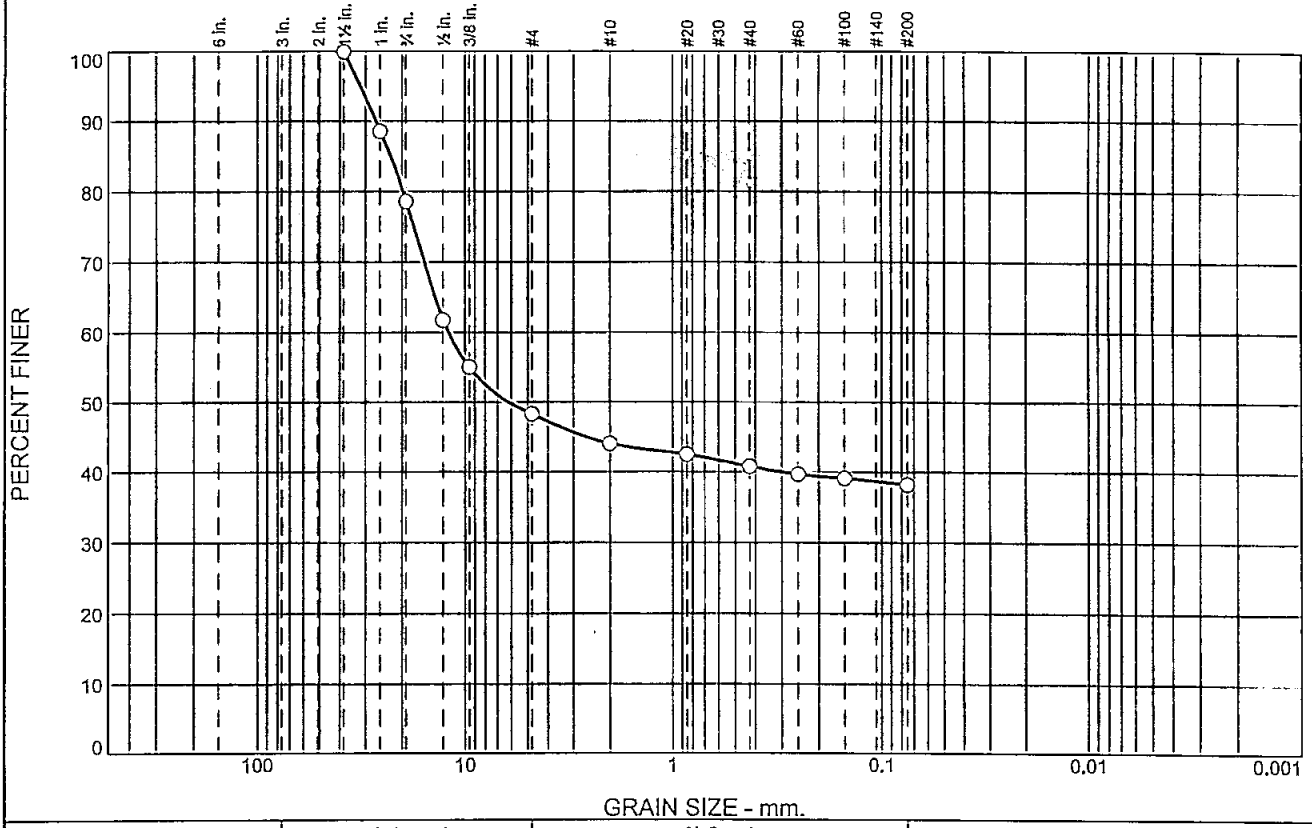
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 Figure

Tested By: RL Checked By: JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.4	30.3	4.2	3.3	2.6	38.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	88.5		
0.75	78.6		
0.50	61.8		
0.375	55.0		
#4	48.3		
#10	44.1		
#20	42.5		
#40	40.8		
#60	39.7		
#100	39.1		
#200	38.2		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 26.6676 D_{85}= 22.7294 D_{60}= 11.9913
D_{50}= 6.1451 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As-Rec'd M/C = 7.3%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-3 / S-8 Depth: 14-16 Date: 11/16/2012

JLT Laboratories, Inc.

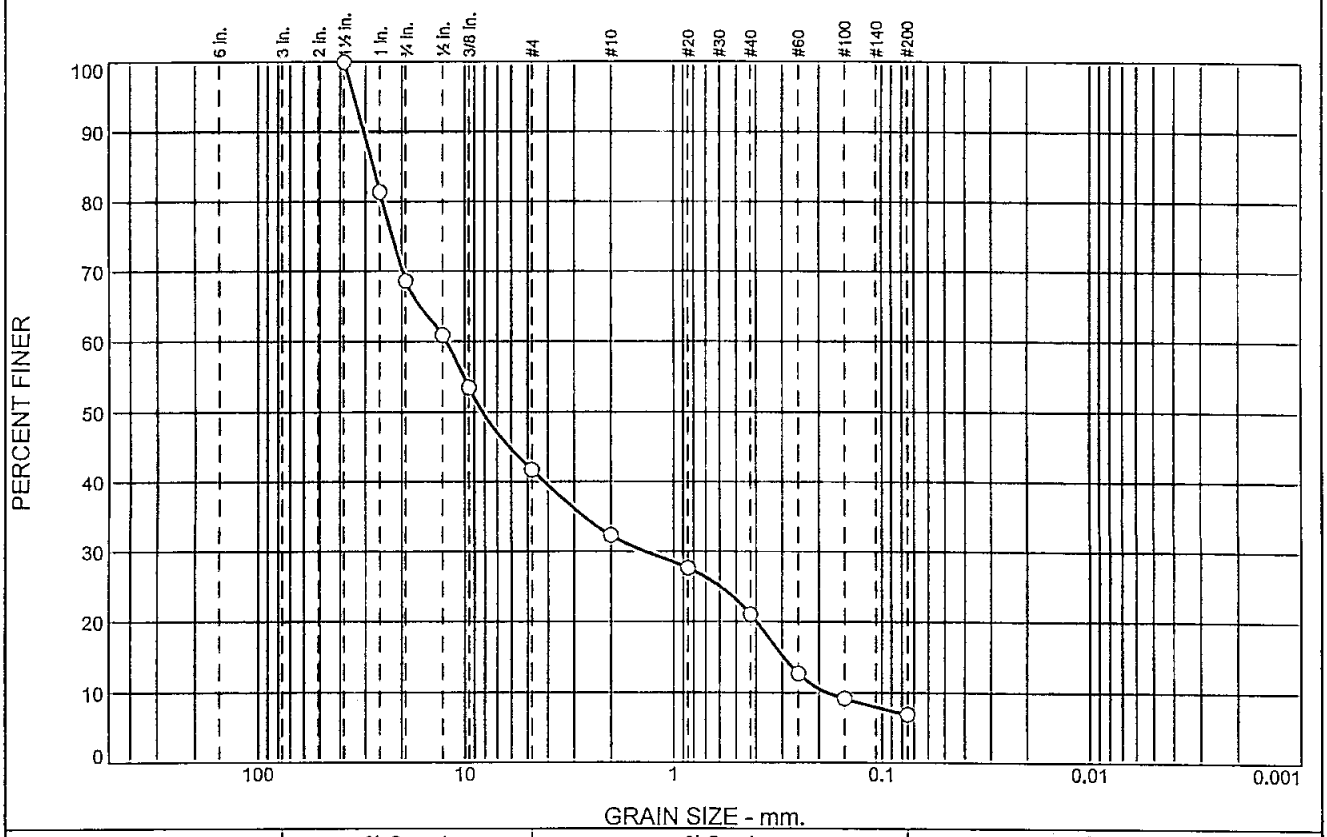
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 Figure

Tested By: RL Checked By: JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	31.4	26.9	9.3	11.4	14.1	6.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	81.3		
0.75	68.6		
0.50	60.9		
0.375	53.5		
#4	41.7		
#10	32.4		
#20	27.6		
#40	21.0		
#60	12.6		
#100	9.2		
#200	6.9		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 30.5152 D_{85}= 27.4082 D_{60}= 12.2089
D_{50}= 8.1941 D_{30}= 1.3607 D_{15}= 0.2953
D_{10}= 0.1821 C_u= 67.04 C_c= 0.83

Classification

USCS= AASHTO=

Remarks

As-Rec'd M/C = 10.2%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-3 / S-14 **Depth:** 26-28 **Date:** 11/16/2012

JLT Laboratories, Inc.

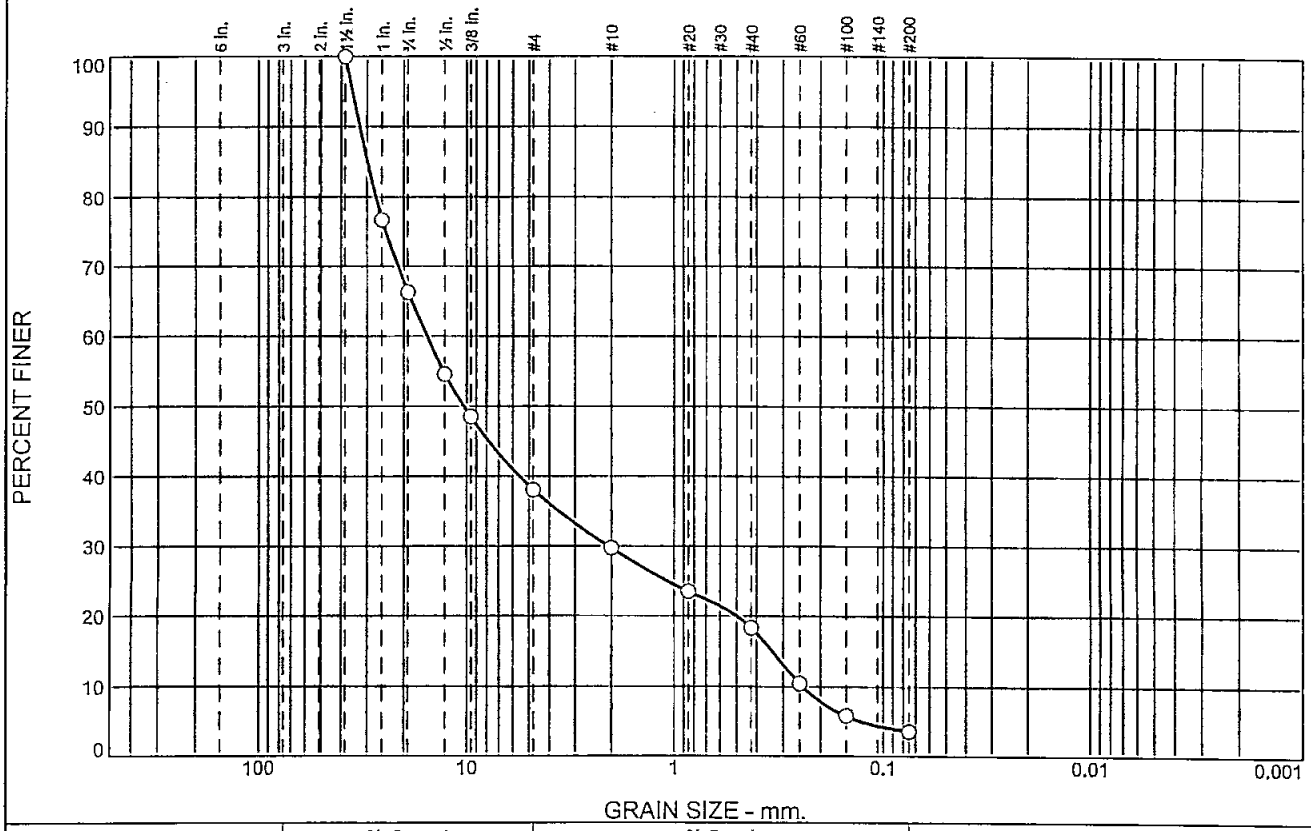
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 **Figure**

Tested By: RL **Checked By:** JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	33.7	28.2	8.3	11.5	14.7	3.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	76.7		
0.75	66.3		
0.50	54.6		
0.375	48.5		
#4	38.1		
#10	29.8		
#20	23.5		
#40	18.3		
#60	10.4		
#100	5.8		
#200	3.6		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 32.4980 D_{85}= 29.8632 D_{60}= 15.5015
D_{50}= 10.3077 D_{30}= 2.0604 D_{15}= 0.3383
D_{10}= 0.2422 C_u= 63.99 C_c= 1.13

Classification

USCS= AASHTO=

Remarks

As-Rec'd M/C = 9.8%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-3 / S-16 **Depth:** 30-32 **Date:** 11/16/2012

JLT Laboratories, Inc.

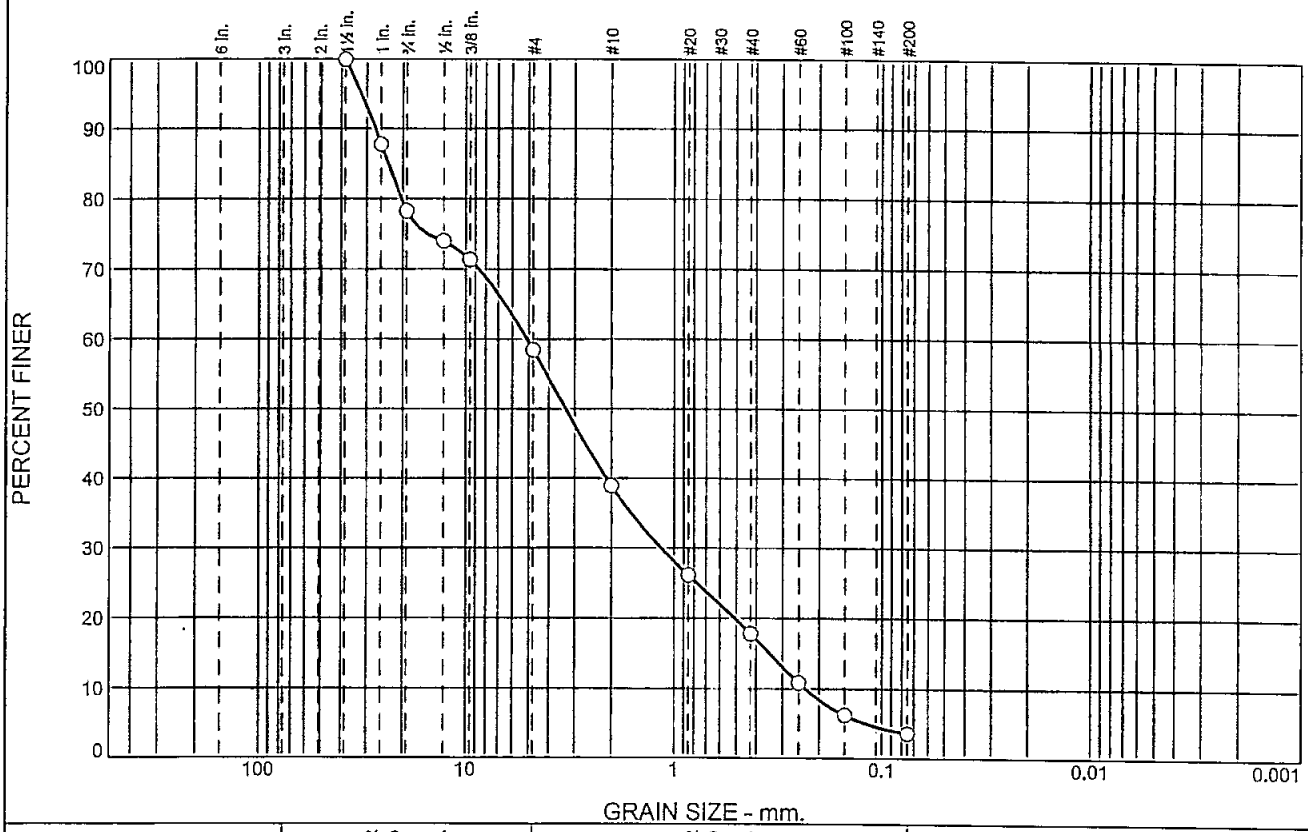
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 **Figure**

Tested By: RL **Checked By:** JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.8	19.8	19.5	21.1	14.2	3.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	87.7		
0.75	78.2		
0.50	74.0		
0.375	71.3		
#4	58.4		
#10	38.9		
#20	26.1		
#40	17.8		
#60	10.8		
#100	6.3		
#200	3.6		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 27.1471 D_{85}= 23.5290 D_{60}= 5.0953
D_{50}= 3.3113 D_{30}= 1.1512 D_{15}= 0.3455
D_{10}= 0.2329 C_u= 21.88 C_c= 1.12

Classification

USCS= AASHTO=

Remarks

As-Rec'd M/C = 13.1%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-3 / S-19 **Depth:** 36-38 **Date:** 11/16/2012

JLT Laboratories, Inc.

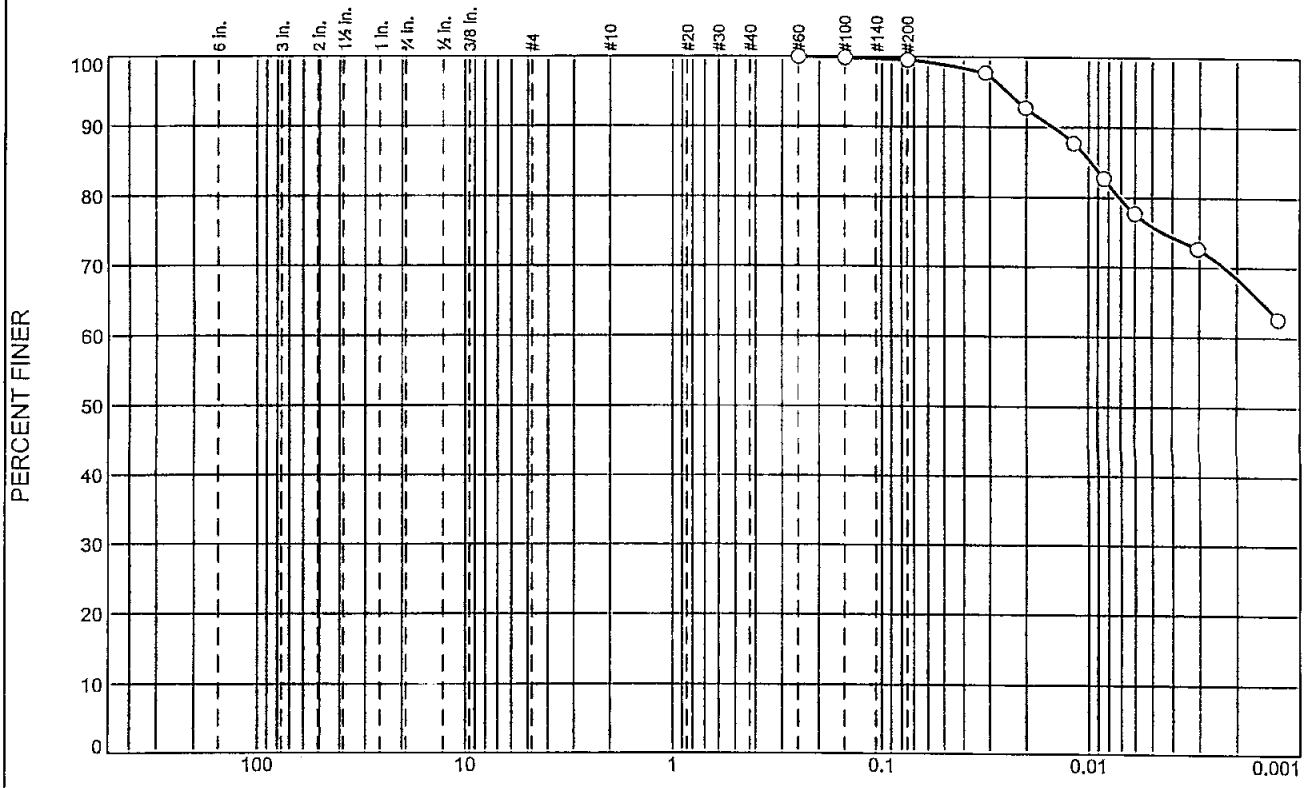
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 **Figure**

Tested By: RL **Checked By:** JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.4	23.8	75.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#60	100.0		
#100	99.9		
#200	99.6		

* (no specification provided)

Material Description

Composite of 2 Jars
B-3 / S-22 (42-44) & B-3 / S-23 (44-46)

Atterberg Limits

PL= 24 LL= 35 PI= 11

Coefficients

D_{90}= 0.0148 D_{85}= 0.0097 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

As-Rec'D M/C = 29.9%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: Composite

Date: 11/19/2012

JLT Laboratories, Inc.

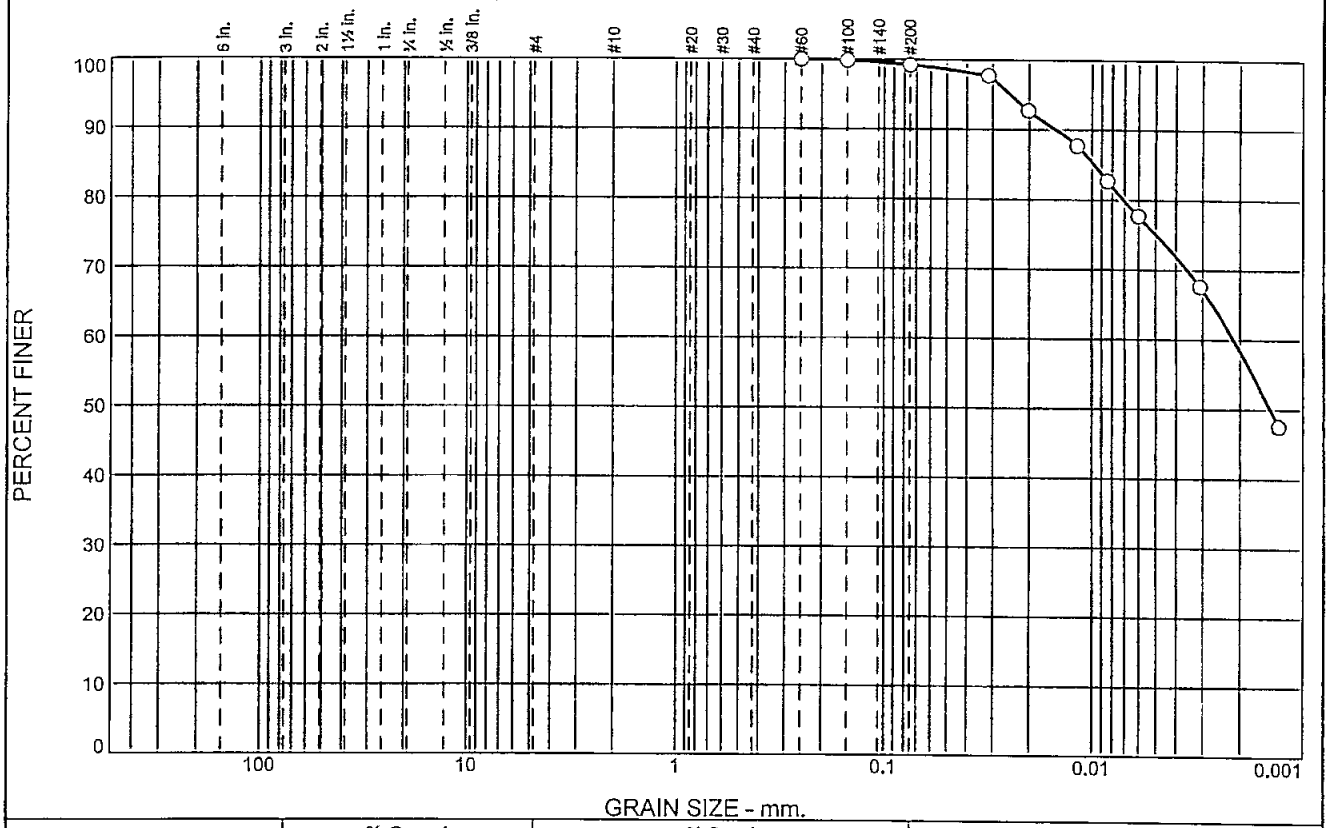
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 Figure

Tested By: RL Checked By: JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.7	24.2	75.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#60	100.0		
#100	99.9		
#200	99.3		

* (no specification provided)

Material Description

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.0148 D_{85}= 0.0097 D_{60}= 0.0021
D_{50}= 0.0014 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

As-Rec'd M/C = 36.9%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-3 / S-28 **Depth:** 60-62 **Date:** 11/19/2012

JLT Laboratories, Inc.

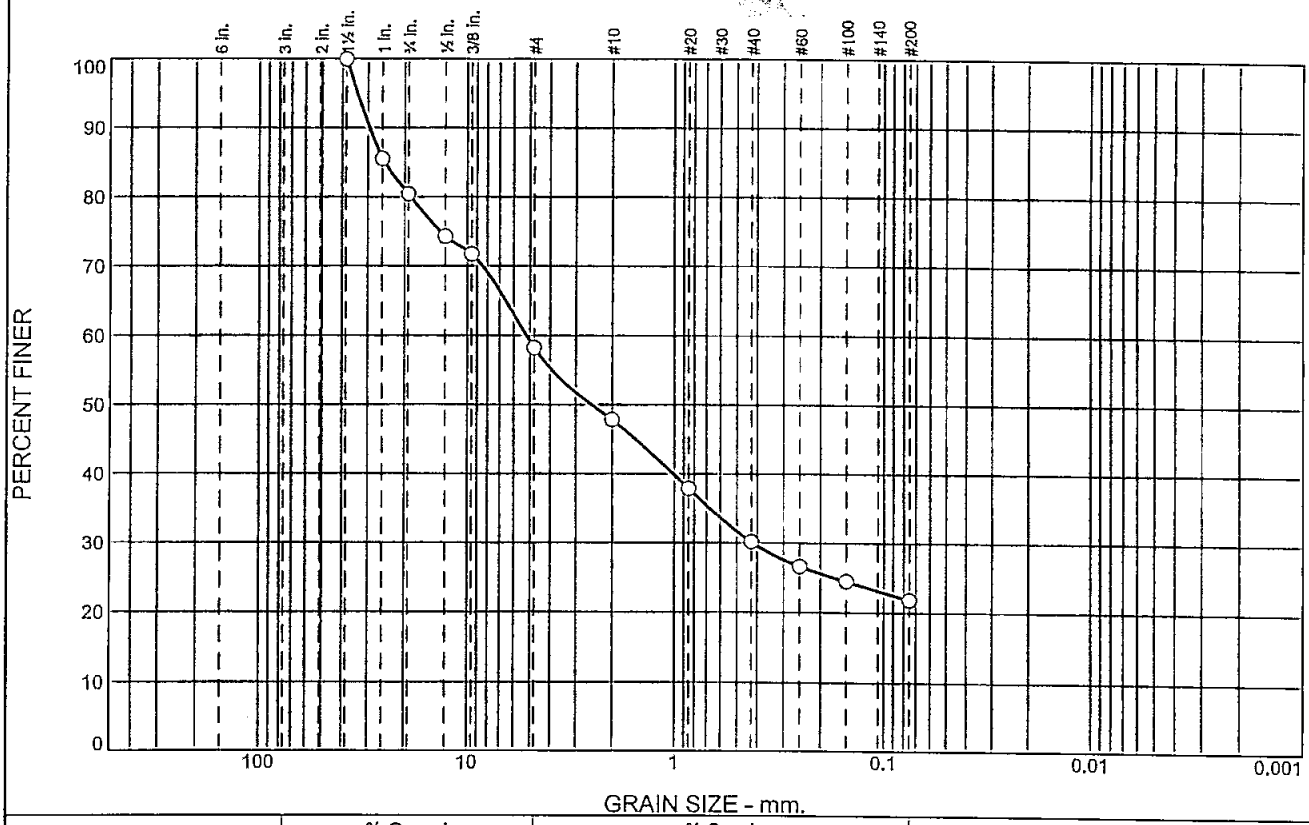
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 **Figure**

Tested By: RL **Checked By:** JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	19.6	22.2	10.4	17.6	8.4	21.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	85.5		
0.75	80.4		
0.50	74.3		
0.375	71.7		
#4	58.2		
#10	47.8		
#20	37.9		
#40	30.2		
#60	26.6		
#100	24.5		
#200	21.8		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 29.5033 D_{85}= 24.8769 D_{60}= 5.1941
D_{50}= 2.5117 D_{30}= 0.4171 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

As-Rec'd M/C = 8.9%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-5 / S-4 **Depth:** 6-8 **Date:** 11/16/2012

JLT Laboratories, Inc.

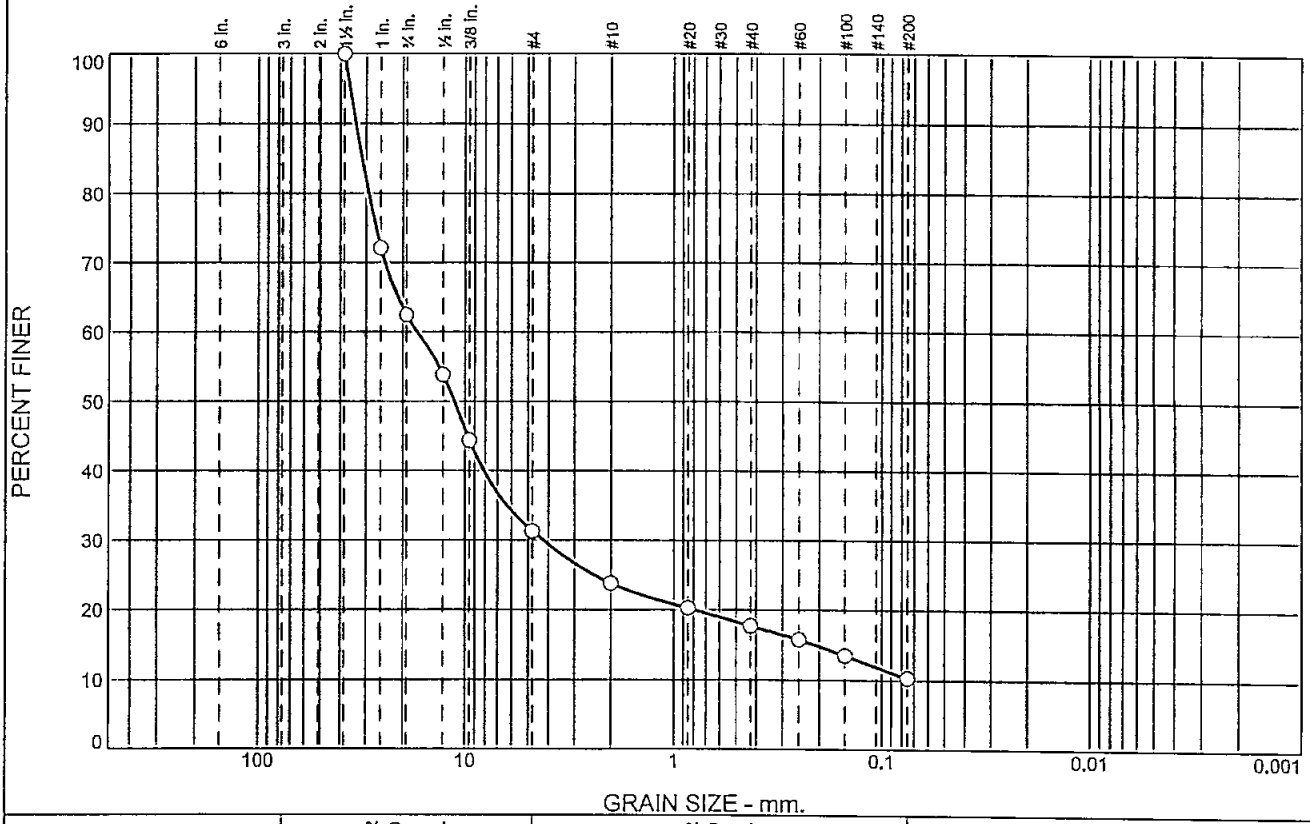
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 Figure

Tested By: RL **Checked By:** JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	37.6	31.1	7.5	6.1	7.4	10.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	72.1		
0.75	62.4		
0.50	53.8		
0.375	44.4		
#4	31.3		
#10	23.8		
#20	20.3		
#40	17.7		
#60	15.8		
#100	13.5		
#200	10.3		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 33.4909 D_{85}= 31.2966 D_{60}= 16.9279
D_{50}= 11.2568 D_{30}= 4.2129 D_{15}= 0.2069
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

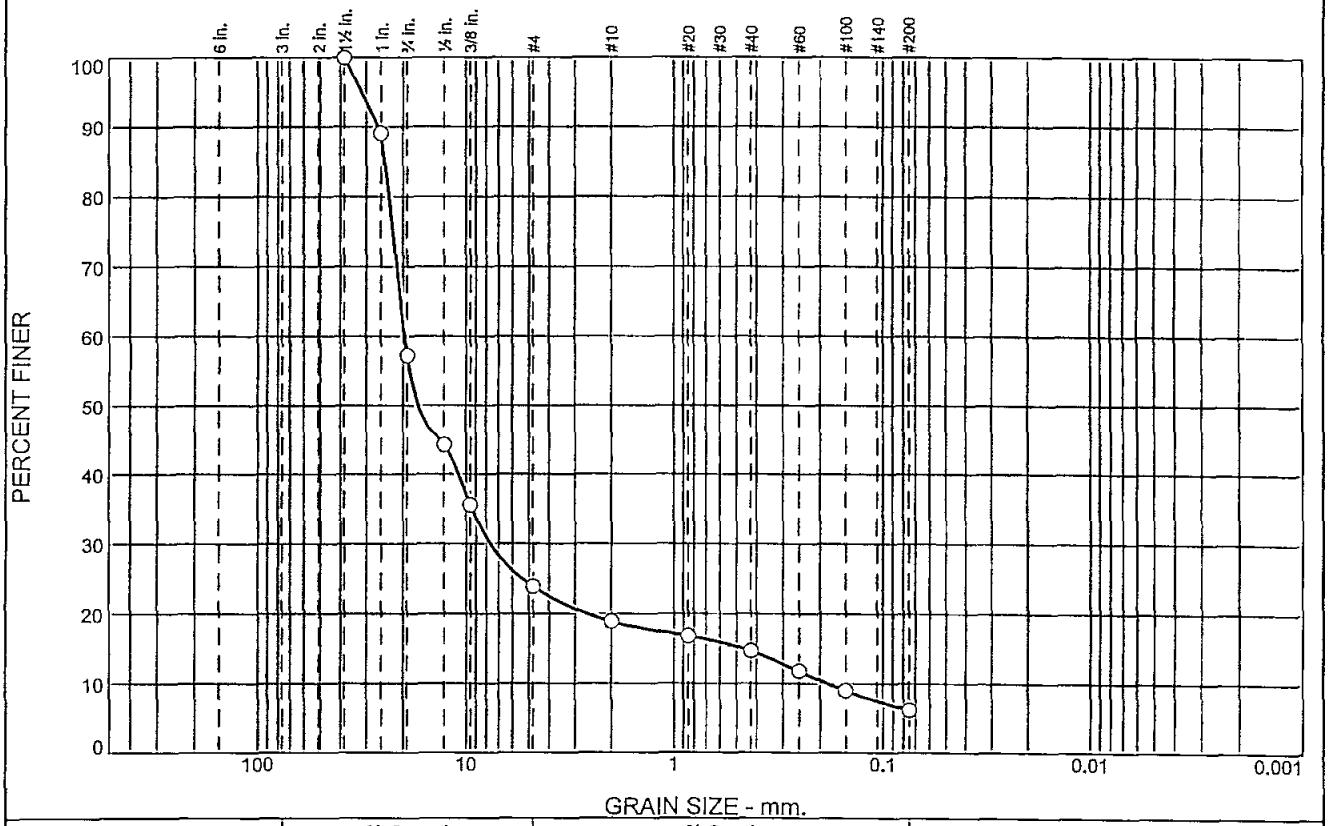
As-Rec'd M/C = 9.1%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-5 / S-9 **Depth:** 16-18 **Date:** 11/16/2012

JLT Laboratories, Inc. Canonsburg, PA	Client: Sterling Environmental Engineering, P.C. Project: Elmira CSD - 28014 Project No: 12LS2756.01 Figure

Tested By: RL Checked By: JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	42.8	33.3	5.0	4.2	8.5	6.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50	100.0		
1.00	89.0		
0.75	57.2		
0.50	44.3		
0.375	35.6		
#4	23.9		
#10	18.9		
#20	16.8		
#40	14.7		
#60	11.7		
#100	9.0		
#200	6.2		

* (no specification provided)

Material Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 26.3173 D_{85}= 24.3734 D_{60}= 19.6253
D_{50}= 16.9714 D_{30}= 7.6566 D_{15}= 0.4577
D_{10}= 0.1830 C_u= 107.21 C_c= 16.32

Classification

USCS= AASHTO=

Remarks

As-Rec'd M/C = 12.0%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-5 / S-12 **Depth:** 22-24 **Date:** 11/16/2012

JLT Laboratories, Inc.

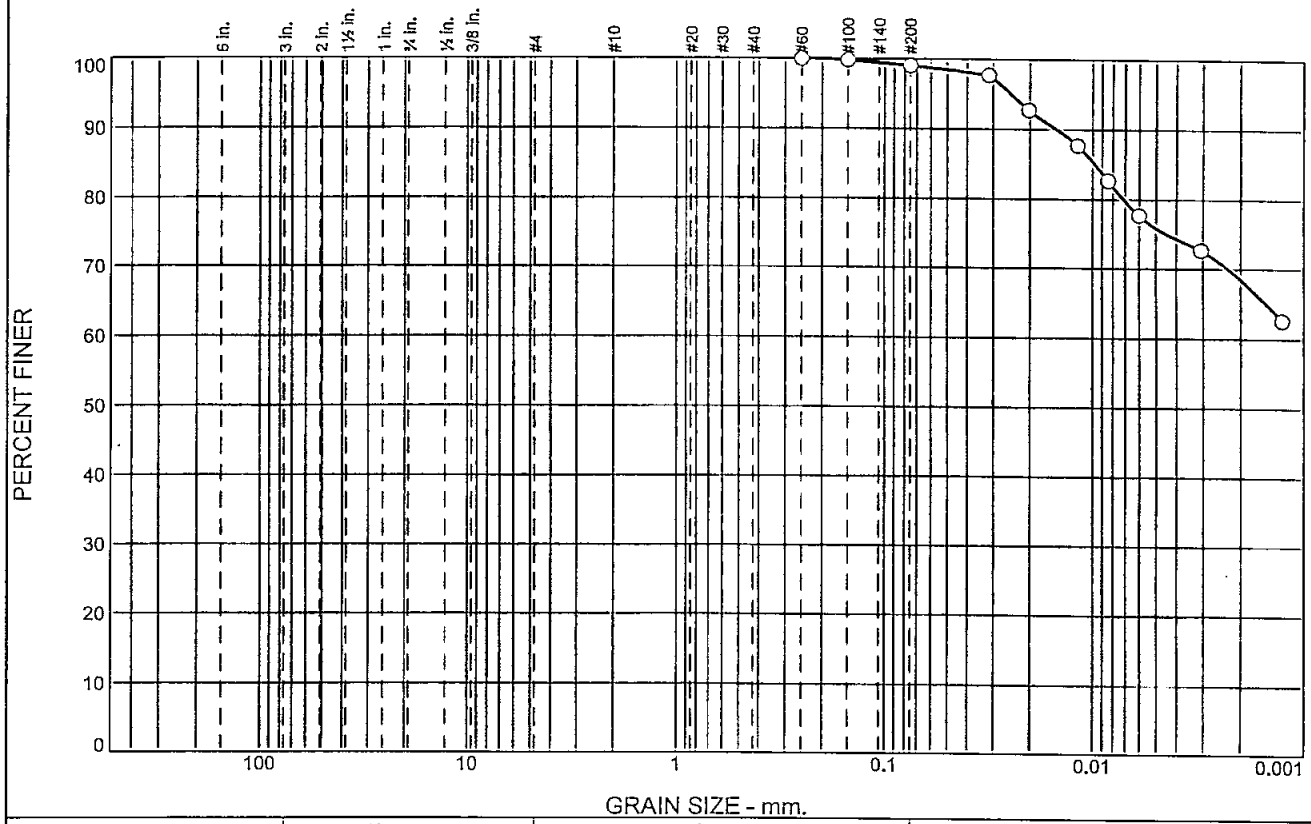
Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 **Figure**

Tested By: RL **Checked By:** JB

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.0	0.9	23.3	75.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#60	100.0		
#100	99.8		
#200	99.1		

* (no specification provided)

Material Description

Atterberg Limits

PL= 24 LL= 35 PI= 11

Coefficients

D_{90}= 0.0148 D_{85}= 0.0097 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

As-Rec'd M/C = 29.7%
Gradation: D-422 Moisture: D-2216

Location: 28014
Sample Number: B-5 / S-22 **Depth:** 42-44 **Date:** 11/19/2012

JLT Laboratories, Inc.

Canonsburg, PA

Client: Sterling Environmental Engineering, P.C.
Project: Elmira CSD - 28014

Project No: 12LS2756.01 **Figure**

Tested By: RL **Checked By:** JB

ATTACHMENT 3

AASHTO Load Distribution [2014]

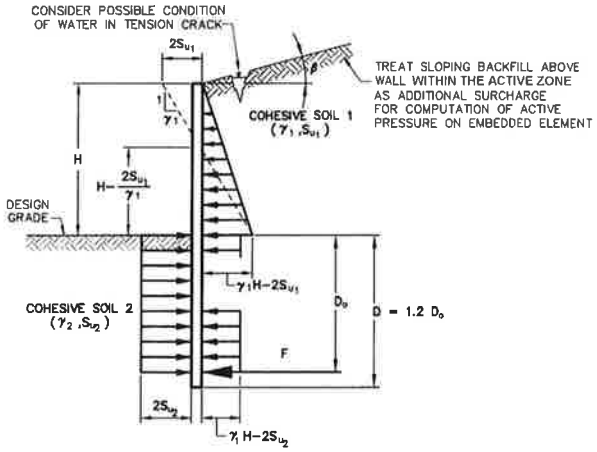


Figure 3.11.5.6-7—Unfactored Simplified Earth Pressure Distributions for Temporary Nongravity Cantilevered Walls with Continuous Vertical Wall Elements Embedded in Cohesive Soil and Retaining Cohesive Soil Modified after Teng (1962)

3.11.5.7—Apparent Earth Pressure (*AEP*) for Anchored Walls

For anchored walls constructed from the top down, the earth pressure may be estimated in accordance with Articles 3.11.5.7.1 or 3.11.5.7.2.

In developing the design pressure for an anchored wall, consideration shall be given to wall displacements that may affect adjacent structures and/or underground utilities.

3.11.5.7.1—Cohesionless Soils

The earth pressure on temporary or permanent anchored walls constructed in cohesionless soils may be determined using Figure 3.11.5.7.1-1, for which the maximum ordinate, p_a, of the pressure diagram is computed as follows:

C3.11.5.7

In the development of lateral earth pressures, the method and sequence of construction, the rigidity of the wall/anchor system, the physical characteristics and stability of the ground mass to be supported, allowable wall deflections, anchor spacing and prestress and the potential for anchor yield should be considered.

Several suitable apparent earth pressure distribution diagrams are available and in common use for the design of anchored walls, Sabatini et al. (1999); Cheney (1988); and U. S. Department of the Navy (1982a). Some of the apparent earth pressure diagrams, such as those described in Articles 3.11.5.7.1 and 3.11.5.7.2, are based on the results of measurements on anchored walls, Sabatini et al. (1999). Others are based on the results of measurements on strutted excavations, Terzaghi and Peck (1967), the results of analytical and scale model studies, Clough and Tsui (1974); Hanna and Matallana (1970), and observations of anchored wall installations (Nicholson et al., 1981); Schnabel (1982). While the results of these efforts provide somewhat different and occasionally conflicting results, they all tend to confirm the presence of higher lateral pressures near the top of the wall than would be predicted by classical earth pressure theories, due to the constraint provided by the upper level of anchors, and a generally uniform pressure distribution with depth.

For walls with one anchor level:

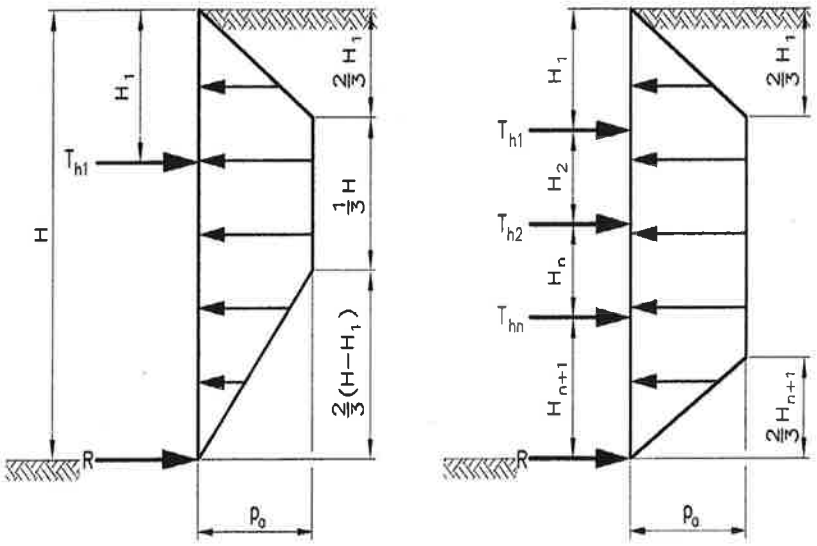
$$p_a = k_a \gamma'_s H \qquad (3.11.5.7.1\text{-}1)$$

For walls with multiple anchor levels:

$$p_a = \frac{k_a \gamma'_s H^2}{1.5H - 0.5H_1 - 0.5H_{n+1}} \qquad (3.11.5.7.1\text{-}2)$$

where:

p_a = maximum ordinate of pressure diagram (ksf)
k_a = active earth pressure coefficient
= $\tan^2$ (45 degrees – $\phi_f/2$) (dim.) for $\beta = 0$
use Eq. 3.11.5.3-1 for $\beta \neq 0$
γ'_s = effective unit weight of soil (kcf)
H = total excavation depth (ft)
H_1 = distance from ground surface to uppermost ground anchor (ft)
H_{n+1} = distance from base of excavation to lowermost ground anchor (ft)
T_{hi} = horizontal load in ground anchor i (kip/ft)
R = reaction force to be resisted by subgrade (i.e., below base of excavation) (kip/ft)



(a) Wall with one level of ground anchors

(b) Walls with multiple levels of ground anchors

Figure 3.11.5.7.1-1—Apparent Earth Pressure Distributions for Anchored Walls Constructed from the Top Down in Cohesionless Soils

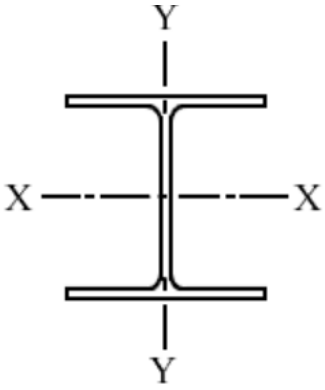
3.11.5.7.2—Cohesive Soils

The apparent earth pressure distribution for cohesive soils is related to the stability number, N_s, which is defined as:

ATTACHMENT 4

Pile Data Sheets

S

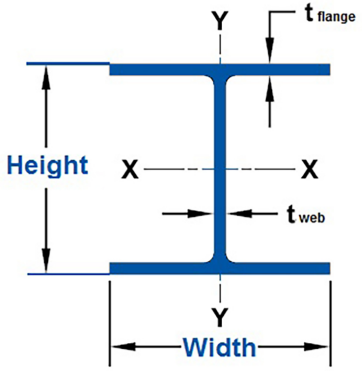


Design Properties - Steel H Piling

Section Number	Weight Per Foot lb	Area of Selection A in.^{2}	Depth of Section d in.	Flange Width b_F in.	Flange Thickness t_F in.	Web Thickness t_w in.	Axis X-X I_x in.^{4}	Axis X-X S_x in.^{3}	Axis X-X r_x in.	Axis Y-Y I_y in.^{4}	Axis Y-Y S_y in.^{3}	Axis Y-Y r_y in.	Surface Area ft^2/ft
HP14X	117	34.4	14.21	14.885	0.805	0.805	1220	172	5.96	443	59.5	3.59	7.11
	102	30	14.01	14.735	0.705	0.705	1050	150	5.92	380	51.4	3.56	7.06
	89	26.1	13.83	14.695	0.615	0.615	904	131	5.88	326	44.3	3.53	7.02
	73	21.4	13.61	14.585	0.505	0.505	729	107	5.84	261	35.8	3.49	6.96
HP12X	84	24.6	12.28	12.295	0.685	0.685	650	106	5.14	213	34.6	2.94	5.97
	74	21.8	12.13	12.215	0.61	0.605	569	93.8	5.11	186	30.4	2.92	5.91
	63	18.4	11.94	12.125	0.515	0.515	472	79.1	5.06	153	25.3	2.88	5.86
	53	15.5	11.78	12.045	0.435	0.435	393	66.8	5.03	127	21.1	2.86	5.82
HP10X	57	16.8	9.99	10.225	0.565	0.565	294	58.8	4.18	101	19.7	2.45	4.91
	42	12.4	9.7	10.075	0.42	0.415	210	43.4	4.13	71.7	14.2	2.41	4.83
HP8X	36	10.6	8.02	8.155	0.445	0.445	119	29.8	3.36	40.3	9.88	1.95	3.92

T +1 (866) 313-8770 | E info@meever.us | I www.meever.us

HP14 x89 (Structural steel and H-piles)



Section description	Product group	Shape	Section Modulus	Moment of Inertia	Width	Height	Thickness flange	Thickness web	Weight single	Weight	Coating 2 sides	Coating area
			in^3/ft cm^3/m	in^4/ft cm^4/m	inch mm	inch mm	inch mm	inch mm	lbs/ft kg/m	lbs/ft^2 kg/m^2	ft^2/ft m^2/m	ft^2/ft m^2/m
HP14 x89	Structural steel and H-piles	H-pile	131.0 7,043	904.0 123,448	14.70 373	13.80 351	0.615 15.6	0.615 15.6	89.0 132.43		7.02 2.15	

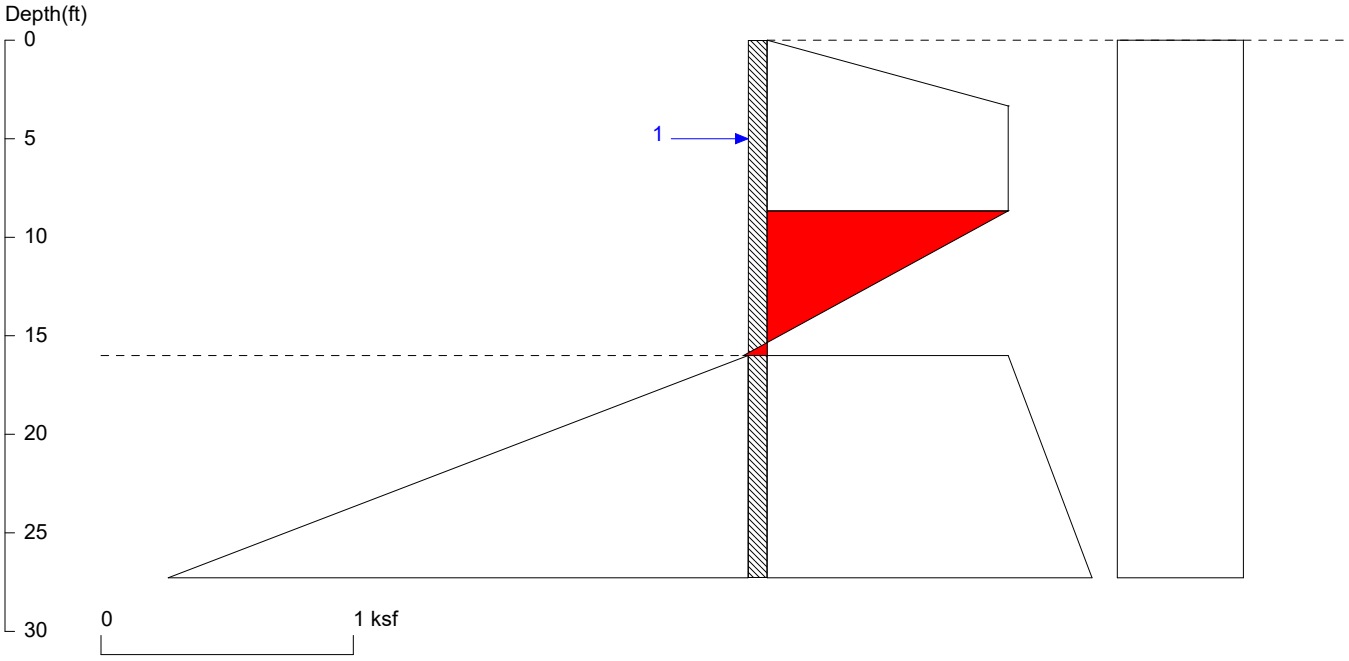
Datasheet for estimation purposes
Production acc. ASTM A6 in varies steel grades
Origin: various

ATTACHMENT 5

CT Shoring Output for IRM #4

EarthPres16FtAtRest AASHTO Load Distribution

EarthPres16FtAtRest AASHTO Load Distribution



Licensed to 4324324234 3424343 Date: 1/20/2020

File: C:\Users\localadmin\Desktop\Elmira#4\Revision_1-20-20\W1A-Strut\EHS16Ft1Anchor_AASHTO-Ko.sh8

Wall Height=16.0 Pile Diameter=1.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=11.28 Min. Pile Length=27.28

MOMENT IN PILE: Max. Moment=152.08 per Pile Spacing=6.0 at Depth=12.93

PILE SELECTION:

Request Min. Section Modulus = 55.3 in3/pile=906.26 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

User Input I (Moment of Inertia):

Top Deflection = -0.27(in) based on E (ksi)=29000.00 and I (in4)/pile=900.0

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	N/A	N/A
1. Strut	5.0	0.0	6.0	95.6	95.6	0.0	0.0	0.0

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
*	Above	Base		
0.000	0.000	3.333	0.955	0.286529
3.333	0.955	8.667	0.955	0.000000
8.667	0.955	16	0	-0.14317
*	Below	Base		
16	0.955	39	1.632	0.029435
*	Sur-	charg		
0.000	0.500	0.800	0.500	0.000000
0.800	0.500	1.600	0.500	0.000000
1.600	0.500	2.400	0.500	0.000000
2.400	0.500	3.200	0.500	0.000000
3.200	0.500	4.000	0.500	0.000000
4.000	0.500	4.800	0.500	0.000000

4.800	0.500	5.600	0.500	0.000000
5.600	0.500	6.400	0.500	0.000000
6.400	0.500	7.200	0.500	0.000000
7.200	0.500	8.000	0.500	0.000000
8.000	0.500	8.800	0.500	0.000000
8.800	0.500	9.600	0.500	0.000000
9.600	0.500	10.40	0.500	0.000000
10.40	0.500	11.20	0.500	0.000000
11.20	0.500	12.00	0.500	0.000000
12.00	0.500	12.80	0.500	0.000000
12.80	0.500	13.60	0.500	0.000000
13.60	0.500	14.40	0.500	0.000000
14.40	0.500	15.20	0.500	0.000000
15.20	0.500	16.00	0.500	0.000000
16.00	0.500	17.60	0.500	0.000000
17.60	0.500	19.20	0.500	0.000000
19.20	0.500	20.80	0.500	0.000000
20.80	0.500	22.40	0.500	0.000000
22.40	0.500	24.00	0.500	0.000000
24.00	0.500	25.60	0.500	0.000000
25.60	0.500	27.20	0.500	0.000000
27.20	0.500	28.80	0.500	0.000000

PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
*	Below	Base		
16.00	0.000	39.00	4.686	0.203737

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	6.00
2	16.00	1.50

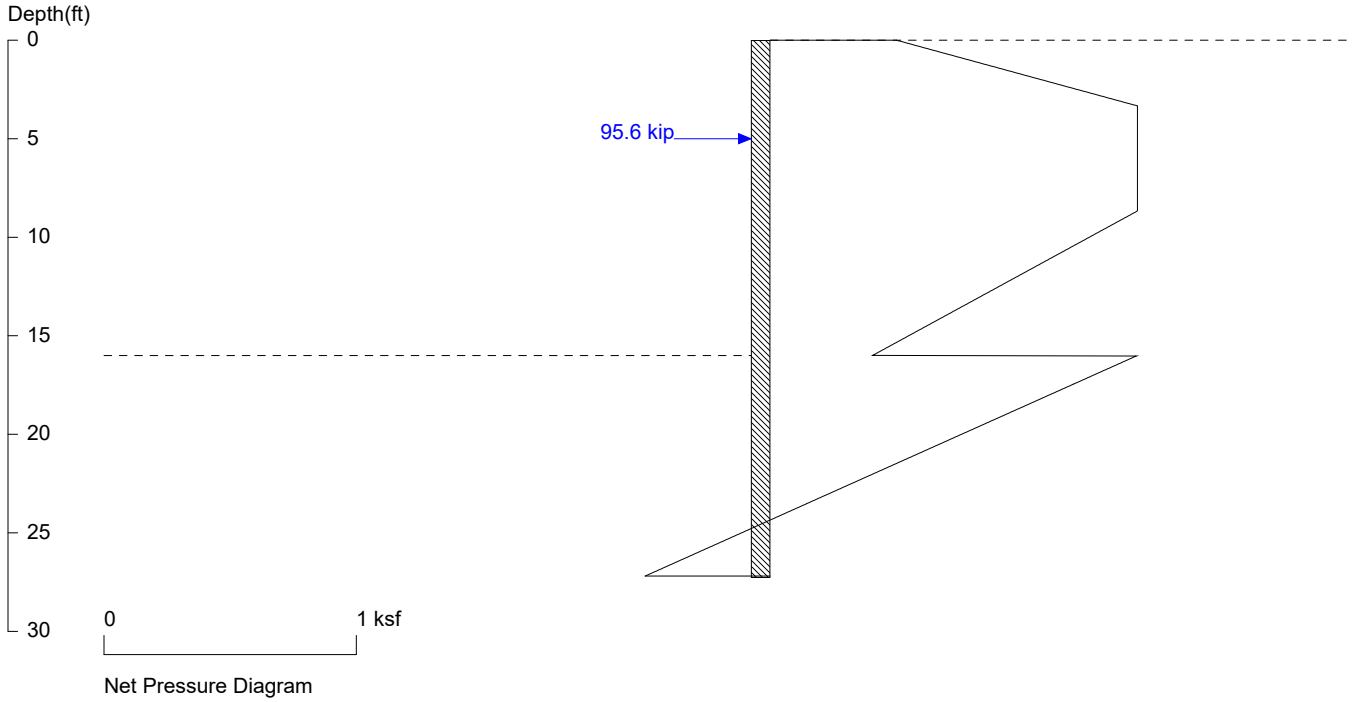
PASSIVE SPACING:

No.	Z depth	Spacing
1	16.00	3.00

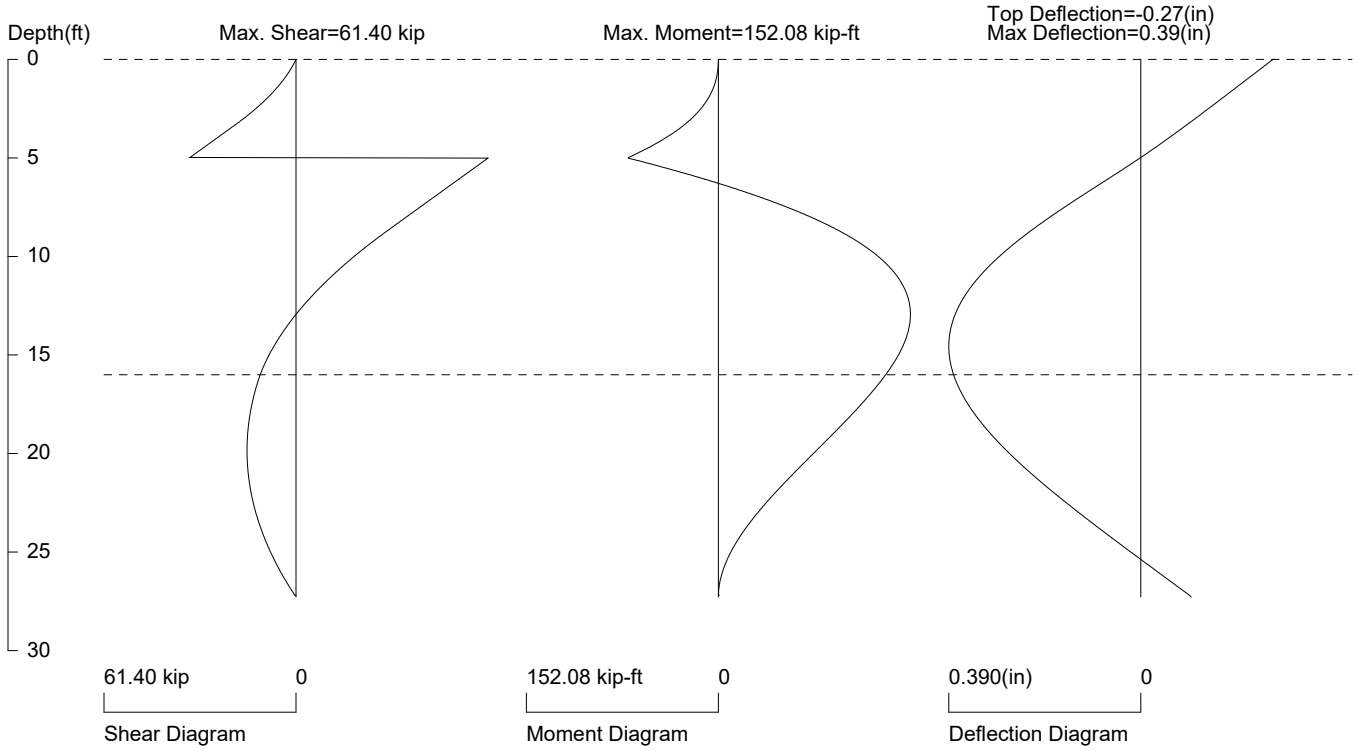
UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

EarthPres16FtAtRest AASHTO Load Distribution

EarthPres16FtAtRest AASHTO Load Distribution



Net Pressure Diagram



Shear Diagram | Moment Diagram | Deflection Diagram

PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

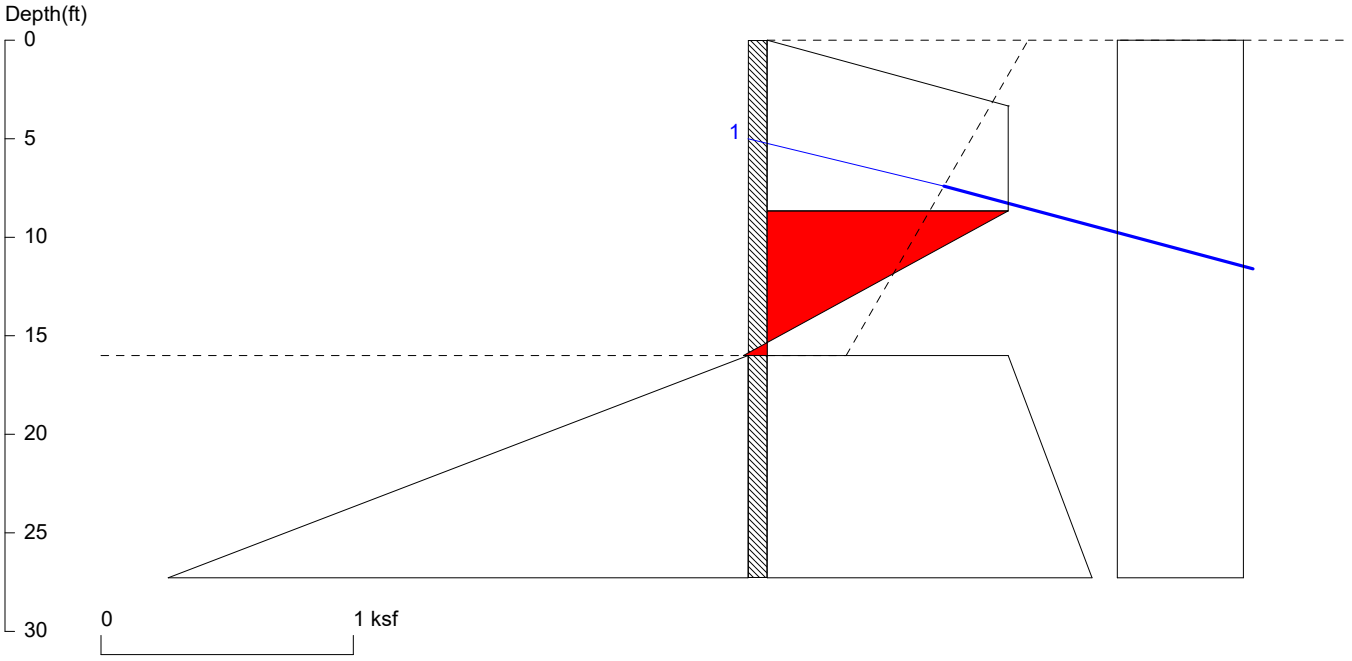
Based on pile spacing: 6.0 foot or meter

User Input I: E (ksi)=29000.0, I (in4)/pile=900.0

File: C:\Users\localadmin\Desktop\Elmira#4\Strut Support\EHS16Ft1Anchor_AASHTO-Ko.sh8

EarthPres16FtAtRest AASHTO Load Distribution

EarthPres16FtAtRest AASHTO Load Distribution



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File: C:\Users\localadmin\Desktop\Elmira#4\Revision_1-20-20\W1A\EHS16Ft1Anchor_AASHTO-Ko.sh8

Wall Height=16.0 Pile Diameter=1.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=11.28 Min. Pile Length=27.28

MOMENT IN PILE: Max. Moment=152.08 per Pile Spacing=6.0 at Depth=12.93

PILE SELECTION:

Request Min. Section Modulus = 55.3 in3/pile=906.26 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66

User Input I (Moment of Inertia):

Top Deflection = -0.27(in) based on E (ksi)=29000.00 and I (in4)/pile=900.0

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	L_free	Fixed Length
1. Tieback	5.0	15.0	8.0	131.9	127.4	34.1	9.3	68.2

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
*	Above	Base		
0.000	0.000	3.333	0.955	0.286529
3.333	0.955	8.667	0.955	0.000000
8.667	0.955	16	0	-0.14317
*	Below	Base		
16	0.955	39	1.632	0.029435
*	Sur-	charg		
0.000	0.500	0.800	0.500	0.000000
0.800	0.500	1.600	0.500	0.000000
1.600	0.500	2.400	0.500	0.000000
2.400	0.500	3.200	0.500	0.000000
3.200	0.500	4.000	0.500	0.000000
4.000	0.500	4.800	0.500	0.000000

4.800	0.500	5.600	0.500	0.000000
5.600	0.500	6.400	0.500	0.000000
6.400	0.500	7.200	0.500	0.000000
7.200	0.500	8.000	0.500	0.000000
8.000	0.500	8.800	0.500	0.000000
8.800	0.500	9.600	0.500	0.000000
9.600	0.500	10.40	0.500	0.000000
10.40	0.500	11.20	0.500	0.000000
11.20	0.500	12.00	0.500	0.000000
12.00	0.500	12.80	0.500	0.000000
12.80	0.500	13.60	0.500	0.000000
13.60	0.500	14.40	0.500	0.000000
14.40	0.500	15.20	0.500	0.000000
15.20	0.500	16.00	0.500	0.000000
16.00	0.500	17.60	0.500	0.000000
17.60	0.500	19.20	0.500	0.000000
19.20	0.500	20.80	0.500	0.000000
20.80	0.500	22.40	0.500	0.000000
22.40	0.500	24.00	0.500	0.000000
24.00	0.500	25.60	0.500	0.000000
25.60	0.500	27.20	0.500	0.000000
27.20	0.500	28.80	0.500	0.000000

PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
*	Below	Base		
16.00	0.000	39.00	4.686	0.203737

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	6.00
2	16.00	1.50

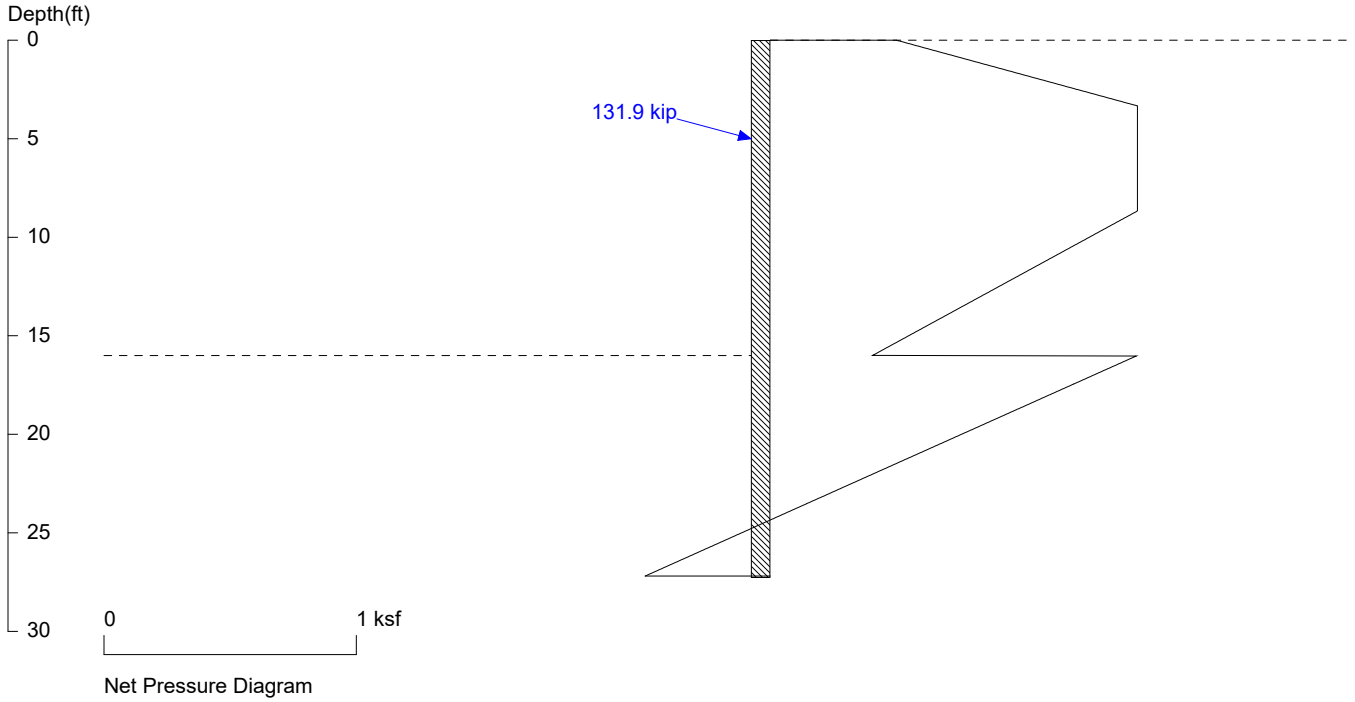
PASSIVE SPACING:

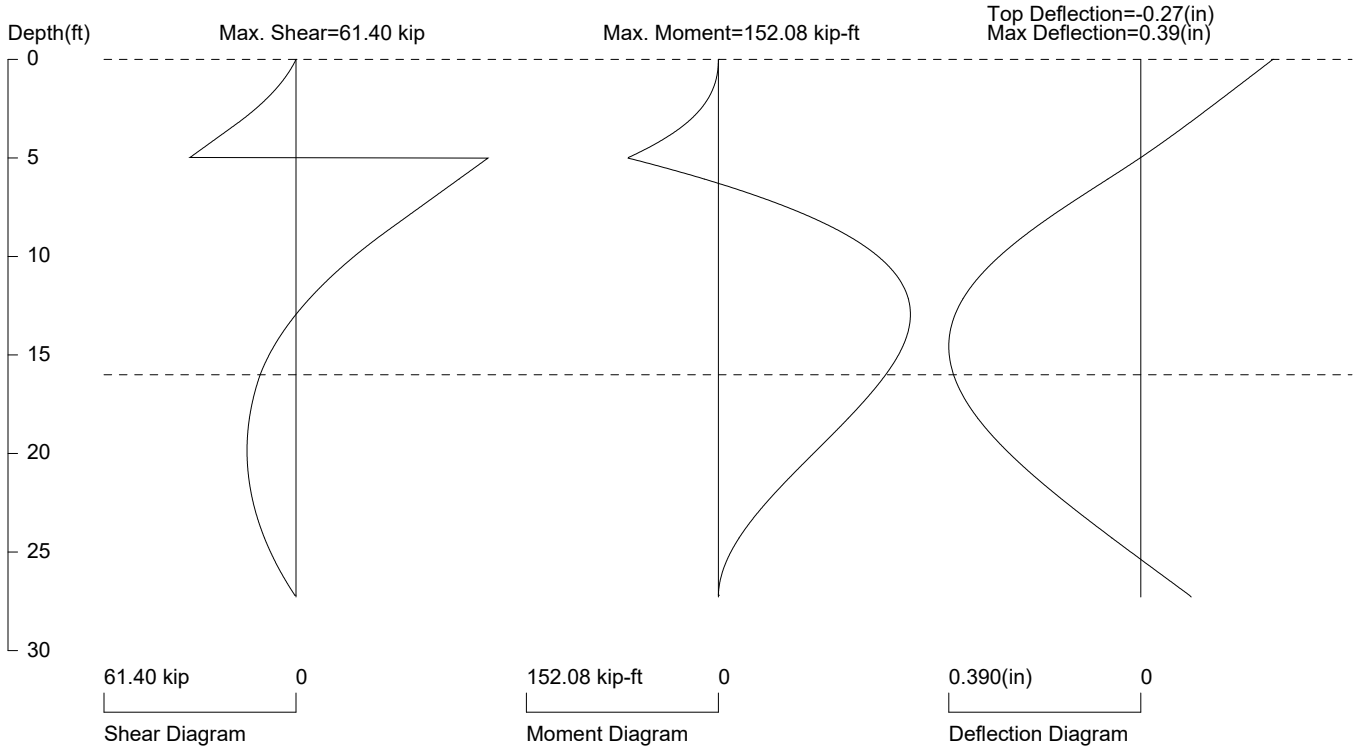
No.	Z depth	Spacing
1	16.00	3.00

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

EarthPres16FtAtRest AASHTO Load Distribution

EarthPres16FtAtRest AASHTO Load Distribution





PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

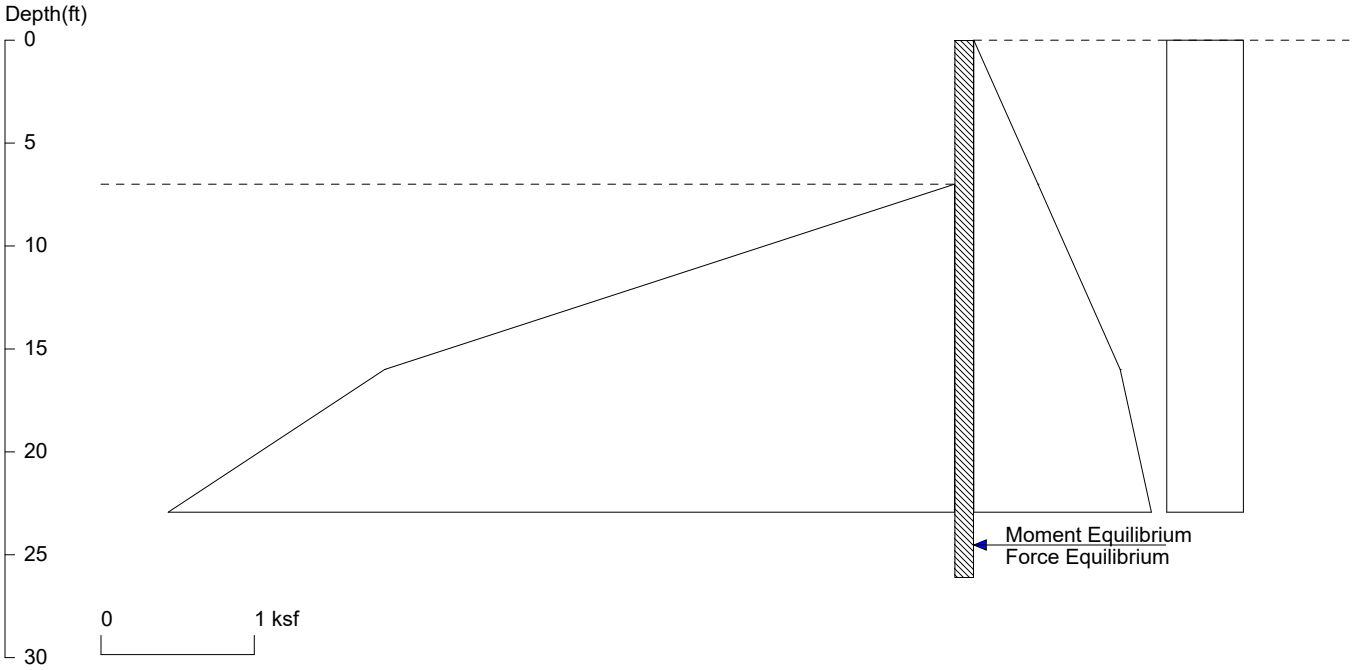
Based on pile spacing: 6.0 foot or meter

User Input I: E (ksi)=29000.0, I (in4)/pile=900.0

File: C:\Users\localadmin\Desktop\Elmira#4\W1A\EHS16Ft1Anchor_AASHTO-Ko.sh8

EarthPres7FtAtRest

EarthPress7FtAtRest



<ShoringSuite> CIVILTECH SOFTWARE USA www.civiltech.com

Licensed to 4324324234 3424343 Date: 1/20/2020
File: C:\Users\localadmin\Desktop\Elmira#4\Revision_1-20-20\W1B-7ft\EHS16Ft0Anchor.sh8

Wall Height=7.0 Pile Diameter=1.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=19.12 Min. Pile Length=26.12
MOMENT IN PILE: Max. Moment=279.06 per Pile Spacing=6.0 at Depth=15.49

PILE SELECTION:
Request Min. Section Modulus = 101.5 in3/pile=1662.91 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
User Input I (Moment of Inertia):
Top Deflection = 0.87(in) based on E (ksi)=29000.00 and I (in4)/pile=881.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
*	Above	Base		
0.000	0.000	7.000	0.418	0.059700
*	Below	Base		
7.000	0.418	16.00	0.955	0.059700
16.00	0.955	39.00	1.632	0.029427
*	Sur-	charg		
0.000	0.500	0.350	0.500	0.000000
0.350	0.500	0.700	0.500	0.000000
0.700	0.500	1.050	0.500	0.000000
1.050	0.500	1.400	0.500	0.000000
1.400	0.500	1.750	0.500	0.000000
1.750	0.500	2.100	0.500	0.000000
2.100	0.500	2.450	0.500	0.000000
2.450	0.500	2.800	0.500	0.000000
2.800	0.500	3.150	0.500	0.000000
3.150	0.500	3.500	0.500	0.000000
3.500	0.500	3.850	0.500	0.000000
3.850	0.500	4.200	0.500	0.000000

4.200	0.500	4.550	0.500	0.000000
4.550	0.500	4.900	0.500	0.000000
4.900	0.500	5.250	0.500	0.000000
5.250	0.500	5.600	0.500	0.000000
5.600	0.500	5.950	0.500	0.000000
5.950	0.500	6.300	0.500	0.000000
6.300	0.500	6.650	0.500	0.000000
6.650	0.500	7.000	0.500	0.000000
7.000	0.500	7.700	0.500	0.000000
7.700	0.500	8.400	0.500	0.000000
8.400	0.500	9.100	0.500	0.000000
9.100	0.500	9.800	0.500	0.000000
9.800	0.500	10.50	0.500	0.000000
10.50	0.500	11.20	0.500	0.000000
11.20	0.500	11.90	0.500	0.000000
11.90	0.500	12.60	0.500	0.000000
12.60	0.500	13.30	0.500	0.000000
13.30	0.500	14.00	0.500	0.000000
14.00	0.500	15.40	0.500	0.000000
15.40	0.500	16.80	0.500	0.000000
16.80	0.500	18.20	0.500	0.000000
18.20	0.500	19.60	0.500	0.000000
19.60	0.500	21.00	0.500	0.000000
21.00	0.500	22.40	0.500	0.000000
22.40	0.500	23.80	0.500	0.000000
23.80	0.500	25.20	0.500	0.000000
25.20	0.500	26.60	0.500	0.000000

PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
*	Below	Base		
7.000	0.000	16.00	3.720	0.413333
16.00	3.720	39.00	8.406	0.203737

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	6.00
2	7.00	1.50

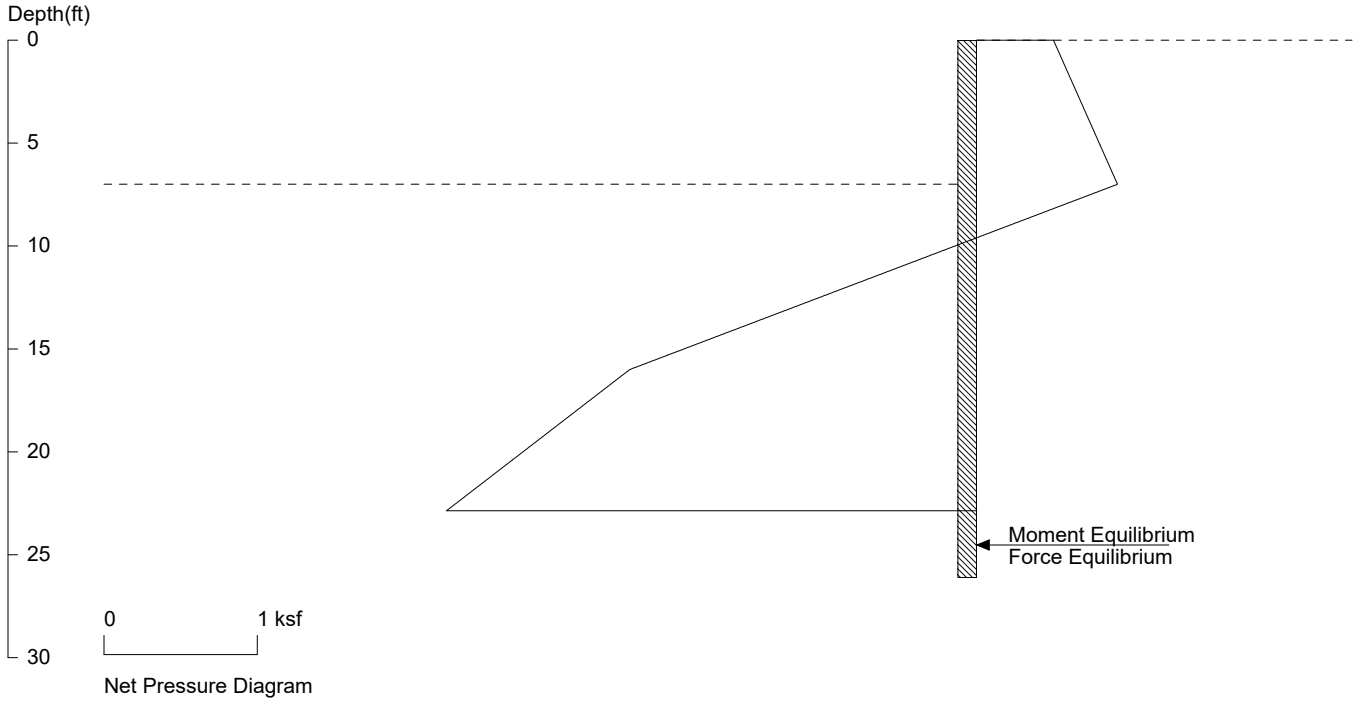
PASSIVE SPACING:

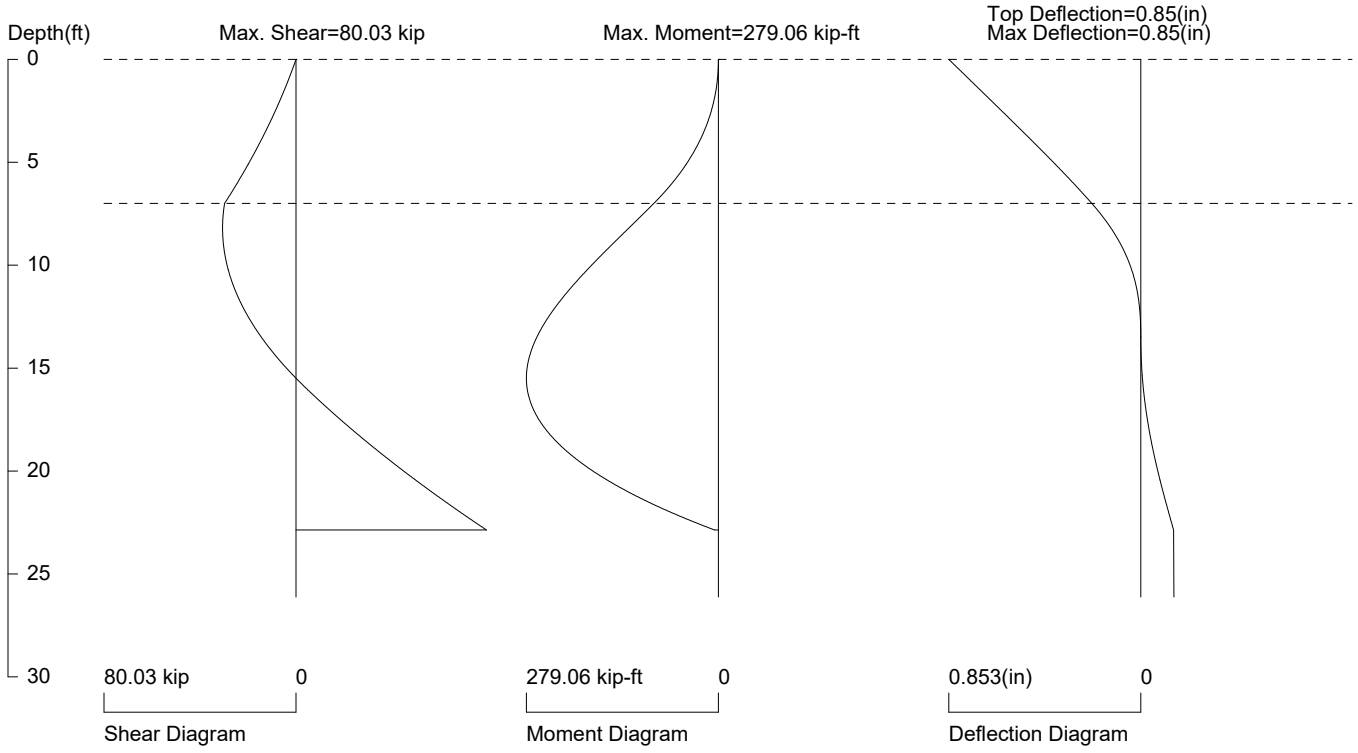
No.	Z depth	Spacing
1	7.00	3.00

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

EarthPres7FtAtRest

EarthPress7FtAtRest





PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

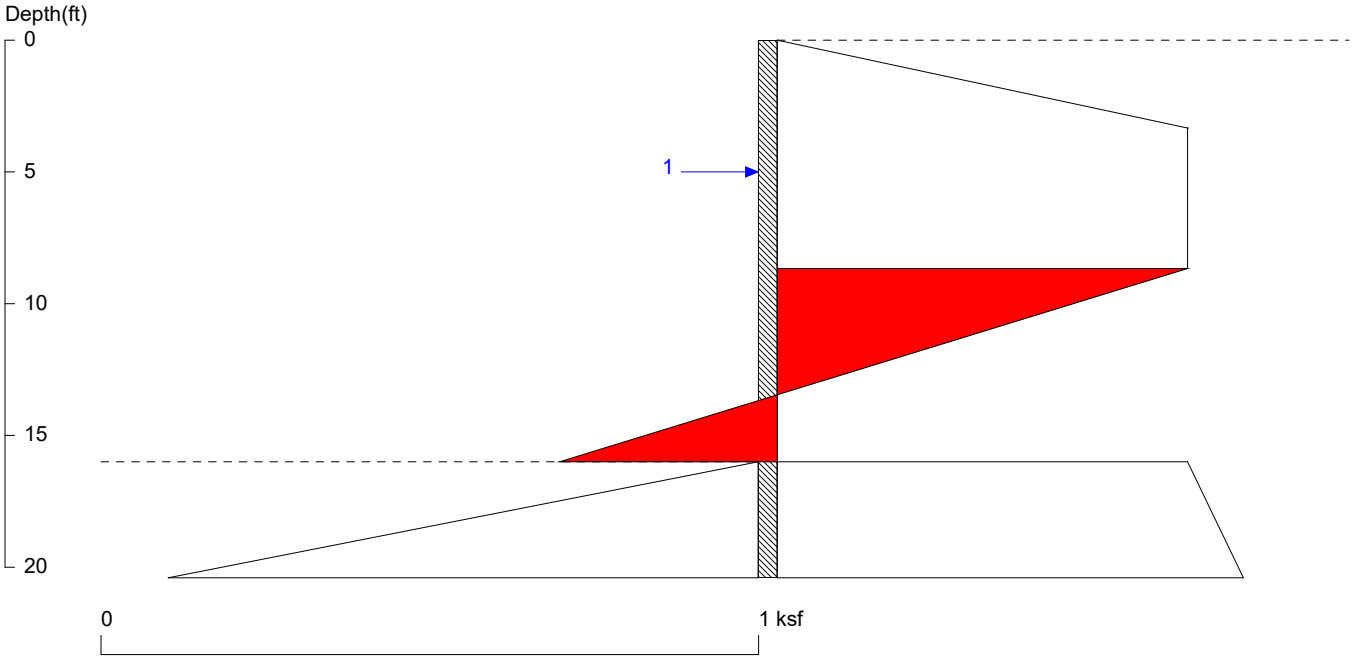
Based on pile spacing: 6.0 foot or meter

User Input I: E (ksi)=29000.0, I (in4)/pile=900.0

File: C:\Users\localadmin\Desktop\Elmira#4\Example\EHS16Ft0Anchor.sh8

EarthPres16FtAtRest

EarthPress16FtAtRest



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File: C:\Users\localadmin\Desktop\Elmira#4\Revision_1-20-20\FF16Ft_strut_Design_Ka_noEquip.sh8

Wall Height=16.0 Pile Diameter=1.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=4.40 (5~10ft is recommended!!!) Min. Pile Length=20.40
MOMENT IN PILE: Max. Moment=24.31 per Pile Spacing=6.0 at Depth=10.24

PILE SELECTION:
Request Min. Section Modulus = 8.8 in3/pile=144.89 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
User Input I (Moment of Inertia):
Top Deflection = -0.02(in) based on E (ksi)=29000.00 and I (in4)/pile=900.0

BRACE FORCE: Strut, Tieback, Plate Anchor, Deadman, Sheet Pile as Anchor

No. & Type	Depth	Angle	Space	Total F.	Horiz. F.	Vert. F.	N/A	N/A
1. Strut	5.0	0.0	6.0	31.1	31.1	0.0	0.0	0.0

UNITS: Width,Diameter,Spacing,Length,Depth,and Height - ft; Force - kip; Bond Strength and Pressure - ksf

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
*	Above	Base		
0.000	0.000	3.333	0.624	0.187219
3.333	0.624	8.667	0.624	0.000000
8.667	0.624	16	0	-0.13023
*	Below	Base		
16	0.624	39	1.067	0.019261

PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
*	Below	Base		
16.00	0.000	39.00	4.686	0.203737

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	6.00
2	16.00	1.50

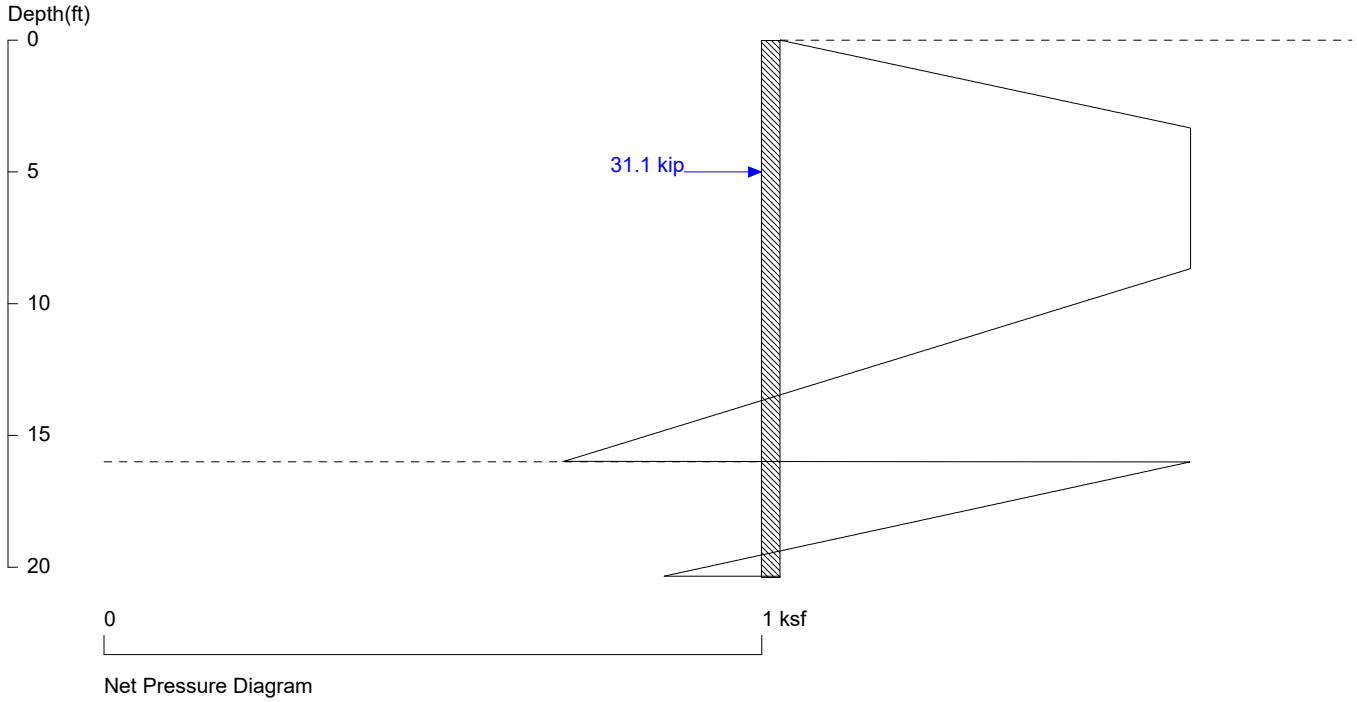
PASSIVE SPACING:

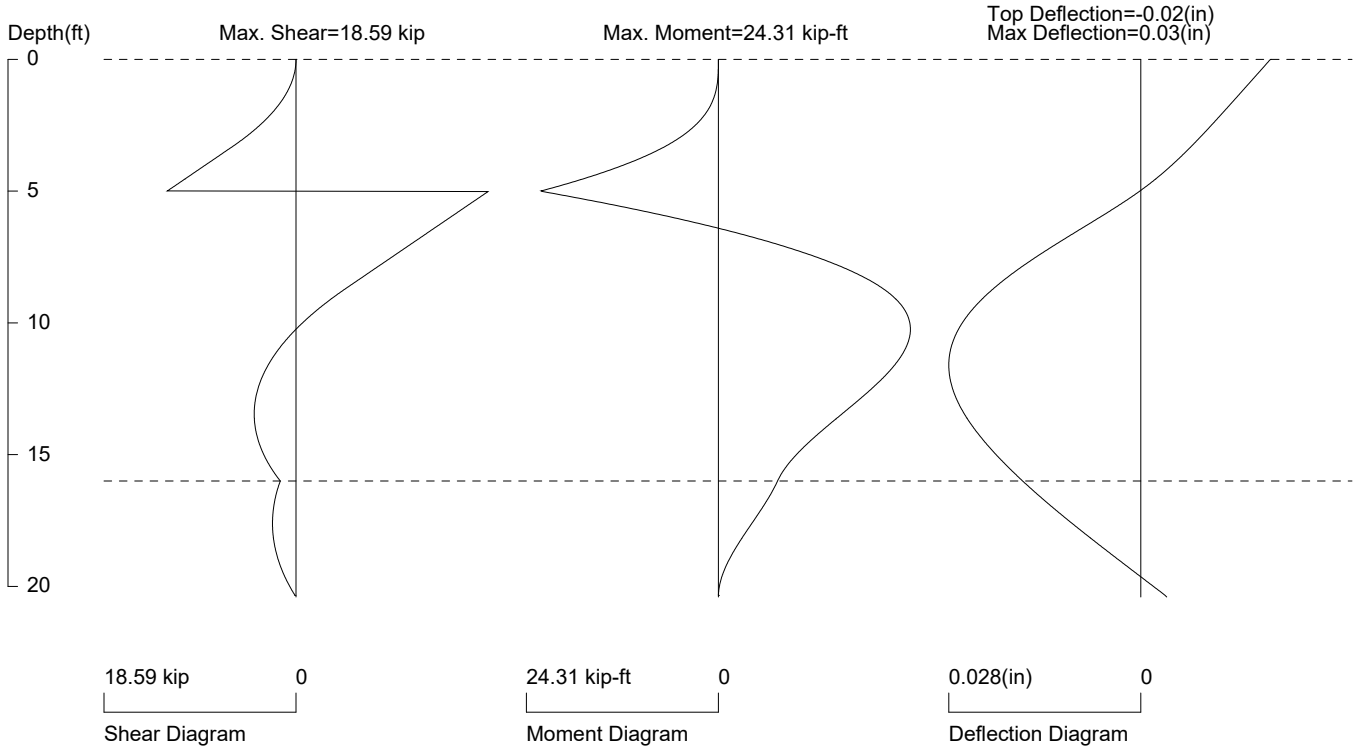
No.	Z depth	Spacing
1	16.00	3.00

UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

EarthPres16FtAtRest

EarthPress16FtAtRest





PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

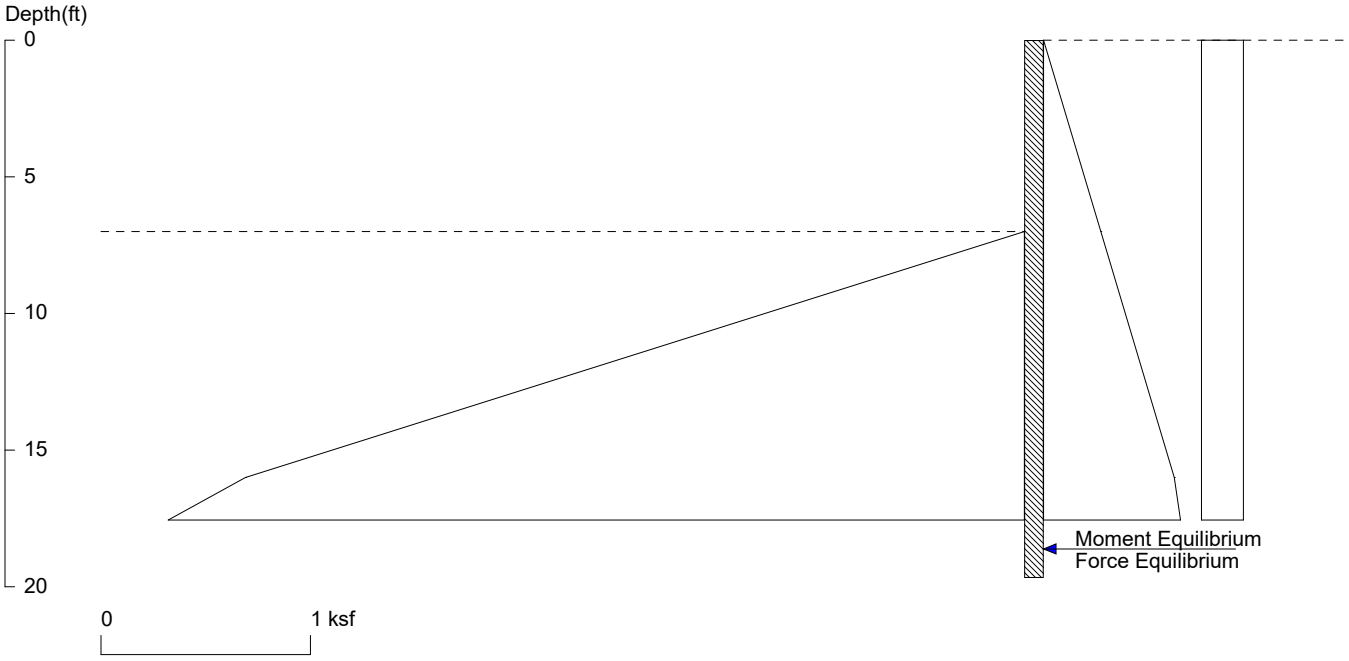
Based on pile spacing: 6.0 foot or meter

User Input I: E (ksi)=29000.0, I (in4)/pile=900.0

File: C:\Users\localadmin\Desktop\Elmira#4\Strut Support\FF16Ft_strut_Design_Ka_noEquip.sh8

EarthPres7FtActive

EarthPres7FtActive



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Licensed to 4324324234 3424343 Date: 1/20/2020
File: C:\Users\localadmin\Desktop\Elmira#4\Revision_1-20-20\FF07FtKa-Equip.sh8

Wall Height=7.0 Pile Diameter=1.5 Pile Spacing=6.0 Wall Type: 2. Soldier Pile, Drilled

PILE LENGTH: Min. Embedment=12.67 Min. Pile Length=19.67
MOMENT IN PILE: Max. Moment=98.51 per Pile Spacing=6.0 at Depth=12.53

PILE SELECTION:
Request Min. Section Modulus = 35.8 in3/pile=586.99 cm3/pile, Fy= 50 ksi = 345 MPa, Fb/Fy=0.66
User Input I (Moment of Inertia):
Top Deflection = 0.21(in) based on E (ksi)=29000.00 and I (in4)/pile=900.0

DRIVING PRESSURES (ACTIVE, WATER, & SURCHARGE):

Z1	P1	Z2	P2	Slope
*	Above	Base		
0.000	0.000	7.000	0.273	0.039022
*	Below	Base		
7.000	0.273	16.00	0.624	0.039022
16.00	0.624	39.00	1.067	0.019234
*	Sur-	charge		
0.000	0.200	0.350	0.200	0.000000
0.350	0.200	0.700	0.200	0.000000
0.700	0.200	1.050	0.200	0.000000
1.050	0.200	1.400	0.200	0.000000
1.400	0.200	1.750	0.200	0.000000
1.750	0.200	2.100	0.200	0.000000
2.100	0.200	2.450	0.200	0.000000
2.450	0.200	2.800	0.200	0.000000
2.800	0.200	3.150	0.200	0.000000
3.150	0.200	3.500	0.200	0.000000
3.500	0.200	3.850	0.200	0.000000
3.850	0.200	4.200	0.200	0.000000

4.200	0.200	4.550	0.200	0.000000
4.550	0.200	4.900	0.200	0.000000
4.900	0.200	5.250	0.200	0.000000
5.250	0.200	5.600	0.200	0.000000
5.600	0.200	5.950	0.200	0.000000
5.950	0.200	6.300	0.200	0.000000
6.300	0.200	6.650	0.200	0.000000
6.650	0.200	7.000	0.200	0.000000
7.000	0.200	7.700	0.200	0.000000
7.700	0.200	8.400	0.200	0.000000
8.400	0.200	9.100	0.200	0.000000
9.100	0.200	9.800	0.200	0.000000
9.800	0.200	10.500	0.200	0.000000
10.500	0.200	11.200	0.200	0.000000
11.200	0.200	11.900	0.200	0.000000
11.900	0.200	12.600	0.200	0.000000
12.600	0.200	13.300	0.200	0.000000
13.300	0.200	14.000	0.200	0.000000
14.000	0.200	15.400	0.200	0.000000
15.400	0.200	16.800	0.200	0.000000
16.800	0.200	18.200	0.200	0.000000
18.200	0.200	19.600	0.200	0.000000
19.600	0.200	21.000	0.200	0.000000

PASSIVE PRESSURES:

Z1	P1	Z2	P2	Slope
*	Below	Base		
7.000	0.000	16.00	3.720	0.413333
16.00	3.720	39.00	9.155	0.236283

ACTIVE SPACING:

No.	Z depth	Spacing
1	0.00	6.00
2	7.00	1.50

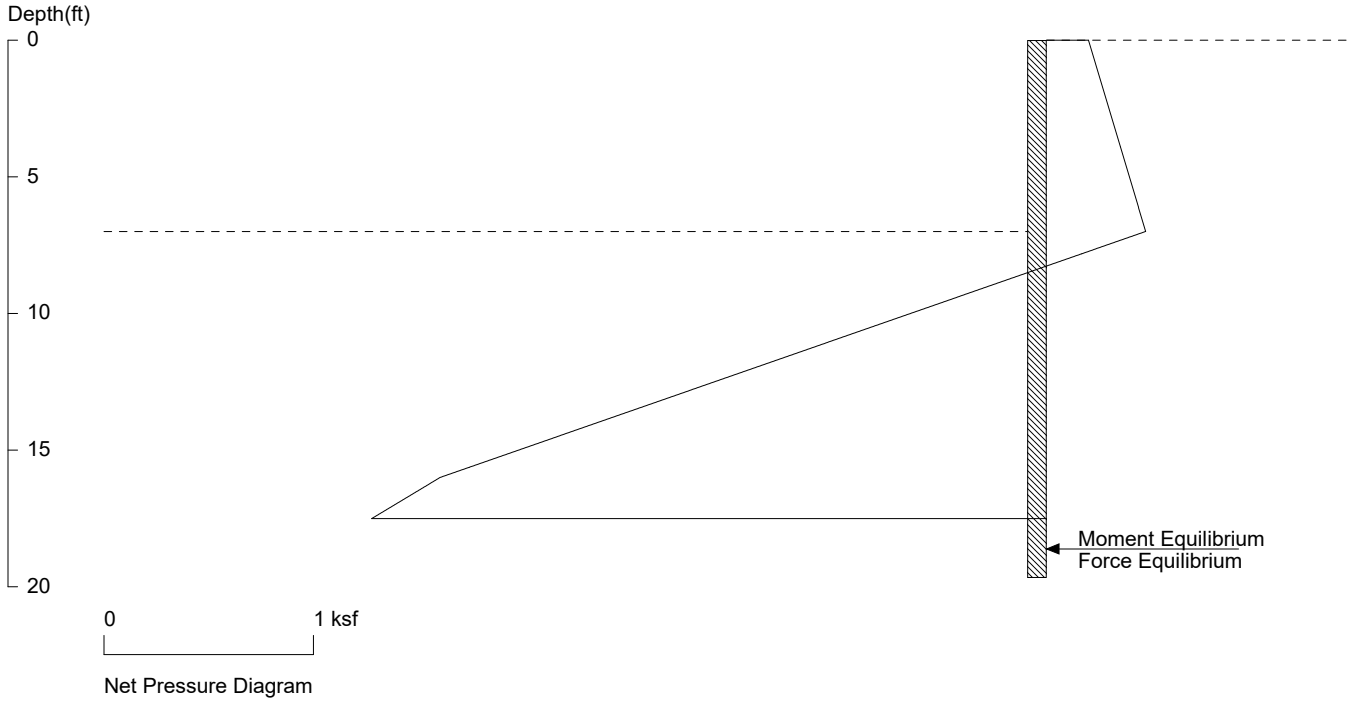
PASSIVE SPACING:

No.	Z depth	Spacing
1	7.00	3.00

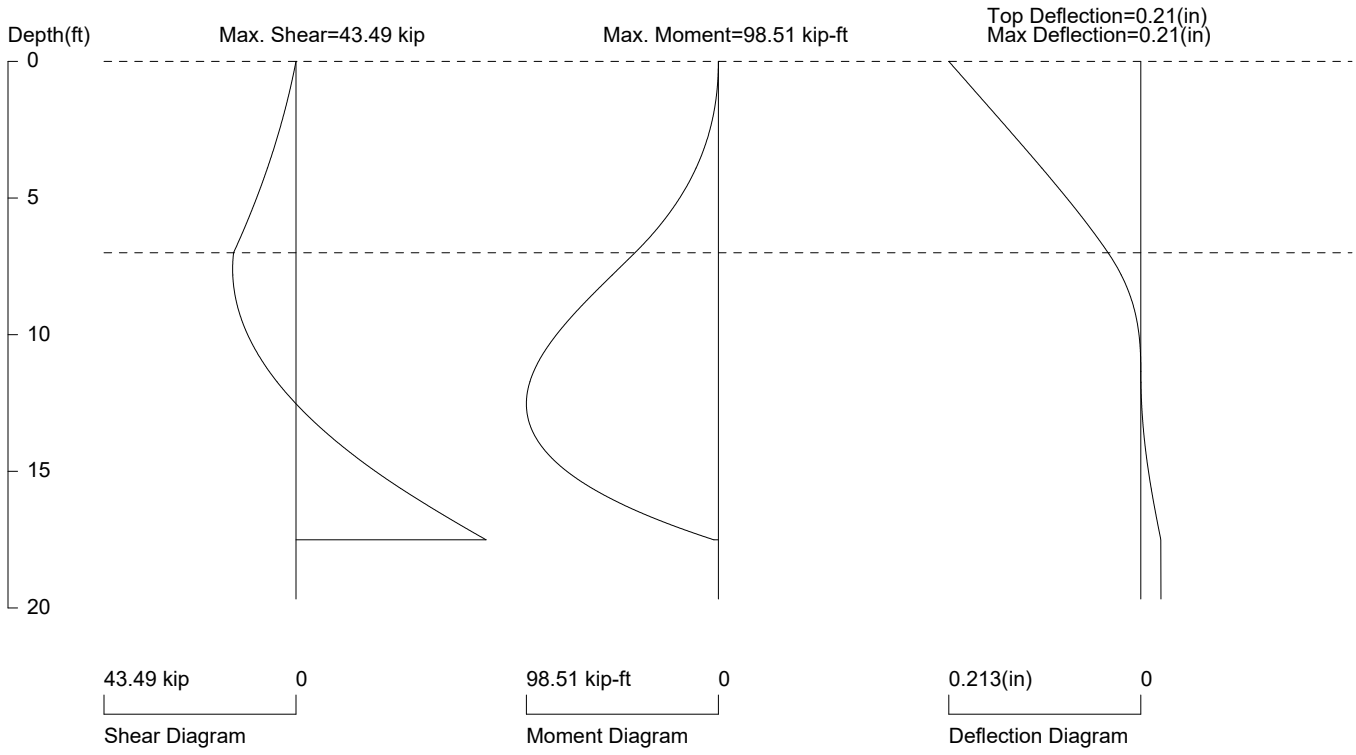
UNITS: Width,Spacing,Diameter,Length,and Depth - ft; Force - kip; Moment - kip-ft
Friction,Bearing,and Pressure - ksf; Pres. Slope - kip/ft3; Deflection - in

EarthPres7FtActive

EarthPres7FtActive



Net Pressure Diagram



Shear Diagram | Moment Diagram | Deflection Diagram

PRESSURE, SHEAR, MOMENT, AND DEFLECTION DIAGRAMS

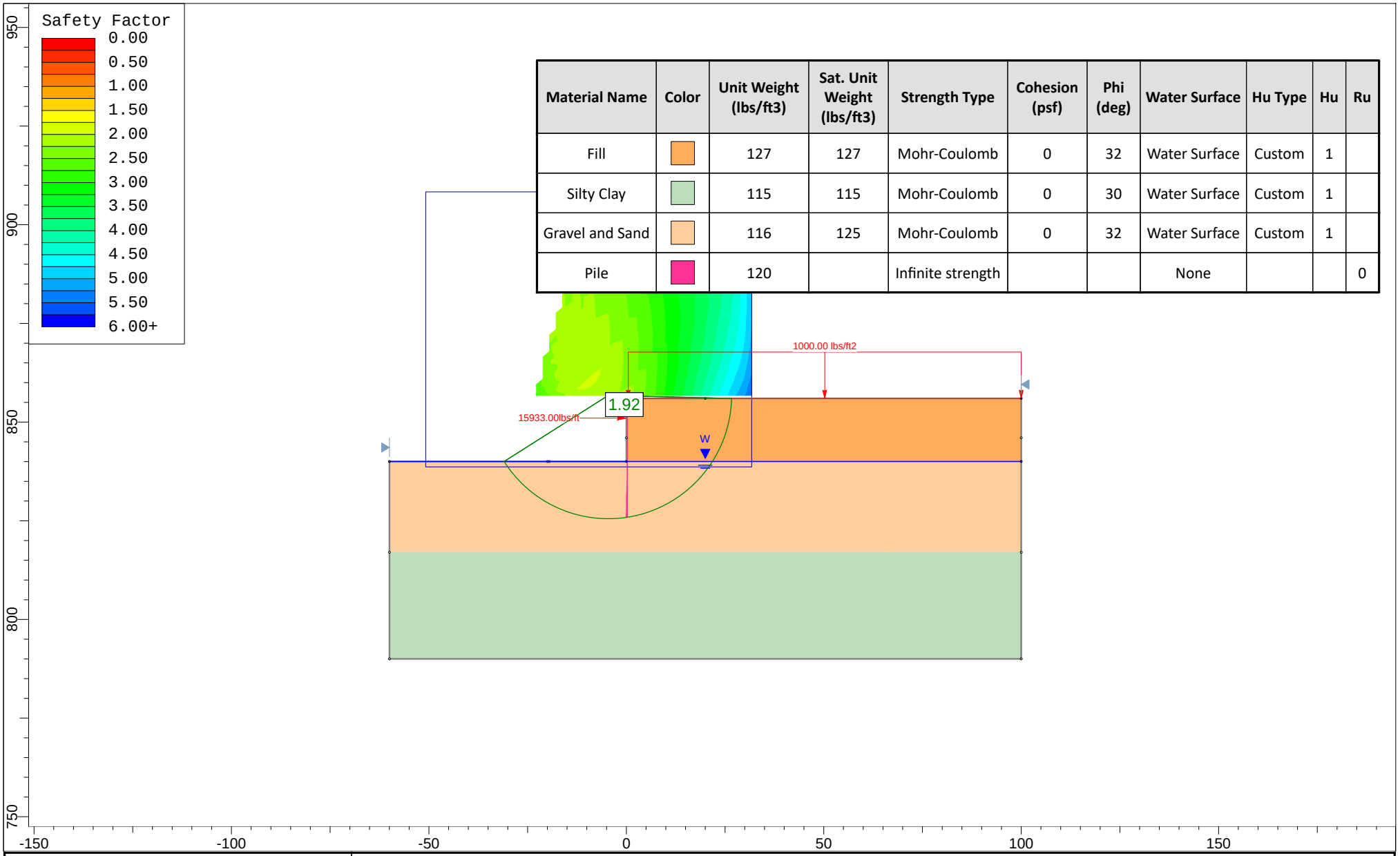
Based on pile spacing: 6.0 foot or meter

User Input I: E (ksi)=29000.0, I (in4)/pile=900.0

File: C:\Users\localadmin\Desktop\Elmira#4\Example\FF07Ft.sh8

ATTACHMENT 6

SLIDE Output



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0

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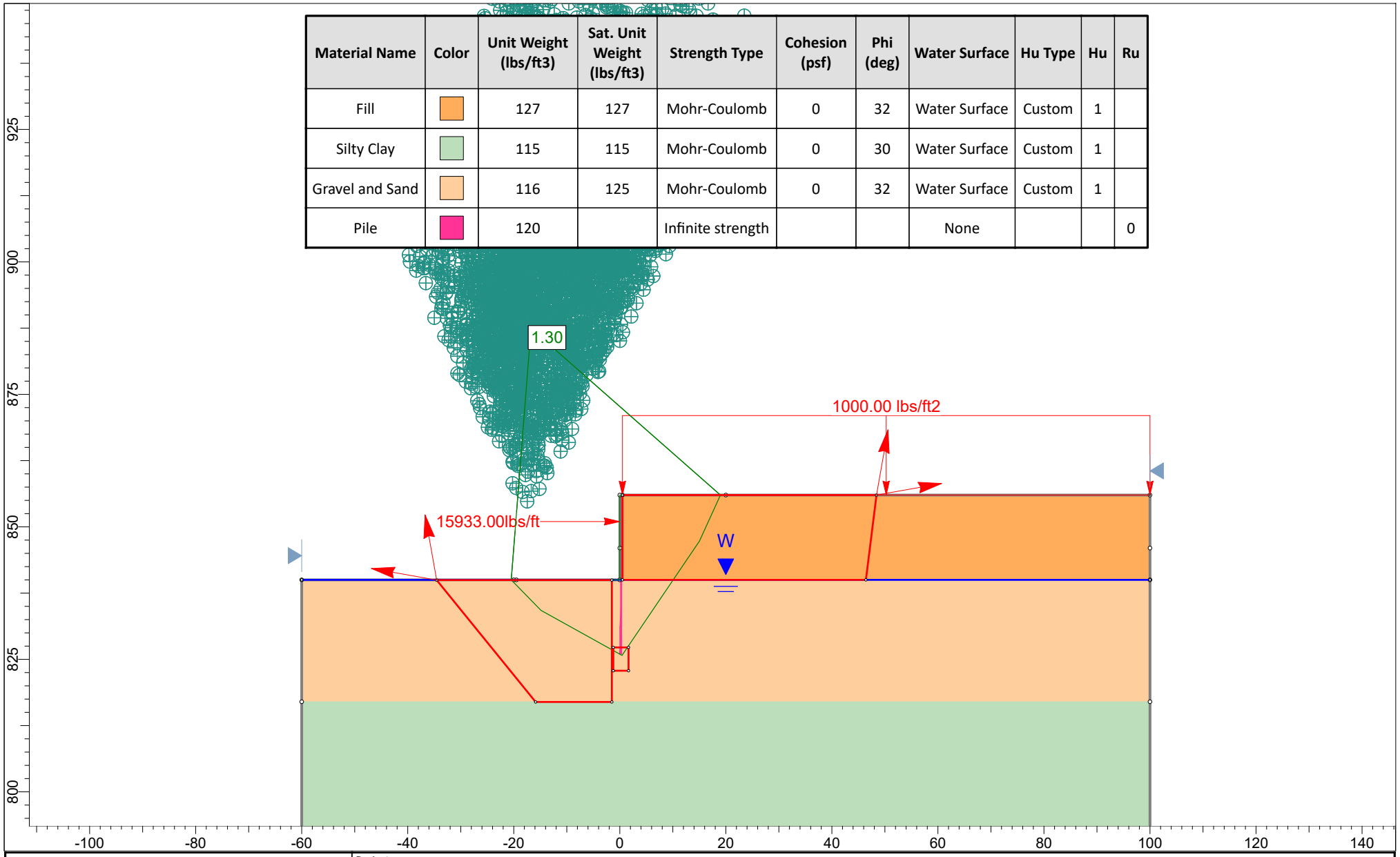
SLIDEINTERPRET 6.036

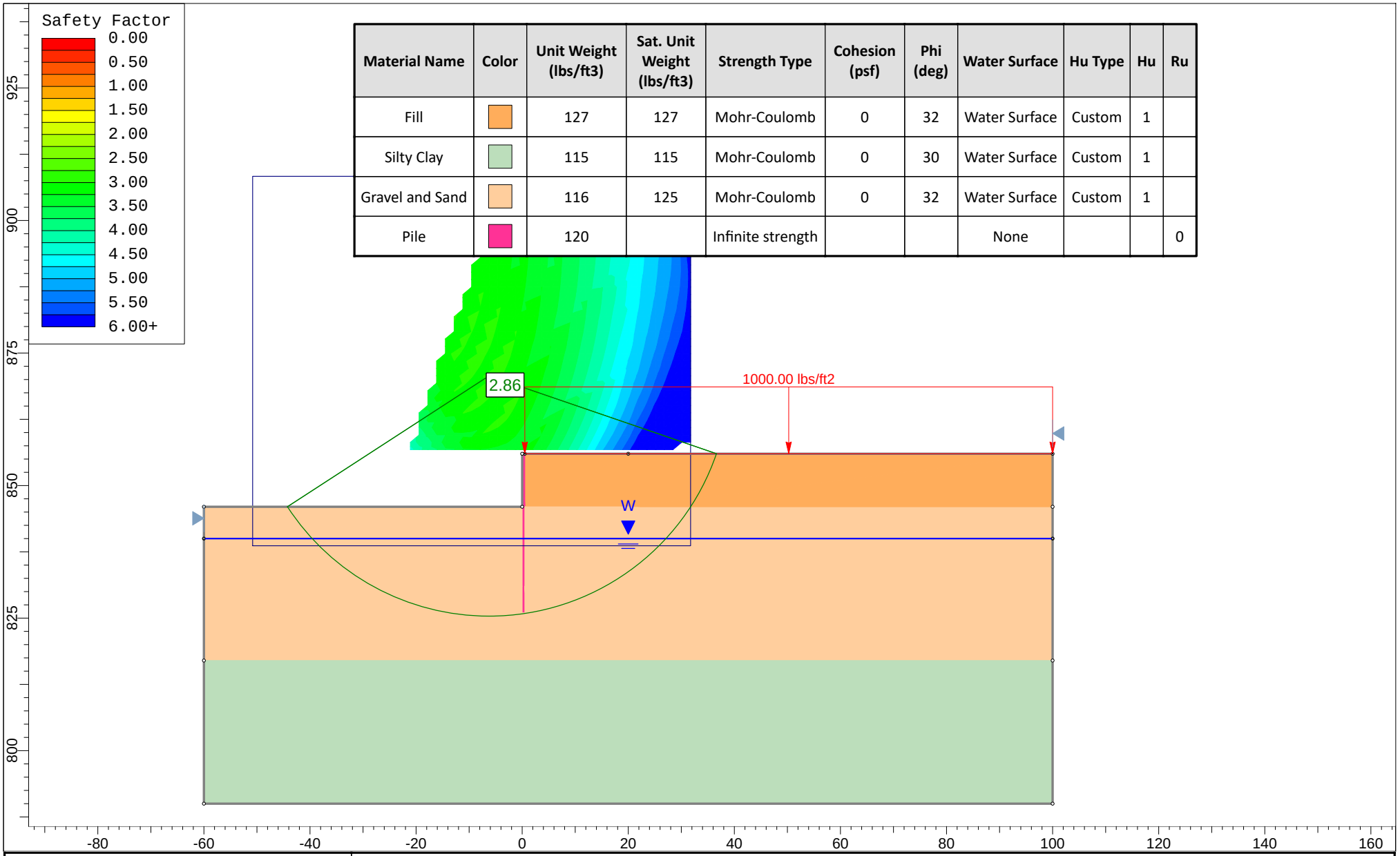
Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:403	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W1A-16FT-STRUT-Circular.slim

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0



SLIDEINTERPRET 6.036

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W1A-16FT-STRUT-NonCircular.slim



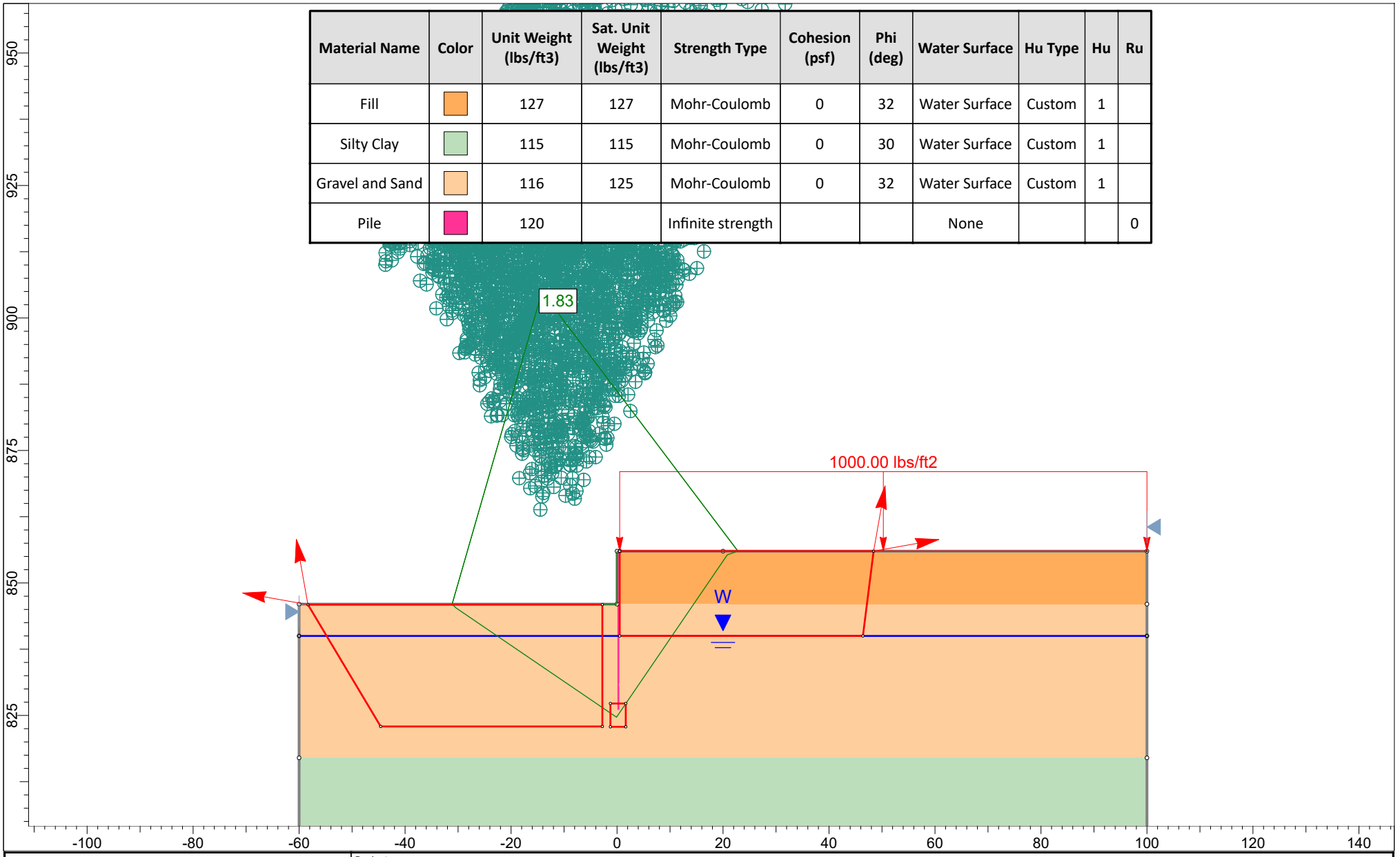
Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0

rocscience

SLIDEINTERPRET 6.036

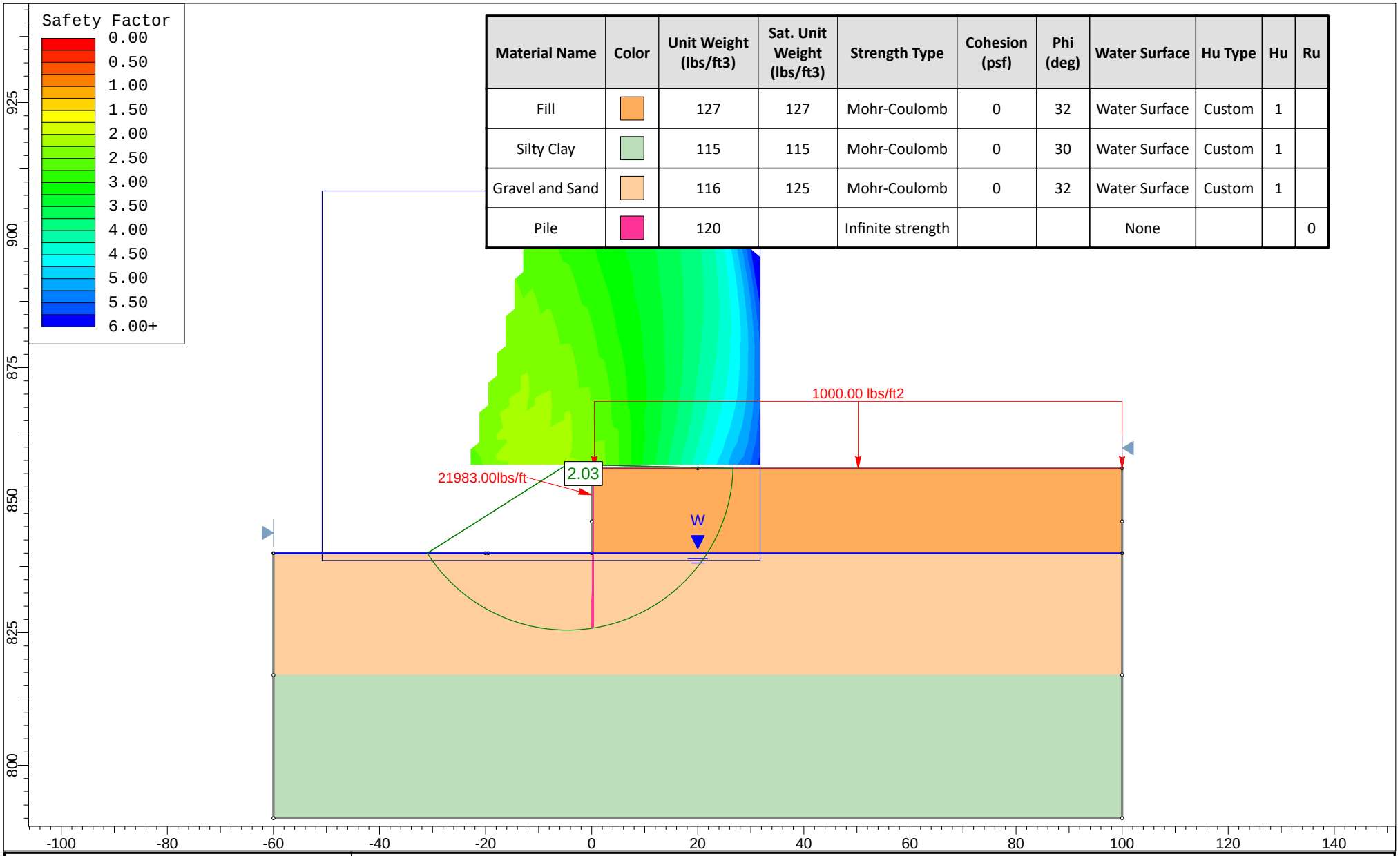
Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W1A1B-7FT-Circular.slim

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W1A1B-7FT-NonCircular.slim

SLIDEINTERPRET 6.036

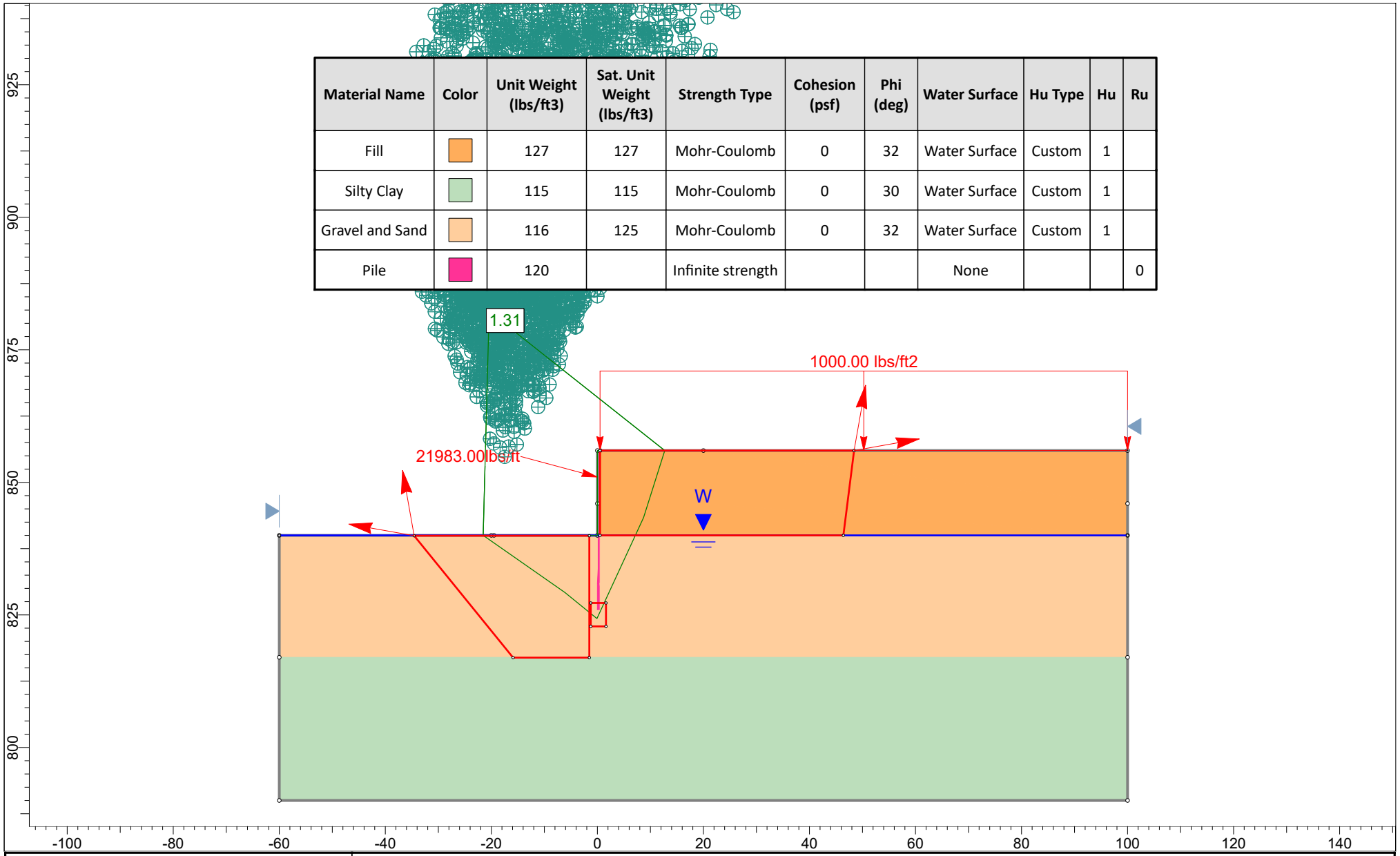


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W1C-16FT-TIEBACK-Circular.slim

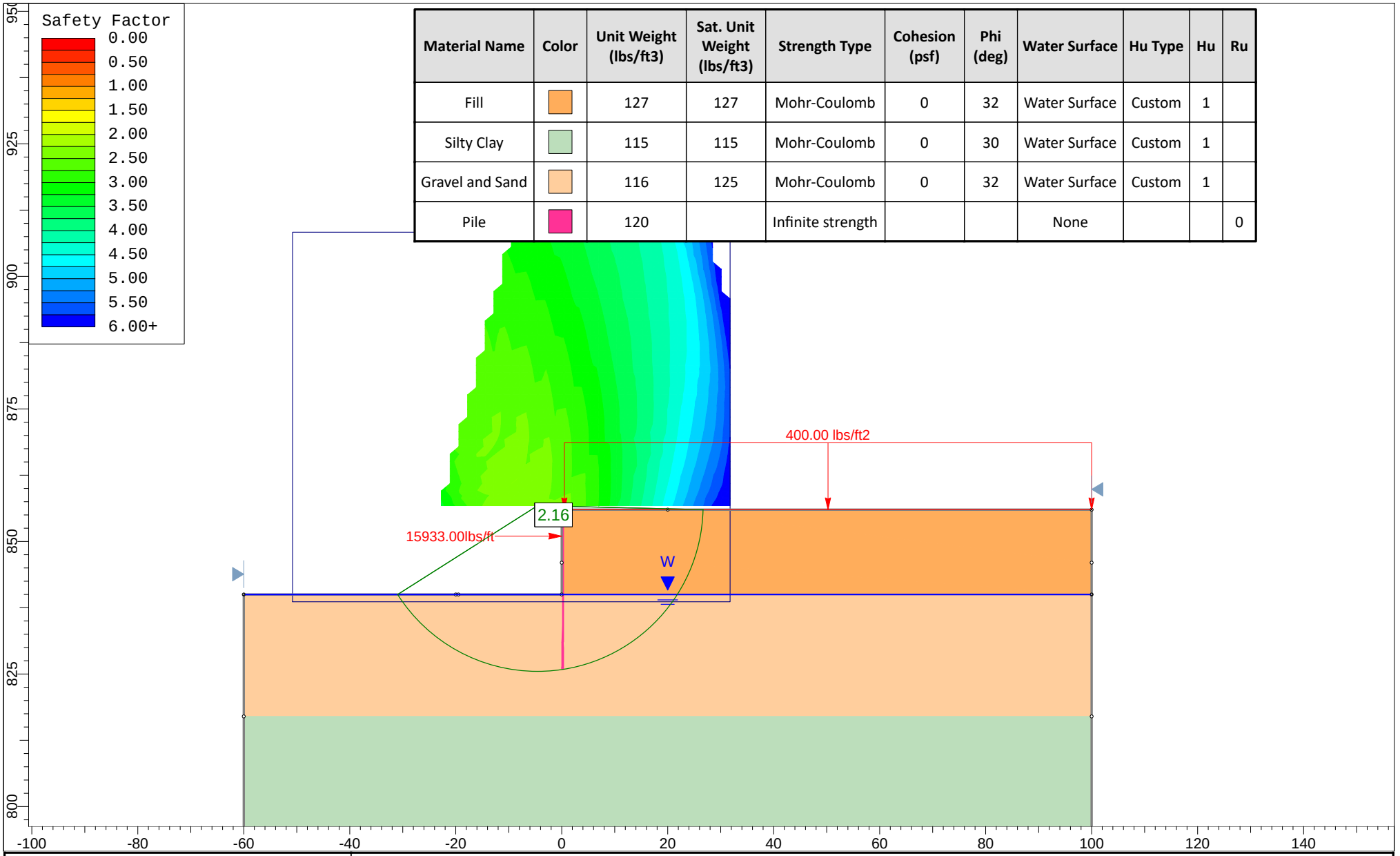
SLIDEINTERPRET 6.036

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W1C-16FT-TIEBACK-NonCircular.slim

SLIDEINTERPRET 6.036



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0

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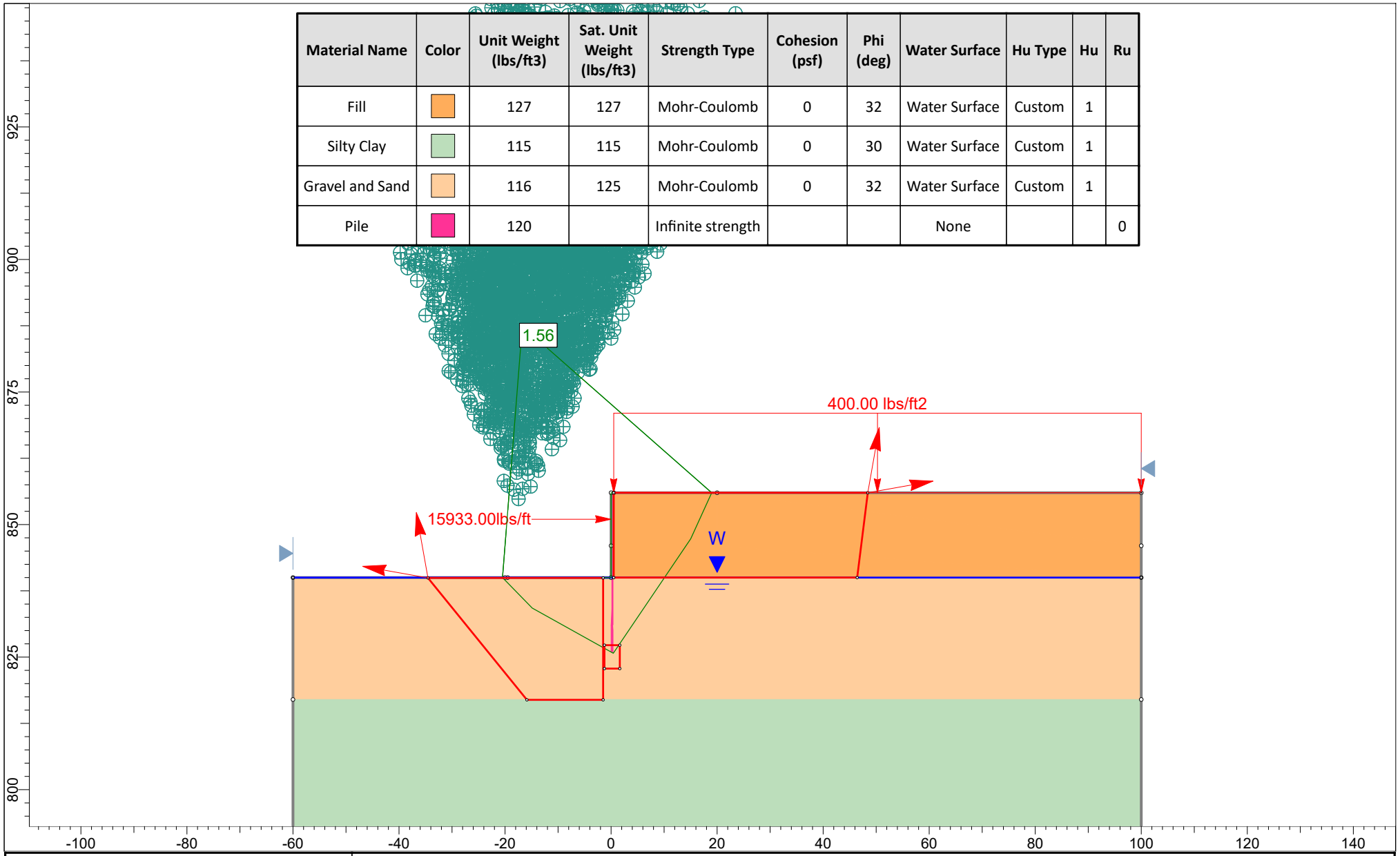
SLIDEINTERPRET 6.036

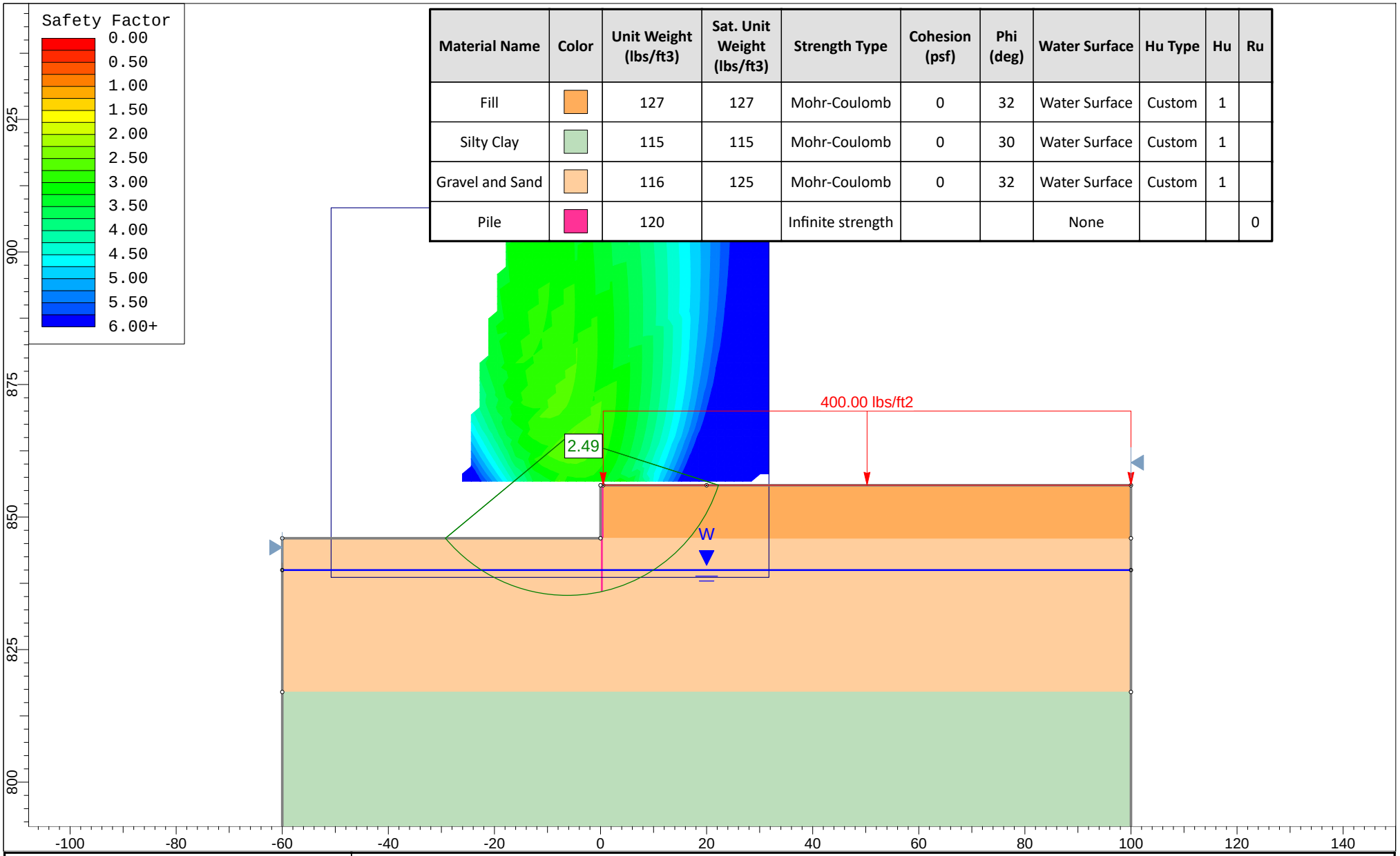
Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W2A-16FT-STRUT-Circular.slim

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0



Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W2A-16FT-STRUT-NonCircular.slim

SLIDEINTERPRET 6.036



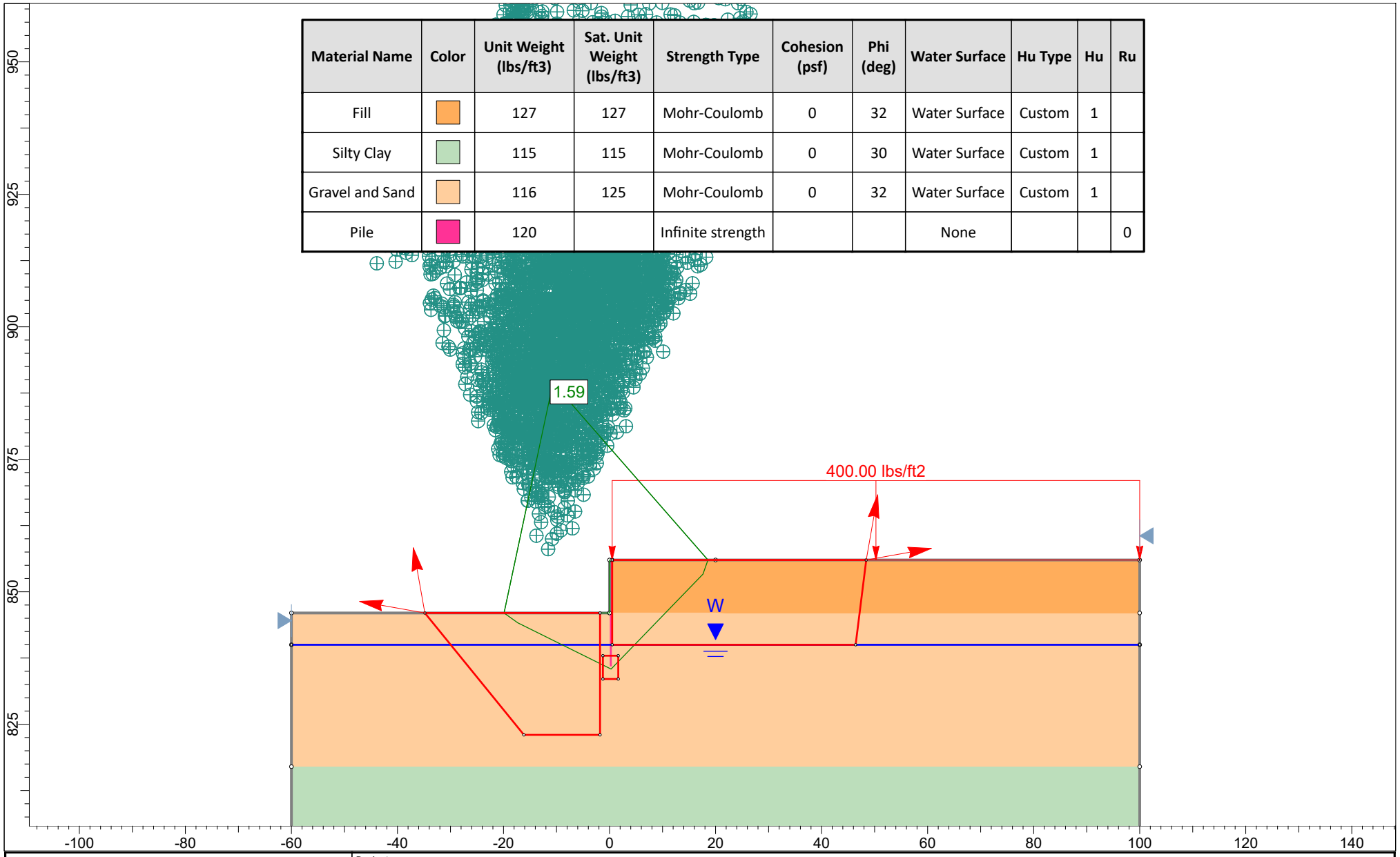
Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0

rocscience

SLIDEINTERPRET 6.036

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	*Scale* 1:300	*Company* Geosyntec
Date	12/19/2019, 1:26:39 PM		*File Name* Section W2A2B-7FT-Circular.slim

Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		127	127	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Silty Clay		115	115	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Gravel and Sand		116	125	Mohr-Coulomb	0	32	Water Surface	Custom	1	
Pile		120		Infinite strength			None			0



SLIDEINTERPRET 6.036

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description	Elmira IRM #4		
Drawn By	ZL	Scale 1:300	Company Geosyntec
Date	12/19/2019, 1:26:39 PM		File Name Section W2A2B-7FT-NonCircular.slim