ARM Group LLC
Engineers and Scientists

July 17, 2020

Mr. Edward M. Dexter, P.G., Administrator
Solid Waste Program
Land Management Administration
1800 Washington Boulevard, Suite 605
Baltimore MD 21230-1719

Re: Greys Landfill Northeast Corner Revised Grading Plan - Supplemental Information
Sparrows Point, MD
ARM Project 20010112-5

Dear Mr. Dexter:

On behalf of EnviroAnalytics Group (EAG), ARM Group LLC (ARM) has prepared the attached revisions and supplemental details for the operation and closure of the northeast area of Greys Landfill. Greys Landfill occupies approximately 40 acres of land designated as Parcel A12 of the Tradepoint Atlantic (TPA) property in Sparrows Point, Maryland (see attached Figure 1).

This supplement has been prepared in response to discussions among the Maryland Department of the Environment (MDE), TPA, EAG, and ARM via email correspondence between April 27 and May 11, 2020 regarding the April 17, 2020 submission for the above-referenced project. Within that correspondence, MDE requested additional details regarding the existing geosynthetic and asphalt cap of the closed northeast corner disposal unit, and the potential for infiltration and subsequent leachate generation in this area if either of those closure systems were to be removed or impacted. The attached documentation provides clarification on the proposed expansion, settlement of the existing waste materials, and existing cap management during fill operations, including interim grading plans to minimize the duration of construction sequencing.

This supplemental information is being submitted for MDE review as part of the process to update the existing grading plan and Closure Plan (CP) for Greys Landfill. The existing CP was prepared for ISG Sparrows Point, Inc. and last revised in April 2014. EAG is requesting approval from MDE for implementation of the grading plan enclosed within the April 17, 2020 submission package and as modified herein, in conjunction with the existing operations, with an acknowledgement that the grading plan will be incorporated into the sitewide CP.

PROPOSED GRADING PLAN REVISIONS

The proposed landfill final grading plan and associated closure details previously included within the April 17, 2020 submission package are presented in Appendix A. Also included within Appendix A is new Sheet 4, outlining the additional measures outlined hereafter:

Modified Final Grades:

- The proposed grading revisions include a horizontal and vertical modification of the grades of the landfill at the northeastern corner of the landfill which has a current elevation of approximately 30' AMSL (El. 30).
- The proposed modification extends horizontally within the existing footprint of the landfill and vertically upward to the elevation of the next bench (~ El. 60).
- New slope grading is presented at 2.5H:1V, consistent with all slopes above El. 60, and the grading between the proposed terrace at approximately El. 40 and El. 60 is graded at 5 percent.
- The proposed elevation for this modification is El. 62, which is well below the maximum height of the landfill (El. 141) and within the existing landfill footprint.
- An interim grading plan has been included on Sheet 4 of Appendix A that reflects a phased waste disposal operation to the western limit of the proposed footprint initially, followed by latter-phased landfilling in the area encompassed by the closed cell disposal unit cap systems.
- This grading proposed encompasses a footprint of approximately 6.3 acres.

EVALUATION OF EFFECTS ON EXISTING CAP DUE TO REVISED GRADING

In addition to the evaluations stated within the April 17, 2020 submission package, additional engineering evaluations have been completed that consider the effect of the revised grading and landfill expansion on the existing geosynthetic and asphalt cap, including the underlying historic waste materials, and mitigates the effect of settlement that will occur within the region of the closed northeast corner disposal unit.

Settlement

A detailed settlement analysis has been conducted to evaluate the post-settlement grades of the closed northeast corner disposal unit, based on the planned waste placement activities and the currently proposed final grading plan for the northeast corner of Greys Landfill. This analysis is included as Appendix B. The settlement analysis completed on the geomembrane cap closure surface in the northeast corner of Greys Landfill identified two isolated closed depressions that would be present within the existing geomembrane cap system as a result of the proposed landfilling operations.

Settlement Mitigation

As noted in ARM's April 17, 2020 submission, the existing geomembrane cap was previously proposed to be removed, to address the potential for isolated leachate "pockets" where leachate would not free-drain to locations readily accessible for liquid removal (e.g., toe of slope interceptor trenches, etc.). In order to adequately address these closed depressions that would be present at the completion of the proposed landfilling activities, and avoid the potential for future stability problems, the following mitigation measures are proposed:

- Prior to new waste fill placement, the existing final cover soils above the existing geosynthetic cap will be regraded and supplemented with additional clean soil material to prepare a modified supplemental cap subgrade (referenced henceforth as a settlement accommodation subgrade) that compensates for the anticipated settlement across the existing closed disposal unit footprint, maintaining positive drainage (2% min.) in post-settlement conditions.
- A new supplemental geosynthetic cap will be installed immediately after completion of the settlement accommodation subgrade activities and prior to the placement of new waste material in this region of Greys Landfill.
- The geosynthetic cap materials and sectional detail shall be in accordance with the Detail 1 included on Sheet 3 of the April 17, 2020, generally including the following components: a 50-mil linear low-density polyethylene (LLDPE) textured geomembrane with a non-woven geotextile (10 oz./sy minimum) drainage layer for the entire supplemental grading plan limits (approximately 1.1 acres).
- Perforated piping will be installed at the limits of the proposed supplemental cap system subgrade and geosynthetic components, and monitored for toe-drainage; any liquids intercepted as leachate or contact water will be containerized and disposed of in accordance with approved regulatory procedures.
    - The installation of the settlement accommodation subgrade is anticipated to be completed over a period of approximately 4 weeks, with the supplemental cap being installed immediately thereafter and, thus, any liquids that drain from this subgrade layer are anticipated to be clean (i.e., non-contact water) runoff.

Landfill Slope Stability

Reflective of the subgrade accommodation grading and supplemental cap installation proposed over the closed northeast corner disposal unit, updated slope stability analyses have been completed as included in Appendix C. Of primary note is that the updated analyses include the existing geosynthetic cap, the subgrade accommodation layer, and the supplemental cap system within Cross Section 4 under the anticipated waste and loading conditions.

This analysis demonstrates consistency with the analyses previously presented in the "Revised Grading Plan – Greys Landfill", dated April 17, 2020 and the June 2015 report entitled "Greys Landfill Slope Stability Analysis, Sparrow's Point, MD", with the estimated critical cross-sections modified to reflect the proposed grading revisions. The results of this analysis validate the conclusions of the April 17, 2020 report that slope requirements and stability will be met under the conditions anticipated.

CLOSING

Following agency review and associated input for the revised grading plan design and the above settlement evaluation, a revised final Erosion/Sediment Control Plan (ESCP) & Closure Plan (CP) for Greys Landfill will be submitted for review and approval. EAG requests approval to commence waste disposal within the footprint and to the grades proposed herein, in conjunction with development of the final ESCP and CP for the site.

We appreciate the MDE's review and support of the ongoing work at Sparrows Point and look forward to your timely review. If you have any questions, please do not hesitate to contact the undersigned at (717) 508-0538 or dfellon@armgroup.net.

Respectfully submitted,

ARM Group LLC

Daniel N. Fellon, P.E.
Vice President, Solid Waste Management

T. Neil Peters, P.E.
Senior Vice President

Attachments:

Appendix A – Proposed Interim Grade Plan (July 2020)
Appendix B – Settlement Analysis
Appendix C – Landfill Slope Stability Analysis

cc: Mr. James Calenda - EAG

FIGURES

ARM Group Inc. Earth Resource Engineers and Consultants 0 375 750 1,500 Feet	Site Boundary Private Property Area A Boundaries Area B Boundaries	Tradepoint Atlantic Area A and Area B Parcels August 1, 2016	EnviroAnalytics Group Area A: Project 150298M Area B: Project 150300M	Tradepoint Atlantic Baltimore County, MD	Figure 1

APPENDIX A

Drawings

NOTE:

TOPOGRAPHY PROVIDED BY CME ENGINEERING, JANUARY 2020.

ARM Group LLC
Engineers and Scientists
www.armgroup.net

No.	Revision	Date	By

designed	RJC	scale	1"=100'
checked	DNF	date	1/29/2020
drawn	RJC	project no.	190416

graphic scale: 0 100 200 300 SCALE IN FEET

sheet title: EXISTING CONDITIONS PLAN

project title: ENVIROANALYTICS GROUP
GREY'S LANDFILL CAPACITY ANALYSIS
JANUARY 2020

SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet 1

\\armpdc02\CorpData\Projects\EnviroAnalytics Group\180215 Greys Landfill 2018 Capacity Analyses\January_2020\Production\01 - 180125_Greys Landfill Closure Volume Analysis-Existing Conditions.dwg

ARM Group LLC
Engineers and Scientists
www.armgroup.net

No.	Revision	Date	By

designed	RJC	scale	1"=60'
checked	DNF	date	1/29/2020
drawn	RJC	project no.	190416

graphic scale: 0 60 120 180 SCALE IN FEET

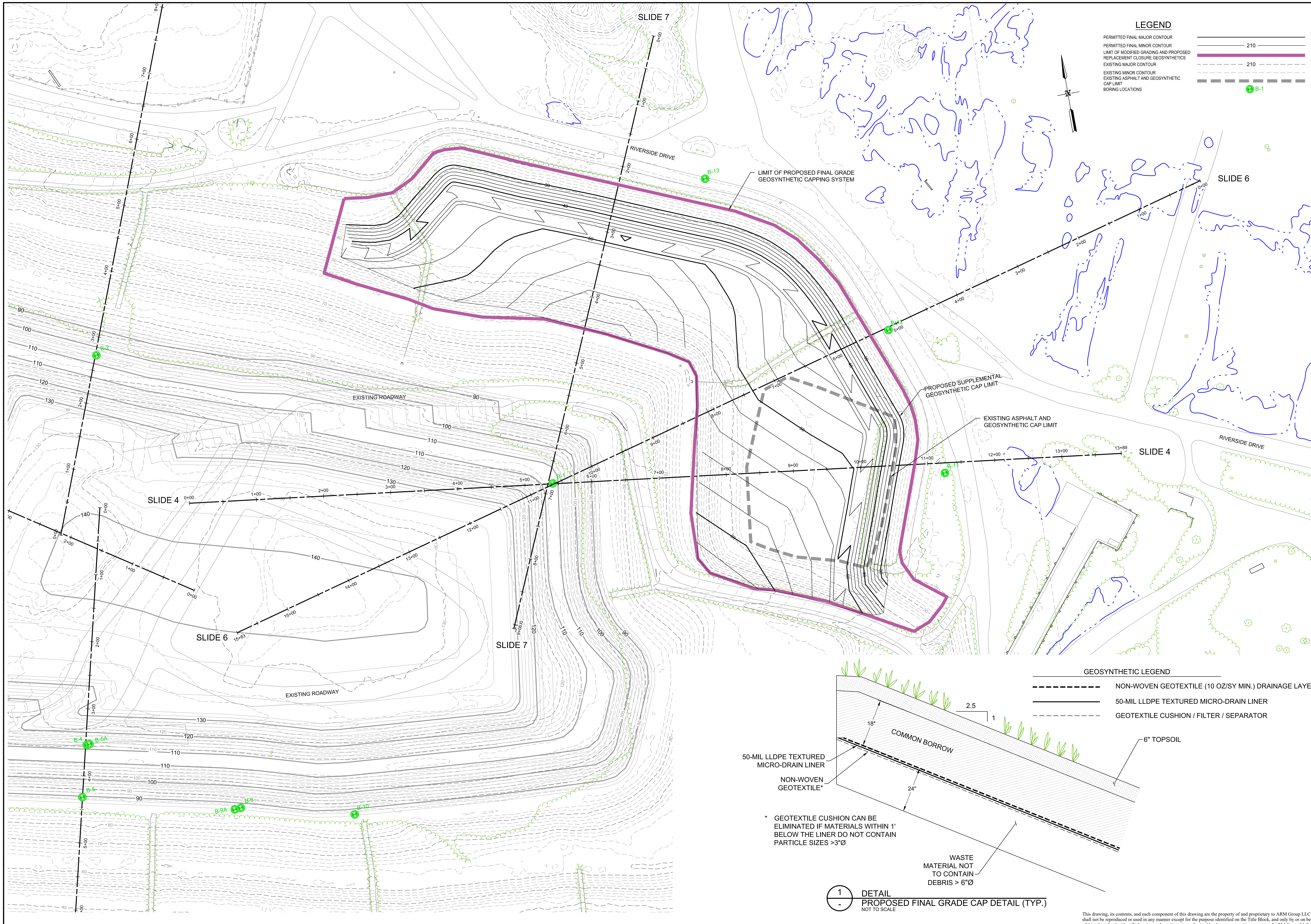
sheet title
PERMITTED FINAL GRADES

project title
ENVIROANALYTICS GROUP
GREY'S LANDFILL CAPACITY ANALYSIS
JANUARY 2020

SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet 2

\\armpdc02\CorpData\Projects\EnviroAnalytics Group\180215 Greys Landfill 2018 Capacity Analyses\January_2020\Production\02 - 180125_Greys Landfill Closure Volume Analysis-Permitted Final Grades.dwg



ARM Group LLC
Engineers and Scientists
www.armgroup.net

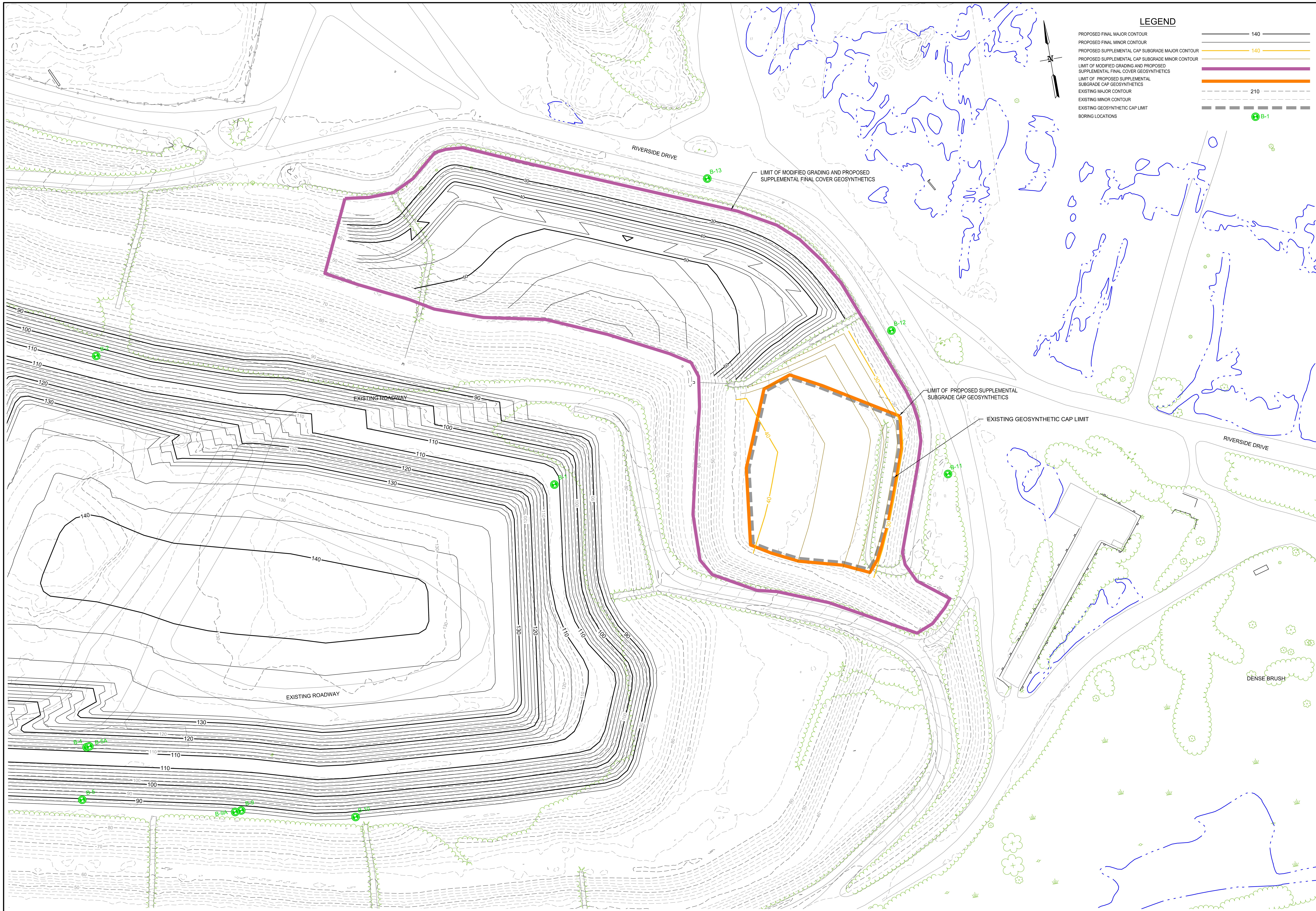
No.	Revision	Date	By
0	ISSUED FOR REVIEW	04/13/2020	ARM

designed ARM | checked DNF | drawn SEH
scale 1" = 100' | date 04/13/2020 | project no. 20010112

SLOPE STABILITY ANALYSIS SECTION LOCATION PLAN

ENVIROANALYTICS GROUP
GREY'S LANDFILL NORTHEAST CORNER MODIFICATION
SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet 3



This drawing, its contents, and each component of this drawing are the property of and proprietary to ARM Group LLC and shall not be reproduced or used in any manner except for the purpose identified on the Title Block, and only by or on behalf of this client for the identified project unless otherwise authorized by the express, written consent of ARM Group LLC

ARM Group LLC
Engineers and Scientists
www.armgroup.net

No.	Revision	Date	By
0	ISSUED FOR REVIEW	04/13/2020	ARM

designed	ARM	scale	1" = 100'
checked	DNF	date	06/05/2020
drawn	BAA	project no.	20010112

graphic scale: 0 – 100 – 200 – 300 SCALE IN FEET (60, 120, 180)

drawing title: PROPOSED INTERIM FINAL GRADE PLAN

project title: ENVIROANALYTICS GROUP
GREY'S LANDFILL NORTHEAST CORNER MODIFICATION
SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet 4

P:\EnviroAnalytics Group\170409 Greys LF Closure Plan\Drwg\Production\180215H_Greys Landfill Closure Volume Analysis-Permitted Final Grades Revised 2.5 to 1_2020-05-27 update.dwg Plotted: July 13, 2020

APPENDIX B

Settlement and Strain Analysis

DESCRIPTION

Evaluate total and differential settlement of the subgrade surface of the proposed supplement cap in order to verify that the anticipated post-settlement slope of the cap will promote drainage of infiltrated leachate away from the area, while still remaining within the waste mass. Additionally, this analysis evaluates the strain for the proposed geosynthetic cap to verify that differential settlements do not cause exceedance of the maximum strain due (i.e., 5.0% for HDPE geomembrane systems).

REFERENCES

1. Qian, Koerner, Gray, Geotechnical Aspects of Landfill Design and Construction, Prentice Hall, 2002.
2. Holtz, Kovacs, An Introduction to Geotechnical Engineering, Prentice Hall, 1981.
3. Das, Braja M. *Principles of Geotechnical Engineering*, Southbank, Vic., Australia: Thomson, 2010, Print.
4. Lindeburg, Michael R., Civil Engineering Reference Manual for the PE Exam, 13th Edition.

DEFINITION OF VARIABLES

psf = pounds per square foot
$\Delta\sigma$ = change in vertical effective stress (psf)
ΔH = total settlement (ft)
ΔH_c = primary settlement (ft)
H_o = initial thickness of the layer (ft)
e_o = initial void ratio
p_c = preconsolidation pressure (psf)
σ_o = initial vertical effective stress (psf)
C'_c = modified primary compression Index
σ_f = final vertical effective stress (psf)
ΔH_α = long-term secondary settlement (ft)
C'_α = modified secondary compression index
t_1 = start time of long-term settlement (years)
t_2 = end time of long-term settlement (years)

BACKGROUND

The bearing capacity-related performance standard requires that potential settlement be accommodated without damage to the cap systems. Since the proposed expansion includes an increase in total waste thickness over the existing waste mass, settlement and differential settlement and their effects on capping system strain must be accommodated. This analysis was performed to verify that the anticipated settlements and differential settlements estimated to occur within the existing waste mass and compressible foundation layers beneath the proposed capping system do not cause the calculated strain to exceed 5% for HDPE (*Reference 1*).

The total area of the existing capping system is approximately 1.19 acres (51,883 square feet, SF), and was the focus of this settlement and strain analysis. Total settlements were evaluated at 54 locations (Points 1 through 54) where there is an existing capping system, equating to a frequency of about 1 settlement point per 960 SF. Existing and proposed waste thicknesses at each of the locations were approximated using available as-built, existing ground, and proposed topographic data. The settlement points were selected at locations where proposed waste heights (surcharge loads) and/or existing waste heights varied significantly between locations, thereby increasing the possibility of significant differential settlements and cap strain. Points were also located along leachate flow paths to determine if the post-settlement slope is adequate. The attached drawing entitled "Settlement Point Location Plan" shows the locations of the 54 analysis points, as well as the proposed final grade and supplemental cap subgrade surfaces for reference.

Foundation information pertaining to the settlement points were derived from the historical documents found in the previously submitted reports for the Greys Landfill. Specifically, for the purposes of this analysis, the foundation layers were assumed to create a generally flat surface beneath the existing waste material. In general, the existing landfill is underlain by a layer of slag fill, a coastal sand layer, and a compressible clay layer. The clay layer was assumed to be the only compressible foundation soil layer, therefore, settlement of the clay layer is included in the total anticipated settlement of the proposed supplemental cap.

CALCULATIONS

This analysis is divided into the three following sections:

- Section 1 – Settlement of Compressible Layers: this section outlines the calculations necessary to estimate the settlement of the historical waste and compressible foundation clay within the Northeast Corner of the Landfill.
- Section 2 – Strain Analysis: this section describes the steps taken to calculate the strain in the HDPE capping system caused by differential settlement of the underlying waste layer.

1.0 Settlement of Compressible Layers

The settlement of waste can be divided into two categories: primary settlement and secondary settlement. Primary settlement is a function of waste thickness, overburden pressures, and the primary compression index. The calculation for primary settlement of historical waste accounts for changes in overburden pressure due to the proposed expansion. These areas have been previously closed; therefore, they are considered historical for the purposes of this settlement analysis. Calculation of settlements anticipated of the proposed waste mass are not relevant to this calculation (i.e., settlement will occur above the capping system) and are therefore not further discussed herein.

1.1 Primary Consolidation Settlements (Waste)

The primary settlement of historical waste is given by the following equation:

$$\Delta H_c = C'_c \cdot H_o \cdot log\left(\frac{\sigma_o + \Delta\sigma}{p_c}\right)$$

where ΔH_c is the primary settlement of the layer, C'_c is the modified primary compression index, H_o is the initial thickness of the waste layer (ft.), p_c is the preconsolidation pressure (psf), σ_o is the initial vertical effective stress (psf), and $\Delta\sigma$ is the change in the vertical effective overburden stress (psf). Use of the “modified” compression indices is an alternative engineering approach to characterize the compressive properties of waste. The need for this alternative method is because it is very difficult to determine the initial void ratio of waste once it has been placed in the landfill. The modified primary compression index (C'_c) for historical waste was conservatively estimated to be 0.15. The historical waste mass in the landfill modelled in one single layer, given the relatively small existing waste thickness; the maximum existing waste thickness was found to be approximately 19 feet.

The compressible clay layer beneath the landfill was sampled during a recent subsurface investigation, and an Atterberg Limit was run on the sample (LL = 55). ARM assumed that the foundation clay layer had an initial void ratio of 1.37, based on lab results on Shelby Tube samples collected along the toe of the landfill as part of the recent subsurface investigation. Using Equations 40.9 and 40.12 from *Reference 4*, the modified primary compression index for the foundation clay was calculated to be approximately 0.17.

1.2 Secondary Consolidation Settlements (Waste)

Secondary settlement is a function of waste thickness, secondary compression index, and age of the waste. Whereas primary settlement is expected to occur shortly (within 3 to 5 years) after placement and/or loading, secondary settlement is expected to occur over many years. The equation used to quantify secondary settlement of waste is:

$$\Delta H_\alpha = C'_\alpha \cdot H_o \cdot log\left(\frac{t_2}{t_1}\right)$$

where ΔH_α is the long-term, secondary compression settlement (ft.); C'_α is the modified secondary compression index (assumed to be 10% of the modified primary compression index); t_1 is the starting time of the long-term settlement time period (years); and t_2 is the ending time of the long-term settlement time period (years). Secondary settlement was assumed to begin a year after waste placement began (assumed to be 2000), continue through the operational life of the landfill expansion, and continue for the industry-standard 30-year post-closure period. Given the estimated start date of waste placement and the anticipated end of the post-closure period, t_1 = 22 and t_2 = 52. Since the calculation of secondary settlement is not dependent on overburden stresses, the existing waste masses were analyzed as a single layer.

1.3 Total Settlement of Waste

The total settlement of the historical waste layers at a given point on the proposed capping system was calculated using the following equation:

$$\Delta H = \Delta H_c + \Delta H_\alpha$$

where ΔH is the total settlement of historical waste, ΔH_c is the primary consolidation settlement of waste (ft.), and ΔH_α is the long-term, secondary compression settlement of waste (ft.); the latter two were calculated in Sections 1.1 and 1.2 herein. The primary, secondary, and total settlements of the historical waste layers calculated for each analysis point are provided in Table 1 (following the text of this analysis).

Conservatively estimated total settlements, where applicable, ranged from 2.5 and 4.8 feet at Points 51 and 1, respectively. These estimated total settlement values are utilized in the strain analysis (see Section 2) to determine if excessive strains in the geosynthetics would result as a function of the differential settlement of the existing underlying waste and subgrade soils.

2.0 Cap Strain Analysis

Anticipated total and differential settlement of the existing and proposed capping systems may occur as a result of settlements in the historical waste. Any differential settlement of the underlying layers may subject the capping system to tensile stresses and/or changes in grade. The purpose of this section is to verify that the existing capping system has adequate mechanical properties to withstand the stresses and strains that may be caused by potential settlements, which were calculated in Section 1 above.

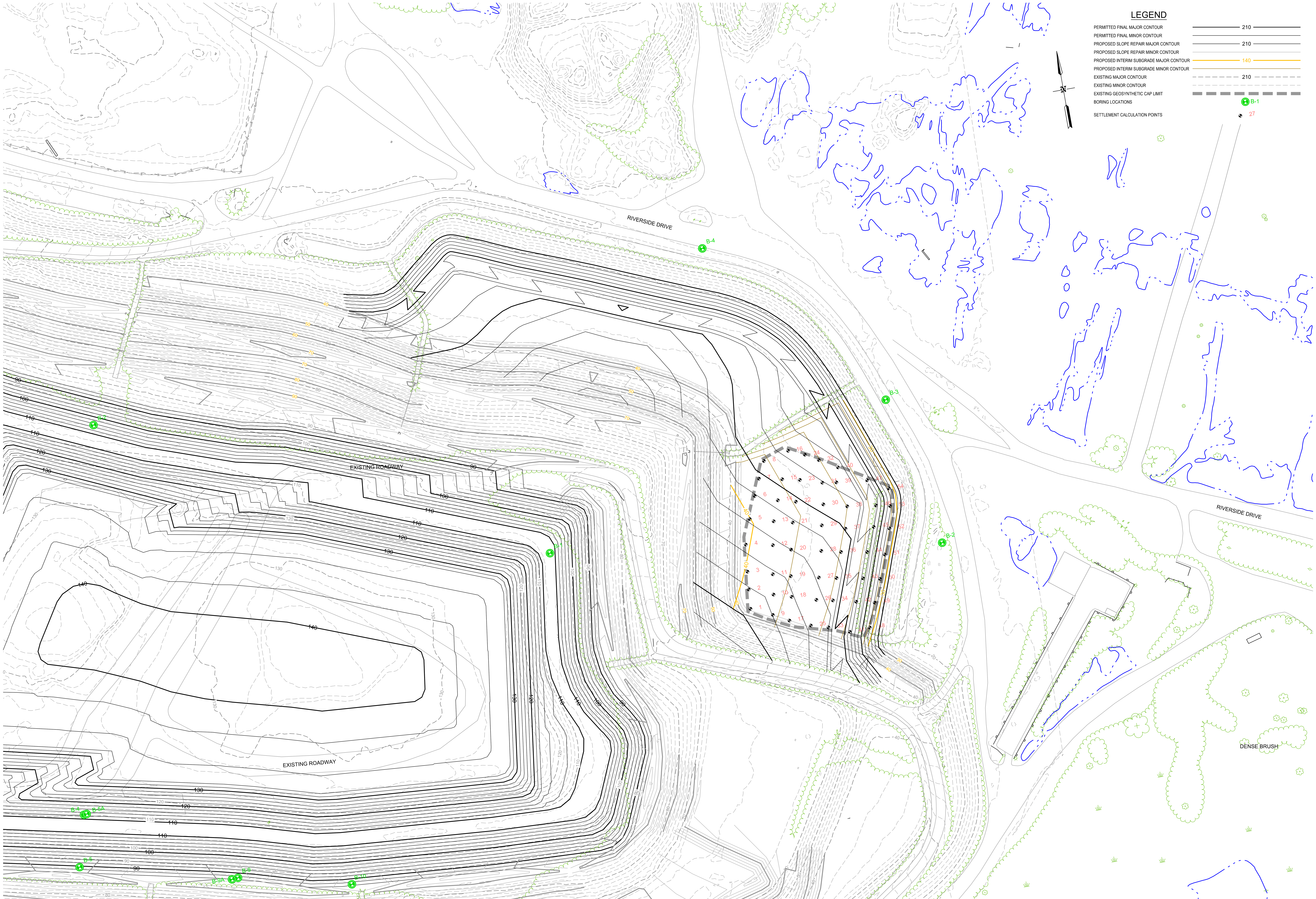
To evaluate potential strain, cap strain analysis segments were drawn between adjacent settlement points. The distance of the segments connecting each of the adjacent settlement points varied depending on the geometry of the cross section. Capping system strains were calculated by first determining the slope length between the adjacent settlement points (pre-settlement). Once this slope length was determined, the settlement point elevation was reduced to account for the settlement calculated for the waste beneath the capping system. The new final elevations at the two settlement points were then used to re-calculate the slope length between the adjacent points. This change in slope length between the two points as a result of settlement was used to compute the resulting strain in the cap.

2.1 Post-Settlement Slopes and Grade Reversal Analysis

In order to verify that adequate slopes of the proposed capping system will be maintained post-settlement, segments were analyzed perpendicular to the slope. The same methods were utilized to calculate the pre-settlement and post-settlement slope inclinations as discussed above. Table 2 (attached) includes the calculation of the pre- and post-settlement slopes for the nine (9) flow path segments analyzed.

Based on the results of this analysis shown in Table 2 the post-settlement slopes of subgrade will meet design requirements; furthermore, no grade reversals caused by differential settlement are anticipated. The proposed supplemental cap will maintain positive drainage off of the cap in both the pre-settlement and the anticipated post-settlement conditions.

SETTLEMENT ANALYSIS POINT LOCATION MAP



This drawing, its contents, and each component of this drawing are the property of and proprietary to ARM Group LLC and shall not be reproduced or used in any manner except for the purpose identified on the Title Block, and only by or on behalf of this client for the identified project unless otherwise authorized by the express, written consent of ARM Group LLC

ARM Group LLC
Engineers and Scientists
www.armgroup.net

No.	Revision	Date	By
0	ISSUED FOR REVIEW	00/00/0000	ARM

designed	RJC
checked	DNF
drawn	RJC
scale	1" = 100'
date	06/05/2020
project no.	20010112

graphic scale: 0 100 200 300 / SCALE IN FEET / 0 60 120 180

drawing title
SETTLEMENT POINT LOCATION PLAN

project title
ENVIROANALYTICS GROUP
GREY'S LANDFILL CAPACITY ANALYSIS
JANUARY 2020

SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet
1

Table 1

Table 1: Summary of Settlement Calculations

Point ID	Waste Thickness	Primary Settlement (H_c)	Secondary Settlement (H_α)	Total Settlement (H)
	ft	*ft*	*ft*	*ft*
1	87.3	4.55	0.25	4.80
2	86.2	4.49	0.25	4.73
3	85.1	4.42	0.25	4.67
4	83.5	4.31	0.25	4.57
5	81.8	4.17	0.25	4.42
6	80.1	4.01	0.25	4.26
7	78.5	3.86	0.24	4.11
8	77.1	3.72	0.24	3.96
9	86.0	4.40	0.24	4.65
10	85.4	4.38	0.24	4.62
11	84.3	4.31	0.24	4.56
12	82.4	4.19	0.25	4.43
13	80.9	4.07	0.25	4.32
14	79.3	3.92	0.24	4.16
15	77.5	3.75	0.24	3.99
16	75.5	3.57	0.23	3.80
17	85.0	4.30	0.24	4.54
18	84.2	4.26	0.24	4.49
19	83.6	4.23	0.24	4.47
20	82.0	4.12	0.24	4.36
21	80.2	3.99	0.24	4.23
22	78.4	3.83	0.24	4.07
23	76.8	3.68	0.24	3.92
24	75.1	3.52	0.23	3.75
25	83.7	4.17	0.23	4.40
26	82.5	4.10	0.23	4.33
27	81.8	4.05	0.23	4.28
28	80.7	3.98	0.23	4.21
29	79.1	3.86	0.23	4.10
30	77.4	3.73	0.23	3.96
31	76.1	3.61	0.23	3.84
32	74.8	3.49	0.23	3.72
33	82.0	4.02	0.23	4.25
34	81.5	3.99	0.23	4.22
35	80.6	3.93	0.23	4.16
36	79.1	3.83	0.23	4.06
37	77.9	3.74	0.23	3.97
38	76.6	3.64	0.23	3.87
39	75.5	3.55	0.23	3.78
40	74.5	3.46	0.23	3.68
41	75.1	3.46	0.22	3.68
42	74.6	3.43	0.22	3.65
43	73.1	3.31	0.22	3.52
44	73.2	3.32	0.22	3.54

Table 1: Summary of Settlement Calculations

Point ID	Waste Thickness	Primary Settlement (H_c)	Secondary Settlement (H_α)	Total Settlement (H)
	ft	*ft*	*ft*	*ft*
45	72.1	3.22	0.22	3.44
46	72.0	3.22	0.21	3.43
47	71.7	3.19	0.21	3.40
48	63.8	2.46	0.20	2.66
49	63.6	2.42	0.20	2.62
50	63.0	2.35	0.20	2.55
51	62.6	2.30	0.20	2.51
52	62.7	2.31	0.20	2.51
53	64.5	2.52	0.20	2.72
54	62.9	2.36	0.20	2.56

Table 2

Table 2

SLOPE ANALYSIS OF GREYS LANDFILL - NORTHEAST CORNER

Slope Increment		Location				Increment Horizontal Length	First Point Elevation	Second Point Elevation	Total Calculated Settlement		Original Elevation Difference	Initial Slope Inclination	Differential Settlement	Final Slope Inclination	Final Increment Slope Length	Change in Slope Length	Tensile Strain (+ = Tension) (- = Compression)
		Point A		Point B													
		Easting	Northing	Easting	Northing				Point A	Point B							
Point A	Point B	ft	ft	ft	ft	ft	ft	ft	ft	ft	ft	%	ft	%	ft	ft	%
1	8	1458867.3	573681.4	1458925.0	573894.5	220.8	40.1	38.6	4.80	3.96	1.48	0.67	0.83	0.29	220.8	0.001	0.000
8	17	1458925.0	573894.5	1458921.2	573654.1	240.5	38.6	38.3	3.96	4.54	0.34	0.14	-0.58	0.38	240	0.002	0.001
17	25	1458921.2	573654.1	1458951.4	573641.3	32.8	38.3	37.3	4.54	4.40	0.98	2.99	0.14	2.56	33	0.011	0.033
25	33	1458951.4	573641.3	1458976.7	573634.0	26.3	37.3	36.5	4.40	4.25	0.77	2.94	0.15	2.38	26	0.007	0.028
33	41	1458976.7	573634.0	1459006.9	573622.0	32.5	36.5	34.4	4.25	3.68	2.07	6.36	0.57	4.61	33	0.034	0.106
41	48	1459006.9	573622.0	1459037.2	573623.0	30.4	34.4	31.5	3.68	2.66	2.97	9.77	1.01	6.43	30	0.063	0.206
2	10	1458869.6	573710.3	1458904.6	573696.3	37.7	40.4	39.3	4.73	4.62	1.13	2.99	0.12	2.68	38	0.014	0.036
10	18	1458904.6	573696.3	1458930.6	573688.4	27.1	39.3	38.5	4.62	4.49	0.80	2.95	0.12	2.49	27	0.008	0.031
18	26	1458930.6	573688.4	1458966.0	573677.5	37.1	38.5	37.4	4.49	4.33	1.10	2.95	0.17	2.51	37	0.012	0.031
26	34	1458966.0	573677.5	1458990.2	573672.4	24.7	37.4	36.7	4.33	4.22	0.72	2.94	0.11	2.49	25	0.008	0.031
34	42	1458990.2	573672.4	1459024.0	573664.5	34.7	36.7	34.8	4.22	3.65	1.87	5.40	0.57	3.76	35	0.025	0.071
42	49	1459024.0	573664.5	1459050.8	573658.2	27.6	34.8	32.1	3.65	2.62	2.71	9.83	1.03	6.10	28	0.051	0.186
3	11	1458872.4	573736.6	1458908.8	573726.3	37.9	40.7	39.5	4.67	4.56	1.13	2.97	0.12	2.66	38	0.013	0.035
11	19	1458908.8	573726.3	1458934.7	573718.8	26.9	39.5	38.7	4.56	4.47	0.80	2.97	0.09	2.65	27	0.009	0.035
19	27	1458934.7	573718.8	1458975.4	573709.6	41.8	38.7	37.5	4.47	4.28	1.24	2.96	0.19	2.51	42	0.013	0.032
27	35	1458975.4	573709.6	1459001.3	573704.3	26.4	37.5	36.7	4.28	4.16	0.78	2.96	0.12	2.51	26	0.008	0.032
35	43	1459001.3	573704.3	1459040.0	573696.9	39.4	36.7	34.5	4.16	3.52	2.19	5.55	0.64	3.93	39	0.030	0.077
43	50	1459040.0	573696.9	1459064.8	573691.7	25.3	34.5	32.0	3.52	2.55	2.50	9.87	0.97	6.03	25	0.046	0.182
4	12	1458876.9	573776.7	1458916.5	573768.8	40.4	41.0	39.8	4.57	4.43	1.20	2.96	0.13	2.63	40	0.014	0.035
12	20	1458916.5	573768.8	1458942.0	573757.6	27.8	39.8	39.0	4.43	4.36	0.83	2.99	0.07	2.75	28	0.011	0.038
20	28	1458942.0	573757.6	1458985.9	573747.9	45.0	39.0	37.6	4.36	4.21	1.34	2.97	0.15	2.63	45	0.016	0.035
28	36	1458985.9	573747.9	1459014.6	573741.2	29.4	37.6	36.7	4.21	4.06	0.88	2.98	0.15	2.45	29	0.009	0.030
36	44	1459014.6	573741.2	1459052.9	573734.6	38.9	36.7	34.6	4.06	3.54	2.10	5.39	0.52	4.06	39	0.032	0.083
44	51	1459052.9	573734.6	1459078.0	573726.2	26.5	34.6	32.0	3.54	2.51	2.65	10.00	1.03	6.10	27	0.049	0.186
5	13	1458889.4	573813.1	1458923.8	573803.7	35.7	40.8	39.9	4.42	4.32	0.89	2.49	0.10	2.20	36	0.009	0.024
13	21	1458923.8	573803.7	1458951.4	573796.8	28.4	39.9	39.1	4.32	4.23	0.85	2.98	0.09	2.67	28	0.010	0.036
21	29	1458951.4	573796.8	1458993.2	573785.2	43.5	39.1	37.8	4.23	4.10	1.30	2.99	0.14	2.68	43	0.016	0.036
29	37	1458993.2	573785.2	1459027.1	573774.2	35.6	37.8	36.7	4.10	3.97	1.07	3.00	0.13	2.64	36	0.012	0.035
37	45	1459027.1	573774.2	1459069.0	573769.5	42.2	36.7	34.4	3.97	3.44	2.38	5.65	0.53	4.39	42	0.041	0.096
45	52	1459069.0	573769.5	1459091.6	573763.2	23.5	34.4	32.0	3.44	2.51	2.35	9.96	0.93	6.03	24	0.043	0.182
5	14	1458889.4	573813.1	1458935.3	573833.3	50.2	40.8	39.3	4.42	4.16	1.50	2.99	0.26	2.48	50	0.015	0.031
14	23	1458935.3	573833.3	1458972.8	573857.4	44.6	39.3	38.0	4.16	3.92	1.31	2.93	0.24	2.39	45	0.013	0.028
23	32	1458972.8	573857.4	1459005.8	573881.6	40.9	38.0	36.8	3.92	3.72	1.18	2.88	0.20	2.40	41	0.012	0.029
21	30	1458951.4	573796.8	1459000.9	573815.6	53.0	39.1	37.7	4.23	3.96	1.43	2.70	0.27	2.19	53	0.013	0.024
30	47	1459000.9	573815.6	1459071.4	573839.6	74.5	37.7	34.1	3.96	3.40	3.55	4.77	0.56	4.02	75	0.060	0.081
38	54	1459035.4	573806.6	1459101.1	573822.1	67.5	36.7	31.5	3.87	2.56	5.22	7.74	1.31	5.80	68	0.113	0.168
6	15	1458902.5	573845.6	1458947.2	573863.0	47.9	40.1	38.7	4.26	3.99	1.44	3.00	0.27	2.45	48	0.014	0.030
15	32	1458947.2	573863.0	1459005.8	573881.6	61.5	38.7	36.8	3.99	3.72	1.84	3.00	0.27	2.55	61	0.020	0.033
7	24	1458913.3	573869.9	1458986.7	573893.1	77.0	39.6	37.3	4.11	3.75	2.31	3.00	0.36	2.53	77	0.025	0.032
8	16	1458925.0	573894.5	1458963.1	573903.2	39.1	38.6	37.8	3.96	3.80	0.77	1.97	0.16	1.56	39	0.005	0.012
13	22	1458923.8	573803.7	1458961.4	573826.6	44.0	39.9	38.7	4.32	4.07	1.28	2.91	0.25	2.35	44	0.012	0.027
22	31	1458961.4	573826.6	1459005.1	573847.6	48.5	38.7	37.2	4.07	3.84	1.45	2.99	0.23	2.50	48	0.015	0.031
31	40	1459005.1	573847.6	1459032.0	573866.0	32.6	37.2	36.3	3.84	3.68	0.95	2.91	0.16	2.43	33	0.010	0.030

Settlement Analysis Point Calculations

POINT 1

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	20.1	114.0	0.18	1,143	-	-	-
Existing Waste	23.3	106.0	0.15	-	3,520	-	1.91
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,753	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,798	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,914	-	1.52

Waste Thickness: 87.3 **Total Primary Settlement: 3.43**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	20.1	0.018	2022	-	-	-
Existing Waste	23.3	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 87.3 **Total Secondary Settlement: 0.20**

TOTAL SETTLEMENT
3.62

% of Total Waste Thickness: 4.1%

POINT 2

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	18.6	114.0	0.18	1,058	-	-	-
Existing Waste	23.6	106.0	0.15	-	3,366	-	1.87
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,617	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,662	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,778	-	1.51

Waste Thickness: 86.2 **Total Primary Settlement: 3.38**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	18.6	0.018	2022	-	-	-
Existing Waste	23.6	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 86.2 **Total Secondary Settlement: 0.20**

TOTAL SETTLEMENT
3.57

% of Total Waste Thickness: 4.1%

POINT 3

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	17.2	114.0	0.18	1,000	-	-	-
Existing Waste	23.9	106.0	0.15	-	3,231	-	1.82
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,496	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,541	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,657	-	1.50

Waste Thickness: 85.1 **Total Primary Settlement: 3.32**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	17.2	0.018	2022	-	-	-
Existing Waste	23.9	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 85.1 **Total Secondary Settlement: 0.20**

TOTAL SETTLEMENT
3.52

% of Total Waste Thickness: 4.1%

POINT 4

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	15.5	114.0	0.18	1,000	-	-	-
Existing Waste	24.0	106.0	0.15	-	3,039	-	1.74
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,311	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,356	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,472	-	1.48

Waste Thickness: 83.5 **Total Primary Settlement: 3.22**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	15.5	0.018	2022	-	-	-
Existing Waste	24.0	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 83.5 **Total Secondary Settlement: 0.20**

TOTAL SETTLEMENT
3.42

% of Total Waste Thickness: 4.1%

POINT 5

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	13.8	114.0	0.18	1,000	-	-	-
Existing Waste	24.0	106.0	0.15	-	2,840	-	1.63
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,112	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,157	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,273	-	1.47

Waste Thickness: 81.8 **Total Primary Settlement: 3.10**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	13.8	0.018	2022	-	-	-
Existing Waste	24.0	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 81.8 **Total Secondary Settlement: 0.20**

TOTAL SETTLEMENT
3.30

% of Total Waste Thickness: 4.0%

POINT 6

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	12.8	114.0	0.18	1,000	-	-	-
Existing Waste	23.3	106.0	0.15	-	2,695	-	1.51
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,932	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,977	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,093	-	1.45

Waste Thickness: 80.1 **Total Primary Settlement: 2.96**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	12.8	0.018	2022	-	-	-
Existing Waste	23.3	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 80.1 **Total Secondary Settlement: 0.20**

TOTAL SETTLEMENT
3.16

% of Total Waste Thickness: 3.9%

POINT 7

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.9	114.0	0.18	1,000	-	-	-
Existing Waste	22.7	106.0	0.15	-	2,555	-	1.38
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,756	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,801	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,917	-	1.44

Waste Thickness: 78.5 **Total Primary Settlement: 2.82**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.9	0.018	2022	-	-	-
Existing Waste	22.7	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 78.5 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.02

% of Total Waste Thickness: 3.8%

POINT 8

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C'_c \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C'_c \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.0	114.0	0.18	1,000	-	-	-
Existing Waste	22.1	106.0	0.15	-	2,430	-	1.28
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,602	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,647	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,763	-	1.42

Waste Thickness: 77.1 **Total Primary Settlement: 2.70**

Secondary Settlement

$$H_s = H_0 C'_\alpha \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.0	0.018	2022	-	-	-
Existing Waste	22.1	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 77.1 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
2.89

% of Total Waste Thickness: 3.7%

POINT 9

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	19.7	114.0	0.18	1,124	-	-	-
Existing Waste	22.2	106.0	0.15	-	3,427	-	1.78
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,606	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,651	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,767	-	1.51

Waste Thickness: 86.0 **Total Primary Settlement: 3.29**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	19.7	0.018	2022	-	-	-
Existing Waste	22.2	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 86.0 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.48

% of Total Waste Thickness: 4.1%

POINT 10

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	18.9	114.0	0.18	1,076	-	-	-
Existing Waste	22.5	106.0	0.15	-	3,343	-	1.77
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,535	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,580	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,696	-	1.50

Waste Thickness: 85.4 **Total Primary Settlement: 3.27**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	18.9	0.018	2022	-	-	-
Existing Waste	22.5	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 85.4 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.46

% of Total Waste Thickness: 4.1%

POINT 11

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	17.5	114.0	0.18	1,000	-	-	-
Existing Waste	22.7	106.0	0.15	-	3,203	-	1.72
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,409	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,454	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,570	-	1.49

Waste Thickness: 84.3 **Total Primary Settlement: 3.22**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	17.5	0.018	2022	-	-	-
Existing Waste	22.7	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 84.3 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.41

% of Total Waste Thickness: 4.0%

POINT 12

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	15.4	114.0	0.18	1,000	-	-	-
Existing Waste	23.0	106.0	0.15	-	2,978	-	1.63
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,196	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,241	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,357	-	1.48

Waste Thickness: 82.4 **Total Primary Settlement: 3.11**

Secondary Settlement

$$H_s = H_0 C'_\alpha \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	15.4	0.018	2022	-	-	-
Existing Waste	23.0	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 82.4 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.30

% of Total Waste Thickness: 4.0%

POINT 13

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	13.8	114.0	0.18	1,000	-	-	-
Existing Waste	23.1	106.0	0.15	-	2,796	-	1.55
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,022	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,067	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,183	-	1.46

Waste Thickness: 80.9 **Total Primary Settlement: 3.01**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	13.8	0.018	2022	-	-	-
Existing Waste	23.1	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 80.9 **Total Secondary Settlement: 0.20**

TOTAL SETTLEMENT
3.21

% of Total Waste Thickness: 4.0%

POINT 14

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	12.7	114.0	0.18	1,000	-	-	-
Existing Waste	22.5	106.0	0.15	-	2,646	-	1.43
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,840	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,885	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,001	-	1.45

Waste Thickness: 79.3 **Total Primary Settlement: 2.87**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	12.7	0.018	2022	-	-	-
Existing Waste	22.5	0.015	2000	22	52	0.13
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 79.3 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.07

% of Total Waste Thickness: 3.9%

POINT 15

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.7	114.0	0.18	1,000	-	-	-
Existing Waste	21.8	106.0	0.15	-	2,491	-	1.29
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,645	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,690	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,806	-	1.43

Waste Thickness: 77.5 **Total Primary Settlement: 2.72**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.7	0.018	2022	-	-	-
Existing Waste	21.8	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 77.5 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
2.91

% of Total Waste Thickness: 3.8%

POINT 16

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.2	114.0	0.18	1,000	-	-	-
Existing Waste	20.3	106.0	0.15	-	2,354	-	1.13
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,432	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,477	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,593	-	1.41

Waste Thickness: 75.5 **Total Primary Settlement: 2.54**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.2	0.018	2022	-	-	-
Existing Waste	20.3	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 75.5 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.72

% of Total Waste Thickness: 3.6%

POINT 17

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	19.5	114.0	0.18	1,113	-	-	-
Existing Waste	21.5	106.0	0.15	-	3,364	-	1.70
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,501	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,546	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,662	-	1.50

Waste Thickness: 85.0 **Total Primary Settlement: 3.20**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	19.5	0.018	2022	-	-	-
Existing Waste	21.5	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 85.0 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.38

% of Total Waste Thickness: 4.0%

POINT 18

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	18.5	114.0	0.18	1,054	-	-	-
Existing Waste	21.7	106.0	0.15	-	3,256	-	1.67
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,405	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,450	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,566	-	1.49

Waste Thickness: 84.2 **Total Primary Settlement: 3.16**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	18.5	0.018	2022	-	-	-
Existing Waste	21.7	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 84.2 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.35

% of Total Waste Thickness: 4.0%

POINT 19

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	17.6	114.0	0.18	1,006	-	-	-
Existing Waste	21.9	106.0	0.15	-	3,174	-	1.65
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,337	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,382	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,498	-	1.49

Waste Thickness: 83.6 **Total Primary Settlement: 3.14**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	17.6	0.018	2022	-	-	-
Existing Waste	21.9	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 83.6 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.33

% of Total Waste Thickness: 4.0%

POINT 20

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	15.8	114.0	0.18	1,000	-	-	-
Existing Waste	22.2	106.0	0.15	-	2,980	-	1.58
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,155	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,200	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,316	-	1.47

Waste Thickness: 82.0 **Total Primary Settlement: 3.05**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	15.8	0.018	2022	-	-	-
Existing Waste	22.2	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 82.0 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.24

% of Total Waste Thickness: 3.9%

POINT 21

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	13.9	114.0	0.18	1,000	-	-	-
Existing Waste	22.3	106.0	0.15	-	2,767	-	1.48
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,949	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,994	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,110	-	1.45

Waste Thickness: 80.2 **Total Primary Settlement: 2.93**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	13.9	0.018	2022	-	-	-
Existing Waste	22.3	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 80.2 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
3.12

% of Total Waste Thickness: 3.9%

POINT 22

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C'_c \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C'_c \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	12.5	114.0	0.18	1,000	-	-	-
Existing Waste	21.9	106.0	0.15	-	2,589	-	1.36
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,748	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,793	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,909	-	1.44

Waste Thickness: 78.4 **Total Primary Settlement: 2.79**

Secondary Settlement

$$H_s = H_0 C'_\alpha \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	12.5	0.018	2022	-	-	-
Existing Waste	21.9	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 78.4 **Total Secondary Settlement: 0.19**

TOTAL SETTLEMENT
2.98

% of Total Waste Thickness: 3.8%

POINT 23

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.6	114.0	0.18	1,000	-	-	-
Existing Waste	21.2	106.0	0.15	-	2,448	-	1.24
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,573	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,618	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,734	-	1.42

Waste Thickness: 76.8 **Total Primary Settlement: 2.66**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.6	0.018	2022	-	-	-
Existing Waste	21.2	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 76.8 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.84

% of Total Waste Thickness: 3.7%

POINT 24

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	10.8	114.0	0.18	1,000	-	-	-
Existing Waste	20.2	106.0	0.15	-	2,309	-	1.10
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,382	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,427	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,543	-	1.40

Waste Thickness: 75.1 **Total Primary Settlement: 2.51**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	10.8	0.018	2022	-	-	-
Existing Waste	20.2	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 75.1 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.69

% of Total Waste Thickness: 3.6%

POINT 25

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	19.2	114.0	0.18	1,094	-	-	-
Existing Waste	20.5	106.0	0.15	-	3,273	-	1.58
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,358	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,403	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,519	-	1.49

Waste Thickness: 83.7 **Total Primary Settlement: 3.07**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	19.2	0.018	2022	-	-	-
Existing Waste	20.5	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 83.7 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
3.25

% of Total Waste Thickness: 3.9%

POINT 26

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	18.0	114.0	0.18	1,024	-	-	-
Existing Waste	20.6	106.0	0.15	-	3,138	-	1.53
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,229	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,274	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,390	-	1.48

Waste Thickness: 82.5 **Total Primary Settlement: 3.01**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	18.0	0.018	2022	-	-	-
Existing Waste	20.6	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 82.5 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
3.19

% of Total Waste Thickness: 3.9%

POINT 27

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	17.1	114.0	0.18	1,000	-	-	-
Existing Waste	20.7	106.0	0.15	-	3,042	-	1.50
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,139	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,184	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,300	-	1.47

Waste Thickness: 81.8 **Total Primary Settlement: 2.97**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	17.1	0.018	2022	-	-	-
Existing Waste	20.7	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 81.8 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
3.15

% of Total Waste Thickness: 3.9%

POINT 28

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	15.9	114.0	0.18	1,000	-	-	-
Existing Waste	20.8	106.0	0.15	-	2,913	-	1.45
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,017	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,062	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,178	-	1.46

Waste Thickness: 80.7 **Total Primary Settlement: 2.91**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	15.9	0.018	2022	-	-	-
Existing Waste	20.8	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 80.7 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
3.09

% of Total Waste Thickness: 3.8%

POINT 29

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	14.1	114.0	0.18	1,000	-	-	-
Existing Waste	21.0	106.0	0.15	-	2,717	-	1.37
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,830	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,875	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,991	-	1.44

Waste Thickness: 79.1 **Total Primary Settlement: 2.81**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	14.1	0.018	2022	-	-	-
Existing Waste	21.0	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 79.1 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.99

% of Total Waste Thickness: 3.8%

POINT 30

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	12.6	114.0	0.18	1,000	-	-	-
Existing Waste	20.9	106.0	0.15	-	2,537	-	1.27
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,643	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,688	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,804	-	1.43

Waste Thickness: 77.4 **Total Primary Settlement:** **2.69**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	12.6	0.018	2022	-	-	-
Existing Waste	20.9	0.015	2000	22	52	0.12
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 77.4 **Total Secondary Settlement:** **0.18**

TOTAL SETTLEMENT
2.88

% of Total Waste Thickness: 3.7%

POINT 31

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.7	114.0	0.18	1,000	-	-	-
Existing Waste	20.4	106.0	0.15	-	2,414	-	1.17
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,496	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,541	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,657	-	1.41

Waste Thickness: 76.1 **Total Primary Settlement: 2.59**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.7	0.018	2022	-	-	-
Existing Waste	20.4	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 76.1 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.77

% of Total Waste Thickness: 3.6%

POINT 32

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	10.8	114.0	0.18	1,000	-	-	-
Existing Waste	20.0	106.0	0.15	-	2,294	-	1.08
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,356	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,401	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,517	-	1.40

Waste Thickness: 74.8 **Total Primary Settlement: 2.48**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	10.8	0.018	2022	-	-	-
Existing Waste	20.0	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 74.8 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.66

% of Total Waste Thickness: 3.6%

POINT 33

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	18.6	114.0	0.18	1,061	-	-	-
Existing Waste	19.4	106.0	0.15	-	3,150	-	1.45
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,178	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,223	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,339	-	1.47

Waste Thickness: 82.0 **Total Primary Settlement: 2.92**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	18.6	0.018	2022	-	-	-
Existing Waste	19.4	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 82.0 **Total Secondary Settlement: 0.17**

TOTAL SETTLEMENT
3.10

% of Total Waste Thickness: 3.8%

POINT 34

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	17.7	114.0	0.18	1,011	-	-	-
Existing Waste	19.7	106.0	0.15	-	3,067	-	1.44
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,112	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,157	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,273	-	1.47

Waste Thickness: 81.5 **Total Primary Settlement: 2.91**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	17.7	0.018	2022	-	-	-
Existing Waste	19.7	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 81.5 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
3.08

% of Total Waste Thickness: 3.8%

POINT 35

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	16.7	114.0	0.18	1,000	-	-	-
Existing Waste	19.9	106.0	0.15	-	2,961	-	1.40
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	4,013	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	5,058	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,174	-	1.46

Waste Thickness: 80.6 **Total Primary Settlement: 2.86**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	16.7	0.018	2022	-	-	-
Existing Waste	19.9	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 80.6 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
3.04

% of Total Waste Thickness: 3.8%

POINT 36

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	15.2	114.0	0.18	1,000	-	-	-
Existing Waste	19.9	106.0	0.15	-	2,786	-	1.33
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,840	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,885	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	8,001	-	1.45

Waste Thickness: 79.1 **Total Primary Settlement: 2.77**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	15.2	0.018	2022	-	-	-
Existing Waste	19.9	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 79.1 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.95

% of Total Waste Thickness: 3.7%

POINT 37

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	14.0	114.0	0.18	1,000	-	-	-
Existing Waste	19.9	106.0	0.15	-	2,651	-	1.26
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,704	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,749	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,865	-	1.43

Waste Thickness: 77.9 **Total Primary Settlement: 2.69**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	14.0	0.018	2022	-	-	-
Existing Waste	19.9	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 77.9 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.87

% of Total Waste Thickness: 3.7%

POINT 38

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	12.7	114.0	0.18	1,000	-	-	-
Existing Waste	19.9	106.0	0.15	-	2,505	-	1.19
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,562	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,607	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,723	-	1.42

Waste Thickness: 76.6 **Total Primary Settlement: 2.61**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1 (yr)	t_2 (yr)	Settlement, H_s (ft)
Proposed Waste	12.7	0.018	2022	-	-	-
Existing Waste	19.9	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 76.6 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.79

% of Total Waste Thickness: 3.6%

POINT 39

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.8	114.0	0.18	1,000	-	-	-
Existing Waste	19.7	106.0	0.15	-	2,392	-	1.12
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,439	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,484	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,600	-	1.41

Waste Thickness: 75.5 **Total Primary Settlement: 2.53**

Secondary Settlement

$$H_s = H_0 C'_\alpha \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.8	0.018	2022	-	-	-
Existing Waste	19.7	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 75.5 **Total Secondary Settlement: 0.18**

TOTAL SETTLEMENT
2.71
% of Total Waste Thickness: 3.6%

POINT 40

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C'_c \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C'_c \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.6	114.0	0.18	1,000	-	-	-
Existing Waste	18.9	106.0	0.15	-	2,324	-	1.04
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,328	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,373	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,489	-	1.40

Waste Thickness: 74.5 **Total Primary Settlement: 2.44**

Secondary Settlement

$$H_s = H_0 C'_\alpha \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.6	0.018	2022	-	-	-
Existing Waste	18.9	0.015	2000	22	52	0.11
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 74.5 **Total Secondary Settlement: 0.17**

TOTAL SETTLEMENT
2.61

% of Total Waste Thickness: 3.5%

POINT 41

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	13.6	114.0	0.18	1,000	-	-	-
Existing Waste	17.5	106.0	0.15	-	2,478	-	1.03
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,404	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,449	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,565	-	1.41

Waste Thickness: 75.1 **Total Primary Settlement: 2.44**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	13.6	0.018	2022	-	-	-
Existing Waste	17.5	0.015	2000	22	52	0.10
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 75.1 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
2.60

% of Total Waste Thickness: 3.5%

POINT 42

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	12.9	114.0	0.18	1,000	-	-	-
Existing Waste	17.7	106.0	0.15	-	2,409	-	1.01
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,346	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,391	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,507	-	1.40

Waste Thickness: 74.6 **Total Primary Settlement: 2.41**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	12.9	0.018	2022	-	-	-
Existing Waste	17.7	0.015	2000	22	52	0.10
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 74.6 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
2.58

% of Total Waste Thickness: 3.5%

POINT 43

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.6	114.0	0.18	1,000	-	-	-
Existing Waste	17.5	106.0	0.15	-	2,246	-	0.92
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,175	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,220	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,336	-	1.38

Waste Thickness: 73.1 **Total Primary Settlement: 2.31**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.6	0.018	2022	-	-	-
Existing Waste	17.5	0.015	2000	22	52	0.10
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 73.1 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
2.47

% of Total Waste Thickness: 3.4%

POINT 44

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	11.6	114.0	0.18	1,000	-	-	-
Existing Waste	17.6	106.0	0.15	-	2,260	-	0.93
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,192	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,237	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,353	-	1.39

Waste Thickness: 73.2 **Total Primary Settlement: 2.32**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	11.6	0.018	2022	-	-	-
Existing Waste	17.6	0.015	2000	22	52	0.10
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 73.2 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
2.48

% of Total Waste Thickness: 3.4%

POINT 45

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C'_c \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C'_c \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	10.7	114.0	0.18	1,000	-	-	-
Existing Waste	17.4	106.0	0.15	-	2,139	-	0.86
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,062	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,107	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,223	-	1.37

Waste Thickness: 72.1 **Total Primary Settlement: 2.24**

Secondary Settlement

$$H_s = H_0 C'_\alpha \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	10.7	0.018	2022	-	-	-
Existing Waste	17.4	0.015	2000	22	52	0.10
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 72.1 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
2.40

% of Total Waste Thickness: 3.3%

POINT 46

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	10.6	114.0	0.18	1,000	-	-	-
Existing Waste	17.4	106.0	0.15	-	2,134	-	0.86
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,055	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,100	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,216	-	1.37

Waste Thickness: 72.0 **Total Primary Settlement: 2.23**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	10.6	0.018	2022	-	-	-
Existing Waste	17.4	0.015	2000	22	52	0.10
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 72.0 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
2.39

% of Total Waste Thickness: 3.3%

POINT 47

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	10.4	114.0	0.18	1,000	-	-	-
Existing Waste	17.3	106.0	0.15	-	2,100	-	0.83
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	3,015	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	4,060	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	7,176	-	1.37

Waste Thickness: 71.7 **Total Primary Settlement: 2.20**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	10.4	0.018	2022	-	-	-
Existing Waste	17.3	0.015	2000	22	52	0.10
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 71.7 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
2.37

% of Total Waste Thickness: 3.3%

POINT 48

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	4.4	114.0	0.18	1,000	-	-	-
Existing Waste	15.5	106.0	0.15	-	1,319	-	0.28
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	2,139	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	3,184	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	6,300	-	1.28

Waste Thickness: 63.8 **Total Primary Settlement: 1.56**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	4.4	0.018	2022	-	-	-
Existing Waste	15.5	0.015	2000	22	52	0.09
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 63.8 **Total Secondary Settlement: 0.15**

TOTAL SETTLEMENT
1.71

% of Total Waste Thickness: 2.7%

POINT 49

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	3.6	114.0	0.18	1,000	-	-	-
Existing Waste	16.0	106.0	0.15	-	1,260	-	0.24
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	2,111	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	3,156	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	6,272	-	1.28

Waste Thickness: 63.6 **Total Primary Settlement: 1.52**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	3.6	0.018	2022	-	-	-
Existing Waste	16.0	0.015	2000	22	52	0.09
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 63.6 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
1.67

% of Total Waste Thickness: 2.6%

POINT 50

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	3.0	114.0	0.18	1,000	-	-	-
Existing Waste	16.0	106.0	0.15	-	1,193	-	0.18
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	2,043	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	3,088	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	6,204	-	1.27

Waste Thickness: 63.0 **Total Primary Settlement: 1.45**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	3.0	0.018	2022	-	-	-
Existing Waste	16.0	0.015	2000	22	52	0.09
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 63.0 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
1.61

% of Total Waste Thickness: 2.6%

POINT 51

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C'_c \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C'_c \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	2.6	114.0	0.18	1,000	-	-	-
Existing Waste	16.0	106.0	0.15	-	1,150	-	0.15
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	1,998	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	3,043	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	6,159	-	1.26

Waste Thickness: 62.6 **Total Primary Settlement: 1.41**

Secondary Settlement

$$H_s = H_0 C'_\alpha \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	2.6	0.018	2022	-	-	-
Existing Waste	16.0	0.015	2000	22	52	0.09
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 62.6 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
1.56

% of Total Waste Thickness: 2.5%

POINT 52

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	2.7	114.0	0.18	1,000	-	-	-
Existing Waste	16.0	106.0	0.15	-	1,156	-	0.15
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	2,004	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	3,049	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	6,165	-	1.26

Waste Thickness: 62.7 **Total Primary Settlement: 1.41**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	2.7	0.018	2022	-	-	-
Existing Waste	16.0	0.015	2000	22	52	0.09
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 62.7 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
1.57

% of Total Waste Thickness: 2.5%

POINT 53

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right)$$

$$H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	4.4	114.0	0.18	1,000	-	-	-
Existing Waste	16.1	106.0	0.15	-	1,358	-	0.32
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	2,212	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	3,257	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	6,373	-	1.29

Waste Thickness: 64.5 **Total Primary Settlement: 1.61**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	4.4	0.018	2022	-	-	-
Existing Waste	16.1	0.015	2000	22	52	0.09
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 64.5 **Total Secondary Settlement: 0.16**

TOTAL SETTLEMENT
1.76

% of Total Waste Thickness: 2.7%

POINT 54

SETTLEMENT ANALYSIS
Greys Landfill - NE Corner Settlement Analysis

Primary Settlement

$$H_{p,historical} = H_0 C_c' \log\left(\frac{\sigma_0 + \Delta\sigma}{\sigma_0}\right) \qquad H_{p,active} = H_0 C_c' \log\left(\frac{\sigma_i}{\sigma_c}\right)$$

Layer	Thickness H_0 (ft)	Unit Weight γ (pcf)	Modified Compress. Index, C'_c	Initial Stress σ_0 (psf)	Overburden Pressure, σ_i (psf)	Change in Stress, $\Delta\sigma$ (psf)	Settlement H_p (ft)
Proposed Waste	3.4	114.0	0.18	1,000	-	-	-
Existing Waste	15.5	106.0	0.15	-	1,210	-	0.19
Foundation Soil (Slag)	9.5	110.0	0.00	1,000	-	2,033	-
Foundation Soil (Sand)	18.5	120.0	0.00	1,110	-	3,078	-
Foundation Soil (Clay)	16.0	112.0	0.10	-	6,194	-	1.27

Waste Thickness: 62.9 **Total Primary Settlement: 1.46**

Secondary Settlement

$$H_s = H_0 C_\alpha' \log\left(\frac{t_2}{t_1}\right)$$

Layer	Thickness, H_0, (ft)	Modified Compress. Index, C'_α	Yr. of Waste Placement	t_1, (yr)	t_2, (yr)	Settlement, H_s (ft)
Proposed Waste	3.4	0.018	2022	-	-	-
Existing Waste	15.5	0.015	2000	22	52	0.09
Foundation Soil (Slag)	9.5	0.000	2001	21	51	0.00
Foundation Soil (Sand)	18.5	0.000	2002	20	50	0.00
Foundation Soil (Clay)	16.0	0.010	2003	19	49	0.07

Waste Thickness: 62.9 **Total Secondary Settlement: 0.15**

TOTAL SETTLEMENT
1.61

% of Total Waste Thickness: 2.6%

APPENDIX C

Landfill Slope Stability Analysis

INTRODUCTION

Based on the revised grading plan proposed as part of this letter, ARM has re-evaluated the global slope stability utilizing SLIDE version 7.0 software. In addition to the revised grading plan, the updated stability analysis also incorporates the existing asphalt and geosynthetic capping system within the expansion area. This stability analysis is a revision to the version submitted in April 2020 and is updated to account for the existing asphalt and geosynthetic cap in the area of the proposed expansion, as well as the proposed supplemental cap to be installed above the existing capping system, as discussed in the letter. The following analysis describes the methodology and process implemented in this analysis, followed by a discussion of the results along with recommendations.

REFERENCES

1. SLIDE Software, Version 7.0, Rocscience Inc., 2019.
2. Stark, T.D.; *Session II: Slope Stability Analysis*, 2018.
3. Excerpt from Appendix 3B of the "Current Conditions Report" related to the existing asphalt cap in the Northeast Corner of the Greys Landfill.
4. Mattos, Nunez, et. al., *Shear Strength of Hot-Mix Asphalt and its Relation to Near-Surface Placement Failure*.

METHODOLOGY

Limit equilibrium analyses were conducted to assess the slope stability of the proposed supplemental capping system with respect to a sliding block failure along the geosynthetic system. Slope stability was evaluated using the computer program SLIDE 7.0. Two separate analyses were performed for each scenario: (i) static analysis and (ii) externally loaded analysis (i.e., seismic and vibratory loading). For all analyses, translational failure surfaces were evaluated with the Morgenstern-Price/GLE solution method.

For the static analyses, two scenarios were completed to evaluate stability. For the first scenario, a combination of peak and large displacement (LD) shear strength parameters were used to model the capping system. Peak shear strengths were applied to any areas of the liner system with a slope of 15% or less. Large displacement shear strengths were applied to all other areas, with slopes greater than 15%. Note that all of the existing and proposed geosynthetic surfaces are less than 15%, so all geosynthetic layers for scenario use peak strength properties. Acceptable factors of safety for this analysis were 1.6.

The second scenario utilized the large-displacement shear strength for the capping system throughout the entirety of the section regardless of the slope. The large-displacement analysis is intended to represent and model a "worst-case" condition. The acceptable factor of safety for the large-displacement analysis is 1.1. Both static stability scenarios need to be satisfied with regard to factor of safety for the section to be considered stable.

Pseudo-static analyses were also completed for vibratory and seismic stability scenarios. The large-displacement shear strength scenario described above was used to model the capping system for these analyses and the relevant external loading coefficient for the section, as identified in previous versions of this stability analyses, was applied to the models. Note that the seismic load was applied in the horizontal plane, while the vibratory load was applied vertically (down). If the resulting factor of safety was less than 1.0, then the yield acceleration would be determined for the purposes of completing a permanent deformation analysis; however, none of the seismic analyses resulted in a factor of safety less than 1.0; therefore, deformation analyses were not required.

In addition to testing for failure along the capping system, global stability (waste mass and foundation soils) was also evaluated. Global stability through the foundational soils was also included since the landfill bears on existing slag layers and coastal sand and clay deposits. Each critical section was tested for circular and sliding block failures through the waste mass. Both circular and sliding block failures were evaluated with the Morgenstern-Price/GLE solution method. An acceptable factor of safety for global stability analysis was considered to be 1.6 or greater for the peak/LD scenario, 1.1 or greater for the all LD scenario, and 1.0 or greater for the seismic scenario.

Material Parameters

All of the material properties discussed in previous versions of this slope stability analysis were used as part of this iteration. In addition to these material properties, additional materials were included in this analysis, including the existing and proposed geosynthetic capping systems, the existing asphalt cap, and a compacted sand layer. The existing and proposed supplemental geosynthetic capping systems are assumed to have a unit weight of 120 pcf and include the following components, from top to bottom:

- 2-foot compacted sand layer (note that this layer may be a waste layer as long as the material within the 6 inches adjacent to the geotextile has no particles with diameter greater than 1-inch, as measured in any direction)
- Non-woven geotextile
- HDPE MicroDrain Geomembrane (drainage stud side facing up, towards the geotextile)
- 2-foot compacted sand layer

The shear strength of the geosynthetic cap layers were modelled using a normal-shear curve, based on actual testing data for materials similar to those used or proposed for use at the site; the peak and large displacement normal-shear curves are provided in Table 1 below.

Table 1 – Geosynthetic Cap Normal-Shear Strength Curve

Normal Stress (psf)	Peak Shear Strength (psf)	Large Displacement Shear Strength (psf)
150	94	82
725	372	312
1300	664	588
2500	1405	1330
4500	2495	2260

The existing asphalt cap in the proposed expansion area is understood to be a 3-inch thick layer of hot-mixed asphalt based on *Reference 3*. Based on the conclusions outlined in *Reference 4*, the asphalt cap was modelled using a Mohr-Coulomb strength curve with an internal friction angle (*phi*, φ) of 40 degrees and a conservative cohesion intercept of 100 psf; the unit weight was assumed to be 120 pcf.

The compacted sand layer was used to approximate the layer of soil between the asphalt and existing geosynthetic cap, as well as the structural fill material between the existing cap and the proposed supplemental cap. This layer was assumed to have a unit weight of 120 pcf and was modelled using a Mohr-Coulomb strength curve with cohesion of zero and friction angle of 32 degrees.

Section Analyzed

Factors considered when selecting the cross-section include length of subgrade slope, steepness of subgrade slope, degree of buttress at the toe of slope (passive force), height of waste (driving force), etc. Since this analysis is an update to a previously submitted version in order to account for the proposed modifications, only one of the existing cross sections required update (i.e., Section 4). This cross-section cuts through the existing capping system and runs perpendicular to the perimeter slopes such that it presents a worst-case scenario for stability. The location of the cross-section analyzed is shown on the drawing provided as an Attachment following the narrative of this slope stability analysis.

RESULTS

The minimum factors of safety obtained from the stability analyses are summarized below. Model output files for the static and seismic analyses are provided following the narrative of this analysis. A discussion of the results is provided in the following section.

Table 2 - Factor of Safety for Slope Stability Summary Table

Section	Slope Failure Method	Minimum Factor of Safety	Calculated Factor of Safety
Section 4	Global Stability – Circular Static	1.6	2.271
	Global Stability – Circular Seismic	1.0	1.762
	Global Stability – Circular Vibratory	1.0	2.215
	Global Stability – Translational Static	1.6	1.644
	Global Stability – Translational Seismic	1.0	1.405
	Global Stability – Translational Vibratory	1.0	1.643
	Proposed Cap – Translational (Peak/LD)	1.6	1.638
	Proposed Cap – Translational (All LD)	1.1	1.557
	Proposed Cap – Translational Seismic (All LD)	1.0	1.315
	Proposed Cap – Translational Vibratory (All LD)	1.0	1.556
	Existing Cap – Translational (Peak/LD)	1.6	1.638
	Existing Cap – Translational (All LD)	1.1	1.557
	Existing Cap – Translational Seismic (All LD)	1.0	1.316
	Existing Cap – Translational Vibratory (All LD)	1.0	1.556

As shown in the table above, all of the scenarios analyzed returned a factor of safety greater than the minimum required, indicating that the proposed expansion and the supplemental cap system, will remain stable under the conditions analyzed herein.

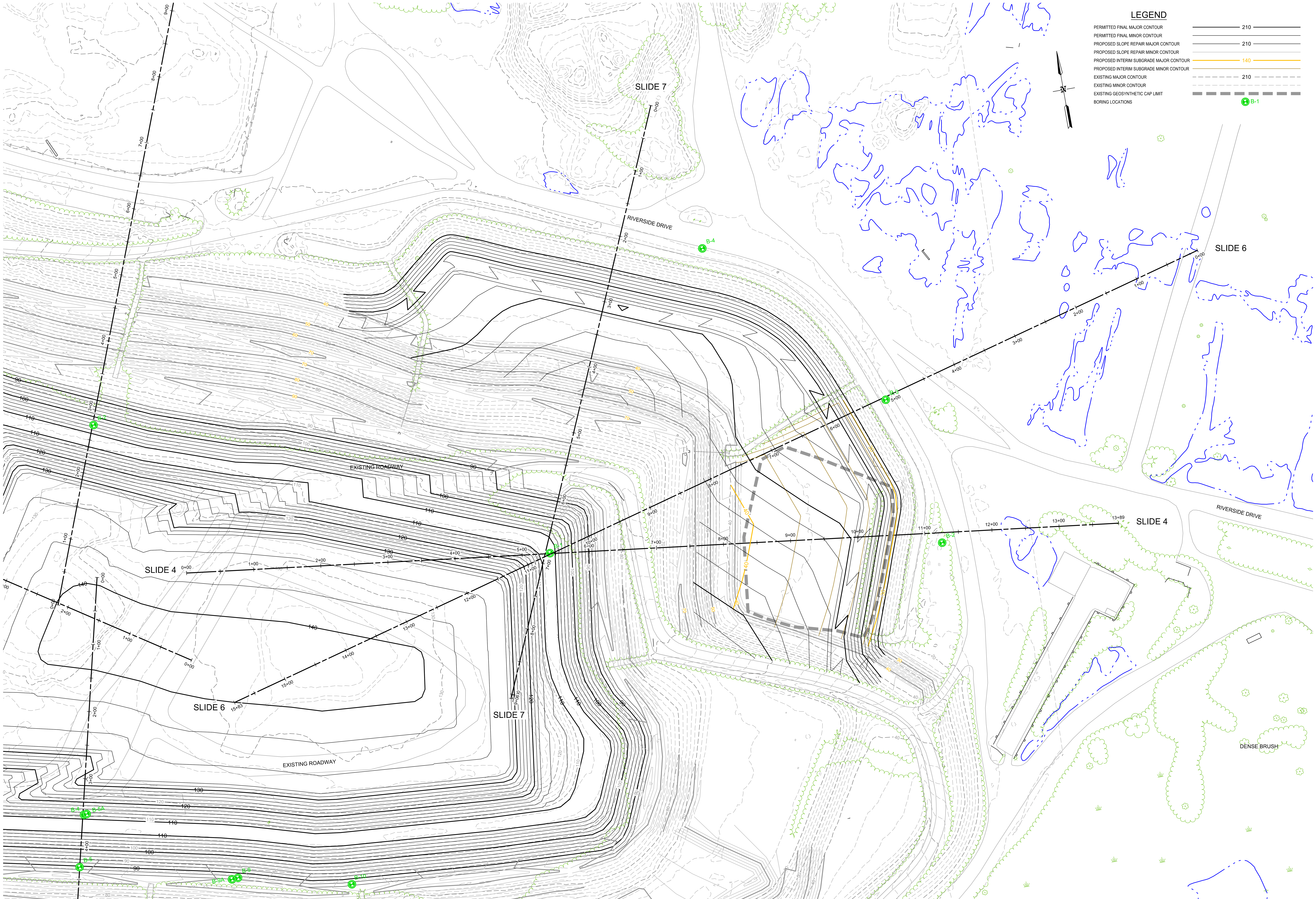
LIMITATIONS AND ASSUMPTIONS

ARM has conducted stability analyses of the existing landfill configuration and has attempted to model the most critical conditions based upon our understanding of past and present operational procedures and sequencing. The strength characteristics of the waste, which represent a critical parameter when conducting analyses, are estimated based on credible references and engineering judgment, and the slope stability modeling does not vary waste strength characteristics throughout the life of the landfill, nor does it represent differing operational and waste acceptance scenarios that may impact the waste strength characteristics, which are solely in the Owner's control. Waste acceptance and placement protocols have a significant influence on waste strength and the corresponding stability of the landfill, both in interim grading and final grading configurations. Low-strength wastes, such as bio-solids, sludges, wet drill cuttings, and the like, can significantly and detrimentally impact the stability of the landfill, whether placed in isolated areas or mixed with other municipal and residual wastes.

Prior to acceptance and disposal, the Owner should develop a waste acceptance and placement plan that considers slope stability, among other factors, and includes directives for solidification of wet and low-strength wastes to meet minimum strength requirements cited in the stability analyses.

The stability analyses completed by ARM also take into account strength parameters of other materials used for the construction of the landfill. These include, but may not be limited to, the strength parameters of subgrade and subbase soils; and critical interface strength parameters of the liner or cap system components. This expansion includes the placement of waste over an existing landfill. ARM has modeled these systems using the information available, credible references, and engineering judgment.

SLOPE STABILITY SECTION LOCATION MAP



This drawing, its contents, and each component of this drawing are the property of and proprietary to ARM Group LLC and shall not be reproduced or used in any manner except for the purpose identified on the Title Block, and only by or on behalf of this client for the identified project unless otherwise authorized by the express, written consent of ARM Group LLC

ARM Group LLC
Engineers and Scientists
www.armgroup.net

No.	Revision	Date	By
0	ISSUED FOR REVIEW	00/00/0000	ARM

designed	RJC	scale	1" = 100'
checked	DNF	date	06/05/2020
drawn	RJC	project no.	20010112
graphic scale	0 100 200 300 SCALE IN FEET 60 120 180		

drawing title

SLOPE STABILITY ANALYSIS SECTION LOCATION PLAN

project title

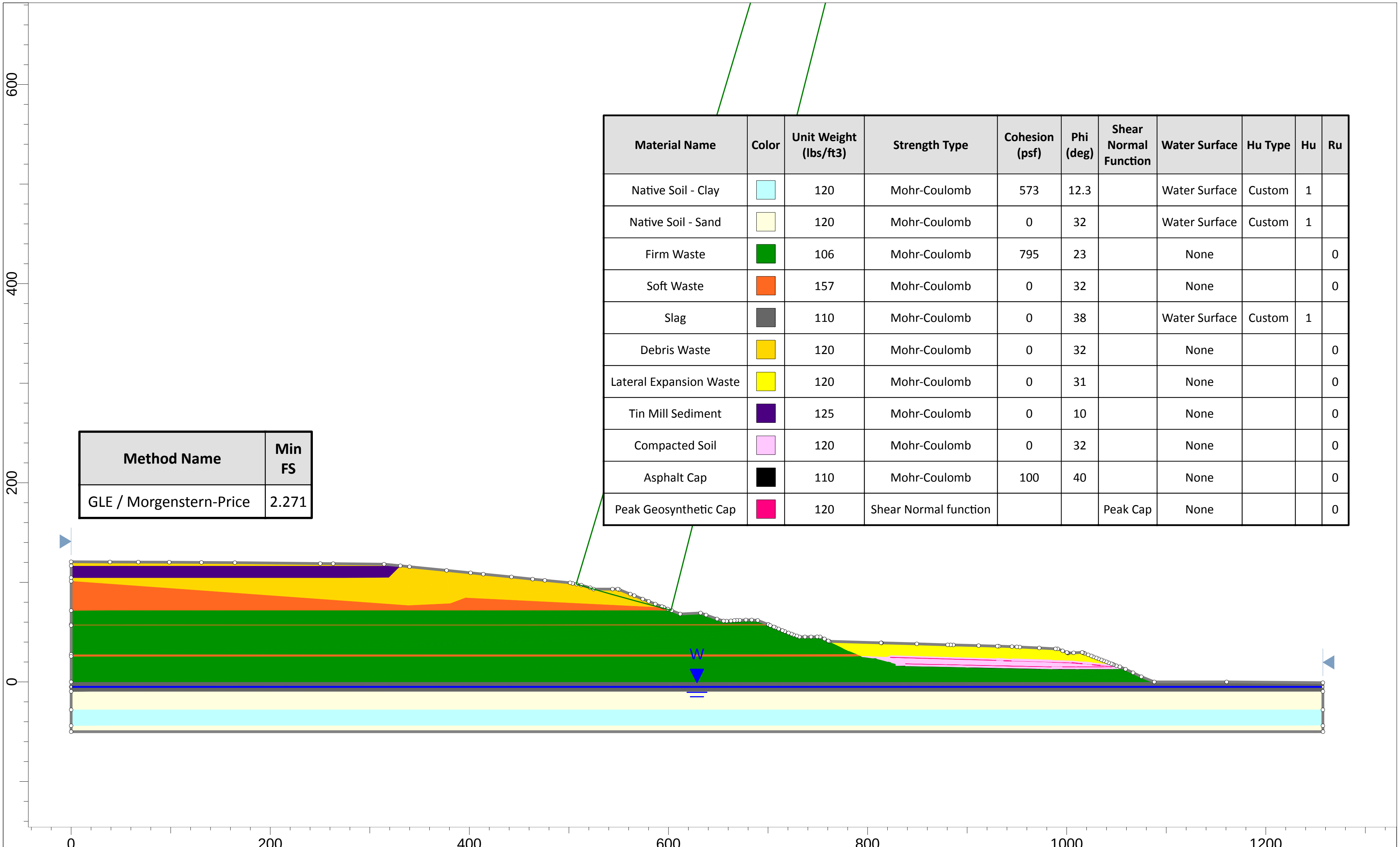
ENVIROANALYTICS GROUP
GREY'S LANDFILL CAPACITY ANALYSIS
JANUARY 2020

SPARROWS POINT
BALTIMORE COUNTY, MARYLAND

Sheet
1

P:\EnviroAnalytics Group\170409 Greys LF Closure Plan\Drwg\Production\180215H_Greys Landfill Slope Stability Section Plan.dwg Plotted: June 8, 2020

Section 4



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface	Hu Type	Hu	Ru
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		Water Surface	Custom	1	
Native Soil - Sand		120	Mohr-Coulomb	0	32		Water Surface	Custom	1	
Firm Waste		106	Mohr-Coulomb	795	23		None			0
Soft Waste		157	Mohr-Coulomb	0	32		None			0
Slag		110	Mohr-Coulomb	0	38		Water Surface	Custom	1	
Debris Waste		120	Mohr-Coulomb	0	32		None			0
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None			0
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None			0
Compacted Soil		120	Mohr-Coulomb	0	32		None			0
Asphalt Cap		110	Mohr-Coulomb	100	40		None			0
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None			0

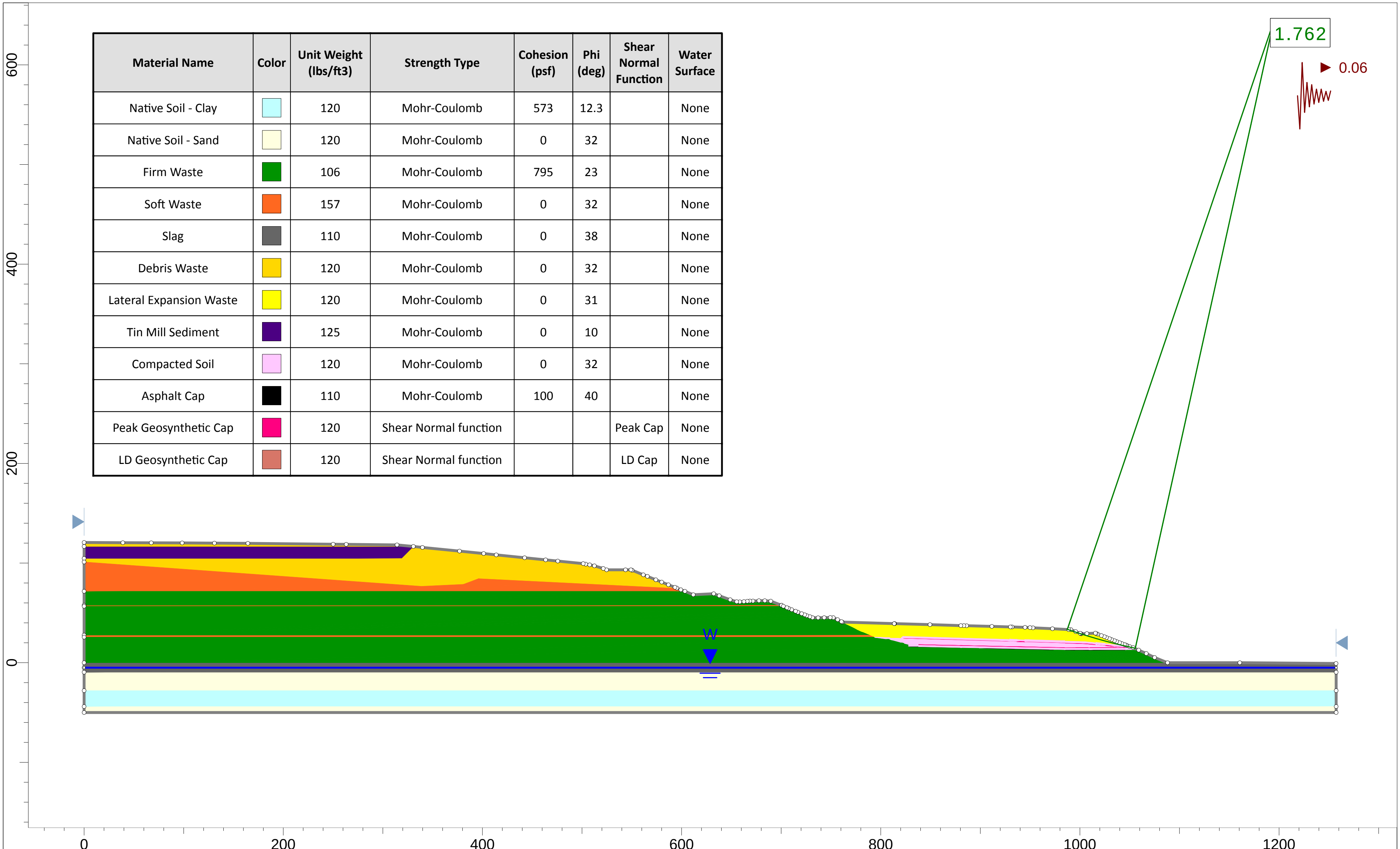
Method Name	Min FS
GLE / Morgenstern-Price	2.271

Project	Greys LF Expansion		
Analysis Description	Section 4 - Circular		
Drawn By	WJP	*Scale*	1:1600
Company	ARM Group		
Date	07/17/2020	*File Name*	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

ARM Group LLC

SLIDEINTERPRET 7.038

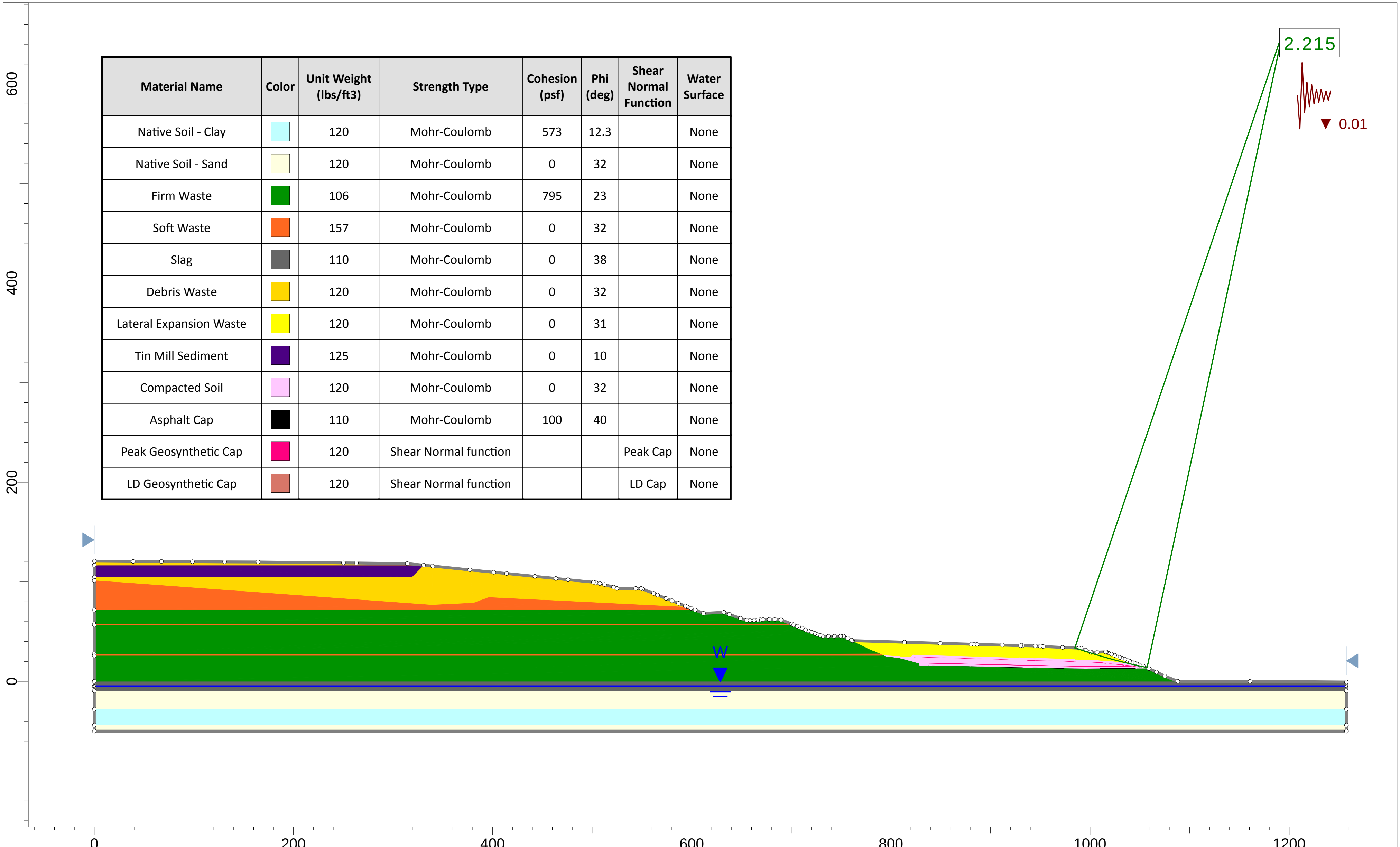
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None



Project	Greys LF Expansion		
Analysis Description	Section 4 - Circular Seismic		
Drawn By	WJP	Scale	1:1600
Company	ARM Group		
Date	07/17/2020	File Name	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

ARM Group LLC

SLIDEINTERPRET 7.038



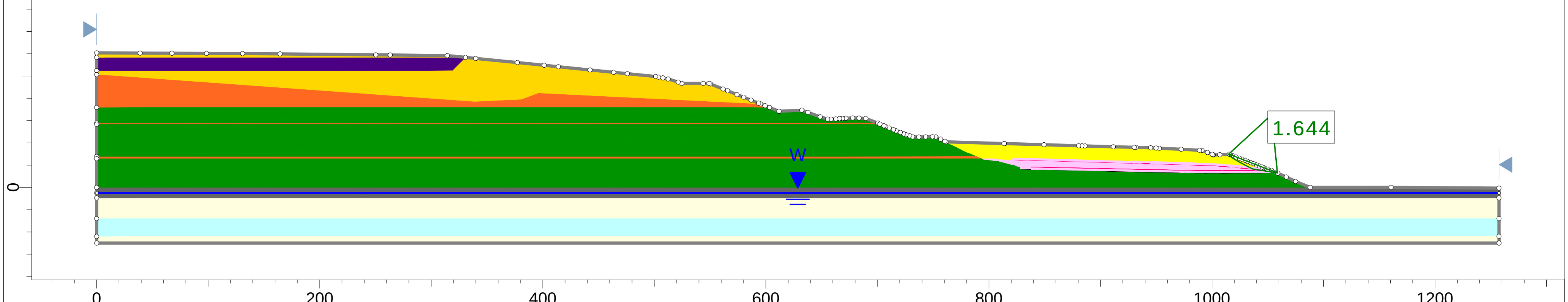
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

Project	Greys LF Expansion		
Analysis Description	Section 4 - Circular Vibratory		
Drawn By WJP	*Scale* 1:1600	*Company*	ARM Group
Date 07/17/2020		*File Name*	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

SLIDEINTERPRET 7.038

ARM Group LLC

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

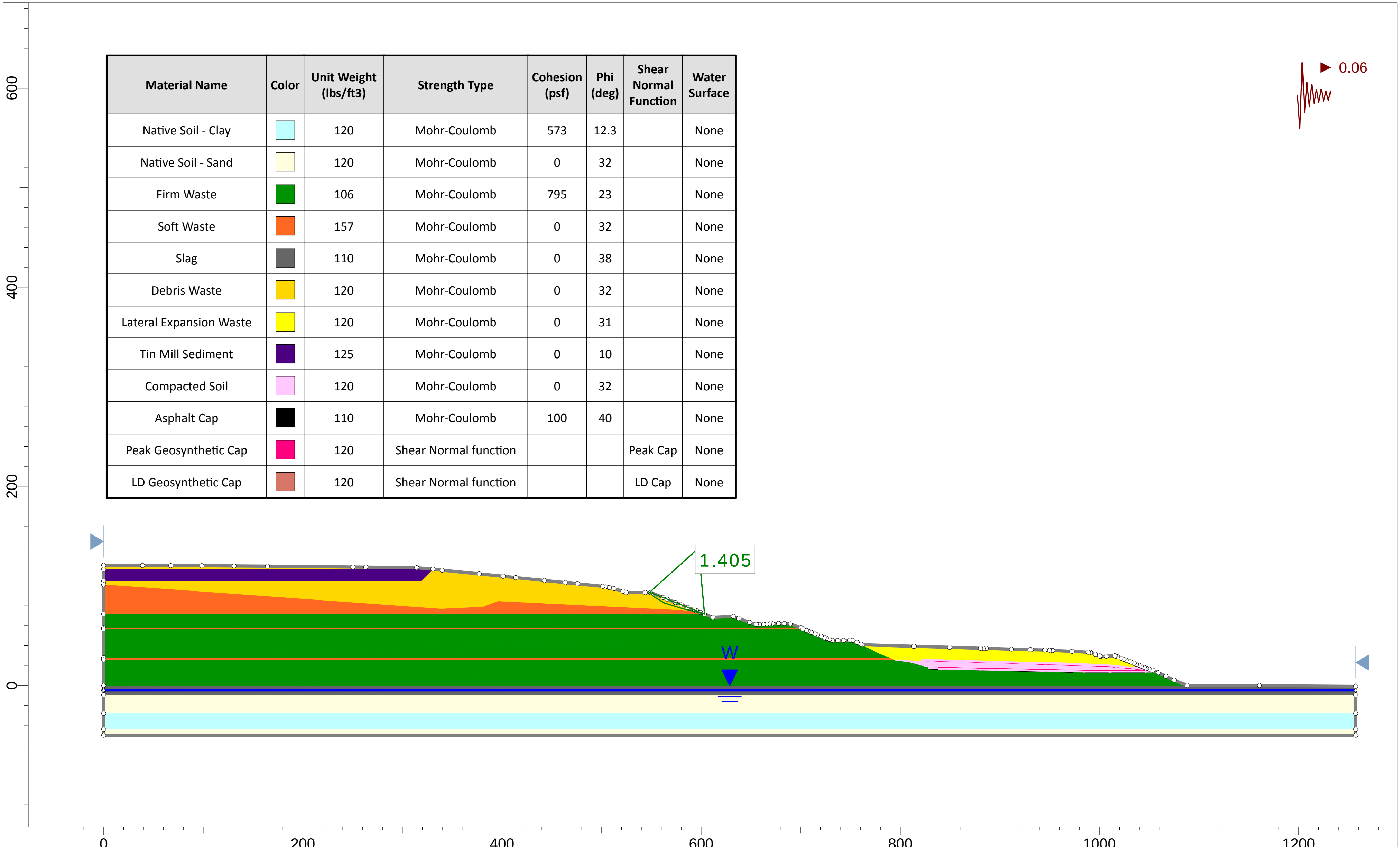


Project	Greys LF Expansion		
Analysis Description	Translational		
Drawn By WJP	*Scale* 1:1600	*Company*	ARM Group
Date 07/17/2020		*File Name*	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

ARM Group LLC

SLIDEINTERPRET 7.038

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

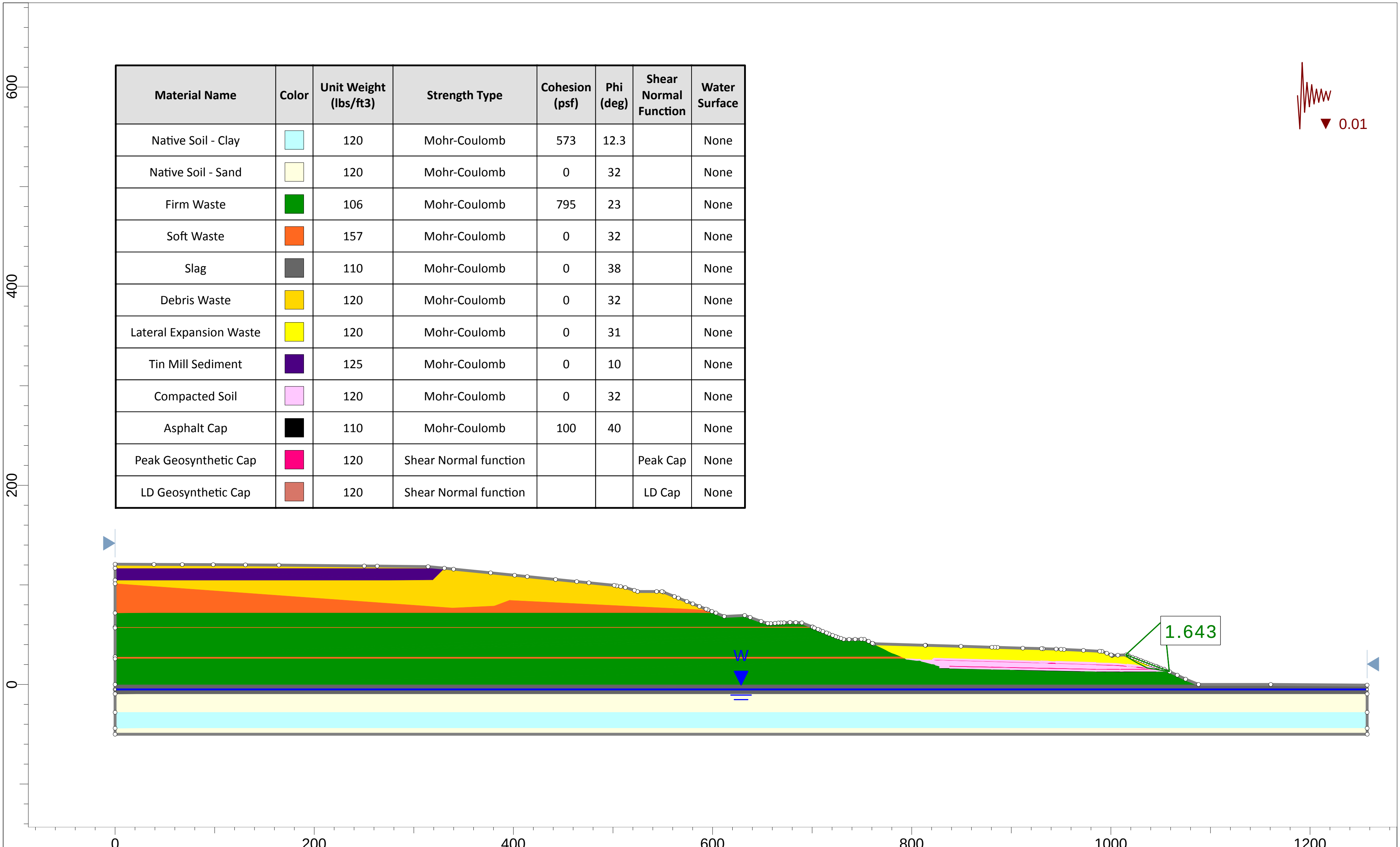


Project	Greys LF Expansion		
Analysis Description	Section 4 - Translational Seismic		
Drawn By WJP	*Scale* 1:1600	*Company* ARM Group	
Date 07/17/2020		*File Name* Grey LF Section 4 June 2020 REV_July 2020_VK.slmd	

ARM Group LLC

SLIDEINTERPRET 7.038

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

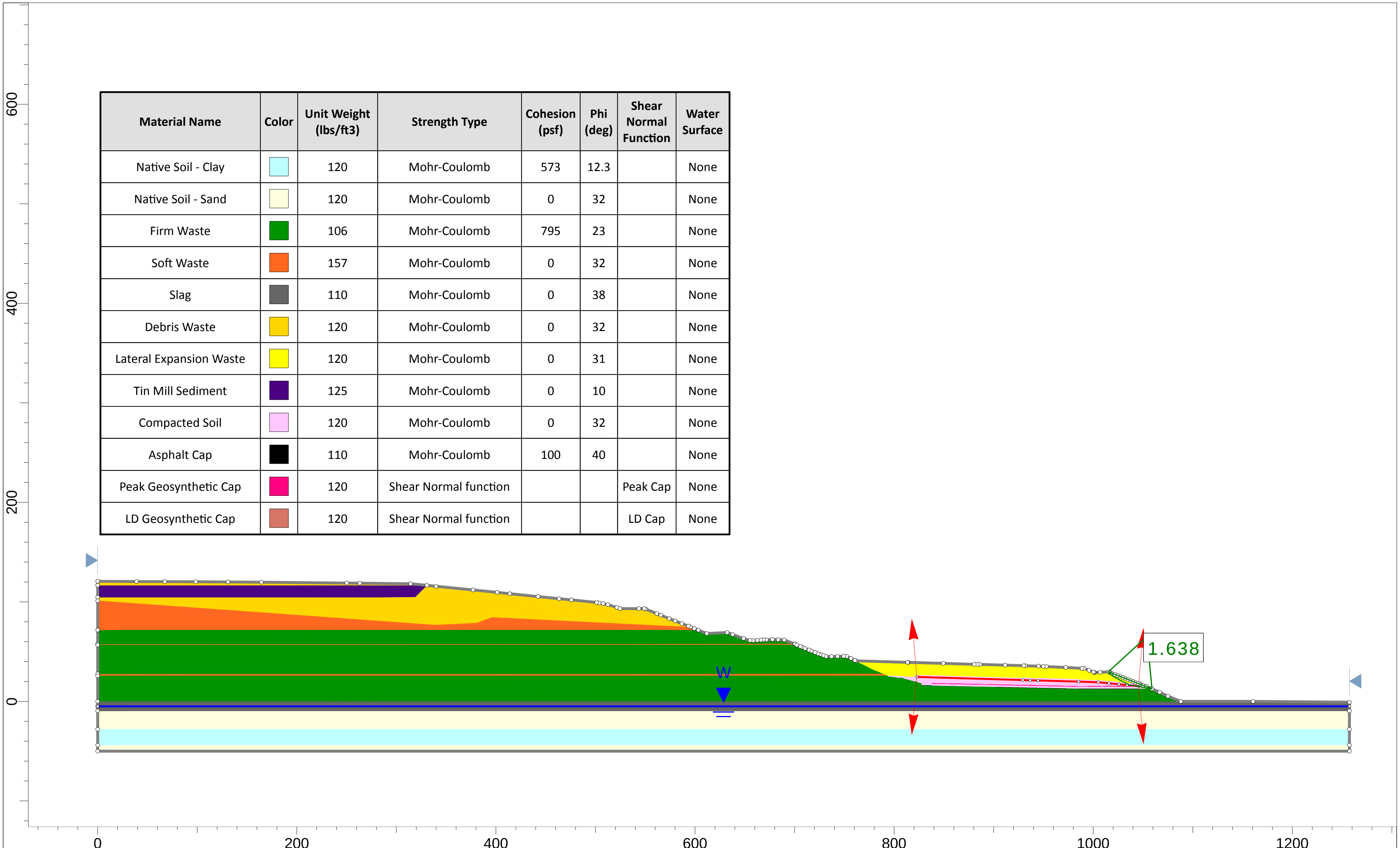


SLIDEINTERPRET 7.038

ARM Group LLC

Project	Greys LF Expansion		
Analysis Description	Section 4 - Translational		
Drawn By WJP	*Scale* 1:1600	*Company* ARM Group	
Date 07/17/2020		*File Name* Grey LF Section 4 June 2020 REV_July 2020_VK.slmd	

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

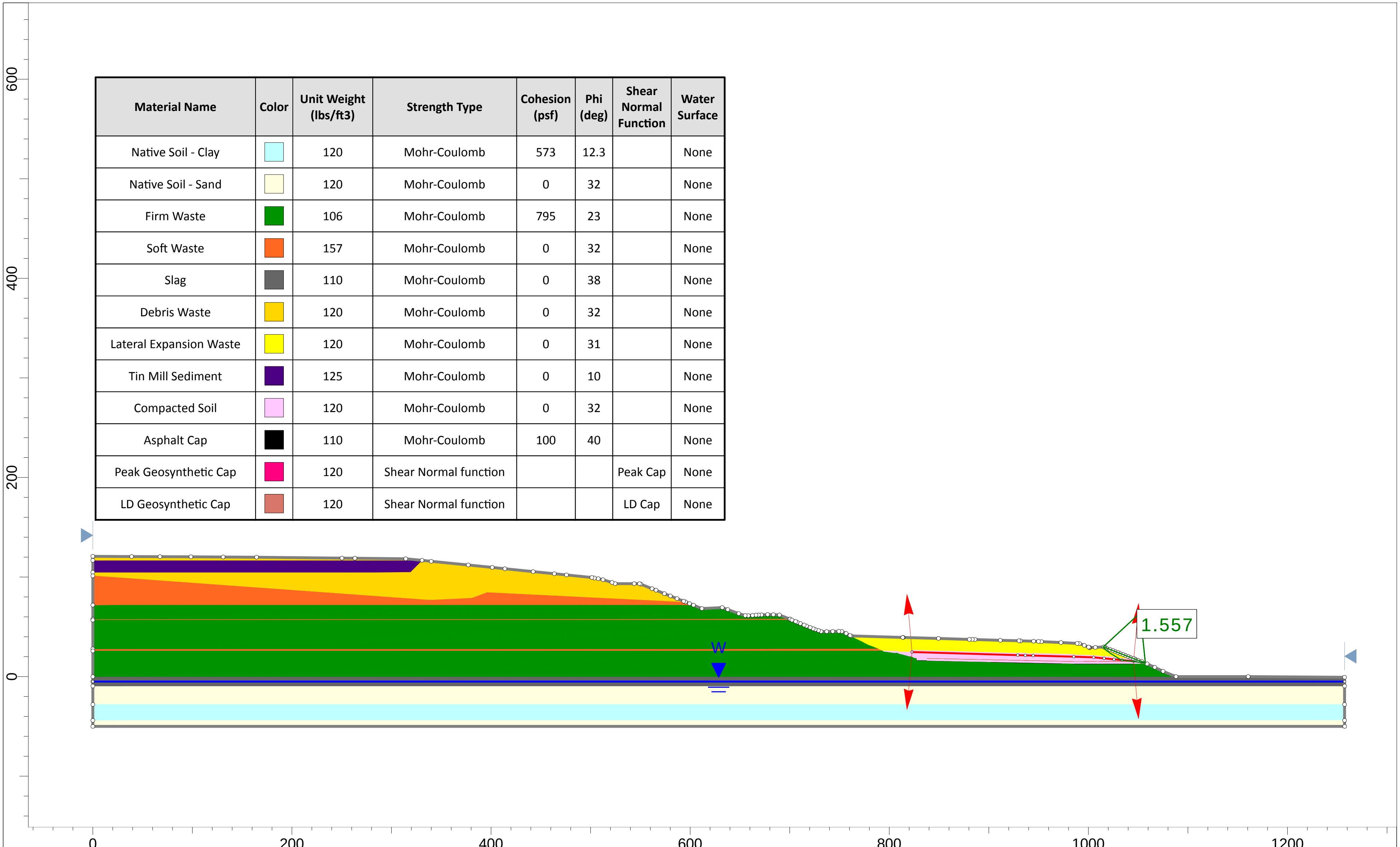


Project	Greys LF Expansion
Analysis Description	Translational - Proposed Cap (Peak/LD)
Drawn By WJP	*Scale* 1:1600
Company	ARM Group
Date	07/17/2020
File Name	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

SLIDEINTERPRET 7.038

ARM Group LLC

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

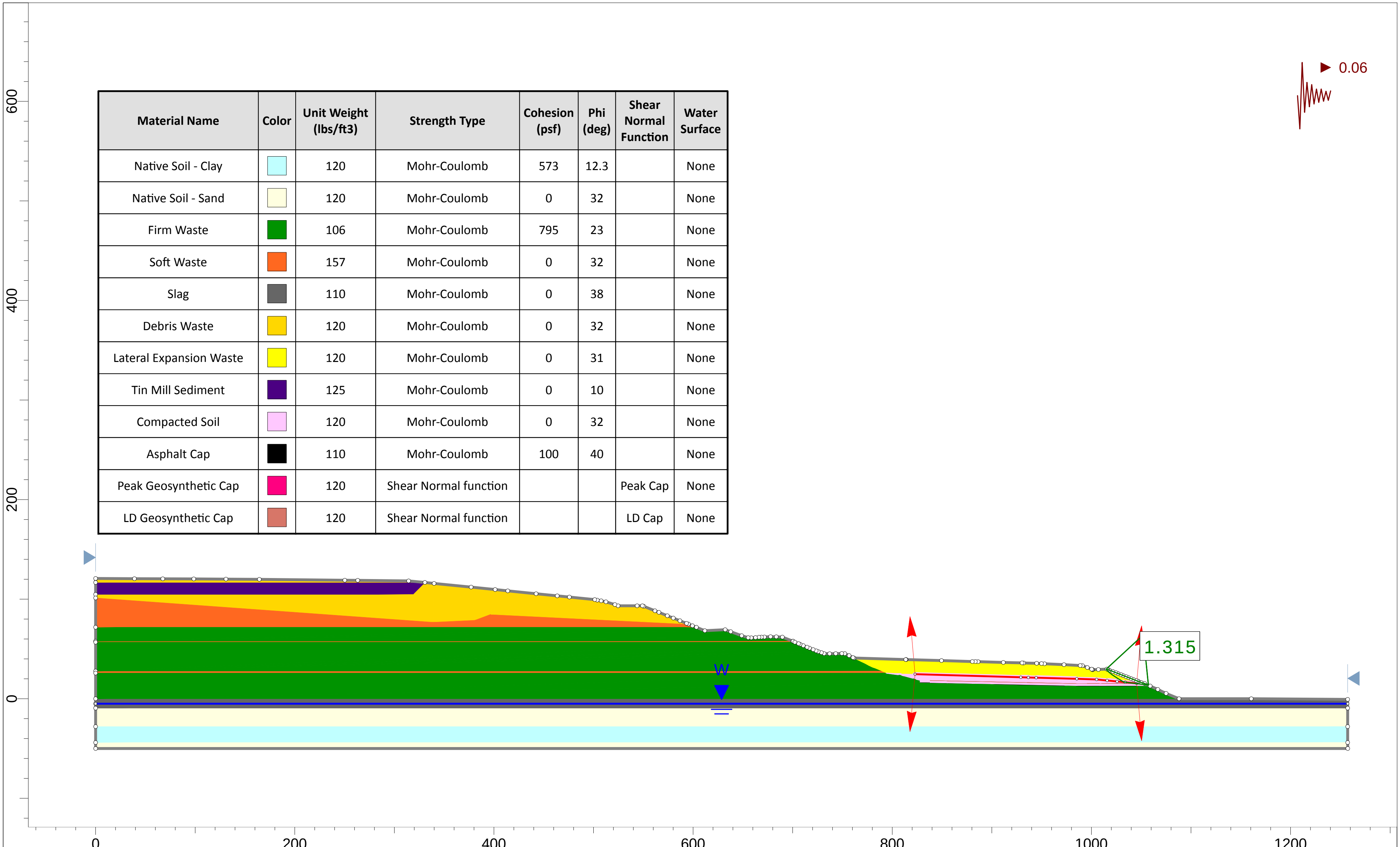


Project	Greys LF Expansion		
Analysis Description	Translational - Proposed Cap (All LD)		
Drawn By WJP	*Scale* 1:1600	*Company*	ARM Group
Date 07/17/2020		*File Name*	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

ARM Group LLC

SLIDEINTERPRET 7.038

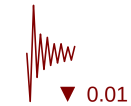
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None



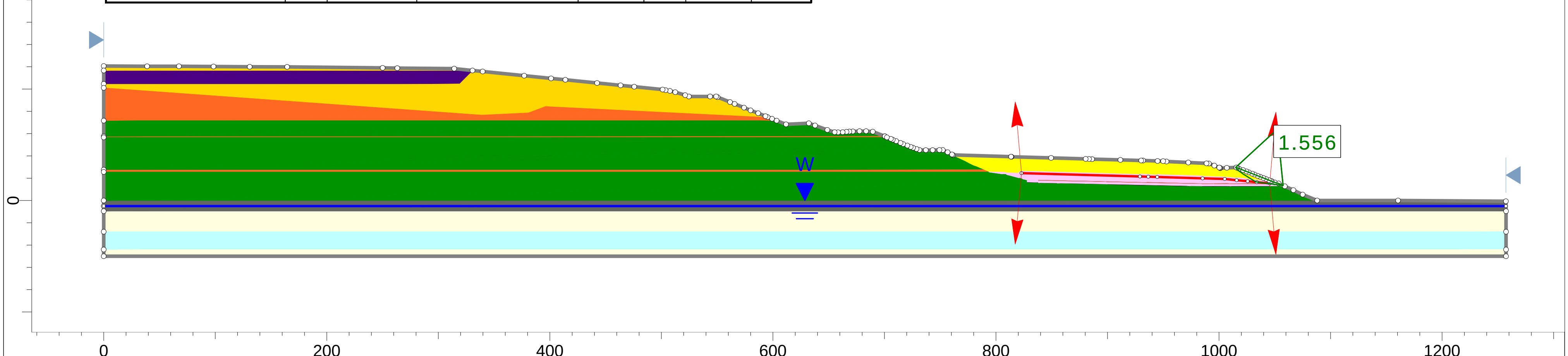
Project	Greys LF Expansion		
Analysis Description	Translational - Proposed Cap (All LD, Seismic)		
Drawn By WJP	*Scale* 1:1600	*Company*	ARM Group
Date	07/17/2020	*File Name*	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

ARM Group LLC

SLIDEINTERPRET 7.038

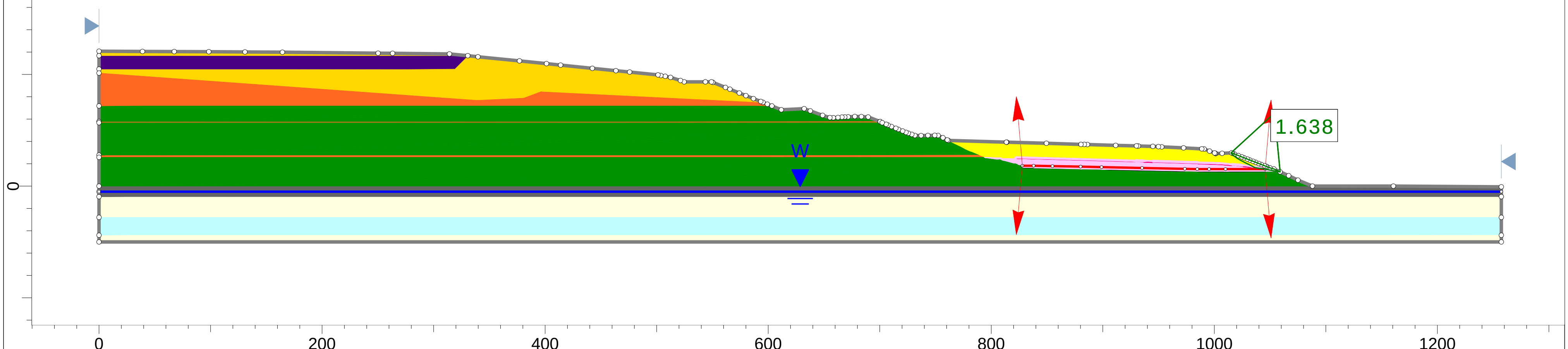


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None



SLIDEINTERPRET 7.038 ARM Group LLC	*Project* Greys LF Expansion		
	Analysis Description Translational - Proposed Cap (All LD, Vibratory)		
	Drawn By WJP	*Scale* 1:1600	*Company* ARM Group
	Date 07/17/2020		*File Name* Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

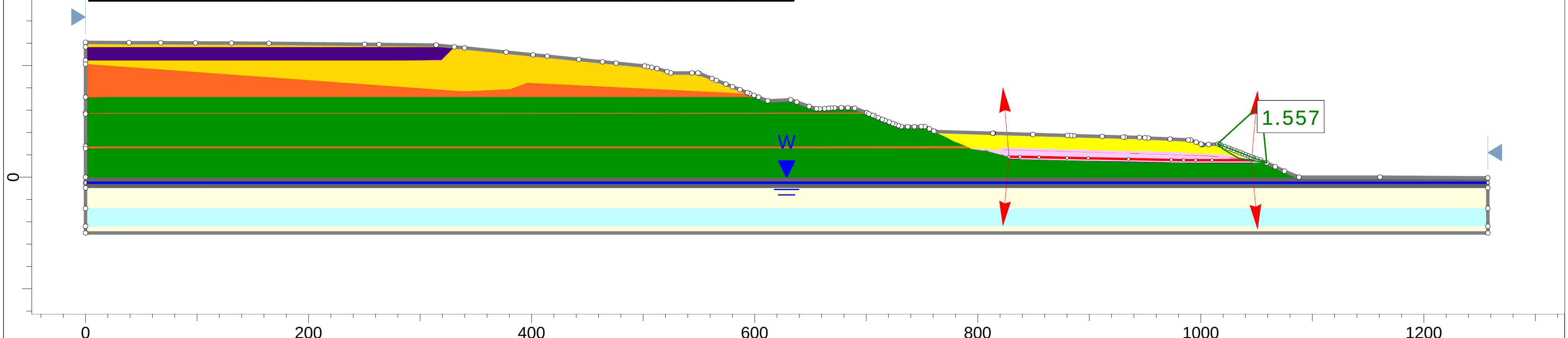


SLIDEINTERPRET 7.038

ARM Group LLC

Project	Greys LF Expansion
Analysis Description	Translational - Existing Cap (Peak/LD)
Drawn By	WJP
Scale	1:1600
Company	ARM Group
Date	07/17/2020
File Name	Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

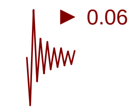


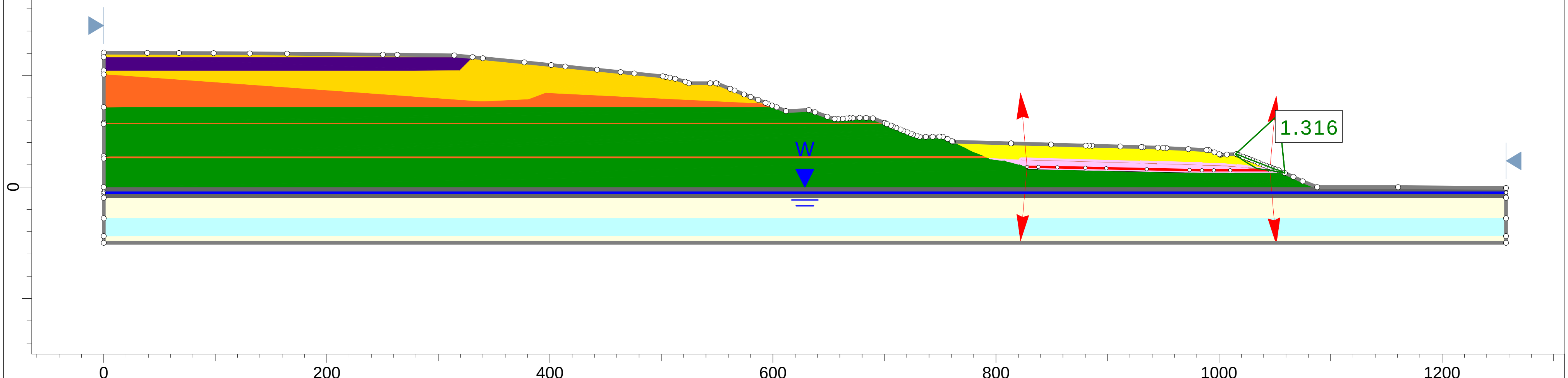
Project	Greys LF Expansion		
Analysis Description	Translational - Existing Cap (All LD)		
Drawn By WJP	*Scale* 1:1600	*Company* ARM Group	
Date 07/17/2020		*File Name* Grey LF Section 4 June 2020 REV_July 2020_VK.slmd	

SLIDEINTERPRET 7.038

ARM Group LLC

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None

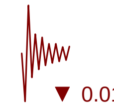




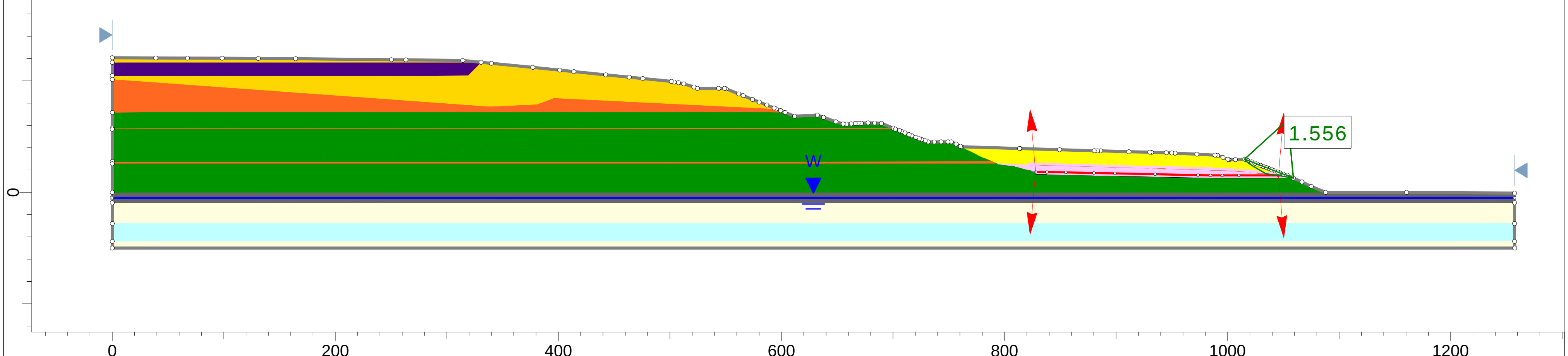
Project	Greys LF Expansion
Analysis Description	Translational - Existing Cap (All LD, Seismic)
Drawn By WJP	*Scale* 1:1600
Company	ARM Group
Date 07/17/2020	*File Name* Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

ARM Group LLC

SLIDEINTERPRET 7.038



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
Native Soil - Clay		120	Mohr-Coulomb	573	12.3		None
Native Soil - Sand		120	Mohr-Coulomb	0	32		None
Firm Waste		106	Mohr-Coulomb	795	23		None
Soft Waste		157	Mohr-Coulomb	0	32		None
Slag		110	Mohr-Coulomb	0	38		None
Debris Waste		120	Mohr-Coulomb	0	32		None
Lateral Expansion Waste		120	Mohr-Coulomb	0	31		None
Tin Mill Sediment		125	Mohr-Coulomb	0	10		None
Compacted Soil		120	Mohr-Coulomb	0	32		None
Asphalt Cap		110	Mohr-Coulomb	100	40		None
Peak Geosynthetic Cap		120	Shear Normal function			Peak Cap	None
LD Geosynthetic Cap		120	Shear Normal function			LD Cap	None



Project	Greys LF Expansion
Analysis Description	Translational - Existing Cap (All LD, Vibratory)
Drawn By WJP	*Scale* 1:1600
Company	ARM Group
Date 07/17/2020	*File Name* Grey LF Section 4 June 2020 REV_July 2020_VK.slmd

ARM Group LLC

SLIDEINTERPRET 7.038