MUNICIPAL SOLID WASTE PERMIT
MAJOR AMENDMENT

PART III-ATTACHMENT D5
GEOTECHNICAL DESIGN

NAME OF PROJECT: Beck Landfill

MSW PERMIT APPLICATION NO.: 1848A

OWNER: Nido, LTD (CN603075011)

OPERATOR: Beck Landfill (RN102310968)

CITY, COUNTY: Schertz, Guadalupe County

Major Amendment: Revised March 2023

Prepared by:

Civil & Environmental Consultants, Inc.

Texas Registration Number F-38
3711 S MoPac Expressway
Building 1 Suite 550,
Austin, Texas 78746
(512) 329-0006

Contents

INTRODUCTION i
1 GEOTECHNICAL TESTING 2
2 SUBSURFACE MATERIALS 2
2.1 Material Properties 4
2.2 Material Requirements 4
3 EARTHWORK 5
3.1 Excavation 5
3.2 General Fill 5
4 CONSTRUCTION BELOW THE GROUNDWATER TABLE 5
5 SETTLEMENT ANALYSIS 5
5.1 Subgrade Heave 5
5.2 Subgrade Settlement 6
5.3 Solid Waste Settlement 6
6 SLOPE STABILITY ANALYSIS 6
7 LINER CONSTRUCTION 8
8 COVER CONSTRUCTION 8
8.1 Operational Cover 8
8.2 Final Cover 9
8.3 Final Cover Testing and Documentation 9

List of Appendices

Appendix D5-A
Settlement Analysis

Appendix D5-B
Slope Stability Analyses

Appendix D5-C - Previous Geotechnical Reports
Geotechnical Investigation (Attachment 11) prepared by Snowden , Inc. (1985)
Geotechnical Data Report prepared by Terracon Consultants, Inc. (2020)

INTRODUCTION

This Geotechnical Design Report present the results of the geotechnical engineering analysis performed in connection with the Permit Amendment Application for vertical expansion for the Beck Landfill located in Guadalupe County, Texas. The entire footprint of the landfill has been excavated and is currently partially filled with waste. The Beck Landfill is a Type IV landfill that accepts construction and demolition debris and is owned and operated by NIDO, Ltd. and is regulated by Texas Commission on Environmental Quality (TCEQ) under MSW Permit No. 1848.

The geotechnical characteristics of the site are summarized herein and are based on the information from previous geotechnical investigations of the site performed by Snowden, Inc. (Last Revised 1985) and Terracon (October, 2020).

Engineering analyses performed as part of this Geotechnical Design Report include the following:

- an analysis for settlement;
- stability of final filled landfill.

These calculations, along with the geotechnical properties of the subsurface described in Section 2 of this report, demonstrate that the soils at the site location are suitable for the intended landfill construction purposes. Descriptions of the engineering properties of the subsurface and the analyses performed are presented in the following sections. Calculations performed as part of the engineering evaluation are included in the attached appendices of this report and are summarized in the following sections.

This report supplements other reports and analyses included in the Permit Amendment Application. The analyses in this report are intended to address specific requirements of the Texas Commission on Environmental Quality (TCEQ) as they relate to municipal solid waste landfills. This report is intended to be considered as an integral part of the Permit Amendment Application.

1. GEOTECHNICAL TESTING

This Geotechnical Design Report is based on the field explorations described in Attachment E — Geology Report. All laboratory testing procedures followed the commonly accepted ASTM testing standards, as follows:

- Tests to determine Atterberg limits were performed in accordance with ASTM D 4318,
- Gradation testing and percent passing the number 200 sieve tests were performed in accordance with ASTM C 136 and ASTM D1140, respectively.
- Tests to determine moisture content were performed in accordance with ASTM D 2216.
- Permeability tests using tap water as the permeant were performed in accordance with ASTM D 5084.

These test results were used to classify the soils according to the Unified Soil Classification System (USCS) and to evaluate the engineering properties of the soils.

2. SUBSURFACE MATERIALS

The stratigraphy beneath the proposed Beck Landfill was characterized using information from the site exploration for the site and is presented in Attachment E — Geology Report.

Two strata have been identified by the current and previous subsurface explorations of the site and are described as follows:

- Unit I is composed primarily of alluvial silty clays, sands, and gravels deposited by Cibolo Creek encountered from the surface to a depth of up to 25 feet below ground surface (bgs).
- Unit II is composed primarily of low permeability clays and shales. Unit II is part of the Navarro Formation.

Table D5-1

Beck Landfill

Generalized Site Stratigraphy

Geologic Unit	Lithology	Average Depth to Top of Unit (ft)
Unit I	Silty Clay, Sand, and Gravel	Surface
Unit II	Clay and Shale	10-25

The Beck Landfill is wholly situated within the fluviatile terrace deposits (Qt) of the Pleistocene. This rock unit is comprised of gravel, sand, silt, and clay; adjacent to the Edwards Plateau, predominantly gravel, limestone, and chert; southeastward in vicinity of Tertiary rocks, increasing in amounts of sand, silt, and clay; contiguous terraces are separated by a solid line. The clay and shale of the Navarro and Taylor formations underlie the alluvial materials. The stratigraphy is variable within the Alluvial Deposit and somewhat variable in the Navarro and Taylor Deposits due to historic erosion of Cibolo Creek.

The Navarro Shale was shown by the laboratory portion of the previous investigations to be relatively impermeable. The Navarro Group, consisting of the upper Kemp Formation and the lower Corsicana Formation, represent the youngest of the Cretaceous age deposits in the central Texas vicinity. Generally, the Navarro deposit could be described as a gray calcareous clay shale. At least two beds of the Navarro, are indicated by geologic sources, to contain limey sandstones and concretionary siltstones. Neither of these beds were encountered by the exploratory borings. The uppermost portion of the deposit has weathered to produce an expansive tan-gray clay. The depth of weathering, as indicated by the borings, was somewhat variable beneath this site. This variation is primarily due to the natural joint structure and development of gypsum type deposits within such joints. Areas for greater and/or lesser potential moisture migration are thus expressed within the upper deposits. The determined values of permeability, however indicate all of the Navarro deposit, regardless of the state of weathering, to likely retain low permeabilities. The

total thickness and position of the Navarro Group deposits could not be accurately determined by the exploratory borings performed.

2.1 Material Properties

The laboratory test results are included in Attachment E, - Geology Report. These test results were reviewed along with the boring logs to develop generalized soil properties for use in the analyses. The landfill excavation completely removed the Unit I material and was extended into the unweathered portion of Unit II.

2.2 Material Requirements

On-site soils are intended to be used for the construction of the infiltration layer and erosion layer components of the final cover system. Additionally, on-site soils will be required for operational cover. The bottom liner system utilized in-situ clay soils of Unit II and the entire liner system has been previously constructed.

The compacted final cover infiltration layer must be constructed from soils that can be compacted to form a low hydraulic conductivity barrier. The classification and hydraulic conductivity test results indicate that the clays excavated from the site will be satisfactory for use as compacted soil infiltration layer material. Classification and hydraulic conductivity test results for the compacted final cover infiltration layer will be verified prior to construction in accordance with Attachment D8 — Final Cover Quality Control Plan.

Erosion layer soils will not contain large rocks. Operational cover soils will not have been previously mixed with waste materials and erosion layer material will be capable of sustaining vegetation. The test results and boring logs indicate that any of the soil material excavated from the site will be suitable for use as operational cover and that the surficial soils will be suitable for use as the upper layer of the final cover system erosion layer. Classification results for erosion layer soils will be verified prior to construction in accordance with Attachment D8 — Final Cover

Quality Control Plan.

3 EARTHWORK

3.1 Excavation

All excavation has been completed at the site and all of the landfill cells are partially filled with waste.

3.2 General Fill

General fill will be required to construct access roads and perimeter berms for landfill operations. General fill material shall be placed in accordance with the Liner Quality Control Plan contained in Attachment D7.

4 CONSTRUCTION BELOW THE GROUNDWATER TABLE

All landfill disposal cells have been previously constructed and none of them were excavated below the groundwater table.

5 SETTLEMENT ANALYSIS

5.1 Subgrade Heave

Heave or rebound can occur in cohesive soils after the removal of overburden. Heave occurs relatively soon after excavating the overburden and is directly related to the depth of the excavation. The potential heave in the subgrade beneath the floor of the landfill is expected to be minimal and should be uniform over the landfill floor. As such, any heave that may occur during and soon after excavation should not adversely affect the performance of the in-situ liner system.

5.2 Subgrade Settlement

Settlement may occur due to consolidation of cohesive soils from the weight of the landfill components (i.e., solid waste and operational cover, and final cover systems). However, since the landfill has ben previously excavated and does not have a leachate collection system, the expected minor degree of subgrade settlement will not affect the landfill's performance.

5.3 Solid Waste Settlement

Consolidation and decomposition can produce settlement within the solid waste. Primary consolidation results from stress increase and occurs soon after load application and secondary consolidation results from the decomposition of solid waste. Due to the length of time that it will take to construct and fill the landfill, most of the consolidation in the waste will have occurred prior to construction of the final cover system. Minor settlement that occurs after the construction of the final cover system will be corrected by the addition of erosion layer material in accordance with Attachment I — Post Closure Plan.

6 SLOPE STABILITY ANALYSIS

Slope stability analyses were performed on representative cross-sections of the landfill to predict the stability of the final waste slope and final cover slope. Table D5-2 summarizes the unit weights and strength parameters that were used for the stability analyses. The unit weights and strength parameters for the in-situ soils were selected based on a review of the boring logs and historical laboratory and field test results, as well as prior CEC experience where applicable field data was not present. The unit weights and strength parameters for the liner/cover material and solid waste were selected based on prior CEC experience and laboratory test values. Site specific strength parameters for the liner and cover geosynthetic materials will be verified prior to construction in accordance with Attachment D7 — Liner Quality Control Plan and Attachment D8 — Final Cover Quality Control Plan.

Table D5-2
Beck Landfill
Summary of Material Weight and Strength Properties

Material	Dry Unit Weight (pcf)	Effective Angle of Internal Friction φ' (deg.)	Effective Cohesion, c' (psf)
C&D Waste	60	35	0
Clay Subgrade	108	0	1,400
Shale Subgrade	118	27	0
Compacted Perimeter Berm	123	28	270
In-situ Clay Liner	123	28	270

Slide, a computer program developed to model the slope stability, was used to analyze the stability of the final waste slopes and final cover slopes. The results of the stability analyses indicate that the proposed slopes are stable under the conditions analyzed. Table D5-3 summarizes the results of the stability analyses and compares the calculated factor of safety to the recommended minimum factor of safety. The recommended minimum factors of safety were selected from the Corps of Engineers "Design and construction of Levees" manual (EM 1110-2-1913) or CEC's experience. The slope stability analyses are provided in Appendix D5-B.

The interim, global, and final waste slope stability was analyzed for two failure modes. The circular arc failure analysis was performed using properties of the solid waste, in-situ clay liner and supporting soils.

Table D5-3
Beck Landfill
Summary of Slope Stability Analyses

Cross Section	Failure Type	Minimum Factor of Safety	Allowable Factor of Safety
A	Circular	2.46	1.5
A	Non-Circular	2.34	1.5
B	Circular	2.43	1.5
B	Non-Circular	2.34	1.5
C	Circular	2.30	1.5
C	Non-Circular	2.22	1.5
D	Circular	2.44	1.5
D	Non-Circular	2.37	1.5

The slope stability analyses were performed for 3H:1V excavation and liner slopes, 3H:1V interim waste and 4H:1V final waste slopes. Any changes to the excavation plan, liner system, final cover system, or landfill completion plan will necessitate that the slope stability analyses be revised to reflect the changed conditions. Waste must be placed and properly compacted in horizontal lifts generally less than 20 feet thick. Temporary construction slopes should not be steeper than 3H:1V and concentrated loadings such as heavy equipment and soil stockpiles should not be placed near the crest of slopes unless additional slope stability analyses are performed.

7 LINER CONSTRUCTION

The entire landfill footprint has been excavated and an in-situ liner from the unweathered portion of Unit II was used in all cells.

8 COVER CONSTRUCTION

8.1 Operational Cover

The operational cover should be constructed of soils that are free of waste and debris. Suitable cover soils should be available from on-site sources such as the proposed landfill excavations or

on-site borrows. Requirements for the placement of operational cover are provided in Part IV — Site Operating Plan.

8.2 Final Cover

The final cover for the Beck Landfill has been designed in accordance with 30TAC§330.457(a)(2), since the landfill does not have a synthetic bottom liner system. The final cover consists of a minimum 18-inch re-compacted cohesive soil cover, exhibiting a minimum hydraulic conductivity of 1.0×10^{-5} cm/sec, overlain by a minimum 6-inch erosion layer consisting of earthen material that is capable of sustaining native plant growth.

The final cover plan and details are included in Attachment D3 - Construction Design Details.

The infiltration layer material must consist of relatively homogeneous cohesive materials that are free of debris, rocks greater than 1 inch in diameter, plant materials, frozen materials, foreign objects, and organic material. The infiltration layer should be constructed directly over the intermediate cover once the waste has reached final grades.

The erosion layer should consist of: (1) topsoil stockpiled during the excavation process, (2) on-site soil that has been modified to be capable of sustaining vegetation, or (3) an imported material suitable to sustain vegetation growth. This layer may be spread and placed in one lift over the compacter soil layer. After spreading, the layer may be rolled lightly to reduce future erosion, although not to the extent that compaction would inhibit plant growth.

8.3 Final Cover Testing and Documentation

CQA testing of the final cover system must be performed during construction. Final cover system requirements are outlined in Attachment D8 — Final Cover Quality Control Plan.

Appendix D5-A

Settlement Analysis

CALCULATION BRIEF

BECK LANDFILL
VERTICAL EXPANSION PERMIT APPLICATION
FINAL COVER SETTLEMENT ANALYSIS

OBJECTIVE: Estimate the overall settlement that may occur in existing construction and demolition (C&D) waste at the Beck Landfill. This settlement will occur as new C&D waste is placed on top of the existing waste in accordance with the vertical expansion proposed grading, and also as decomposition of the existing waste occurs. Evaluate if the benches constructed in the final slopes will provide enough post-settlement grade to maintain drainage.

METHODOLOGY: Use the method established by Sowers for calculating both primary and secondary waste settlement.

REFERENCES:

1. Sowers, G. F., "Settlement of Waste Disposal Fills," Proceedings, 8th International Conference on Soil Mechanics and Foundation Engineering, Moscow, 1973.

ANALYSIS:

Overall settlement of existing waste will occur as new waste is placed in accordance with the proposed vertical expansion grades. Settlement of existing waste will occur through both primary and secondary consolidation. Sowers has provided the following methods for estimating both primary and secondary settlement of waste.

Primary Settlement

Primary settlement in waste is similar to primary consolidation in a soil and is due to the compression of the waste by an overlying load. In an effort to be conservative, the primary settlement of the waste mass was calculated using typical municipal solid waste (MSW) waste properties. In actuality, C&D waste is comprised of construction materials, aggregates, and similar materials that are likely to settle less than a comparable MSW waste column. CEC believes the settlements calculated using MSW properties will be greater than actual settlments from C&D waste, and therefore provide a conservative estimate of anticipated settlement. The method used

to estimate primary settlement in this analysis was developed by Sowers [Reference Number (Ref. No.) 1].

The Sowers equation for primary settlement of waste is:

$$\Delta H = \frac{C_c H}{1 + e_o} \log \frac{\sigma_o + \Delta\sigma}{\sigma_o}$$

Where:
- ΔH = Primary settlement (ft);
- C = Coefficient of primary consolidation (dimensionless);
- H = Existing waste thickness (ft);
- e_o = Initial void ratio of existing waste (dimensionless);
- σ_o = Initial effective vertical stress in existing waste (psf); and
- $\Delta\sigma$ = Change in vertical effective stress produced by surcharge load from overlay waste (psf).

Sowers related C to the initial void ratio and the decomposition environment as follows:

$C_C = 0.15e_o$ (anaerobic, poor decomposition); and
$C_C = 0.55e_o$ (aerobic, good decomposition).

The estimate of primary settlement in this analysis was made assuming a poor decomposition environment ($C_C = 0.15e_o$), since the existing waste is relatively old and anaerobic conditions are present with minimal further decomposition anticipated. Sowers recommends a void ratio of between 15 for very poorly compacted municipal solid waste to a low of 2 for well-compacted waste. The void ratio assumed in this analysis was 4, to represent MSW with relatively good decomposition that has already occurred in the existing waste.

Secondary Settlement

Secondary settlement in waste is similar to secondary consolidation in a soil and is due to the rearranging of the waste due primarily to decomposition. The method used to estimate secondary settlement in this analysis was developed by Sowers (Ref. 1). The Sowers equation for secondary settlement of waste is:

$$\Delta Hs = \frac{\alpha H}{1 + e} \log \frac{t2}{t1}$$

Where: ΔHs = Secondary settlement (ft);
α = Coefficient of secondary consolidation (dimensionless);
H = Waste thickness (ft);
e = Void ratio of waste (dimensionless);
t1 = Time of initial primary consolidation (months); and
t2 = Time of secondary consolidation (months).

Sowers also related α to the initial void ratio and the decomposition environment as follows:

α = 0.03e (anaerobic, poor decomposition); and
α = 0.09e (aerobic, good decomposition).

The estimate of secondary settlement in this analysis was made assuming a poor decomposition environment ($\alpha = 0.03e$). Sowers also recommends a time of initial primary consolidation (t1) of 1 month after placement of the waste. In this analysis, the time of secondary consolidation (t2) was taken as 240 months, since this represents approximately half of the estimated age of old existing waste. There is no as-built information available regarding the existing waste base grades. However, based on assumptions contained in the original landfill permit application, it is assumed that existing waste was placed at a constant base elevation of 650 feet above sea-level (FASL).

Settlement Analysis

In order to estimate the overall settlement that will occur in the existing waste along the drainage benches, a pair of points were placed approximately every 250 linear feet along each bench. At each location, one point was located at the crest of the bench, and one point was located at the toe of the bench. The thicknesses of the existing waste and the proposed vertical expansion waste were estimated at each point based on the existing and final grades shown on the attached Figures 1 and 2, respectively. Primary and secondary settlement was calculated, using the equations provided above, at each point location.

In all, settlement calculations were performed at 250 locations (125 sets of points) located along the drainage benches. Spreadsheets to estimate the primary and secondary settlement at each point location are attached to this calculation brief. The purpose of each spreadsheet is as follows:

- The Attachment 1 spreadsheet calculates the overall settlement that will occur at each point location as vertical expansion waste is placed; and

- The Attachment 2 spreadsheet shows the pre-settlement and post-settlement height difference between each set of points, in order to demonstrate that the benches will maintain sufficient grade to provide drainage during post-settlement conditions.

RESULTS

Primary and Secondary Settlement

The results from the primary and secondary overall settlement evaluation (see Attachment 1) shows that the total settlement at each point ranges from 3.4 feet to 14.3 feet. In percentages, this equates to 5.7% to 22.3% of the existing waste thickness. This range is fairly consistent with the range of 8 to 20 percent provided by Sowers, as being typical of the percent settlement experienced by municipal solid waste. As such, the estimated magnitude of overall settlement in the proposed vertical expansion grading is reasonable.

Referring to Attachment 2, it is seen that each set of points on the benches will maintain a positive post-settlement grade between the crest of the bench and toe of the bench. As shown, all of the points maintain drainage from the bench crest to the bench toe point.

CONCLUSION: Generally, the estimated settlement calculated for each point is consistent with typically accepted MSW settlement values. Using typical MSW properties, each drainage bench will maintain positive grade in order to function as intended. In reality, the benches will likely experience less settlement than estimated as C&D waste is less likely to settle than MSW. As such, the estimated settlement values are acceptable and the configuration of the benches will be sufficient to maintain drainage.

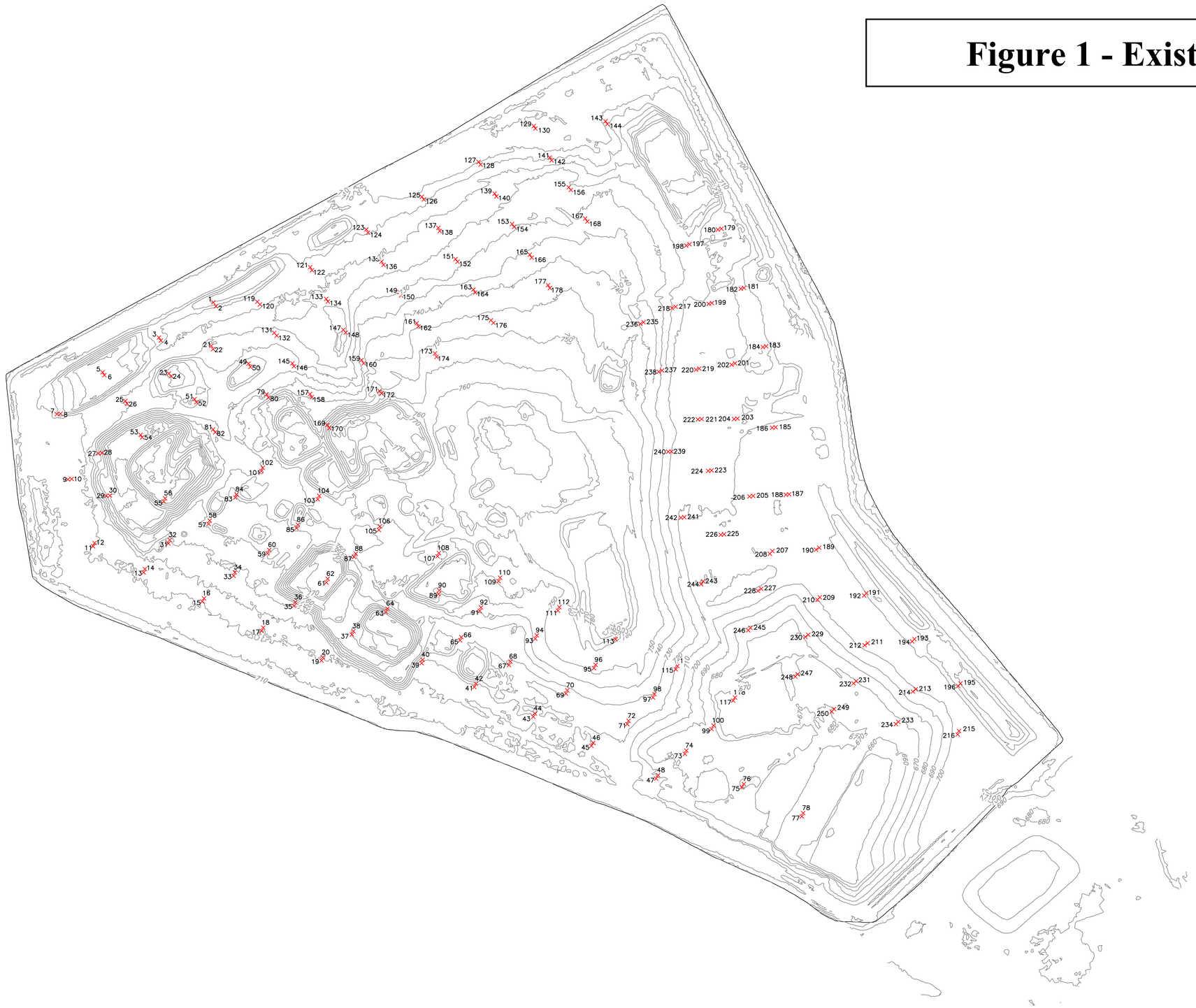
FIGURES

FIGURE 1

EXISTING CONDITIONS

Figure 1 - Existing Grades

NORTH



REFERENCE

EXISTING GROUND CONTOURS: UNITED STATES GEOLOGICAL SURVEY (USGS) HURRICANE LIDAR, 20190220 SUPPLEMENTED WITH SURVEY BY FIRMATEK DATED OCTOBER 24, 2020.

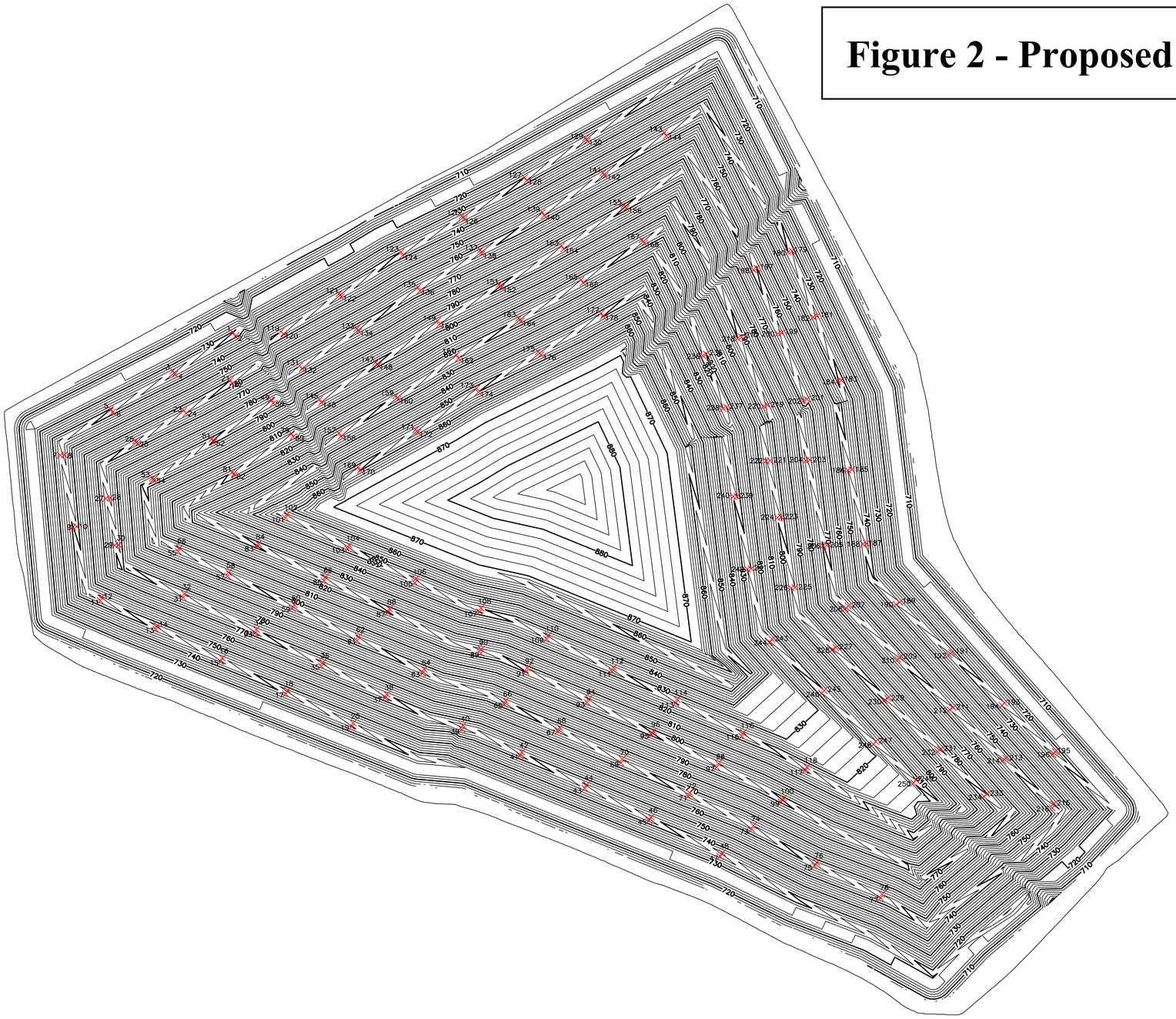
SCALE IN FEET
0 200 400

FIGURE 2

VERTICAL EXPANSION FINAL GRADES

Figure 2 - Proposed Vertical Expansion Final Grades

NORTH



REFERENCE

EXISTING GROUND CONTOURS: UNITED STATES GEOLOGICAL SURVEY (USGS) HURRICANE LIDAR, 20190220 SUPPLEMENTED WITH SURVEY BY FIRMATEK DATED OCTOBER 24, 2020.

SCALE IN FEET

0 200 400

ATTACHMENT 1

SETTLEMENT SPREADSHEET

BECK LANDFILL
ATTACHMENT 1 - SETTLEMENT SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Unit Weight of Waste (pcf) =	60
Void Ratio (e_o) =	4
Compression Index (C_c) =	0.60
Coefficient of Secondary Consolidation (α) =	0.12

	Existing Waste	Existing Waste	Vertical Expansion Waste	Vertical Expansion Waste	Front of Primary	Primary Settlement in Each of 10 Equal Layers										Total Primary Settle.	Secondary Settle.	Total Settle.	Post Settle Final
Pt	El. (ft)	Thick (ft)	El. (ft)	Thick (ft)	Settle Eqn	1	2	3	4	5	6	7	8	9	10	(ft)	(ft)	(ft)	El. (ft)
1	729.60	80	730.25	1	0.96	0.06	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.1	4.5	4.7	725.6
2	722.74	73	729.21	6	0.87	0.39	0.18	0.12	0.09	0.07	0.06	0.05	0.04	0.04	0.03	1.1	4.2	5.2	724.0
3	721.93	72	735.04	13	0.86	0.58	0.30	0.21	0.16	0.13	0.11	0.09	0.08	0.07	0.07	1.8	4.1	5.9	729.1
4	721.92	72	733.33	11	0.86	0.54	0.27	0.18	0.14	0.11	0.09	0.08	0.07	0.06	0.06	1.6	4.1	5.7	727.6
5	743.70	94	740.15	0	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	5.4	5.4	734.8
6	743.52	94	738.30	0	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	5.3	5.3	733.0
7	724.04	74	745.22	21	0.89	0.74	0.41	0.29	0.23	0.19	0.16	0.14	0.12	0.11	0.10	2.5	4.2	6.7	738.5
8	726.59	77	743.30	17	0.92	0.67	0.36	0.25	0.19	0.16	0.13	0.12	0.10	0.09	0.08	2.2	4.4	6.5	736.8
9	717.72	68	750.36	33	0.81	0.83	0.51	0.38	0.31	0.26	0.22	0.20	0.18	0.16	0.14	3.2	3.9	7.0	743.3
10	719.00	69	748.37	29	0.83	0.81	0.48	0.36	0.29	0.24	0.21	0.18	0.16	0.15	0.13	3.0	3.9	6.9	741.4
11	720.40	70	753.62	33	0.84	0.86	0.52	0.39	0.31	0.26	0.23	0.20	0.18	0.16	0.15	3.3	4.0	7.3	746.3
12	719.00	69	751.70	33	0.83	0.84	0.51	0.38	0.31	0.26	0.22	0.20	0.18	0.16	0.15	3.2	3.9	7.1	744.6
13	722.06	72	749.30	27	0.86	0.81	0.47	0.35	0.28	0.23	0.20	0.17	0.15	0.14	0.13	2.9	4.1	7.0	742.3
14	722.68	73	747.43	25	0.87	0.78	0.45	0.33	0.26	0.21	0.18	0.16	0.14	0.13	0.12	2.8	4.2	6.9	740.5
15	720.14	70	744.37	24	0.84	0.76	0.44	0.32	0.25	0.21	0.18	0.16	0.14	0.12	0.11	2.7	4.0	6.7	737.7
16	722.03	72	742.44	20	0.86	0.71	0.40	0.28	0.22	0.18	0.16	0.14	0.12	0.11	0.10	2.4	4.1	6.5	735.9
17	720.00	70	739.38	19	0.84	0.68	0.38	0.27	0.21	0.17	0.15	0.13	0.11	0.10	0.09	2.3	4.0	6.3	733.1
18	721.05	71	737.43	16	0.85	0.64	0.34	0.24	0.19	0.15	0.13	0.11	0.10	0.09	0.08	2.1	4.1	6.1	731.3
19	719.28	69	734.31	15	0.83	0.60	0.32	0.23	0.17	0.14	0.12	0.10	0.09	0.08	0.07	1.9	4.0	5.9	728.4
20	719.91	70	732.44	13	0.84	0.55	0.29	0.20	0.15	0.12	0.10	0.09	0.08	0.07	0.06	1.7	4.0	5.7	726.7
21	727.00	77	759.92	33	0.92	0.91	0.54	0.40	0.32	0.27	0.23	0.20	0.18	0.16	0.15	3.4	4.4	7.8	752.2
22	727.57	78	758.10	31	0.93	0.88	0.52	0.38	0.30	0.25	0.22	0.19	0.17	0.15	0.14	3.2	4.4	7.6	750.5
23	745.00	95	764.02	19	1.14	0.80	0.42	0.29	0.22	0.18	0.15	0.13	0.12	0.10	0.09	2.5	5.4	7.9	756.1
24	745.00	95	762.11	17	1.14	0.76	0.39	0.27	0.21	0.17	0.14	0.12	0.11	0.10	0.09	2.3	5.4	7.8	754.3
25	725.90	76	768.77	43	0.91	0.99	0.62	0.47	0.38	0.32	0.28	0.25	0.22	0.20	0.18	3.9	4.3	8.3	760.5
26	725.30	75	767.05	42	0.90	0.98	0.61	0.46	0.37	0.32	0.27	0.24	0.22	0.20	0.18	3.8	4.3	8.1	758.9
27	731.90	82	775.32	43	0.98	1.05	0.65	0.49	0.39	0.33	0.29	0.25	0.23	0.21	0.19	4.1	4.7	8.7	766.6
28	741.94	92	773.28	31	1.10	0.99	0.57	0.41	0.33	0.27	0.23	0.20	0.18	0.16	0.15	3.5	5.3	8.7	764.5
29	743.40	93	779.31	36	1.12	1.05	0.62	0.45	0.36	0.30	0.26	0.23	0.20	0.18	0.17	3.8	5.3	9.2	770.2
30	749.50	100	777.34	28	1.19	0.98	0.55	0.39	0.30	0.25	0.21	0.19	0.16	0.15	0.13	3.3	5.7	9.0	768.3
31	729.99	80	777.96	48	0.96	1.07	0.67	0.51	0.42	0.35	0.31	0.27	0.24	0.22	0.20	4.3	4.6	8.8	769.1
32	729.02	79	776.10	47	0.95	1.05	0.66	0.50	0.41	0.35	0.30	0.27	0.24	0.22	0.20	4.2	4.5	8.7	767.4
33	729.00	79	772.48	43	0.95	1.02	0.63	0.48	0.39	0.33	0.29	0.25	0.23	0.21	0.19	4.0	4.5	8.5	764.0
34	729.53	80	770.55	41	0.95	1.01	0.62	0.46	0.38	0.32	0.27	0.24	0.22	0.20	0.18	3.9	4.5	8.4	762.1
35	729.89	80	767.38	37	0.96	0.97	0.59	0.44	0.35	0.30	0.26	0.23	0.20	0.18	0.17	3.7	4.6	8.3	759.1
36	736.92	87	765.52	29	1.04	0.92	0.53	0.38	0.30	0.25	0.21	0.19	0.16	0.15	0.13	3.2	5.0	8.2	757.3
37	755.01	105	762.49	7	1.26	0.48	0.21	0.14	0.10	0.08	0.07	0.06	0.05	0.04	0.04	1.3	6.0	7.3	755.2
38	755.71	106	760.56	5	1.27	0.36	0.15	0.09	0.07	0.05	0.04	0.04	0.03	0.03	0.03	0.9	6.0	6.9	753.6
39	724.21	74	756.89	33	0.89	0.88	0.53	0.39	0.32	0.26	0.23	0.20	0.18	0.16	0.15	3.3	4.2	7.5	749.4
40	725.04	75	755.03	30	0.90	0.86	0.51	0.37	0.30	0.25	0.21	0.19	0.17	0.15	0.14	3.1	4.3	7.4	747.6
41	724.00	74	752.57	29	0.89	0.84	0.49	0.36	0.29	0.24	0.21	0.18	0.16	0.14	0.13	3.0	4.2	7.3	745.3
42	725.87	76	750.66	25	0.91	0.80	0.46	0.33	0.26	0.22	0.18	0.16	0.14	0.13	0.12	2.8	4.3	7.1	743.5
43	722.76	73	747.61	25	0.87	0.78	0.45	0.33	0.26	0.21	0.18	0.16	0.14	0.13	0.12	2.8	4.2	6.9	740.7
44	724.96	75	745.66	21	0.90	0.73	0.41	0.29	0.23	0.19	0.16	0.14	0.12	0.11	0.10	2.5	4.3	6.8	738.9
45	719.53	70	742.70	23	0.83	0.74	0.42	0.31	0.24	0.20	0.17	0.15	0.13	0.12	0.11	2.6	4.0	6.6	736.1
46	719.97	70	740.80	21	0.84	0.71	0.40	0.29	0.22	0.19	0.16	0.14	0.12	0.11	0.10	2.4	4.0	6.4	734.4
47	701.45	51	736.94	35	0.62	0.72	0.46	0.36	0.29	0.25	0.22	0.19	0.17	0.16	0.15	3.0	2.9	5.9	731.0
48	698.83	49	735.34	37	0.59	0.70	0.46	0.35	0.29	0.25	0.22	0.19	0.18	0.16	0.15	3.0	2.8	5.7	729.6
49	739.99	90	786.14	46	1.08	1.14	0.70	0.52	0.42	0.36	0.31	0.27	0.24	0.22	0.20	4.4	5.1	9.5	776.6
50	740.76	91	784.37	44	1.09	1.12	0.68	0.51	0.41	0.34	0.30	0.26	0.23	0.21	0.19	4.3	5.2	9.4	774.9
51	737.92	88	791.22	53	1.06	1.18	0.74	0.56	0.46	0.39	0.34	0.30	0.27	0.25	0.23	4.7	5.0	9.7	781.5
52	739.00	89	789.41	50	1.07	1.17	0.73	0.55	0.45	0.38	0.33	0.29	0.26	0.24	0.22	4.6	5.1	9.7	779.7
53	763.00	113	798.87	36	1.36	1.17	0.67	0.48	0.38	0.31	0.27	0.23	0.21	0.19	0.17	4.1	6.5	10.5	788.3
54	763.08	113	797.30	34	1.36	1.15	0.65	0.47	0.37	0.30	0.26	0.23	0.20	0.18	0.16	4.0	6.5	10.4	786.9
55	781.99	132	807.47	25	1.58	1.09	0.57	0.39	0.30	0.25	0.21	0.18	0.16	0.14	0.13	3.4	7.5	10.9	796.5
56	783.49	133	805.66	22	1.60	1.02	0.52	0.35	0.27	0.22	0.18	0.16	0.14	0.12	0.11	3.1	7.6	10.7	794.9
57	735.99	86	803.75	68	1.03	1.26	0.82	0.64	0.53	0.45	0.40	0.36	0.32	0.29	0.27	5.3	4.9	10.3	793.5
58	735.61	86	801.93	66	1.03	1.25	0.81	0.63	0.52	0.45	0.39	0.35	0.32	0.29	0.27	5.3	4.9	10.2	791.8
59	737.31	87	798.75	61	1.05	1.23	0.79	0.61	0.50	0.43	0.37	0.33	0.30	0.27	0.25	5.1	5.0	10.1	788.7
60	737.64	88	796.86	59	1.05	1.22	0.78	0.60	0.49	0.42	0.37	0.33	0.29	0.27	0.25	5.0	5.0	10.0	786.8
61	778.00	128	793.74	16	1.54	0.83	0.40	0.27	0.20	0.16	0.13	0.12	0.10	0.09	0.08	2.4	7.3	9.7	784.1

BECK LANDFILL
ATTACHMENT 1 - SETTLEMENT SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Unit Weight of Waste (pcf) =	60
Void Ratio (e_o) =	4
Compression Index (C_c) =	0.60
Coefficient of Secondary Consolidation (α) =	0.12

	Existing Waste	Existing Waste	Vertical Expansion Waste	Vertical Expansion Waste	Front of Primary	Primary Settlement in Each of 10 Equal Layers										Total Primary Settle.	Secondary Settle.	Total Settle.	Post Settle Final
Pt	El. (ft)	Thick (ft)	El. (ft)	Thick (ft)	Settle Eqn	1	2	3	4	5	6	7	8	9	10	(ft)	(ft)	(ft)	El. (ft)
62	777.94	128	791.99	14	1.54	0.77	0.37	0.24	0.18	0.15	0.12	0.10	0.09	0.08	0.07	2.2	7.3	9.5	782.5
63	766.02	116	788.58	23	1.39	0.96	0.50	0.35	0.27	0.22	0.18	0.16	0.14	0.12	0.11	3.0	6.6	9.6	778.9
64	751.19	101	786.76	36	1.21	1.10	0.64	0.46	0.37	0.30	0.26	0.23	0.20	0.18	0.17	3.9	5.8	9.7	777.1
65	732.94	83	782.68	50	1.00	1.11	0.70	0.53	0.43	0.37	0.32	0.28	0.25	0.23	0.21	4.4	4.7	9.2	773.5
66	733.00	83	780.90	48	1.00	1.09	0.68	0.52	0.42	0.36	0.31	0.27	0.25	0.22	0.21	4.3	4.7	9.1	771.8
67	729.58	80	778.73	49	0.95	1.07	0.68	0.52	0.42	0.36	0.31	0.28	0.25	0.23	0.21	4.3	4.5	8.9	769.9
68	729.70	80	776.89	47	0.96	1.06	0.66	0.50	0.41	0.35	0.30	0.27	0.24	0.22	0.20	4.2	4.6	8.8	768.1
69	726.33	76	774.03	48	0.92	1.04	0.65	0.50	0.41	0.35	0.30	0.27	0.24	0.22	0.20	4.2	4.4	8.5	765.5
70	727.81	78	772.16	44	0.93	1.02	0.64	0.48	0.39	0.33	0.29	0.26	0.23	0.21	0.19	4.0	4.4	8.5	763.7
71	722.99	73	768.85	46	0.88	0.99	0.63	0.48	0.39	0.33	0.29	0.26	0.23	0.21	0.19	4.0	4.2	8.2	760.7
72	723.50	73	767.02	44	0.88	0.98	0.61	0.47	0.38	0.32	0.28	0.25	0.22	0.20	0.19	3.9	4.2	8.1	758.9
73	686.38	36	764.05	78	0.44	0.72	0.52	0.43	0.37	0.33	0.30	0.28	0.26	0.24	0.22	3.7	2.1	5.7	758.3
74	686.00	36	762.16	76	0.43	0.71	0.51	0.42	0.37	0.33	0.30	0.27	0.25	0.23	0.22	3.6	2.1	5.7	756.5
75	680.00	30	758.81	79	0.36	0.62	0.46	0.38	0.33	0.30	0.27	0.25	0.24	0.22	0.21	3.3	1.7	5.0	753.8
76	680.00	30	757.57	78	0.36	0.62	0.45	0.38	0.33	0.30	0.27	0.25	0.23	0.22	0.21	3.3	1.7	5.0	752.6
77	668.00	18	753.97	86	0.22	0.43	0.33	0.28	0.25	0.23	0.21	0.20	0.19	0.18	0.17	2.5	1.0	3.5	750.5
78	667.99	18	752.18	84	0.22	0.43	0.33	0.28	0.25	0.23	0.21	0.20	0.19	0.18	0.17	2.4	1.0	3.5	748.7
79	739.96	90	814.24	74	1.08	1.34	0.88	0.68	0.57	0.49	0.43	0.38	0.35	0.32	0.29	5.7	5.1	10.9	803.4
80	743.21	93	812.32	69	1.12	1.34	0.87	0.67	0.55	0.47	0.41	0.37	0.33	0.30	0.28	5.6	5.3	10.9	801.4
81	735.83	86	819.16	83	1.03	1.35	0.90	0.71	0.59	0.51	0.45	0.41	0.37	0.34	0.31	6.0	4.9	10.9	808.3
82	735.50	86	817.54	82	1.03	1.34	0.89	0.70	0.59	0.51	0.45	0.40	0.37	0.34	0.31	5.9	4.9	10.8	806.8
83	739.99	90	830.65	91	1.08	1.43	0.96	0.76	0.64	0.55	0.49	0.44	0.40	0.37	0.34	6.4	5.1	11.5	819.1
84	742.23	92	828.87	87	1.11	1.43	0.95	0.75	0.63	0.54	0.48	0.43	0.39	0.36	0.33	6.3	5.3	11.6	817.3
85	744.34	94	825.45	81	1.13	1.43	0.94	0.73	0.61	0.53	0.46	0.41	0.38	0.34	0.32	6.1	5.4	11.5	813.9
86	747.24	97	823.59	76	1.17	1.43	0.93	0.72	0.60	0.51	0.45	0.40	0.36	0.33	0.31	6.0	5.6	11.6	812.0
87	744.95	95	820.42	75	1.14	1.40	0.91	0.71	0.59	0.50	0.44	0.40	0.36	0.33	0.30	5.9	5.4	11.4	809.1
88	744.99	95	818.49	73	1.14	1.39	0.90	0.70	0.58	0.50	0.43	0.39	0.35	0.32	0.29	5.8	5.4	11.3	807.2
89	756.21	106	813.31	57	1.27	1.36	0.84	0.64	0.52	0.44	0.38	0.33	0.30	0.27	0.25	5.3	6.1	11.4	801.9
90	757.23	107	811.54	54	1.29	1.35	0.82	0.62	0.50	0.42	0.36	0.32	0.29	0.26	0.24	5.2	6.1	11.3	800.2
91	740.51	91	810.11	70	1.09	1.32	0.86	0.66	0.55	0.47	0.41	0.37	0.33	0.30	0.28	5.6	5.2	10.7	799.4
92	742.06	92	808.27	66	1.10	1.31	0.84	0.65	0.54	0.46	0.40	0.36	0.32	0.29	0.27	5.4	5.3	10.7	797.6
93	742.38	92	805.64	63	1.11	1.29	0.83	0.63	0.52	0.45	0.39	0.35	0.31	0.28	0.26	5.3	5.3	10.6	795.0
94	743.75	94	803.76	60	1.12	1.28	0.81	0.62	0.51	0.43	0.38	0.33	0.30	0.27	0.25	5.2	5.4	10.6	793.2
95	751.16	101	800.87	50	1.21	1.26	0.77	0.57	0.46	0.39	0.34	0.30	0.27	0.24	0.22	4.8	5.8	10.6	790.3
96	753.30	103	798.93	46	1.24	1.23	0.74	0.55	0.44	0.37	0.32	0.28	0.25	0.23	0.21	4.6	5.9	10.5	788.4
97	727.64	78	795.97	68	0.93	1.18	0.78	0.61	0.51	0.44	0.39	0.35	0.31	0.29	0.27	5.1	4.4	9.6	786.4
98	729.29	79	794.07	65	0.95	1.18	0.77	0.60	0.50	0.43	0.38	0.34	0.30	0.28	0.26	5.0	4.5	9.6	784.5
99	687.43	37	790.80	103	0.45	0.79	0.58	0.49	0.43	0.38	0.35	0.32	0.30	0.28	0.27	4.2	2.1	6.3	784.5
100	684.54	35	789.15	105	0.41	0.74	0.55	0.46	0.41	0.37	0.34	0.31	0.29	0.27	0.26	4.0	2.0	6.0	783.2
101	739.99	90	857.65	118	1.08	1.55	1.07	0.86	0.73	0.64	0.57	0.52	0.47	0.44	0.41	7.2	5.1	12.4	845.3
102	740.06	90	855.76	116	1.08	1.54	1.06	0.85	0.72	0.63	0.57	0.51	0.47	0.43	0.40	7.2	5.1	12.3	843.4
103	746.25	96	852.84	107	1.15	1.58	1.07	0.85	0.72	0.62	0.55	0.50	0.45	0.42	0.39	7.1	5.5	12.6	840.2
104	746.91	97	850.95	104	1.16	1.57	1.06	0.84	0.71	0.62	0.55	0.49	0.45	0.41	0.38	7.1	5.5	12.6	838.3
105	746.82	97	847.31	100	1.16	1.55	1.04	0.83	0.70	0.60	0.53	0.48	0.44	0.40	0.37	7.0	5.5	12.5	834.8
106	750.04	100	845.43	95	1.20	1.56	1.04	0.82	0.69	0.59	0.52	0.47	0.43	0.39	0.36	6.9	5.7	12.6	832.8
107	753.50	104	842.10	89	1.24	1.56	1.03	0.80	0.67	0.57	0.51	0.45	0.41	0.38	0.35	6.7	5.9	12.6	829.5
108	753.94	104	840.54	87	1.25	1.56	1.02	0.79	0.66	0.57	0.50	0.45	0.40	0.37	0.34	6.7	5.9	12.6	827.9
109	751.49	101	837.54	86	1.22	1.53	1.00	0.78	0.65	0.56	0.49	0.44	0.40	0.37	0.34	6.6	5.8	12.4	825.2
110	751.29	101	835.64	84	1.22	1.52	0.99	0.77	0.64	0.55	0.49	0.44	0.39	0.36	0.33	6.5	5.8	12.3	823.4
111	754.87	105	832.87	78	1.26	1.51	0.98	0.75	0.62	0.53	0.47	0.42	0.38	0.34	0.32	6.3	6.0	12.3	820.6
112	754.77	105	830.95	76	1.26	1.50	0.96	0.74	0.61	0.53	0.46	0.41	0.37	0.34	0.31	6.2	6.0	12.2	818.7
113	766.65	117	828.27	62	1.40	1.49	0.92	0.69	0.56	0.47	0.41	0.36	0.32	0.29	0.27	5.8	6.7	12.4	815.8
114	770.45	120	826.34	56	1.45	1.46	0.88	0.66	0.53	0.44	0.38	0.34	0.30	0.27	0.25	5.5	6.9	12.4	813.9
115	719.35	69	823.29	104	0.83	1.24	0.87	0.70	0.60	0.53	0.48	0.43	0.40	0.37	0.34	6.0	4.0	9.9	813.4
116	718.41	68	821.40	103	0.82	1.23	0.86	0.69	0.59	0.52	0.47	0.43	0.39	0.36	0.34	5.9	3.9	9.8	811.6
117	667.32	17	818.39	151	0.21	0.47	0.37	0.32	0.29	0.27	0.25	0.24	0.23	0.22	0.21	2.9	1.0	3.9	814.5
118	667.95	18	816.55	149	0.22	0.48	0.38	0.33	0.30	0.28	0.26	0.25	0.23	0.22	0.21	2.9	1.0	4.0	812.6
119	719.04	69	749.77	31	0.83	0.82	0.50	0.37	0.30	0.25	0.21	0.19	0.17	0.15	0.14	3.1	3.9	7.0	742.7
120	719.46	69	747.76	28	0.83	0.80	0.48	0.35	0.28	0.23	0.20	0.18	0.16	0.14	0.13	2.9	4.0	6.9	740.9
121	716.20	66	744.96	29	0.79	0.78	0.47	0.35	0.28	0.23	0.20	0.18	0.16	0.14	0.13	2.9	3.8	6.7	738.3
122	716.80	67	743.09	26	0.80	0.76	0.45	0.33	0.26	0.22	0.19	0.16	0.15	0.13	0.12	2.8	3.8	6.6	736.5

BECK LANDFILL
ATTACHMENT 1 - SETTLEMENT SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Unit Weight of Waste (pcf) =	60
Void Ratio (e_o) =	4
Compression Index (C_c) =	0.60
Coefficient of Secondary Consolidation (α) =	0.12

Pt	Existing Waste El. (ft)	Existing Waste Thick (ft)	Vertical Expansion Waste El. (ft)	Vertical Expansion Waste Thick (ft)	Front of Primary Settle Eqn	Primary Settlement in Each of 10 Equal Layers										Total Primary Settle. (ft)	Secondary Settle. (ft)	Total Settle. (ft)	Post Settle Final El. (ft)
						1	2	3	4	5	6	7	8	9	10				
123	714.14	64	739.85	26	0.77	0.74	0.43	0.32	0.26	0.21	0.18	0.16	0.14	0.13	0.12	2.7	3.7	6.4	733.5
124	714.77	65	737.96	23	0.78	0.71	0.41	0.30	0.24	0.20	0.17	0.15	0.13	0.12	0.11	2.5	3.7	6.2	731.7
125	711.72	62	734.95	23	0.74	0.69	0.40	0.30	0.23	0.20	0.17	0.15	0.13	0.12	0.11	2.5	3.5	6.0	728.9
126	714.04	64	733.11	19	0.77	0.65	0.36	0.26	0.21	0.17	0.14	0.13	0.11	0.10	0.09	2.2	3.7	5.9	727.2
127	709.76	60	729.88	20	0.72	0.64	0.37	0.27	0.21	0.17	0.15	0.13	0.12	0.10	0.09	2.2	3.4	5.7	724.2
128	711.56	62	728.09	17	0.74	0.59	0.33	0.23	0.18	0.15	0.13	0.11	0.10	0.09	0.08	2.0	3.5	5.5	722.6
129	705.60	56	724.86	19	0.67	0.60	0.35	0.25	0.20	0.17	0.14	0.12	0.11	0.10	0.09	2.1	3.2	5.3	719.6
130	705.81	56	723.28	17	0.67	0.58	0.33	0.24	0.19	0.15	0.13	0.11	0.10	0.09	0.08	2.0	3.2	5.2	718.1
131	727.13	77	777.84	51	0.93	1.07	0.68	0.52	0.42	0.36	0.32	0.28	0.25	0.23	0.21	4.3	4.4	8.7	769.1
132	727.86	78	775.87	48	0.93	1.05	0.66	0.50	0.41	0.35	0.31	0.27	0.24	0.22	0.20	4.2	4.4	8.7	767.2
133	720.82	71	773.13	52	0.85	1.02	0.66	0.51	0.42	0.36	0.31	0.28	0.25	0.23	0.21	4.3	4.0	8.3	764.8
134	720.71	71	771.44	51	0.85	1.01	0.65	0.50	0.41	0.35	0.31	0.27	0.25	0.23	0.21	4.2	4.0	8.2	763.2
135	721.36	71	768.09	47	0.86	0.98	0.62	0.48	0.39	0.33	0.29	0.26	0.23	0.21	0.19	4.0	4.1	8.1	760.0
136	722.75	73	766.40	44	0.87	0.97	0.61	0.46	0.38	0.32	0.28	0.25	0.22	0.20	0.19	3.9	4.2	8.0	758.4
137	722.25	72	762.99	41	0.87	0.94	0.59	0.44	0.36	0.31	0.27	0.24	0.21	0.19	0.18	3.7	4.1	7.8	755.1
138	722.56	73	761.25	39	0.87	0.93	0.57	0.43	0.35	0.30	0.26	0.23	0.20	0.18	0.17	3.6	4.1	7.8	753.5
139	722.79	73	757.96	35	0.87	0.90	0.55	0.41	0.33	0.28	0.24	0.21	0.19	0.17	0.16	3.4	4.2	7.6	750.4
140	722.95	73	756.22	33	0.88	0.88	0.53	0.39	0.32	0.27	0.23	0.20	0.18	0.16	0.15	3.3	4.2	7.5	748.7
141	713.97	64	753.07	39	0.77	0.86	0.54	0.41	0.34	0.29	0.25	0.22	0.20	0.18	0.17	3.5	3.7	7.1	746.0
142	716.72	67	751.24	35	0.80	0.84	0.52	0.39	0.32	0.27	0.23	0.20	0.18	0.17	0.15	3.3	3.8	7.1	744.2
143	712.40	62	748.07	36	0.75	0.82	0.51	0.39	0.31	0.27	0.23	0.21	0.18	0.17	0.15	3.2	3.6	6.8	741.3
144	713.13	63	746.26	33	0.76	0.80	0.49	0.37	0.30	0.25	0.22	0.19	0.17	0.16	0.14	3.1	3.6	6.7	739.5
145	731.05	81	805.78	75	0.97	1.25	0.83	0.65	0.55	0.47	0.42	0.37	0.34	0.31	0.29	5.5	4.6	10.1	795.7
146	730.96	81	803.99	73	0.97	1.24	0.82	0.64	0.54	0.46	0.41	0.37	0.33	0.31	0.28	5.4	4.6	10.0	794.0
147	715.84	66	801.16	85	0.79	1.13	0.78	0.63	0.53	0.47	0.42	0.38	0.34	0.32	0.30	5.3	3.8	9.0	792.1
148	719.98	70	799.29	79	0.84	1.15	0.78	0.62	0.53	0.46	0.41	0.37	0.34	0.31	0.29	5.3	4.0	9.3	790.0
149	729.96	80	796.05	66	0.96	1.19	0.78	0.61	0.51	0.43	0.38	0.34	0.31	0.28	0.26	5.1	4.6	9.7	786.4
150	730.80	81	794.18	63	0.97	1.19	0.77	0.60	0.50	0.42	0.37	0.33	0.30	0.28	0.25	5.0	4.6	9.6	784.6
151	728.39	78	791.03	63	0.94	1.16	0.75	0.59	0.49	0.42	0.37	0.33	0.30	0.27	0.25	4.9	4.5	9.4	781.6
152	729.02	79	789.20	60	0.95	1.15	0.74	0.58	0.48	0.41	0.36	0.32	0.29	0.26	0.24	4.8	4.5	9.3	779.9
153	728.64	79	785.92	57	0.94	1.13	0.72	0.56	0.46	0.39	0.35	0.31	0.28	0.25	0.23	4.7	4.5	9.2	776.7
154	729.39	79	784.20	55	0.95	1.12	0.71	0.55	0.45	0.38	0.34	0.30	0.27	0.25	0.23	4.6	4.5	9.1	775.1
155	725.49	75	780.95	55	0.91	1.08	0.70	0.54	0.45	0.38	0.33	0.30	0.27	0.25	0.23	4.5	4.3	8.8	772.1
156	725.72	76	779.09	53	0.91	1.07	0.69	0.53	0.44	0.37	0.33	0.29	0.26	0.24	0.22	4.4	4.3	8.8	770.3
157	743.15	93	833.81	91	1.12	1.47	0.98	0.77	0.65	0.56	0.49	0.44	0.40	0.37	0.34	6.5	5.3	11.8	822.0
158	743.78	94	831.91	88	1.13	1.46	0.97	0.76	0.64	0.55	0.49	0.44	0.40	0.36	0.34	6.4	5.4	11.8	820.1
159	736.82	87	829.06	92	1.04	1.40	0.95	0.75	0.63	0.55	0.49	0.44	0.40	0.37	0.34	6.3	5.0	11.3	817.8
160	738.48	88	827.30	89	1.06	1.41	0.94	0.74	0.62	0.54	0.48	0.43	0.39	0.36	0.33	6.2	5.1	11.3	816.0
161	743.28	93	824.04	81	1.12	1.41	0.93	0.73	0.61	0.52	0.46	0.41	0.37	0.34	0.31	6.1	5.3	11.4	812.6
162	744.28	94	822.16	78	1.13	1.41	0.92	0.72	0.60	0.51	0.45	0.40	0.36	0.33	0.31	6.0	5.4	11.4	810.8
163	739.22	89	818.98	80	1.07	1.37	0.90	0.71	0.59	0.51	0.45	0.40	0.36	0.33	0.31	5.9	5.1	11.0	807.9
164	739.96	90	817.14	77	1.08	1.36	0.89	0.70	0.58	0.50	0.44	0.39	0.36	0.33	0.30	5.9	5.1	11.0	806.1
165	736.31	86	813.92	78	1.04	1.32	0.87	0.69	0.57	0.49	0.44	0.39	0.35	0.32	0.30	5.8	4.9	10.7	803.2
166	737.00	87	812.10	75	1.04	1.32	0.87	0.68	0.56	0.49	0.43	0.38	0.35	0.32	0.29	5.7	5.0	10.6	801.4
167	730.99	81	808.90	78	0.97	1.27	0.85	0.67	0.56	0.48	0.43	0.38	0.35	0.32	0.30	5.6	4.6	10.2	798.7
168	731.84	82	807.08	75	0.98	1.26	0.84	0.66	0.55	0.47	0.42	0.38	0.34	0.31	0.29	5.5	4.7	10.2	796.9
169	766.98	117	861.80	95	1.40	1.73	1.13	0.88	0.73	0.63	0.55	0.49	0.45	0.41	0.38	7.4	6.7	14.1	847.7
170	775.09	125	859.90	85	1.50	1.75	1.11	0.86	0.70	0.60	0.52	0.47	0.42	0.38	0.35	7.2	7.1	14.3	845.6
171	754.91	105	857.08	102	1.26	1.65	1.10	0.87	0.73	0.63	0.56	0.50	0.46	0.42	0.39	7.3	6.0	13.3	843.8
172	754.97	105	855.39	100	1.26	1.64	1.09	0.86	0.72	0.62	0.55	0.50	0.45	0.41	0.38	7.2	6.0	13.2	842.2
173	752.20	102	852.03	100	1.23	1.61	1.07	0.85	0.71	0.61	0.54	0.49	0.44	0.41	0.38	7.1	5.8	13.0	839.1
174	752.94	103	850.22	97	1.24	1.60	1.07	0.84	0.70	0.61	0.54	0.48	0.44	0.40	0.37	7.0	5.9	12.9	837.3
175	746.93	97	846.95	100	1.16	1.55	1.04	0.83	0.69	0.60	0.53	0.48	0.44	0.40	0.37	6.9	5.5	12.5	834.5
176	747.36	97	845.02	98	1.17	1.55	1.03	0.82	0.69	0.59	0.53	0.47	0.43	0.40	0.37	6.9	5.6	12.4	832.6
177	742.68	93	841.78	99	1.11	1.50	1.01	0.80	0.68	0.59	0.52	0.47	0.43	0.39	0.36	6.8	5.3	12.1	829.7
178	743.14	93	839.92	97	1.12	1.50	1.00	0.80	0.67	0.58	0.52	0.46	0.42	0.39	0.36	6.7	5.3	12.0	827.9
179	716.98	67	732.03	15	0.80	0.59	0.32	0.22	0.17	0.14	0.12	0.10	0.09	0.08	0.07	1.9	3.8	5.7	726.3
180	716.99	67	730.09	13	0.80	0.56	0.29	0.20	0.15	0.13	0.11	0.09	0.08	0.07	0.07	1.7	3.8	5.6	724.5
181	711.27	61	736.79	26	0.74	0.71	0.42	0.31	0.25	0.21	0.18	0.16	0.14	0.13	0.12	2.6	3.5	6.1	730.7
182	712.51	63	734.97	22	0.75	0.68	0.40	0.29	0.23	0.19	0.16	0.14	0.13	0.11	0.10	2.4	3.6	6.0	729.0
183	717.62	68	741.46	24	0.81	0.74	0.43	0.31	0.25	0.20	0.17	0.15	0.14	0.12	0.11	2.6	3.9	6.5	735.0

BECK LANDFILL
ATTACHMENT 1 - SETTLEMENT SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Unit Weight of Waste (pcf) =	60
Void Ratio (e_o) =	4
Compression Index (C_c) =	0.60
Coefficient of Secondary Consolidation (α) =	0.12

Pt	Existing Waste El. (ft)	Existing Waste Thick (ft)	Vertical Expansion Waste El. (ft)	Vertical Expansion Waste Thick (ft)	Front of Primary Settle Eqn	Primary Settlement in Each of 10 Equal Layers										Total Primary Settle. (ft)	Secondary Settle. (ft)	Total Settle. (ft)	Post Settle Final El. (ft)
						1	2	3	4	5	6	7	8	9	10				
184	711.26	61	739.60	28	0.74	0.74	0.45	0.33	0.27	0.23	0.19	0.17	0.15	0.14	0.13	2.8	3.5	6.3	733.3
185	704.00	54	747.90	44	0.65	0.80	0.52	0.41	0.34	0.29	0.26	0.23	0.21	0.19	0.17	3.4	3.1	6.5	741.4
186	704.03	54	746.02	42	0.65	0.79	0.51	0.40	0.33	0.28	0.25	0.22	0.20	0.18	0.17	3.3	3.1	6.4	739.6
187	701.04	51	742.66	42	0.61	0.76	0.50	0.39	0.32	0.28	0.24	0.22	0.20	0.18	0.16	3.2	2.9	6.1	736.5
188	701.01	51	740.92	40	0.61	0.75	0.49	0.38	0.31	0.27	0.24	0.21	0.19	0.17	0.16	3.2	2.9	6.1	734.8
189	702.19	52	737.84	36	0.63	0.73	0.47	0.36	0.29	0.25	0.22	0.20	0.18	0.16	0.15	3.0	3.0	6.0	731.9
190	702.04	52	735.98	34	0.62	0.72	0.45	0.35	0.29	0.24	0.21	0.19	0.17	0.15	0.14	2.9	3.0	5.9	730.1
191	710.74	61	732.88	22	0.73	0.67	0.39	0.28	0.23	0.19	0.16	0.14	0.13	0.11	0.10	2.4	3.5	5.9	727.0
192	705.30	55	731.09	26	0.66	0.67	0.41	0.30	0.24	0.20	0.18	0.16	0.14	0.13	0.12	2.5	3.2	5.7	725.4
193	713.66	64	727.87	14	0.76	0.56	0.30	0.21	0.16	0.13	0.11	0.10	0.09	0.08	0.07	1.8	3.6	5.5	722.4
194	713.83	64	726.10	12	0.77	0.52	0.27	0.19	0.15	0.12	0.10	0.09	0.08	0.07	0.06	1.6	3.6	5.3	720.8
195	730.56	81	723.04	0	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	4.6	4.6	718.4
196	721.86	72	721.16	0	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	4.1	4.1	717.1
197	722.48	72	760.09	38	0.87	0.92	0.56	0.42	0.34	0.29	0.25	0.22	0.20	0.18	0.16	3.6	4.1	7.7	752.4
198	723.21	73	758.18	35	0.88	0.90	0.55	0.41	0.33	0.28	0.24	0.21	0.19	0.17	0.16	3.4	4.2	7.6	750.6
199	719.00	69	764.84	46	0.83	0.96	0.61	0.47	0.38	0.33	0.28	0.25	0.23	0.21	0.19	3.9	3.9	7.8	757.0
200	719.27	69	762.99	44	0.83	0.94	0.60	0.45	0.37	0.32	0.28	0.24	0.22	0.20	0.18	3.8	4.0	7.8	755.2
201	715.29	65	769.73	54	0.78	0.98	0.64	0.50	0.41	0.36	0.31	0.28	0.25	0.23	0.21	4.2	3.7	7.9	761.8
202	715.95	66	767.83	52	0.79	0.97	0.63	0.49	0.40	0.35	0.31	0.27	0.25	0.23	0.21	4.1	3.8	7.9	760.0
203	715.48	65	777.17	62	0.79	1.02	0.68	0.53	0.45	0.39	0.34	0.31	0.28	0.25	0.24	4.5	3.7	8.2	769.0
204	716.00	66	775.29	59	0.79	1.01	0.67	0.52	0.44	0.38	0.33	0.30	0.27	0.25	0.23	4.4	3.8	8.2	767.1
205	704.00	54	771.60	68	0.65	0.92	0.63	0.50	0.43	0.37	0.33	0.30	0.28	0.25	0.24	4.3	3.1	7.3	764.3
206	705.51	56	769.82	64	0.67	0.92	0.63	0.50	0.42	0.37	0.33	0.30	0.27	0.25	0.23	4.2	3.2	7.4	762.4
207	707.29	57	767.35	60	0.69	0.92	0.62	0.49	0.41	0.36	0.32	0.29	0.26	0.24	0.22	4.1	3.3	7.4	759.9
208	707.98	58	765.37	57	0.70	0.92	0.61	0.48	0.41	0.35	0.31	0.28	0.25	0.23	0.22	4.1	3.3	7.4	758.0
209	701.52	52	762.64	61	0.62	0.86	0.59	0.47	0.40	0.35	0.31	0.28	0.25	0.23	0.22	4.0	2.9	6.9	755.7
210	700.39	50	760.87	60	0.60	0.85	0.58	0.46	0.39	0.34	0.30	0.27	0.25	0.23	0.21	3.9	2.9	6.8	754.1
211	702.55	53	758.05	56	0.63	0.85	0.57	0.45	0.38	0.33	0.29	0.26	0.24	0.22	0.20	3.8	3.0	6.8	751.2
212	701.65	52	756.23	55	0.62	0.83	0.56	0.45	0.37	0.33	0.29	0.26	0.24	0.22	0.20	3.7	3.0	6.7	749.5
213	699.61	50	753.03	53	0.60	0.81	0.54	0.43	0.36	0.32	0.28	0.25	0.23	0.21	0.20	3.6	2.8	6.5	746.6
214	697.98	48	751.17	53	0.58	0.79	0.53	0.42	0.36	0.31	0.28	0.25	0.23	0.21	0.19	3.6	2.7	6.3	744.9
215	704.00	54	748.45	44	0.65	0.80	0.53	0.41	0.34	0.29	0.26	0.23	0.21	0.19	0.18	3.4	3.1	6.5	741.9
216	704.00	54	746.51	43	0.65	0.79	0.52	0.40	0.33	0.28	0.25	0.22	0.20	0.18	0.17	3.4	3.1	6.4	740.1
217	723.18	73	792.01	69	0.88	1.14	0.76	0.60	0.50	0.43	0.38	0.34	0.31	0.28	0.26	5.0	4.2	9.2	782.8
218	725.12	75	790.20	65	0.90	1.14	0.75	0.59	0.49	0.42	0.37	0.33	0.30	0.28	0.25	4.9	4.3	9.2	781.0
219	718.00	68	797.00	79	0.82	1.13	0.77	0.61	0.52	0.45	0.40	0.36	0.33	0.31	0.28	5.2	3.9	9.1	788.0
220	718.00	68	795.16	77	0.82	1.12	0.76	0.61	0.51	0.45	0.40	0.36	0.33	0.30	0.28	5.1	3.9	9.0	786.2
221	716.00	66	805.67	90	0.79	1.15	0.79	0.64	0.55	0.48	0.43	0.39	0.36	0.33	0.31	5.4	3.8	9.2	796.5
222	716.00	66	803.81	88	0.79	1.14	0.79	0.63	0.54	0.47	0.42	0.38	0.35	0.32	0.30	5.4	3.8	9.1	794.7
223	712.98	63	802.22	89	0.76	1.11	0.77	0.62	0.53	0.47	0.42	0.38	0.35	0.32	0.30	5.3	3.6	8.9	793.4
224	713.73	64	800.40	87	0.76	1.11	0.77	0.62	0.53	0.46	0.41	0.37	0.34	0.32	0.30	5.2	3.6	8.9	791.5
225	709.56	60	797.89	88	0.71	1.06	0.74	0.60	0.51	0.45	0.41	0.37	0.34	0.31	0.29	5.1	3.4	8.5	789.4
226	709.47	59	796.07	87	0.71	1.06	0.73	0.60	0.51	0.45	0.40	0.36	0.33	0.31	0.29	5.0	3.4	8.4	787.6
227	708.17	58	793.50	85	0.70	1.03	0.72	0.58	0.50	0.44	0.39	0.36	0.33	0.30	0.28	4.9	3.3	8.3	785.2
228	707.22	57	791.61	84	0.69	1.02	0.71	0.58	0.49	0.43	0.39	0.35	0.32	0.30	0.28	4.9	3.3	8.1	783.5
229	674.24	24	789.38	115	0.29	0.58	0.44	0.38	0.34	0.31	0.29	0.27	0.25	0.24	0.23	3.3	1.4	4.7	784.7
230	671.28	21	787.49	116	0.26	0.52	0.40	0.35	0.31	0.29	0.27	0.25	0.23	0.22	0.21	3.0	1.2	4.3	783.2
231	670.20	20	784.57	114	0.24	0.50	0.39	0.33	0.30	0.27	0.26	0.24	0.23	0.21	0.20	2.9	1.2	4.1	780.5
232	667.98	18	782.78	115	0.22	0.46	0.35	0.31	0.28	0.25	0.24	0.22	0.21	0.20	0.19	2.7	1.0	3.7	779.0
233	667.99	18	780.04	112	0.22	0.45	0.35	0.31	0.28	0.25	0.24	0.22	0.21	0.20	0.19	2.7	1.0	3.7	776.3
234	667.18	17	778.32	111	0.21	0.44	0.34	0.29	0.27	0.24	0.23	0.21	0.20	0.19	0.18	2.6	1.0	3.6	774.7
235	739.00	89	820.01	81	1.07	1.37	0.91	0.71	0.59	0.51	0.45	0.41	0.37	0.34	0.31	6.0	5.1	11.1	809.0
236	739.18	89	818.17	79	1.07	1.36	0.90	0.70	0.59	0.51	0.45	0.40	0.36	0.33	0.31	5.9	5.1	11.0	807.2
237	728.88	79	823.95	95	0.95	1.32	0.90	0.72	0.61	0.54	0.48	0.43	0.39	0.36	0.34	6.1	4.5	10.6	813.3
238	732.23	82	822.03	90	0.99	1.34	0.91	0.72	0.61	0.53	0.47	0.42	0.39	0.35	0.33	6.1	4.7	10.8	811.3
239	719.81	70	832.05	112	0.84	1.27	0.90	0.73	0.63	0.55	0.50	0.45	0.42	0.39	0.36	6.2	4.0	10.2	821.9
240	724.31	74	830.32	106	0.89	1.31	0.91	0.74	0.63	0.55	0.50	0.45	0.41	0.38	0.36	6.2	4.2	10.5	819.8
241	709.98	60	827.91	0	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	3.4	3.4	824.5
242	709.99	60	826.07	0	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	3.4	3.4	822.6
243	708.00	58	823.62	116	0.70	1.12	0.80	0.66	0.57	0.51	0.46	0.42	0.39	0.37	0.34	5.7	3.3	9.0	814.6
244	709.65	60	821.67	112	0.72	1.14	0.81	0.67	0.58	0.51	0.46	0.42	0.39	0.36	0.34	5.7	3.4	9.1	812.6

BECK LANDFILL
ATTACHMENT 1 - SETTLEMENT SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Unit Weight of Waste (pcf) =	60
Void Ratio (e_o) =	4
Compression Index (C_c) =	0.60
Coefficient of Secondary Consolidation (α) =	0.12

Pt	Existing Waste El. (ft)	Existing Waste Thick (ft)	Vertical Expansion Waste El. (ft)	Vertical Expansion Waste Thick (ft)	Front of Primary Settle Eqn	Primary Settlement in Each of 10 Equal Layers										Total Primary Settle. (ft)	Secondary Settle. (ft)	Total Settle. (ft)	Post Settle Final El. (ft)
						1	2	3	4	5	6	7	8	9	10				
245	678.50	29	819.74	141	0.34	0.68	0.52	0.45	0.40	0.37	0.34	0.32	0.30	0.29	0.27	4.0	1.6	5.6	814.2
246	677.76	28	817.97	140	0.33	0.67	0.51	0.44	0.40	0.36	0.34	0.31	0.30	0.28	0.27	3.9	1.6	5.5	812.5
247	669.97	20	815.84	146	0.24	0.52	0.41	0.35	0.32	0.30	0.28	0.26	0.25	0.24	0.23	3.1	1.1	4.3	811.6
248	669.90	20	814.08	144	0.24	0.52	0.40	0.35	0.32	0.29	0.27	0.26	0.25	0.23	0.22	3.1	1.1	4.3	809.8
249	669.40	19	812.05	143	0.23	0.51	0.40	0.35	0.31	0.29	0.27	0.25	0.24	0.23	0.22	3.1	1.1	4.2	807.9
250	669.35	19	810.30	141	0.23	0.50	0.39	0.34	0.31	0.29	0.27	0.25	0.24	0.23	0.22	3.0	1.1	4.1	806.2

ATTACHMENT 2

DRAINAGE GRADE SPREADSHEET

BECK LANDFILL
ATTACHMENT 2 - DRAINAGE SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Bench Crest Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Bench Toe Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Pre-Settle Diff. (ft)	Post-Settle Diff. (ft)	Maintains Drainage?
1	730.25	725.57	2	729.21	724.00	1.04	1.56	Yes
3	735.04	729.14	4	733.33	727.61	1.71	1.54	Yes
5	740.15	734.80	6	738.30	732.96	1.85	1.84	Yes
7	745.22	738.49	8	743.30	736.77	1.92	1.72	Yes
9	750.36	743.31	10	748.37	741.43	1.99	1.89	Yes
11	753.62	746.33	12	751.70	744.56	1.91	1.78	Yes
13	749.30	742.27	14	747.43	740.52	1.87	1.74	Yes
15	744.37	737.69	16	742.44	735.91	1.93	1.78	Yes
17	739.38	733.07	18	737.43	731.30	1.95	1.77	Yes
19	734.31	728.41	20	732.44	726.73	1.87	1.68	Yes
21	759.92	752.16	22	758.10	750.45	1.82	1.70	Yes
23	764.02	756.08	24	762.11	754.35	1.91	1.73	Yes
25	768.77	760.52	26	767.05	758.91	1.72	1.62	Yes
27	775.32	766.57	28	773.28	764.55	2.04	2.02	Yes
29	779.31	770.16	30	777.34	768.34	1.97	1.82	Yes
31	777.96	769.12	32	776.10	767.39	1.85	1.73	Yes
33	772.48	763.95	34	770.55	762.12	1.93	1.84	Yes
35	767.38	759.13	36	765.52	757.34	1.86	1.79	Yes
37	762.49	755.22	38	760.56	753.64	1.93	1.58	Yes
39	756.89	749.35	40	755.03	747.60	1.86	1.75	Yes
41	752.57	745.31	42	750.66	743.53	1.91	1.78	Yes
43	747.61	740.69	44	745.66	738.90	1.95	1.79	Yes
45	742.70	736.13	46	740.80	734.38	1.90	1.76	Yes
47	736.94	731.03	48	735.34	729.60	1.60	1.43	Yes
49	786.14	776.62	50	784.37	774.93	1.77	1.69	Yes
51	791.22	781.47	52	789.41	779.73	1.81	1.75	Yes
53	798.87	788.33	54	797.30	786.87	1.57	1.45	Yes
55	807.47	796.52	56	805.66	794.94	1.81	1.58	Yes
57	803.75	793.49	58	801.93	791.77	1.82	1.72	Yes
59	798.75	788.66	60	796.86	786.85	1.89	1.81	Yes
61	793.74	784.05	62	791.99	782.50	1.76	1.56	Yes
63	788.58	778.94	64	786.76	777.07	1.82	1.87	Yes
65	782.68	773.52	66	780.90	771.83	1.78	1.69	Yes
67	778.73	769.87	68	776.89	768.12	1.84	1.75	Yes
69	774.03	765.50	70	772.16	763.69	1.87	1.82	Yes
71	768.85	760.68	72	767.02	758.92	1.83	1.75	Yes
73	764.05	758.31	74	762.16	756.50	1.88	1.81	Yes
75	758.81	753.81	76	757.57	752.60	1.23	1.21	Yes

BECK LANDFILL
ATTACHMENT 2 - DRAINAGE SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Bench Crest Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Bench Toe Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Pre-Settle Diff. (ft)	Post-Settle Diff. (ft)	Maintains Drainage?
77	753.97	750.48	78	752.18	748.70	1.79	1.77	Yes
79	814.24	803.37	80	812.32	801.39	1.92	1.98	Yes
81	819.16	808.30	82	817.54	806.75	1.63	1.55	Yes
83	830.65	819.14	84	828.87	817.31	1.78	1.84	Yes
85	825.45	813.92	86	823.59	812.00	1.86	1.92	Yes
87	820.42	809.06	88	818.49	807.22	1.93	1.85	Yes
89	813.31	801.92	90	811.54	800.22	1.77	1.69	Yes
91	810.11	799.39	92	808.27	797.57	1.84	1.82	Yes
93	805.64	795.04	94	803.76	793.21	1.87	1.83	Yes
95	800.87	790.29	96	798.93	788.42	1.95	1.86	Yes
97	795.97	786.42	98	794.07	784.52	1.90	1.90	Yes
99	790.80	784.48	100	789.15	783.18	1.65	1.31	Yes
101	857.65	845.27	102	855.76	843.42	1.90	1.85	Yes
103	852.84	840.20	104	850.95	838.33	1.90	1.87	Yes
105	847.31	834.83	106	845.43	832.83	1.88	1.99	Yes
107	842.10	829.46	108	840.54	827.94	1.56	1.52	Yes
109	837.54	825.18	110	835.64	823.36	1.90	1.82	Yes
111	832.87	820.56	112	830.95	818.74	1.92	1.83	Yes
113	828.27	815.82	114	826.34	813.93	1.93	1.89	Yes
115	823.29	813.37	116	821.40	811.61	1.89	1.77	Yes
117	818.39	814.53	118	816.55	812.59	1.84	1.93	Yes
119	749.77	742.74	120	747.76	740.85	2.01	1.88	Yes
121	744.96	738.26	122	743.09	736.50	1.88	1.76	Yes
123	739.85	733.50	124	737.96	731.73	1.90	1.77	Yes
125	734.95	728.94	126	733.11	727.23	1.85	1.71	Yes
127	729.88	724.22	128	728.09	722.58	1.79	1.64	Yes
129	724.86	719.56	130	723.28	718.09	1.58	1.46	Yes
131	777.84	769.09	132	775.87	767.20	1.97	1.90	Yes
133	773.13	764.84	134	771.44	763.22	1.70	1.62	Yes
135	768.09	760.01	136	766.40	758.36	1.69	1.65	Yes
137	762.99	755.14	138	761.25	753.48	1.74	1.65	Yes
139	757.96	750.38	140	756.22	748.74	1.75	1.65	Yes
141	753.07	745.97	142	751.24	744.16	1.83	1.81	Yes
143	748.07	741.26	144	746.26	739.54	1.80	1.72	Yes
145	805.78	795.67	146	803.99	793.96	1.79	1.71	Yes
147	801.16	792.12	148	799.29	790.04	1.87	2.08	Yes
149	796.05	786.38	150	794.18	784.56	1.86	1.82	Yes
151	791.03	781.64	152	789.20	779.86	1.83	1.78	Yes

BECK LANDFILL
ATTACHMENT 2 - DRAINAGE SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Bench Crest Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Bench Toe Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Pre-Settle Diff. (ft)	Post-Settle Diff. (ft)	Maintains Drainage?
153	785.92	776.75	154	784.20	775.07	1.73	1.68	Yes
155	780.95	772.12	156	779.09	770.33	1.87	1.79	Yes
157	833.81	822.01	158	831.91	820.15	1.90	1.86	Yes
159	829.06	817.79	160	827.30	816.00	1.75	1.79	Yes
161	824.04	812.61	162	822.16	810.77	1.88	1.85	Yes
163	818.98	807.95	164	817.14	806.15	1.84	1.80	Yes
165	813.92	803.23	166	812.10	801.45	1.82	1.79	Yes
167	808.90	798.68	168	807.08	796.88	1.82	1.80	Yes
169	861.80	847.74	170	859.90	845.60	1.90	2.14	Yes
171	857.08	843.79	172	855.39	842.16	1.69	1.63	Yes
173	852.03	839.07	174	850.22	837.30	1.80	1.77	Yes
175	846.95	834.47	176	845.02	832.59	1.93	1.88	Yes
177	841.78	829.73	178	839.92	827.91	1.85	1.82	Yes
179	732.03	726.28	180	730.09	724.52	1.94	1.76	Yes
181	736.79	730.66	182	734.97	728.95	1.82	1.70	Yes
183	741.46	734.98	184	739.60	733.29	1.86	1.69	Yes
185	747.90	741.40	186	746.02	739.60	1.88	1.81	Yes
187	742.66	736.51	188	740.92	734.84	1.74	1.67	Yes
189	737.84	731.86	190	735.98	730.09	1.86	1.76	Yes
191	732.88	727.01	192	731.09	725.39	1.79	1.62	Yes
193	727.87	722.41	194	726.10	720.81	1.76	1.60	Yes
195	723.04	718.43	196	721.16	717.06	1.87	1.37	Yes
197	760.09	752.39	198	758.18	750.58	1.91	1.82	Yes
199	764.84	756.99	200	762.99	755.23	1.85	1.76	Yes
201	769.73	761.82	202	767.83	759.96	1.91	1.86	Yes
203	777.17	768.96	204	775.29	767.12	1.88	1.84	Yes
205	771.60	764.26	206	769.82	762.44	1.78	1.82	Yes
207	767.35	759.94	208	765.37	757.99	1.98	1.95	Yes
209	762.64	755.74	210	760.87	754.10	1.76	1.63	Yes
211	758.05	751.24	212	756.23	749.54	1.82	1.71	Yes
213	753.03	746.57	214	751.17	744.87	1.86	1.70	Yes
215	748.45	741.93	216	746.51	740.07	1.94	1.86	Yes
217	792.01	782.83	218	790.20	781.00	1.81	1.84	Yes
219	797.00	787.95	220	795.16	786.17	1.84	1.78	Yes
221	805.67	796.49	222	803.81	794.68	1.86	1.81	Yes
223	802.22	793.35	224	800.40	791.53	1.82	1.82	Yes
225	797.89	789.40	226	796.07	787.63	1.82	1.77	Yes
227	793.50	785.23	228	791.61	783.46	1.89	1.77	Yes

BECK LANDFILL
ATTACHMENT 2 - DRAINAGE SPREADSHEET

Project: Beck Landfill
Project No.: 311-653
Subject: Final Grades Settlement
Prepared By: ZLM 4/7/2022
Checked By: TDM 4/22/2022

Bench Crest Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Bench Toe Point	Pre Settle Elev. (ft)	Post Settle Elev. (ft)	Pre-Settle Diff. (ft)	Post-Settle Diff. (ft)	Maintains Drainage?
229	789.38	784.68	230	787.49	783.22	1.89	1.45	Yes
231	784.57	780.48	232	782.78	779.04	1.78	1.44	Yes
233	780.04	776.32	234	778.32	774.74	1.72	1.58	Yes
235	820.01	808.95	236	818.17	807.17	1.84	1.78	Yes
237	823.95	813.34	238	822.03	811.27	1.92	2.06	Yes
239	832.05	821.87	240	830.32	819.83	1.73	2.03	Yes
241	827.91	824.49	242	826.07	822.64	1.85	1.85	Yes
243	823.62	814.65	244	821.67	812.59	1.95	2.05	Yes
245	819.74	814.15	246	817.97	812.51	1.77	1.65	Yes
247	815.84	811.56	248	814.08	809.81	1.76	1.74	Yes
249	812.05	807.88	250	810.30	806.15	1.75	1.73	Yes

Appendix D5-B

Slope Stability Analyses

CALCULATION BRIEF

BECK LANDFILL
VERTICAL EXPANSION PERMIT APPLICATION
OVERALL SLOPE STABILITY

OBJECTIVE: Evaluate the overall (i.e., at final grades) slope stability of the final grading configurations at the Beck Landfill, using slope stability cross-sections to model the critical slopes of the landfill area. The landfill area consists of an existing construction and demolition (C&D) landfill. The landfill footprint has previously been excavated to proposed base grades and is in the process of being filled to the currently permitted final grades. The slope stability analyses presented herein will encompass failure surfaces within the C&D waste configured to the vertical expansion final grades, existing base liner system, and existing foundation soils under static conditions. As the Beck Landfill is not located in a seismic region, no seismic analysis is included with this calculation.

METHODOLOGY: Use the slope stability computer software SLIDE to evaluate slope stability by means of circular and non-circular failure search methods under static conditions.

REFERENCES:

1. Slide; Version 9.020 64-bit, Rocscience Inc., March 2022.

2. Beck Readymix Concrete Company Type IV Landfill Permit Application No. 1848, prepared by Snowden, Inc., Last Revised January 1989.

3. "Geotechnical Data Report: Beck Landfill Southeast Section" prepared by Terracon October 20, 2020.

4. Waste Materials in Construction (pp. 225-231), edited by Th.G. Aalbers, J.J.J.M. Goumans, and H.A. van der Sloot, 1991.

5. Construction Demolition Waste (pp. 150-154), edited by Mukesh C. Limbachiya and J. J. Roberts, 2004.

6. Proceedings of the First International Conference on Construction Materials and Structures (p. 591), edited by Steven O. Ekolu, Morgan Dundu, and Xiaojian Gao, 2014.

7. Kavazanjian, E. Jr., et al, "Evaluation of MSW Properties for Seismic Analysis," Geoenvironment 2000, ASCE Geotechnical Special Publication No. 46, 1995.

8. "Geotechnical Engineering Investigation Manual", R.E. Hunt, 1984.

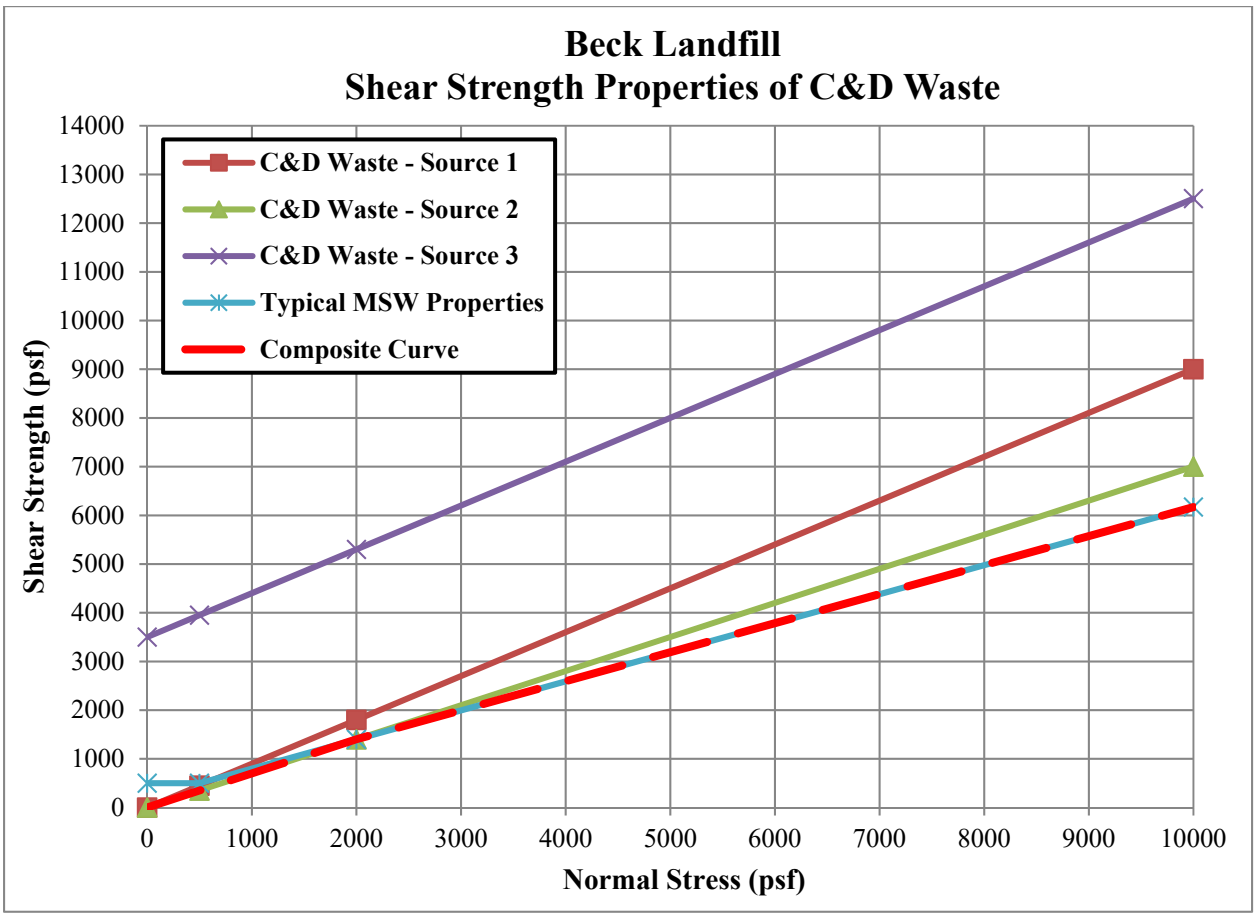
ANALYSIS:

Overall slope stability of the Beck Landfill final grading configuration was analyzed using four (4) cross-sections located in the landfill area to evaluate the final grading configurations of the landfill. The cross-sections were located to encompass critical locations and combinations of the waste mass under the proposed vertical expansion final grading configuration. CEC is not aware of record drawings detailing the base grading configuration, base grading was considered as a crucial factor in selection of cross-section locations. Based on previously permitted documents, it is assumed that the base grades are located at a bottom elevation of 650 ft above mean sea level and consist of 3 horizontal to 1 vertical (3H:1V) excavated sideslopes. Cross-sections were also located in order to evaluate critical areas surrounding the landfill, such as Cibolo Creek, or residential areas that are located downslope of the landfill. The cross-section locations and final grading configurations are shown on the attached Figure 1.

The overall stability of the landfill depends on the individual shear strength properties of the soils, waste, and base liner system components used in its construction. This analysis incorporates shear strength properties for the C&D waste material using data from Ref. Nos. 4, 5, and 6, as well as typical municipal solid waste (MSW) properties (Ref. No. 7) for comparison. The table and graph below present the peak shear strength properties determined for the various waste materials. CEC notes that strengths used for C&D stability analysis used a composite strength curve that combined the lowest C&D waste strength per literature sources considered, and typical MSW strengths, which are considered were shown to be lower at higher normal loads.

Waste Shear Strength Properties

	Friction Angle (degrees)	**Cohesion (psf)**
C&D Waste - Source 1 (Ref. No. 4)	42	0
C&D Waste - Source 2 (Ref. No. 5)	35	0
C&D Waste - Source 3 (Ref. No. 6)	42	3,500
Typical MSW	0 for $0 < \sigma < 500$ psf, and 33 for $\sigma > 500$ psf	500 psf for $0 < \sigma < 500$ psf, and 0 for $\sigma > 500$ psf



As shown in the above graph, a composite curve was developed to represent the lowest anticipated peak shear strength properties of the C&D waste at different normal stresses. These normal and shear stress parameters were then input into the SLIDE program to model the C&D waste mass. A table of normal shear stress points used to represent the modeled composite shear strength is shown in the table below.

Effective Normal Stress (psf)	Shear Stress (psf)
0	0
2000	1400
10000	6169

The Beck Landfill liner system was excavated to base grades and constructed with an in-situ clay liner. All excavation of the landfill footprint has previously occurred, and no further excavation or lateral

expansion is proposed with this permit amendment application. The shear strength properties for the various soils materials used in the construction of Beck Landfill are listed below.

Shear Strength and Unit Weight Properties of Clay Subgrade (Ref. No. 2 and Similar Site Experience):

Unit Weight = 108 pcf
ϕ = 0 degrees
c = 1400 psf

Shear Strength and Unit Weight Properties of Shale Subgrade (Ref. No. 8):

Unit Weight = 118 pcf
ϕ = 27 degrees
c = 0 psf

Shear Strength and Unit Weight Properties of Soil Perimeter Berm (CEC Experience with Similar Site):

Unit Weight = 123 pcf
ϕ = 28 degrees
c = 270 psf

Shear Strength and Unit Weight Properties of In-situ Clay Liner (CEC Experience with Similar Site):

Unit Weight = 123 pcf
ϕ = 28 degrees
c = 270 psf

A piezometric surface was conservatively assumed to develop within the waste mass to the top of the soil perimeter berm elevation. CEC notes that this does not necessarily indicate that the waste mass is saturated, however, for modeling purposes, CEC intended to build some conservatism into the models. CEC does not possess any data currently that would indicate a piezometric surface has developed in the waste mass.

STATIC SLOPE STABILITY RESULTS

As stated above, a total of four (4) slope stability cross-sections were analyzed to encompass critical locations and combinations of waste mass and final grades. For each cross section, two (2) failure search methods were performed, including a circular and non-circular search routines. The following minimum factors of safety were obtained for each of the cross-sections analyzed. Outputs for the static slope stability analyses are included as Attachment 1 at the end of this calculation brief.

Static Results

Cross Section	Failure Type	Minimum Factor of Safety
A	Circular	2.46
A	Non-Circular	2.34
B	Circular	2.43
B	Non-Circular	2.34
C	Circular	2.30
C	Non-Circular	2.22
D	Circular	2.44
D	Non-Circular	2.37

CONCLUSIONS: As shown above, the calculated FSs indicate that the overall stability of the Beck Landfill will be stable under static conditions (FS $\geq$ 1.5), for the assumptions and conditions modeled.

Please note that these assumptions do not model interim slope conditions, nor do they account for any additional loading from stockpiled materials located above proposed final grading. It is recommended to verify the material property assumptions included in this calculation for consistency with actual site conditions prior to increasing waste placement from the currently permitted elevations.

Also, laboratory testing for unit weight and shear strength properties should be performed on the specific soil materials to be used in landfill construction (i.e. shale and clay subgrades, cohesive soil for soil perimeter berm) to verify the material properties are consistent with the shear strength property assumptions listed in the table above, under moderate to high normal loads.

FIGURE 1

SLOPE STABILITY CROSS-SECTION LOCATIONS – FINAL GRADING

FIGURE 1 - PROPOSED FINAL GRADES

NORTH

A

B

C

D

REFERENCE

EXISTING GROUND CONTOURS: UNITED STATES GEOLOGICAL SURVEY (USGS) HURRICANE LIDAR, 20190220 SUPPLEMENTED WITH SURVEY BY FIRMATEK DATED OCTOBER 24, 2020.

SCALE IN FEET

0 200 400

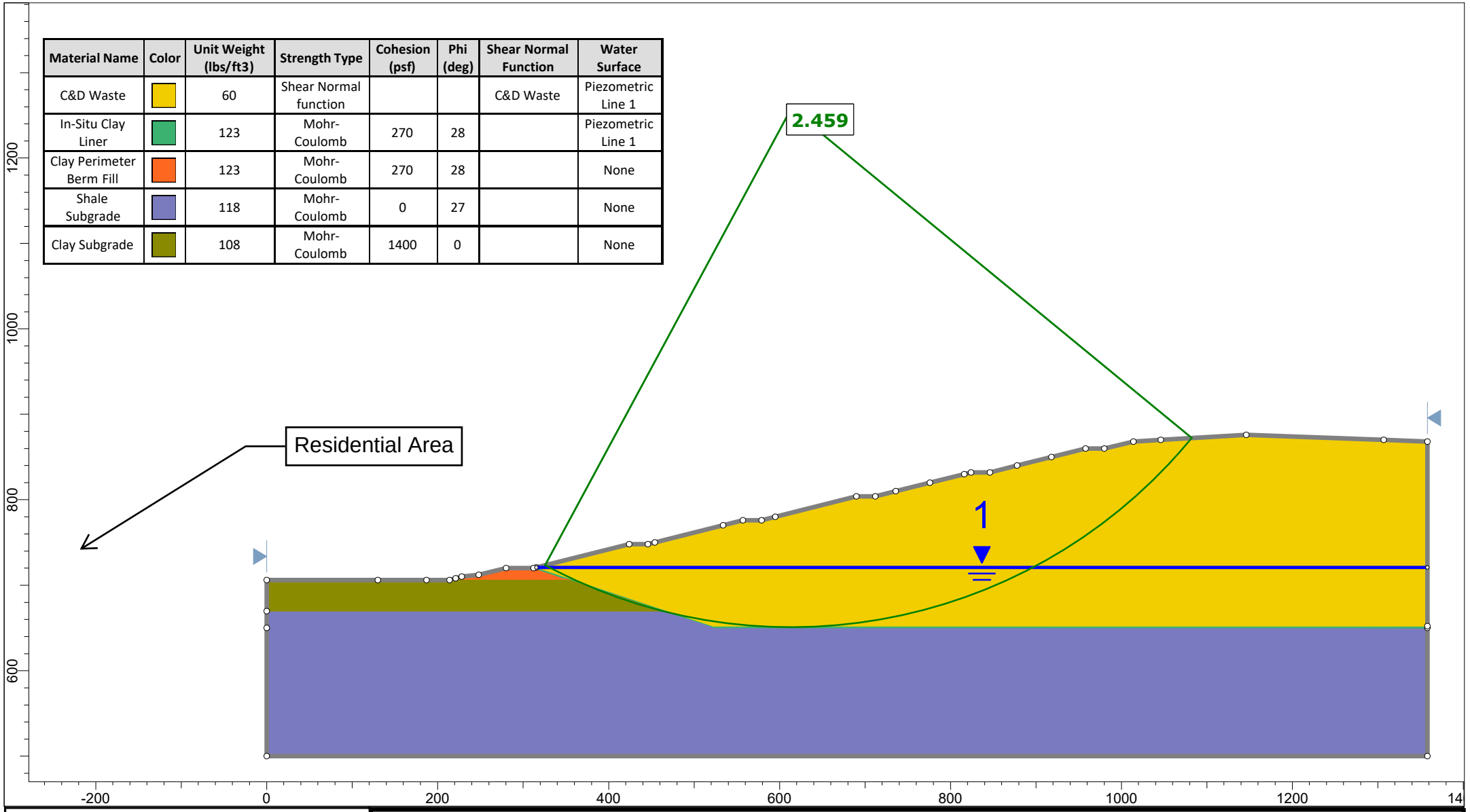
ATTACHMENT 1

SLIDE OUTPUTS

CROSS-SECTION A

CIRCULAR ARC

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In-Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



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SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section A, Circular

Created By: ZLM	Checked By: TDM	Civil & Environmental Consultants, Inc.
Created Date: 3-18-22	Checked Date: 4-22-22	

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:00m:04.616s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In-Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.459070
Center:	613.558, 1257.859
Radius:	607.115
Left Slip Surface Endpoint:	325.574, 723.393
Right Slip Surface Endpoint:	1082.433, 872.186
Resisting Moment:	1.18703e+09 lb-ft
Driving Moment:	4.82715e+08 lb-ft
Resisting Horizontal Force:	1.80161e+06 lb
Driving Horizontal Force:	732637 lb
Total Slice Area:	77432.2 ft2
Surface Horizontal Width:	756.859 ft
Surface Average Height:	102.307 ft

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.45907

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.75762	531.769	-28.0625	C&D Waste	1.42109e-14	34.992	37.6644	92.6193	132.313	0	132.313	112.234	112.234
2	15.714	9135.38	-26.976	C&D Waste	5.68434e-14	34.992	113.135	278.208	646.975	249.538	397.437	589.39	339.852
3	15.714	20115.4	-25.3236	C&D Waste	1.13687e-13	34.992	191.101	469.931	1402.42	731.089	671.332	1311.99	580.903
4	19.5983	40893.7	-23.4949	In-Situ Clay Liner	270	28	344.811	847.914	2315.8	1228.9	1086.9	2165.91	937.005
5	16.4207	47558.4	-21.6527	Clay Subgrade	1400	0	569.321	1400	3270.92	0	3270.92	3044.91	3044.91
6	16.4207	58376	-19.9944	Clay Subgrade	1400	0	569.321	1400	3968.56	0	3968.56	3761.41	3761.41
7	16.4207	67915	-18.3535	Clay Subgrade	1400	0	569.321	1400	4586.59	0	4586.59	4397.72	4397.72
8	16.4207	73544.7	-16.728	Clay Subgrade	1400	0	569.321	1400	4956.67	0	4956.67	4785.56	4785.56
9	16.4207	79819	-15.1162	Clay Subgrade	1400	0	569.321	1400	5361.1	0	5361.1	5207.31	5207.31
10	20.7963	110906	-13.3051	In-Situ Clay Liner	270	28	656.789	1615.09	5882.19	3352.43	2529.76	5726.87	2374.44
11	15.046	86947.2	-11.572	C&D Waste	207.75	30.8002	754.838	1856.2	6367.28	3601.99	2765.29	6212.72	2610.73
12	15.046	92946.5	-10.126	C&D Waste	207.75	30.8002	811.221	1994.85	6779.79	3781.96	2997.83	6634.91	2852.95
13	15.046	98592.8	-8.68657	C&D Waste	207.75	30.8002	864.925	2126.91	7156.94	3937.52	3219.42	7024.8	3087.28
14	15.046	103926	-7.25262	C&D Waste	207.75	30.8002	916.497	2253.73	7501.1	4068.98	3432.12	7384.47	3315.49
15	15.046	108971	-5.82322	C&D Waste	207.75	30.8002	966.268	2376.12	7814.04	4176.6	3637.44	7715.49	3538.89
16	15.046	111420	-4.39745	C&D Waste	207.75	30.8002	974.088	2395.35	7930.25	4260.57	3669.68	7855.34	3594.77

17	15.6095	117838	-2.9478	In-Situ Clay Liner	270	28	905.106	2225.72	7999.91	4321.75	3678.16	7953.3	3631.55
18	15.6095	122509	-1.47341	In-Situ Clay Liner	270	28	949.522	2334.94	8242.96	4359.36	3883.6	8218.53	3859.17
19	15.6095	126586	0	In-Situ Clay Liner	270	28	988.654	2431.17	8436.46	4371.88	4064.58	8436.46	4064.58
20	15.6095	129894	1.47341	In-Situ Clay Liner	270	28	1020.33	2509.07	8570.41	4359.36	4211.05	8596.65	4237.29
21	15.6095	132430	2.9478	In-Situ Clay Liner	270	28	1044.95	2569.61	8646.67	4321.75	4324.92	8700.48	4378.73
22	15.2626	131765	4.40772	C&D Waste	207.75	30.8002	1164.78	2864.27	8716.27	4259.97	4456.3	8806.05	4546.08
23	15.2626	134041	5.85406	C&D Waste	207.75	30.8002	1198.36	2946.85	8769.27	4174.44	4594.83	8892.14	4717.7
24	15.2626	135429	7.30416	C&D Waste	207.75	30.8002	1222.82	3007	8760.35	4064.58	4695.77	8917.09	4852.51
25	15.2626	133837	8.75899	C&D Waste	207.75	30.8002	1206.23	2966.2	8557.48	3930.17	4627.31	8743.33	4813.16
26	15.2626	133601	10.2195	C&D Waste	207.75	30.8002	1217.13	2993	8443.2	3770.95	4672.25	8662.63	4891.68
27	15.2626	134390	11.6868	C&D Waste	207.75	30.8002	1249.92	3073.63	8394.14	3586.6	4807.54	8652.69	5066.09
28	15.2626	134804	13.1619	C&D Waste	207.75	30.8002	1283.16	3155.37	8321.4	3376.74	4944.66	8621.46	5244.72
29	15.2626	134838	14.646	C&D Waste	207.75	30.8002	1317.08	3238.8	8225.55	3140.94	5084.61	8569.75	5428.81
30	15.2626	134483	16.1402	C&D Waste	207.75	30.8002	1351.91	3324.43	8106.91	2878.68	5228.23	8498.14	5619.46
31	15.2626	133732	17.6457	C&D Waste	207.75	30.8002	1387.78	3412.66	7965.61	2589.4	5376.21	8407.06	5817.66
32	15.2626	132574	19.164	C&D Waste	207.75	30.8002	1424.85	3503.81	7801.61	2272.43	5529.18	8296.79	6024.36
33	15.2626	129967	20.6963	C&D Waste	207.75	30.8002	1448.49	3561.93	7553.66	1927.03	5626.63	8100.89	6173.86
34	15.2626	124749	22.2444	C&D Waste	207.75	30.8002	1442.98	3548.39	7156.28	1552.37	5603.91	7746.45	6194.08
35	15.2626	121511	23.8097	C&D Waste	207.75	30.8002	1473.46	3623.33	6877.1	1147.48	5729.62	7527.27	6379.79
36	15.2626	118604	25.3942	C&D Waste	207.75	30.8002	1516.24	3728.55	6617.43	711.304	5906.13	7337.21	6625.91
37	15.2626	115220	26.9998	C&D Waste	207.75	30.8002	1560.1	3836.39	6329.67	242.618	6087.06	7124.58	6881.96
38	14.2807	104308	28.5755	C&D Waste	207.75	30.8002	1549.59	3810.55	6043.69	0	6043.69	6887.7	6887.7
39	14.2807	100485	30.1219	C&D Waste	207.75	30.8002	1482.58	3645.78	5767.3	0	5767.3	6627.48	6627.48
40	14.2807	96216.5	31.693	C&D Waste	207.75	30.8002	1411.25	3470.36	5473.02	0	5473.02	6344.39	6344.39
41	14.2807	91480.4	33.2912	C&D Waste	207.75	30.8002	1335.29	3283.57	5159.69	0	5159.69	6036.52	6036.52
42	14.2807	85472.5	34.9192	C&D Waste	207.75	30.8002	1243.46	3057.75	4780.88	0	4780.88	5648.95	5648.95
43	14.2807	76829.5	36.5803	C&D Waste	207.75	30.8002	1116.99	2746.76	4259.19	0	4259.19	5088.15	5088.15
44	14.2807	69355.1	38.2779	C&D Waste	207.75	30.8002	1008.88	2480.9	3813.22	0	3813.22	4609.35	4609.35
45	14.2807	62269.5	40.0162	C&D Waste	207.75	30.8002	907.916	2232.63	3396.73	0	3396.73	4159.01	4159.01
46	14.2807	53878.5	41.8001	C&D Waste	207.75	30.8002	790.75	1944.51	2913.41	0	2913.41	3620.43	3620.43
47	14.2807	43385.3	43.6352	C&D Waste	207.75	30.8002	646.684	1590.24	2319.13	0	2319.13	2935.72	2935.72
48	14.2807	32079.9	45.5283	C&D Waste	0	34.992	482.837	1187.33	1696.18	0	1696.18	2188.01	2188.01
49	14.2807	19911.2	47.4875	C&D Waste	1.13687e-13	34.992	297.61	731.843	1045.49	0	1045.49	1370.13	1370.13
50	14.2807	6802.18	49.5229	C&D Waste	2.84217e-14	34.992	100.846	247.988	354.268	0	354.268	472.44	472.44

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.45907

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	325.574	723.393	0	0	0
2	330.332	720.857	515.09	2.03427	0.22628
3	346.046	712.859	7470.75	126.812	0.972472
4	361.76	705.423	20907.1	625.694	1.7142
5	381.358	696.903	47405.8	2175.79	2.62787
6	397.779	690.384	78093.3	4611.29	3.3793
7	414.199	684.41	111169	7995.92	4.11396
8	430.62	678.962	145520	12291.9	4.82824
9	447.041	674.027	179347	17328.4	5.51875
10	463.461	669.591	212492	23017.4	6.18225
11	484.258	664.673	255102	31227.9	6.97905
12	499.304	661.592	286096	37777.7	7.52213
13	514.35	658.905	316541	44684	8.03498
14	529.396	656.606	346029	51811.2	8.51568
15	544.442	654.692	374205	59017.5	8.96254
16	559.488	653.157	400759	66158.5	9.37401
17	574.534	652	424616	72952.3	9.74868
18	590.143	651.196	445199	79279.3	10.0972
19	605.753	650.795	463355	85070.8	10.4035
20	621.362	650.795	478814	90183.7	10.6666
21	636.972	651.196	491327	94486.2	10.8856
22	652.581	652	500716	97870.6	11.0597
23	667.844	653.176	508270	100511	11.186
24	683.107	654.741	512868	102188	11.2685
25	698.369	656.698	514426	102857	11.3069
26	713.632	659.049	512744	102467	11.3011
27	728.895	661.801	508120	101082	11.2512
28	744.157	664.958	500729	98758	11.1572
29	759.42	668.527	490647	95544.7	11.0194
30	774.683	672.516	477974	91510.3	10.8384
31	789.945	676.933	462835	86739.5	10.6146
32	805.208	681.788	445380	81331.3	10.3488
33	820.47	687.092	425782	75397.9	10.0419
34	835.733	692.858	404372	69083	9.69483
35	850.996	699.1	381762	62575.9	9.30877
36	866.258	705.835	357973	55961.9	8.88513
37	881.521	713.081	333209	49354.5	8.42532
38	896.784	720.857	307838	42885.8	7.93099
39	911.064	728.635	282996	36950	7.43887
40	925.345	736.921	256419	31119.8	6.91975
41	939.626	745.738	228349	25513.9	6.37533
42	953.907	755.116	199065	20246.6	5.8075
43	968.187	765.085	169190	15451.8	5.21824
44	982.468	775.684	140029	11290.1	4.60961
45	996.749	786.953	111489	7764.33	3.98377
46	1011.03	798.943	83750.6	4892.11	3.34301
47	1025.31	811.711	57862.5	2718.29	2.68969
48	1039.59	825.327	35535.8	1257.22	2.02622
49	1053.87	839.874	17769.3	420.336	1.35509
50	1068.15	855.452	5740.12	68.0115	0.678834
51	1082.43	872.186	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
315.429	720.857
1358	720.857

External Boundary

X	Y
0	706
0	669.5
0	650
0	500
1358	500
1358	650
1358	652
1358	868
1307	870
1146	876
1046	870
1014	868
980	860
958	860
918	850
878	840
846	832
824	832
816	830
776	820
736	810
712	804
690	804
595	780
579	776
557	776
534	770
454	750
446	748
424	748
315.429	720.857
312	720
280	720
248	712
228	710
221	708
214	706
187	706
130	706

Material Boundary

X	Y
312	720
348	708
354.012	706
463.735	669.5
522.354	650

Material Boundary

X	Y
522.354	650
1358	650

Material Boundary

X	Y
214	706
354.012	706

Material Boundary

X	Y
522.354	652
1358	652

Material Boundary

X	Y
315.429	720.857
348	710
354.012	708
522.354	652

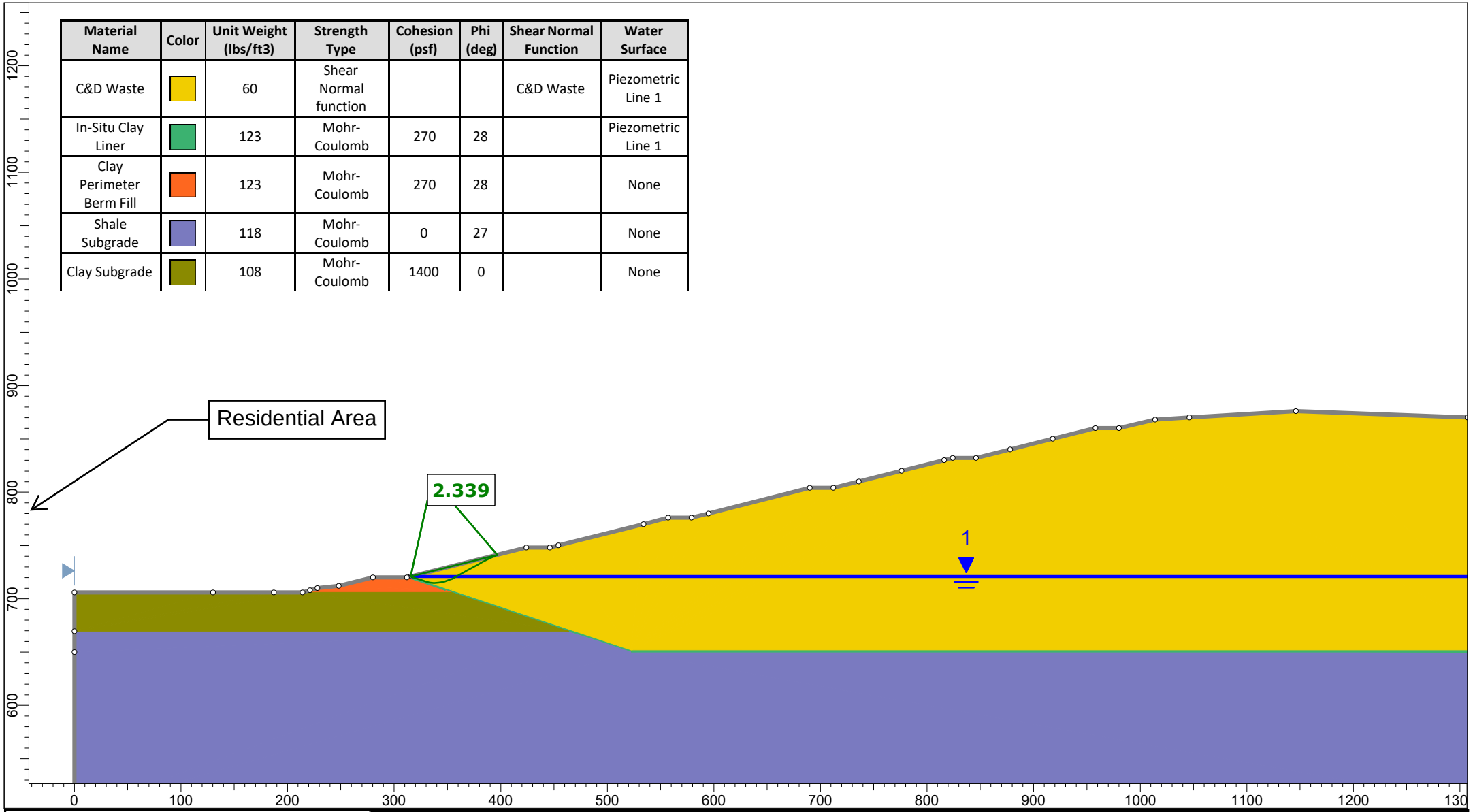
Material Boundary

X	Y
0	669.5
463.735	669.5

CROSS-SECTION A

NON-CIRCULAR SEARCH

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In-Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



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SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section A, Non-Circular

Created By: ZLM	Checked By: TDM	Civil & Environmental Consultants, Inc.
Created Date: 3-18-22	Checked Date: 4-22-22	

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:02m:09.241s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	500
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In-Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.338560
Axis Location:	335.755, 812.325
Left Slip Surface Endpoint:	315.429, 720.857
Right Slip Surface Endpoint:	396.734, 741.183
Resisting Moment:	1.61877e+06 lb-ft
Driving Moment:	692208 lb-ft
Resisting Horizontal Force:	16003.5 lb
Driving Horizontal Force:	6843.32 lb
Total Slice Area:	581.881 ft2
Surface Horizontal Width:	81.3051 ft
Surface Average Height:	7.15676 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
315.429	720.857
318.972	719.676
322.516	718.495
326.043	717.319
329.571	716.143
333.519	715.185
337.365	714.816
339.577	714.979
341.813	715.237
344.413	715.591
347.013	716.046
350.295	717.151
352.406	717.909
354.516	718.667
356.898	720.02
359.279	721.369
361.661	722.712
364.043	724.05
365.68	724.965
367.317	725.877
370.037	727.387
373.43	729.259
375.33	730.298
377.717	731.595
380.424	733.069
383.411	734.781
386.209	736.288
389.008	737.697
392.871	739.508
396.734	741.183

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.33856

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.77167	54.9327	-18.4359	C&D Waste	0	34.992	4.27819	10.0048	32.7063	18.4137	14.2926	31.2801	12.8664
2	1.77167	164.798	-18.4359	C&D Waste	3.55271e-15	34.992	13.198	30.8643	99.3584	55.2664	44.092	94.9589	39.6925
3	1.26649	185.14	-18.4322	C&D Waste	7.10543e-15	34.992	21.2871	49.7812	157.978	86.8622	71.1156	150.883	64.021
4	2.27729	474.114	-18.4322	C&D Waste	0	34.992	31.305	73.2087	228.296	123.712	104.584	217.862	94.1502
5	1.7639	491.966	-18.434	C&D Waste	0	34.992	43.3968	101.486	310.714	165.735	144.979	296.249	130.514
6	1.7639	600.859	-18.434	C&D Waste	0	34.992	54.578	127.634	384.757	202.422	182.335	366.565	164.143
7	1.7639	709.753	-18.434	C&D Waste	0	34.992	66.3088	155.067	460.633	239.109	221.524	438.531	199.422
8	1.7639	818.646	-18.434	C&D Waste	0	34.992	78.5543	183.704	538.229	275.796	262.433	512.046	236.25
9	1.31582	676.903	-13.6495	C&D Waste	2.84217e-14	34.992	83.8785	196.155	584.331	304.109	280.222	563.962	259.853
10	1.31582	728.101	-13.6495	C&D Waste	0	34.992	92.4612	216.226	632.943	324.048	308.895	610.49	286.442
11	1.31582	779.299	-13.6495	C&D Waste	0	34.992	101.16	236.568	681.941	343.987	337.954	657.375	313.388
12	1.92312	1214.76	-5.47569	C&D Waste	2.84217e-14	34.992	99.8683	233.548	693.346	359.708	333.638	683.773	324.065
13	1.92312	1291.51	-5.47569	C&D Waste	0	34.992	110.462	258.322	740.242	371.212	369.03	729.653	358.441
14	2.21195	1555.49	4.21615	C&D Waste	0	34.992	106.934	250.072	729.119	371.876	357.243	737.002	365.126
15	2.23638	1618.99	6.59465	C&D Waste	0	34.992	113.487	265.397	737.862	358.722	379.14	750.982	392.26
16	1.30001	958.636	7.73566	C&D Waste	5.68434e-14	34.992	119.486	279.425	744.324	345.145	399.179	760.555	415.41
17	1.30001	970.212	7.73566	C&D Waste	5.68434e-14	34.992	125.116	292.592	752.115	334.126	417.989	769.11	434.984
18	1.30001	979.8	9.92885	C&D Waste	0	34.992	127.164	297.381	746.346	321.516	424.83	768.606	447.09
19	1.30001	987.4	9.92885	C&D Waste	0	34.992	132.691	310.305	750.61	307.316	443.294	773.837	466.521
20	1.64104	1244.22	18.6054	C&D Waste	5.68434e-14	34.992	124.849	291.967	700.074	282.98	417.094	742.104	459.124
21	1.64104	1230.22	18.6054	C&D Waste	0	34.992	131.77	308.151	688.72	248.508	440.212	733.079	484.571
22	2.11012	1558.28	19.7584	C&D Waste	0	34.992	137.965	322.64	668.538	207.623	460.915	718.095	510.472
23	2.11012	1529.1	19.7584	C&D Waste	0	34.992	147.214	344.268	652.138	160.327	491.811	705.017	544.69
24	1.19095	841.25	29.6082	C&D Waste	0	34.992	138.599	324.122	578.595	115.563	463.032	657.356	541.793
25	1.19095	814.165	29.6082	C&D Waste	0	34.992	144.496	337.912	556.064	73.332	482.732	638.176	564.844
26	1.47834	973.093	29.5177	C&D Waste	5.68434e-14	34.992	151.328	353.889	531.658	26.1019	505.556	617.337	591.235
27	0.903558	574.337	29.5177	C&D Waste	0	34.992	152.912	357.595	510.851	0	510.851	597.427	597.427
28	2.3819	1440.18	29.4212	C&D Waste	0	34.992	145.386	339.993	485.703	0	485.703	567.695	567.695

29	1.19095	680.112	29.318	C&D Waste	0	34.992	137.301	321.086	458.695	0	458.695	535.801	535.801
30	1.19095	653.596	29.318	C&D Waste	0	34.992	131.888	308.429	440.613	0	440.613	514.68	514.68
31	1.63672	855.176	29.2071	C&D Waste	5.68434e-14	34.992	125.682	293.915	419.879	0	419.879	490.141	490.141
32	1.63672	805.651	29.1267	C&D Waste	0	34.992	118.519	277.163	395.947	0	395.947	461.986	461.986
33	1.36033	632.139	29.0416	C&D Waste	5.68434e-14	34.992	112.041	262.015	374.307	0	374.307	436.519	436.519
34	1.36033	598.246	29.0416	C&D Waste	0	34.992	106.118	248.163	354.519	0	354.519	413.442	413.442
35	1.69612	698.753	28.8856	C&D Waste	0	34.992	99.6831	233.115	333.021	0	333.021	388.016	388.016
36	1.69612	646.676	28.8856	C&D Waste	2.84217e-14	34.992	92.4184	216.126	308.751	0	308.751	359.738	359.738
37	1.90054	663.295	28.6618	C&D Waste	0	34.992	84.9749	198.719	283.883	0	283.883	330.332	330.332
38	2.38733	742.626	28.5248	C&D Waste	0	34.992	76.0866	177.933	254.19	0	254.19	295.544	295.544
39	1.35321	376.322	28.5636	C&D Waste	0	34.992	68.2296	159.559	227.942	0	227.942	265.085	265.085
40	1.35321	343.977	28.5636	C&D Waste	2.84217e-14	34.992	62.5363	146.245	208.922	0	208.922	242.966	242.966
41	1.49346	340.14	29.8307	C&D Waste	0	34.992	55.6064	130.039	185.77	0	185.77	217.656	217.656
42	1.49346	296.859	29.8307	C&D Waste	0	34.992	48.7231	113.942	162.775	0	162.775	190.713	190.713
43	1.39918	240.9	28.3023	C&D Waste	1.42109e-14	34.992	42.8982	100.32	143.314	0	143.314	166.414	166.414
44	1.39918	207.012	28.3023	C&D Waste	1.42109e-14	34.992	36.998	86.522	123.603	0	123.603	143.526	143.526
45	1.39918	175.176	26.7287	C&D Waste	0	34.992	31.7971	74.3595	106.228	0	106.228	122.24	122.24
46	1.39918	145.39	26.7287	C&D Waste	7.10543e-15	34.992	26.4803	61.9257	88.465	0	88.465	101.8	101.8
47	1.93153	155.675	25.1104	C&D Waste	0	34.992	20.8513	48.7619	69.6597	0	69.6597	79.4317	79.4317
48	1.93153	106.73	25.1104	C&D Waste	0	34.992	14.3548	33.5695	47.9564	0	47.9564	54.6838	54.6838
49	1.93153	61.6929	23.448	C&D Waste	0	34.992	8.4162	19.6818	28.1168	0	28.1168	31.7672	31.7672
50	1.93153	20.5643	23.448	C&D Waste	-8.88178e-16	34.992	2.81412	6.581	9.40144	0	9.40144	10.622	10.622

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.33856

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	315.429	720.857	0	0	0
2	317.2	720.267	26.8955	0.485219	1.03356
3	318.972	719.676	108.958	3.92218	2.0616
4	320.238	719.254	202.599	9.87368	2.79011
5	322.516	718.495	447.16	31.8937	4.07971
6	324.28	717.907	706.387	62.4814	5.05478
7	326.043	717.319	1028.87	108.204	6.0036
8	327.807	716.731	1416.65	171.976	6.92162
9	329.571	716.143	1871.66	256.53	7.80434
10	330.887	715.824	2168.74	321.7	8.43744
11	332.203	715.504	2492.65	396.895	9.04704
12	333.519	715.185	2843.66	482.586	9.63167
13	335.442	715	3163.54	582.807	10.4383
14	337.365	714.816	3512.44	694.513	11.1848
15	339.577	714.979	3630.08	769.24	11.9644
16	341.813	715.237	3693.11	829.725	12.6623
17	343.113	715.414	3717	859.823	13.0247
18	344.413	715.591	3746.83	889.466	13.3543
19	345.713	715.818	3742.31	908.865	13.6507
20	347.013	716.046	3744	927.463	13.9132
21	348.654	716.598	3562.13	901.072	14.1957
22	350.295	717.151	3397.89	873.872	14.4228
23	352.406	717.909	3182.29	830.859	14.6326
24	354.516	718.667	2998.64	789.426	14.7491
25	355.707	719.343	2772.12	731.053	14.7735
26	356.898	720.02	2567.88	676.925	14.7679
27	358.376	720.857	2346.59	616.467	14.7194
28	359.279	721.369	2223.42	581.94	14.6671
29	361.661	722.712	1917.27	493.958	14.4473
30	362.852	723.381	1774	451.959	14.2931
31	364.043	724.05	1636.38	411.321	14.1096
32	365.68	724.965	1457.9	358.367	13.8101
33	367.317	725.877	1290.78	308.855	13.4566
34	368.677	726.632	1160.47	270.527	13.1223
35	370.037	727.387	1037.04	234.699	12.7521
36	371.733	728.323	894.494	194.069	12.2411
37	373.43	729.259	762.333	157.553	11.677
38	375.33	730.298	628.913	122.068	10.9842
39	377.717	731.595	480.732	85.0029	10.0274
40	379.071	732.332	405.142	67.3955	9.44469
41	380.424	733.069	335.859	52.2014	8.8346
42	381.917	733.925	259.816	37.1221	8.1313
43	383.411	734.781	193.186	25.0861	7.39872
44	384.81	735.535	145.228	17.0294	6.68795
45	386.209	736.288	103.866	10.8356	5.95572
46	387.608	736.993	73.5086	6.6952	5.20417
47	389.008	737.697	48.2273	3.7411	4.43568
48	390.939	738.603	25.4446	1.49004	3.35142
49	392.871	739.508	9.76014	0.382814	2.24611
50	394.802	740.346	2.46086	0.0483949	1.12662
51	396.734	741.183	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
315.429	720.857
1358	720.857

External Boundary

X	Y
0	706
0	669.5
0	650
0	500
1358	500
1358	650
1358	652
1358	868
1307	870
1146	876
1046	870
1014	868
980	860
958	860
918	850
878	840
846	832
824	832
816	830
776	820
736	810
712	804
690	804
595	780
579	776
557	776
534	770
454	750
446	748
424	748
315.429	720.857
312	720
280	720
248	712
228	710
221	708
214	706
187	706
130	706

Material Boundary

X	Y
312	720
348	708
354.012	706
463.735	669.5
522.354	650

Material Boundary

X	Y
522.354	650
1358	650

Material Boundary

X	Y
214	706
354.012	706

Material Boundary

X	Y
522.354	652
1358	652

Material Boundary

X	Y
315.429	720.857
348	710
354.012	708
522.354	652

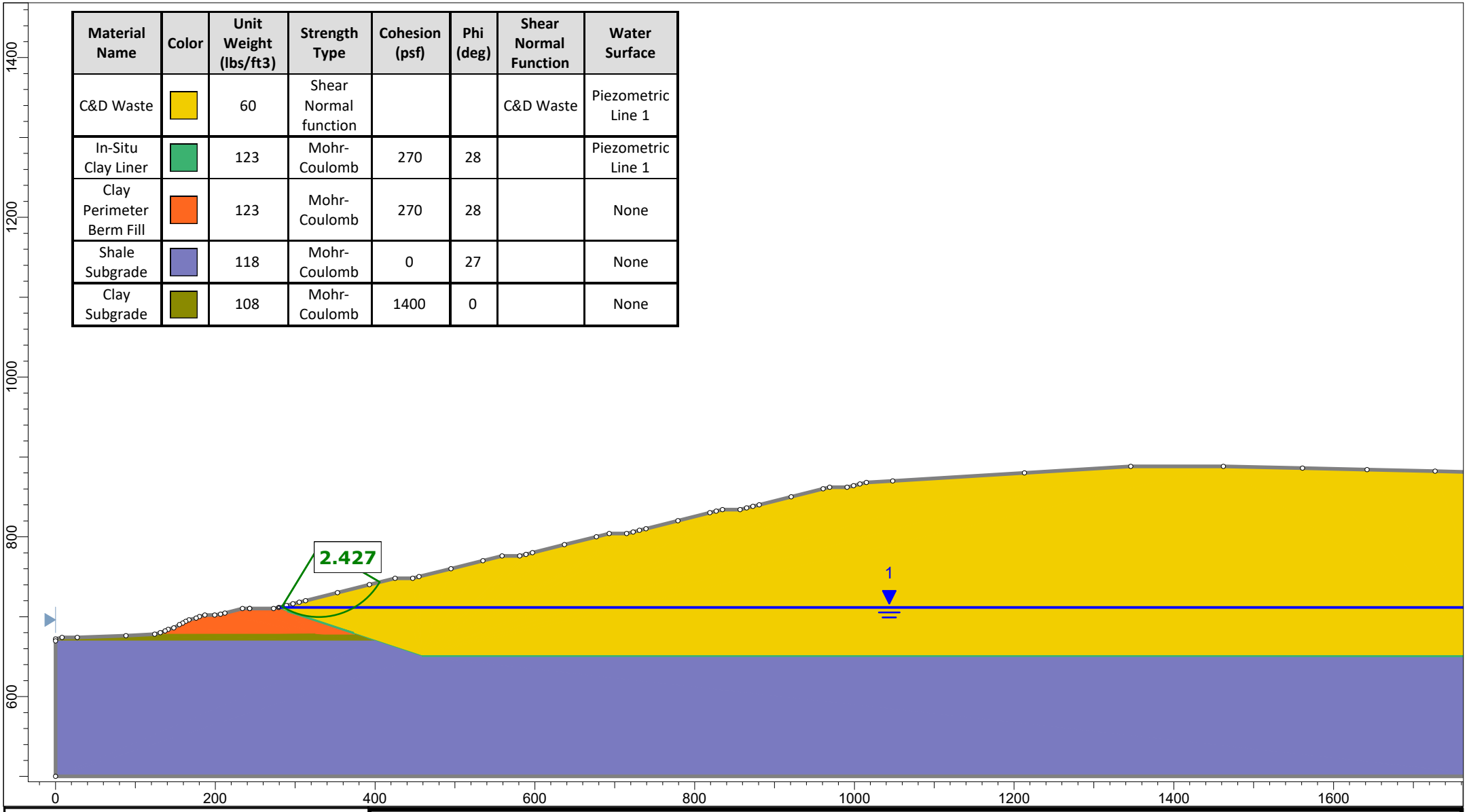
Material Boundary

X	Y
0	669.5
463.735	669.5

CROSS-SECTION B

CIRCULAR ARC

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In-Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



rocscience

SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section B, Circular

Created By: ZLM	Checked By: TDM	Civil & Environmental Consultants, Inc.
Created Date: 3-18-22	Checked Date: 4-22-22	

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:00m:55.74s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In-Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.427420
Center:	329.597, 787.843
Radius:	88.281
Left Slip Surface Endpoint:	283.412, 712.607
Right Slip Surface Endpoint:	405.752, 743.188
Resisting Moment:	5.89723e+06 lb-ft
Driving Moment:	2.42942e+06 lb-ft
Resisting Horizontal Force:	60164.8 lb
Driving Horizontal Force:	24785.5 lb
Total Slice Area:	2302.43 ft2
Surface Horizontal Width:	122.34 ft
Surface Average Height:	18.82 ft

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.42742

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.72405	75.5777	-30.893	C&D Waste	0	34.992	15.4691	37.55	53.6428	0	53.6428	44.3873	44.3873
2	2.46198	363.322	-29.3246	C&D Waste	0	34.992	37.4149	90.8216	172.878	43.1324	129.745	151.86	108.728
3	2.46198	650.829	-27.5074	C&D Waste	1.42109e-14	34.992	50.8861	123.522	302.741	126.281	176.46	276.243	149.962
4	2.46198	923.986	-25.7198	C&D Waste	2.84217e-14	34.992	65.0852	157.989	428.979	203.281	225.698	397.628	194.347
5	2.46198	1183.3	-23.9587	C&D Waste	0	34.992	79.7163	193.505	550.85	274.415	276.435	515.427	241.012
6	2.46198	1429.31	-22.2213	C&D Waste	0	34.992	94.5205	229.441	667.704	339.929	327.775	629.09	289.161
7	2.46198	1662.53	-20.5053	C&D Waste	5.68434e-14	34.992	109.265	265.233	778.943	400.037	378.906	738.079	338.042
8	3.6613	2875.46	-18.4	C&D Waste	0	34.992	127.213	308.8	907.906	466.765	441.141	865.588	398.823
9	2.43069	2160.77	-16.3258	C&D Waste	5.68434e-14	34.992	144.312	350.306	1027.42	526.979	500.438	985.147	458.168
10	2.43069	2347.77	-14.6884	C&D Waste	5.68434e-14	34.992	157.241	381.69	1114.34	569.071	545.27	1073.12	504.053
11	2.43069	2523.99	-13.0632	C&D Waste	5.68434e-14	34.992	169.416	411.243	1194.04	606.547	587.491	1154.73	548.181
12	2.43069	2689.63	-11.4486	C&D Waste	0	34.992	180.759	438.778	1266.33	639.502	626.827	1229.72	590.22
13	2.43069	2844.91	-9.84319	C&D Waste	0	34.992	191.221	464.174	1331.13	668.019	663.108	1297.95	629.93
14	2.43069	2989.97	-8.24555	C&D Waste	5.68434e-14	34.992	200.781	487.38	1388.42	692.167	696.257	1359.33	667.161
15	2.43069	3124.96	-6.65435	C&D Waste	0	34.992	209.441	508.402	1438.29	712.005	726.289	1413.86	701.855
16	2.43069	3249.98	-5.06829	C&D Waste	0	34.992	217.228	527.304	1480.87	727.578	753.294	1461.61	734.028

17	2.43069	3365.12	-3.48612	C&D Waste	0	34.992	224.188	544.199	1516.35	738.924	777.426	1502.69	763.768
18	2.43069	3470.44	-1.90661	C&D Waste	0	34.992	230.385	559.24	1544.98	746.069	798.916	1537.32	791.246
19	2.43069	3565.98	-0.328546	C&D Waste	0	34.992	235.896	572.619	1567.06	749.028	818.027	1565.7	816.675
20	2.43069	3651.76	1.24927	C&D Waste	0	34.992	240.811	584.55	1582.88	747.809	835.072	1588.13	840.324
21	2.43069	3727.76	2.82803	C&D Waste	1.13687e-13	34.992	245.227	595.269	1592.79	742.409	850.385	1604.91	862.499
22	2.43069	3793.96	4.40894	C&D Waste	1.13687e-13	34.992	249.245	605.023	1597.13	732.816	864.317	1616.35	883.535
23	2.43069	3850.31	5.99323	C&D Waste	1.13687e-13	34.992	252.969	614.062	1596.24	719.007	877.233	1622.8	903.791
24	2.43069	3896.74	7.58214	C&D Waste	1.13687e-13	34.992	256.501	622.636	1590.43	700.95	889.479	1624.57	923.622
25	2.43069	3933.13	9.17693	C&D Waste	0	34.992	259.941	630.986	1580.01	678.604	901.406	1622	943.4
26	2.43069	3959.38	10.7789	C&D Waste	0	34.992	263.383	639.341	1565.26	651.914	913.343	1615.4	963.485
27	2.43069	3975.32	12.3895	C&D Waste	0	34.992	266.914	647.912	1546.41	620.817	925.589	1605.04	984.223
28	2.43069	3980.78	14.0101	C&D Waste	0	34.992	270.613	656.891	1523.65	585.235	938.415	1591.17	1005.94
29	2.43069	3975.55	15.6423	C&D Waste	0	34.992	274.549	666.446	1497.14	545.077	952.065	1574.02	1028.94
30	2.43069	3959.38	17.2876	C&D Waste	0	34.992	278.781	676.719	1466.98	500.24	966.741	1553.74	1053.5
31	2.43069	3931.99	18.9477	C&D Waste	1.13687e-13	34.992	283.357	687.826	1433.21	450.602	982.609	1530.49	1079.89
32	2.43069	3893.05	20.6245	C&D Waste	0	34.992	288.311	699.852	1395.81	396.024	999.79	1504.32	1108.3
33	2.43069	3842.2	22.32	C&D Waste	1.13687e-13	34.992	293.667	712.853	1354.71	336.347	1018.36	1475.27	1138.92
34	2.43069	3779	24.0364	C&D Waste	0	34.992	299.434	726.851	1309.75	271.39	1038.36	1443.3	1171.91
35	2.43069	3702.98	25.7761	C&D Waste	1.13687e-13	34.992	305.607	741.837	1260.71	200.945	1059.77	1408.29	1207.35
36	2.43069	3613.58	27.5417	C&D Waste	1.13687e-13	34.992	312.168	757.763	1207.29	124.774	1082.52	1370.09	1245.31
37	2.43069	3510.16	29.3362	C&D Waste	0	34.992	319.081	774.544	1149.09	42.6041	1106.49	1328.42	1285.82
38	2.43788	3401.81	31.1656	C&D Waste	0	34.992	314.368	763.103	1090.15	0	1090.15	1280.28	1280.28
39	2.43788	3267.19	33.0339	C&D Waste	0	34.992	297.598	722.396	1032	0	1032	1225.51	1225.51
40	2.43788	3115.82	34.9428	C&D Waste	1.13687e-13	34.992	279.95	679.556	970.796	0	970.796	1166.4	1166.4
41	2.43788	2946.53	36.8972	C&D Waste	0	34.992	261.331	634.36	906.227	0	906.227	1102.42	1102.42
42	2.43788	2757.94	38.9031	C&D Waste	0	34.992	241.625	586.526	837.892	0	837.892	1032.88	1032.88
43	2.43788	2548.39	40.9676	C&D Waste	0	34.992	220.689	535.706	765.293	0	765.293	956.916	956.916
44	2.43788	2315.88	43.0989	C&D Waste	0	34.992	198.349	481.477	687.825	0	687.825	873.429	873.429
45	2.43788	2057.97	45.3073	C&D Waste	0	34.992	174.394	423.328	604.753	0	604.753	781.028	781.028
46	2.43788	1771.6	47.6057	C&D Waste	5.68434e-14	34.992	148.569	360.639	515.199	0	515.199	677.935	677.935
47	2.43788	1452.88	50.0102	C&D Waste	0	34.992	120.565	292.663	418.089	0	418.089	561.825	561.825
48	2.43788	1096.75	52.5422	C&D Waste	2.84217e-14	34.992	90.0087	218.489	312.126	0	312.126	429.607	429.607
49	2.43788	696.354	55.2305	C&D Waste	0	34.992	56.4418	137.008	195.726	0	195.726	277.027	277.027
50	2.43788	242.05	58.1158	C&D Waste	7.10543e-15	34.992	19.3058	46.8632	66.9474	0	66.9474	97.9825	97.9825

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.42742

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	283.412	712.607	0	0	0
2	285.136	711.576	82.0214	0.938426	0.655506
3	287.598	710.193	413.284	11.4625	1.5887
4	290.06	708.911	926.769	40.7021	2.51472
5	292.522	707.725	1595.85	95.6324	3.42939
6	294.984	706.631	2394.87	181.278	4.32871
7	297.446	705.625	3299.3	300.763	5.20867
8	299.908	704.704	4285.69	455.403	6.06556
9	303.569	703.486	5857.55	749.276	7.28948
10	306	702.774	6940.05	983.267	8.064
11	308.43	702.137	8032.51	1244.17	8.80468
12	310.861	701.573	9118	1527.27	9.5088
13	313.292	701.081	10181	1827.06	10.1739
14	315.722	700.659	11207.5	2137.44	10.7975
15	318.153	700.307	12184.9	2451.97	11.3777
16	320.584	700.023	13102.2	2764.05	11.9125
17	323.015	699.808	13949.8	3067.14	12.4003
18	325.445	699.66	14719.6	3354.94	12.8397
19	327.876	699.579	15405	3621.53	13.2293
20	330.307	699.565	16000.6	3861.55	13.5682
21	332.737	699.618	16502.4	4070.28	13.8553
22	335.168	699.738	16907.6	4243.75	14.09
23	337.599	699.925	17214.5	4378.82	14.2716
24	340.029	700.18	17422.5	4473.19	14.3995
25	342.46	700.504	17531.8	4525.46	14.4737
26	344.891	700.897	17543.6	4535.09	14.4939
27	347.321	701.359	17459.8	4502.43	14.4601
28	349.752	701.893	17283.3	4428.64	14.3721
29	352.183	702.5	17017.5	4315.69	14.2304
30	354.614	703.18	16666.3	4166.28	14.0353
31	357.044	703.937	16234.6	3983.76	13.7872
32	359.475	704.771	15727.8	3772.1	13.4869
33	361.906	705.686	15152.1	3535.77	13.135
34	364.336	706.684	14514.6	3279.67	12.7325
35	366.767	707.768	13823	3009.04	12.2808
36	369.198	708.942	13086.5	2729.35	11.7809
37	371.628	710.21	12315.4	2446.19	11.2344
38	374.059	711.576	11521.8	2165.18	10.6429
39	376.497	713.05	10681.3	1884.68	10.0067
40	378.935	714.635	9771.36	1605.24	9.32923
41	381.373	716.339	8800.64	1333.04	8.61316
42	383.811	718.169	7779.54	1074.11	7.86105
43	386.248	720.136	6720.55	834.185	7.07562
44	388.686	722.253	5638.94	618.561	6.26001
45	391.124	724.534	4553.72	431.851	5.41743
46	393.562	726.998	3488.92	277.73	4.55134
47	396	729.669	2475.59	158.587	3.66538
48	398.438	732.575	1554.57	75.0329	2.76329
49	400.876	735.757	780.962	25.2117	1.84903
50	403.314	739.269	231.331	3.74134	0.92657
51	405.752	743.188	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
279.273	711.576
1808	711.576

External Boundary

X	Y
206.442	702.93
199	702
187	702
180	700
176	698
167	696
163	694
159	692
155	690
148	686
141	684
137	682
131	680
124	678
88	676
27	674
8	674
0	672
0	669.5
0	500
1808	500
1808	650
1808	652
1808	880
1727	882
1642	884
1561	886
1462	888
1346	888
1213	880
1048	870
1015	868
1007	866
999	864
991	862
969	862
961	860
921	850
881	840
873	838
865	836
857	834
835	834
827	832
819	830
779	820

739	810
731	808
723	806
715	804
693	804
677	800
637	790
597	780
589	778
581	776
559	776
535	770
495	760
455	750
447	748
425	748
393	740
353	730
313	720
305	718
297	716
289	714
279.273	711.576
272.952	710
243.001	710
243	710
234	710
211.897	704.33

Material Boundary

X	Y
124	678
324.992	678
374.171	678

Material Boundary

X	Y
458.342	650
1808	650

Material Boundary

X	Y
290	706
374.171	678
399.723	669.5
458.342	650

Material Boundary

X	Y
243	710
278	710
284	708
290	706

Material Boundary

X	Y
458.342	652
1808	652

Material Boundary

X	Y
290	708
374.171	680
458.342	652

Material Boundary

X	Y
279.273	711.576
284	710
290	708

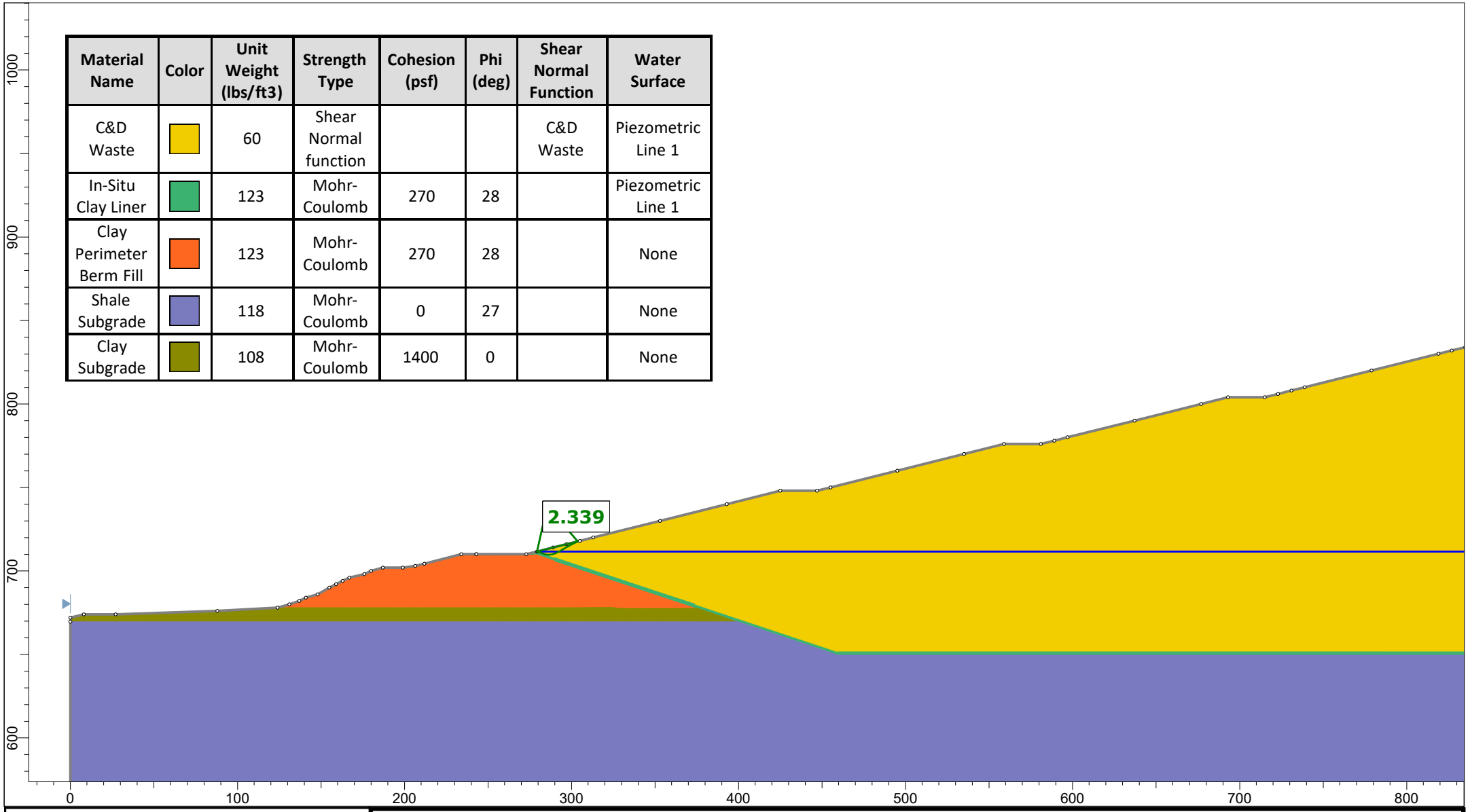
Material Boundary

X	Y
0	669.5
399.723	669.5

CROSS-SECTION B

NON-CIRCULAR SEARCH

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In-Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



rocscience

SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section B, Non-Circular

Created By: ZLM	Checked By: TDM	Civil & Environmental Consultants, Inc.
Created Date: 3-18-22	Checked Date: 4-22-22	

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:02m:18.604s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	500
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In-Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.338680
Axis Location:	285.382, 739.028
Left Slip Surface Endpoint:	279.273, 711.576
Right Slip Surface Endpoint:	303.678, 717.670
Resisting Moment:	45135.3 lb-ft
Driving Moment:	19299.5 lb-ft
Resisting Horizontal Force:	1480.4 lb
Driving Horizontal Force:	633.009 lb
Total Slice Area:	54.2809 ft2
Surface Horizontal Width:	24.4051 ft
Surface Average Height:	2.22416 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
279.273	711.576
280.164	711.279
281.057	710.984
281.692	710.773
282.328	710.563
283.255	710.249
284.181	709.94
285.312	709.753
286.475	709.686
287.391	709.775
288.347	709.913
289.303	710.208
290.26	710.533
291.216	710.943
292.173	711.417
292.934	711.856
293.695	712.294
294.457	712.731
295.218	713.165
295.889	713.546
296.56	713.924
297.172	714.268
297.784	714.609
298.78	715.161
299.685	715.656
300.69	716.198
301.7	716.707
302.709	717.181
303.678	717.67

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.33868

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.445269	3.46846	-18.449	C&D Waste	4.44089e-16	34.992	1.07363	2.51087	8.20465	4.61768	3.58697	7.84648	3.2288
2	0.445269	10.4054	-18.449	C&D Waste	0	34.992	3.28656	7.68621	24.8672	13.8869	10.9803	23.7708	9.88387
3	0.0741439	2.40516	-18.2655	C&D Waste	0	34.992	4.61701	10.7977	34.7102	19.285	15.4252	33.1864	13.9014
4	0.409403	16.7179	-18.2655	C&D Waste	1.77636e-15	34.992	5.9032	13.8057	43.9867	24.2643	19.7224	42.0384	17.7741
5	0.409403	22.5437	-18.2655	C&D Waste	3.55271e-15	34.992	8.15883	19.0809	59.9545	32.6961	27.2584	57.2617	24.5656
6	0.635756	46.5682	-18.3205	C&D Waste	3.55271e-15	34.992	11.1974	26.1871	80.89	43.4798	37.4102	77.1824	33.7026
7	0.635756	60.6425	-18.3205	C&D Waste	0	34.992	15.103	35.3211	107.074	56.6155	50.4588	102.073	45.4579
8	0.463221	53.0978	-18.7168	C&D Waste	7.10543e-15	34.992	18.7575	43.8678	130.748	68.08	62.6683	124.393	56.3131
9	0.463221	60.6687	-18.7168	C&D Waste	-7.10543e-15	34.992	21.9216	51.2677	151.113	77.8733	73.2395	143.686	65.8122
10	0.463221	68.2025	-18.4206	C&D Waste	0	34.992	25.0942	58.6872	171.422	87.5834	83.8388	163.064	75.4811
11	0.463221	75.6992	-18.4206	C&D Waste	0	34.992	28.4477	66.53	192.253	97.2104	95.0429	182.779	85.5682
12	1.13091	209.875	-9.39584	C&D Waste	1.42109e-14	34.992	30.021	70.2094	208.162	107.863	100.299	203.194	95.331
13	0.581557	119.228	-3.3298	C&D Waste	0	34.992	32.3102	75.5632	222.704	114.757	107.947	220.824	106.067
14	0.581557	125.466	-3.3298	C&D Waste	1.42109e-14	34.992	35.3376	82.6434	234.929	116.868	118.061	232.873	116.005
15	0.457891	102.197	5.56978	C&D Waste	0	34.992	33.7397	78.9064	229.253	116.531	112.722	232.544	116.013
16	0.457891	104.105	5.56978	C&D Waste	1.42109e-14	34.992	35.7521	83.6127	233.192	113.744	119.448	236.678	122.934
17	0.478185	110.435	8.21964	C&D Waste	1.42109e-14	34.992	36.5215	85.4122	232.215	110.196	122.019	237.49	127.294
18	0.478185	111.872	8.21964	C&D Waste	1.42109e-14	34.992	38.5531	90.1633	234.69	105.886	128.804	240.259	134.373
19	0.478185	112.185	17.1406	C&D Waste	0	34.992	36.2296	84.7295	220.171	99.1293	121.042	231.345	132.216
20	0.478185	111.375	17.1406	C&D Waste	1.42109e-14	34.992	38.1954	89.3268	217.537	89.9266	127.611	229.317	139.391
21	0.478185	110.36	18.753	C&D Waste	0	34.992	39.4163	92.182	211.949	80.2599	131.689	225.332	145.072
22	0.478185	109.132	18.753	C&D Waste	1.42109e-14	34.992	41.4525	96.9441	208.621	70.1293	138.491	222.694	152.565
23	0.478185	107.288	23.2359	C&D Waste	0	34.992	41.3294	96.6562	196.739	58.6585	138.08	214.483	155.825
24	0.478185	104.827	23.2359	C&D Waste	0	34.992	43.4844	101.696	191.127	45.8475	145.279	209.797	163.949
25	0.478185	101.915	26.3458	C&D Waste	1.42109e-14	34.992	44.1664	103.291	179.611	32.0535	147.558	201.484	169.43
26	0.478185	98.5503	26.3458	C&D Waste	1.42109e-14	34.992	46.4531	108.639	172.475	17.2766	155.199	195.48	178.204
27	0.275398	55.0461	29.9583	C&D Waste	1.42109e-14	34.992	46.519	108.793	160.355	4.93559	155.419	187.167	182.232
28	0.485977	93.5132	29.9583	C&D Waste	1.42109e-14	34.992	46.0405	107.674	153.82	0	153.82	180.357	180.357

29	0.380688	70.0241	29.9433	C&D Waste	0	34.992	43.9697	102.831	146.902	0	146.902	172.23	172.23
30	0.380688	67.1891	29.9433	C&D Waste	-1.42109e-14	34.992	42.1623	98.6041	140.863	0	140.863	165.15	165.15
31	0.380688	64.3657	29.8286	C&D Waste	1.42109e-14	34.992	40.4234	94.5375	135.054	0	135.054	158.231	158.231
32	0.380688	61.5539	29.8286	C&D Waste	1.42109e-14	34.992	38.6543	90.4	129.143	0	129.143	151.306	151.306
33	0.380688	58.7547	29.7041	C&D Waste	0	34.992	36.9501	86.4144	123.449	0	123.449	144.529	144.529
34	0.380688	55.9679	29.7041	C&D Waste	0	34.992	35.2139	82.354	117.649	0	117.649	137.738	137.738
35	0.670729	91.8712	29.5681	C&D Waste	1.42109e-14	34.992	32.8881	76.9147	109.878	0	109.878	128.537	128.537
36	0.670729	83.3459	29.4376	C&D Waste	0	34.992	29.9363	70.0115	100.016	0	100.016	116.911	116.911
37	0.612202	68.7037	29.2944	C&D Waste	0	34.992	27.1462	63.4862	90.6946	0	90.6946	105.925	105.925
38	0.612202	61.746	29.151	C&D Waste	7.10543e-15	34.992	24.5072	57.3144	81.8776	0	81.8776	95.5467	95.5467
39	0.498112	45.1598	28.9923	C&D Waste	0	34.992	22.1349	51.7665	73.9522	0	73.9522	86.2179	86.2179
40	0.498112	40.6322	28.9923	C&D Waste	7.10543e-15	34.992	19.9828	46.7334	66.7619	0	66.7619	77.835	77.835
41	0.45238	33.0222	28.68	C&D Waste	7.10543e-15	34.992	17.9924	42.0785	60.1121	0	60.1121	69.9544	69.9544
42	0.45238	29.375	28.68	C&D Waste	7.10543e-15	34.992	16.0618	37.5633	53.6618	0	53.6618	62.4481	62.4481
43	0.502688	28.4235	28.3299	C&D Waste	0	34.992	14.0808	32.9304	47.0434	0	47.0434	54.6346	54.6346
44	0.502688	24.04	28.3299	C&D Waste	3.55271e-15	34.992	11.9607	27.9722	39.9603	0	39.9603	46.4085	46.4085
45	0.504663	19.9919	26.7571	C&D Waste	0	34.992	10.0676	23.5449	33.6355	0	33.6355	38.7115	38.7115
46	0.504663	16.1075	26.7571	C&D Waste	0	34.992	8.14464	19.0477	27.211	0	27.211	31.3175	31.3175
47	0.504663	12.4899	25.1395	C&D Waste	0	34.992	6.4102	14.9914	21.4163	0	21.4163	24.4244	24.4244
48	0.504663	9.13915	25.1395	C&D Waste	0	34.992	4.70731	11.0089	15.727	0	15.727	17.936	17.936
49	0.484578	5.37504	26.7636	C&D Waste	0	34.992	2.86531	6.70104	9.57291	0	9.57291	11.018	11.018
50	0.484578	1.79168	26.7636	C&D Waste	4.44089e-16	34.992	0.95878	2.24228	3.20327	0	3.20327	3.68682	3.68682

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.33868

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	279.273	711.576	0	0	0
2	279.718	711.427	1.69681	0.0253374	0.855498
3	280.164	711.279	6.85411	0.204359	1.7078
4	280.238	711.254	8.04584	0.259766	1.8492
5	280.647	711.119	16.4063	0.752488	2.62608
6	281.057	710.984	27.8479	1.65189	3.39471
7	281.692	710.773	51.9947	4.15277	4.56647
8	282.328	710.563	84.1365	8.40399	5.70408
9	282.791	710.406	113.346	12.9277	6.50676
10	283.255	710.249	147.216	18.8173	7.28411
11	283.718	710.095	185.287	26.1498	8.03317
12	284.181	709.94	228.126	35.1176	8.75139
13	285.312	709.753	301.031	55.0362	10.3607
14	285.893	709.719	327.357	64.2304	11.1009
15	286.475	709.686	355.857	74.1939	11.7771
16	286.933	709.73	361.069	78.4774	12.2624
17	287.391	709.775	367.028	82.7448	12.7047
18	287.869	709.844	368.452	85.8739	13.1195
19	288.347	709.913	370.676	88.8902	13.4852
20	288.825	710.061	355.53	87.3308	13.8006
21	289.303	710.208	341.712	85.6111	14.0651
22	289.782	710.37	326.151	83.0009	14.2779
23	290.26	710.533	312.103	80.3582	14.4385
24	290.738	710.738	291.475	75.6333	14.5466
25	291.216	710.943	273.029	71.1278	14.6018
26	291.694	711.18	251.615	65.5597	14.604
27	292.173	711.417	232.985	60.4852	14.5533
28	292.448	711.576	220.342	56.9848	14.5001
29	292.934	711.856	199.631	51.1213	14.3636
30	293.315	712.075	184.156	46.663	14.2188
31	293.695	712.294	169.317	42.3444	14.0411
32	294.076	712.513	155.227	38.2154	13.8306
33	294.457	712.731	141.754	34.2619	13.5878
34	294.837	712.948	129.01	30.5276	13.313
35	295.218	713.165	116.865	26.9947	13.0067
36	295.889	713.546	97.1119	21.337	12.3919
37	296.56	713.924	79.3333	16.4064	11.6843
38	297.172	714.268	64.8012	12.5501	10.9608
39	297.784	714.609	51.8466	9.2979	10.1671
40	298.282	714.885	42.46	7.08427	9.4723
41	298.78	715.161	33.9861	5.22267	8.73635
42	299.233	715.409	27.2499	3.8465	8.03459
43	299.685	715.656	21.2365	2.72175	7.30343
44	300.188	715.927	15.5657	1.76232	6.45942
45	300.69	716.198	10.7486	1.05121	5.58575
46	301.195	716.453	7.27088	0.595538	4.68249
47	301.7	716.707	4.45738	0.292718	3.75724
48	302.204	716.944	2.62046	0.128812	2.81418
49	302.709	717.181	1.27151	0.041241	1.85772
50	303.194	717.425	0.320449	0.00520695	0.930913
51	303.678	717.67	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
279.273	711.576
1808	711.576

External Boundary

X	Y
206.442	702.93
199	702
187	702
180	700
176	698
167	696
163	694
159	692
155	690
148	686
141	684
137	682
131	680
124	678
88	676
27	674
8	674
0	672
0	669.5
0	500
1808	500
1808	650
1808	652
1808	880
1727	882
1642	884
1561	886
1462	888
1346	888
1213	880
1048	870
1015	868
1007	866
999	864
991	862
969	862
961	860
921	850
881	840
873	838
865	836
857	834
835	834
827	832
819	830
779	820

739	810
731	808
723	806
715	804
693	804
677	800
637	790
597	780
589	778
581	776
559	776
535	770
495	760
455	750
447	748
425	748
393	740
353	730
313	720
305	718
297	716
289	714
279.273	711.576
272.952	710
243.001	710
243	710
234	710
211.897	704.33

Material Boundary

X	Y
124	678
324.992	678
374.171	678

Material Boundary

X	Y
458.342	650
1808	650

Material Boundary

X	Y
290	706
374.171	678
399.723	669.5
458.342	650

Material Boundary

X	Y
243	710
278	710
284	708
290	706

Material Boundary

X	Y
458.342	652
1808	652

Material Boundary

X	Y
290	708
374.171	680
458.342	652

Material Boundary

X	Y
279.273	711.576
284	710
290	708

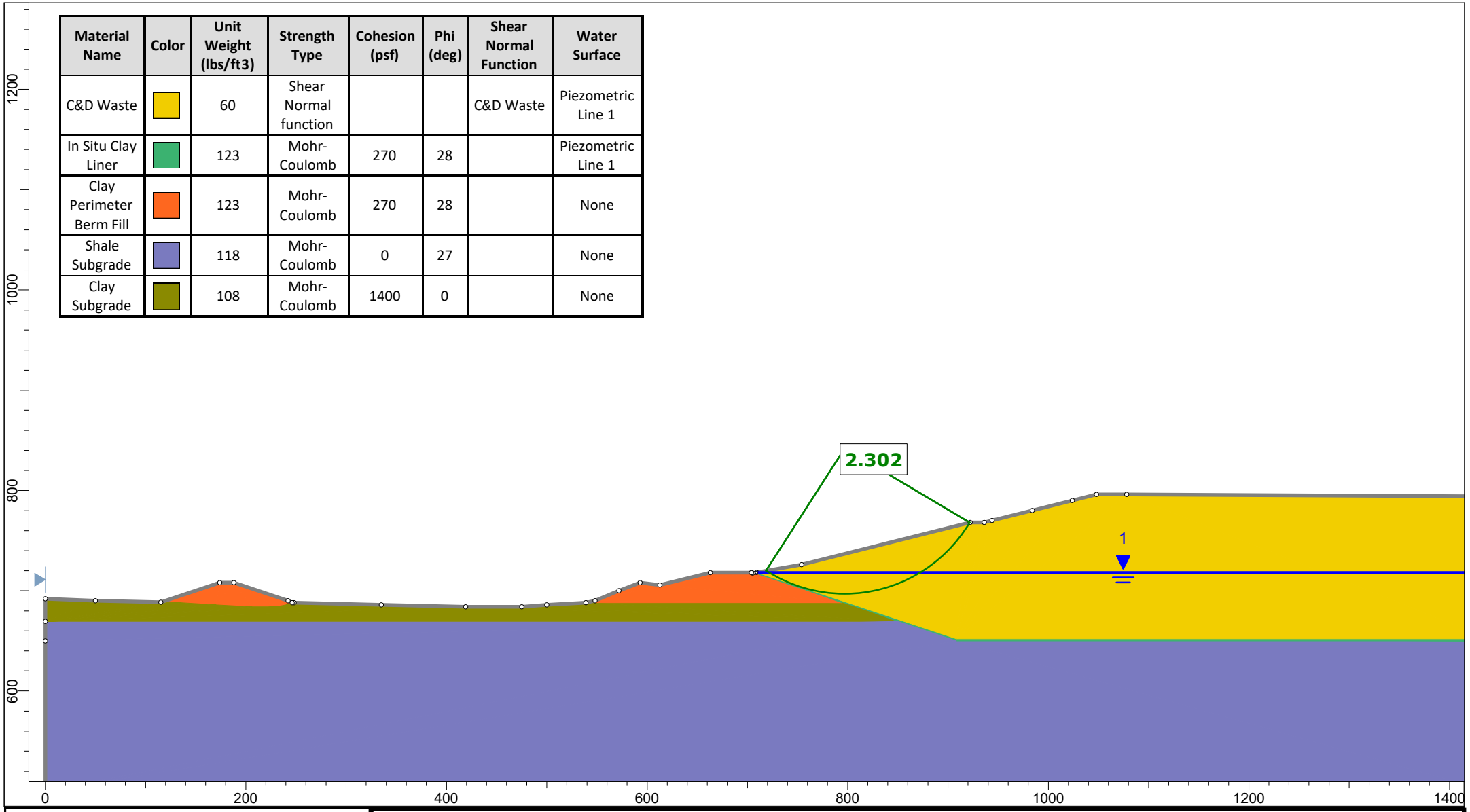
Material Boundary

X	Y
0	669.5
399.723	669.5

CROSS-SECTION C

CIRCULAR ARC

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



rocscience

SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section C, Circular

Created By: ZLM	Checked By: TDM	Civil & Environmental Consultants, Inc.
Created Date: 3-18-22	Checked Date: 4-22-22	

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:01m:11.193s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.301850
Center:	796.929, 841.968
Radius:	145.100
Left Slip Surface Endpoint:	718.489, 719.897
Right Slip Surface Endpoint:	921.718, 767.930
Resisting Moment:	2.405e+07 lb-ft
Driving Moment:	1.04481e+07 lb-ft
Resisting Horizontal Force:	148662 lb
Driving Horizontal Force:	64583.7 lb
Total Slice Area:	6154.9 ft2
Surface Horizontal Width:	203.229 ft
Surface Average Height:	30.2856 ft

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.30185

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.55871	157.095	-32.127	C&D Waste	7.10543e-15	34.992	23.3433	53.7328	76.7612	0	76.7612	62.1026	62.1026
2	3.86581	817.352	-30.6433	C&D Waste	0	34.992	54.0166	124.338	249.066	71.4402	177.626	217.066	145.625
3	3.86581	1484.4	-28.8844	C&D Waste	0	34.992	69.5506	160.095	438.141	209.433	228.708	399.771	190.338
4	3.86581	2115.82	-27.1549	C&D Waste	0	34.992	86.1937	198.405	621.276	337.84	283.436	577.064	239.224
5	3.86581	2713.29	-25.4517	C&D Waste	0	34.992	103.552	238.362	797.629	457.111	340.518	748.344	291.233
6	3.86581	3278.26	-23.7724	C&D Waste	5.68434e-14	34.992	121.266	279.137	966.41	567.644	398.766	912.995	345.351
7	3.86581	3812.04	-22.1145	C&D Waste	0	34.992	139.009	319.977	1126.89	669.783	457.111	1070.41	400.624
8	3.86581	4315.75	-20.4758	C&D Waste	0	34.992	156.488	360.212	1278.42	763.832	514.589	1219.99	456.156
9	6.06037	7704.95	-18.4	C&D Waste	5.68434e-14	34.992	178.141	410.055	1457.56	871.769	585.792	1398.3	526.532
10	4.09104	5852	-16.2973	C&D Waste	1.13687e-13	34.992	202.762	466.728	1638.74	971.987	666.755	1579.46	607.474
11	4.09104	6380.83	-14.621	C&D Waste	0	34.992	225.294	518.594	1783.45	1042.6	740.851	1724.68	682.078
12	4.09104	6878.39	-12.9574	C&D Waste	0	34.992	246.497	567.4	1915.84	1105.27	810.569	1859.12	753.854
13	4.09104	7345.34	-11.3048	C&D Waste	1.13687e-13	34.992	266.254	612.877	2035.69	1160.15	875.541	1982.47	822.315
14	4.09104	7782.24	-9.66173	C&D Waste	1.13687e-13	34.992	284.498	654.871	2142.93	1207.4	935.53	2094.5	887.095
15	4.09104	8189.57	-8.02664	C&D Waste	0	34.992	301.206	693.33	2237.6	1247.13	990.471	2195.13	947.996
16	4.09104	8567.73	-6.3981	C&D Waste	0	34.992	316.399	728.304	2319.87	1279.44	1040.43	2284.4	1004.96

17	4.09104	8917.02	-4.77474	C&D Waste	1.13687e-13	34.992	330.137	759.927	2390.03	1304.42	1085.61	2362.45	1058.03
18	4.09104	9237.69	-3.15522	C&D Waste	0	34.992	342.512	788.411	2448.42	1322.11	1126.31	2429.54	1107.43
19	4.09104	9529.9	-1.53822	C&D Waste	0	34.992	353.643	814.032	2495.48	1332.58	1162.9	2485.99	1153.41
20	4.09104	9793.75	0.0775485	C&D Waste	1.13687e-13	34.992	363.671	837.117	2531.7	1335.83	1195.87	2532.19	1196.36
21	4.09104	10029.3	1.69338	C&D Waste	0	34.992	372.756	858.029	2557.65	1331.89	1225.76	2568.67	1236.78
22	4.09104	10236.4	3.31057	C&D Waste	0	34.992	381.067	877.16	2573.82	1320.73	1253.09	2595.86	1275.13
23	4.09104	10415.1	4.9304	C&D Waste	0	34.992	388.779	894.911	2580.78	1302.33	1278.45	2614.32	1311.99
24	4.09104	10565.2	6.55419	C&D Waste	0	34.992	396.068	911.689	2579.07	1276.66	1302.41	2624.58	1347.92
25	4.09104	10686.3	8.1833	C&D Waste	1.13687e-13	34.992	403.106	927.889	2569.19	1243.64	1325.55	2627.16	1383.52
26	4.09104	10778.3	9.8191	C&D Waste	0	34.992	410.058	943.892	2551.6	1203.19	1348.41	2622.57	1419.38
27	4.09104	10840.6	11.463	C&D Waste	0	34.992	417.079	960.053	2526.72	1155.22	1371.5	2611.3	1456.08
28	4.09104	10872.8	13.1166	C&D Waste	1.13687e-13	34.992	424.309	976.695	2494.86	1099.59	1395.27	2593.73	1494.14
29	4.09104	10874.4	14.7814	C&D Waste	0	34.992	431.873	994.106	2456.31	1036.17	1420.14	2570.27	1534.1
30	4.09104	10844.6	16.459	C&D Waste	1.13687e-13	34.992	439.877	1012.53	2411.25	964.783	1446.46	2541.2	1576.42
31	4.09104	10782.7	18.1513	C&D Waste	0	34.992	448.409	1032.17	2359.75	885.227	1474.53	2506.76	1621.53
32	4.09104	10687.8	19.8602	C&D Waste	0	34.992	457.536	1053.18	2301.81	797.276	1504.54	2467.08	1669.8
33	4.09104	10558.8	21.5877	C&D Waste	0	34.992	467.307	1075.67	2237.33	700.667	1536.67	2422.24	1721.57
34	4.09104	10394.6	23.3361	C&D Waste	0	34.992	477.733	1099.67	2166.06	595.096	1570.96	2372.16	1777.06
35	4.09104	10193.8	25.1078	C&D Waste	2.27374e-13	34.992	488.824	1125.2	2087.64	480.218	1607.42	2316.71	1836.49
36	4.09104	9954.74	26.9056	C&D Waste	2.27374e-13	34.992	500.541	1152.17	2001.59	355.634	1645.96	2255.59	1899.96
37	4.09104	9675.73	28.7326	C&D Waste	0	34.992	512.835	1180.47	1907.27	220.887	1686.38	2188.42	1967.53
38	4.09104	9354.67	30.5921	C&D Waste	0	34.992	525.612	1209.88	1803.85	75.4492	1728.4	2114.6	2039.15
39	4.07575	8956.33	32.4845	C&D Waste	0	34.992	516.989	1190.03	1700.05	0	1700.05	2029.21	2029.21
40	4.07575	8546.81	34.4139	C&D Waste	2.27374e-13	34.992	486.226	1119.22	1598.88	0	1598.88	1931.98	1931.98
41	4.07575	8087.3	36.3891	C&D Waste	0	34.992	453.726	1044.41	1492.02	0	1492.02	1826.4	1826.4
42	4.07575	7573.99	38.4158	C&D Waste	0	34.992	419.311	965.19	1378.84	0	1378.84	1711.37	1711.37
43	4.07575	7002.3	40.5012	C&D Waste	0	34.992	382.739	881.007	1258.58	0	1258.58	1585.48	1585.48
44	4.07575	6366.71	42.6538	C&D Waste	0	34.992	343.726	791.206	1130.29	0	1130.29	1446.96	1446.96
45	4.07575	5660.42	44.8837	C&D Waste	0	34.992	301.928	694.993	992.847	0	992.847	1293.55	1293.55
46	4.07575	4875.02	47.2041	C&D Waste	0	34.992	256.927	591.407	844.867	0	844.867	1122.36	1122.36
47	4.07575	3999.74	49.6311	C&D Waste	5.68434e-14	34.992	208.221	479.293	684.705	0	684.705	929.633	929.633
48	4.07575	3020.56	52.1862	C&D Waste	0	34.992	155.204	357.256	510.366	0	510.366	710.353	710.353
49	4.07575	1918.54	54.8983	C&D Waste	2.84217e-14	34.992	97.1432	223.609	319.441	0	319.441	457.653	457.653
50	4.07575	667.043	57.8085	C&D Waste	0	34.992	33.1569	76.3222	109.032	0	109.032	161.701	161.701

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.30185

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	718.489	719.897	0	0	0
2	721.048	718.29	183.108	1.78178	0.557514
3	724.914	716	962.481	23.4833	1.39767
4	728.78	713.867	2165.95	84.4277	2.23223
5	732.645	711.884	3731.33	199.332	3.0579
6	736.511	710.044	5599.49	378.929	3.87142
7	740.377	708.341	7714.23	630.109	4.66963
8	744.243	706.77	10022.2	956.109	5.44947
9	748.109	705.327	12473	1356.77	6.20803
10	754.169	703.311	16491.9	2126.59	7.34761
11	758.26	702.115	19282	2736.82	8.0784
12	762.351	701.048	22107.8	3412.48	8.77472
13	766.442	700.106	24920.3	4140.75	9.43406
14	770.533	699.289	27675.2	4906.77	10.054
15	774.624	698.592	30332.4	5694.27	10.6323
16	778.715	698.015	32856.4	6486.14	11.1671
17	782.806	697.556	35215.9	7265.02	11.6566
18	786.897	697.215	37384.2	8013.86	12.0991
19	790.988	696.989	39338.6	8716.39	12.4934
20	795.079	696.879	41060.6	9357.54	12.8382
21	799.171	696.885	42535.4	9923.83	13.1326
22	803.262	697.006	43752.1	10403.7	13.3758
23	807.353	697.242	44703.1	10787.5	13.5669
24	811.444	697.595	45384	11068.1	13.7056
25	815.535	698.065	45793.2	11240.7	13.7915
26	819.626	698.654	45932	11302.6	13.8243
27	823.717	699.362	45804.1	11253.9	13.8039
28	827.808	700.191	45415.5	11096.7	13.7305
29	831.899	701.145	44774.3	10835.4	13.6041
30	835.99	702.224	43890.9	10476.6	13.4251
31	840.081	703.433	42777.4	10028.7	13.1941
32	844.172	704.774	41448.2	9501.72	12.9116
33	848.263	706.252	39919.9	8907.38	12.5784
34	852.354	707.87	38211.4	8258.52	12.1956
35	856.445	709.635	36344.3	7569.03	11.7642
36	860.536	711.552	34343.3	6853.51	11.2856
37	864.627	713.628	32237.2	6127.01	10.7613
38	868.718	715.871	30059.1	5404.68	10.193
39	872.809	718.29	27848	4701.42	9.58256
40	876.885	720.885	25545	4016.11	8.93474
41	880.961	723.677	23063.8	3343.92	8.24958
42	885.036	726.681	20432.8	2700.79	7.52966
43	889.112	729.913	17686.3	2101.97	6.77766
44	893.188	733.394	14866	1561.6	5.99665
45	897.264	737.149	12023.8	1092.06	5.18964
46	901.34	741.208	9225.07	703.364	4.36007
47	905.415	745.61	6553.85	402.158	3.51139
48	909.491	750.405	4120.46	190.513	2.64723
49	913.567	755.656	2073.14	64.1146	1.77138
50	917.643	761.455	616.963	9.55915	0.887663
51	921.718	767.93	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
709.141	718.29
1440	718.29

External Boundary

X	Y
612.738	705.608
593	708
572	700
548	690
539	688
500	686
475	684
419	684
335	686
248	688
246	688
242	690
188	708
174	708
115.227	688.465
50	690
0	692
0	669.5
0	650
0	500
1440	500
1440	650
1440	652
1440	794
1078	796
1048	796
1024	790
984	780
944	770
936	768
922	768
754	726
709.141	718.29
705.177	717.609
704	718
663	718

Material Boundary

X	Y
115.227	688.465
135	688
170	686
206	684
230	684
240	686
248	688

Material Boundary

X	Y
705.177	717.609
794.183	688
849.796	669.5
908.416	650

Material Boundary

X	Y
908.416	650
1440	650

Material Boundary

X	Y
539	688
794.183	688

Material Boundary

X	Y
908.416	652
1440	652

Material Boundary

X	Y
709.141	718.29
794.183	690
908.416	652

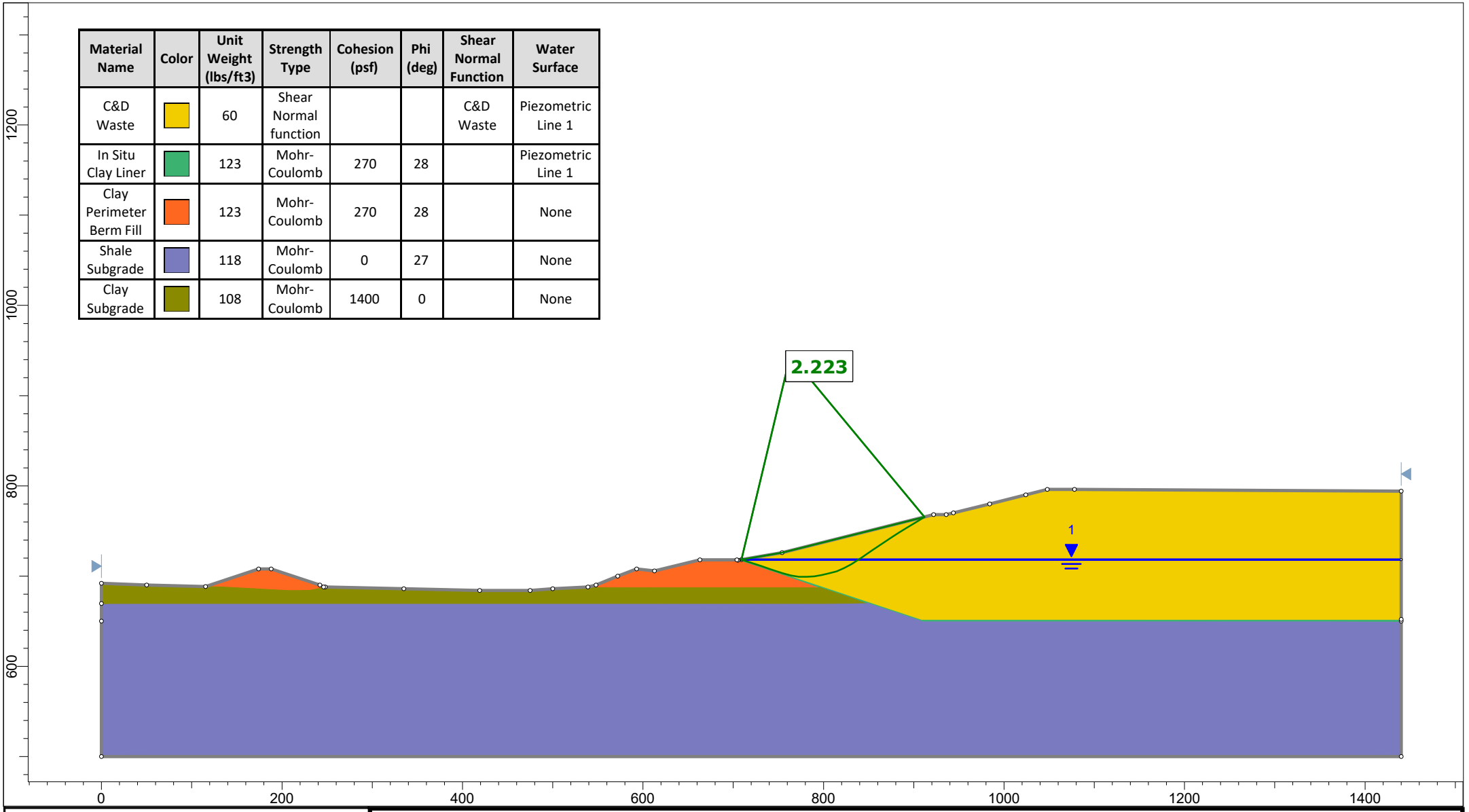
Material Boundary

X	Y
0	669.5
849.796	669.5

CROSS-SECTION C

NON-CIRCULAR SEARCH

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



rocscience

SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section C, Non-Circular

Created By: ZLM	Checked By: TDM	Civil & Environmental Consultants, Inc.
Created Date: 3-18-22	Checked Date: 4-22-22	

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:01m:51.990s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	500
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.223190
Axis Location:	763.317, 944.557
Left Slip Surface Endpoint:	709.141, 718.290
Right Slip Surface Endpoint:	911.825, 765.456
Resisting Moment:	2.6644e+07 lb-ft
Driving Moment:	1.19846e+07 lb-ft
Resisting Horizontal Force:	102238 lb
Driving Horizontal Force:	45986.9 lb
Total Slice Area:	4284.08 ft2
Surface Horizontal Width:	202.684 ft
Surface Average Height:	21.1367 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
709.141	718.29
716.521	715.839
723.905	713.378
731.385	710.91
738.863	708.459
746.034	706.019
754.943	703.083
763.854	700.622
772.605	699.323
781.357	699.263
789.631	699.822
797.905	701.089
806.179	703.014
814.453	705.293
822.727	708.965
831.001	713.207
836.367	716.759
841.732	720.294
848.03	724.572
854.329	728.828
861.624	733.73
870.096	739.38
876.745	743.768
883.395	748.111
892.872	753.976
902.348	759.73
911.825	765.456

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.22319

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.69022	205.868	-18.3685	C&D Waste	1.77636e-15	34.992	6.29771	14.001	58.218	38.2166	20.0014	56.1269	17.9103
2	3.69022	617.603	-18.3685	C&D Waste	0	34.992	19.3687	43.0604	176.191	114.677	61.5144	169.76	55.0831
3	3.30618	903.443	-18.4351	C&D Waste	0	34.992	32.4571	72.1582	290.374	187.291	103.083	279.555	92.2639
4	3.30618	1234.79	-18.4351	C&D Waste	0	34.992	45.4478	101.039	400.402	256.06	144.342	385.253	129.193
5	0.771602	335.878	-18.4351	C&D Waste	1.42109e-14	34.992	53.7462	119.488	469.167	298.47	170.697	451.252	152.782
6	0.195621	88.0176	-18.2613	C&D Waste	1.42109e-14	34.992	55.6516	123.724	485.257	308.509	176.748	466.893	158.384
7	3.64195	1849.01	-18.2613	C&D Waste	2.84217e-14	34.992	63.7453	141.718	550.471	348.017	202.454	529.437	181.42
8	3.64195	2248.4	-18.2613	C&D Waste	2.84217e-14	34.992	79.6144	176.998	675.857	423.005	252.852	649.587	226.582
9	3.73922	2723	-18.1422	C&D Waste	-2.84217e-14	34.992	96.2756	214.039	804.495	498.725	305.77	772.948	274.223
10	3.73922	3142.07	-18.1422	C&D Waste	2.84217e-14	34.992	113.972	253.382	937.153	575.179	361.974	899.809	324.63
11	3.58541	3411.28	-18.7965	C&D Waste	5.68434e-14	34.992	133.199	296.126	1074.52	651.479	423.037	1029.18	377.701
12	3.58541	3806.37	-18.7965	C&D Waste	0	34.992	151.705	337.268	1209.44	727.628	481.812	1157.81	430.178
13	4.45469	5273.13	-18.2353	C&D Waste	0	34.992	171.577	381.448	1356.42	811.493	544.926	1299.89	488.397
14	4.45469	5872.15	-18.2353	C&D Waste	0	34.992	195.756	435.202	1524.79	903.076	621.718	1460.3	557.223
15	8.91034	13631.3	-15.444	C&D Waste	1.13687e-13	34.992	231.112	513.806	1759.68	1025.67	734.009	1695.83	670.159
16	4.37579	7538.65	-8.44364	C&D Waste	0	34.992	247.448	550.123	1908.63	1122.74	785.893	1871.9	749.16
17	4.37579	7996.41	-8.44364	C&D Waste	1.13687e-13	34.992	273.173	607.316	2030.87	1163.28	867.589	1990.32	827.037
18	4.3758	8372.78	-0.38747	C&D Waste	0	34.992	263.962	586.838	2022.81	1184.47	838.336	2021.02	836.55
19	4.3758	8667.77	-0.38747	C&D Waste	0	34.992	285.558	634.849	2093.24	1186.31	906.929	2091.31	904.998
20	4.13702	8427.93	3.86094	C&D Waste	1.13687e-13	34.992	287.945	640.156	2093.03	1178.52	914.512	2112.46	933.944
21	4.13702	8615.35	3.86094	C&D Waste	0	34.992	306.87	682.23	2135.72	1161.1	974.617	2156.43	995.327
22	4.13702	8758.79	8.70664	C&D Waste	1.13687e-13	34.992	304.253	676.412	2098.93	1132.62	966.306	2145.52	1012.9
23	4.13702	8858.26	8.70664	C&D Waste	0	34.992	322.273	716.474	2116.62	1093.09	1023.53	2165.98	1072.89
24	4.13702	8916.87	13.1007	C&D Waste	0	34.992	320.853	713.317	2062.31	1043.29	1019.02	2136.98	1093.69
25	4.13702	8934.62	13.1007	C&D Waste	0	34.992	338.779	753.169	2059.17	983.21	1075.96	2138.01	1154.8
26	4.13702	8930.46	15.3965	C&D Waste	0	34.992	346.611	770.583	2018.46	917.627	1100.83	2113.91	1196.28
27	4.13702	8904.4	15.3965	C&D Waste	0	34.992	364.907	811.257	2005.48	846.538	1158.94	2105.97	1259.43
28	4.13703	8791.87	23.9324	C&D Waste	1.13687e-13	34.992	346.012	769.25	1852.64	753.707	1098.93	2006.2	1252.5
29	4.13703	8592.84	23.9324	C&D Waste	0	34.992	365.888	813.438	1801.19	639.136	1162.05	1963.58	1324.44
30	4.13703	8358.45	27.1435	C&D Waste	0	34.992	372.381	827.874	1698.35	515.676	1182.68	1889.27	1373.59

31	4.13703	8088.7	27.1435	C&D Waste	1.13687e-13	34.992	393.493	874.81	1633.05	383.326	1249.73	1834.79	1451.47
32	5.36557	9959.93	33.5072	C&D Waste	0	34.992	391.52	870.423	1449.78	206.318	1243.46	1708.99	1502.67
33	2.32336	4092.48	33.373	C&D Waste	1.13687e-13	34.992	413.748	919.841	1361.8	47.7352	1314.06	1634.33	1586.6
34	3.04221	5158.56	33.373	C&D Waste	0	34.992	411.325	914.454	1306.36	0	1306.36	1577.3	1577.3
35	3.14903	5094.52	34.1862	C&D Waste	1.13687e-13	34.992	389.471	865.869	1236.95	0	1236.95	1501.5	1501.5
36	3.14903	4839.13	34.1862	C&D Waste	0	34.992	370.354	823.368	1176.24	0	1176.24	1427.8	1427.8
37	6.29805	8916.18	34.0508	C&D Waste	1.13687e-13	34.992	342.415	761.254	1087.51	0	1087.51	1318.91	1318.91
38	3.64755	4701.98	33.9001	C&D Waste	0	34.992	313.186	696.273	994.677	0	994.677	1205.13	1205.13
39	3.64755	4365.13	33.9001	C&D Waste	0	34.992	291.515	648.094	925.849	0	925.849	1121.74	1121.74
40	4.23595	4649.26	33.6993	C&D Waste	0	34.992	268.736	597.451	853.503	0	853.503	1032.72	1032.72
41	4.23595	4200.43	33.6993	C&D Waste	1.13687e-13	34.992	243.735	541.87	774.1	0	774.1	936.647	936.647
42	3.32497	2985.02	33.4172	C&D Waste	5.68434e-14	34.992	222.075	493.714	705.306	0	705.306	851.833	851.833
43	3.32497	2713.18	33.4172	C&D Waste	5.68434e-14	34.992	202.571	450.354	643.363	0	643.363	777.022	777.022
44	3.32497	2443.54	33.1522	C&D Waste	0	34.992	183.549	408.065	582.95	0	582.95	702.842	702.842
45	3.32497	2176.09	33.1522	C&D Waste	0	34.992	164.105	364.836	521.194	0	521.194	628.386	628.386
46	9.47651	4827.31	31.7501	C&D Waste	5.68434e-14	34.992	130.149	289.347	413.354	0	413.354	493.893	493.893
47	4.73826	1676.21	31.2683	C&D Waste	0	34.992	91.5234	203.474	290.677	0	290.677	346.255	346.255
48	4.73826	1194.96	31.2683	C&D Waste	0	34.992	65.6305	145.909	208.442	0	208.442	248.296	248.296
49	4.73826	715.757	31.1417	C&D Waste	0	34.992	39.5796	87.993	125.704	0	125.704	149.619	149.619
50	4.73826	238.586	31.1417	C&D Waste	0	34.992	13.2654	29.4914	42.1306	0	42.1306	50.1459	50.1459

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.22319

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	709.141	718.29	0	0	0
2	712.831	717.065	94.5757	1.25278	0.758914
3	716.521	715.839	381.942	10.1021	1.51508
4	719.828	714.737	809.264	30.9189	2.18799
5	723.134	713.635	1400.79	69.8473	2.85456
6	723.905	713.378	1562.94	82.1563	3.009
7	724.101	713.313	1605.15	85.473	3.04808
8	727.743	712.112	2498.82	164.642	3.76965
9	731.385	710.91	3600.98	282.016	4.47806
10	735.124	709.685	4946.65	449.241	5.18921
11	738.863	708.459	6521.03	671.75	5.88146
12	742.449	707.239	8309.86	950.503	6.52528
13	746.034	706.019	10329.7	1295.33	7.1475
14	750.489	704.551	13084.8	1812.81	7.88773
15	754.943	703.083	16194.7	2445.85	8.58835
16	763.854	700.622	22585.8	3925.01	9.85853
17	768.23	699.972	24908.3	4577.41	10.4131
18	772.605	699.323	27422.9	5290.23	10.919
19	776.981	699.293	28637.8	5761.02	11.3743
20	781.357	699.263	29949.3	6244.39	11.7774
21	785.494	699.543	30556.1	6555.76	12.1091
22	789.631	699.822	31229.4	6861.58	12.3919
23	793.768	700.455	31158.3	6978.83	12.6247
24	797.905	701.089	31150.6	7081.26	12.807
25	802.042	702.052	30492.4	7005.11	12.9382
26	806.179	703.014	29911.5	6915.46	13.0179
27	810.316	704.154	29045.9	6730.29	13.0459
28	814.453	705.293	28270.8	6538.31	13.0221
29	818.59	707.129	26300.7	6046.15	12.9465
30	822.727	708.965	24507.2	5576.68	12.8195
31	826.864	711.086	22445.6	5034.18	12.6413
32	831.001	713.207	20609.8	4536.08	12.4125
33	836.367	716.759	17560.4	3745.87	12.0415
34	838.69	718.29	16437.6	3450.53	11.8552
35	841.732	720.294	15071.1	3090.46	11.5884
36	844.881	722.433	13651.7	2724.21	11.2852
37	848.03	724.572	12302	2381.27	10.9551
38	854.329	728.828	9829.93	1771.66	10.2168
39	857.976	731.279	8534.28	1465.46	9.7435
40	861.624	733.73	7328.29	1191.94	9.23821
41	865.86	736.555	6055.54	917.236	8.61315
42	870.096	739.38	4901.2	684.4	7.94934
43	873.42	741.574	4092.26	531.701	7.40288
44	876.745	743.768	3354.36	402.095	6.83556
45	880.07	745.939	2698.58	295.49	6.2489
46	883.395	748.111	2112.27	208.763	5.64441
47	892.872	753.976	921.629	61.8373	3.83854
48	897.61	756.853	518.919	26.2785	2.89903
49	902.348	759.73	230.141	7.80477	1.94233
50	907.087	762.593	57.7879	0.98253	0.974069
51	911.825	765.456	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
709.141	718.29
1440	718.29

External Boundary

X	Y
612.738	705.608
593	708
572	700
548	690
539	688
500	686
475	684
419	684
335	686
248	688
246	688
242	690
188	708
174	708
115.227	688.465
50	690
0	692
0	669.5
0	650
0	500
1440	500
1440	650
1440	652
1440	794
1078	796
1048	796
1024	790
984	780
944	770
936	768
922	768
754	726
709.141	718.29
705.177	717.609
704	718
663	718

Material Boundary

X	Y
115.227	688.465
135	688
170	686
206	684
230	684
240	686
248	688

Material Boundary

X	Y
705.177	717.609
794.183	688
849.796	669.5
908.416	650

Material Boundary

X	Y
908.416	650
1440	650

Material Boundary

X	Y
539	688
794.183	688

Material Boundary

X	Y
908.416	652
1440	652

Material Boundary

X	Y
709.141	718.29
794.183	690
908.416	652

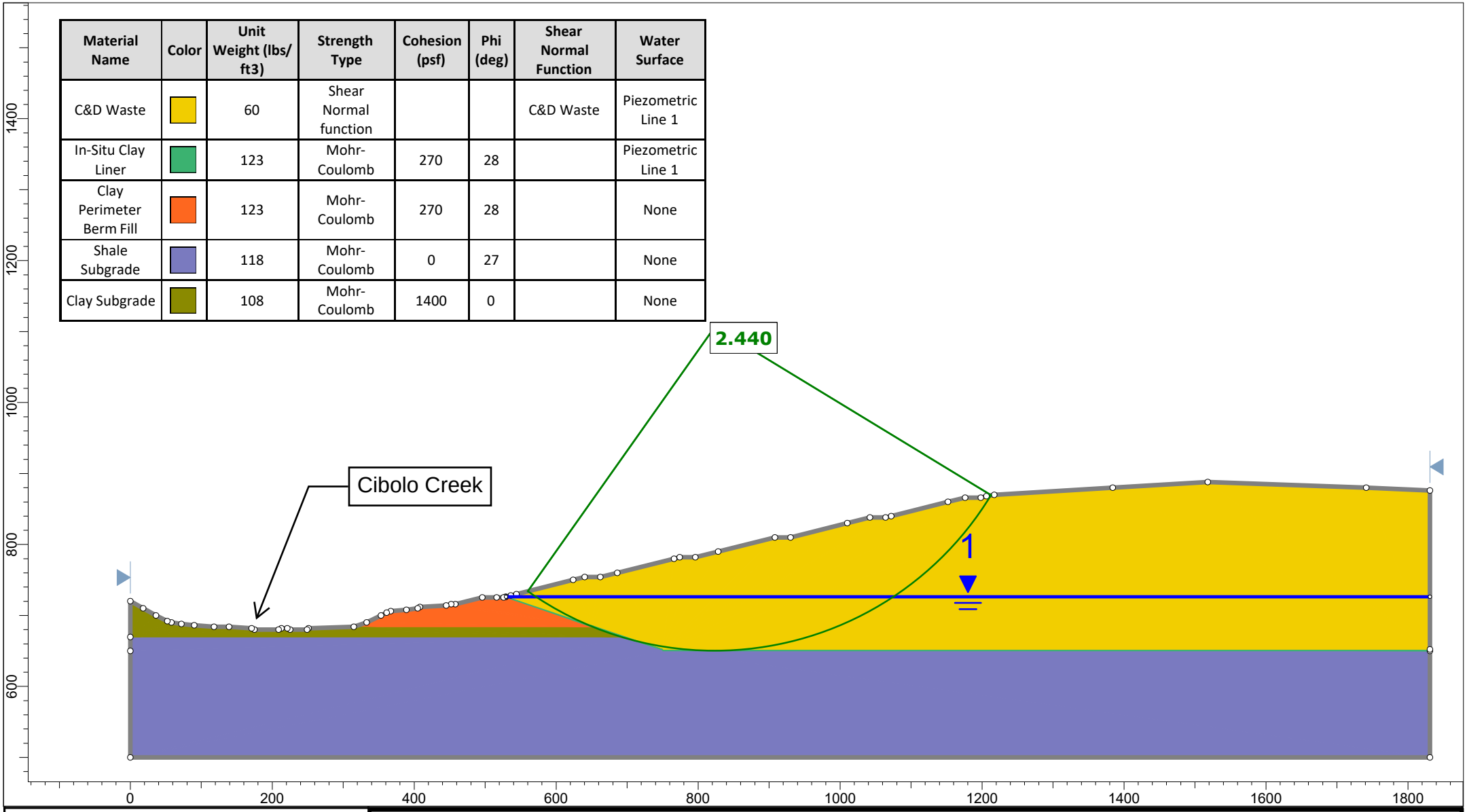
Material Boundary

X	Y
0	669.5
849.796	669.5

CROSS-SECTION D

CIRCULAR ARC

Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In-Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



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SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section D, Circular

Created By: ZLM	Checked By: TDM	Civil & Environmental Consultants, Inc.
Created Date: 3-18-22	Checked Date: 4-22-22	

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:01m:16.212s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In-Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.440140
Center:	823.217, 1106.244
Radius:	455.982
Left Slip Surface Endpoint:	559.900, 733.975
Right Slip Surface Endpoint:	1212.759, 869.229
Resisting Moment:	7.45204e+08 lb-ft
Driving Moment:	3.05394e+08 lb-ft
Resisting Horizontal Force:	1.46493e+06 lb
Driving Horizontal Force:	600346 lb
Total Slice Area:	67777.4 ft2
Surface Horizontal Width:	652.859 ft
Surface Average Height:	103.816 ft

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.44014

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	11.1699	3500.73	-34.4221	C&D Waste	5.68434e-14	34.992	113.391	276.689	395.27	0	395.27	317.566	317.566
2	13.0958	12784.6	-32.5947	C&D Waste	0	34.992	260.915	636.67	1170.76	261.233	909.532	1003.94	742.703
3	13.0958	21697	-30.6615	C&D Waste	1.13687e-13	34.992	332.337	810.948	1923.21	764.715	1158.49	1726.18	961.469
4	13.0958	30144.3	-28.7663	C&D Waste	1.13687e-13	34.992	406.805	992.662	2649.35	1231.26	1418.09	2426.01	1194.75
5	13.0958	38152.2	-26.905	C&D Waste	0	34.992	482.952	1178.47	3346.43	1662.9	1683.53	3101.36	1438.46
6	13.0958	45742.7	-25.0739	C&D Waste	0	34.992	559.542	1365.36	4011.93	2061.41	1950.52	3750.13	1688.72
7	13.4431	54211.8	-23.2463	In-Situ Clay Liner	270	28	584.389	1425.99	4606.84	2432.74	2174.1	4355.81	1923.07
8	13.4431	59619.1	-21.4197	In-Situ Clay Liner	270	28	606.859	1480.82	5054.66	2777.45	2277.21	4816.59	2039.14
9	14.3654	70453.5	-19.5546	Clay Subgrade	1400	0	573.738	1400	5539.54	0	5539.54	5335.75	5335.75
10	14.3654	77719.2	-17.6497	Clay Subgrade	1400	0	573.738	1400	6070.87	0	6070.87	5888.32	5888.32
11	14.1047	82514.8	-15.7816	In-Situ Clay Liner	270	28	748.838	1827.27	6598.77	3669.96	2928.81	6387.13	2717.17
12	14.1047	87777.5	-13.9476	In-Situ Clay Liner	270	28	781.406	1906.74	6981.9	3903.63	3078.27	6787.83	2884.2
13	12.6136	82891.2	-12.2236	C&D Waste	207.75	30.8002	880.154	2147.7	7352.46	4098.18	3254.28	7161.78	3063.6
14	12.6136	87205.6	-10.6064	C&D Waste	207.75	30.8002	922.218	2250.34	7683.57	4257.13	3426.44	7510.88	3253.75
15	12.6136	91241.8	-8.99779	C&D Waste	207.75	30.8002	961.06	2345.12	7978.62	4393.14	3585.48	7826.44	3433.3
16	12.6136	95003.7	-7.39627	C&D Waste	207.75	30.8002	996.767	2432.25	8238.1	4506.55	3731.55	8108.71	3602.16

17	12.6136	97825.9	-5.80055	C&D Waste	207.75	30.8002	1015.29	2477.46	8405.08	4597.61	3807.47	8301.94	3704.33
18	13.2577	104201	-4.1688	In-Situ Clay Liner	270	28	926.242	2260.16	8410.7	4667.74	3742.96	8343.19	3675.45
19	13.2577	106915	-2.49987	In-Situ Clay Liner	270	28	943.081	2301.25	8536.14	4715.95	3820.19	8494.97	3779.02
20	13.2577	110181	-0.833053	In-Situ Clay Liner	270	28	972.854	2373.9	8696.85	4740.02	3956.83	8682.7	3942.68
21	13.2577	112817	0.833053	In-Situ Clay Liner	270	28	995.238	2428.52	8799.57	4740.02	4059.55	8814.04	4074.02
22	13.2577	114825	2.49987	In-Situ Clay Liner	270	28	1010.75	2466.37	8846.69	4715.95	4130.74	8890.81	4174.86
23	13.2577	116201	4.1688	In-Situ Clay Liner	270	28	1019.93	2488.76	8840.64	4667.74	4172.9	8914.98	4247.24
24	13.2733	117650	5.84228	C&D Waste	207.75	30.8002	1120.87	2735.07	8834.76	4595.22	4239.54	8949.45	4354.23
25	13.2733	119054	7.52177	C&D Waste	207.75	30.8002	1141.63	2785.73	8822.7	4498.16	4324.54	8973.43	4475.27
26	13.2733	120142	9.2078	C&D Waste	207.75	30.8002	1162.27	2836.1	8785.42	4376.35	4409.07	8973.83	4597.48
27	13.2733	120420	10.9019	C&D Waste	207.75	30.8002	1174.46	2865.84	8688.43	4229.45	4458.98	8914.63	4685.18
28	13.2733	118422	12.6057	C&D Waste	207.75	30.8002	1153.28	2814.16	8429.34	4057.08	4372.26	8687.24	4630.16
29	13.2733	117087	14.321	C&D Waste	207.75	30.8002	1151.28	2809.28	8222.77	3858.74	4364.03	8516.68	4657.94
30	13.2733	116857	16.0495	C&D Waste	207.75	30.8002	1175.67	2868.81	8097.79	3633.89	4463.9	8436.01	4802.12
31	13.2733	116283	17.7931	C&D Waste	207.75	30.8002	1201.45	2931.7	7951.28	3381.84	4569.44	8336.86	4955.02
32	13.2733	115352	19.5539	C&D Waste	207.75	30.8002	1228.71	2998.22	7782.86	3101.85	4681.01	8219.27	5117.42
33	13.2733	114053	21.3342	C&D Waste	207.75	30.8002	1257.58	3068.68	7592.24	2793.01	4799.23	8083.42	5290.41
34	13.2733	112373	23.1364	C&D Waste	207.75	30.8002	1288.14	3143.23	7378.56	2454.31	4924.25	7928.96	5474.65
35	13.2733	110297	24.9632	C&D Waste	207.75	30.8002	1320.38	3221.9	7140.78	2084.57	5056.21	7755.45	5670.88
36	13.2733	107807	26.8176	C&D Waste	207.75	30.8002	1354.25	3304.56	6877.31	1682.43	5194.88	7561.92	5879.49
37	13.2733	104536	28.7028	C&D Waste	207.75	30.8002	1384.2	3377.65	6563.83	1246.33	5317.5	7321.75	6075.42
38	13.2733	98825.7	30.6227	C&D Waste	207.75	30.8002	1384.97	3379.53	6095.09	774.436	5320.66	6914.91	6140.47
39	13.2733	93287.6	32.5816	C&D Waste	207.75	30.8002	1397.54	3410.19	5636.73	264.641	5372.09	6529.86	6265.22
40	12.4906	83775.8	34.5238	C&D Waste	207.75	30.8002	1377.02	3360.12	5288.1	0	5288.1	6235.34	6235.34
41	12.4906	79439.1	36.452	C&D Waste	207.75	30.8002	1296.05	3162.55	4956.68	0	4956.68	5914.03	5914.03
42	12.4906	74608.4	38.4295	C&D Waste	207.75	30.8002	1209.57	2951.51	4602.65	0	4602.65	5562.36	5562.36
43	12.4906	69242.8	40.4628	C&D Waste	207.75	30.8002	1116.95	2725.51	4223.54	0	4223.54	5176.25	5176.25
44	12.4906	63293	42.5597	C&D Waste	207.75	30.8002	1017.47	2482.76	3816.33	0	3816.33	4750.62	4750.62
45	12.4906	56698.9	44.7298	C&D Waste	207.75	30.8002	910.239	2221.11	3377.41	0	3377.41	4279.1	4279.1
46	12.4906	49386.2	46.9849	C&D Waste	207.75	30.8002	794.188	1937.93	2902.37	0	2902.37	3753.58	3753.58
47	12.4906	41260.7	49.3398	C&D Waste	207.75	30.8002	668.019	1630.06	2385.92	0	2385.92	3163.65	3163.65
48	12.4906	31160.7	51.8137	C&D Waste	0	34.992	507.303	1237.89	1768.41	0	1768.41	2413.39	2413.39
49	12.4906	18707	54.4324	C&D Waste	0	34.992	299.895	731.786	1045.41	0	1045.41	1464.8	1464.8
50	12.4906	6353.27	57.2317	C&D Waste	0	34.992	99.9533	243.9	348.428	0	348.428	503.714	503.714

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.44014

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	559.9	733.975	0	0	0
2	571.07	726.321	4292.63	46.1236	0.61561
3	584.166	717.947	17514.1	408.087	1.33478
4	597.262	710.183	36799.4	1316.09	2.04825
5	610.358	702.994	61176.3	2941.66	2.75294
6	623.454	696.349	89741.4	5403.8	3.44592
7	636.549	690.221	121654	8772.05	4.12426
8	649.992	684.447	156115	13116	4.80243
9	663.436	679.173	190933	18247.8	5.45928
10	677.801	674.071	227443	24445.3	6.13453
11	692.166	669.5	263436	31315.3	6.77908
12	706.271	665.514	300307	38891.8	7.37912
13	720.376	662.011	335791	46857.8	7.94401
14	732.989	659.278	366988	54306.4	8.41747
15	745.603	656.916	396774	61844.2	8.85927
16	758.216	654.919	424836	69326	9.26801
17	770.83	653.281	450903	76606.9	9.64229
18	783.444	652	474484	83502	9.98099
19	796.701	651.034	494896	89915.1	10.2975
20	809.959	650.455	512345	95626.9	10.5724
21	823.217	650.262	526924	100562	10.8048
22	836.474	650.455	538427	104601	10.994
23	849.732	651.034	546712	107651	11.1394
24	862.99	652	551696	109644	11.2405
25	876.263	653.358	554580	110786	11.297
26	889.536	655.111	554276	110842	11.3086
27	902.81	657.262	550806	109815	11.2753
28	916.083	659.819	544189	107724	11.1971
29	929.356	662.787	534482	104613	11.0744
30	942.63	666.176	521906	100574	10.9075
31	955.903	669.994	506595	95693.8	10.6969
32	969.176	674.254	488678	90071.2	10.4433
33	982.45	678.968	468301	83818.9	10.1476
34	995.723	684.153	445640	77061.8	9.81079
35	1009	689.824	420897	69935	9.43391
36	1022.27	696.003	394305	62581.4	9.01837
37	1035.54	702.713	366141	55148.8	8.5656
38	1048.82	709.981	336816	47799.7	8.07727
39	1062.09	717.838	307318	40760.1	7.55514
40	1075.36	726.321	278060	34147.6	7.00124
41	1087.85	734.913	249830	28256.4	6.45287
42	1100.34	744.139	220293	22687.9	5.88014
43	1112.83	754.05	189793	17556.8	5.2851
44	1125.33	764.703	158752	12967.9	4.66992
45	1137.82	776.173	127694	9011.78	4.03686
46	1150.31	788.546	97278.2	5759.32	3.38822
47	1162.8	801.934	68346.5	3254.82	2.7265
48	1175.29	816.476	41997.5	1506.37	2.05421
49	1187.78	832.356	20253.1	485.756	1.37393
50	1200.27	849.824	5739.68	68.9556	0.688309
51	1212.76	869.229	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
529.283	726.321
1831	726.321

External Boundary

X	Y
458	716
452	716
445	714
408	712
405	710
389	708
367	706
361	704
353	700
333	690
315	684
251	682
249	680
225	680
221	682
213	682
209	680
175	680
171	682
139	684
118	684
90	686
72	688
58	690
52	692
36	700
18	710
0	720
0	669.5
0	650
0	500
1831	500
1831	650
1831	652
1831	876
1741	880
1518	888
1384	880
1217	870
1206	868
1198	866
1176	866
1152	860
1072	840
1064	838
1042	838

1010	830
930	810
908	810
828	790
796	782
774	782
766	780
686	760
662	754
640	754
624	750
544	730
536	728
529.283	726.321
528	726
525.829	725.483
515.993	725.483
495.921	725.483

Material Boundary

X	Y
525.829	725.483
649.093	684
692.179	669.5
750.122	650

Material Boundary

X	Y
750.122	650
1831	650

Material Boundary

X	Y
315	684
649.093	684

Material Boundary

X	Y
750.122	652
1831	652

Material Boundary

X	Y
529.283	726.321
649.093	686
750.122	652

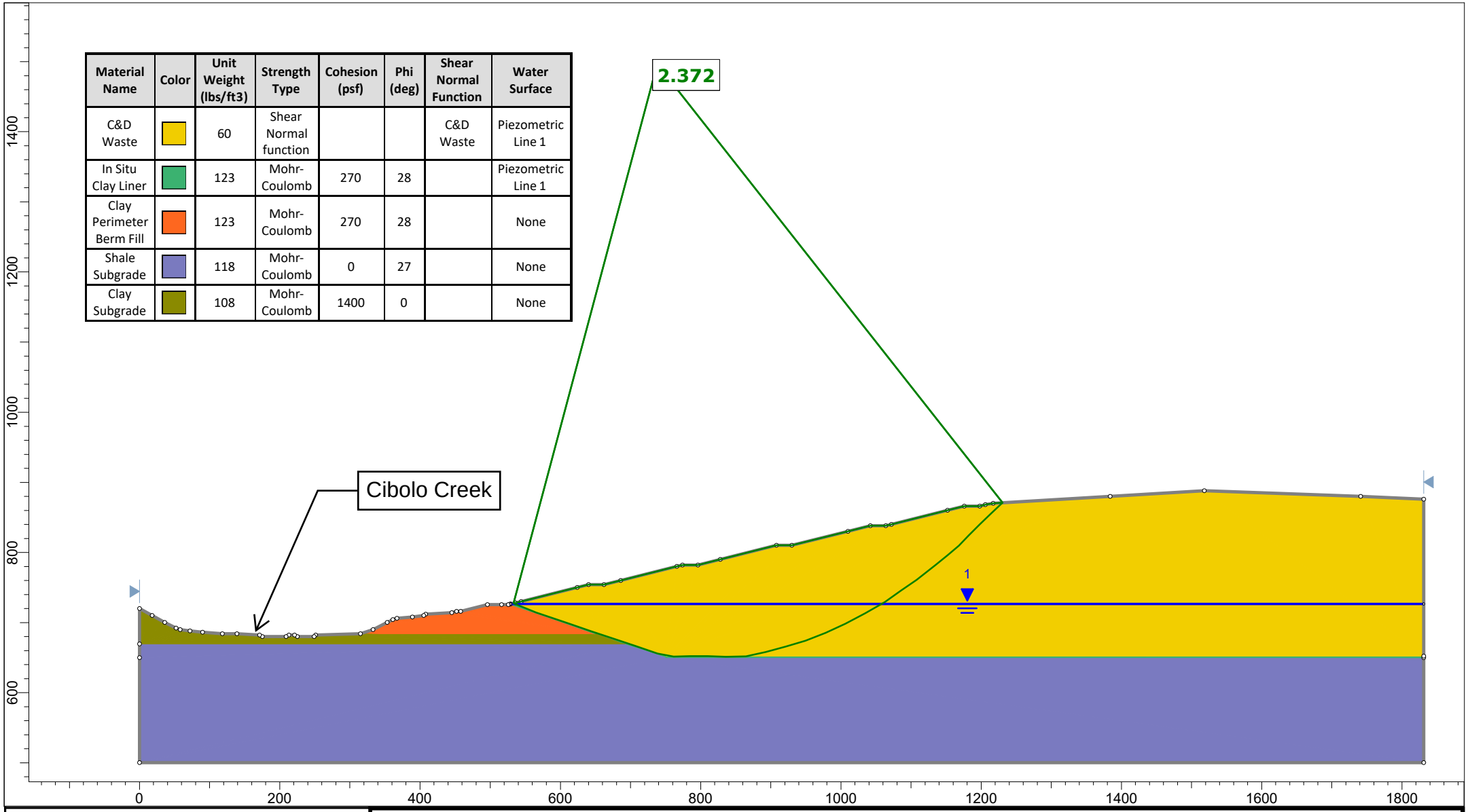
Material Boundary

X	Y
0	669.5
692.179	669.5

CROSS-SECTION D

NON-CIRCULAR SEARCH

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Shear Normal Function	Water Surface
C&D Waste		60	Shear Normal function			C&D Waste	Piezometric Line 1
In Situ Clay Liner		123	Mohr-Coulomb	270	28		Piezometric Line 1
Clay Perimeter Berm Fill		123	Mohr-Coulomb	270	28		None
Shale Subgrade		118	Mohr-Coulomb	0	27		None
Clay Subgrade		108	Mohr-Coulomb	1400	0		None



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SLIDEINTERPRET 9.021

Project: 311-653 Beck Landfill Vertical Expansion

Analysis Description: Section D, Non-Circular

Created By: ZLM	Checked By: TDM
Created Date: 3-18-22	Checked Date: 4-22-22

Civil & Environmental Consultants, Inc.

Slide2 Analysis Information

SLIDE - An Interactive Slope Stability Program

Project Summary

Slide2 Modeler Version:	9.021
Compute Time:	00h:01m:52.962s
Date Created:	3/24/2022, 9:28:32 AM

General Settings

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

Analysis Options

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

Groundwater Analysis

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

Random Numbers

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

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	500
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

C&D Waste	
Color	
Strength Type	Shear Normal function
Unit Weight [lbs/ft3]	60
Water Surface	Piezometric Line 1
Hu Value	1
In Situ Clay Liner	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	Piezometric Line 1
Hu Value	1
Clay Perimeter Berm Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	123
Cohesion [psf]	270
Friction Angle [deg]	28
Water Surface	None
Ru Value	0
Shale Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	118
Cohesion [psf]	0
Friction Angle [deg]	27
Water Surface	None
Ru Value	0
Clay Subgrade	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	108
Cohesion [psf]	1400
Friction Angle [deg]	0
Water Surface	None
Ru Value	0

Shear Normal Functions

Name: C&D Waste

Effective Normal (psf)	Shear (psf)
0	0
2000	1400
10000	6169

Global Minimums

Method: gle/morgenstern-price

FS	2.372300
Axis Location:	738.239, 1496.433
Left Slip Surface Endpoint:	533.079, 727.270
Right Slip Surface Endpoint:	1230.473, 870.807
Resisting Moment:	1.3144e+09 lb-ft
Driving Moment:	5.54478e+08 lb-ft
Resisting Horizontal Force:	1.44181e+06 lb
Driving Horizontal Force:	608226 lb
Total Slice Area:	66550.1 ft2
Surface Horizontal Width:	697.394 ft
Surface Average Height:	95.4268 ft

Global Minimum Coordinates

Method: gle/morgenstern-price

X	Y
533.079	727.27
564.984	714.457
588.957	706.239
612.93	698.17
644.053	687.312
675.176	677.028
706.771	666.583
738.367	655.804
761.411	651.315
784.456	652
810.335	651.933
836.214	651.176
864.581	651.81
892.948	658.043
921.315	665.776
949.683	674.121
977.958	685.187
1006.23	698.141
1034.51	713.05
1062.79	729.147
1085.45	745.323
1108.11	761.009
1135.58	782.44
1151.9	795.939
1168.1	809.482
1182.14	824.05
1198.25	840.198
1214.36	855.784
1230.47	870.807

Global Minimum Support Data

No Supports Present

Slice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.3723

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.36348	109.195	-21.8801	C&D Waste	0	34.992	15.4939	36.7562	52.5088	0	52.5088	46.2865	46.2865
2	14.7706	5629.63	-21.8801	C&D Waste	0	34.992	66.8718	158.64	411.684	185.055	226.629	384.829	199.774
3	14.7706	14159.2	-21.8801	C&D Waste	0	34.992	141.453	335.57	1034.58	555.201	479.382	977.776	422.575
4	11.9864	17506.2	-18.9212	C&D Waste	0	34.992	207.426	492.076	1571.43	868.468	702.965	1500.33	631.862
5	11.9864	22616.3	-18.9212	C&D Waste	1.13687e-13	34.992	272.063	645.416	2046.89	1124.86	922.025	1953.62	828.765
6	11.9864	27699.8	-18.6027	C&D Waste	0	34.992	337.982	801.795	2524.35	1378.93	1145.42	2410.59	1031.66
7	11.9864	32756.5	-18.6027	C&D Waste	0	34.992	406.865	965.207	3009.56	1630.69	1378.87	2872.61	1241.92
8	31.1229	109274	-19.2332	In Situ Clay Liner	270	28	524.578	1244.46	3928.04	2095.34	1832.7	3745.02	1649.68
9	15.5615	64996.6	-18.2851	In Situ Clay Liner	270	28	584.766	1387.24	4695.78	2594.56	2101.22	4502.56	1908
10	15.5615	71006.4	-18.2851	In Situ Clay Liner	270	28	616.849	1463.35	5159.78	2915.41	2244.37	4955.95	2040.54
11	15.7977	80574.7	-18.2938	In Situ Clay Liner	270	28	688.661	1633.71	5803.55	3238.79	2564.76	5575.88	2337.09
12	15.7977	89175.3	-18.2938	In Situ Clay Liner	270	28	762.711	1809.38	6459.83	3564.69	2895.14	6207.68	2642.99
13	31.5955	204800	-18.8369	In Situ Clay Liner	270	28	883.459	2095.83	7497.82	4063.93	3433.89	7196.43	3132.5
14	1.0738	7577.12	-11.023	In Situ Clay Liner	270	28	879.383	2086.16	7822.45	4406.75	3415.7	7651.15	3244.4
15	18.4537	134936	-11.023	C&D Waste	207.75	30.8002	996.565	2364.15	8142.8	4525.44	3617.36	7948.67	3423.23
16	3.51705	26824.2	-11.023	In Situ Clay Liner	270	28	968.044	2296.49	8470.25	4658.97	3811.28	8281.68	3622.71
17	11.5223	89422.4	1.70247	In Situ Clay Liner	270	28	870.354	2064.74	8045.07	4669.66	3375.41	8070.94	3401.28
18	11.5223	90108.6	1.70247	In Situ Clay Liner	270	28	886.153	2102.22	8094.19	4648.29	3445.9	8120.53	3472.24
19	12.9395	100969	-0.148038	In Situ Clay Liner	270	28	899.022	2132.75	8141.95	4638.64	3503.31	8139.63	3500.99
20	12.9395	102535	-0.148038	In Situ Clay Liner	270	28	923.336	2190.43	8252.55	4640.73	3611.82	8250.16	3609.43
21	12.9395	105374	-1.67507	In Situ Clay Liner	270	28	984.218	2334.86	8537.04	4653.58	3883.46	8508.26	3854.68
22	12.9395	108487	-1.67507	In Situ Clay Liner	270	28	1031.53	2447.1	8771.73	4677.19	4094.54	8741.56	4064.37
23	14.1836	121857	1.27963	In Situ Clay Liner	270	28	1041.01	2469.59	8815.96	4679.11	4136.85	8839.21	4160.1
24	14.1836	124322	1.27963	In Situ Clay Liner	270	28	1079.69	2561.34	8968.7	4659.34	4309.36	8992.82	4333.48
25	0.86556	7657.52	12.392	In Situ Clay Liner	270	28	976.31	2316.1	8491.68	4643.52	3848.16	8706.19	4062.67
26	13.7509	121753	12.392	C&D Waste	207.75	30.8002	1077.02	2555.02	8480.86	4543.33	3937.53	8717.5	4174.17
27	13.7509	122096	12.392	C&D Waste	207.75	30.8002	1123	2664.09	8475.32	4354.8	4120.52	8722.06	4367.26
28	28.3673	250356	15.2498	C&D Waste	207.75	30.8002	1148.78	2725.26	8242.36	4019.24	4223.12	8555.55	4536.31

29	14.1837	121189	16.3929	C&D Waste	207.75	30.8002	1152.61	2734.33	7886.07	3647.76	4238.31	8225.15	4577.39
30	14.1837	120090	16.3929	C&D Waste	207.75	30.8002	1193.98	2832.48	7790.36	3387.39	4402.97	8141.61	4754.22
31	14.1378	118588	21.3717	C&D Waste	207.75	30.8002	1187.77	2817.74	7462.88	3084.6	4378.28	7927.68	4843.08
32	14.1378	116893	21.3717	C&D Waste	207.75	30.8002	1242.01	2946.43	7333.51	2739.37	4594.14	7819.55	5080.18
33	14.1379	114798	24.6156	C&D Waste	207.75	30.8002	1260.21	2989.59	7031.2	2364.66	4666.54	7608.59	5243.93
34	14.1379	112302	24.6156	C&D Waste	207.75	30.8002	1317.77	3126.14	6856.04	1960.46	4895.58	7459.79	5499.33
35	14.1379	109391	27.8013	C&D Waste	207.75	30.8002	1340.23	3179.42	6510.78	1525.79	4984.99	7217.44	5691.65
36	14.1379	106065	27.8013	C&D Waste	207.75	30.8002	1400.9	3323.35	6287.04	1060.63	5226.41	7025.69	5965.06
37	11.6553	84638.6	29.6521	C&D Waste	207.75	30.8002	1433.43	3400.52	5976.9	621.032	5355.87	6792.92	6171.89
38	11.6553	80419.3	29.6521	C&D Waste	207.75	30.8002	1455.28	3452.37	5649.85	206.999	5442.85	6478.31	6271.31
39	4.96522	32849.7	29.6521	C&D Waste	207.75	30.8002	1445.05	3428.09	5402.13	0	5402.13	6224.77	6224.77
40	22.6611	140457	35.5192	C&D Waste	207.75	30.8002	1302.61	3090.17	4835.26	0	4835.26	5765.06	5765.06
41	11.3306	64947.1	34.6908	C&D Waste	207.75	30.8002	1223.88	2903.42	4521.99	0	4521.99	5369.16	5369.16
42	11.3306	61540.9	34.6908	C&D Waste	207.75	30.8002	1167.63	2769.96	4298.12	0	4298.12	5106.34	5106.34
43	13.7379	69550.3	37.9542	C&D Waste	207.75	30.8002	1071.59	2542.13	3915.93	0	3915.93	4751.77	4751.77
44	13.7379	63548.7	37.9542	C&D Waste	207.75	30.8002	991.148	2351.3	3595.8	0	3595.8	4368.9	4368.9
45	16.3149	67294.7	39.6059	C&D Waste	207.75	30.8002	886.89	2103.97	3180.9	0	3180.9	3914.76	3914.76
46	16.2	57629.1	39.894	C&D Waste	207.75	30.8002	779.661	1849.59	2754.18	0	2754.18	3405.94	3405.94
47	14.0452	41022.2	46.0461	C&D Waste	207.75	30.8002	628.529	1491.06	2152.75	0	2152.75	2804.66	2804.66
48	16.1099	32745.1	45.0683	C&D Waste	0	34.992	449.564	1066.5	1523.57	0	1523.57	1974.21	1974.21
49	16.1099	19272.3	44.0526	C&D Waste	1.13687e-13	34.992	269.866	640.202	914.573	0	914.573	1175.66	1175.66
50	16.1099	6768.99	43.0009	C&D Waste	0	34.992	96.6134	229.196	327.423	0	327.423	417.519	417.519

Interslice Data

Global Minimum Query (gle/morgenstern-price) - Safety Factor: 2.3723

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	533.079	727.27	0	0	0
2	535.443	726.321	86.5044	0.184197	0.122002
3	550.213	720.389	3517.51	54.2459	0.883527
4	564.984	714.457	11746.4	336.486	1.64084
5	576.97	710.348	20692.6	812.943	2.2498
6	588.957	706.239	32368	1612.35	2.85172
7	600.943	702.205	46608.8	2805.58	3.44472
8	612.93	698.17	63633.8	4479.83	4.02699
9	644.053	687.312	122633	11756.7	5.47615
10	659.614	682.17	155889	16824.8	6.15998
11	675.176	677.028	192032	22939.5	6.81208
12	690.973	671.805	233235	30451.2	7.43847
13	706.771	666.583	279037	39344.9	8.02593
14	738.367	655.804	387802	61930.5	9.0733
15	739.44	655.595	390383	62569.5	9.10576
16	757.894	652	438067	74321.1	9.62894
17	761.411	651.315	447279	76625	9.72118
18	772.933	651.657	454565	80202.3	10.0061
19	784.456	652	462016	83664.7	10.2642
20	797.395	651.966	473936	88021.4	10.5213
21	810.335	651.933	486174	92242.7	10.7431
22	823.274	651.555	502156	96963.7	10.929
23	836.214	651.176	518839	101590	11.0785
24	850.397	651.493	530830	105107	11.2
25	864.581	651.81	543321	108338	11.2769
26	865.446	652	542552	108217	11.2801
27	879.197	655.021	531757	106344	11.3092
28	892.948	658.043	521612	104190	11.2959
29	921.315	665.776	490497	96547.3	11.1355
30	935.499	669.949	473960	92029.6	10.9885
31	949.683	674.121	458410	87425.7	10.7975
32	963.821	679.654	433935	80926.8	10.564
33	977.958	685.187	410944	74594.1	10.2882
34	992.096	691.664	383238	67375.8	9.97109
35	1006.23	698.141	357482	60550.9	9.61361
36	1020.37	705.596	327919	53211.4	9.21704
37	1034.51	713.05	300883	46486.4	8.78275
38	1046.17	719.685	277953	41032	8.39747
39	1057.82	726.321	257449	36129.6	7.98854
40	1062.79	729.147	249363	34191.4	7.80742
41	1085.45	745.323	200706	24398.5	6.93106
42	1096.78	753.166	179124	20295.3	6.46422
43	1108.11	761.009	158661	16619.2	5.97973
44	1121.85	771.724	131439	12356.5	5.37056
45	1135.58	782.44	106541	8833.5	4.73965
46	1151.9	795.939	78087.8	5413.3	3.96559
47	1168.1	809.482	53435.8	2963.56	3.17438
48	1182.14	824.05	30913.9	1335.47	2.47362
49	1198.25	840.198	13562.2	392.308	1.65691
50	1214.36	855.784	3660.75	53.0863	0.830815
51	1230.47	870.807	0	0	0

Discharge Sections

Entity Information

Piezoline

X	Y
529.283	726.321
1831	726.321

External Boundary

X	Y
458	716
452	716
445	714
408	712
405	710
389	708
367	706
361	704
353	700
333	690
315	684
251	682
249	680
225	680
221	682
213	682
209	680
175	680
171	682
139	684
118	684
90	686
72	688
58	690
52	692
36	700
18	710
0	720
0	669.5
0	650
0	500
1831	500
1831	650
1831	652
1831	876
1741	880
1518	888
1384	880
1217	870
1206	868
1198	866
1176	866
1152	860
1072	840
1064	838
1042	838

1010	830
930	810
908	810
828	790
796	782
774	782
766	780
686	760
662	754
640	754
624	750
544	730
536	728
529.283	726.321
528	726
525.829	725.483
515.993	725.483
495.921	725.483

Material Boundary

X	Y
525.829	725.483
649.093	684
692.179	669.5
750.122	650

Material Boundary

X	Y
750.122	650
1831	650

Material Boundary

X	Y
315	684
649.093	684

Material Boundary

X	Y
750.122	652
1831	652

Material Boundary

X	Y
529.283	726.321
649.093	686
750.122	652

Material Boundary

X	Y
0	669.5
692.179	669.5

Appendix D5-C

Previous Geotechnical Reports

Geotechnical Investigation (Attachment 11) prepared by Snowden , Inc. (1985)

Geotechnical Data Report prepared by Terracon Consultants, Inc. (2020)

GEOTECHNICAL INVESTIGATION

Beck Ready Mix, Inc.

F.M. 78

Schertz, Texas

Job #5108

August - December, 1985

ATTACHMENT 11

SNOWDEN, INC.

WALTER L. SNOWDEN
20019

Walter L. Snowden, P.E.

TABLE OF CONTENTS

Investigation	1
Geology and Hydrology	4
Appendix A (Recorded Water Well Datum)	9
Geologic Cross Sections	
Figure 1	10
Figure 2	11
Figure 3	12
Laboratory Test Results	
Boring Plan	
Boring Logs	
Unified Soil Classification System	

INVESTIGATION

The exploration and analysis of the subsurface stratum, as relevent to a future usage as a landfill site for Beck Ready Mix, Inc., formulates the basis of this publication. The investigation was conducted in such a manner as to allow the development of datum, both as pertaining to the applicable sections of the 325.74 (b) (5) requirements provided by the Texas Department of Health, and as appropriate to the existing conditions of the site.

The locality of the site, and the Geologic Atlas of Texas, San Antonio Sheet, indicated that the site would likely be surficially underlain by recent terrace type deposits and at greater depths by a clay and/or shale of the Navarro Formation. The upper deposits, as such would be of a stream depositional nature, were invisioned as being highly permeable. The deposits of the Navarro Formation, were by contrast, invisioned as retaining very low permeability values. These specific geologic conditions indicated a likelihood for the existance of a perched water table beneath the site. The construction of a vertical cut-off or confining type of wall, surrounding the site, was invisioned as a possible method of facilitating the proposed land usage, given the theorized geologic conditions. The subsurface investigation was thus guided somewhat by this assumption.

The current land use and surface condtions of this specific tract of land is quite variable. The site could generally be described as being located within an oxbow bend of Cibolo Creek. Portions of the site correspondantly, were somewhat low topographically and supported the heavy

vegetation growth common to south Texas streams. Higher portions of the site were, or had been under cultivation. The primary land usage, which had been in effect for many years, included the removal of sand and gravel to support a concrete batch plant located on a portion of the property. Excavated soil was also being sold commercially. Portions of the site, where previous excavations had been discontinued, were semi-reconstructed through the placement of buried waste materials.

An investigative program, appropriate to the datum requirements, subsurface geology and current land usage, was thus developed. A series of borings, along a 400 foot grid layout within the confines of the project area, was felt adequate and thus proposed. The Texas Department of Health approved the investigative proposal with the understanding that some individual boring locations were subject to equipment accessability and thus may be delated. Ommission of boring could not however compromise the development of an adequate subsurface stratagraphic relationship.

A total of fifty-four (54) borings were excavated. Each of the proposed boring locations is indicated on the boring plan, but only those designated by grid numbers were actually drilled. A continous flight auger system, either of a solid or hollowstem type, was employed in the advancement of the borings.

Representative samples of the subsurface sediments were obtained from selected borings. Undisturbed or Shelby tube samples were recovered to represent much of the clay-shale penetration as recorded on the accompanying logs. Auger samples were generally recovered to represent the stream

deposited stratum. All samples were immediately sealed to preserve in-situ states and moisture conditions as near as possible.

The analysis of the soil samples was performed in a soils laboratory. Testing generally conformed to an appropriate A.S.T.M specification as per the soil property being determined. The values of permeability, each expressed as centimeters per second, were derived by a constant head method utilizing flexible wall permeameters. The recompacted samples were also tested by the same method. Permeability was determined for selected clay samples from six (6) widely spaced borings. The samples were chosen as to be representative of the entirity of the clay formation underlying the proposed site and/or to confirm the impermeable nature of the natural clay. Atterberg Limits were determined from un-tested portions of the permeability samples, in order to formulate a basis of comparison, with the plasticity indexes, as determined from other sampled borings. A comparison of this nature should support the suitibility of the particular natural clay, as relevent to the proposed site usage. Sieve and Hydrometer analysis were not performed, as the majority of the laboratory investigation was concentrated on materials predominatly of clay minerals. Such clay materials would generally pass the #200 sieve.

The conclusions of the laboratory testing are given on the tables included in this report. The findings of the exploratory borings as depicted by the boring logs, along with the other aspects of the field accumulated datum, allowed an analysis of the subsurface conditions existing at the proposed site. The conclusions of the analysis are addressed "Geology and Hydrology" section of the report.

GEOLOGY & HYDROLOGY

The exploratory borings proved the theorized existance of recent terrace type deposits overlying clay and shale of the Navarro Group. The two deposits afford drastically different characteristics and thus are addressed separately.

The terrace deposits could be divided into areas of high and low tributary alluvial stratum. The ancient meanderings of Cibolo Creek have however reworked and thus isolated the deposits numerous times. Defining the separate stratum, though possible, would prove lengthy and not necessarily of great significance to an investigation of this nature.

Previous flood plain environments resulted in the occurance of the terrace stratum. The sediments generally consist of silty clay, sand, and gravel. Each of the constituants generally relate to a particular environment or water velocity. As typical of many flood plain deposits, the subsurface stratigraphy is variable both vertically and laterally. The included geologic cross-sections (figures 1, 2, 3), though greatly distorted along the horizontal axis, depict the variable subsurface stratigraphy. Several older channels of Cibolo Creek are also depicted by the cross-sections.

All of the stream deposited stratum is considered of the Quaternary Period, which extends through recent geologic times. It is possible that some of the higher gravel deposits are remnants of the older Pleistocene Epoch terraces. The generally low topographic condition would however indicate that the majority if not all of the deposits, are of the recent or Holocene Epoch.

The terrace deposits, as originally theroized, were found to contain a perched ground water table. As the center line of Cibolo Creek forms two portions of the property lines that define the investigated tract, it is quite reasonable to assume considerable recharge is occuring from the creek. The influx of waters through the permeable terrace stratum was not however found to be as dramatic as the potential would suggest. The groundwater as shown by the geologic cross-sections, generally parallels the top of the impervious clay and flows along ancient creek channels erroded into such clays. Evidence of capillary action, in response to sediment types and surface features, is also depicted by the static, water elevations. Generally, the ground water migration or subsurface flow beneath the project area, is towards the Northeast, or in a direction basically parallel to the immediate thurst of Cibolo Creek.

The volume or availibility of ground water, for most portions of the site, should be considered significant. The initial depth at which ground water was encountered by the exploratory borings, proved to be the equivalent of the static water level. An exception would be the few borings in which clay cuttings sealed off the water bearing zone. Generally, the static water level stabilized in the open bore holes within minutes of completion. As exploratory borings are small diameter excavations, and the thickness of the water bearing stratum was typically just a few feet, only low yield bailers could be used. In those borings in which bailing was attempted, the removal of water, equivelent to a bore volume, reflected no change in the static water elevation. The elevation of the ground water shortly after completion, was thus established as the static water elevation.

The high permeability and a considerable porosity, were also confirmed by this datum, as originally invisioned for the terrace stratum.

The ground water encountered by the exploratory borings, was found to possibly correspond with the completion aquifer of some recent domestic water wells. Recorded water well datum, as available at the Texas Water Commission, indicated two recent domestic wells to have been completed within an Alluvial aquifer in the proximity of the project area. The two wells (see Appendix A) are not felt to be within 500 feet of the project area. Should the two recorded wells, as theorized, be in excess of 500 feet beyond the project area, it is also probable that each such well could be completed in a Pleistocene deposit rather than the predominate Holocene deposits as encountered beneath this project. The geologic structure of the two deposits would normally indicate an interconnection of any saturated zones. The potential for recharge and/or discharge along Cibolo Creek, which generally separates the two age deposits, would make it difficult to verify the interconnection of saturated zones.

The perched ground water table, or Alluvial aquifer, though of significance to this proposed development, is not considered the primary use aquifer of the immediate area. The majority of the recorded water wells within a five mile radius of the project are producing from the Edwards aquifer. The Edwards aquifer should be in excess of approximatly 500 feet beneath the site of this investigation. Seventy (70) feet of Navarro shale and an underlying 110 feet of Taylor shale is indicated by the log of well Kx 68-30-603 (Appendix A). Equivalent shales should extend beneath this project and thus preclude any connection between the Edwards aquifer and the development of this project. The Navarro Shale

was shown by the laboratory portion of this investigation to be relatively impermeable.

The Navarro deposit as it immediatly underlies the terrace type deposits with the perched ground water table, is of considerable significance to the proposed development. The Navarro Group, consisting of the upper Kemp Formation and the lower Corsicana Formation, represent the youngest of the Cretaceous age deposits in the central Texas vicinity. Generally, the Navarro deposit could be described as a gray calcareous clay shale. At least two beds of the Navarro, are indicated by geologic sources, to contain limey sandstones and concretionary siltstones. Neither of these beds were encountered by the exploratory borings. The uppermost portion of the deposit has weathered to produce an expansive tan-gray clay. The depth of weathering, as indicated by the borings, was somewhat variable beneath this site. This variation is primarilly due to the natural joint structure and development of gypsum type deposits within such joints. Areas for greater and/or lesser potential moisture migration are thus expressed within the upper deposits. The determined values of permeability, however indicate all of the Navarro deposit, reguardless of the state of weathering, to likely retain characteristics favorable to the proposed development.

The thickness and position of the Navarro Group deposits could not be accurately determined by the shallow depth exploratory borings performed. The site is approximately along the extreme southeastern edge of the northeast trending Balcones fault system. The system generally comprises a series of slip-dip normal faults with downward displacements to the southeast. The faulting associated with the system, which altered the

Cretaceous age stratum of the general area, occured primarilly during the Miocene Epoch. No movement has been detected within the system in recent times.

Past erosion and the mantle of alluvial materials, obscures any evidence of fault traces within the immediate area of the project. sources must thus be depended upon rather heavilly for an evaluation of the structural geology. While no faults are though to exist beneath the proposed project, it is felt that the course of Cibolo Creek is somewhat controlled by a secondary geologic joint. Such a joint would connect the extensions of two separate fault traces as masked by the alluvial deposits. The known trend patterns, of joints associated with the Balcones fault system, and the fact that the entire site was found to be underlain by Navarro deposits, suggests, that a joint potentially occurs along or generally parallel to Cibolo Creek, as it flows northward away from the project area.

The theorized joint and/or trend, basically coincides with a slight subsurface delineation depicted by the exploratory borings. Wheather of not a joint occurs beneath the site, is felt to be irrelevent to the proposed development. Joints are typically, a break in the geologic stratum along which no relative movement has occurred. Similar deposits were found to exist on either side of the theorized joint. Permeabilities, as determined both on opposite sides and along the theorized joint, indicate little to no effect relevent to the potential joint. Additional deep subsurface exploration and subsequent expenses were thus not warranted relevent to the proposed future land usage.

Recorded Water Well Datum[1]

A. Water Wells (located)[2]

1. Kx 68 - 30 - 603 (Guadalupe Co.)
   a. location: ½ mi. east of Schertz
   b. date drilled: September, 1959
   c. depth: 550 feet
   d. completetion aquifer: Edwards (535' to 550')
   e. static water level: 84 feet
   f. pumping datum: 171' draw down @ 55 gpm

B. Water Wells (plotted)[3]

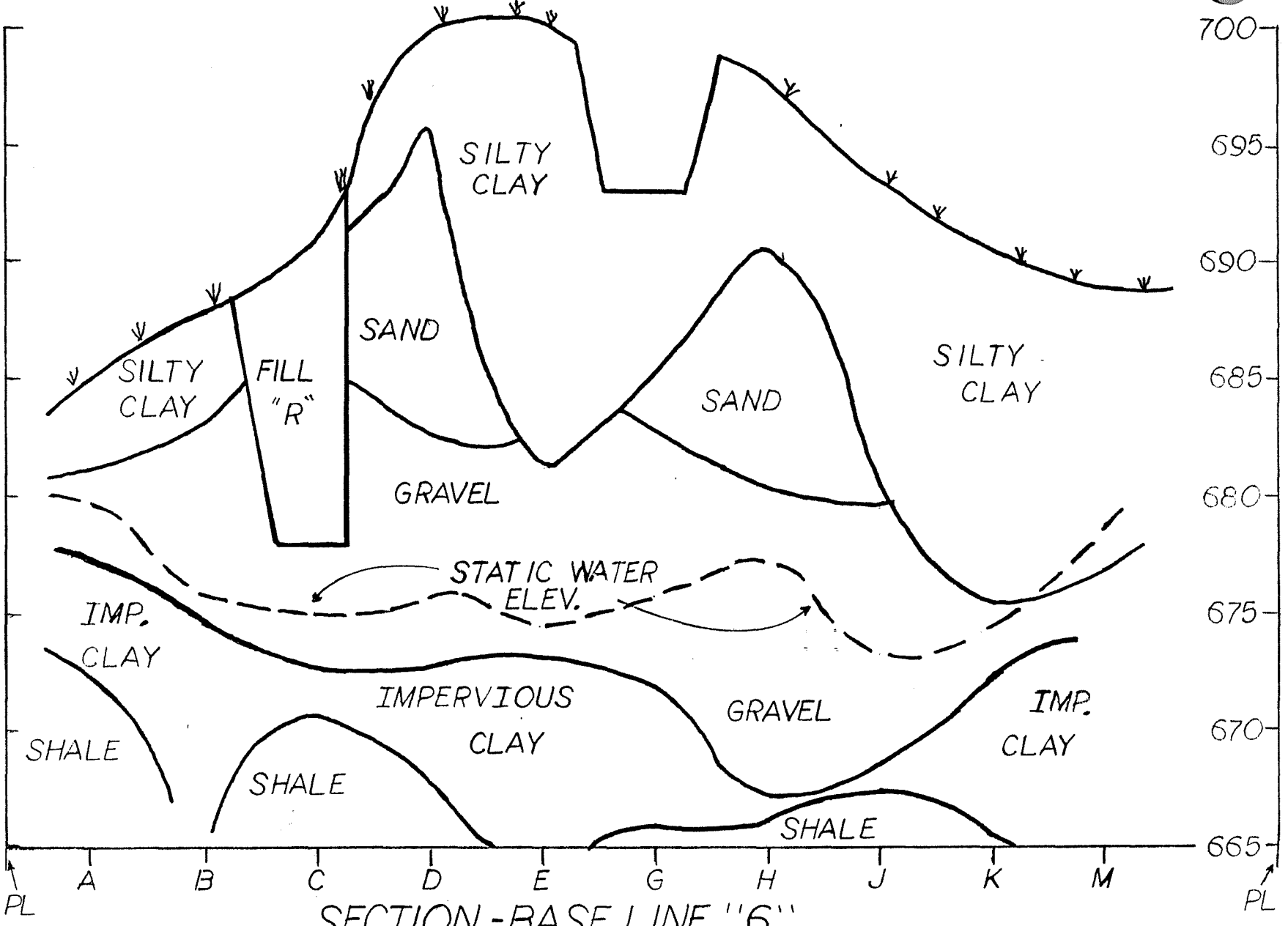
1. Kx 68 - 30 - 6A (Bexar Co.)
   a. location: 1 mile south of Schertz
   b. depth: 35 feet
   c. completion aquifer: Alluvial
   d. static water level: 20 feet
   e. pumping datum: 4' draw down @ 12 gpm

2. Kx 68 - 30 - 9A (Bexar Co.)
   a. location: ½ mile south of Schertz
   b. depth: 37 feet
   c. completion aquifer: Alluvial
   d. static water level 22 feet
   e. pumping datum: Test 4 gpm with bailer

1. The above information was derived from the records of the Texas Department of Water Resources, now known as the Texas Water Commission (T.W.C.). No water wells are recorded as being within the boundaries of the project. The wells listed, thus represent the only recorded wells potentially within a reasonable proximity of this project site.

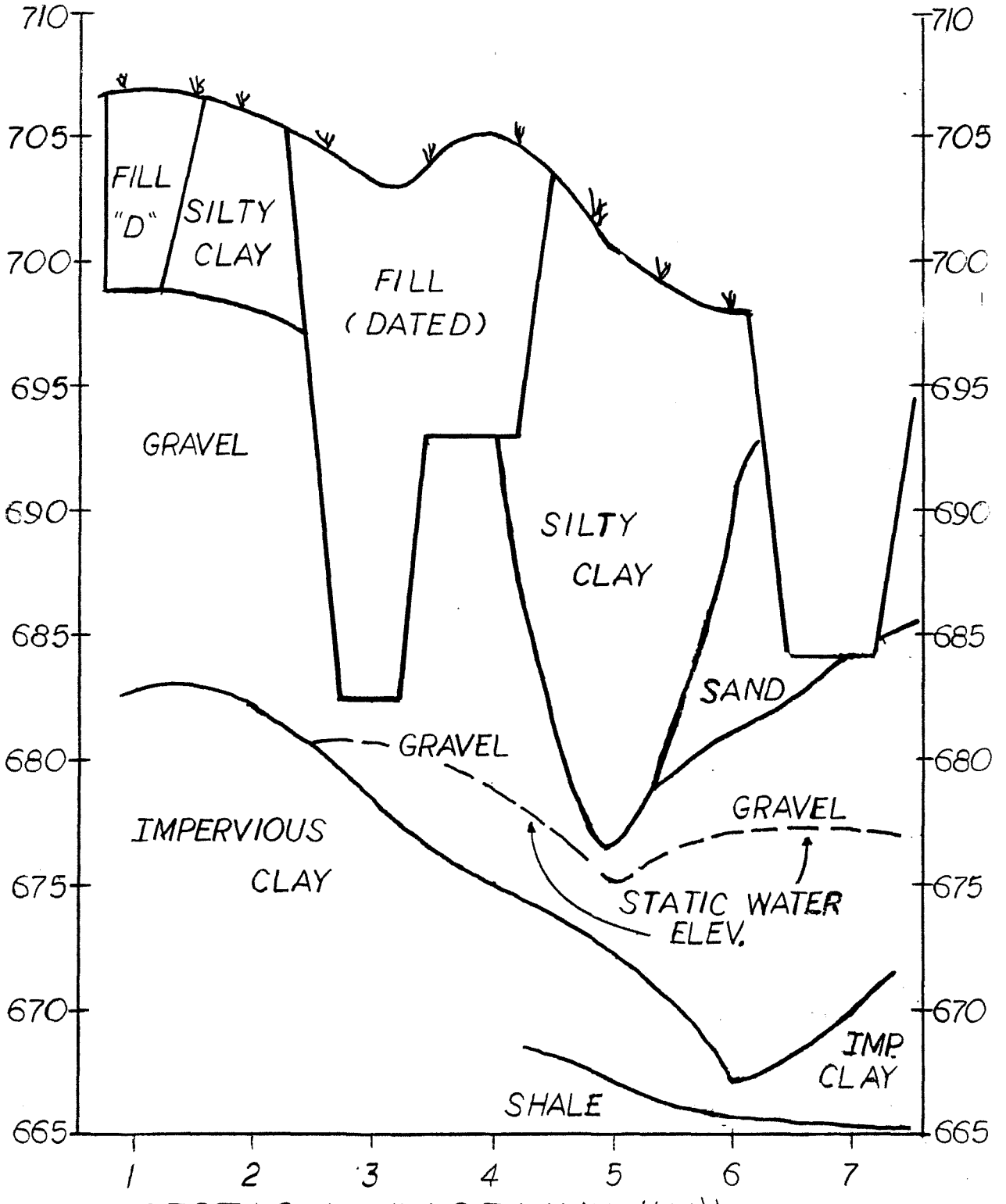
2. The water well designated within this catagory, has reportedly been field located by T.W.C. personel. The well, Kx 68 - 30 - 603, is indicated to be on the opposite side of F.M. 78 approximately 1000 feet from the property line of this project.

3. The water wells designated by this catagory, are each recently completed wells, as plotted but not field located by T.W.C. personel. The records indicate the wells to be located in Bexar County, or on the opposite side of Cibolo Creek from this project site. The current land uses of the Bexar County properties, as adjoining this project site, are such that the wells, Kx 68 - 30 - 6A and Kx 68 - 30 - 9A, are in all likelyhood located in excess of 500 feet from the boundries of this project site.



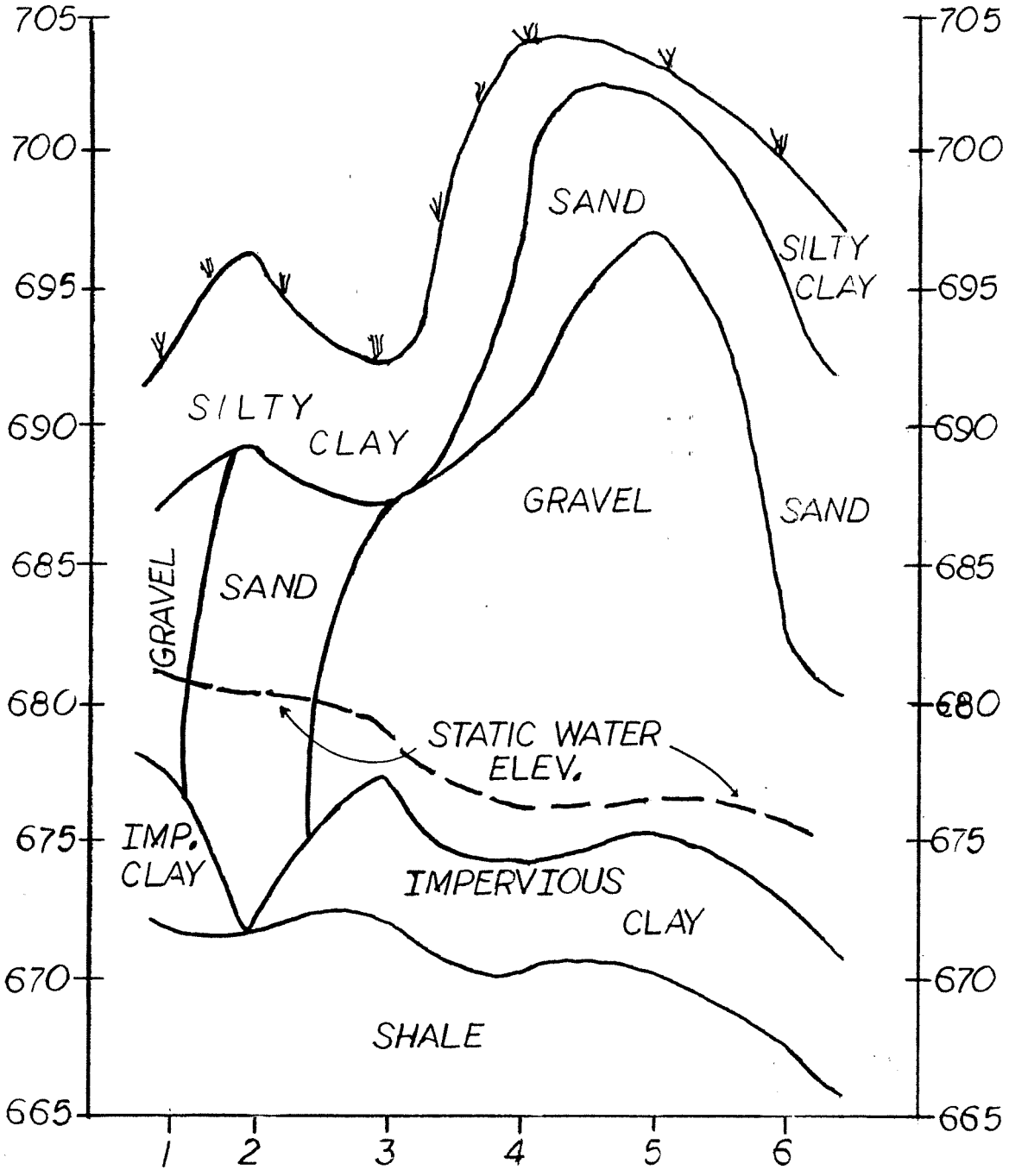
SECTION - BASE LINE "6"

FIGURE 1



SECTION - BASE LINE "H"

FIGURE 2



SECTION - BASE LINE "D"

FIGURE 3

SNOWDEN, INC.

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
A-4	2'	17.9						
	4'	12.4	29	16	13		CL	
	6'	11.5						
	8'	16.3	26	14	12		CL	
	10'	3.9						
	12'	26.3	57	17	40		CH	
	14'	20.4						
	16'	20.8						
	20'	26.6						
A-6	10 to 11.5'		72	24	48	2.0×10^{-9}	CH	
	10 to 11.5'		"	"	"	$*3.0 \times 10^{-9}$	CH	
B-6	2'	7.2						
	4'	8.9						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System
* permeability of sample recompacted to: 93 PCF/17.0% moisture

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
B-6	6'	6.1						
	8'	6.1						
	10'	13.8						
	12'	12.1						
	14'	22.8	59	18	41		CH	
	16'	19.4						
	18'	21.1						
	20'	22.5						
C-3	2'	32.1						
	4'	19.9						
	6'	19.2						
	8'	17.1						
	10'	29.2						
	12'	29.1						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
C-3	14'	16.6						
	16'	11.3						
	18'	9.2						
	20'	9.6						
	24'	22.8	52	19	33		CH	
D-1	2'	21.6						
	4'	6.0						
	6'	1.4						
	8'	3.9						
	10'	5.5						
	12'	20.6						
	14'	22.8						
	16'	22.6						
	18 to 19'	22.1	63	18	45	1.0×10^{-9}	CH	

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
D-1	20'	18.6						
	22'	18.4	69	19	50		CH	
D-5	2'	5.4						
	4'	6.2						
	6'	4.7						
	8'	2.2						
	10'	3.3						
	12'	2.8						
	14'	4.1						
	16'	0.8						
	18'	0.8						
	20'	0.8						
	22'	1.2						
	24'	1.4						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
D-5	26'	9.8						
	28'	10.7						
	30'	25.8	57	16	41		CH	
	32'	26.6						
	34'	25.4						
E-4	17 to 18'		71	19	52	2.0×10^{-9}	CH	
E-7	2'	1.9						
	4'	6.5						
	6'	27.9	58	17	41		CH	
	8'	24.1						
	10'	23.3	56	17	39		CH	
	12'	24.6						
	14'	21.2	53	16	37		CH	

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
E-7	16'	21.8						
	18'	21.3						
	20'	18.9						
G-1	2'	13.7						
	4'	7.8						
	6'	6.6	27	15	12		CL	
	8'	2.3						
	10'	1.6						
	12'	26.2						
	14'	21.2						
	16'	6.7						
	18'	8.5						
	20'	16.0						
	22'	26.3						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
G-1	24'	19.0						
	26'	17.9						
	28'	16.0						
	34'	14.9	41	14	27		CL	
G-5	2'	14.4	26	15	11		CL	
	4'	13.5						
	6'	12.2						
	8'	14.6						
	10'	16.6	32	14	18		CL	
	12'	11.3						
	14'	8.5						
	16'	14.0						
	18'	14.3						
	20'	15.3	33	14	19		CL	

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
G-5	22'	15.0						
	24'	16.3						
	26'	17.7						
	28'	19.4						
	30'	20.2						
	32'	22.6	56	17	39		CH	
	34'	23.8						
G-7	10.5 to 11.3'		56	17	39	1.0×10^{-9}	CH	
H-6	2'	8.0						
	4'	8.6						
	6'	9.8						
	8'	7.3						
	10'	8.1						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
H-6	12'	6.4						
	14'	6.7						
	16'	5.6						
	18'	1.8						
	20'	2.5						
	22'	3.6						
	24'	8.6						
	26'	7.8						
	28'	8.5						
	30'	12.3						
	32'	18.6	57	17	40		CH	
	34'	19.2	56	18	38		CH	
J-1	2 to 3.5'	18.7	66	18	48	7.0×10^{-10}	CH	
	2 to 3.5'	"	"	"	"	*2.0×10^{-9}	CH	

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System
* permeability of sample recompacted to: 98 PCF/20.5% moisture

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
J-1	4'	19.1						
	5 to 6.5'	19.8	63	18	45	8.0×10^{-10}		
	10'	20.1						
	15'	19.4						
	20'	14.3						
J-2	5'	13.4						
	10'	3.2						
	15'	4.0						
	20'	3.5						
	25'	6.3						
J-3	2'	3.4						
	4'	10.6						
	6'	14.7						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
J-3	8'	18.1						
	10'	27.0						
	12'	19.4						
	14'	17.9						
	16'	16.4						
	18'	14.8						
	20'	15.5						
	22'	16.5						
	26'	23.0						
	28'	21.0	58	17	41		CH	
	30'	25.6						
	32'	22.5						
J-7	6'		48	17	31		CL	
	12'		29	16	13		CL	

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
J-7	18'		58	17	41		CH	
	28'		49	16	33		CL	
K-5	2'	12.8						
	4'	14.8						
	6'	16.8						
	8'	16.1						
	10'	15.9	33	17	16		CL	
	12'	12.0						
	14'	11.6						
	18'	5.4						
	20'	14.9						
	22'	21.1						
	24'	23.4	57	18	39		CH	
	26.5 to 27.5		59	19	40	2.0×10^{-7}	CH	

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
M-4	2'	9.1						
	4'	11.8						
	6'	13.1						
	8'	15.7						
	10'	15.0						
	12'	14.3						
	14'	12.3						
	16'	12.9						
	18'	9.7						
	20'	8.2						
	22'	2.5						
	24'	8.2						
	26'	21.5						
	28'	20.9	60	20	40		CH	
	30'	22.4						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	permeability	Classif.	qu
M-4	32'	20.7						
	34'	12.8	46	16	30		CL	
M-7	2'	21.6						
	4'	20.5						
	6'	20.7	45	18	27		CL	
	8'	21.1						
	10'	22.0	43	19	24		CL	
	12'	21.4						
	14'	3.4						
	16'	6.5						
	18'	27.0						
	20'	32.2	60	20	40		CH	
	22'	21.9						
	24'	18.4	61	18	43		CH	

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	-#200 (%)	Classif.	qu
M-7	30'	18.1						
G-0	2'	13.6						
	4'	3.9						
	6'	5.1						
	8'	3.9						
	10'	5.7						
	12'	7.7						
	14'	7.5						
	16'	24.6	65	18	47		CH	
	18'	22.3						
H-0	2'	6.8						
	4'	5.2						
	6'	3.7						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

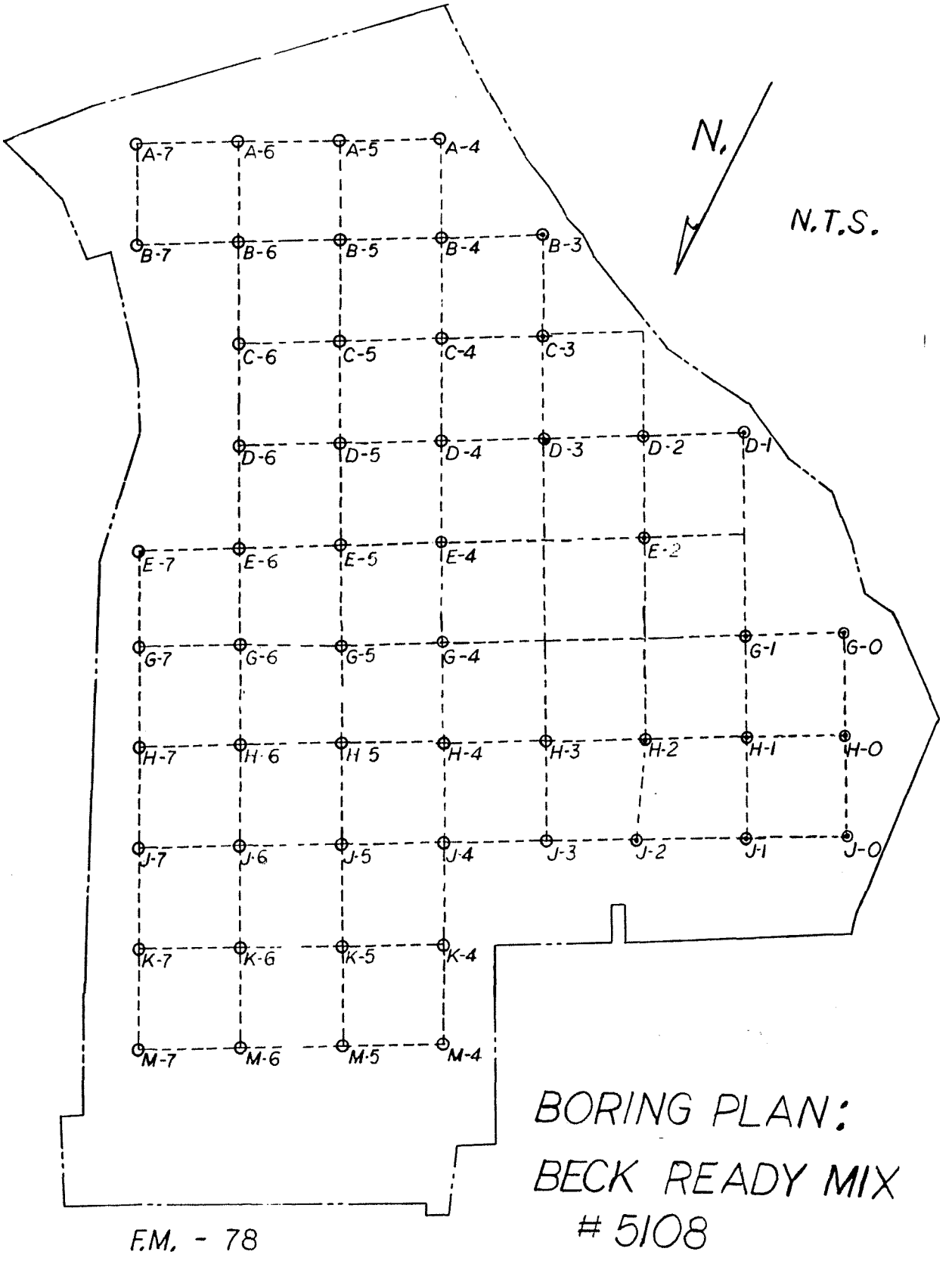
SUMMARY OF LABORATORY TEST RESULTS

Job Name: Beck Ready Mix, Inc.
Job Number: 5108

Boring	Depth ft.	M.C.	Lw	Pw	Iw	-#200 (%)	Classif.	qu
H-0	8'	5.1						
	10'	14.3						
	12'	9.2						
	14'	8.2						
	16'	20.9	56	17	39		CH	
	18'	17.4						
J-0	2'	10.9						
	4'	22.6						
	6'	20.4						
	8'	18.2						
	10'	16.4						
	15'	14.8						

M.C. = Moisture Content in place (%)
Lw = Liquid Limit
Pw = Plastic Limit
Iw = Plasticity Index

qu = Unconfined Compressive Strength (tons per square foot)
Classif: = Casagrande Classification System

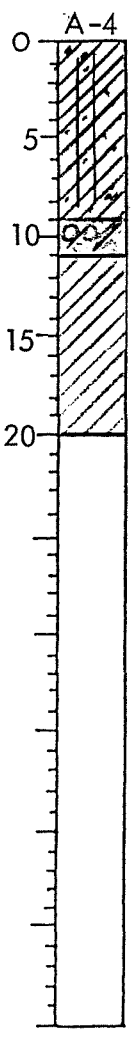


BORING PLAN:
BECK READY MIX
#5108

SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985

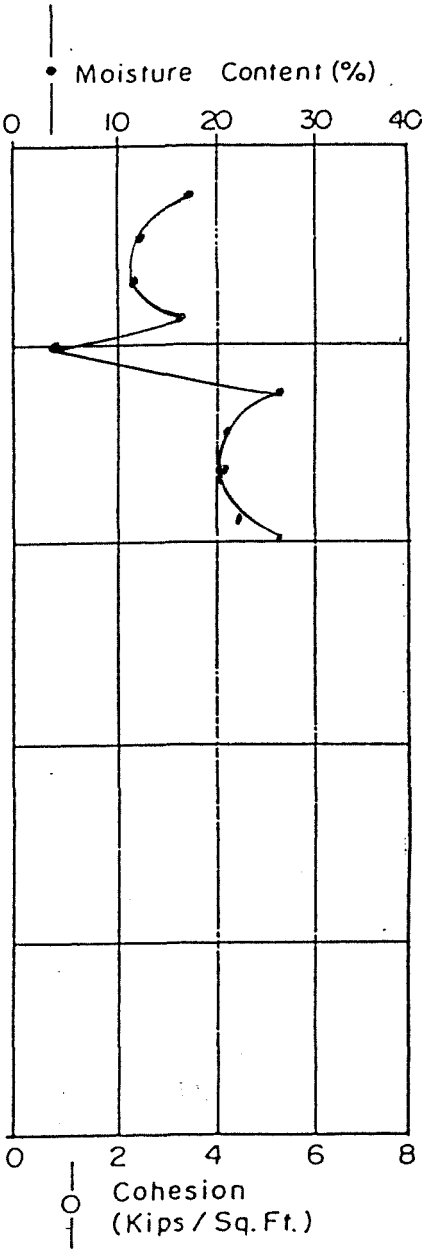


G.S.E. 679.2

Clay, sl. silty, sl. sandy, brown	CH/CL
... silty, sandy, lt. brown	CL
Gravel, clayey, lt. brown	GC
Clay, stiff w/gypsum & pyrite stain seams tan & gray	CH
... gray & green tan	

Discontinued @ 20'

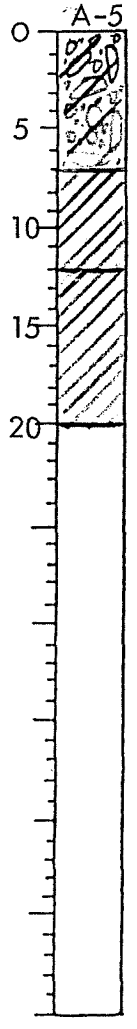
Static Water Elev. 660.2



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985

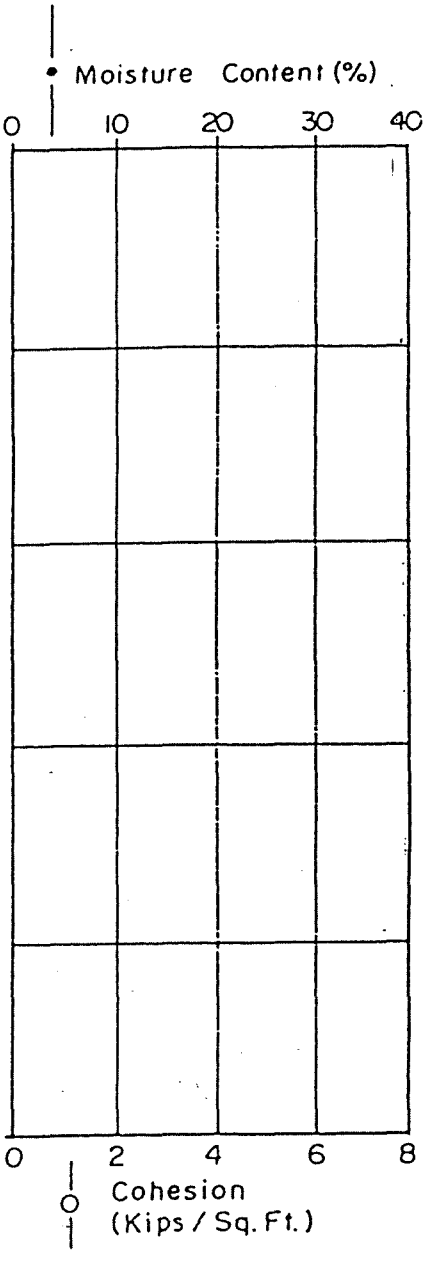


G.S.E. 689.8

Gravel, sandy, sl. clayey, tan	GC/GW
... v. clayey	GC
Clay, stiff w/pyrite stain seams	CH
... gray & green tan tan & gray	
Shale, clayey, dk. gray	CH
... sl. clayey	

Discontinued @ 20'

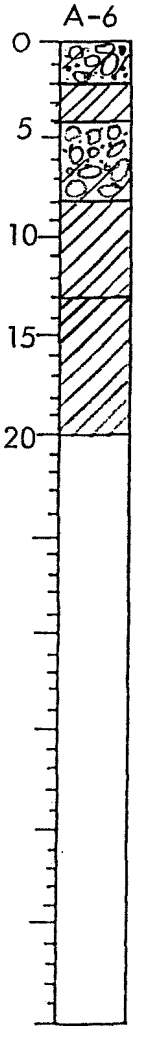
Static Water Elev. Boring Dry



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 31, 1985

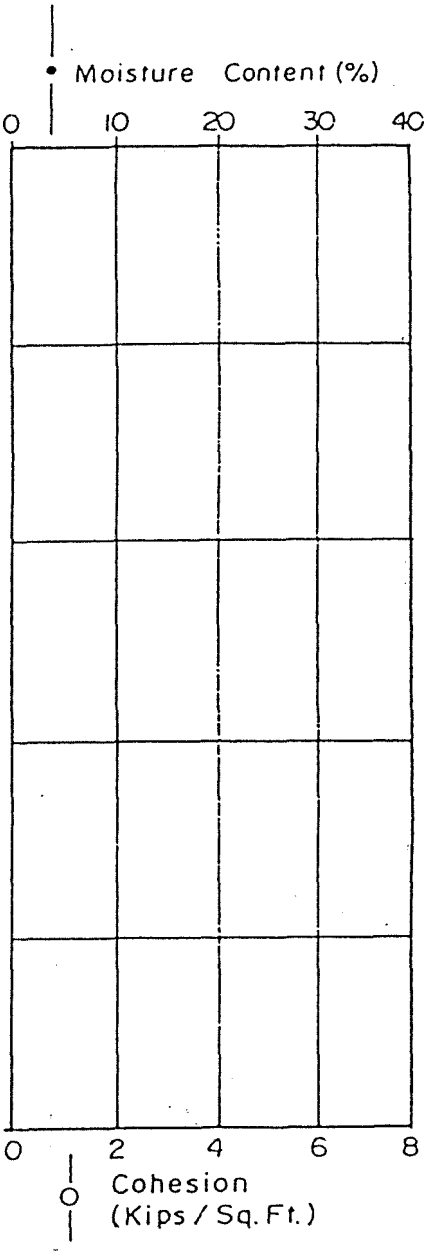


G.S.E. 684.6

Gravel, fill, sandy, clayey, tan	GC
Clay, sl. silty, dk. brown	CL
Gravel, sandy w/cobbles, tan	GP
... clayey brown	GC
Clay, stiff w/pyritic seams tan & gray	CH
... gray & green tan	
Shale, sl. clayey dk. gray	CH

Discontinued @ 20'

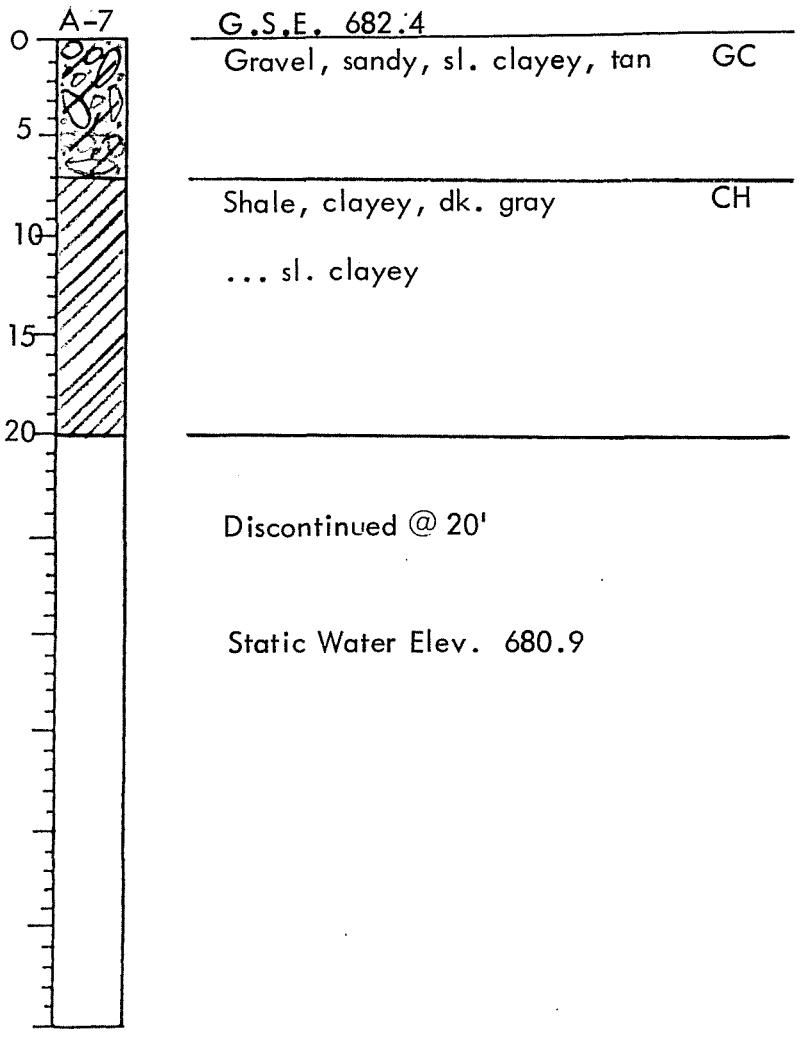
Static Water Elev. 678.6



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985



G.S.E. 682.4

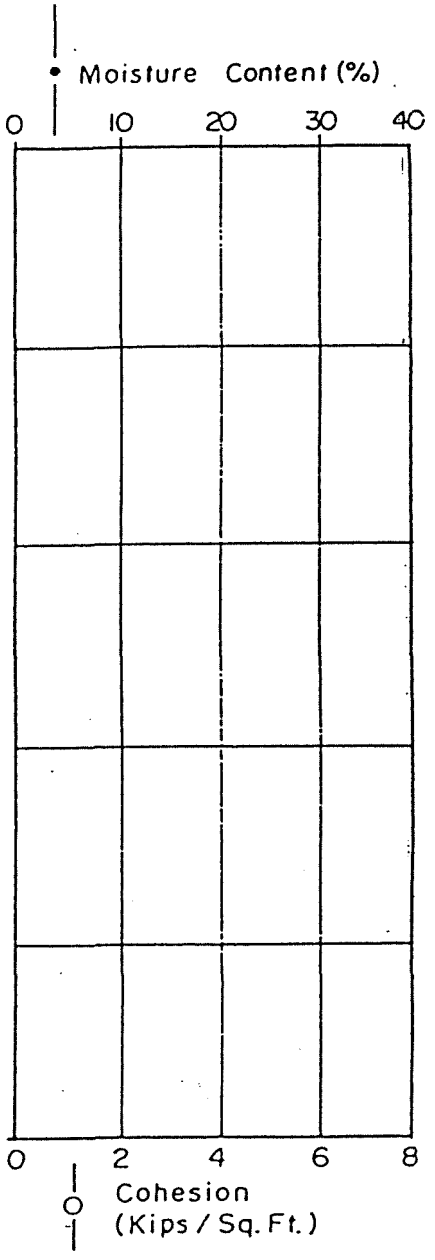
Gravel, sandy, sl. clayey, tan GC

Shale, clayey, dk. gray CH

... sl. clayey

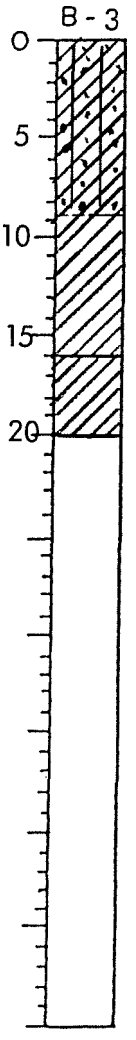
Discontinued @ 20'

Static Water Elev. 680.9



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985

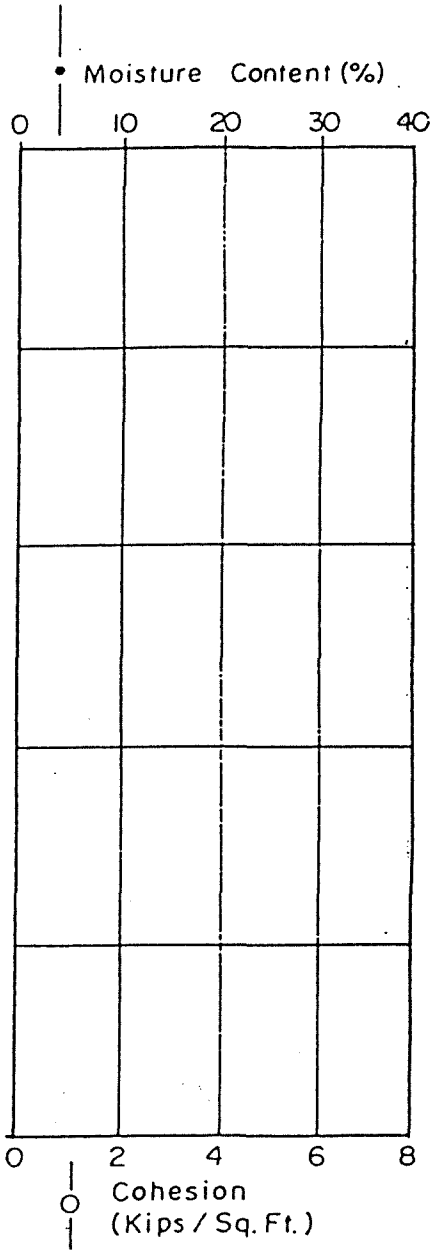


G.S.E. 687.3

Clay, sl. silty, dk. brown	CH
... silty, sandy, lt. brown	CL
... stiff w/gypsum & pyrite stain seams, tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 20'

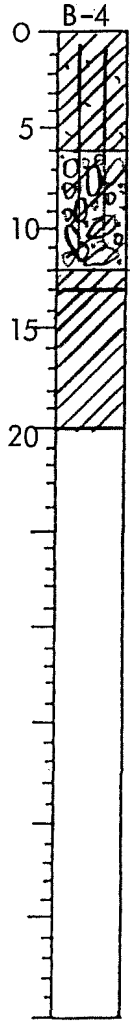
Static Water Elev. 680.3



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985



G.S.E. 684.42

Clay, silty, sl. sandy, lt. brown CL

Gravel, sandy, silty, clayey, tan GC

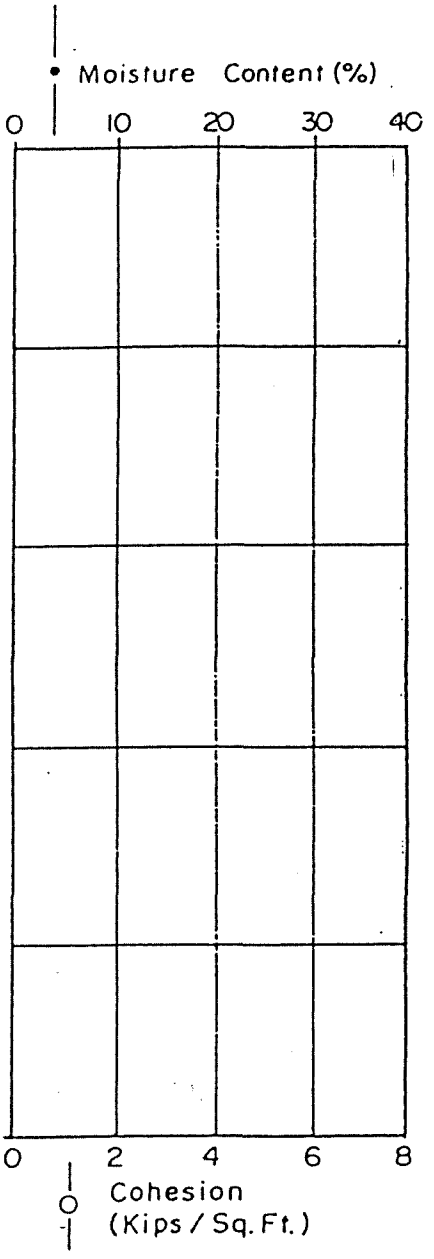
Clay, stiff, tan & gray CH

Shale, clayey, dk. gray CH

... sl. clayey

Discontinued @ 20'

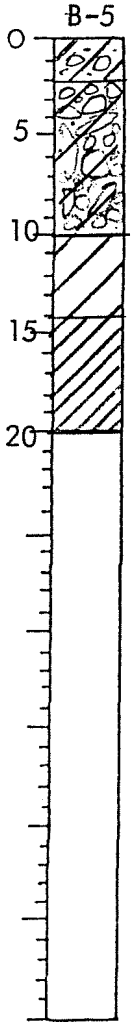
Static Water Elev. 676.4



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 8, 1985

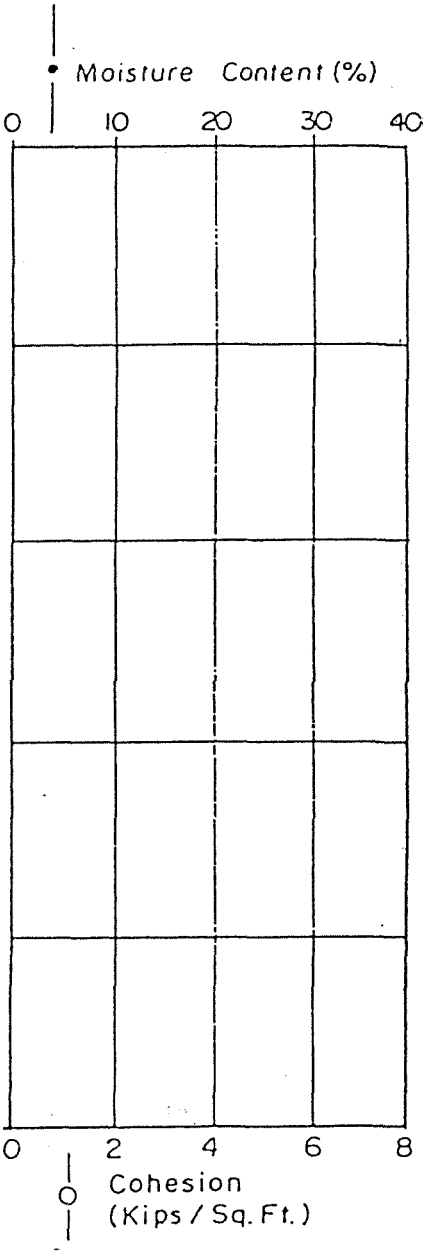


G.S.E. 682.41

Clay, sandy, gravelley, lt. brown	CL
Gravel, sandy, clayey, w/cobbles tan	GC/GW
... v. clayey	GC
Clay, stiff, trace silt, gray & green tan	CH
Shale, clayey, dk. gray	CH
... sl. clayey	

Discontinued @ 20'

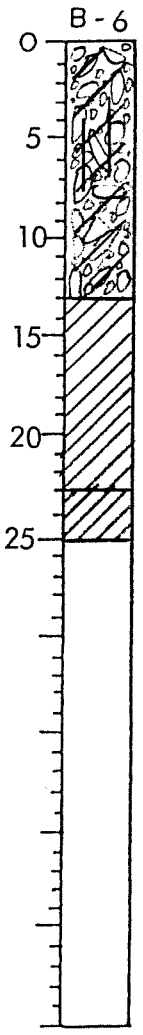
Static Water Elev. 675.4



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985

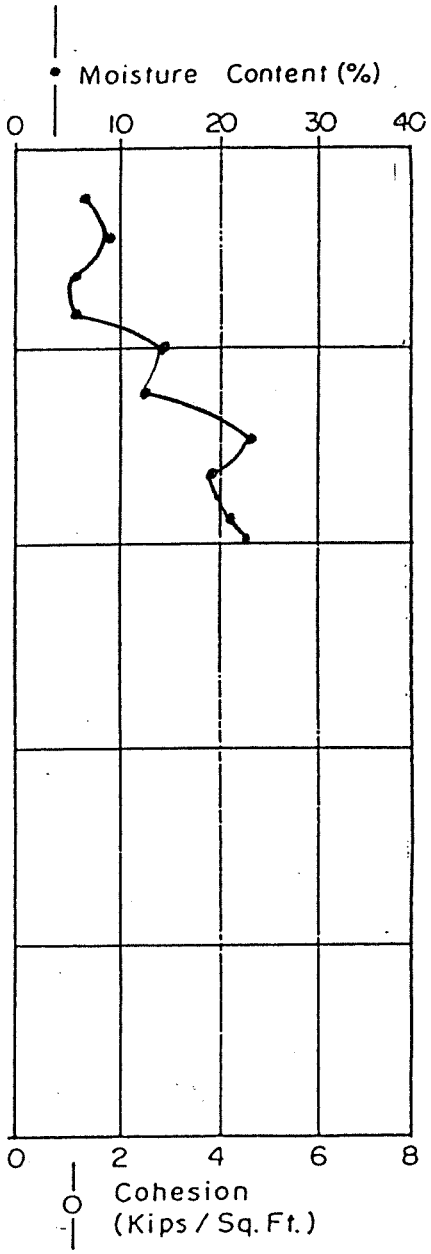


G.S.E. 687.58

Gravel, sandy, clayey, tan	GC
... silty, clayey	GM/GC
... clayey w/cobbles	GC
... v. clayey	
Clay, stiff, w/pyrite stained seams tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 25'

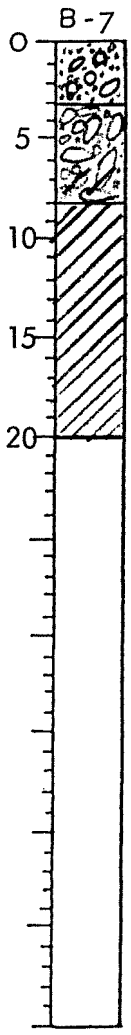
Static Water Elev. 675.9



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985

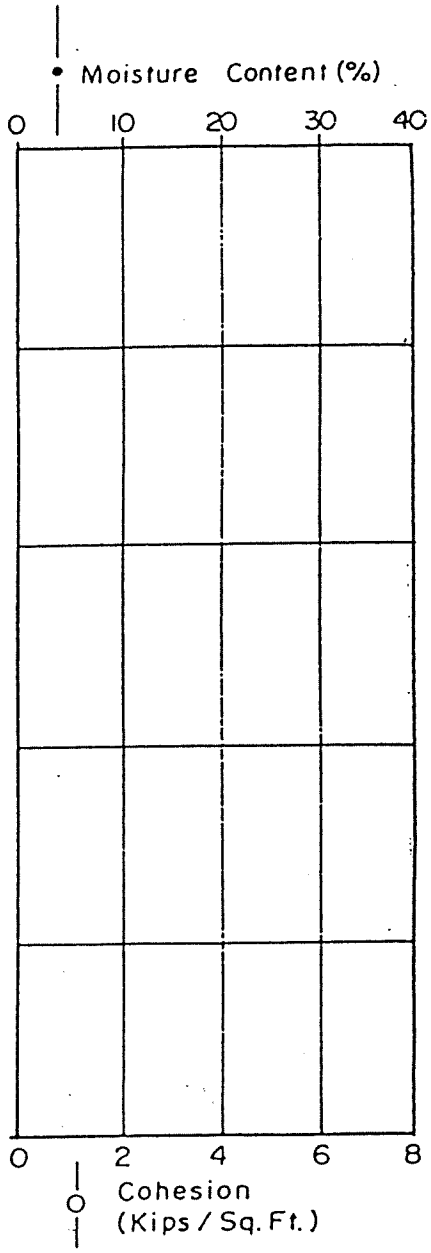


G.S.E. 676.8

Sand, trace gravel, tan	SP
Gravel, sandy, tan	GP
... trace clay	
Shale, clayey, dk. gray	CH
... sl. clayey	

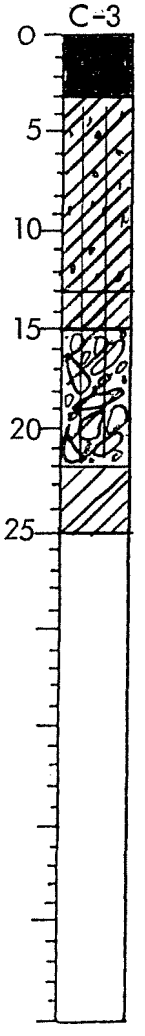
Discontinued @ 20'

Static Water Elev. 675.3



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985



G.S.E. 697.76

Trash (recent) w/clay, dk. gray

Clay, fill, silty, sandy, w/trash (recent) lt. brown — CL

... dk. gray

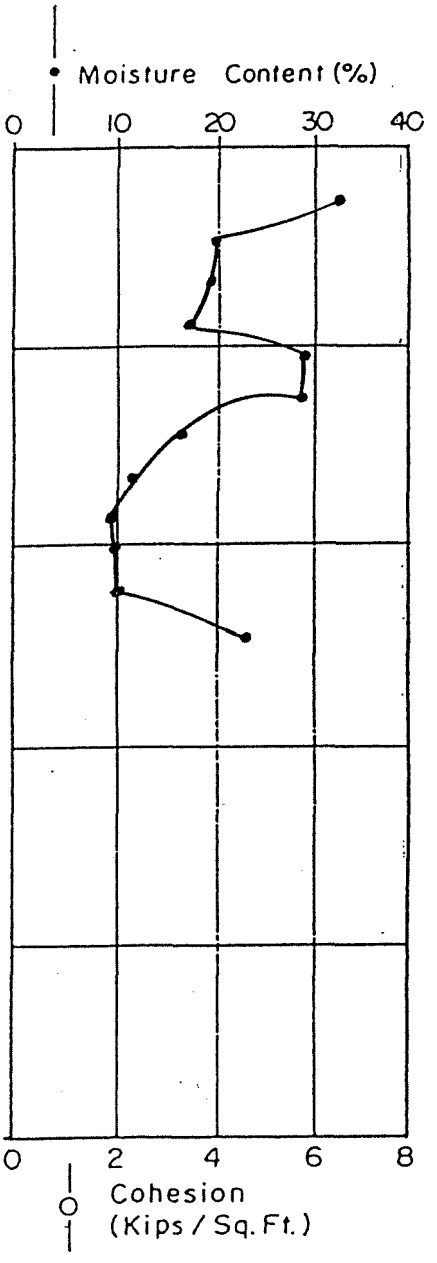
Clay, silty, brown — CL

Gravel, silty, clayey, brown — GC/GM

Clay, stiff, w/pyrite stain seams tan & gray — CH

Discontinued @ 25'

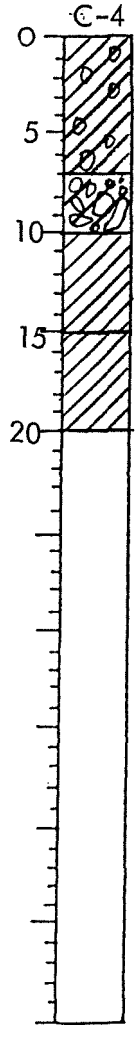
Static Water Elev. 675.8



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985



G.S.E. 685.31

Clay, fill, trace gravel w/trash (recent) dk. gray — CH

Gravel, clayey, tan — GC

Clay, stiff w/gypsum seams, tan & gray — CH

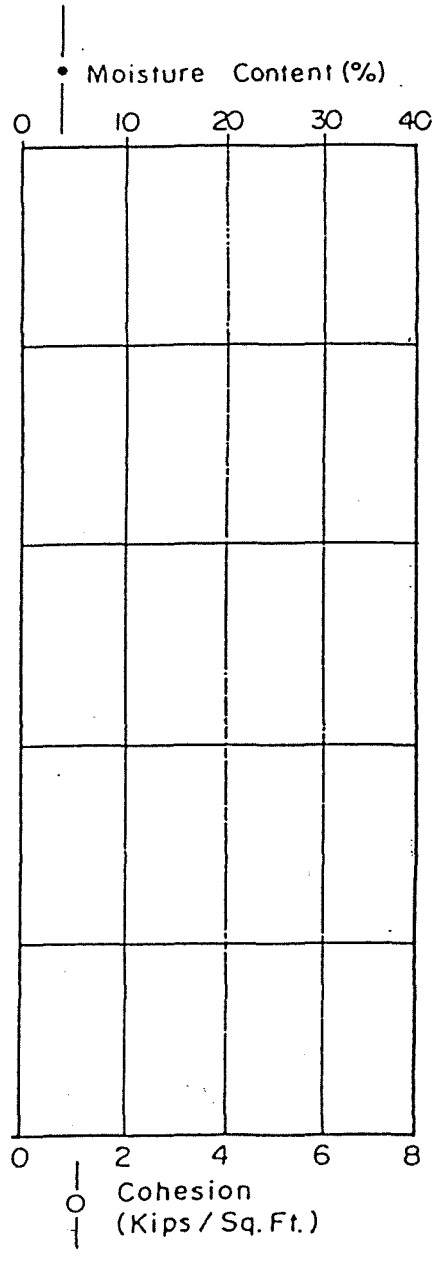
... tan & dk. gray

Shale, clayey, dk. gray — CH

... sl. clayey

Discontinued @ 20'

Static Water Elev. 676.3

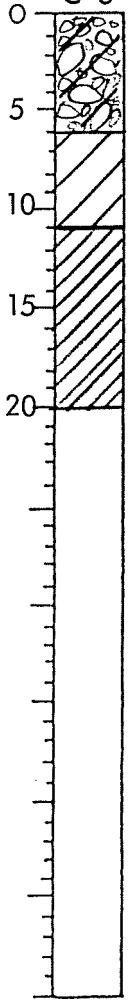


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 8, 1985

C-5

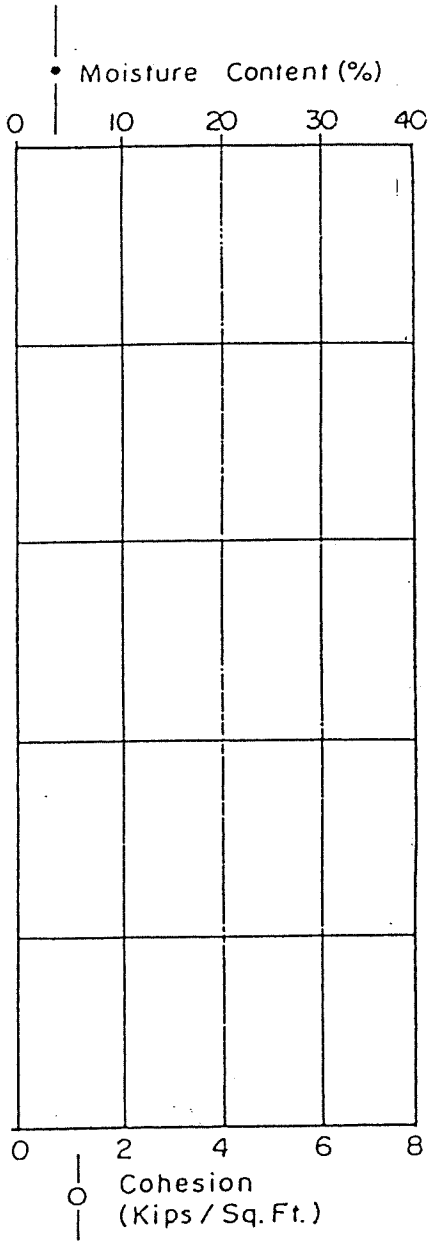


G.S.E. 681.51

Gravel, sandy, clayey, w/cobbles lt. brown	GC
... v. clayey, tan	
Clay, stiff, trace silt , tan & gray	CH
... gray & green tan	
Shale, clayey, dk. gray	CH
... sl. clayey	

Discontinued @ 20'

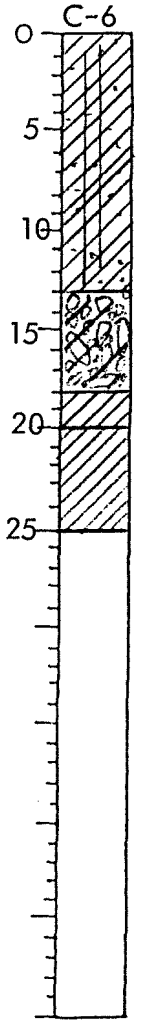
Static Water Elev. Boring Dry



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985

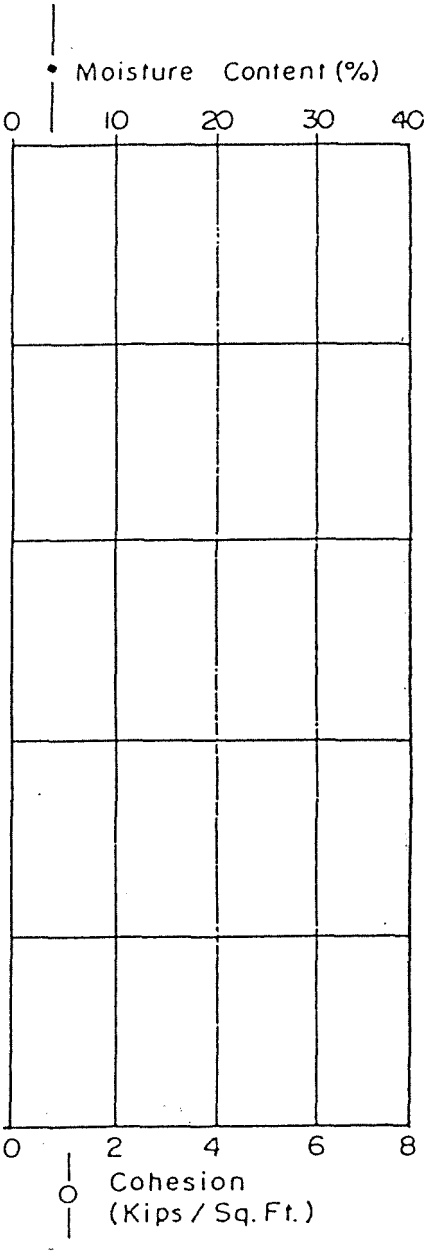


G.S.E. 690.60

Clay, fill, silty, sandy brown	CL
... w/trash (recent) black	CL
Gravel, clayey, gray	GC
Clay, stiff, tan & gray	CH
Shale, clayey dk. gray	CH
... sl. clayey	

Discontinued @ 25'

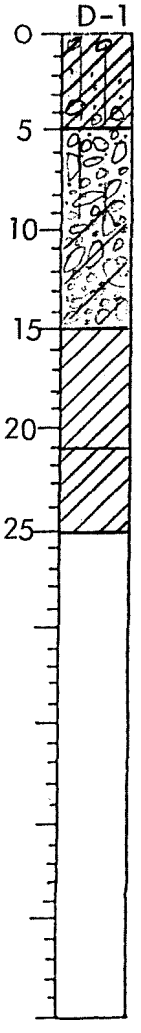
Static Water Elev. 675.1



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 31, 1985

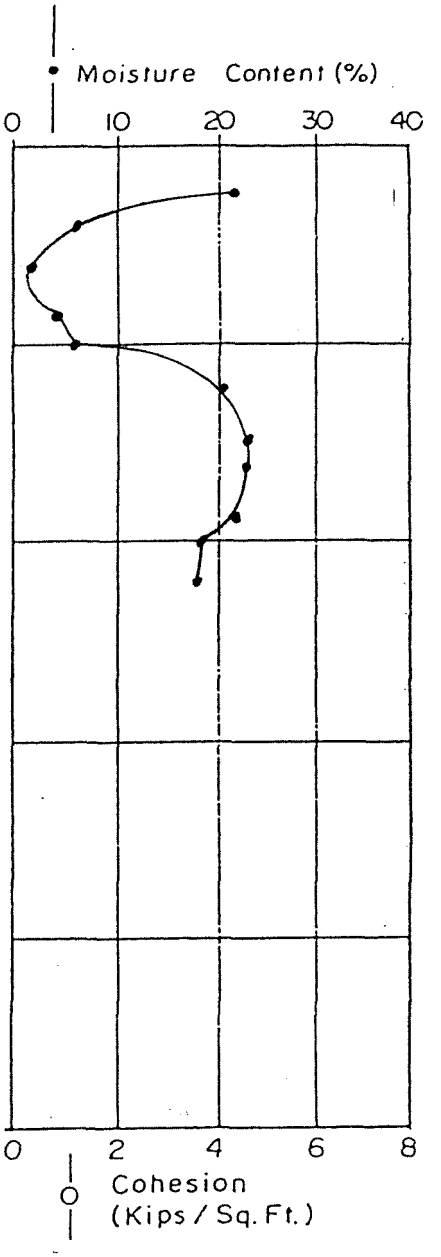


G.S.E. 692.4

Clay, silty, gravelley, brown	CL
... sl. silty, trace sand	CH/CL
... silty, gravelley lt. brown	CL
Gravel, sl. silty, tan	GM/GW
... sl. silty, sl. clayey brown	GM/GC
... clayey w/cobbles, brown	GC
Clay, stiff w/pyritic seams, tan & dk. gray	CH
... w/gypsum seams, tan & gray	
Shale sl. clayey, dk. gray	CH

Discontinued @ 25'

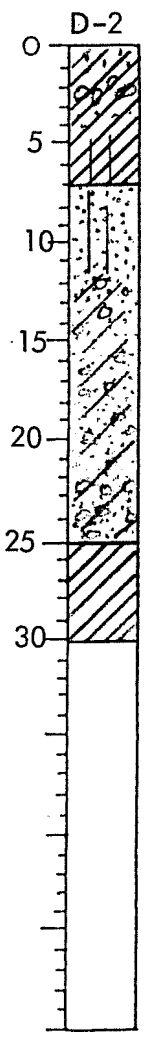
Static Water Elev. 680.9



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 31, 1985

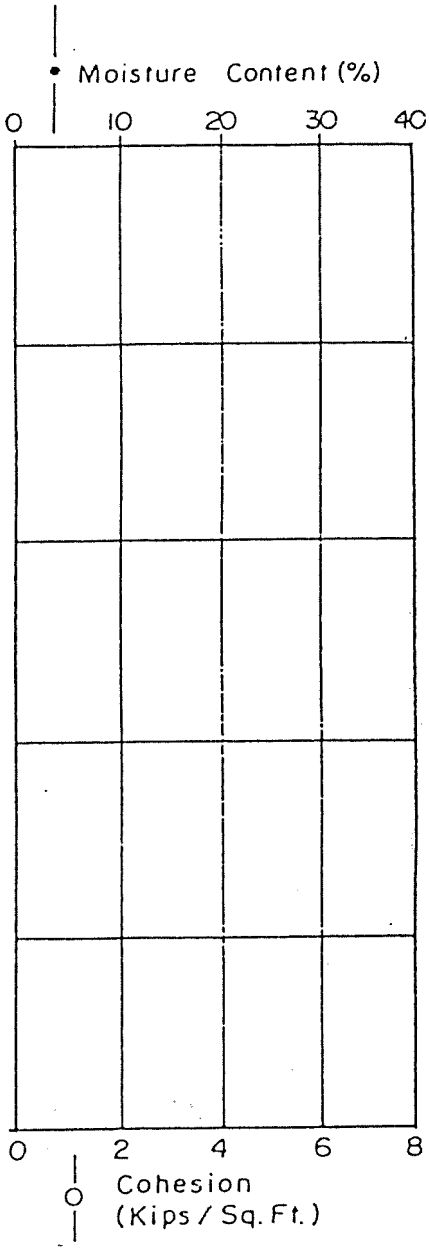


G.S.E. 696.40

Clay, sandy, brown	CL
... gravelley, tan	
... sl. sandy brown	
... v. silty, lt. brown	
Sand, trace silt, tan	SP
... sl. clayey, w/gravel	SC/SP
... clayey, sl. gravelley brown	SC
... v. clayey w/cobbles	
Shale, clayey, dk. gray	CH
... sl. clayey	

Discontinued @ 30'

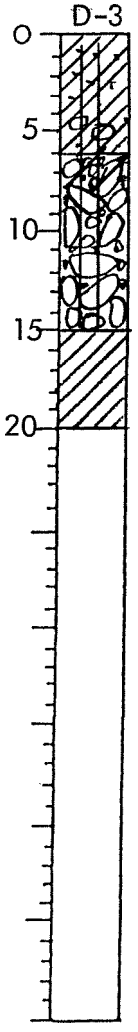
Static Water Elev. 680.4



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985

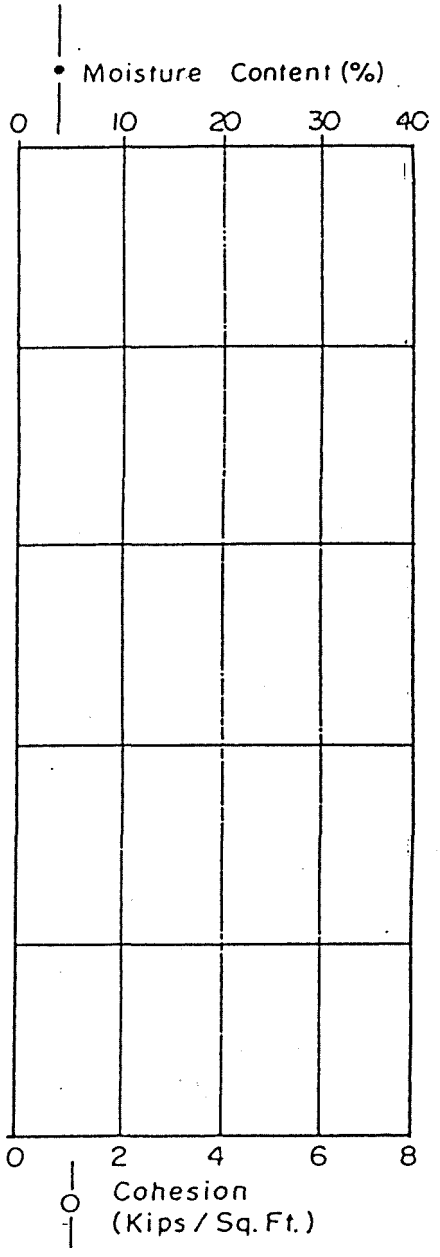


G.S.E. 692.26

Clay, silty, sandy, brown	CL
... w/gravel	
Gravel, silty, sandy, clayey brown	GM/GC
... silty w/cobbles, lt. brown	GM
Clay, stiff w/gypsum & pyrite stain seams, tan & gray	CH

Discontinued @ 20'

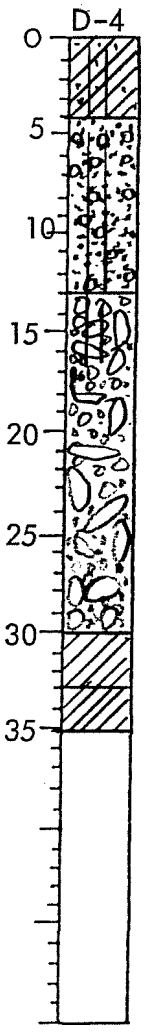
Static Water Elev. 679.4



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985

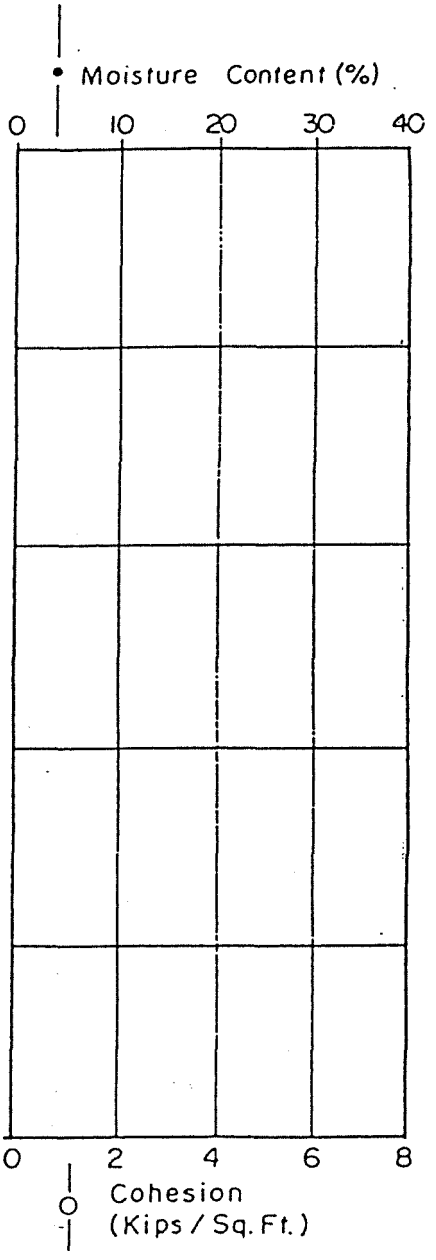


G.S.E. 704.06

Clay, sl. silty, sl. sandy, dk. brown	CL
Sand, sl. gravelley, v. silty lt. brown	SM
Gravel, sandy, silty, lt. brown	GM
... trace silt, lt. tan	GW
... w/cobbles	
Clay, stiff, w/gypsum seams tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 35'

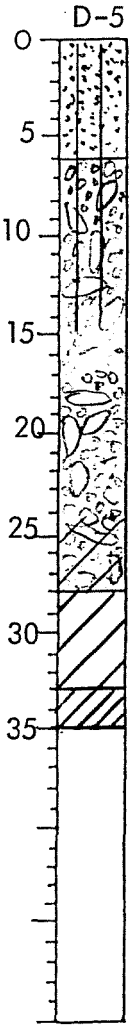
Static Water Elev. 676.0



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 7, 1985

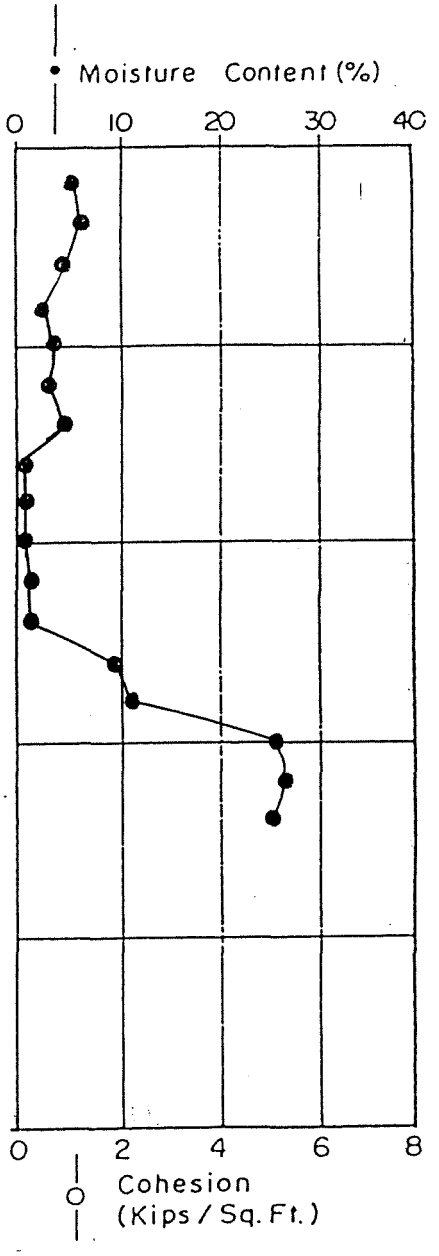


G.S.E. 703.25

Sand, v. silty, lt. brown	SM
Gravel, sandy, silty, lt. brown	GM/GP
... silty, v. sandy	GM
... w/cobbles	
... trace silt, lt. tan	GP
clayey, tan	GC
Clay, stiff, trace silt, tan & gray	CH
... gray & green tan	
Shale, clayey, dk. gray	CH

Discontinued @ 35'

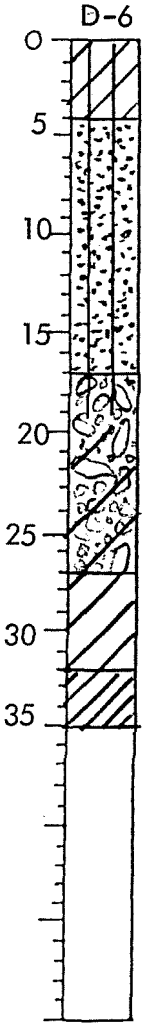
Static Water Elev. 676.3



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 8, 1985

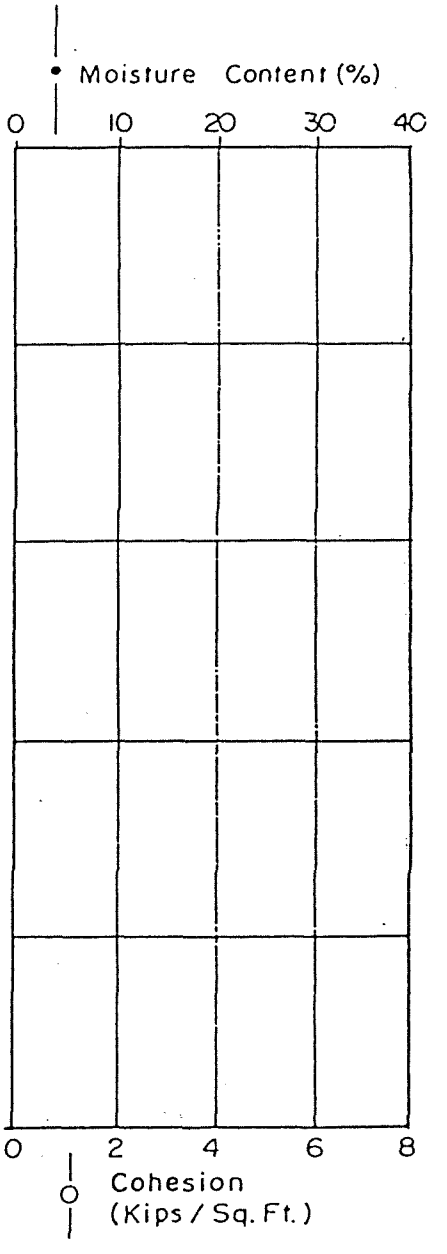


G.S.E. 699.80

Clay, silty, sl. sandy, brown ... lt. brown	CL
Sand, silty, lt. brown	SM
... sl. silty	
Gravel, sandy, sl. silty, tan	*GM/GW*
... clayey w/cobbles	GC
... v. clayey	
Clay, stiff, trace silt, gray & green tan	CH
Shale, clayey, dk. gray	CH

Discontinued @ 35'

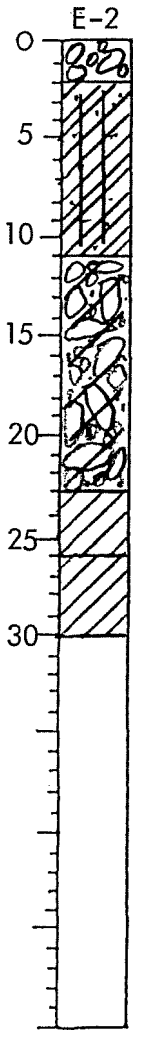
Static Water Elev. 675.8



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985

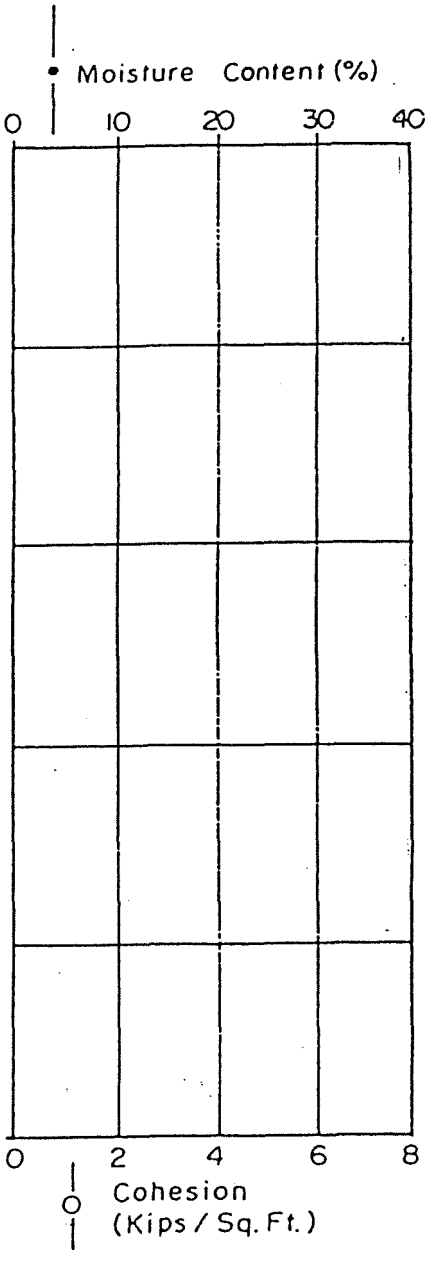


G.S.E. 702.60

Gravel, fill, clayey, brown	GC
Clay, fill, silty sandy w/trash (dated) dk. gray	CL
Gravel, sandy, clayey, gray	GC
... w/cobbles, brown	
... tan	
Clay, stiff w/gypsum & pyrite stain seams tan & gray	CH
Shale, clayey, dk. gray	CH

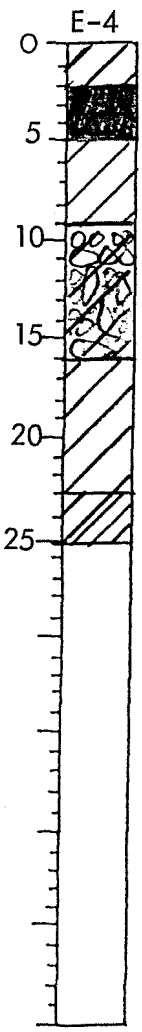
Discontinued @ 30'

Static Water Elev. 680.6



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 8, 1985

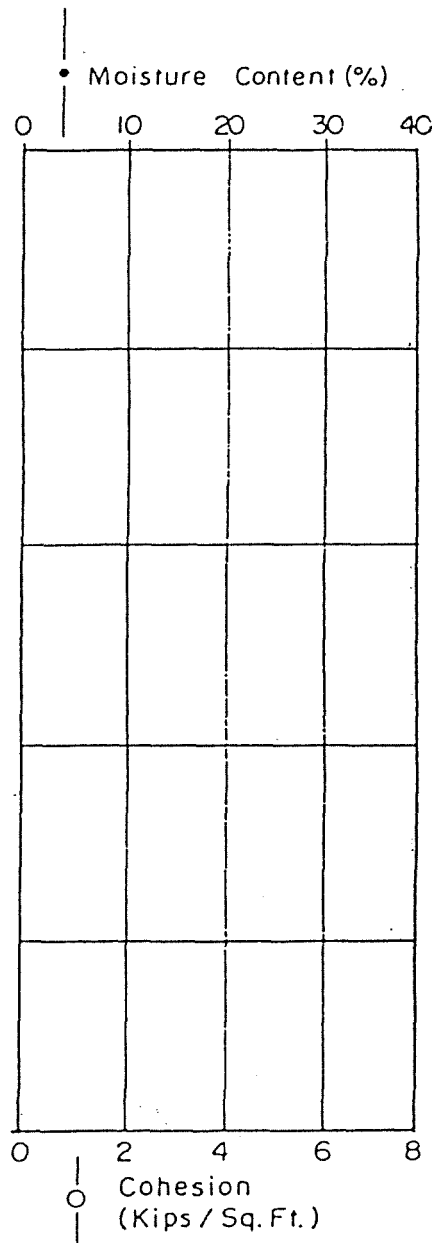


G.S.E. 693.26

Clay, fill, silty, sandy, brown	CL
Wood, fill (recent), clayey, dk. gray	
Clay, fill, w/waste, dk. gray	CH
Gravel, fill, w/waste, clayey, dk. gray	GC
... gravel, clayey, tan	GC
Clay, stiff, plastic, tan & gray	CH
... trace silt, gray & green tan	CH
Shale, clayey, dk. gray	CH

Discontinued @ 25'

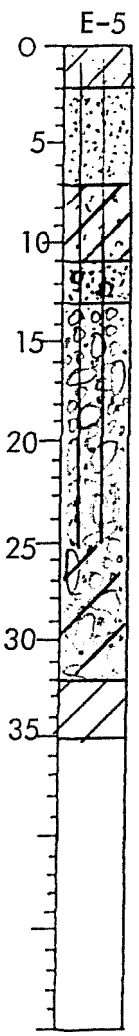
Static Water Elev. 677.3



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 7, 1985

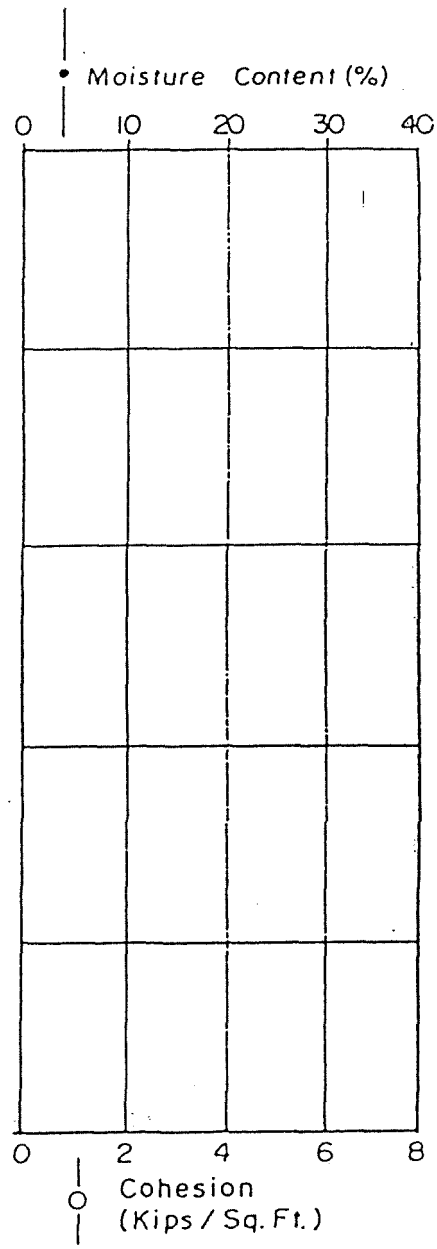


G.S.E. 703.25

Clay, silty, sandy, brown	CL
Sand, v. silty, lt. brown	SM
Clay, silty, sandy lt. brown	CL
Sand, v. silty, gravelley, lt. brown	SM
Gravel, sandy, sl. silty, lt. brown	GM/GP
... sl. sandy, sl. silty, tan	GW
... sl. clayey, sl. sandy, lt. brown	GC
... v. clayey, tan	
Clay, stiff, tan & gray	CH
gray & green tan	CH

Discontinued @ 35'

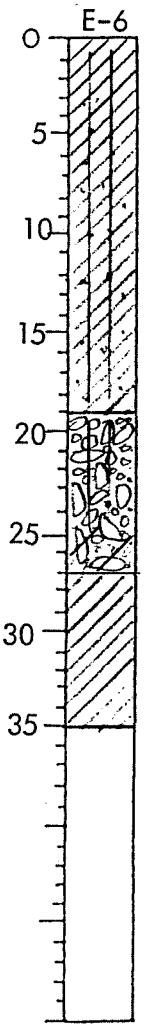
Static Water Elev. 676.3



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985

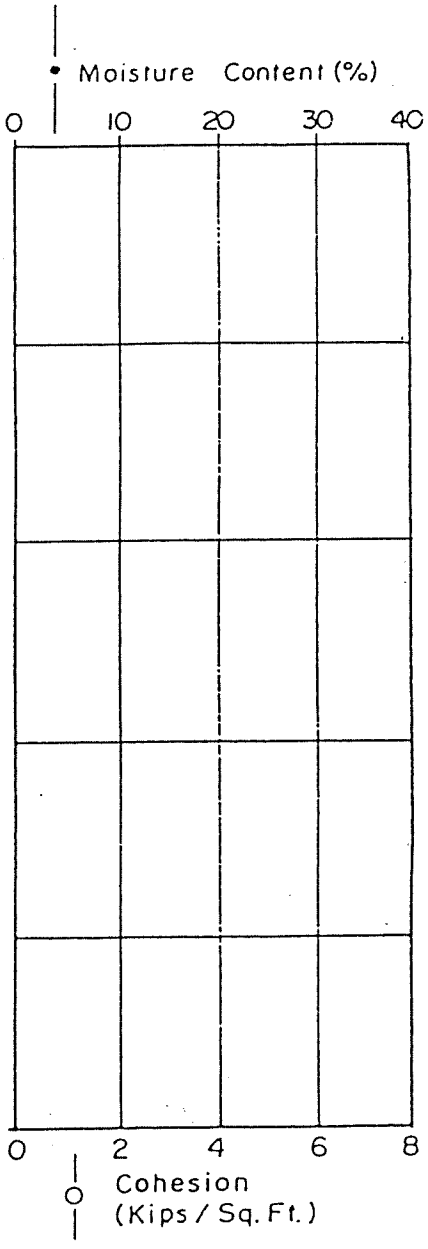


G.S.E. 700.08

Clay, sl. silty, dk. brown	CH
... silty, sl. sandy, lt. brown	CL
Gravel, v. silty, tan	GM
... sl. silty lt. brown	GM/GW
... clayey w/cobbles	GC
Clay, stiff w/pyritic seams, tan & gray	CH

Discontinued @ 35'

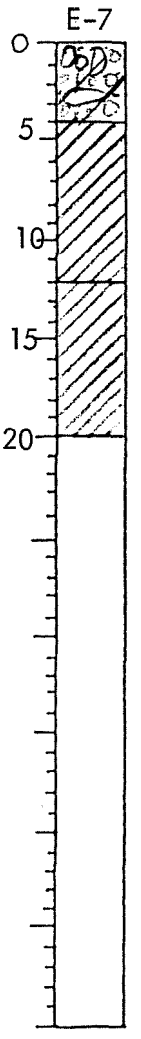
Static Water Elev. 674.5



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 1, 1985



G.S.E. 675.9

Gravel, sandy, clayey, tan GC

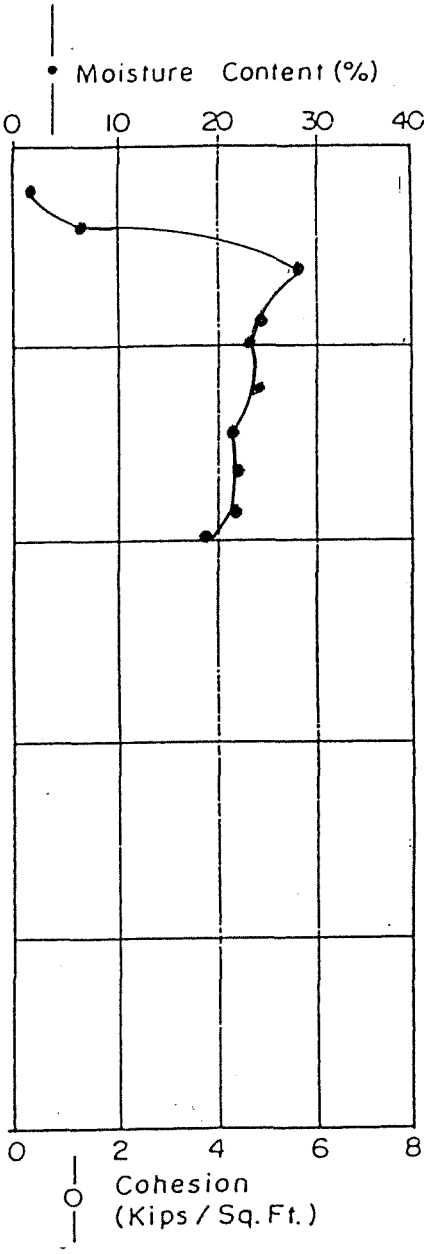
Clay, stiff w/gypsum & pyrite stain seams, tan & gray CH

Shale, clayey, dk. gray CH

... sl clayey

Discontinued @ 20'

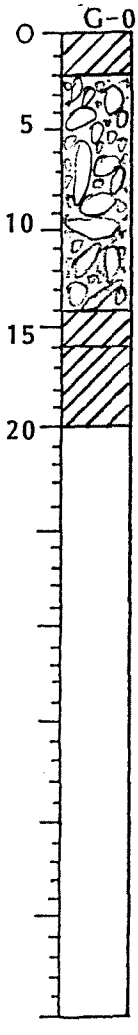
Static Water Elev. 673.9



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: December 10, 1985

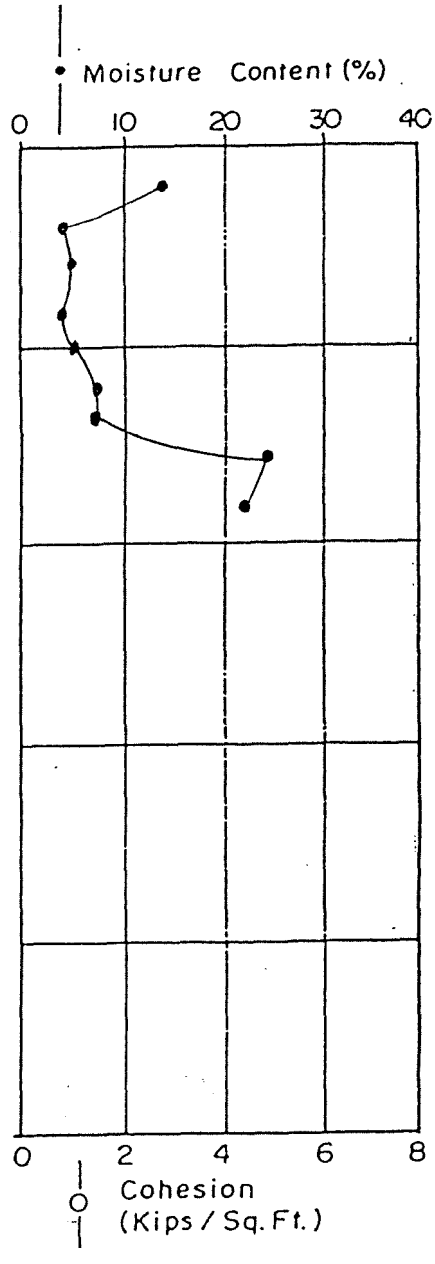


G.S.E. 693.7

Clay, sandy, gravelley, dk. brown	CL
Gravel, v. sandy, sl. clayey lt. brown	GW/GC
... sl. sandy, clayey	GC
Clay, stiff, tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 20'

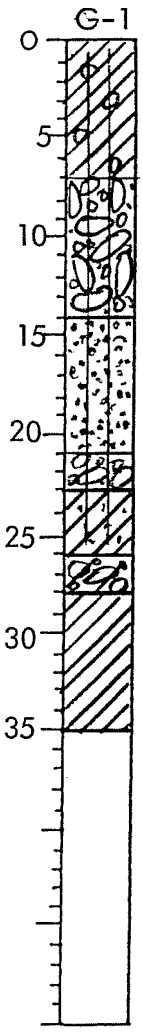
Static Water Elev. 680.7



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985

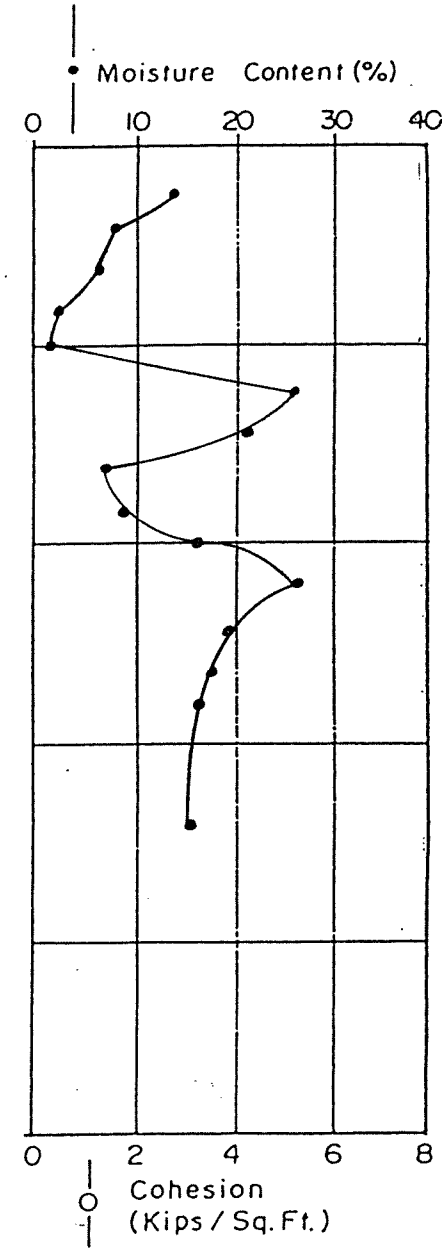


G.S.E. 702.0

Clay, sl. silty, sl. gravelley dk. brown	CL
... silty, gravelley, brown	
Gravel v. silty, sl. clayey brown	GM
Sand, v. silty, sl. clayey, brown	SM
Gravel, silty, brown	GM
Clay, silty, sandy brown	CL
Gravel, clayey, tan	GC
Shale, clayey, dk. gray	CH
... sl. clayey	

Discontinued @ 35'

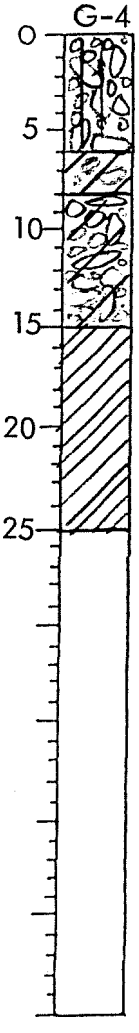
Static Water Elev. 680.0



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 8, 1985

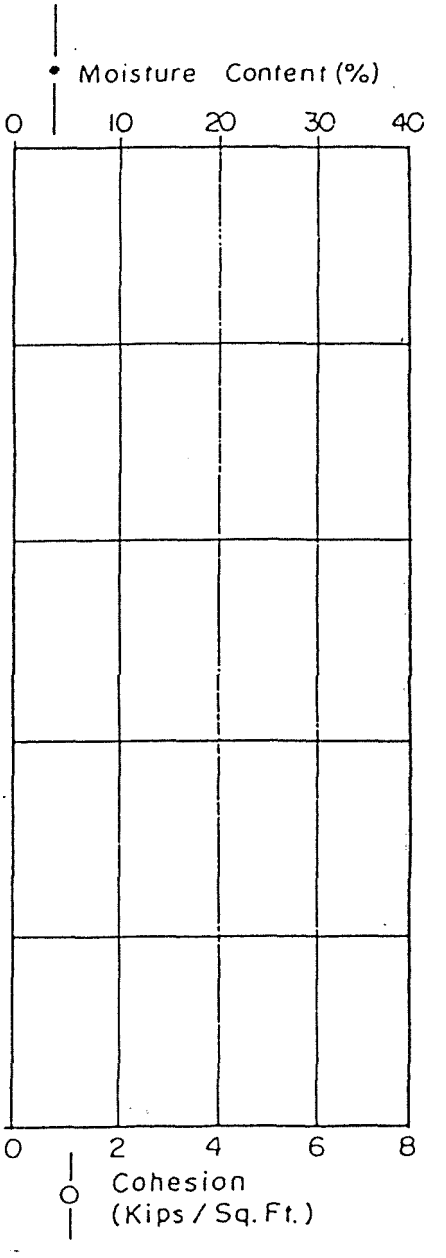


G.S.E. 679.4

Gravel, trace silt, tan	GP
Clay, gravelley, lt. brown	CL
Gravel, clayey, lt. brown	GC
Shale, clayey, dk. gray	CH

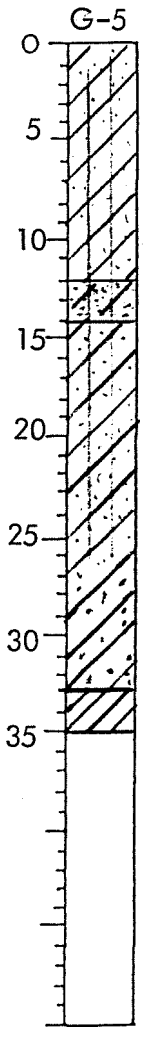
Discontinued @ 25'

Static Water Elev. 669.4



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 7, 1985

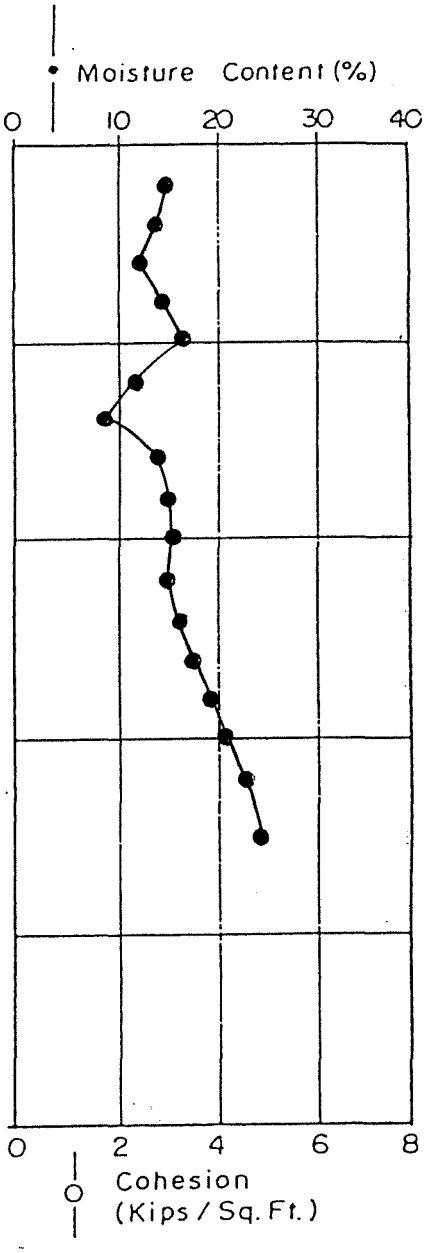


G.S.E. 700.66

Clay, sl. silty, sl. sandy brown	CH/CL
... silty, sandy, lt. brown	CL
... sl. silty, sl. sandy, brown	
... silty, sandy, lt. brown	
Sand, silty, sl. clayey, lt. brown	SM
Clay, silty, sandy, lt. brown	CL
... sl. sandy, tan & gray	CH/CL
... w/calc. sand	CH
... gray & green tan	
Shale, clayey, dk. gray	CH

Discontinued @ 35'

Static Water Elev. 675.7

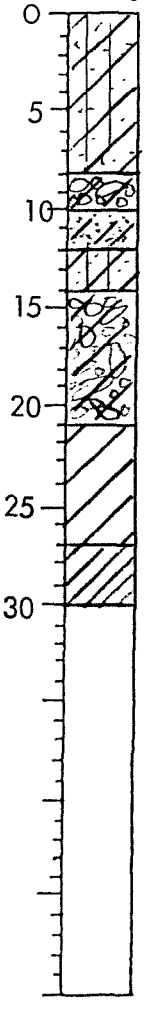


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 7, 1985

G-6

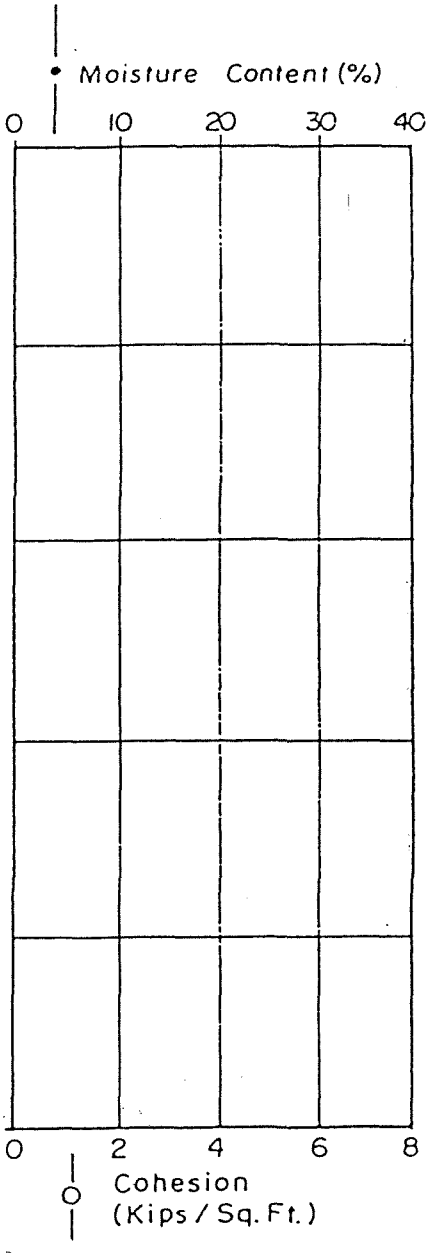


G.S.E. 692.68

Clay, silty, sandy, lt. brown	CL
Gravel, clayey, lt. brown	GC
Sand, clayey, lt. brown	SC
Clay, silty, sandy, lt. brown	CL
Gravel, v. clayey w/cobbles, lt. brown	GC
Clay w/calc. sand , gray & green tan	CH
... v. stiff, gray	CH
Shale, sl. clayey, dk. gray	CH

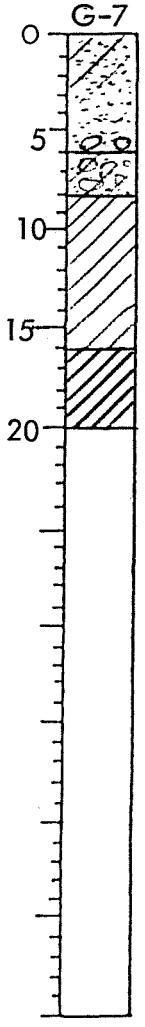
Discontinued @ 30'

Static Water Elev. 675.7



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: August 29, 1985

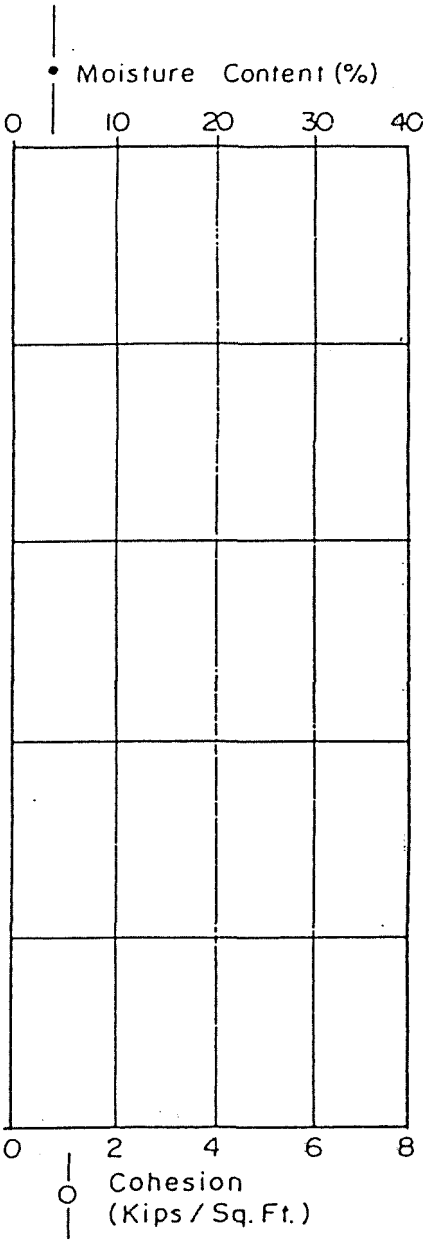


G.S.E. 677.28

Sand, med. gr. w/clay tan	SC
... f. grain lt. gray	SP
... gravelley	
Gravel, clayey, w/cobbles, tan	GC
Clay, stiff, plastic, tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 20'

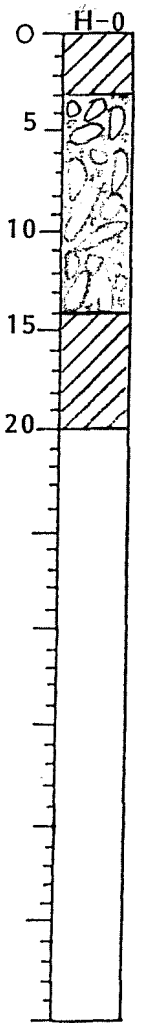
Static Water Elev. 674.3



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: December 10, 1985

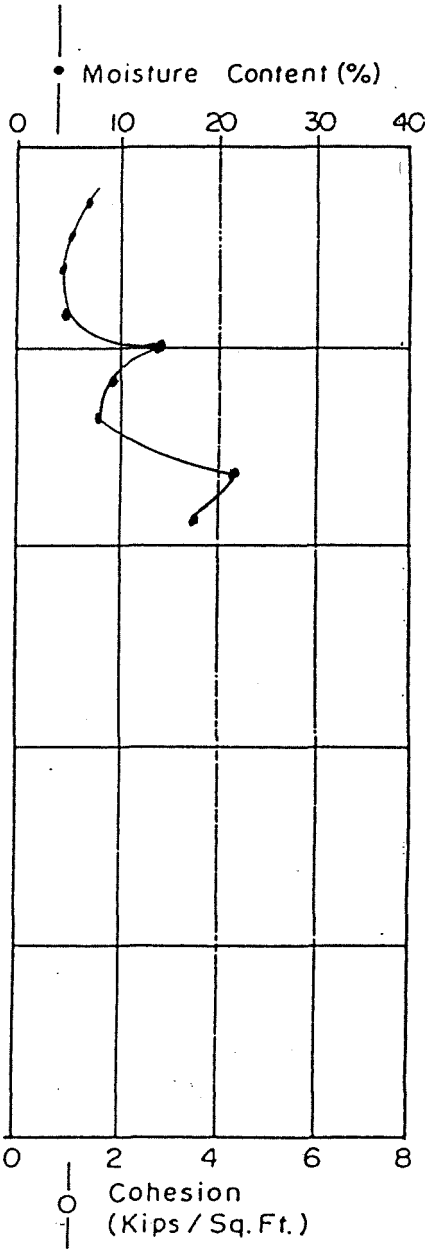


G.S.E. 691.0

Clay, sandy, gravelley, dk. brown	CL
... brown	
Gravel, sandy, clayey brown	GC
... lt. brown	
... v. sandy, trace clay, tan	GW
Shale, v. clayey dk. gray	CH
... sl. clayey	

Discontinued @ 20'

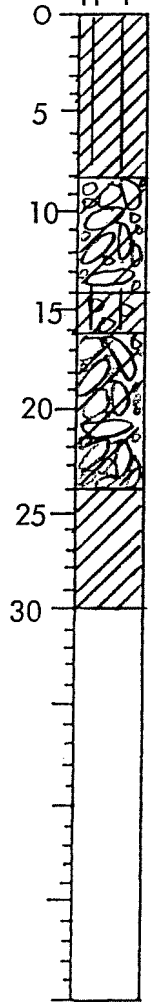
Static Water Elev. 682.7



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985



G.S.E. 706.60

Clay, fill, silty w/trash (dated) brown CL

... dk. gray

Gravel, clayey, gray GC

... brown

Clay, silty, gravelley, brown CL

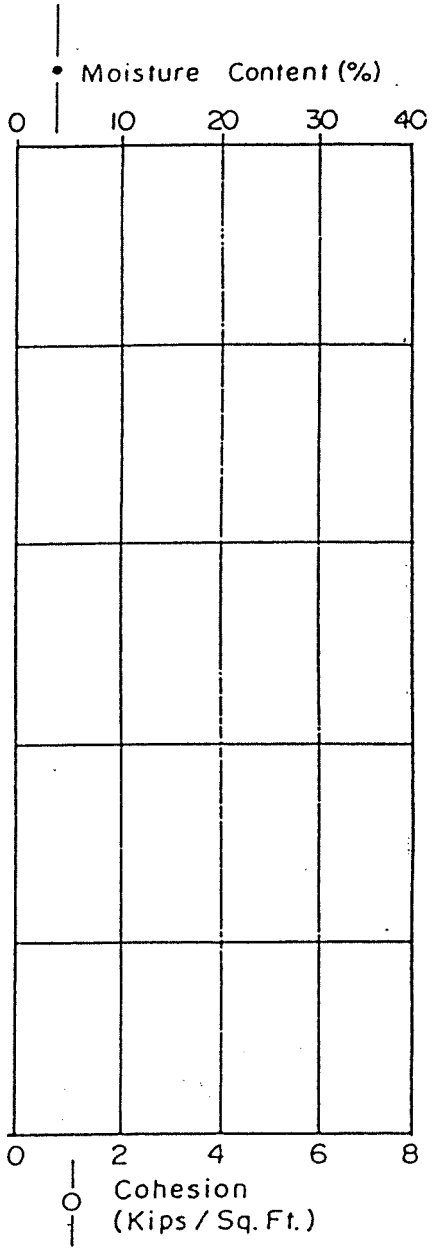
Gravel, clayey w/cobbles brown GC

... sl. clayey, tan

Clay, stiff w/gypsum & pyrite stain CH
seams, tan & gray

Discontinued @ 30'

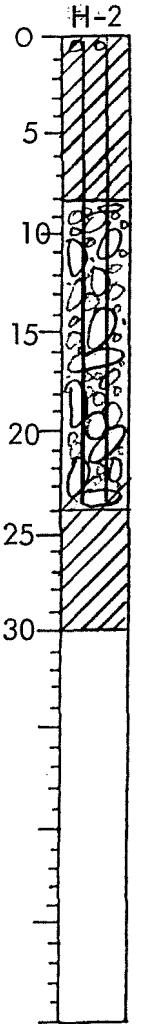
Static Water Elev. Boring Dry



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: November 7, 1985

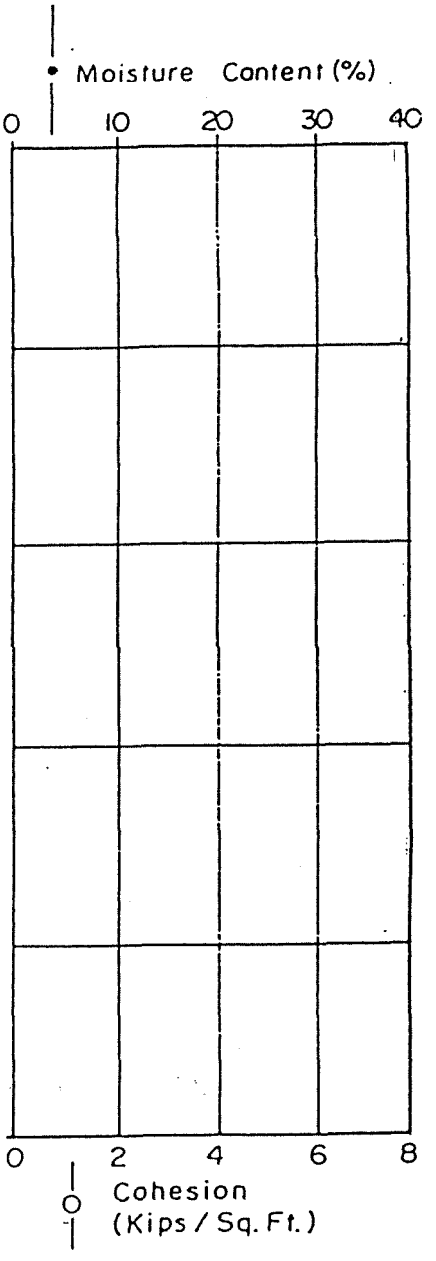


G.S.E. 705.96

Clay, gravelley brown	CL
... sl. silty dk. brown	CH
... sl. silty, sl. sandy lt. brown	CL
... v. silty	
Gravel, silty, lt. brown	GM
... w/cobbles	
... silty, clayey	GC
Clay, sl. stiff w/gypsum & pyrite stain seams, tan & gray	CH

Discontinued @ 30'

Static Water Elev. Boring Dry

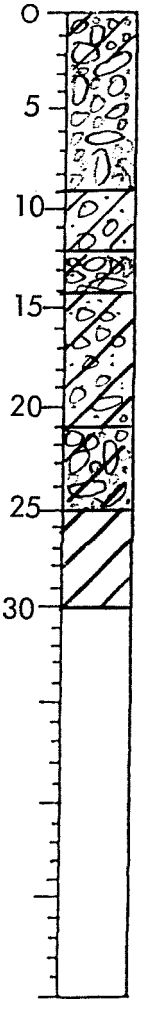


LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 24, 1985

H-3

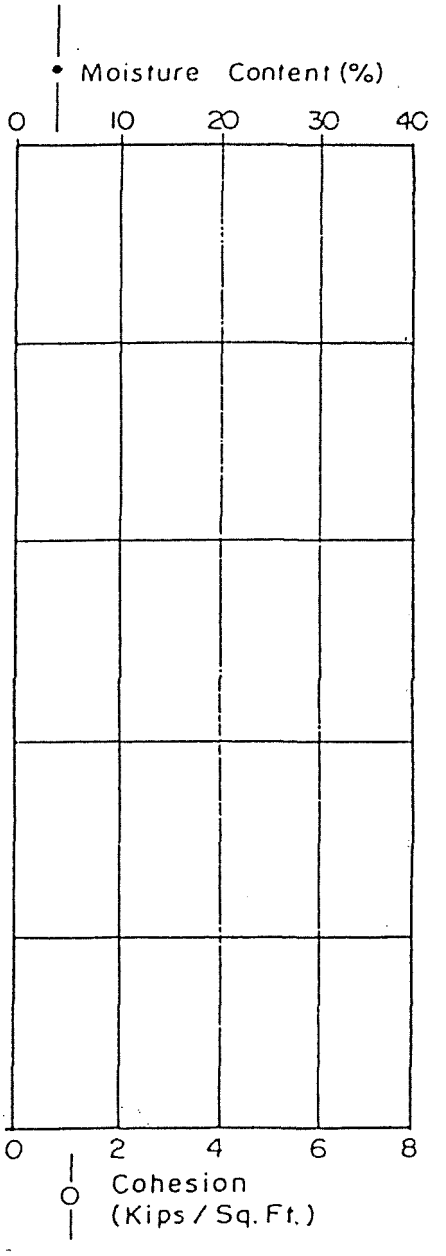
G.S.E. 703.06



Gravel, fill, clayey, brown	GC
... w/broken concrete (dated)	GP
Clay, fill w/trash (dated), sandy, gravelley, brown	CL
Gravel, fill, clayey, lt. tan	GC
Clay, fill, sandy, gravelley, brown	CL
Gravel, clayey w/cobbles, tan	GC
Clay, stiff w/gypsum seams, tan & dk. gray	CH

Discontinued @ 30'

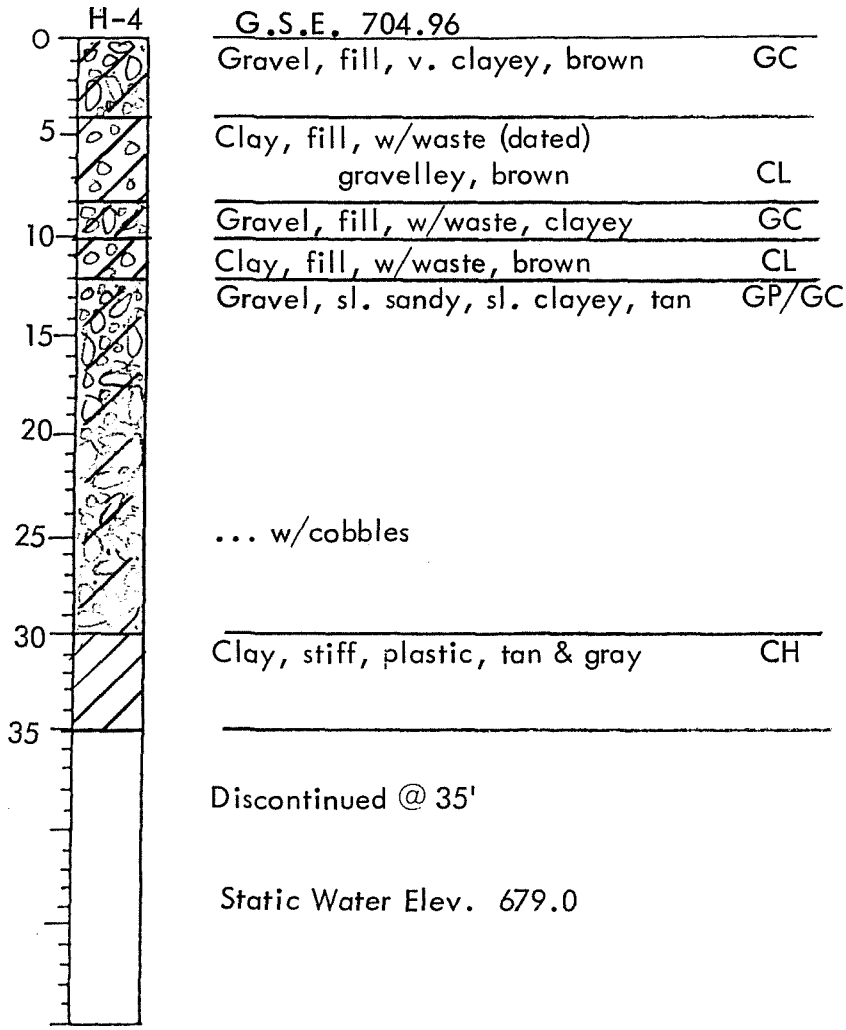
Static Water Elev. 680.1



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: October 7, 1985

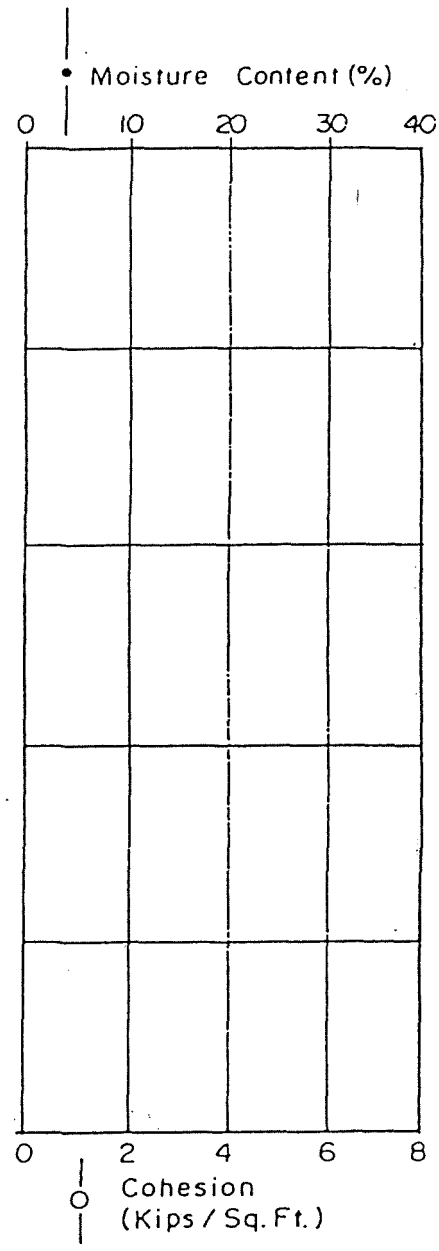


G.S.E. 704.96

Gravel, fill, v. clayey, brown	GC
Clay, fill, w/waste (dated) gravelley, brown	CL
Gravel, fill, w/waste, clayey	GC
Clay, fill, w/waste, brown	CL
Gravel, sl. sandy, sl. clayey, tan	GP/GC
... w/cobbles	
Clay, stiff, plastic, tan & gray	CH

Discontinued @ 35'

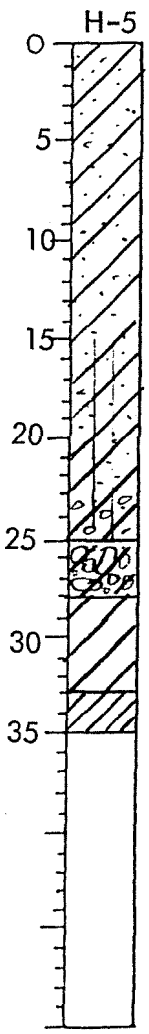
Static Water Elev. 679.0



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 24, 1985

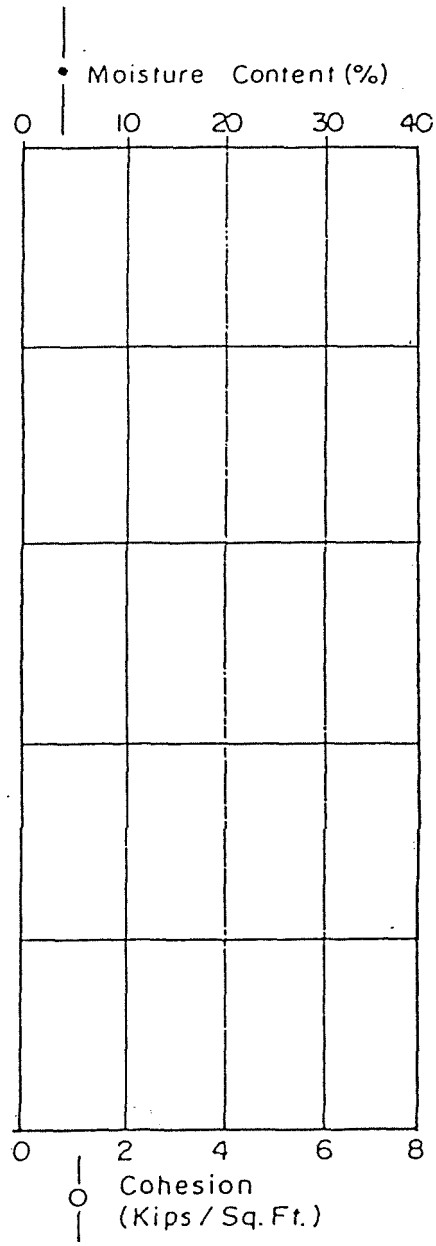


G.S.E. 699.97

Clay, trace sand, dk. brown	CH
... sl. silty, sl. sandy, brown	CL
... sandy, lt. brown	CL
... v. sandy	
... silty, sl. sandy	
... w/trace gravel	
Gravel, silty, clayey, tan	GC
Clay, stiff w/gypsum seams tan & gray	CH
Shale, sl. clayey, dk. gray	CH

Discontinued @ 35'

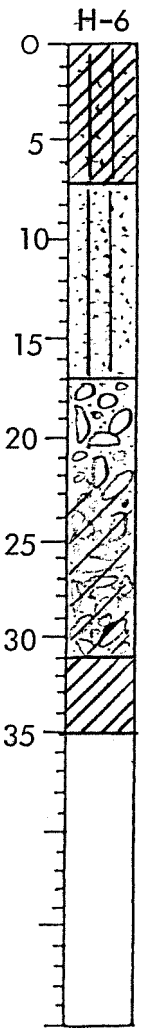
Static Water Elev. 674.5



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 6, 1985



G.S.E. 697.97

Clay, silty w/f. gr. sand, lt. brown CL

Sand, v. silty, trace clay, lt. brown SM

... v. sl. silty tan SP

Gravel, sandy, trace silt, tan GW

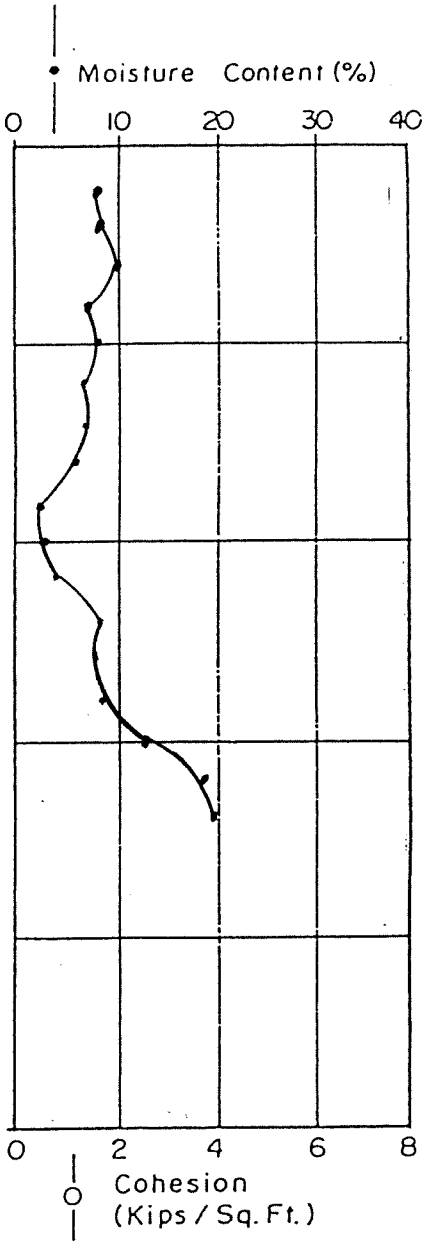
... sandy, clayey GC

... w/cobbles

Shale, clayey dk. gray CH

Discontinued @ 35'

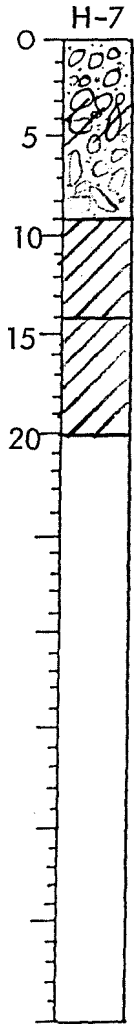
Static Water Elev. 677.0



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 4, 1985

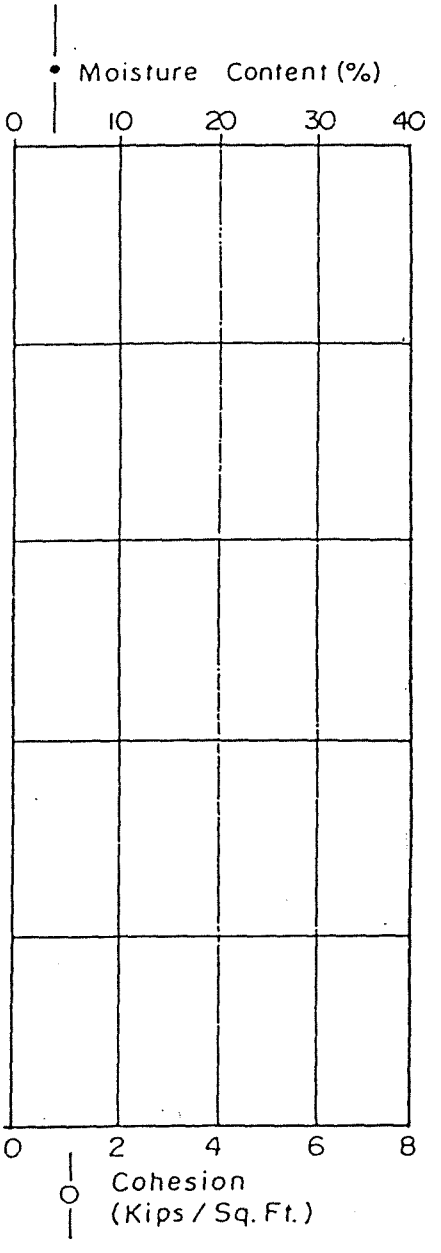


G.S.E. 679.18

Gravel, sandy, tan	GW
... clayey	GC
... sl. sandy w/cobbles	GP
Clay, v. stiff w/gypsum seams tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 20'

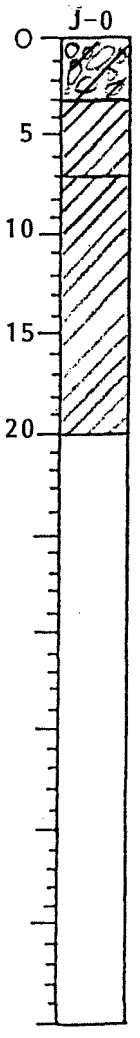
Static Water Elev. 672.2



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: December 10, 1985

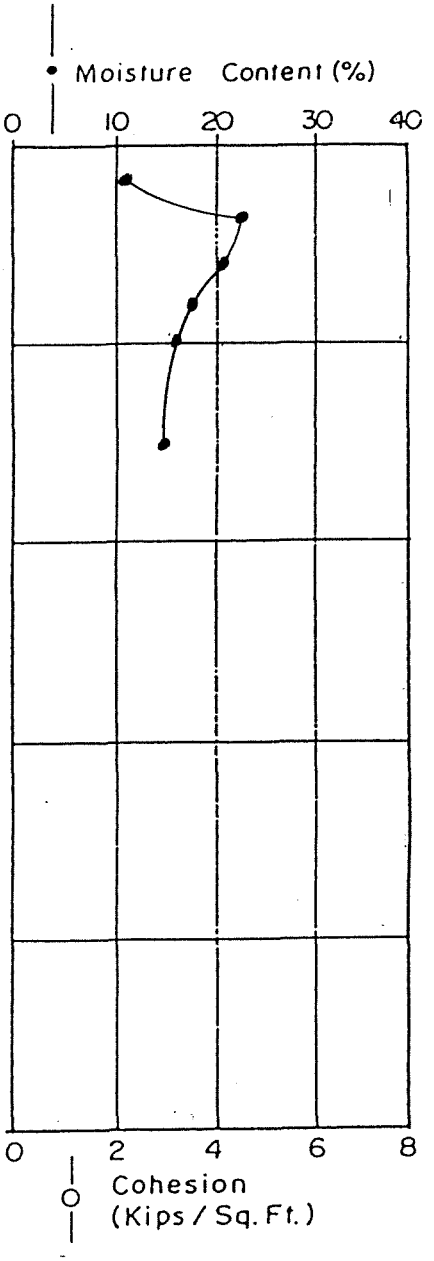


G.S.E. 686.4

Gravel, sl. clayey brown ... tan	GC
Clay, stiff w/gypsum seams tan & gray	CH
Shale, clayey, dk. gray ... sl. clayey	CH

Discontinued @ 20'

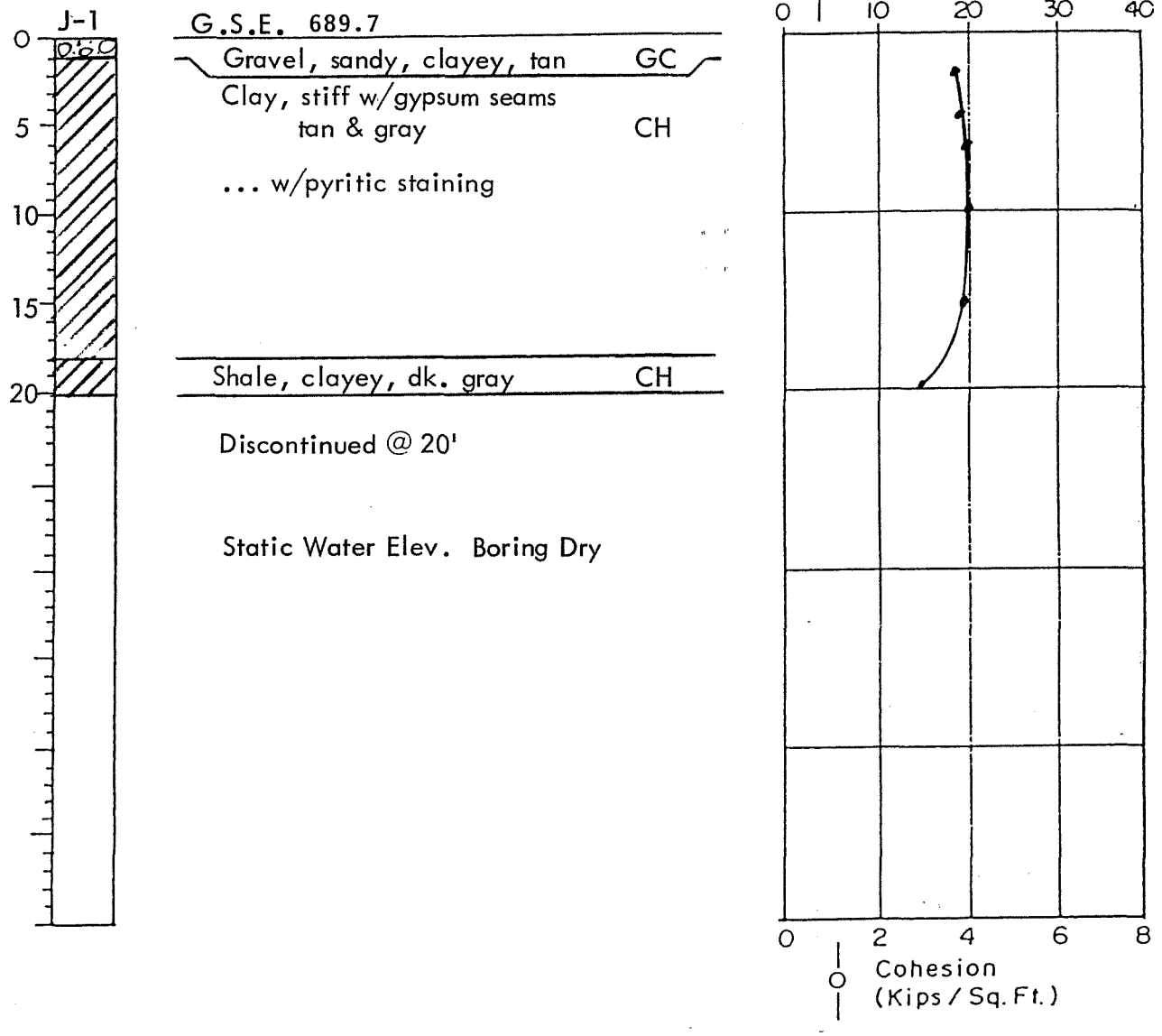
Static Water Elev. Boring Dry



SNOWDEN, INC.

LOG OF BORING

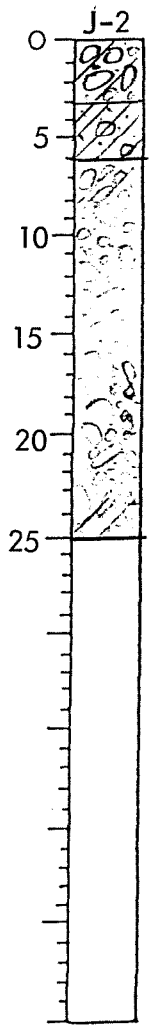
Project Name: Beck Ready Mix, Inc.
Date Drilled: August 29, 1985



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: August 30, 1985

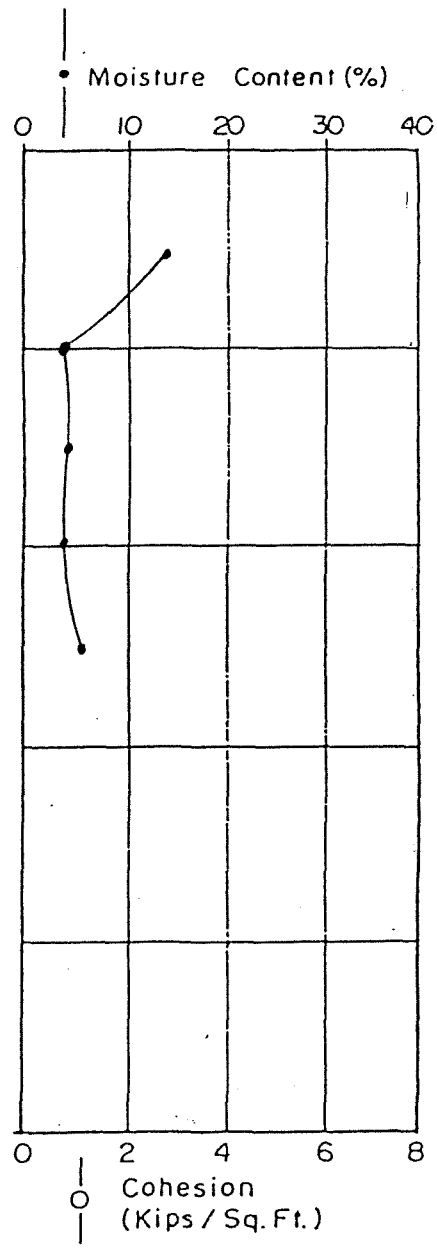


G.S.E. 709.04

Gravel, sandy, clayey, brown	GC
Clay, sandy, gravelley brown	CL
Gravel, sandy, sl. clayey, tan	GW/GC
sandy, trace clay	GW
... w/occasional cobble	
... sandy w/cobbles, sl. clayey	GW/GC

Discontinued @ 25'

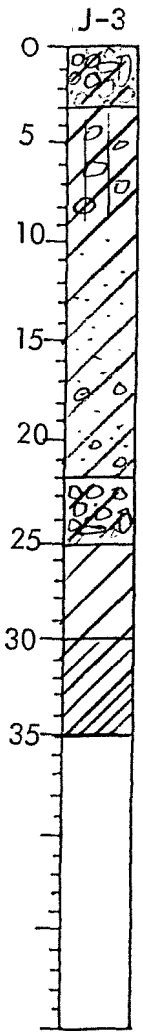
Static Water Elev. 678.1 (approx.)



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 24, 1985

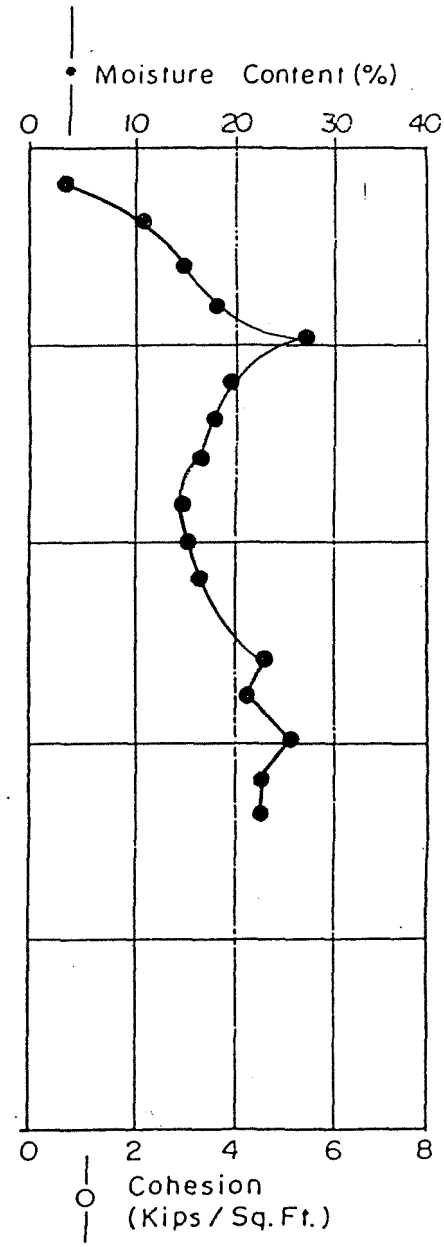


G.S.E. 701.14

Gravel, fill, clayey, lt. brown	GC/GP
Clay, fill, w/trash (dated), silty, gravelley lt. brown	CL
... sandy, gray	
Clay, sandy, sl. gravelley, lt. brown	CL
Gravel, clayey, tan	GC
Clay, stiff w/gypsum seams, tan & gray	CH
... tan w/dk. gray	
Shale, clayey, dk. gray	CH

Discontinued @ 35'

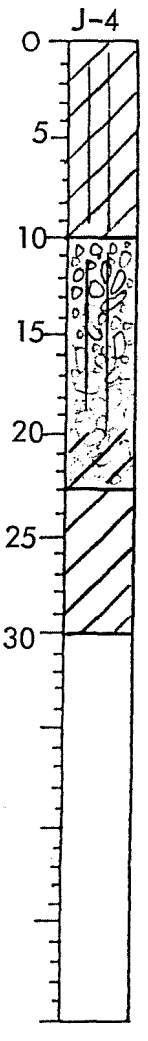
Static Water Elev. 680.1



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 24, 1985

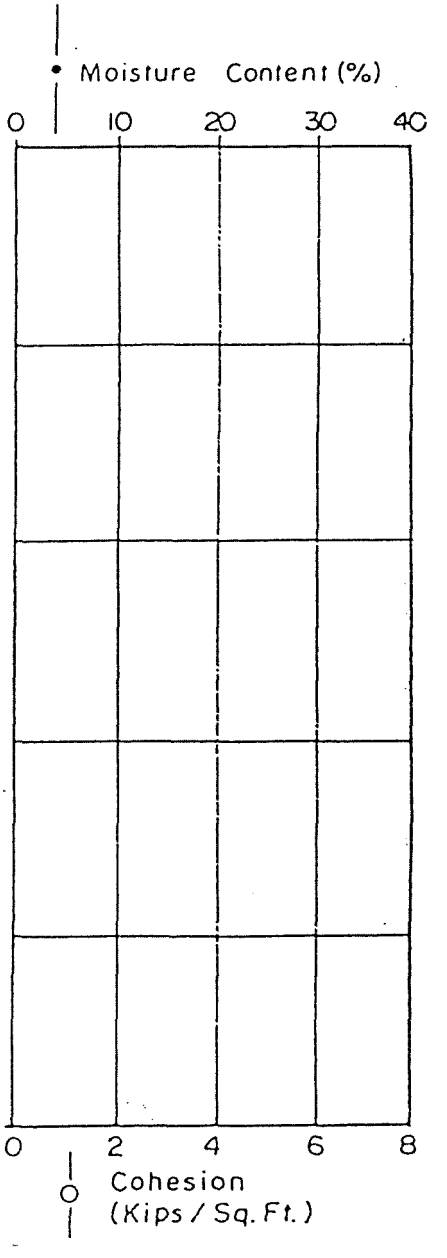


G.S.E. 699.34

Clay, silty, sl. sandy, brown	CL
... v. silty, lt. brown	
Gravel, silty, tan	GM/GP
... sl. silty	GM/GW
... sl. clayey, tan	GC
Clay, stiff w/gypsum seams, tan & gray	CH

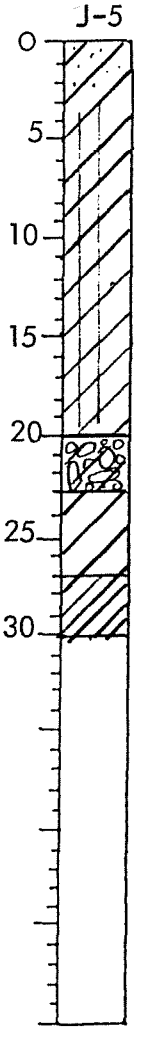
Discontinued @ 30'

Static Water Elev. 678.3



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 24, 1985

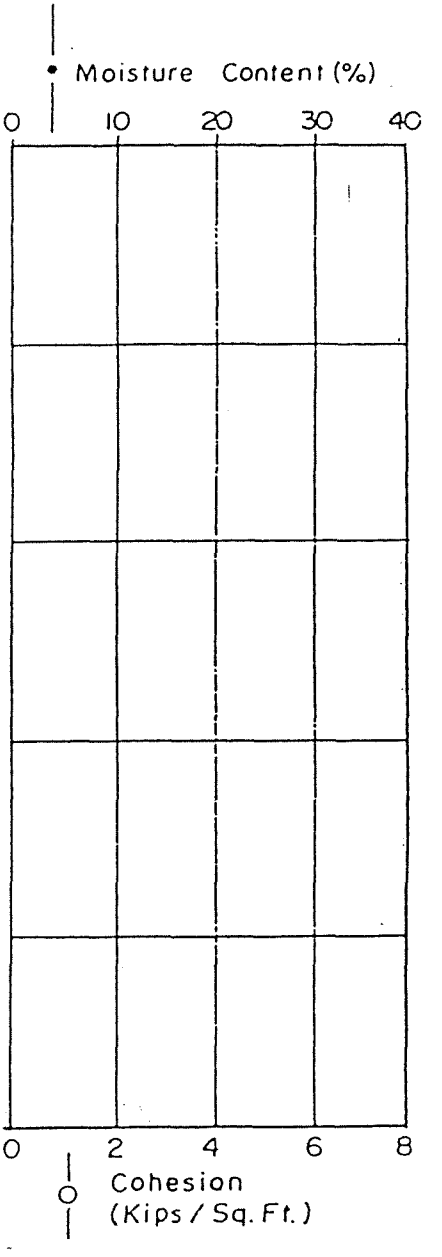


G.S.E. 695.65

Clay, trace sand, dk. brown	CH
... sl. silty, brown	CH/CL
... silty, lt. brown	CL
Gravel, clayey, tan	GC
Clay, Stiff w/gypsum seams, tan & gray	CH
Shale, sl. clayey, dk. gray	CH

Discontinued @ 30'

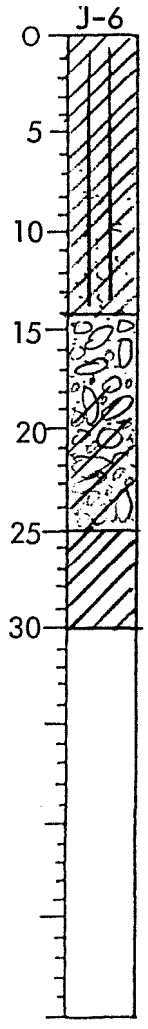
Static Water Elev. 673.7



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 6, 1985

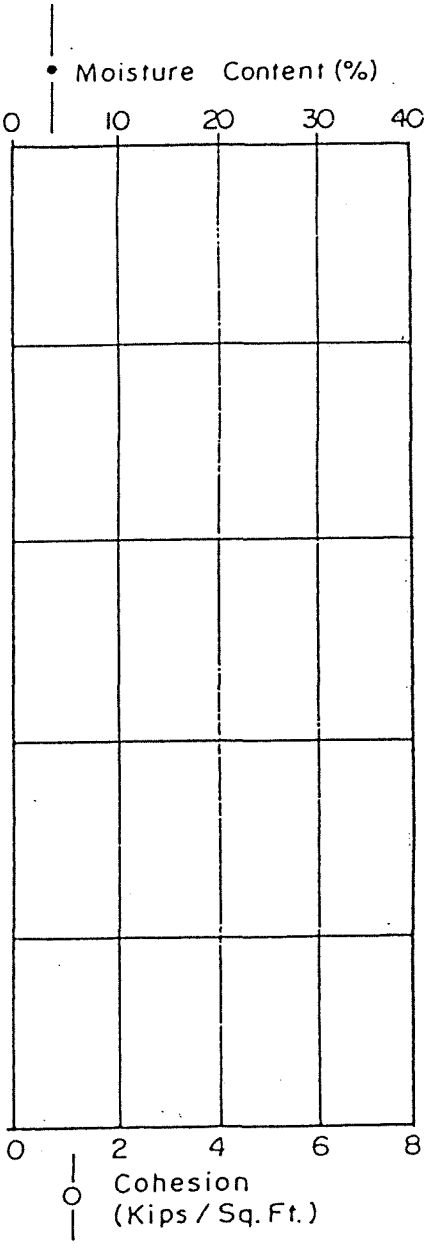


G.S.E. 693.25

Clay, sl. silty, dk. brown	CH
... silty w/trace f. gr. sand brown	CL
... silty, sandy, lt. brown	
Gravel, sandy, tan	GW
... sandy, clayey	GC
... clayey w/cobbles	
Shale, clayey dk. gray	CH

Discontinued @ 30'

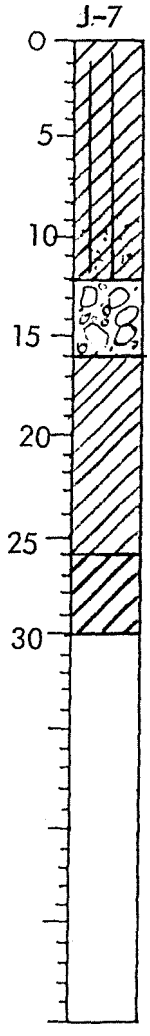
Static Water Elev. 673.3



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 6, 1985

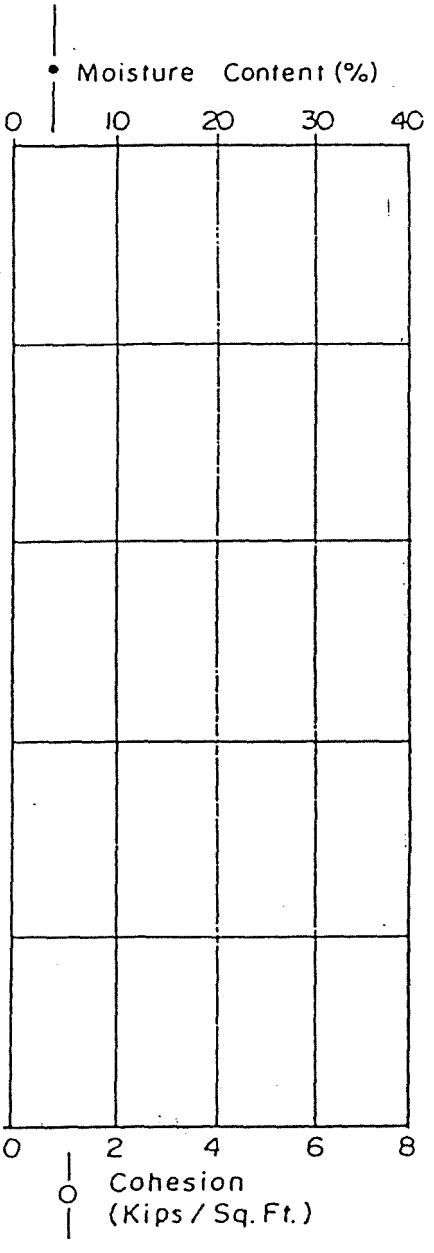


G.S.E. 691.25

Clay, sl. silty, dk. brown	CH
... sl. silty, brown	CH/CL
... silty, sl. sandy, lt. brown	CL
Gravel, sandy w/cobbles, tan	GW
Clay, stiff w/gypsum seams tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 30'

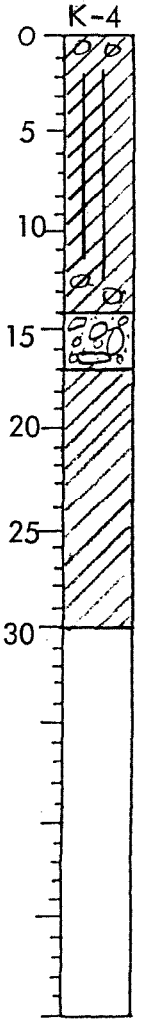
Static Water Elev. Boring Dry



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 6, 1985

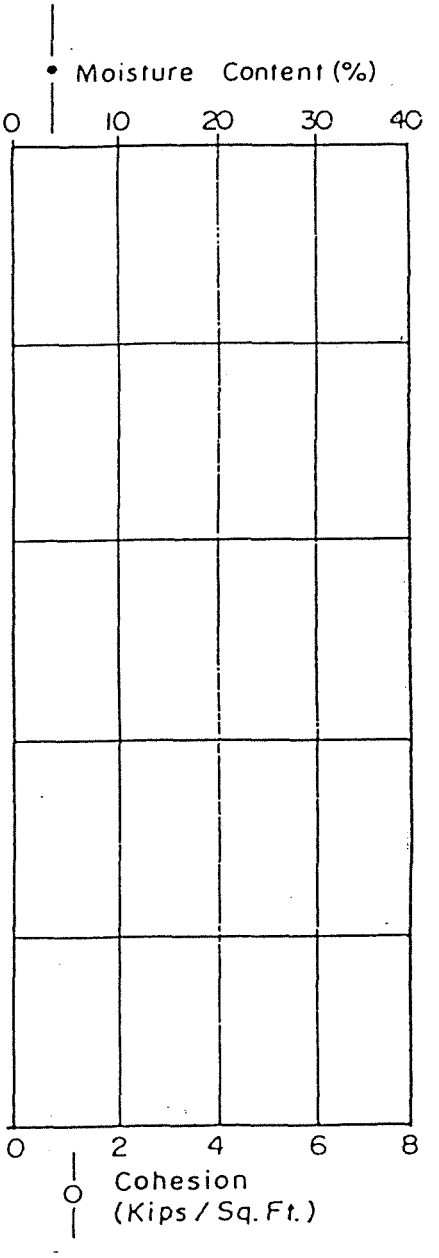


G.S.E. 695.25

Clay, gravelley, brown	CL
... sl. silty, brown	CH/CL
... silty w/trace f. gr. sand	CL
... silty, sandy, gravelley, tan	
Gravel, sandy, silty, clayey, tan	GC
Clay, stiff w/gypsum seams tan & gray	CH

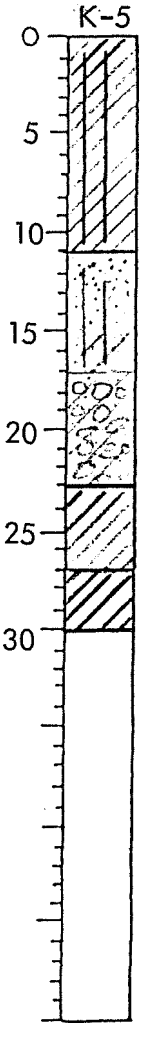
Discontinued @ 30'

Static Water Elev. 682.3



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 4, 1985

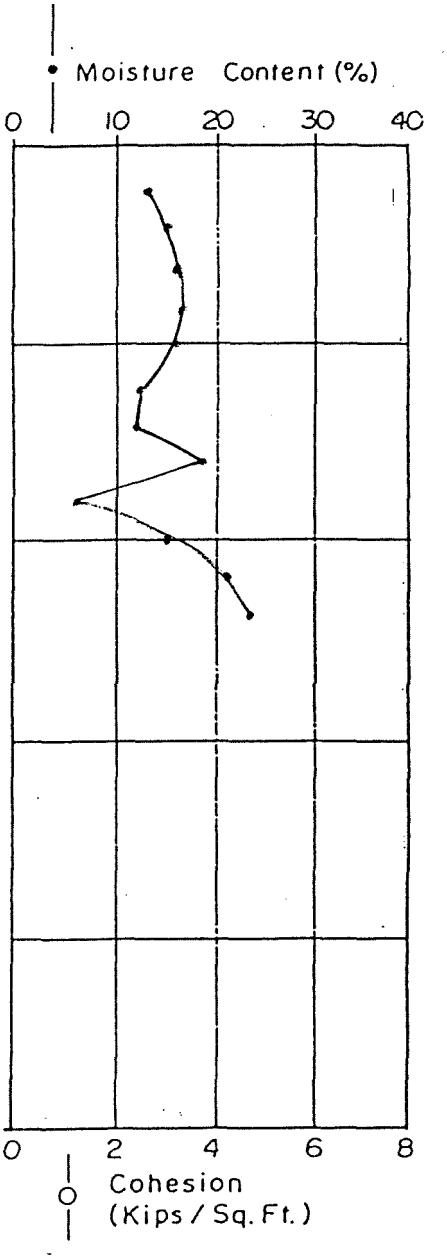


G.S.E. 692.35

Clay, v. silty, brown	CL
... v. silty w/f. gr. sand, lt. brown	
Sand, sl. silty, tan	SM/SP
... silty, sl. clayey	SM/SC
Gravel, sandy, sl. clayey, tan	GW/GC
... sandy, clayey w/cobbles	GC
Clay, stiff w/pyritic stained gypsum seams, tan & gray	CH
Shale, clayey, dk. gray	CH

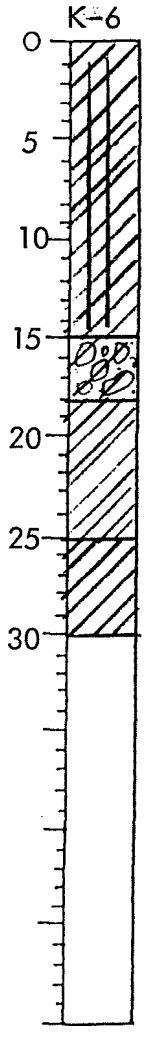
Discontinued @ 30'

Static Water Elev. 673.4



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 6, 1985

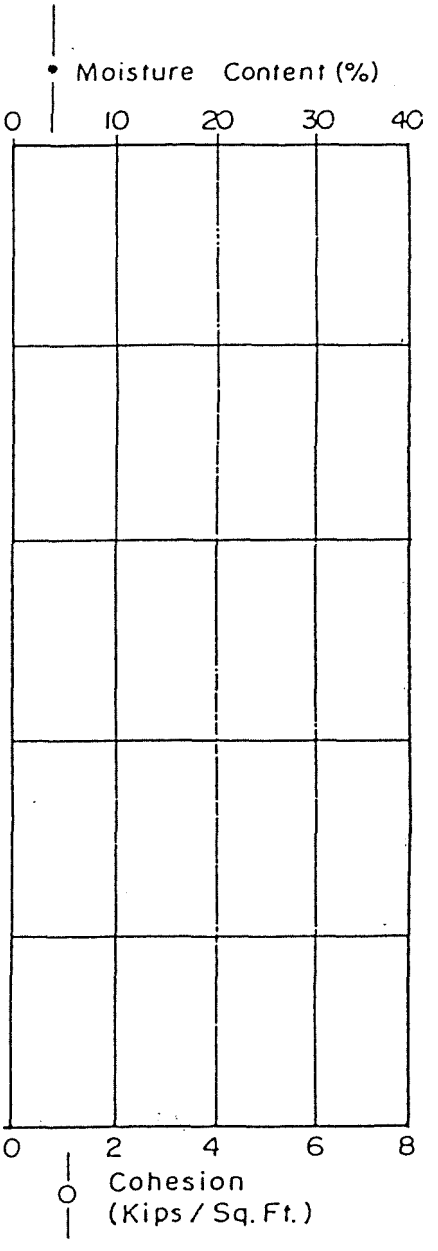


G.S.E. 690.15

Clay, sl. silty, dk. brown	CH
... sl. silty w/trace f. gr. sand	CH/CL
... silty, lt. brown	CL
Gravel, clayey, tan	GC
Clay, stiff, w/gypsum seams tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 30'

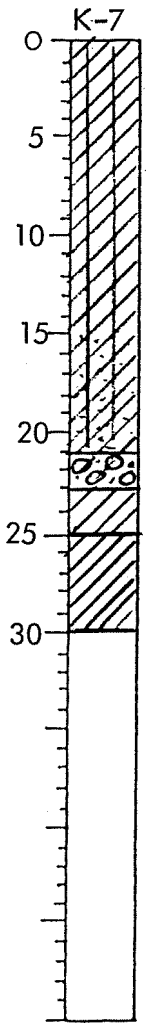
Static Water Elev. 674.2



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 6, 1985

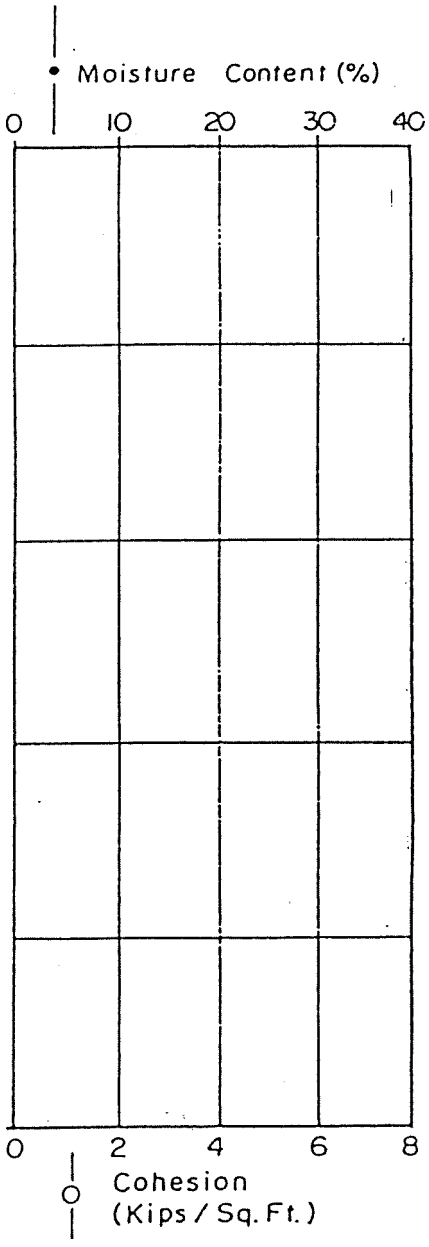


G.S.E. 687.45

Clay, sl. silty, dk. brown	CH
... w/trace f. gr. sand	CH/CL
... silty, lt. brown	CL
... silty, v. sandy, tan	
Gravel, sandy, clayey, tan	GC
Clay, stiff, tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 30'

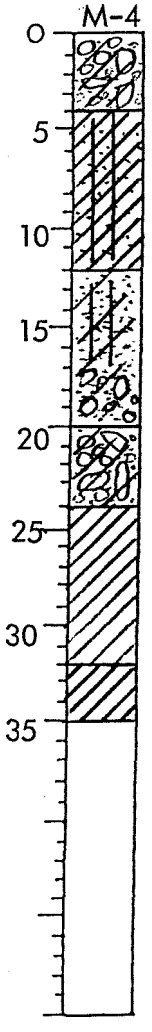
Static Water Elev. 670.5



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: August 29, 1985

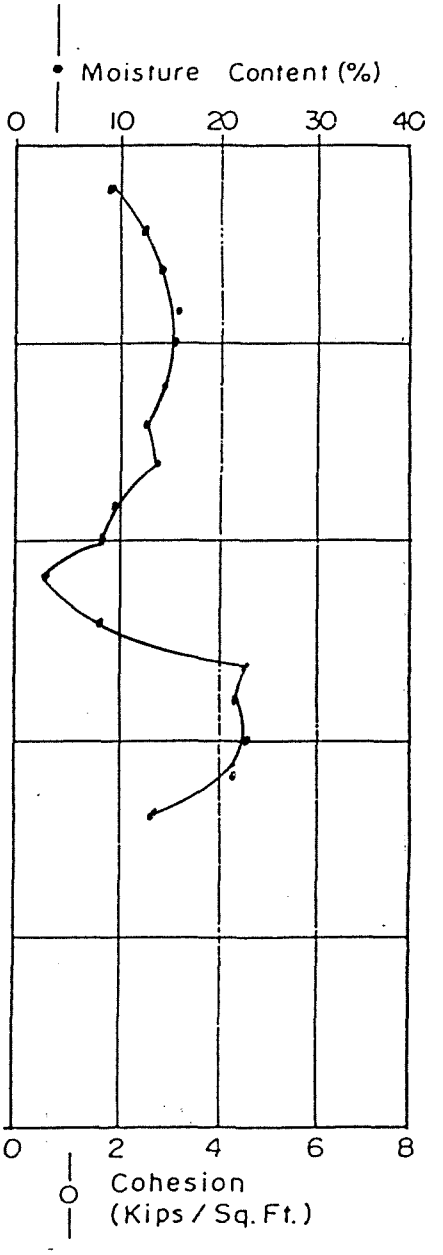


G.S.E. 699.44

Gravel, clayey, brown	GC
sandy, sl. clayey, tan	GP
Clay, silty, sandy, brown	CL
... v. silty, sandy, lt. brown	
... v. silty, v. sandy, tan	CL/SM
Sand, v. silty, sl. clayey, tan	SM
... sl. silty, sl. clayey	SM/SC
... clayey, gravelley	SW/SC
Gravel, sandy, clayey, tan	GC
Clay, stiff, w/gypsum seams, tan & gray	CH
... trace pyritic staining	
Shale, clayey, dk. gray	CH

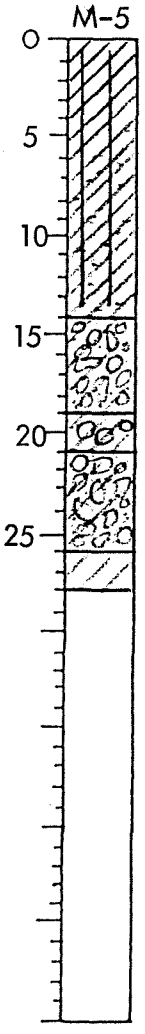
Discontinued @ 35'

Static Water Elev. Boring Dry



LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 4, 1985

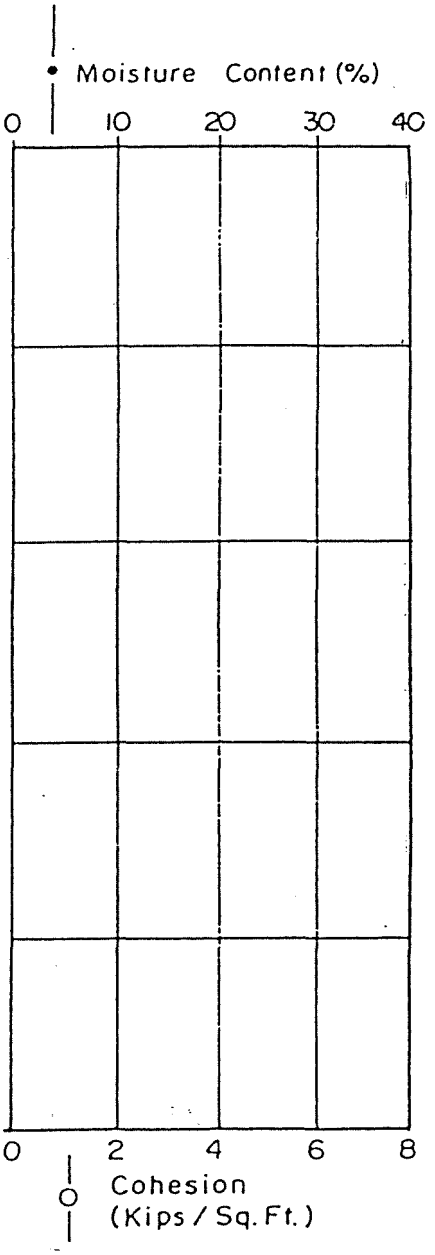


G.S.E. 690.14

Clay, sl. silty, dk. brown	CH/CL
... silty, brown	CL
... silty w/f. gr. sand	
... lt. brown	
Gravel, sandy clayey, tan	GC
... w/cobbles	
Clay, gravelley, tan	CL
Gravel v. clayey w/cobbles	GC
... sandy, sl. clayey tan	GW/GC
Clay, stiff, tan & gray	CH

Discontinued @ 28'

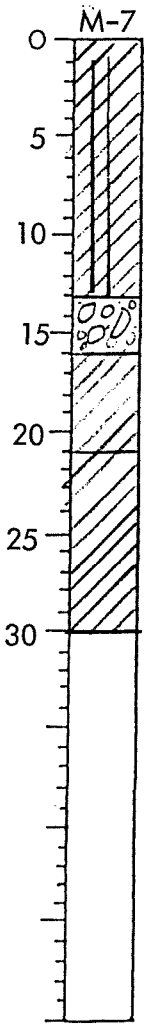
Static Water Elev. 671.1



SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Ready Mix, Inc.
Date Drilled: September 4, 1985

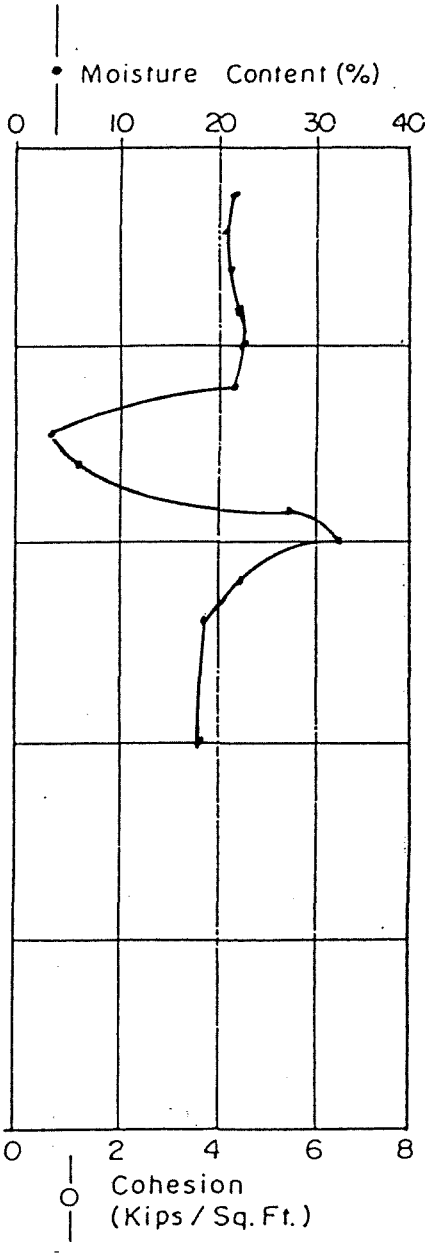


G.S.E. 685.74

Clay, sl. silty, dk. brown	CH
... sl. silty, brown	CH/CL
... silty	CL
... sl. silty	CH/CL
Gravel, sandy, tan	GW
Clay, stiff w/gypsum seams tan & gray	CH
Shale, clayey, dk. gray	CH

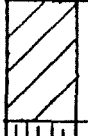
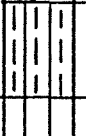
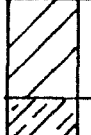
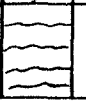
Discontinued @ 30'

Static Water Elev. 669.7



SNOWDEN, INC.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols		Typical Names
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS		GW	Well-graded gravels and gravel-sand mixtures, little or no fines
				GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction	CLEAN SANDS		SW	Well-graded sands and gravelly sands, little or no fines
				SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS & CLAYS Liquid limit 50% or less			ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clay of low plasticity
	SILTS & CLAYS Liquid limit greater than 50%			MH	Inorganic silts, micaceous or diatomacous fine sands or silts, elastic silts
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity
Highly Organic Soils				PT	Peat, muck and other highly organic soils

* Based on the material passing the 3 in. (75 mm) sieve

SNOWDEN, INC.

SUPPLEMENTAL
GEOTECHNICAL INVESTIGATION
BECK READYMIX CONCRETE COMPANY
F.M. 78
SCHERTZ, TEXAS
PROJECT #5108
DECEMBER, 1987
ATTACHMENT 11 SUPPLEMENT

INVESTIGATION

Supplemental soil borings have been excavated to enhance the initial Attachment 11 Geotechnical Investigation. The borings were each for one of three purposes, 1.) To define the aerial extent of known solid waste deposits, 2.) To provide additional soil data along the projected slurry trench wall alignment, or 3.) Deepened into shale strata at certain locations.

All additional investigation conformed to the requirements of the original investigation, and are intended only to provide a greater degree of subsurface condition comprehension. No conditions differing from or discrepancies from the original investigation were noted.

The additional borings have been overlayed upon the original Boring Plan as included within this supplement preceeding the additional boring logs. A graphic depiction of the aerial extent, of both the Randolph Fill and the Beck Fill as of the end of November, 1987, is also included.

HYDROLOGY AND GROUNDWATER GRADIENT

The discussion within is not derived necessarily from the excavation of supplemental soils borings but is rather an enhanced dissertation for clerical consideration. It thus does not replace the original text or any specific circumstances as stated there in, but simply facilitates greater informational availability.

The alluvial aquifer as referenced in the original report, is comprised primarily of the sand and gravel deposits that overlie the clays and shales beneath this site. The current groundwater gradient is generally to the north east with all subsurface waters migrating to the eastern property line with concentration along previous channels and/or historic paths of Cibolo Creek.

Cibolo Creek, as it currently exists, serves as a type of groundwater divide within the alluvial aquifer. Pleistocene segments of the aquifer south of the project site are primarily recharged by Cibolo Creek and other sources as is the Halocene segment immediately beneath the site and extending eastward parallel to F.M. 78. The alluvial aquifer beneath this project and the continuation which extends eastward approximately 1200 to 1500 feet to the next downstream oxbow bend of Cibolo Creek, are thus considered as an isolated and largely independent Halocene unit. The water of Cibolo Creek that recharge the saturated zone beneath this site, though not the sole source of recharge, migrate from recharge at Cibolo Creek, to discharge at Cibolo Creek, and are within predominate Halocene age deposits. Any existing water wells within the proximity of the project would be completed in Pleistocene age deposits and thus be unrelated to the water beneath this project.

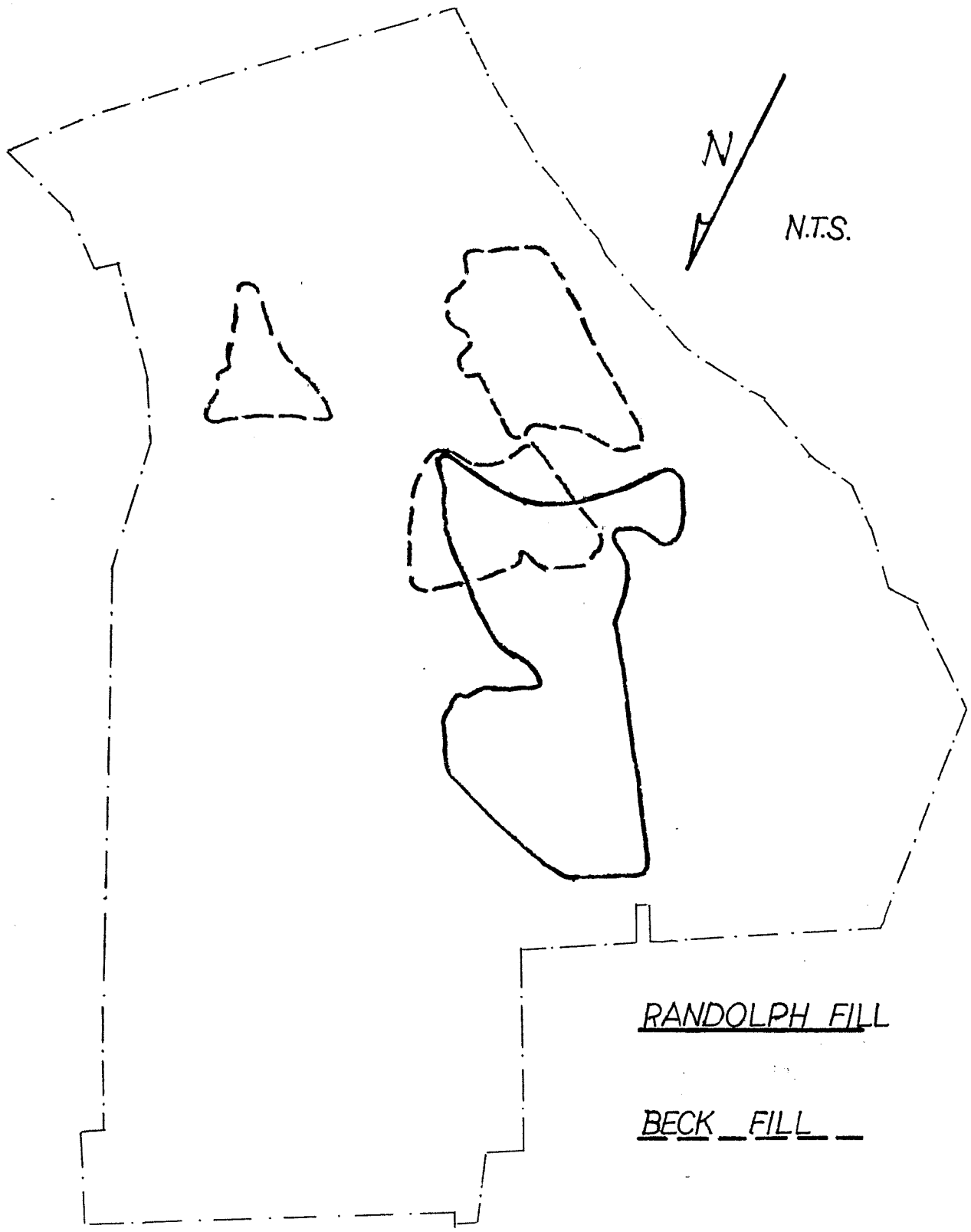
As with most alluvial aquifers, permeability and porosity are each rather high. Flood water along Cibolo Creek as well as some basil flow, is transmitted to the gravel deposits. Discharge immediately following a flood state will occasionally within upper storage limits, reverse gradational flow and discharge back to their source as such affords less resistance, other waters being transmitted by the gravel deposits basically enter the deposits along the south and western property lines and migrate to the eastern property line. Saturation limits of the gravel deposits and basil flows predominately within creek channels cut into clay and shale deposits, dictate much of the flow associated with Cibolo Creek to remain within the creek proper for the majority of the year. Dynamic head characteristics thus do not exist though some static level variations will occur corresponding to periods of flood condition.

The implementation of the soil-bentonite slurry trench wall and ground-water monitoring programs as detailed within other attachments and/or the Site Development Plan, are provisions to insure the integrity of the existing alluvial aquifer by disallowing any contact between current subsurface waters and the deposited solid waste. The slurry wall containment design precludes the infiltration and/or exfiltration of subsurface water in or out of the waste body. The implementation of the slurry trench will however impact to some extent the subsurface migration of water.

Those waters of Cibolo Creek that currently recharge gravel deposits along the southern and western portion of the site will be redirected by contact with the slurry wall when constructed. As recharge predominately occurs during a flood stage, the accompanying flood control dike will disallow contact with the receiving bodies of gravel thus affording a positive or favorable condition. The typical migration and recharge/discharge of groundwater, as currently occurring, will be detered by the slurry wall back to Cibolo Creek affording

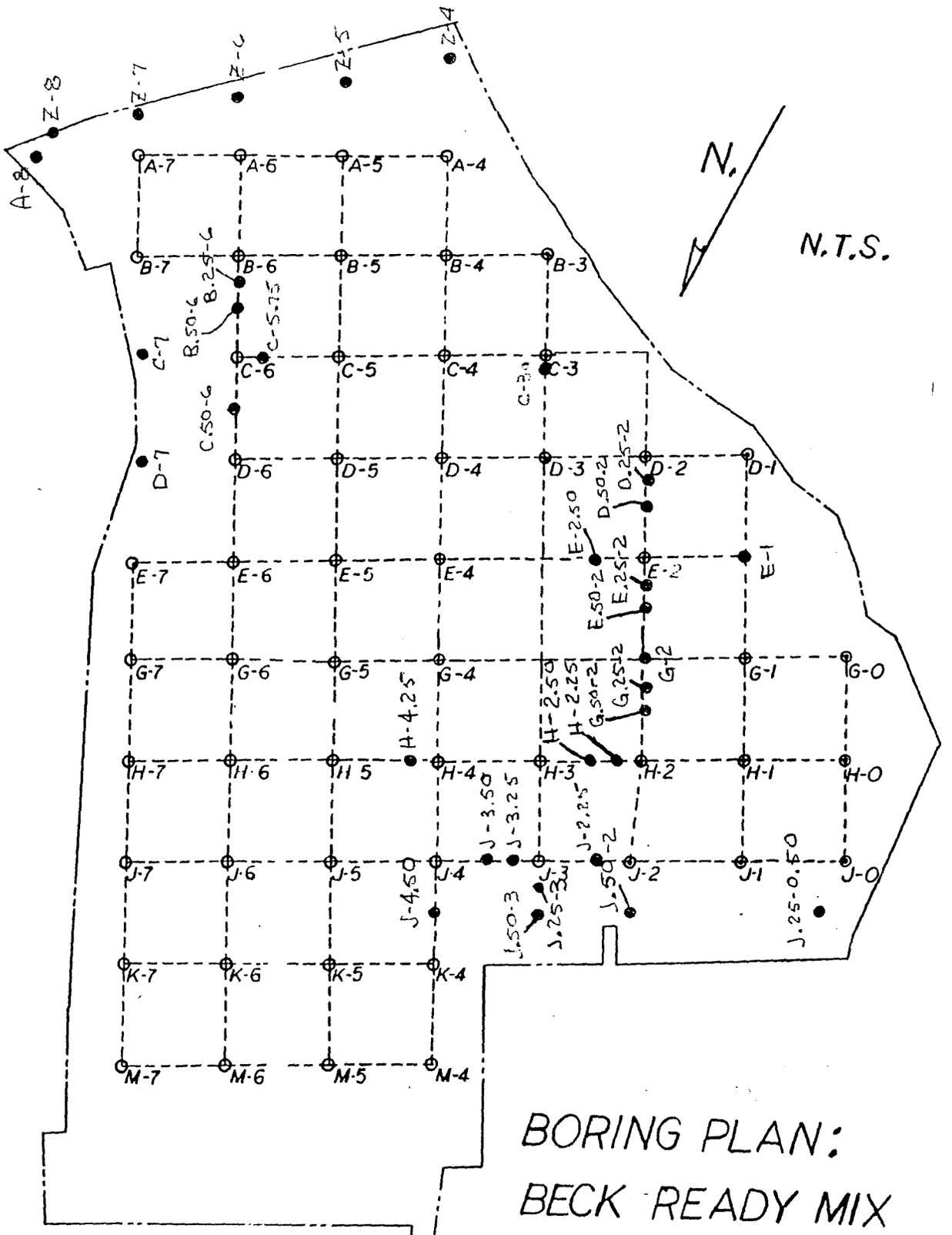
affording only a negliable increase of typical flow and well within basil levels. A slightly increased zone of saturation and/or enhanced subsurface flow parallel to the northern slurry trench wall outside of the waste body is possible. A monitor well is proposed for this northern area as a provision of quality assurance.

The installation of the slurry trench and development of the landfill as proposed, will additionally eliminate leachate migration that may possibly be occurring from the existing Randolph fills. In terms of groundwater and aquifer protection, the landfill development should be viewed as not creating any detectable changes with in the existing subsurface water systems.



FILL AREAS
NOVEMBER 1987

SNOWDEN, INC.



BORING PLAN:

BECK READY MIX

5108

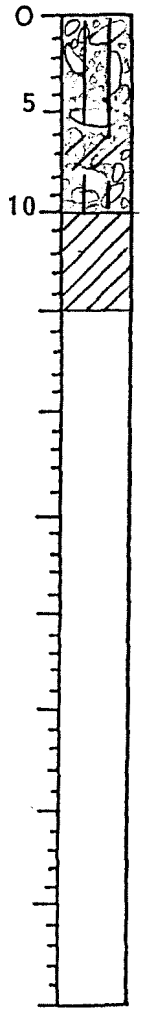
F.M. - 78

SNOWDEN, INC.

LOG OF BORING

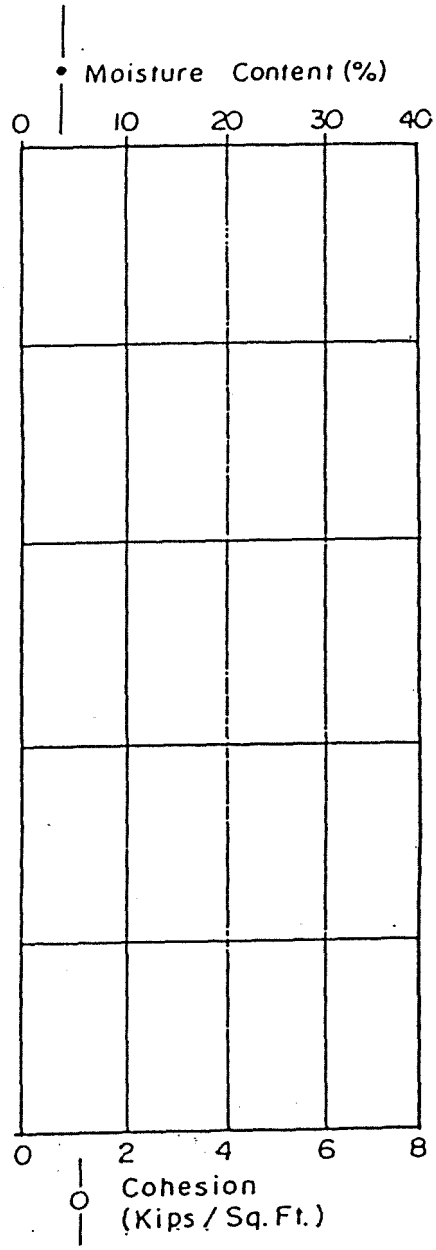
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: September 28, 1987

A-8



Gravel, silty, sandy, brown	GM
...sandy, clayey, dk. brown	GC
...silty, sandy, tan	GP/GM
Shale, clayey, dk. gray	CH

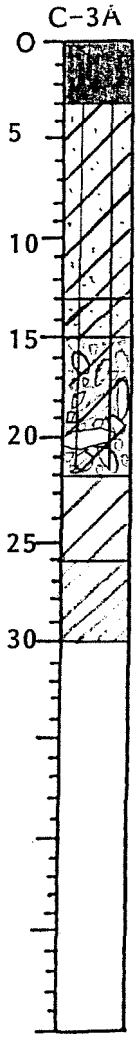
Discontinued @ 15'



SNOWDEN, INC.

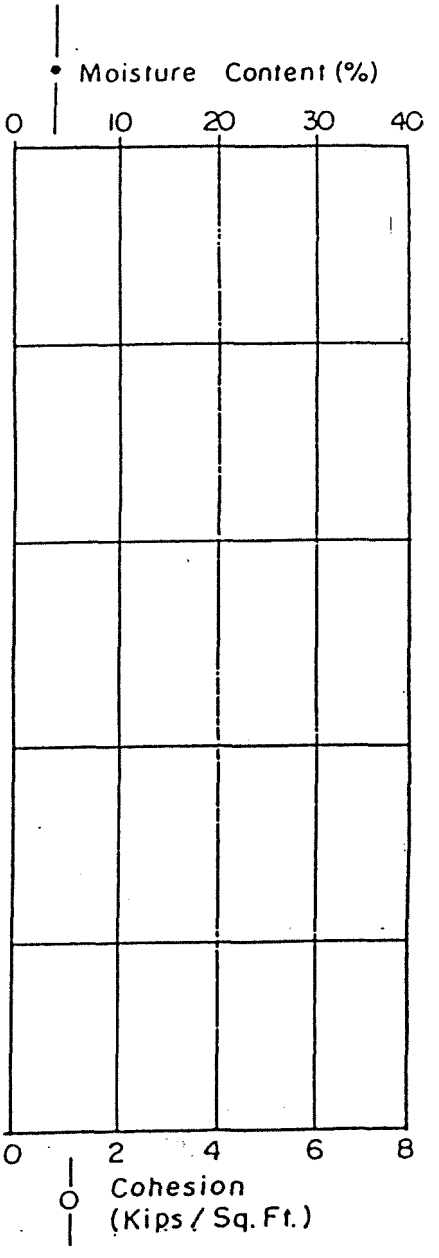
LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: September 28, 1987



Trash (recent) w/clay, dk. gray	
Clay, fill, silty, sandy, lt. brown	CL
Clay, silty, brown	CL
Gravel, silty, clayey, brown	GC/GM
Clay, stiff w/pyrite stain seams tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 30'
Static Water Elevation ± 675.8

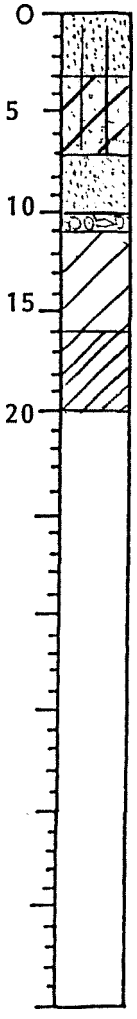


SNOWDEN, INC.

LOG OF BORING

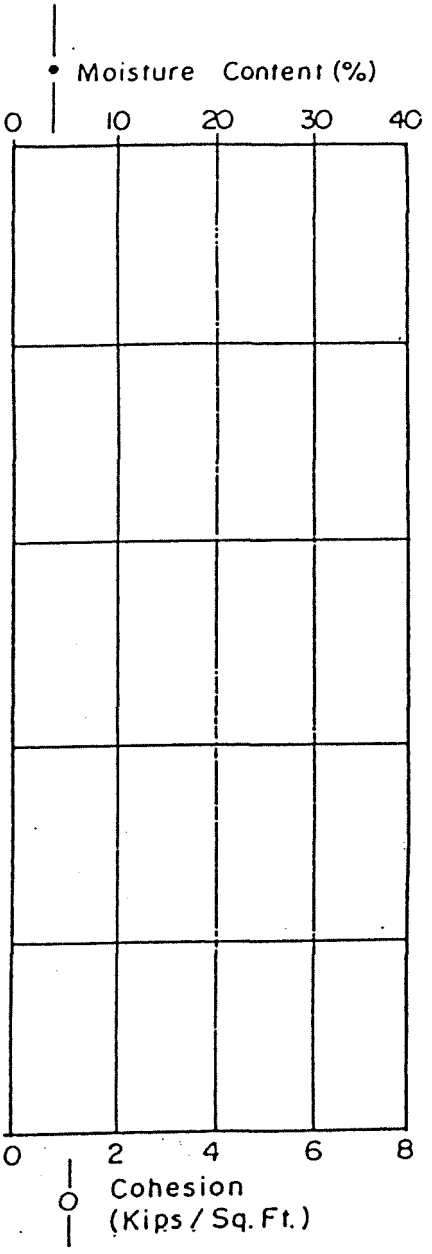
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: September 28, 1987

C-7



Sand, silty, tan	SM
Clay, silty, sandy, brown	CL
Sand, f. grain, tan	SP
Gravel, sandy, clayey, tan	GC
Clay, stiff, w/gypsum seams tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 20'
Boring Dry

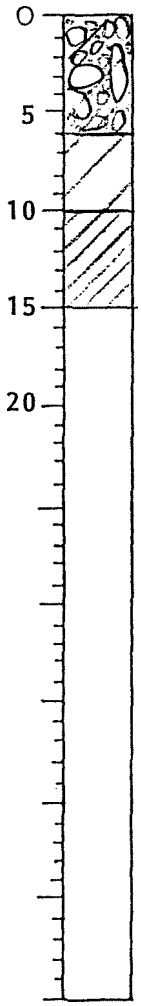


SNOWDEN, INC.

LOG OF BORING

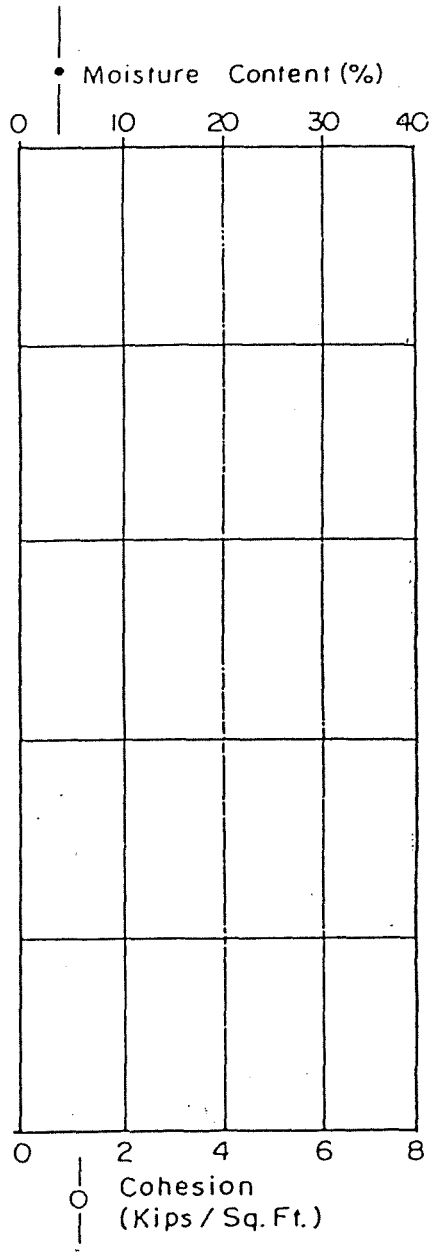
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: September 28, 1987

D-7



Gravel, sl. clayey, tan	GC/GP
Clay, stiff, tan & gray	CH
...tan & dk. gray	
Shale, clayey, dk. gray	CH

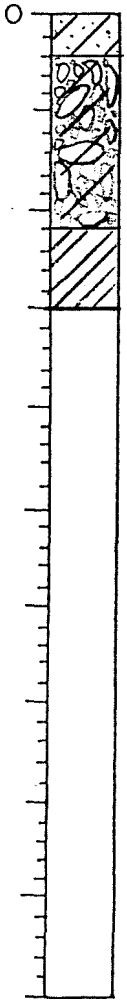
Discontinued @ 15'
Boring Dry



LOG OF BORING

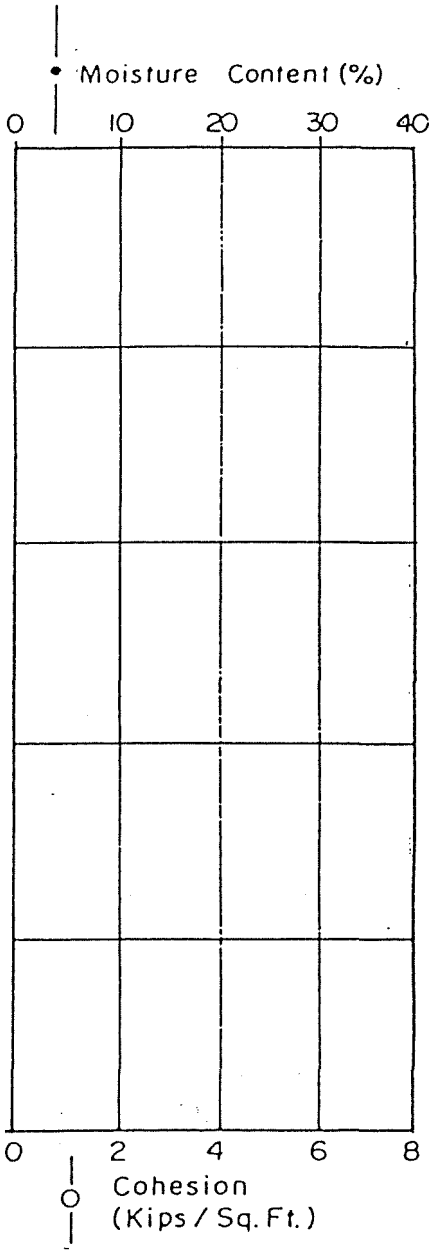
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: September 28, 1987

E-1



Clay, sandy, dk. brown	CL
Gravel, sl. clayey, tan	GC/GP
Shale, clayey, dk. gray	CH

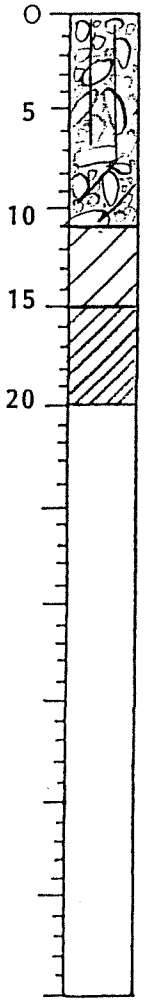
Discontinued @ 15'



LOG OF BORING

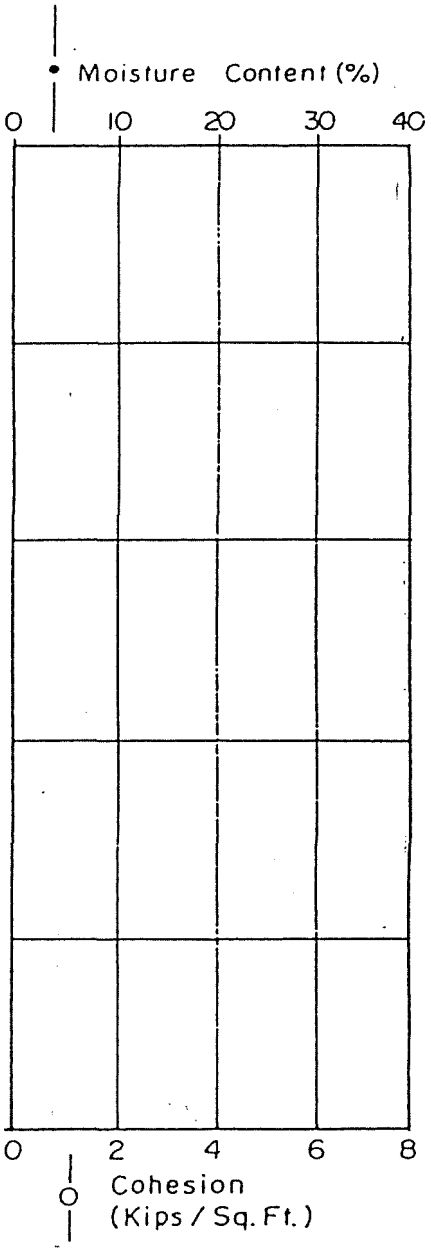
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: September 28, 1987

J.25-0.50



Gravel, sl. silty w/cobbles, lt. brown	GM/GP
...sl. clayey, brown	GC
Clay, stiff, tan & gray	CH
...tan & dk. gray	
Shale, clayey, dk. gray	CH

Discontinued @ 20'

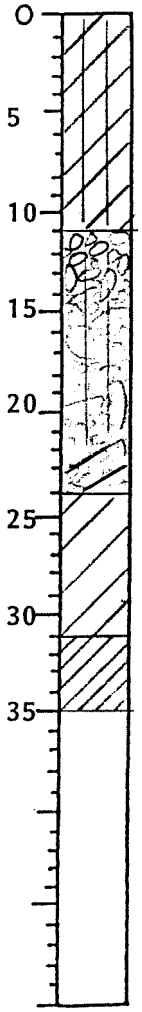


SNOWDEN, INC.

LOG OF BORING

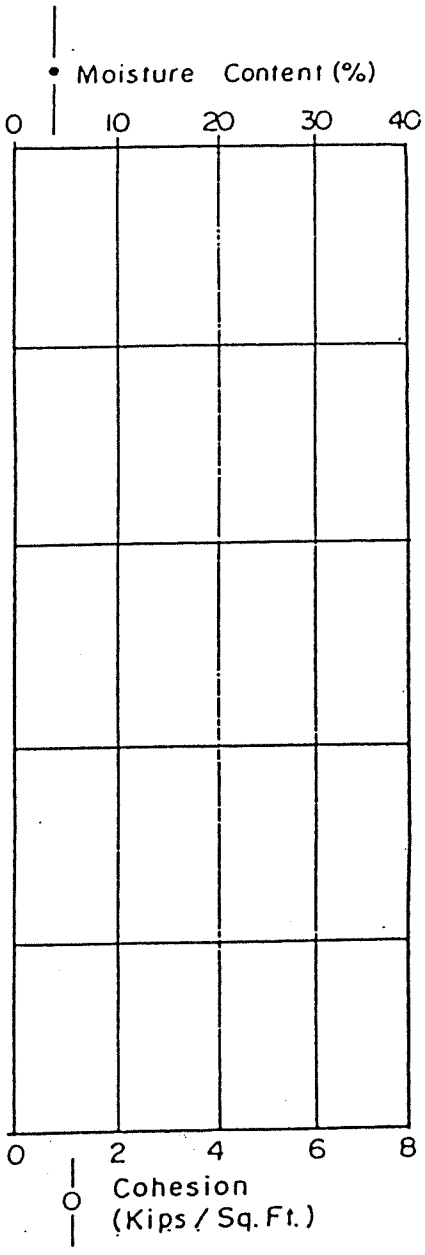
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: September 28, 1987

J.4.50



Clay, silty, sl. sandy, brown	CL
...v. silty, lt. brown	CL
Gravel, silty, tan	GM/GP
...sl. clayey, tan	GC
Clay, stiff w/gypsum seams tan & gray	CH
...tan & dk. gray	
Shale, clayey, dk. gray	CH

Discontinued @ 35'
Static Water Elevation ± 678.3

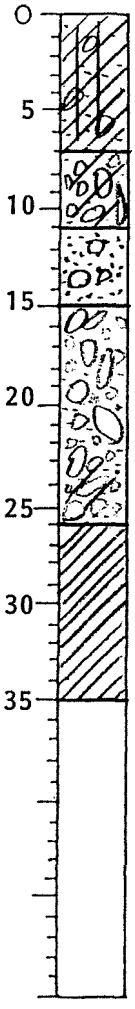


SNOWDEN, INC.

LOG OF BORING

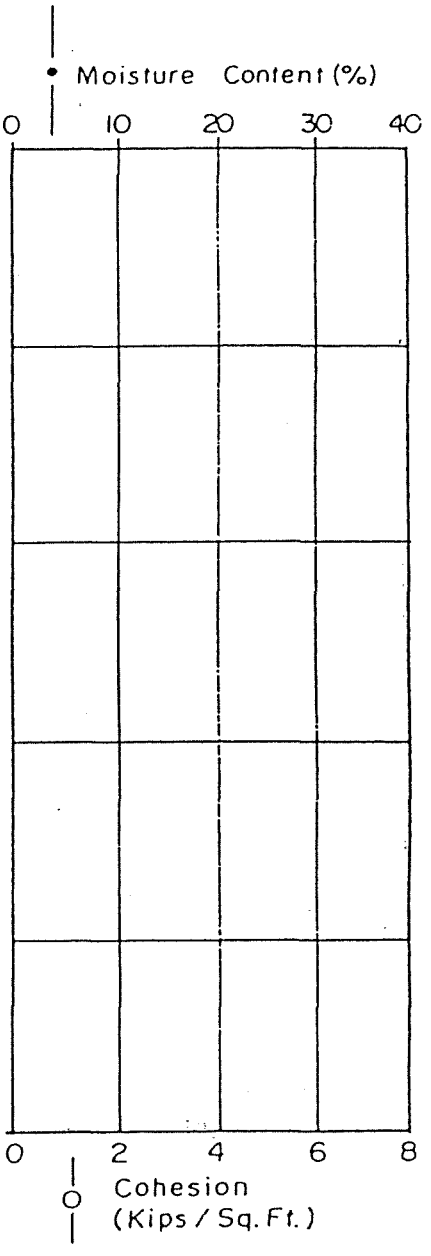
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

H-2.25



Clay, silty, sandy, gravelley, brown	CL
Gravel, sandy, clayey, lt. brown	GC/GP
Sand, gravelley, tan	SW
Gravel, sandy, w/cobbles, tan	GP
...clayey, lt. brown	GC
Clay, w/gypsum seams & pyrite stain, tan & gray	CH

Discontinued @ 35'

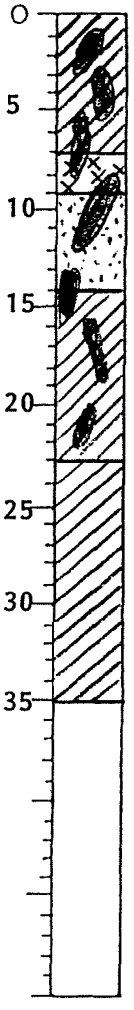


SNOWDEN, INC.

LOG OF BORING

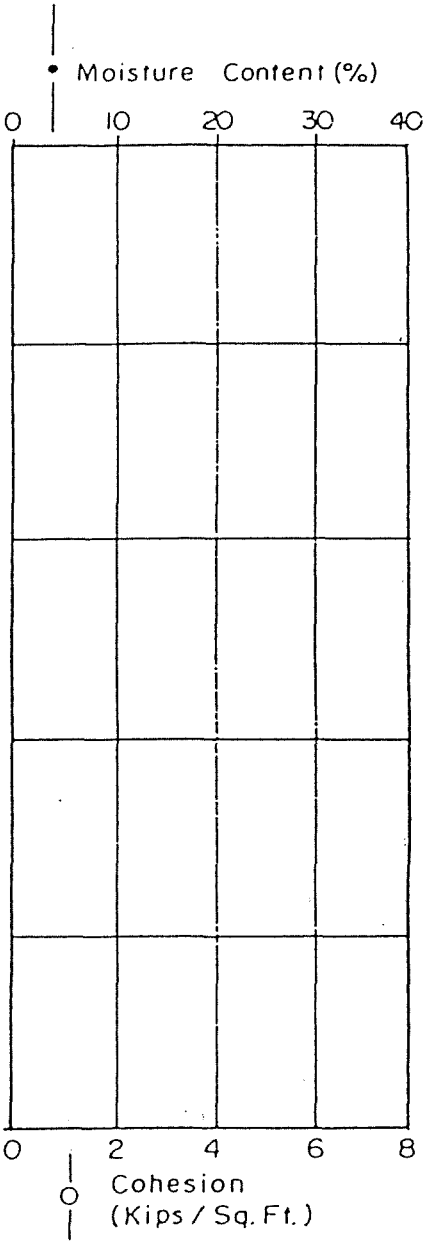
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

H-2.50



Clay, fill w/brick & concrete, dk. brown	CH
Gypsum w/wire, white	ML
Sand, fill w/metal & tile, tan	SP
Clay, fill w/wood, dk. gray	CH/CL
Clay w/gypsum seams & pyrite stain joint, tan & gray	CH

Discontinued @ 35'

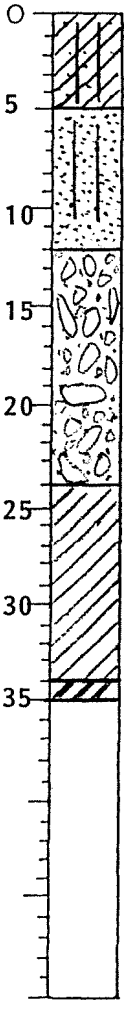


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

H-4.25



Clay, silty, sandy, brown CL

...lt. brown

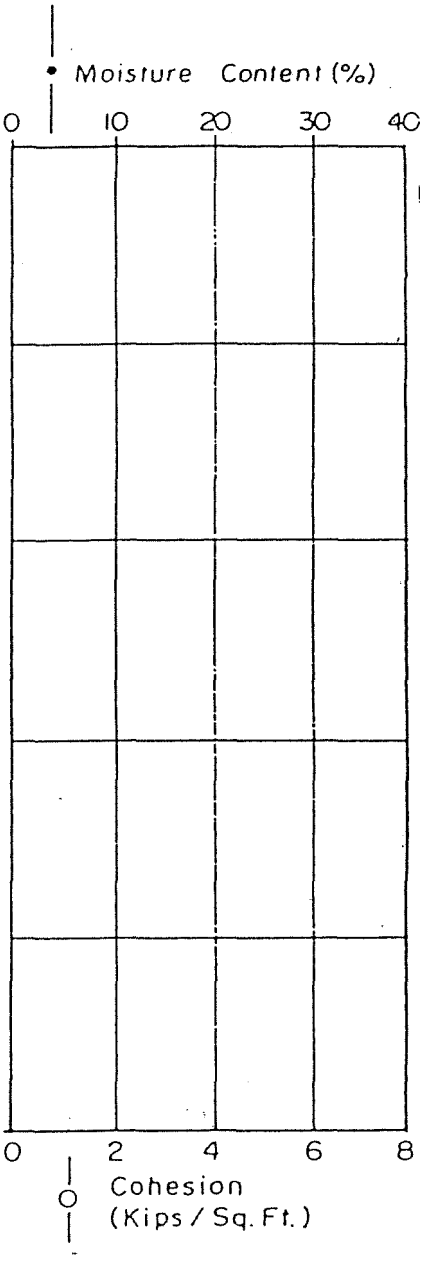
Sand, silty, lt. red, tan SM

Gravel, sandy w/cobbles, lt. brown GP

Clay w/gypsum seams & pyrite stain joint, tan & gray CH

Shale, clayey, dk. gray CH

Discontinued @ 35'

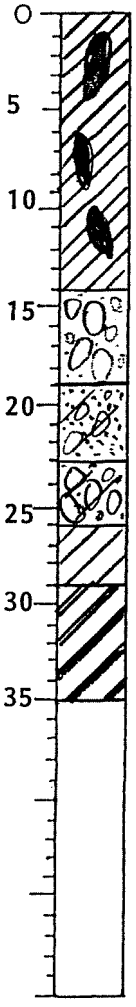


SNOWDEN, INC.

LOG OF BORING

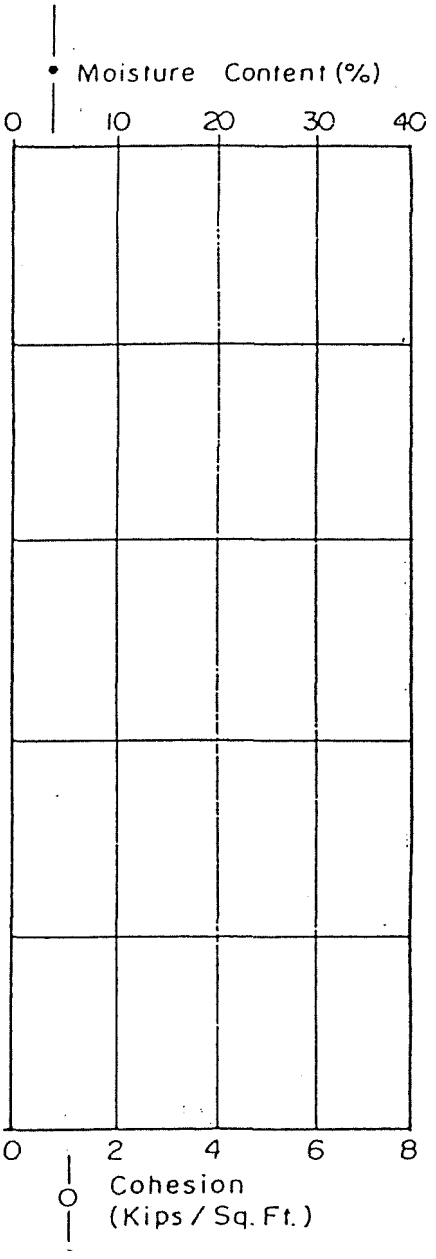
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

J-2.25



Clay, fill w/organics & metal, brown	CL
...w/glass, dk. gray	CH/CL
...v.sandy w/organics	CH/SC
Gravel, sandy, clayey w/cobbles lt. brown	GC/GP
Sand, v. clayey, gravelley, tan	SC
Gravel, v. clayey w/cobbles, tan	GC
Clay, jointed, tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 35'

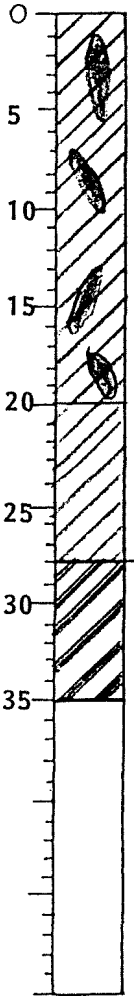


SNOWDEN, INC.

LOG OF BORING

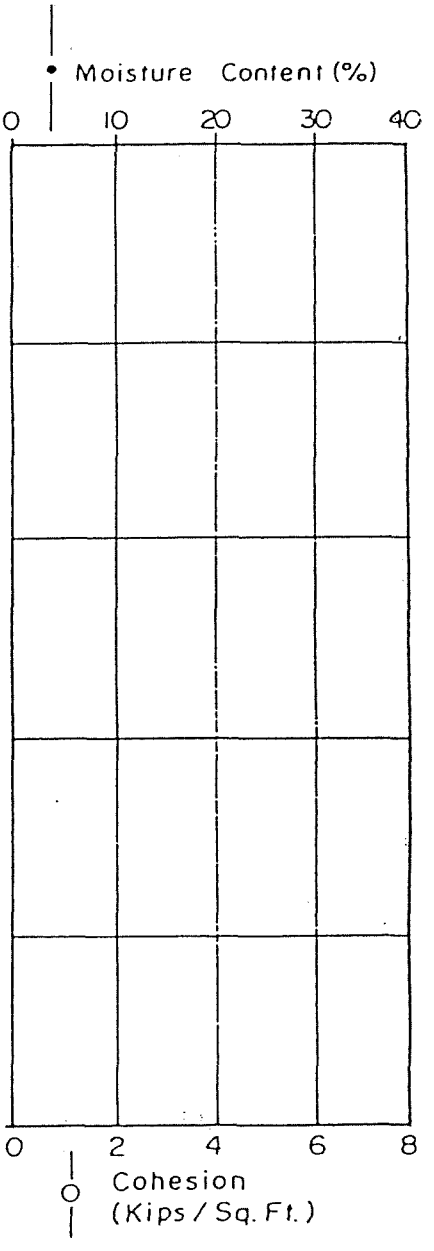
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

J-3.25



Clay, fill w/metal, brown	CL
...w/organics, dk. brown ...dk. gray	CH/CL
Clay w/gypsum seams & pyrite stain joint, tan & gray	CH
Shale, clayey, dk. gray ...sl. clayey	CH

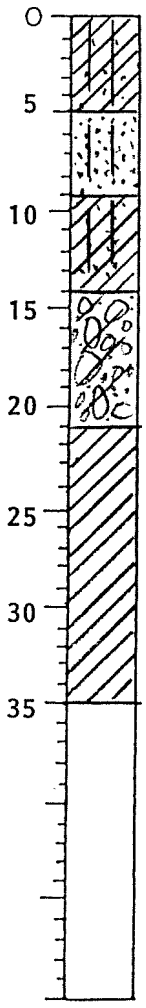
Discontinued @ 35'



LOG OF BORING

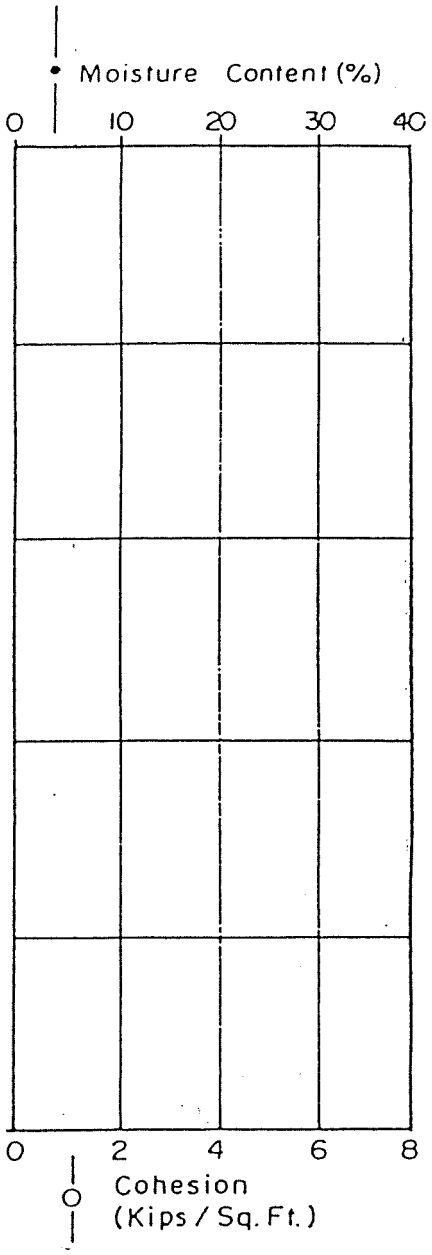
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

J-3.50



Clay, silty, sandy, brown	CL
Sand, silty, clayey, lt. brown	SM/SC
Clay, silty, sandy, lt. brown	CL
Gravel, sandy, clayey w/cobbles, lt. brown	GC
Clay w/gypsum seams & pyrite stain joint, tan & gray	CH

Discontinued @ 35'

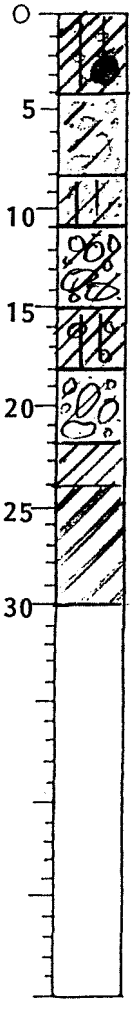


SNOWDEN, INC.

LOG OF BORING

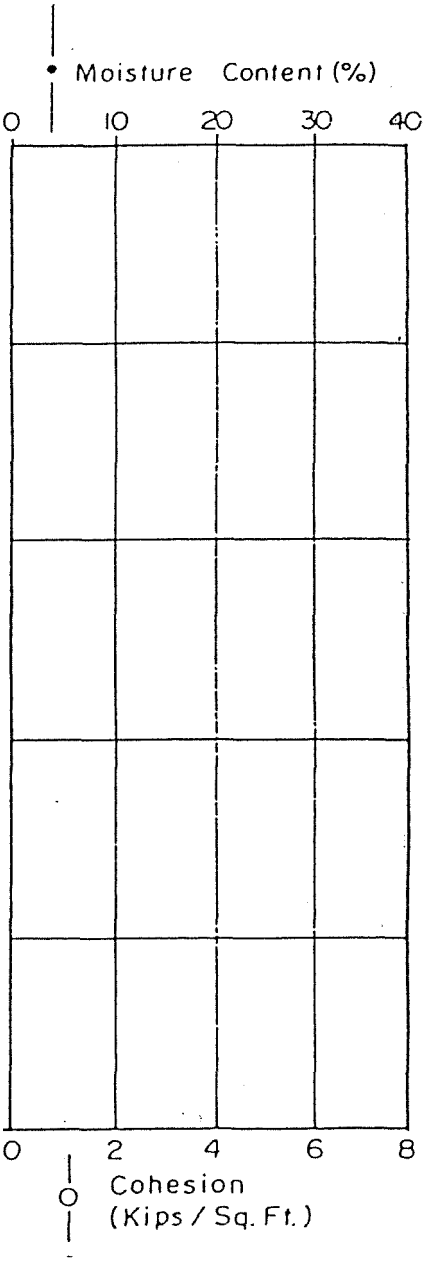
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

D.25-2



Clay, fill w/some trash bags, brown	CL
Gravel, clayey, lt. brown	GC
Sand, sl. clayey, lt. brown	SP/SC
Gravel, clayey w/cobbles, tan	GC
Clay, silty, gravelley, lt. brown	CL
Gravel, clayey, w/cobbles, tan	GC
Clay, jointed, tan & gray	CH
Shale, sl. clayey, dk. gray	CH

Discontinued @ 30'

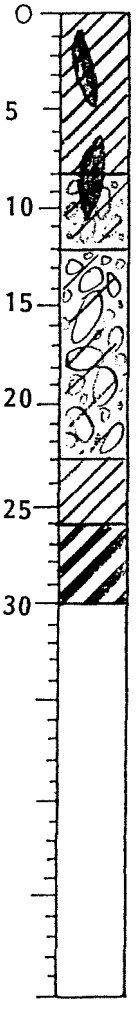


SNOWDEN, INC.

LOG OF BORING

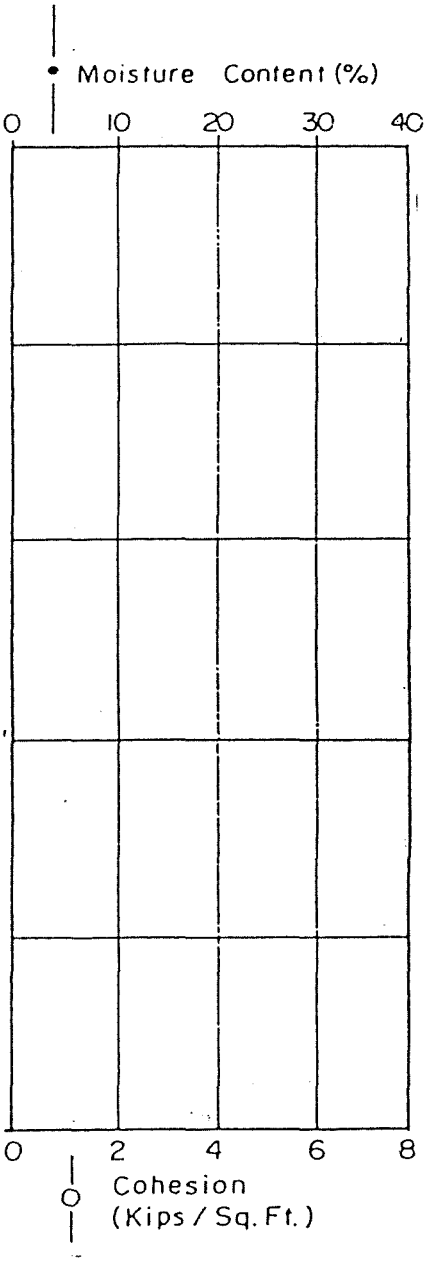
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 10, 1987

D.50-2



Clay, fill w/plaster, lt. tan	CL
...w/incinerated wood & metal dk. gray	CH/CL
Gravel, fill, clayey w/metal, gray	GC
Gravel, sandy, clayey w/cobbles tan	GP/GC
...	GC
Clay, jointed, tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 30'

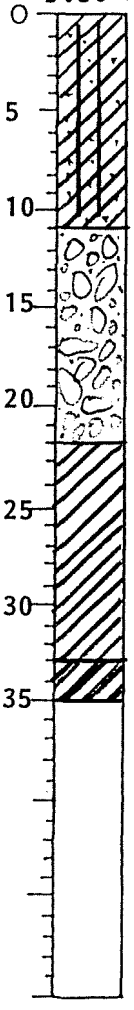


SNOWDEN, INC.

LOG OF BORING

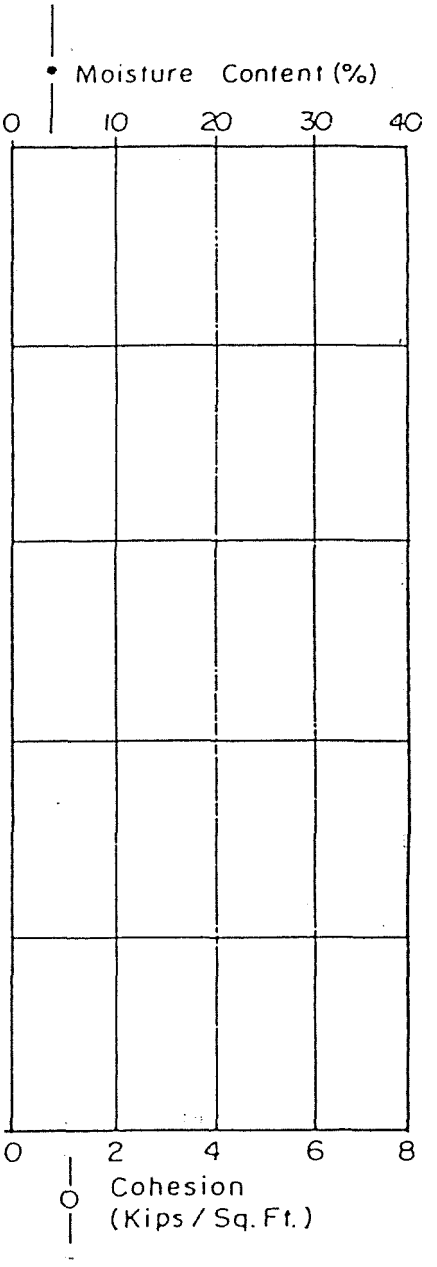
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

J.50-2



Clay, silty, sandy, brown	CL
...v. silty, lt. brown	CL/ML
...silty, sandy	CL
Gravel, sandy, w/cobbles, tan	GP
...clayey w/cobbles	GC
Clay w/gypsum seams & pyrite stain joint, tan & gray	CH
...tan & dk. gray	
Shale, sl. clayey, dk. gray	CH

Discontinued @ 35'

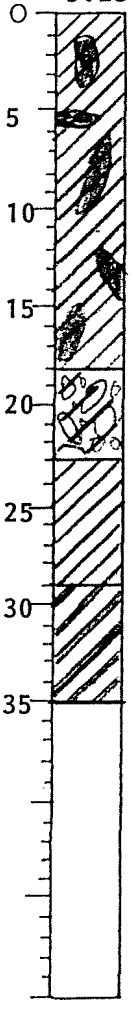


SNOWDEN, INC.

LOG OF BORING

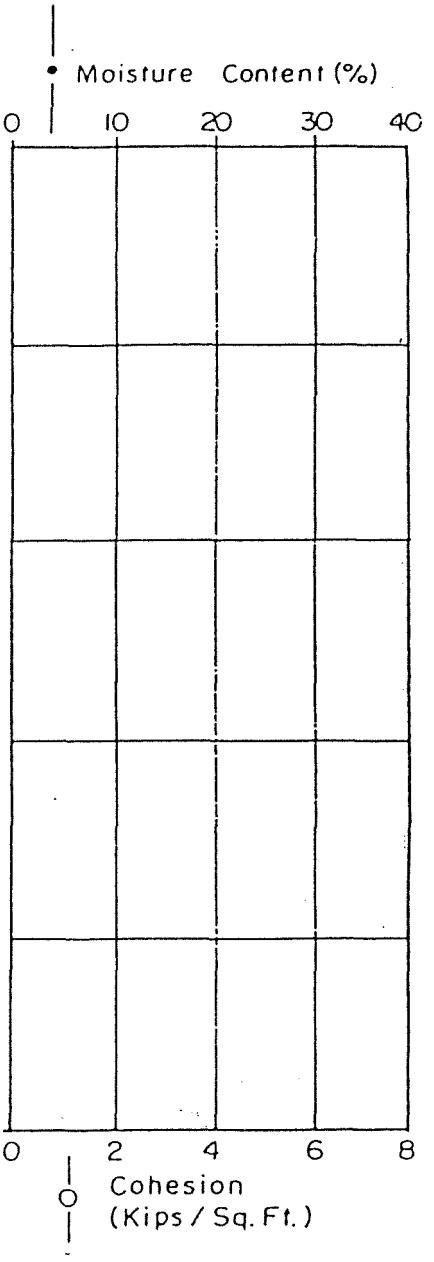
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

J.25-3



Clay, fill, w/broken asphalt	CL
...w/metal & glass, brown	
...w/organics & wire, dk. gray	
...w/wood & metal	CH/CL
Gravel, clayey, tan	GC
Clay, w/gypsum seams & pyrite stain joints, tan & gray	CH
Shale, clayey, dk. gray	CH
...sl. clayey	

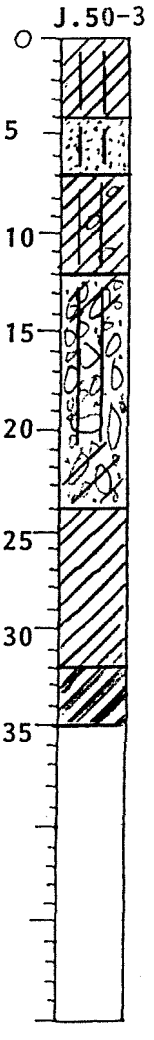
Discontinued @ 35'



SNOWDEN, INC.

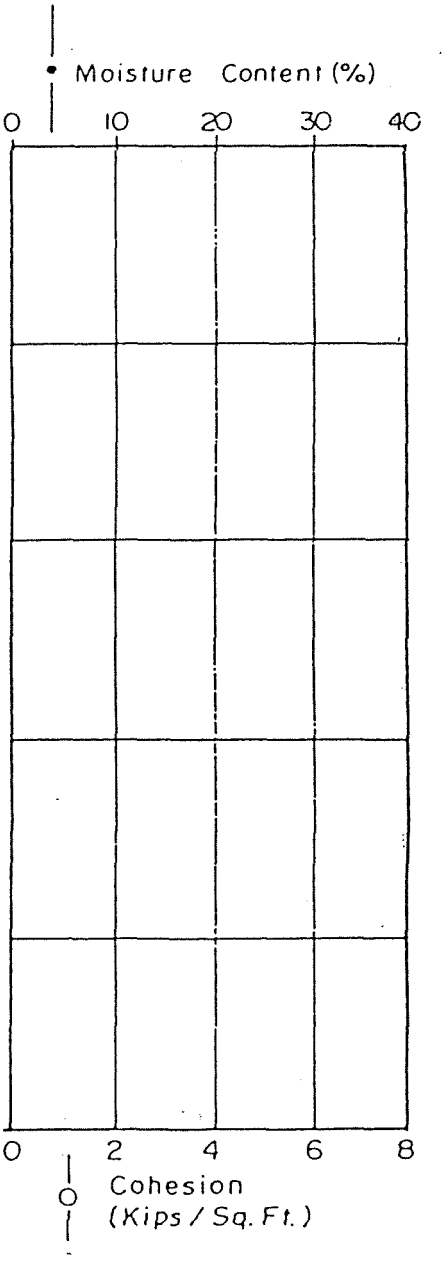
LOG OF BORING

Project Name: Beck Ready Mix Concrete Co., #5108
Date Drilled: November 11, 1987



Clay, silty, sandy, brown	CL
Sand, silty, lt. brown	SM
Clay, silty, trace gravel, lt. brown	CL
Gravel, silty, sandy, clayey lt. brown	GC
...w/cobbles, tan	GM/GP
...clayey w/cobbles, tan	GP/GC
Clay w/gypsum seams & pyrite stain joint, tan & gray	CH
Shale, clayey, dk. gray	CH

Discontinued @ 35'

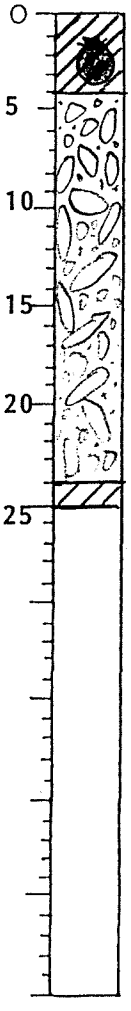


SNOWDEN, INC.

LOG OF BORING

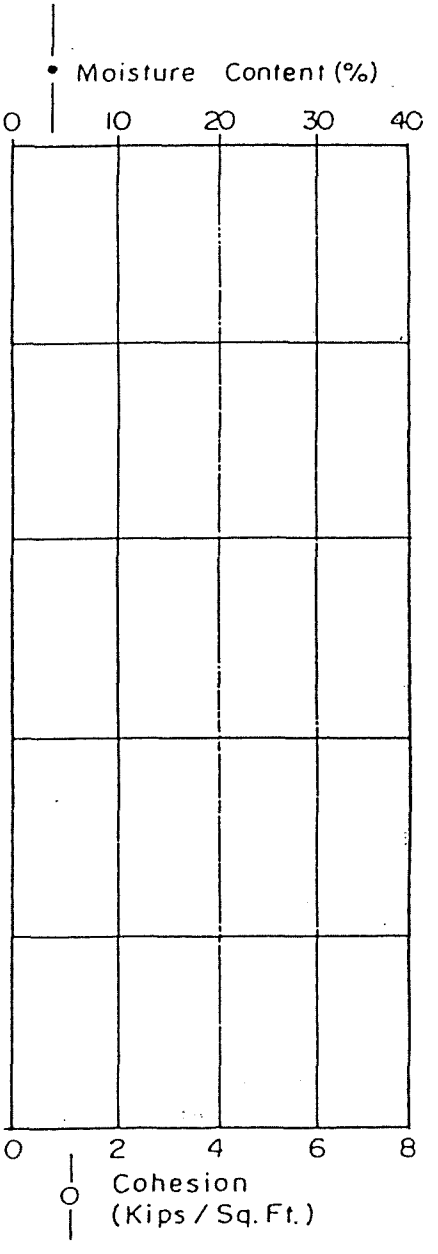
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

G-2



Clay, fill w/trash bags, brown	CL
Gravel, silty w/cobbles brown	GM
...silty, sandy, tan	
...sandy w/cobbles	GW
...sl. clayey w/cobbles	GC/GP
Clay, jointed, tan & gray	CH

Discontinued @ 25'

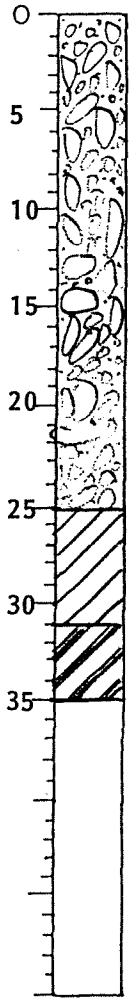


SNOWDEN, INC.

LOG OF BORING

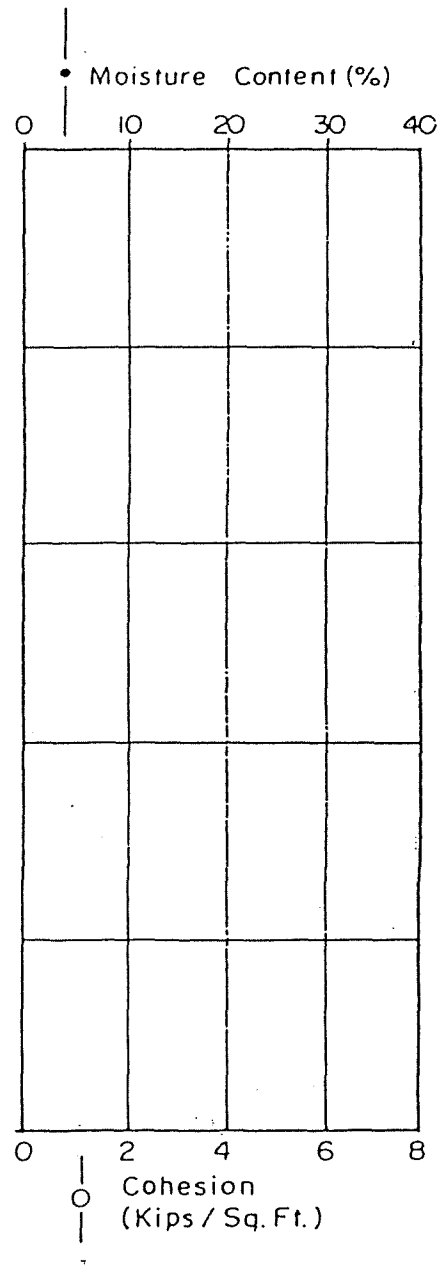
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

G.25-2



Gravel, silty, sandy w/cobbles lt. brown	GM
...tan	
...sl. clayey	GC/GW
...sandy w/cobbles	GW
...clayey w/cobbles	GC
Clay w/gypsum seams & pyrite stain joint, tan & gray	CH
Shale, sl. clayey, dk. gray	CH

Discontinued @ 35'

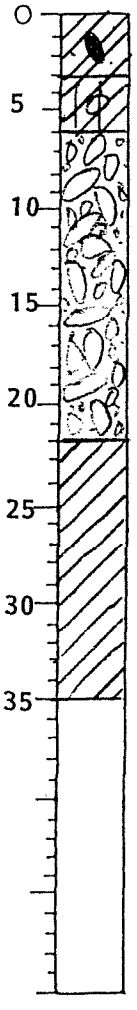


SNOWDEN, INC.

LOG OF BORING

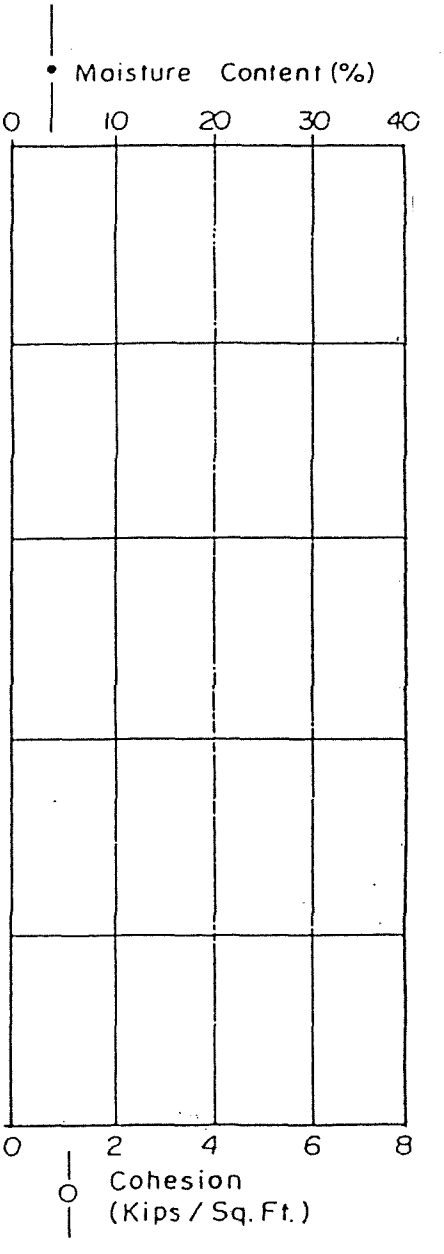
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

G.50-2



Clay, fill w/wood, brown	CL
Clay, silty, w/cobbles, lt. brown	CL
Gravel, silty, sandy w/cobbles lt. brown	GM/GP
...sl. clayey, tan	GC/GW
...clayey, tan	GC
...sandy w/cobbles	GW
Clay w/gypsum seams & pyrite stain joint, tan & gray	CH

Discontinued @ 35'

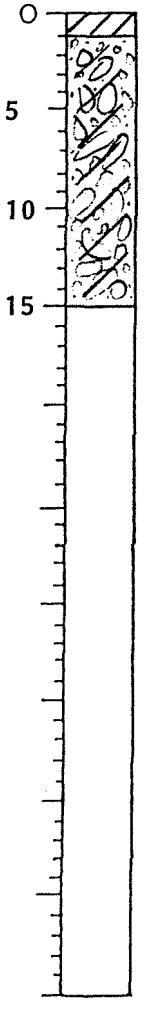


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

E.25-2

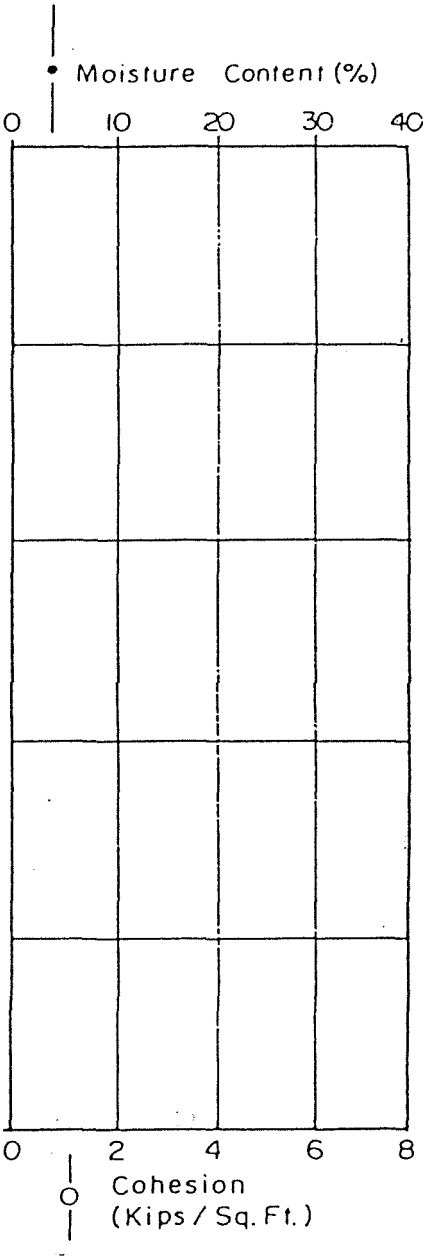


Clay, sandy, lt. brown CL

Gravel, sandy, clayey w/cobbles
lt. brown GC
...sandy, tan GW

...sl. clayey GW/GC

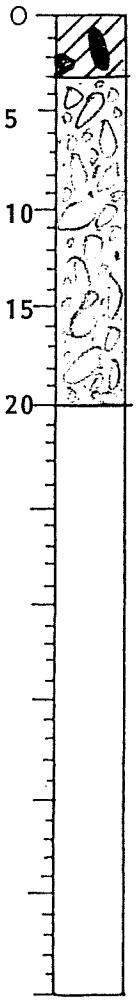
Discontinued @ 15'



LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

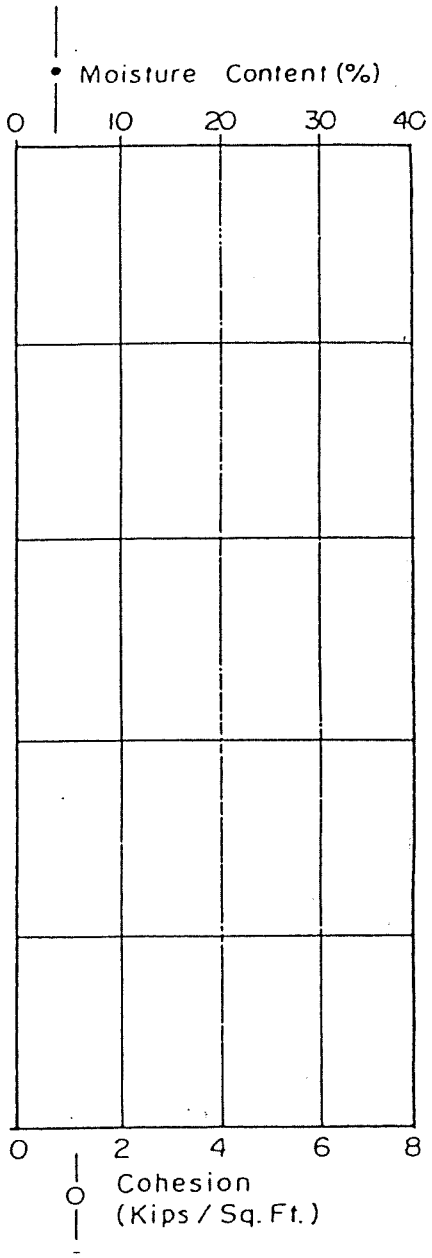
E.50-2



Clay, fill w/plastic & metal, brown CL

Gravel, sandy, clayey w/cobbles
brown GC/GW
...sandy w/cobbles, tan GW

Discontinued @ 20'

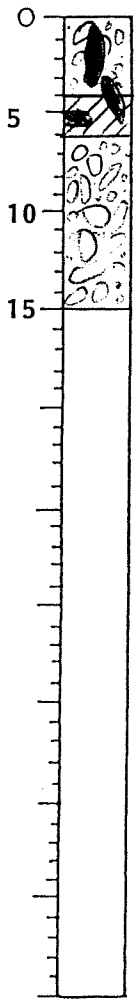


SNOWDEN, INC.

LOG OF BORING

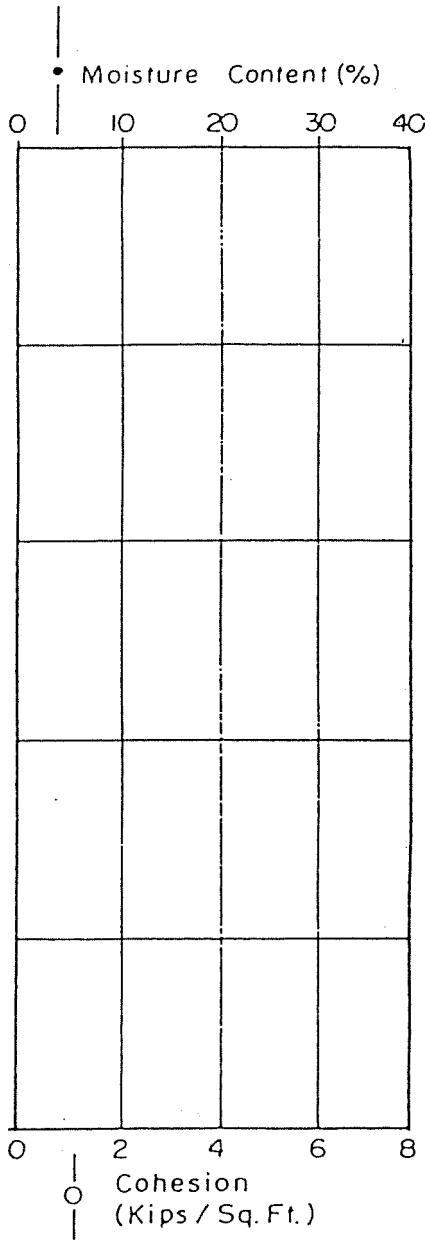
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

E-2.50



Gravel, fill w/building materials lt. brown	CL
Clay, fill, dk. gray	CH/CL
Gravel, sandy w/cobbles, tan	GW

Discontinued @ 15'

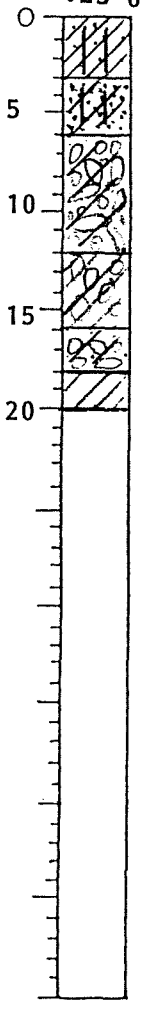


SNOWDEN, INC.

LOG OF BORING

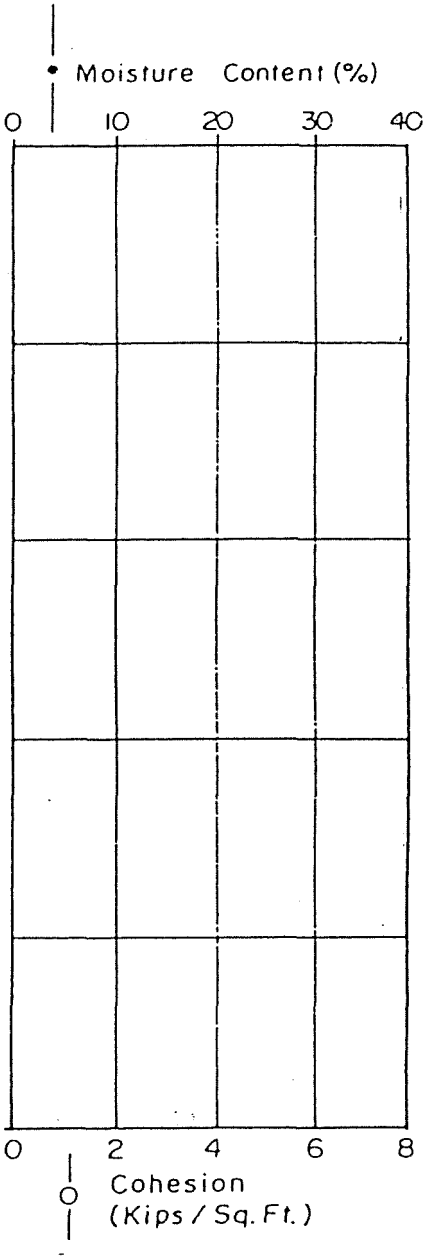
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

B.25-6



Clay, silty, sandy, lt. brown	CL
Sand, silty, clayey, brown	SC
Gravel, clayey w/cobbles, brown	GC
Clay, gravelley, tan	CL
Gravel, clayey, tan	GC
Clay, jointed, tan & gray	CH

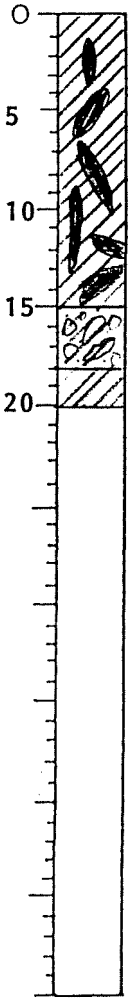
Discontinued @ 20'



LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

B.50-6



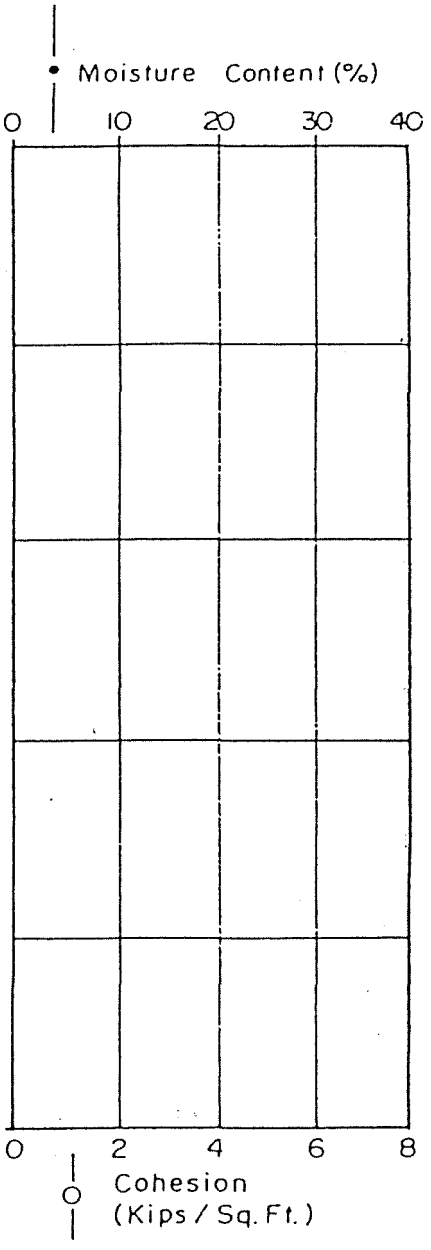
Clay, fill w/building materials, brown — CL

...w/broken concrete, dk. gray — CH/CL

Gravel, clayey, brown — GC

Clay & jointed, tan & gray — CH

Discontinued @ 20'

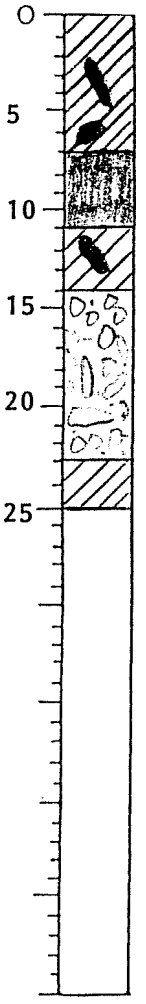


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

C.50-6



Clay, fill w/building materials, lt. gray — CL

Debris, trace clay, brown

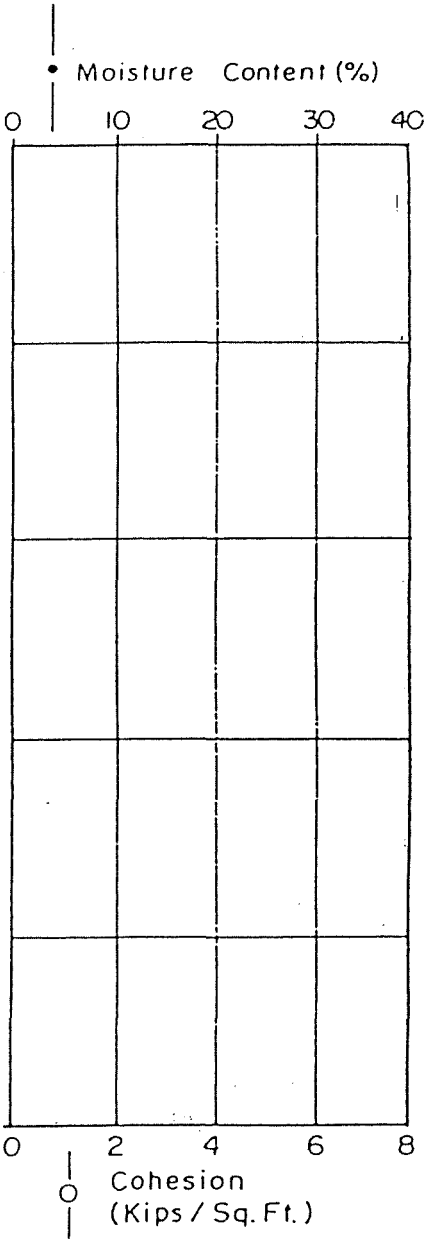
Clay, fill w/bldg. materials, dk. gray — CL

Gravel, sl. sandy, tan — GW

...w/cobbles

Clay, jointed, tan & gray — CH

Discontinued @ 25'

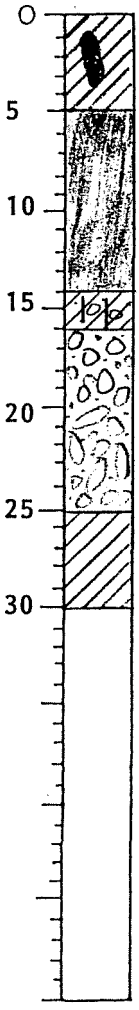


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

C-5.75



Clay, fill w/building material, brown CL

Debris, trace clay, black

...gray

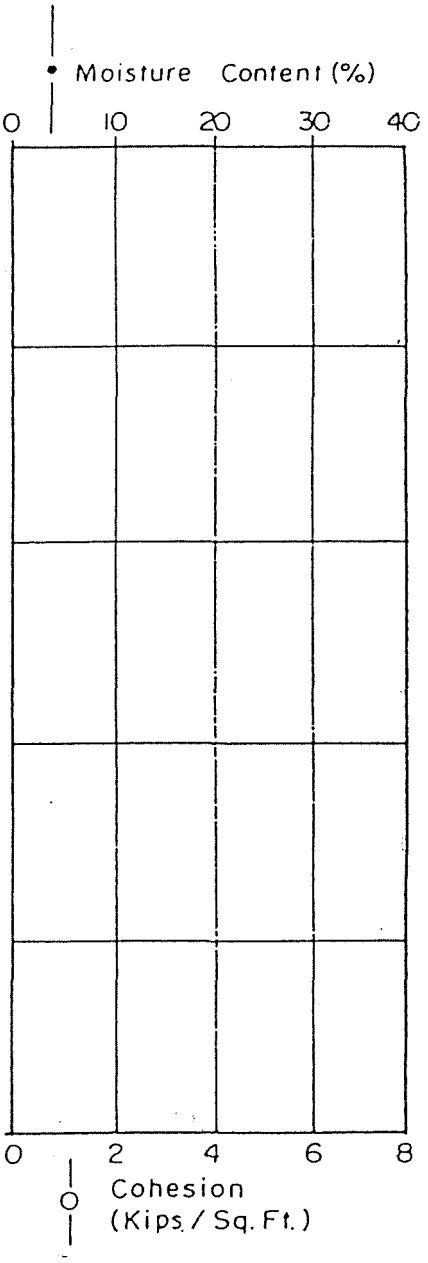
Clay, silty, gravelley, lt. brown CL

Gravel, clayey w/cobbles GC

...sandy w/cobbles GW

Clay, jointed, tan & gray CH

Discontinued @ 30'

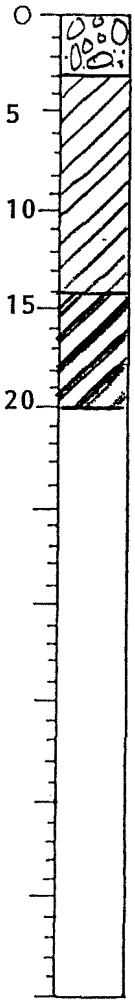


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

Z-4

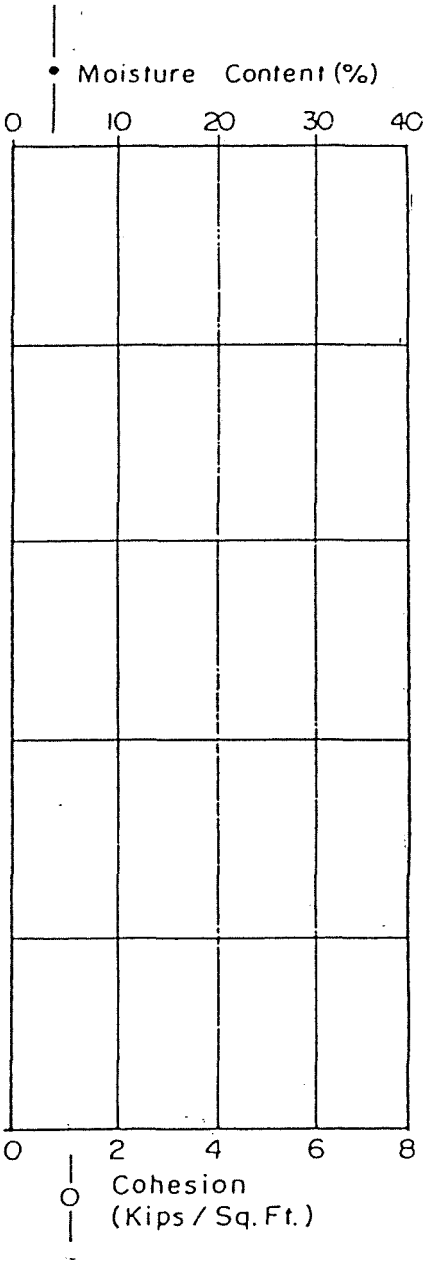


Gravel, sandy w/cobbles, tan GW/GC

Clay w/gypsum seams & pyrite stain joint, tan & gray CH

Shale, sl. clayey, dk. gray CH

Discontinued @ 20'

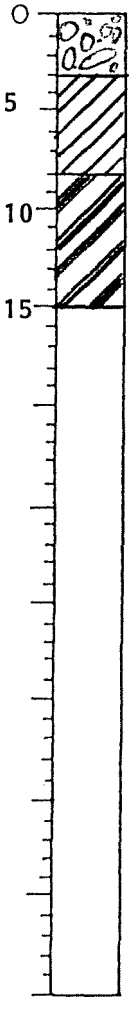


SNOWDEN, INC.

LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

Z-5



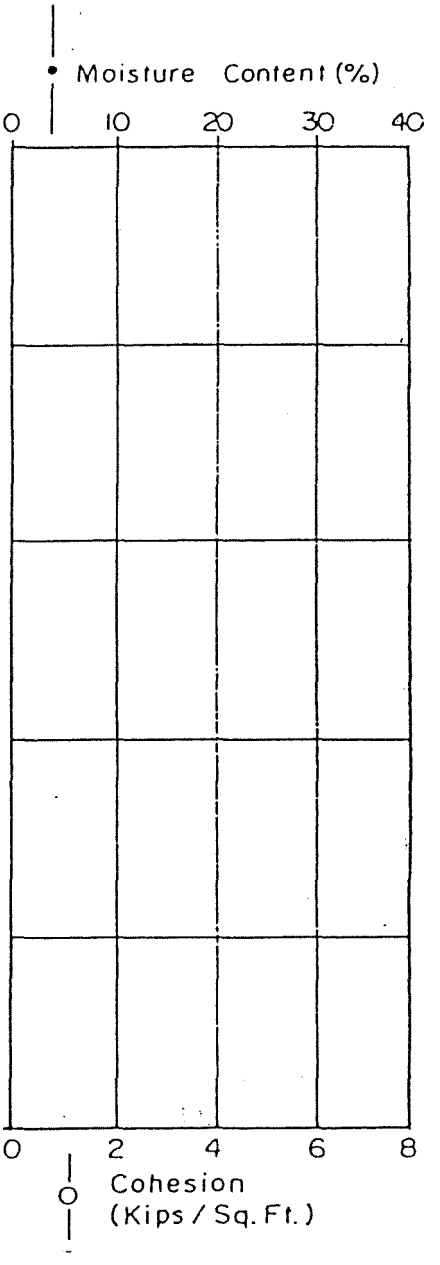
Gravel, sandy, clayey w/cobbles, tan GW/GC

Clay, jointed, tan & gray CH

Shale, clayey, dk. gray CH

...sl. clayey

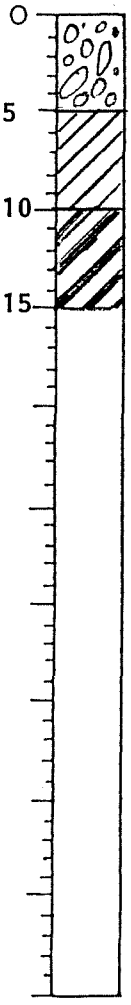
Discontinued @ 15'



LOG OF BORING

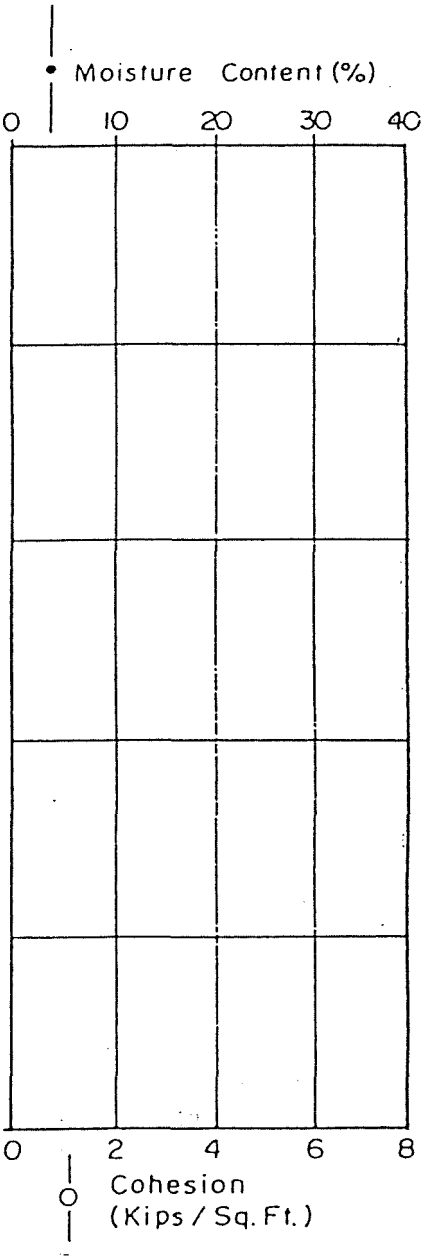
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

Z-6



Gravel, sandy, clayey w/cobbles, tan	GW/GC
Clay, jointed, tan & gray	CH
Shale, clayey, dk. gray	CH
...sl. clayey	

Discontinued @ 15'

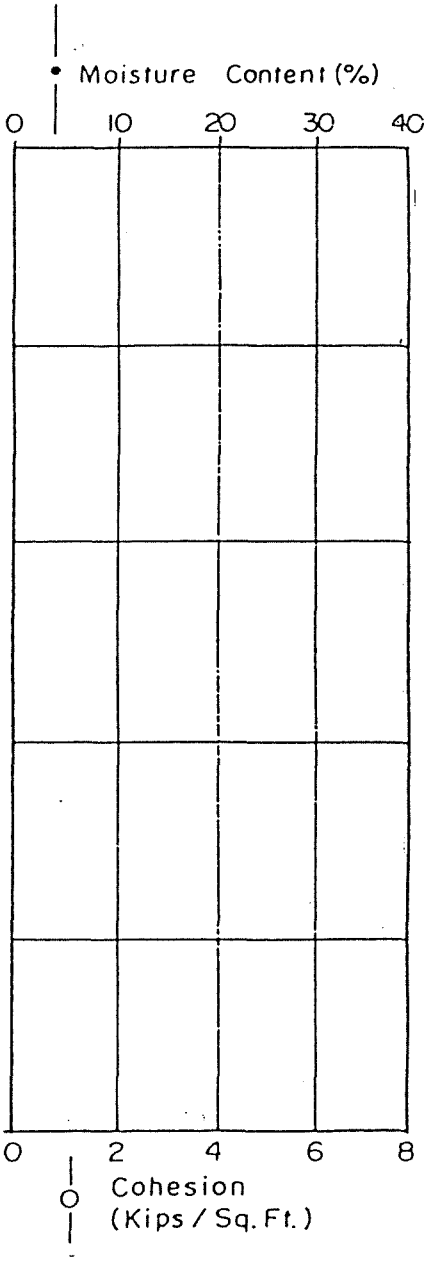


LOG OF BORING

Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

Z-7

Sand, gravelley, clayey, tan	SW/SC
Clay, jointed, tan & gray	CH
Shale, med. hard, gray	
Discontinued @ 15'	

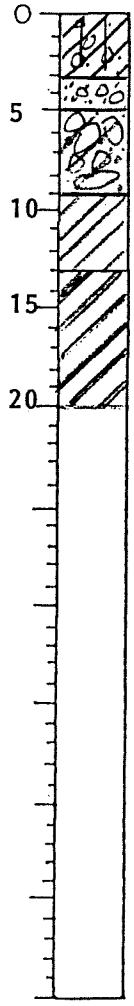


SNOWDEN, INC.

LOG OF BORING

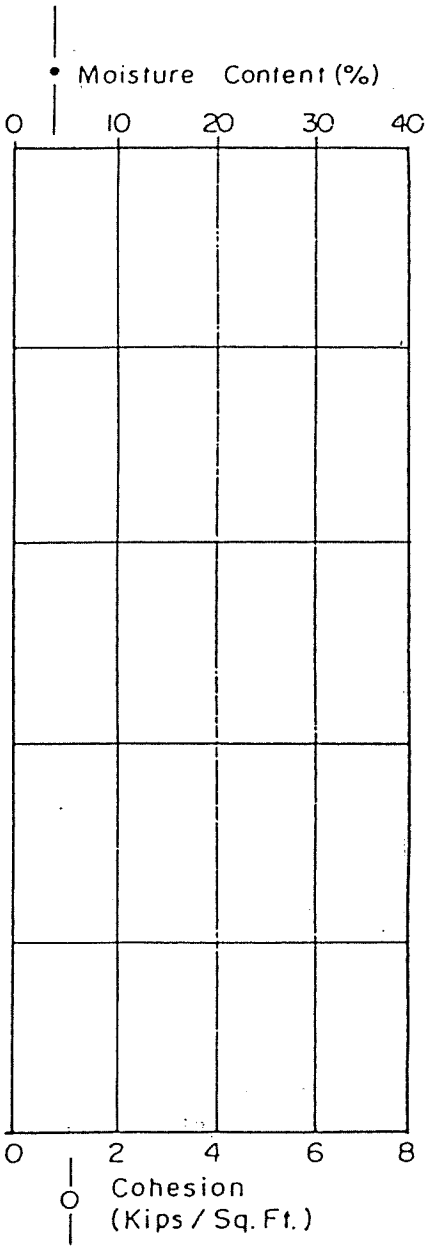
Project Name: Beck Readymix Concrete Co., #5108
Date Drilled: November 11, 1987

Z-8



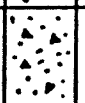
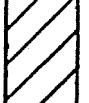
Clay, silty, sandy, gravelley, lt. brown	CL
Sand, silty, brown	SM
Gravel, clayey w/cobbles, tan	GC
Clay, jointed, tan & gray	CH
Shale, sl. clayey, dk. gray	CH

Discontinued @ 20'



SNOWDEN, INC.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols		Typical Names
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS		GW	Well-graded gravels and gravel-sand mixtures, little or no fines
				GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction	CLEAN SANDS		SW	Well-graded sands and gravelly sands, little or no fines
				SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS & CLAYS Liquid limit 50% or less			ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clay of low plasticity
	SILTS & CLAYS Liquid limit greater than 50%			MH	Inorganic silts, micaceous or diatomacous fine sands or silts, elastic silts
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity
Highly Organic Soils				PT	Peat, muck and other highly organic soils

* Based on the material passing the 3 in. (75 mm) sieve

October 20, 2020

Mr. Ali Abazari
Jackson-Walker
100 Congress Ave., Suite 1100
Austin, TX 78701

Re: Geotechnical Data Report
Beck Landfill - Southeast Section
550 FM 78
Schertz, Texas
Terracon Project No.: 90205235

Dear Mr. Abazari:

Terracon Consultants, Inc. is pleased to submit this data report for the proposed Beck Landfill - Southeast Section in Schertz, Texas. The scope of services for this project was outlined in Proposal No. P90205235, dated August 27, 2020. The purposes of this data report are to describe the subsurface conditions observed in the borings drilled for this study and report the laboratory test data.

PROJECT INFORMATION

Project Description

Item	Description
Site layout	Refer to Appendix A; Exhibit A-1: Site Location Plan and Exhibit A-2: Boring Location Plan.
Project description	This study was performed to evaluate the existing soil conditions at the top of the southeastern berm and also inside the berm (floor area).

Site Location and Description

Item	Description
Location	The project is located at 550 FM 78 in Schertz, Texas.
Existing improvements	Existing landfill.
Current ground cover	Bare soil and grass.

SUBSURFACE CONDITIONS

Conditions encountered at the boring locations are indicated on the individual boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in situ, the transition between materials may be gradual. Details of the borings can be found on the boring logs in Appendix A of this report.

Groundwater

Groundwater generally appears as either a permanent or temporary water source. Permanent groundwater is generally present year-round, which may or may not be influenced by seasonal and climatic changes. Temporary groundwater is also referred to as a “perched” water source, which generally develops as a result of seasonal and climatic conditions.

The borings were advanced to the required depths using dry drilling techniques to evaluate groundwater conditions at the time of our field program. The boreholes were observed for the presence of groundwater during and after completion of drilling. The water levels observed in the borings can be found on the attached boring logs and are summarized in the table below.

Boring Number	Approximate Depth to Water from Existing Grade while Drilling (feet)	Approximate Depth to Water from Existing Grade after Drilling (feet)
FB-3	38	38
FB-7	9	12

Seasonal variations such as amount of rainfall and runoff, climatic conditions and other factors generally result in fluctuations of the groundwater level over time. The granular strata can easily transmit water. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The foundation contractor should check the groundwater conditions just before foundation excavation activities.

GENERAL COMMENTS

The subsurface conditions presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur across the site, or due to the modifying effects of construction or weather. Prospective contractors should familiarize themselves with the conditions at the site and retain their own experts to interpret the data in this report and perform additional testing and/or inspection as they deem necessary prior to bidding.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or

prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This data report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made.

We appreciate the opportunity of working with you on this phase of the project. Should you have any questions or if we could be of further assistance, please do not hesitate to contact us.

Sincerely,
Terracon Consultants, Inc.
(Firm Registration: TX F-3272)

Carlos Cotilla
Staff Engineer

Gregory P. Stieben, P.E., D. GE
Senior Consultant

STATE OF TEXAS
GREGORY P STIEBEN
59536
REGISTERED
PROFESSIONAL ENGINEER

CC/GPS/mhb – 90205235

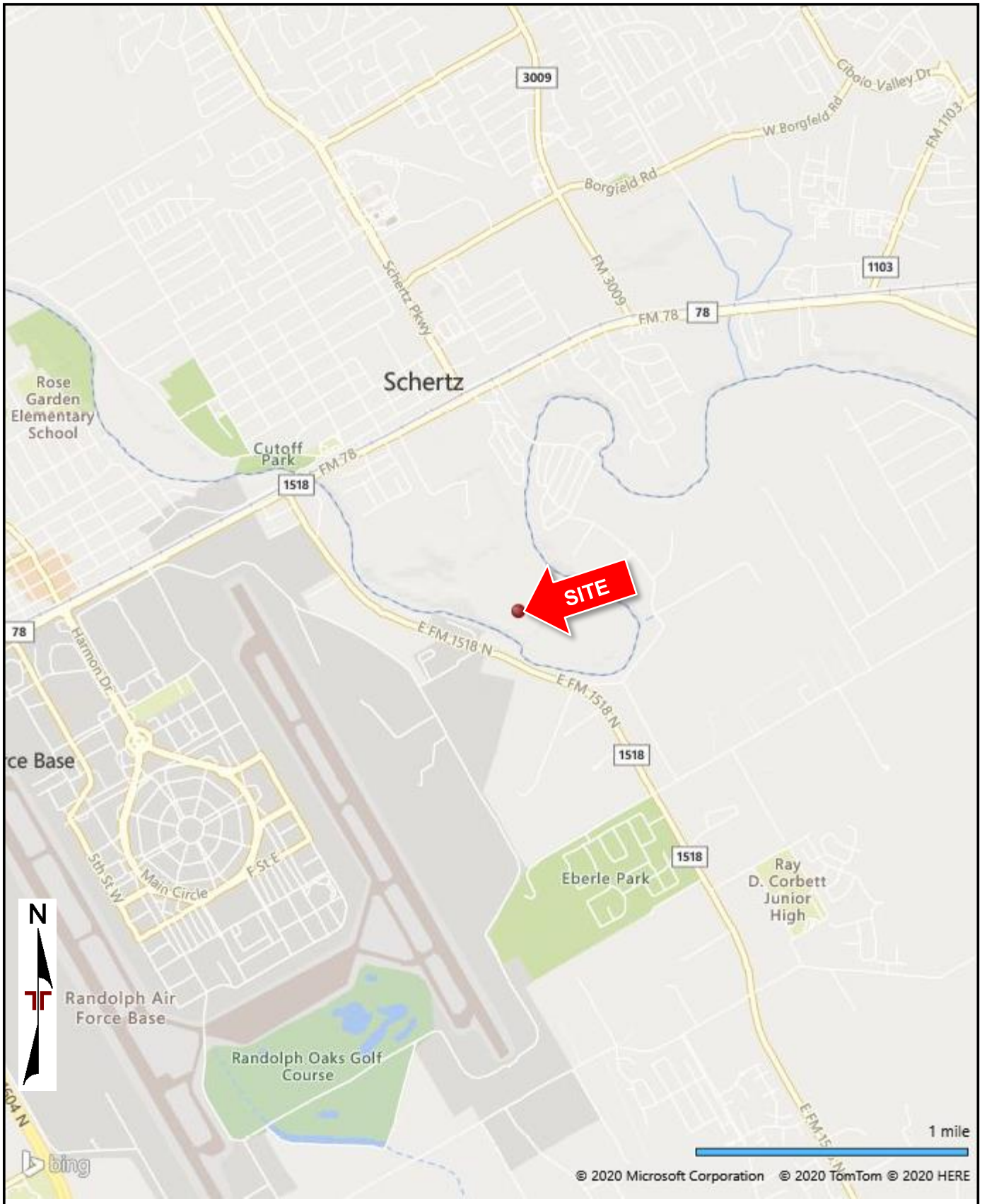
Attachments:

Appendix A – Field Exploration
- Exhibit A-1 – Site Location Plan
- Exhibit A-2– Boring Location Plan
- Exhibit A-3 – Field Exploration Description
- Exhibits A-4 thru A-11 – Boring Logs

Appendix B – Laboratory Testing
- Exhibit B-1 – Laboratory Testing Description
- Exhibit B-2 – Atterberg Limits Graph
- Exhibit B-3 – Grain Size Distribution Graphs
- Exhibit B-4 – Permeability Tests

Appendix C – Supporting Documents
- Exhibit C-1 – General Notes
- Exhibit C-2 – Unified Soil Classification System

APPENDIX A



ROAD MAP PROVDED BY MICROSOFT BING MAPS

Project Manager: CC	Project No. 90205235	Terracon 6911 Blanco Rd San Antonio, TX 78216-6164	SITE LOCATION PLAN	Exhibit
Drawn by: CC	Scale: AS SHOWN		Beck Landfill - Southeast Section 550 FM 78 Schertz, TX	A-1
Checked by: GPS	File Name: exhibits			
Approved by: GPS	Date: 10/19/2020			

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Project Manager: CC	Project No. 90205235	Terracon 6911 Blanco Rd San Antonio, TX 78216-6164	BORING LOCATION PLAN	Exhibit
Drawn by: CC	Scale: AS SHOWN		Beck Landfill - Southeast Section 550 FM 78 Schertz, TX	A-2
Checked by: GPS	File Name: exhibits			
Approved by: GPS	Date: 10/19/2020			

Field Exploration Description

Boring locations were selected by the client. We advanced the soil borings with a truck-mounted drill rig using continuous flight augers. Samples were obtained continuously in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil sampling was performed using thin-wall tube and/or split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split barrel sampling procedure, a standard 2-inch outer diameter split barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration was recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with bentonite chips after their completion.

Our field representative prepared the field logs as part of the drilling operations. The field logs included visual classifications of the materials encountered during drilling and our field representative interpretation of the subsurface conditions between samples. The boring logs included with this report represents the engineer's/geologist's interpretation of the field logs and include modifications based on visual observations and testing of the samples in the laboratory.

BORING LOG NO. FB-1

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5437° Longitude: -98.2628°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
					3-4-7 N=11	16.4	50-19-31	
					8-13-14 N=27	12.6		
					4.5+ (HP)	17.1		95
					4.5+ (HP)	17.7		
					4.5+ (HP)	17.8	52-20-32	92
					4.5+ (HP)	19.5		
					4.5+ (HP)	20.6		
					4.5+ (HP)	23.2		
4.0								
FILL - FAT CLAY (CH), brownish gray, stiff to very stiff								
FILL - FAT CLAY (REWORKED CLAY-SHALE) (CH), gray, hard		5						
13.0		10						
FILL - CLAYEY SAND (SC), brown, stiff to very stiff					7-7-8 N=15	11.6		47
- encountered plastics, paper, and cloth material at 18 feet		15						
23.0					2-6-7 N=13	19.5		
CLAYEY GRAVEL (GC), tan, dense to very dense		20						
					12-19-27 N=46	6.0		18
33.0		25						
LEAN CLAY (CL), light brown, hard, marly					25-43-50/5"	3.6		
38.0		30						
CLAY-SHALE, gray, hard					24-50/4"	3.9		
45.0		35						
Boring Terminated at 45 Feet					14-16-20 N=36	19.6		
		40						
					33-39-50/5"	16.1		
		45						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-23-2020 | Boring Completed: 09-23-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-4

BORING LOG NO. FB-2

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5431° Longitude: -98.2615°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - FAT CLAY (CH), brownish gray, very stiff to hard				25-11-11 N=22	13.8		50
3.0						4.5+ (HP)	14.4	54-21-33	
		FILL - FAT CLAY (REWORKED CLAY-SHALE) (CH), gray, very stiff to hard				4.5+ (HP)	12.8		
						4.5+ (HP)	14.7		
			5			4.5+ (HP)	19.0		92
						4.5+ (HP)	18.4		
						4.5+ (HP)	18.7	61-23-38	
						7-11-13 N=24	18.9		
13.0			10						
		FAT CLAY (CH), brownish gray, very stiff to hard, with gravel				4.5+ (HP)	17.5		58
			15						
						9-12-15 N=27	25.3	54-22-32	
			20						
						14-23-12 N=35	17.5		67
			25						
						5-6-20 N=26	16.3		
			30						
						11-11-13 N=24	15.4		
			35						
38.0									
		CLAY-SHALE, gray, hard				4.5+ (HP)	18.6	62-17-45	100
			40						
45.0						22-31-49 N=80	18.0		
		Boring Terminated at 45 Feet	45						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-23-2020 | Boring Completed: 09-23-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-5

BORING LOG NO. FB-3

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5425° Longitude: -98.2602°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - LEAN CLAY (CL), brownish gray, very stiff to hard, with gravel				25-11-11 N=22	14.6		
						4.5+ (HP)	11.8		70
						4.5+ (HP)	12.5	40-18-22	
						4.5+ (HP)	13.4		
6.0			5			4.5+ (HP)	12.5	46-18-28	
		FILL - FAT CLAY (REWORKED CLAY-SHALE) (CH), gray, hard				4.5+ (HP)	16.2		
						4.5+ (HP)	16.2		
						4.5+ (HP)	15.1		
			10			4.5+ (HP)	14.0		91
						4.5+ (HP)	10.1		
18.0			15						
		LEAN CLAY (CL), brownish gray, hard, with gravel				4.5+ (HP)	7.4	33-16-17	
20.0			20						
		CLAYEY GRAVEL (GC), brown, medium dense to very dense				37-6-20 N=26	10.2		27
			25						
						10-11-13 N=24	9.5		
			30						
		- Lean Clay (CL), marly, below 33 feet				50/5"	3.9		
35.0			35						
		FAT CLAY (CH), brownish gray, hard		▽		15-21-30 N=51	34.4	54-19-35	
			40						
43.0									
		CLAY-SHALE, gray, hard				27-41-50/5"	18.6		
			45						
50.0									
		Boring Terminated at 50 Feet	50			50/5"	14.9		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

▽ *38 feet while drilling*

▽ *38 feet at completion of drilling*

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-23-2020 | Boring Completed: 09-23-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-6

BORING LOG NO. FB-4

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5453° Longitude: -98.261°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
CLAY-SHALE, gray, hard					4.5+ (HP)	18.4		
					4.5+ (HP)	19.0	59-17-42	99
					4.5+ (HP)	19.8		
					4.5+ (HP)	20.2		
					4.5+ (HP)	19.8		
		5			4.5+ (HP)	18.7	61-24-37	99
					21-23-32 N=55	18.3		
		10			16-26-40 N=66	17.6		
					32 50/6"	14.6		
		15						
					31-44-50/2"	14.8	47-21-26	96
		20						
					50/6"	10.1		
		25						
					50/3"	9.4		
		30						
35.0								
Boring Terminated at 35 Feet		35			50/2"	7.7		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-24-2020 | Boring Completed: 09-24-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-7

BORING LOG NO. FB-5

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5446° Longitude: -98.26°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAY-SHALE, gray, hard				17-25-50/5"	14.3	52-18-34	97
					30-50/3"	12.3		
		5			34-50/5"			
					50/6"	11.3	64-15-49	97
					43-46-50/5"	13.5		
		10						
					47-48-50/3"	11.3		
		15						
					45-52-50/5"	14.2		
		20						
					31-45-50/4"	14.9		99
		25						
					29-50	14.3		
		30						
	35.0							
		35			33-50	15.8	63-21-42	
	Boring Terminated at 35 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-23-2020 | Boring Completed: 09-23-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-8

BORING LOG NO. FB-6

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5443° Longitude: -98.2597°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	CLAY-SHALE, gray, hard				11-18-31 N=49	15.6		
					4.5+ (HP)	14.9	55-17-38	99
		5			4.5+ (HP)	14.7		
					4.5+ (HP)	14.4	48-16-32	98
		10			32-39-44 N=83	15.6		
		15			29 50/6"	13.2		
		20			32 50/6"	12.4		98
		25			28-41-50/4"	15.1	53-19-34	
		30			47-50/4"	15.9		
35.0		35			40-50/3"	14.7		
	Boring Terminated at 35 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-24-2020 | Boring Completed: 09-24-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-9

BORING LOG NO. FB-7

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5437° Longitude: -98.2613°

DEPTH	GRAPHIC LOG		FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		FILL - LEAN CLAY (CL), brownish gray, hard	5-18-35 N=53	9.5		
			28-50	7.5	35-15-20	
4.0		**FILL - CLAYEY GRAVEL (GC)**, light brown, dense to very dense	8-18-20 N=38	2.8		18
5			23-27-32 N=59	3.7		
			14-17-23 N=40	19.0		39
10						
14.0		**CLAY-SHALE**, gray, hard	11-13-27 N=40	23.2		
15						
			4.5+ (HP)	18.1	56-17-39	96
20						
			18-21-28 N=49	17.4		
25						
			21-50/5"	22.4		
30						
			28-50	18.4		
35						
			32-41-50/4"	21.8	57-20-37	98
40						
			37-50/4"	20.1		
45						
50.0			47-50/2"	20.9		
50		***Boring Terminated at 50 Feet***				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

9 feet while drilling

12 feet at completion of drilling

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-24-2020 | Boring Completed: 09-24-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-10

BORING LOG NO. FB-8

PROJECT: Beck Landfill - Southeast Section

CLIENT: Nido Ltd
San Antonio, TX

SITE: 550 FM 78
Schertz, TX

LOCATION See Exhibit A-2

Latitude: 29.5441° Longitude: -98.2608°

DEPTH	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
					12-18-27 N=45	8.4		
					12-19-13 N=32	8.6		
		5			5-8-14 N=22	15.4	49-19-30	
					14-16-20 N=36	13.2		69
					4.5+ (HP)	21.8	62-23-39	
		10			4.0 (HP)	16.6		
					4.5+ (HP)	21.4	58-22-36	
		15						
18.0								
					4.5+ (HP)	15.3		
		20						
					22-29-36 N=65	17.7		
		25						
					4.5+ (HP)	17.3		
		30						
					50/6"	14.0	43-17-26	96
		35						
					28-42-50 N=92			
		40						
					50/4"	12.3		
		45						
50.0								
		50			38-50	13.9		98

FAT CLAY (CH), brownish gray, very stiff to hard, with gravel

- with calcareous deposits below 2 feet

CLAY-SHALE, gray, hard

Boring Terminated at 50 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Flight Auger

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

No free water observed

Terracon
6911 Blanco Rd
San Antonio, TX

Boring Started: 09-24-2020 | Boring Completed: 09-24-2020

Drill Rig: CME 75 | Driller: Ramco

Project No.: 90205235 | Exhibit: A-11

APPENDIX B

Laboratory Testing

Samples retrieved during the field exploration were taken to the laboratory for further observation by the project geotechnical engineer and were classified in accordance with the Unified Soil Classification System (USCS) described in Appendix A. The field descriptions were modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples. The laboratory test results are presented on the boring logs next to the respective samples in Appendix A. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- Moisture Content (ASTM D 2216)
- Atterberg Limits (ASTM D 4318)
- Gradation of Soils using Sieve Analysis (ASTM D 422)
- Percent Passing No. 4 and No. 200 Mesh Sieves (ASTM D 1140)
- Permeability Tests

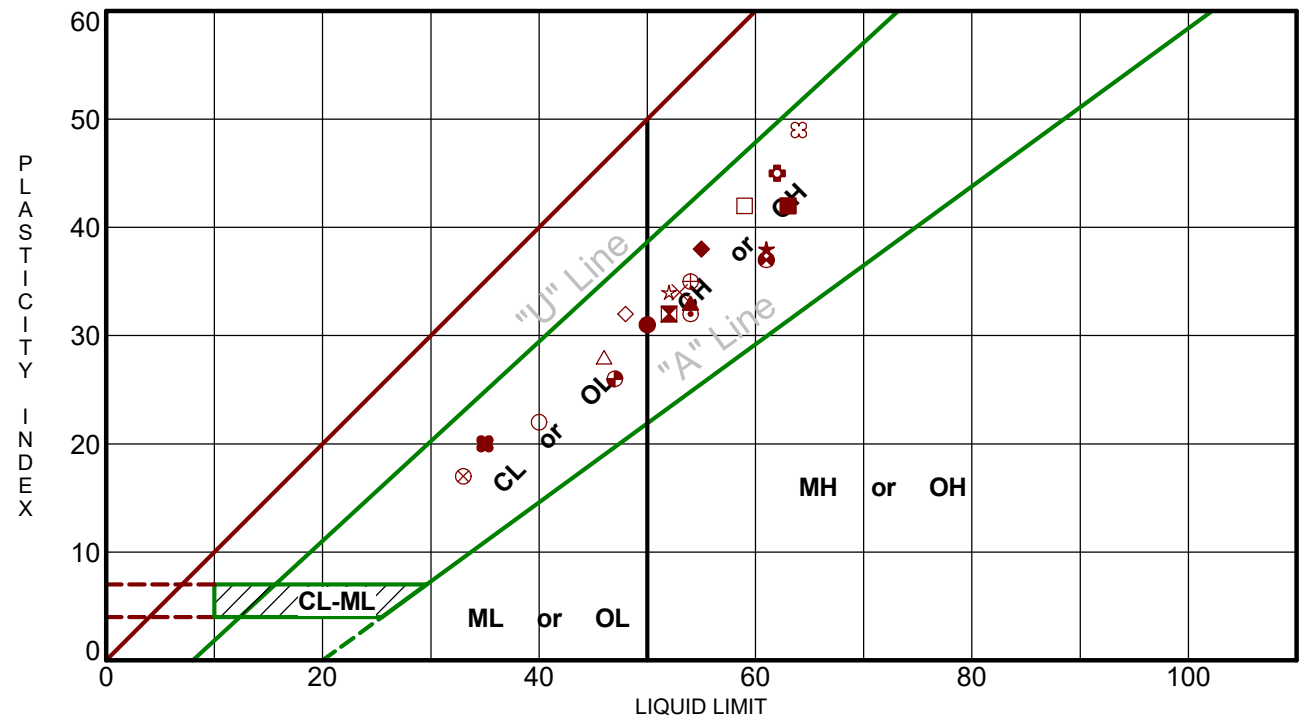
Procedural standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Sample Disposal

All samples were returned to our laboratory. The samples not tested in the laboratory will be stored for a period of 30 days subsequent to submittal of this report and will be discarded after this period, unless other arrangements are made prior to the disposal period.

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
FB-1	0 - 1.5	50	19	31			
FB-1	6 - 7	52	20	32	91.7	CH	FAT CLAY
FB-2	2 - 3	54	21	33			
FB-2	7 - 8	61	23	38			
FB-2	18.5 - 20	54	22	32			
FB-2	38 - 40	62	17	45	99.7	CH	FAT CLAY
FB-3	3 - 4	40	18	22			
FB-3	5 - 6	46	18	28			
FB-3	18 - 20	33	16	17			
FB-3	38 - 39.5	54	19	35			
FB-4	1 - 2	59	17	42	99.0	CH	FAT CLAY
FB-4	5 - 6	61	24	37	98.9	CH	FAT CLAY
FB-4	18.5 - 19.7	47	21	26	96.1	CL	LEAN CLAY
FB-5	0 - 1.4	52	18	34	96.8	CH	FAT CLAY
FB-5	6.5 - 7	64	15	49	97.3	CH	FAT CLAY
FB-5	34 - 35	63	21	42			
FB-6	2 - 4	55	17	38	98.5	CH	FAT CLAY
FB-6	6 - 8	48	16	32	98.0	CL	LEAN CLAY
FB-6	23.5 - 24.8	53	19	34			
FB-7	2.5 - 3.5	35	15	20			

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

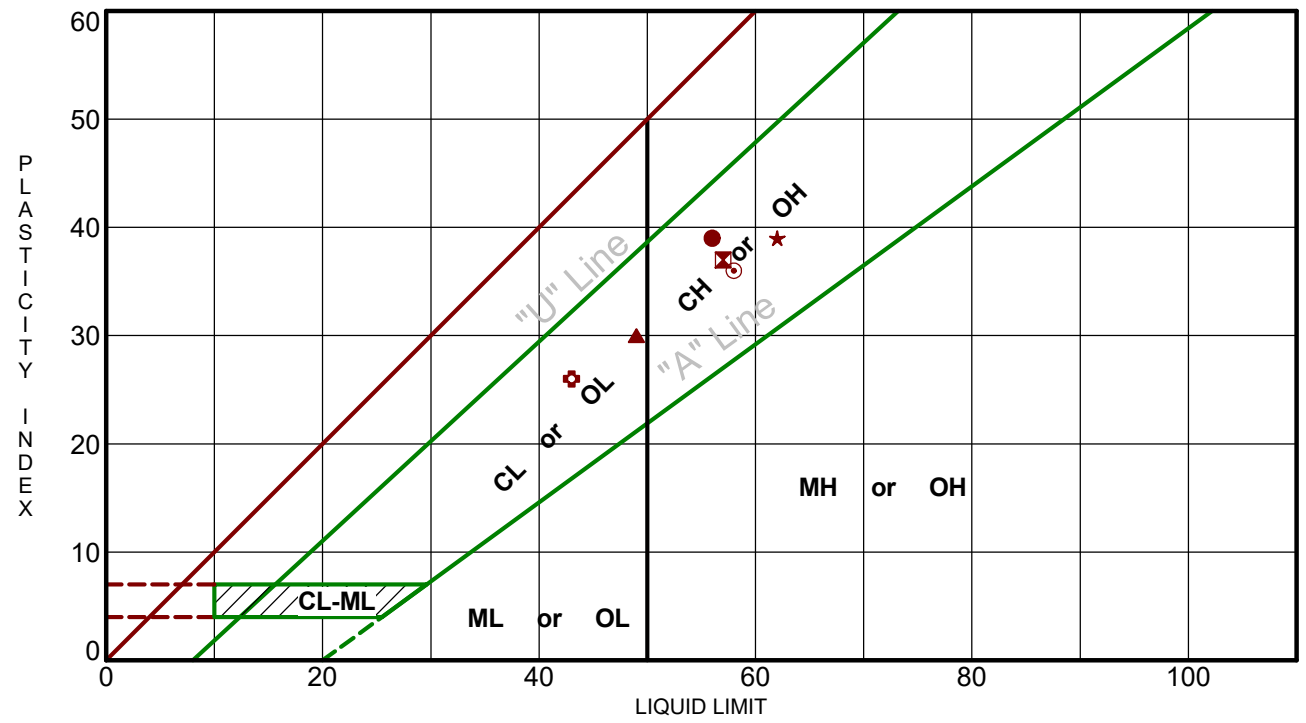
PROJECT NUMBER: 90205235

CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-2

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● FB-7	18 - 20	56	17	39	95.7	CH	FAT CLAY
⊠ FB-7	38.5 - 39.8	57	20	37	98.0	CH	FAT CLAY
▲ FB-8	4.5 - 6	49	19	30			
★ FB-8	8 - 9	62	23	39			
⊙ FB-8	13 - 15	58	22	36			
✿ FB-8	33.5 - 34	43	17	26	96.4	CL	LEAN CLAY

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

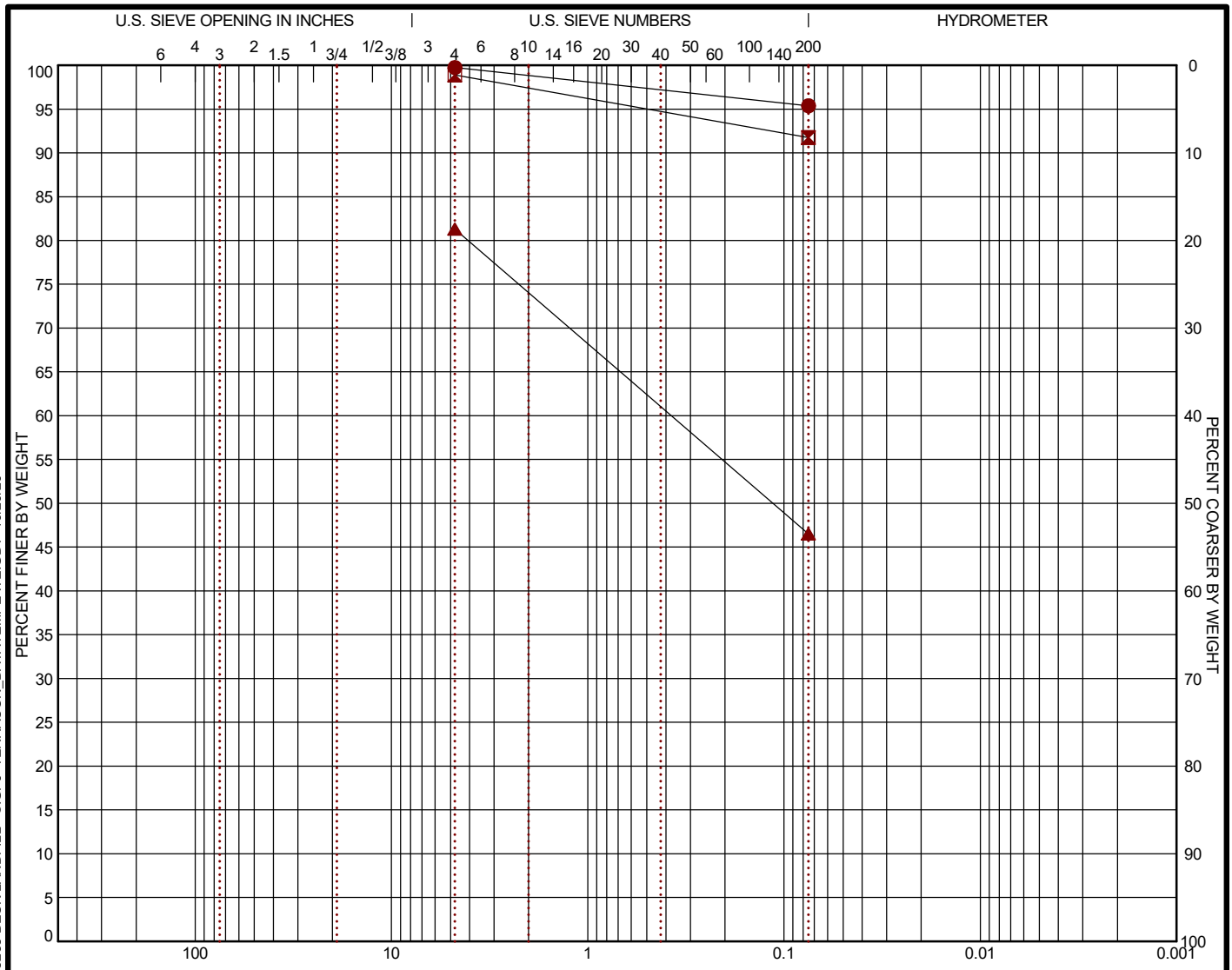
PROJECT NUMBER: 90205235

CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-1**	**4 - 5**			**4.4**		**95.4**		
⊠	**FB-1**	**6 - 7**			**7.1**		**91.7**		**CH**
▲	**FB-1**	**13.5 - 15**			**34.8**		**46.5**		

	GRAIN SIZE		
	●	⊠	▲
D_{60}			**0.375**
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	**99.74**	**#4**	**98.88**	**#4**	**81.3**
#200	**95.37**	**#200**	**91.73**	**#200**	**46.51**

SOIL DESCRIPTION

●

⊠ FAT CLAY (CH)

▲

REMARKS

●

⊠

▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

CLIENT: Nido Ltd
San Antonio, TX

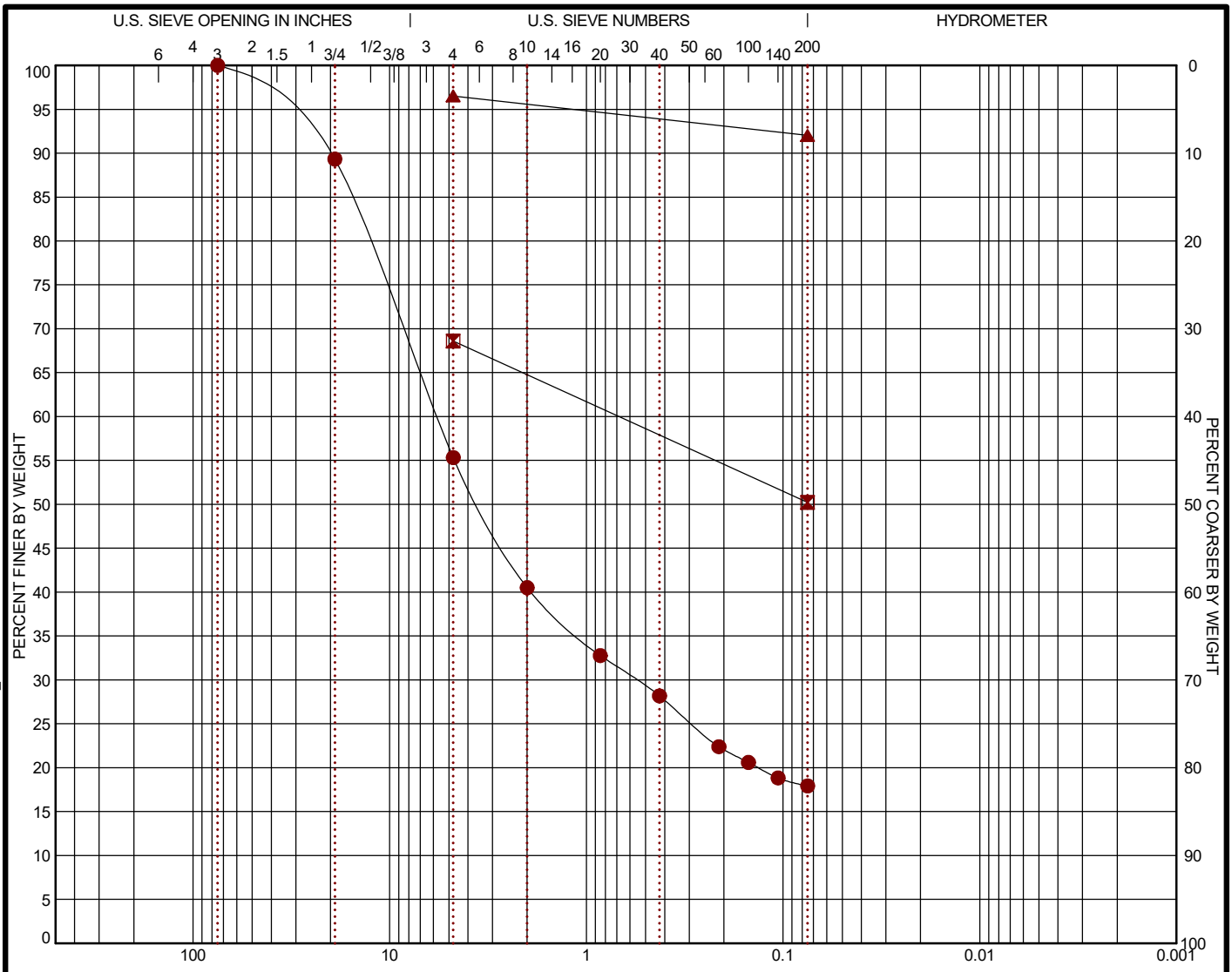
EXHIBIT: B-3

GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-1**	**23.5 - 25**	**0.0**	**44.7**	**37.4**		**17.9**		
⊠	**FB-2**	**0 - 1.5**			**18.4**		**50.2**		
▲	**FB-2**	**5 - 6**			**4.5**		**92.0**		

	GRAIN SIZE		
	●	⊠	▲
D_{60}	**5.747**	**0.681**	
D_{30}	**0.559**		
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3"	**100.0**	**#4**	**68.61**	**#4**	**96.52**
3/4"	**89.33**	**#200**	**50.22**	**#200**	**92.02**
#4	**55.33**				
#10	**40.51**				
#20	**32.77**				
#40	**28.18**				
#70	**22.4**				
#100	**20.6**				
#140	**18.84**				
#200	**17.93**				

SOIL DESCRIPTION

●

⊠

▲

REMARKS

●

⊠

▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

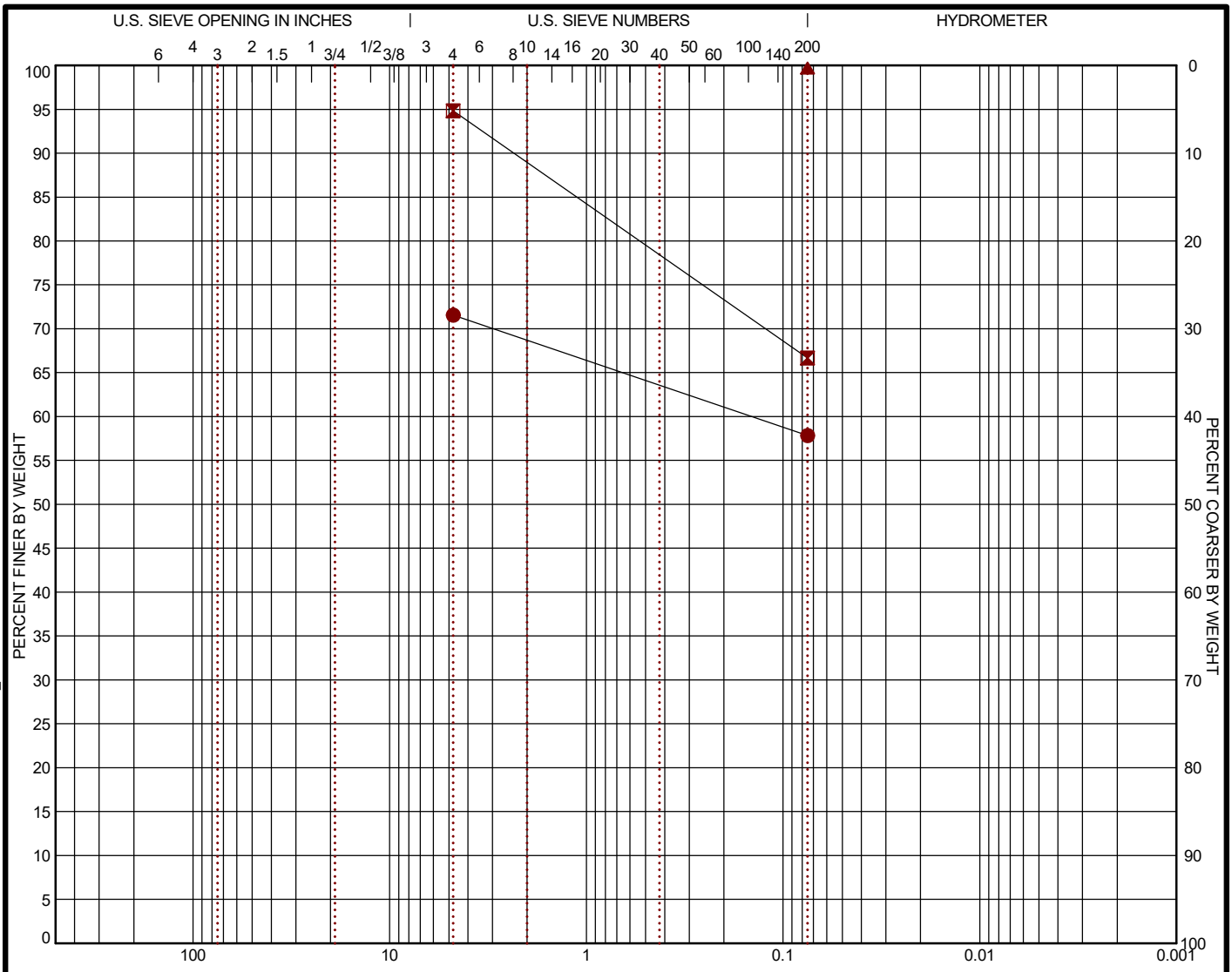
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-2**	**13 - 15**			**13.7**		**57.8**		
⊠	**FB-2**	**23.5 - 25**			**28.2**		**66.7**		
▲	**FB-2**	**38 - 40**					**99.7**		**CH**

	GRAIN SIZE		
	●	⊠	▲
D_{60}	**0.144**		
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	**71.55**	**#4**	**94.83**	**#200**	**99.69**
#200	**57.84**	**#200**	**66.67**		

SOIL DESCRIPTION

●

⊠

▲ FAT CLAY (CH)

REMARKS

●

⊠

▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

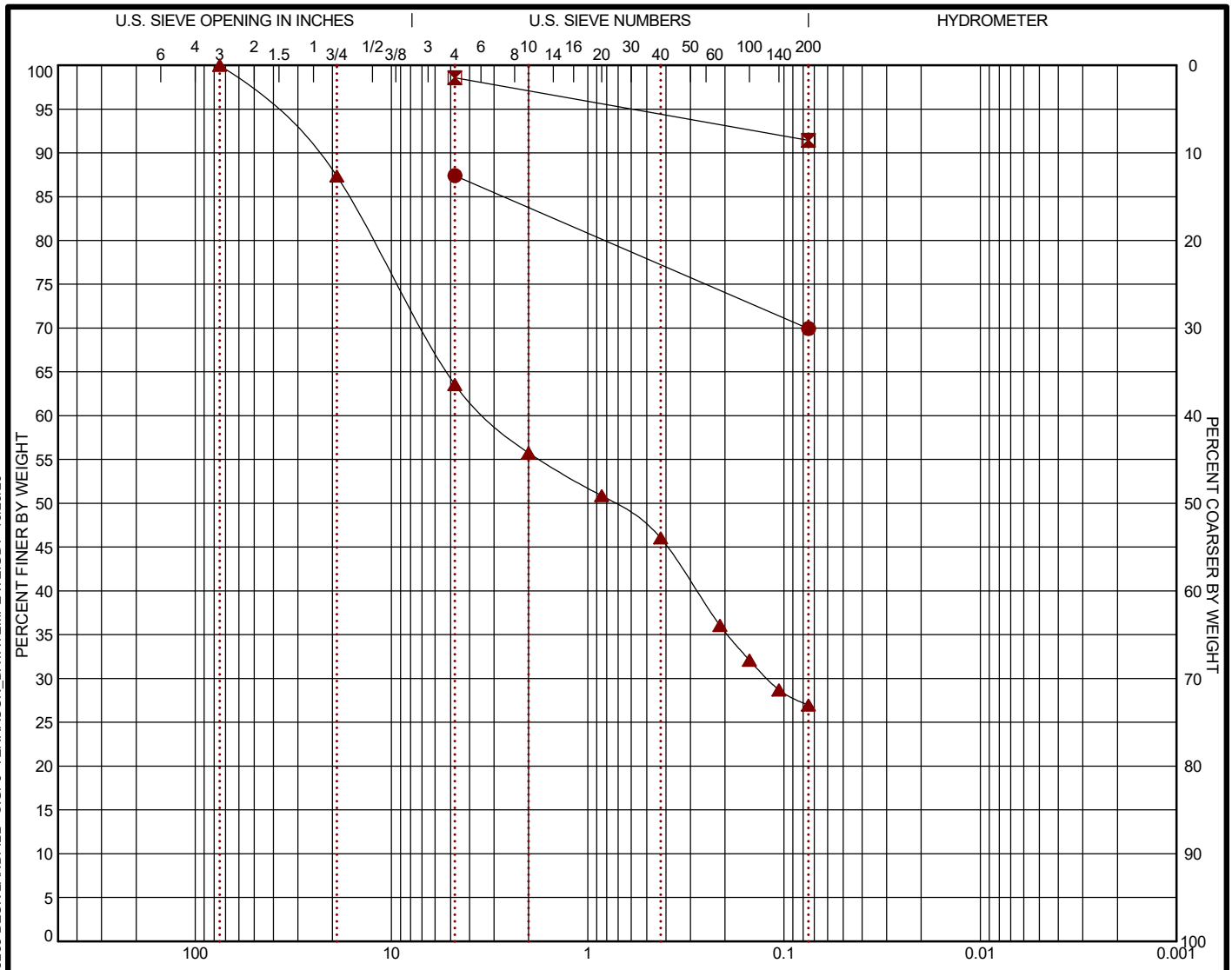
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-3**	**2 - 3**			**17.5**		**69.9**		
⊠	**FB-3**	**9 - 10**			**7.1**		**91.4**		
▲	**FB-3**	**23.5 - 25**	**0.0**	**36.4**	**36.6**		**27.0**		

GRAIN SIZE	●	⊠	▲
D_{60}			**3.203**
D_{30}			**0.121**
D_{10}			
COEFFICIENTS			
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
#4	**87.4**	**#4**	**98.57**	**3"**	**100.0**
#200	**69.94**	**#200**	**91.43**	**3/4"**	**87.35**
				#4	**63.56**
				#10	**55.75**
				#20	**50.87**
				#40	**46.05**
				#70	**36.06**
				#100	**32.1**
				#140	**28.7**
				#200	**26.97**

SOIL DESCRIPTION

●

⊠

▲

REMARKS

●

⊠

▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

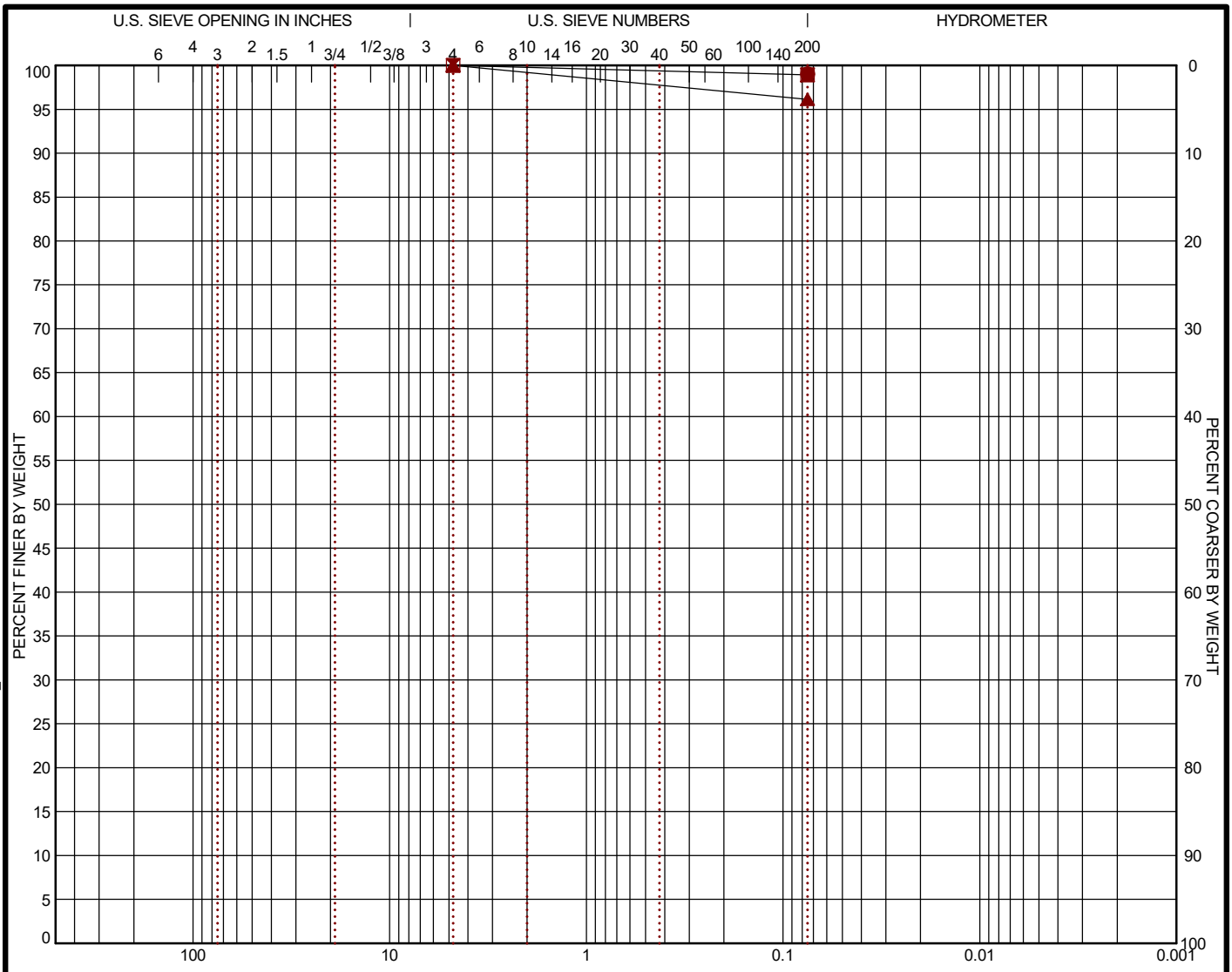
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-4**	**1 - 2**					**99.0**		**CH**
⊠	**FB-4**	**5 - 6**	**0.0**	**0.0**	**1.1**		**98.9**		**CH**
▲	**FB-4**	**18.5 - 19.7**	**0.0**	**0.0**	**3.9**		**96.1**		**CL**

	GRAIN SIZE		
	●	⊠	▲
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#200	**99.02**	**#4** **#200**	**100.0** **98.93**	**#4** **#200**	**100.0** **96.12**

SOIL DESCRIPTION

● FAT CLAY (CH)

⊠ FAT CLAY (CH)

▲ LEAN CLAY (CL)

REMARKS

●

⊠

▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

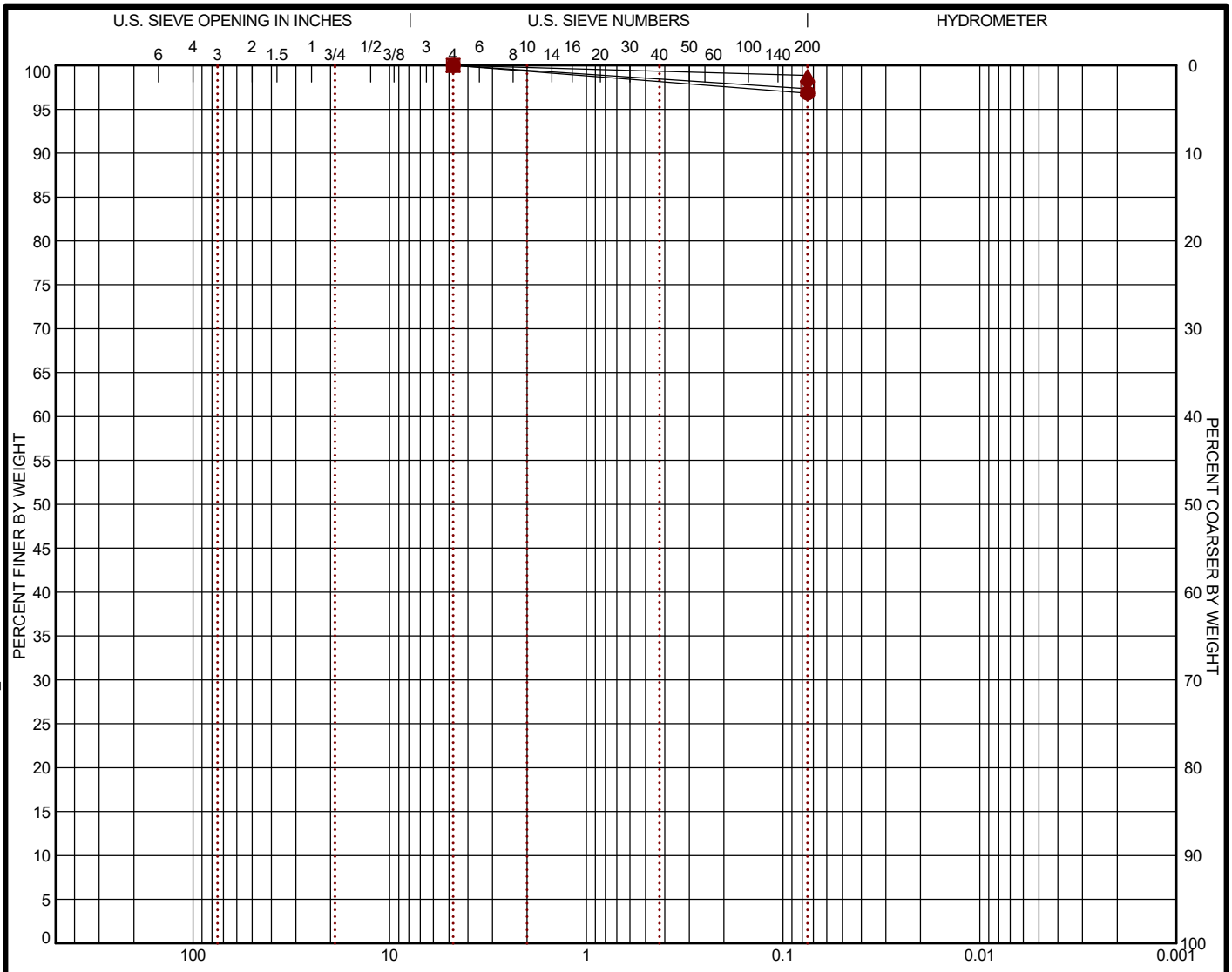
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-5**	**0 - 1.4**	**0.0**	**0.0**	**3.2**		**96.8**		**CH**
⊠	**FB-5**	**6.5 - 7**	**0.0**	**0.0**	**2.7**		**97.3**		**CH**
▲	**FB-5**	**23.5 - 24.8**	**0.0**	**0.0**	**1.2**		**98.8**		

	GRAIN SIZE		
	●	⊠	▲
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	100.0	#4	100.0	#4	100.0
#200	96.84	#200	97.35	#200	98.84

SOIL DESCRIPTION
- ● FAT CLAY (CH)
- ⊠ FAT CLAY (CH)
- ▲

REMARKS
- ●
- ⊠
- ▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

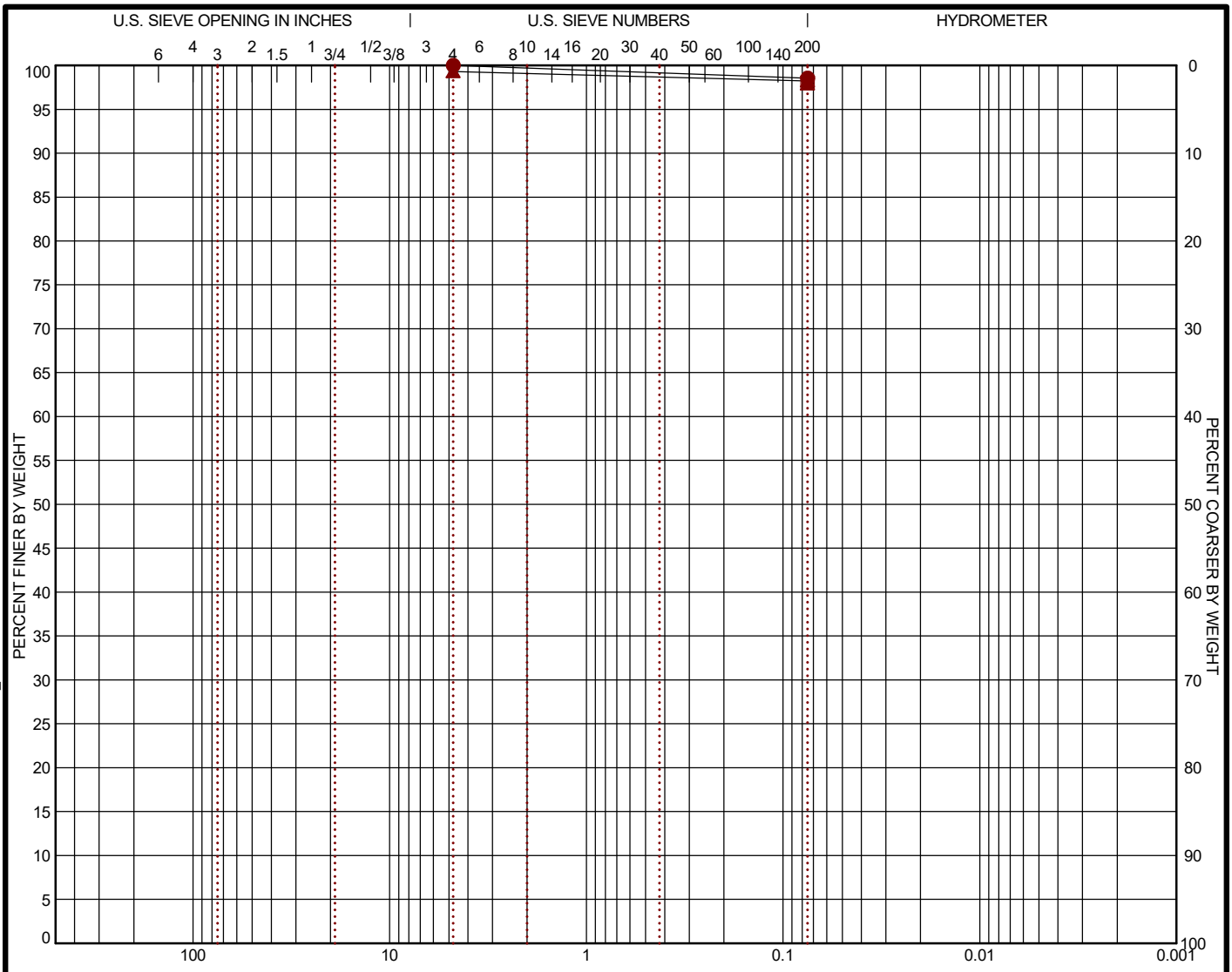
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-6**	**2 - 4**	**0.0**	**0.0**	**1.5**		**98.5**		**CH**
⊠	**FB-6**	**6 - 8**					**98.0**		**CL**
▲	**FB-6**	**18.5 - 19.5**			**1.1**		**98.2**		

	GRAIN SIZE		
	●	⊠	▲
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	**100.0**	**#200**	**98.01**	**#4**	**99.31**
#200	**98.54**			**#200**	**98.23**

SOIL DESCRIPTION
● FAT CLAY (CH)
⊠ LEAN CLAY (CL)
▲

REMARKS
●
⊠
▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

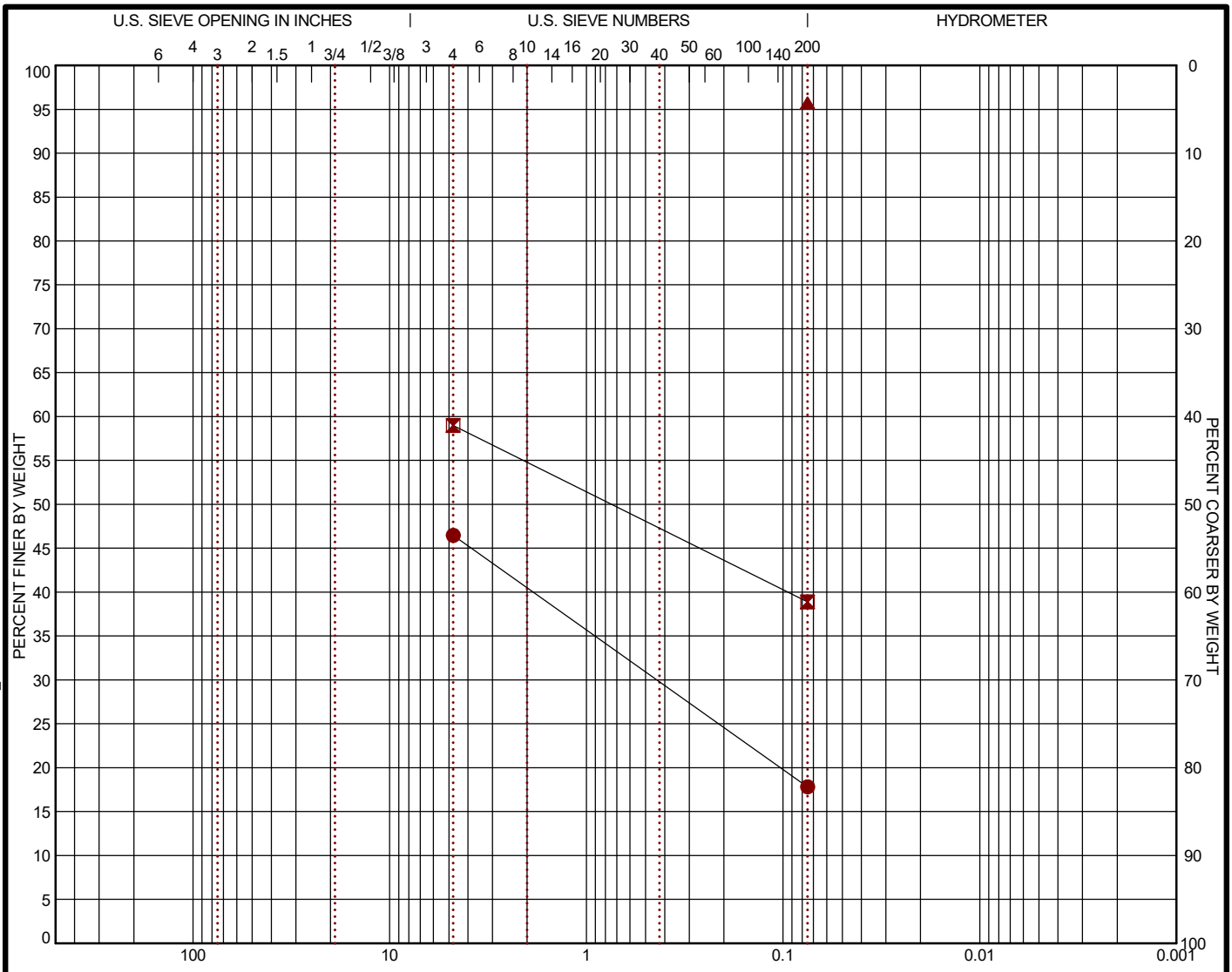
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-7**	**4.5 - 6**			**28.6**		**17.8**		
⊠	**FB-7**	**8.5 - 10**			**20.1**		**38.9**		
▲	**FB-7**	**18 - 20**					**95.7**		**CH**

	GRAIN SIZE		
	●	⊠	▲
D_{60}			
D_{30}	**0.437**		
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	**46.47**	**#4**	**58.97**	**#200**	**95.74**
#200	**17.82**	**#200**	**38.89**		

SOIL DESCRIPTION

●

⊠

▲ FAT CLAY (CH)

REMARKS

●

⊠

▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

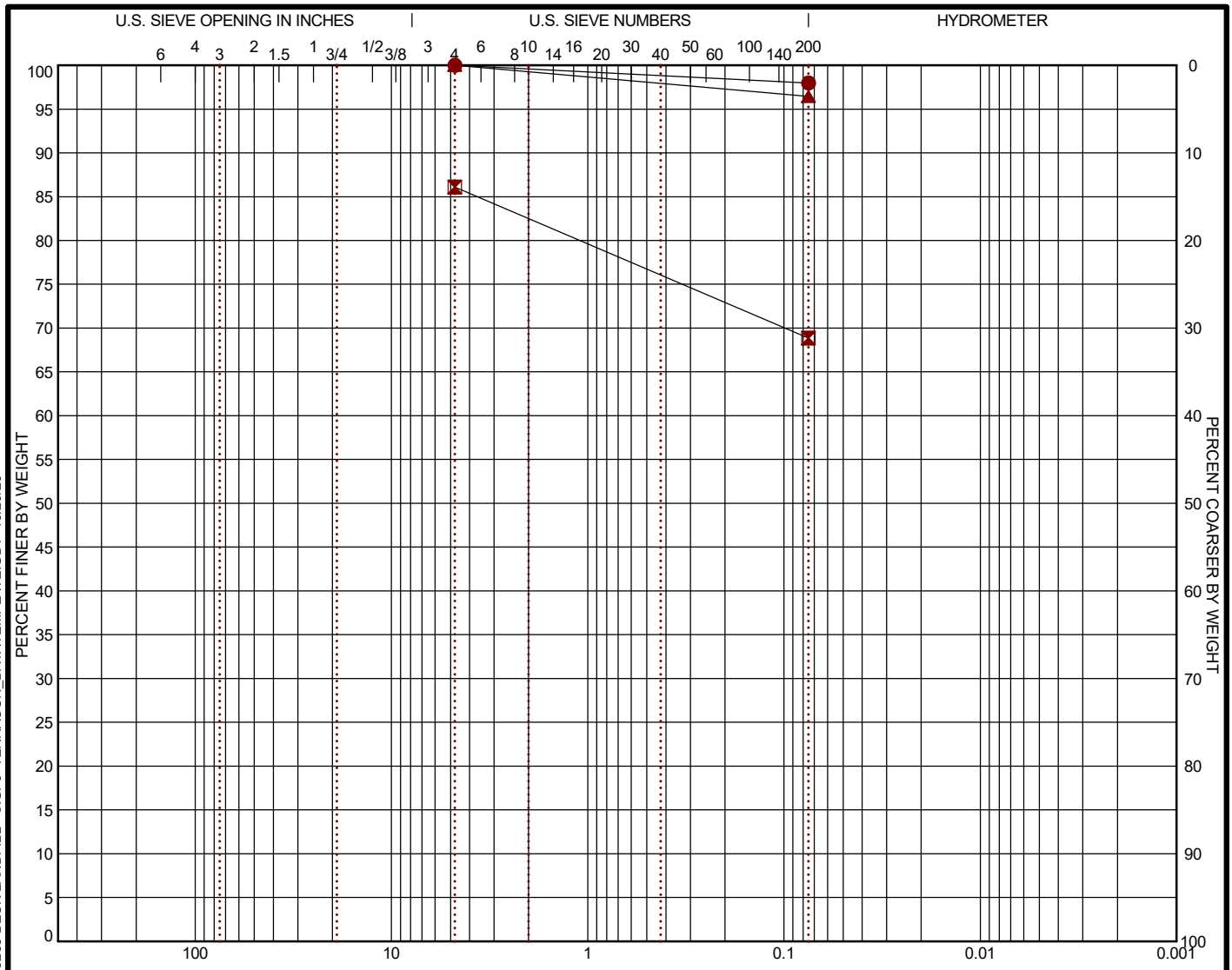
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-7**	**38.5 - 39.8**	**0.0**	**0.0**	**2.0**		**98.0**		**CH**
⊠	**FB-8**	**6.5 - 8**			**17.2**		**68.9**		
▲	**FB-8**	**33.5 - 34**	**0.0**	**0.0**	**3.6**		**96.4**		**CL**

	GRAIN SIZE		
	●	⊠	▲
D_{60}			
D_{30}			
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
#4	100.0	#4	86.11	#4	100.0
#200	97.97	#200	68.86	#200	96.43

SOIL DESCRIPTION
- ● FAT CLAY (CH)
- ⊠
- ▲ LEAN CLAY (CL)

REMARKS
- ●
- ⊠
- ▲

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

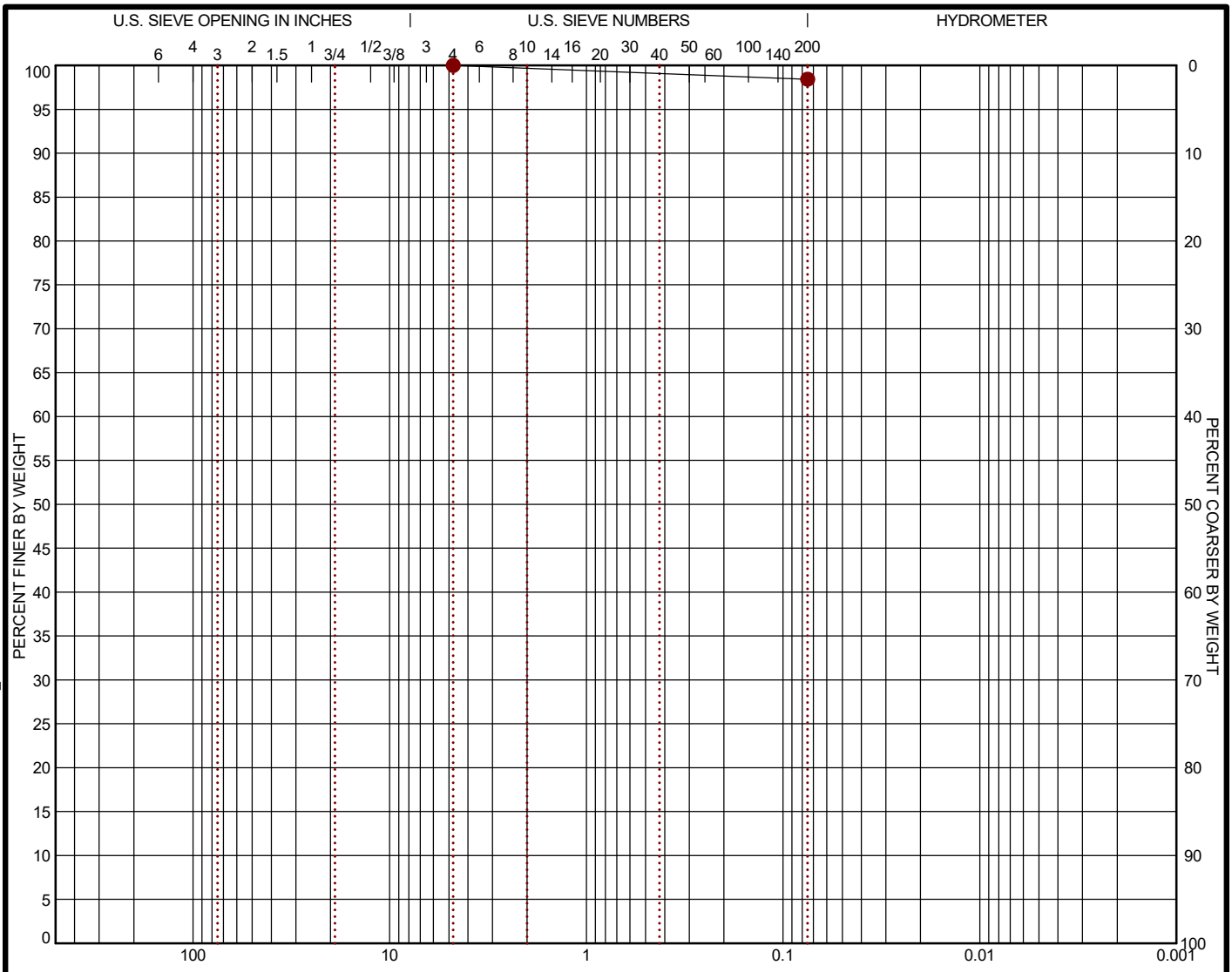
CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**FB-8**	**49 - 50**	**0.0**	**0.0**	**1.6**		**98.4**		

	GRAIN SIZE
	●
D_{60}	
D_{30}	
D_{10}	
	COEFFICIENTS
C_C	
C_U	

● Sieve	● % Finer	Sieve	% Finer	Sieve	% Finer
#4	**100.0**				
#200	**98.43**				

SOIL DESCRIPTION
●

REMARKS
●

PROJECT: Beck Landfill - Southeast Section

SITE: 550 FM 78
Schertz, TX

Terracon
6911 Blanco Rd
San Antonio, TX

PROJECT NUMBER: 90205235

CLIENT: Nido Ltd
San Antonio, TX

EXHIBIT: B-3

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 90205235 BECK LANDFILL - S.GPJ TERRACON_DATATEMPLATE.GDT 10/20/20

Terracon

Permeability Test
ASTM D 5084

EXHIBIT B-4

Project Number: 90205235 Undisturbed
Project : Beck Landfill - Southeast Section
Description: Gray Clay-Shale

Date: 10-15-2020
Location : FB-2, 38-40 ft.
Tested by: MM/Sam

Before Test			After Test	
Specimin Data			Specimin Data	
Length(in)	2.60		Length(in)	2.60
Diameter(in)	2.76		Diameter(in)	2.78
Length(cm)	6.60		Length(cm)	6.60
Diameter(cm)	7.00		Diameter(cm)	7.06
Specific Gravity	2.78	Assumed		
Wet Weight(gm)	527.38		Wet Weight(gm)	548.10
Area(cm^2)	38.51		Area(cm)	39.16
Volume(cc)	254.29		Volume(cc)	258.62
Moisture Data	E5		Moisture Data	L1
Wet Wt.+Tare(gm)	161.75		Wet Wt. + Tare	205.42
Dry Wt.+Tare(gm)	143.99		Dry Wt. + Tare	197.73
Tare Weight(gm)	48.63		Tare Weight	164.47
Moisture(%)	18.62		Moisture(%)	23.12
Weight/Volume Data			Weight/Volume Data	
Wet Weight(pcf)	129.5		Wet Weight(pcf)	132.3
Dry Weight(pcf)	109.1		Dry Weight(pcf)	107.5
Vol.Voids(cc)	94.0		Vol.Voids(cc)	98.8
Void Ratio	0.587		Void Ratio	0.619
Saturation(%)	88.3		Saturation(%)	100.0
Cell(psi)	90		a-in (cm^2)	0.7671
Backpressure(psi)	60		a-out (cm^2)	0.0314

BEFORE		
DIA	LENGTH	
2.78	2.60	
2.73	2.60	
2.76	2.60	
2.76	2.60	Average
AFTER		
DIA	LENGTH	
2.78	2.60	
2.78	2.60	
2.78	2.60	
2.78	2.60	Average

Test Constants	
M1=	0.03018
M2=	1.040953
S=	0.16864
G=	12.542
C=	4.058E-04

Actual Date (mm/dd/yy)	Actual Time (hh:mm:ss)	Elapsed Time (seconds)	Temperature (Fahren.)	(Cels)	a - in Outflow (mm)	a - out Inflow (mm)	Gradient	Trial Constant T	Hydraulic Conductivity (20C,cm/sec)
10/12/2020	5:00:00 PM	0	73.4	23.0	225.5	8.46	44.5		
10/13/2020	9:00:00 AM	57600	73.4	23.0	172.5	10.63	33.2	0.04796	1.9E-09
10/13/2020	9:00:00 AM	0	73.4	23.0	172.5	10.63	33.2		
10/13/2020	4:00:00 PM	25200	73.4	23.0	153	11.43	29.0	0.06431	2.0E-09
10/13/2020	4:00:00 PM	0	73.4	23.0	153	11.43	29.0		
10/14/2020	9:00:00 AM	61200	73.4	23.0	120.5	12.76	22.1	0.07353	1.7E-09
10/14/2020	9:00:00 AM	0	73.4	23.0	120.5	12.76	22.1		
10/14/2020	4:00:00 PM	25200	73.4	23.0	110.5	13.17	20.0	0.09662	1.5E-09

Coefficient of permeability, $k_{20°}$ (cm/sec) **1.8E-09**

Terracon

Permeability Test
ASTM D 5084

EXHIBIT B-4

Project Number: 90205235 Undisturbed
Project : Beck Landfill - Southeast Section
Description: Gray Clay-Shale

Date: 10-15-2020
Location : FB-4, 1-2 ft.
Tested by: MM/Sam

Before Test

Specimin Data		
Length(in)	2.51	
Diameter(in)	2.74	
Length(cm)	6.38	
Diameter(cm)	6.95	
Specific Gravity	2.78	Assumed
Wet Weight(gm)	516.55	
Area(cm^2)	37.95	
Volume(cc)	241.94	
Moisture Data	2T	
Wet Wt.+Tare(gm)	161.61	
Dry Wt.+Tare(gm)	143.50	
Tare Weight(gm)	48.39	
Moisture(%)	19.04	
Weight/Volume Data		
Wet Weight(pcf)	133.3	
Dry Weight(pcf)	112.0	
Vol.Voids(cc)	85.5	
Void Ratio	0.547	
Saturation(%)	96.8	
Cell(psi)	65	
Backpressure(psi)	60	

After Test

Specimin Data	
Length(in)	2.51
Diameter(in)	2.76
Length(cm)	6.38
Diameter(cm)	7.02
Wet Weight(gm)	532.26
Area(cm)	38.69
Volume(cc)	246.68
Moisture Data	201
Wet Wt. + Tare	130.82
Dry Wt. + Tare	117.04
Tare Weight	60.01
Moisture(%)	24.16
Weight/Volume Data	
Wet Weight(pcf)	134.7
Dry Weight(pcf)	108.5
Vol.Voids(cc)	92.8
Void Ratio	0.603
Saturation(%)	100.0
a-in (cm^2)	0.7671
a-out (cm^2)	0.0314

BEFORE		
DIA	LENGTH	
2.74	2.51	
2.73	2.51	
2.74	2.51	
2.74	2.51	Average
AFTER		
DIA	LENGTH	
2.78	2.51	
2.76	2.51	
2.75	2.51	
2.76	2.51	Average

Test Constants	
M1=	0.03018
M2=	1.040953
S=	0.164772
G=	12.542
C=	3.965E-04

Actual Date (mm/dd/yy)	Actual Time (hh:mm:ss)	Elapsed Time (seconds)	Temperature (Fahren.)	(Cels)	a - in Outflow (mm)	a - out Inflow (mm)	Gradient	Trial Constant T	Hydraulic Conductivity (20C,cm/sec)
10/12/2020	8:00:00 AM	0	73.4	23.0	119	12.82	22.6		
10/12/2020	10:00:00 AM	7200	73.4	23.0	113.5	13.05	21.3	0.09804	2.8E-09
10/12/2020	10:00:00 AM	0	73.4	23.0	113.5	13.05	21.3		
10/12/2020	12:00:00 PM	7200	73.4	23.0	109	13.23	20.3	0.10363	2.4E-09
10/12/2020	12:00:00 PM	0	73.4	23.0	109	13.23	20.3		
10/12/2020	2:00:00 PM	7200	73.4	23.0	104.5	13.42	19.3	0.10869	2.6E-09
10/12/2020	2:00:00 PM	0	73.4	23.0	104.5	13.42	19.3		
10/12/2020	4:00:00 PM	7200	73.4	23.0	101	13.56	18.6	0.11428	2.1E-09

Coefficient of permeability, $k_{20°}$ (cm/sec) **2.5E-09**

Terracon

Permeability Test
ASTM D 5084

EXHIBIT B-4

Project Number: 90205235 Undisturbed
Project : Beck Landfill - Southeast Section
Description: Gray Clay-Shale

Date: 10-15-2020
Location FB-6, 6-8
Tested by: MM/Sam

Before Test

Specimin Data		
Length(in)	2.50	
Diameter(in)	2.74	
Length(cm)	6.35	
Diameter(cm)	6.97	
Specific Gravity	2.78	Assumed
Wet Weight(gm)	540.54	
Area(cm^2)	38.13	
Volume(cc)	242.15	
Moisture Data	E12	
Wet Wt.+Tare(gm)	164.27	
Dry Wt.+Tare(gm)	149.78	
Tare Weight(gm)	48.88	
Moisture(%)	14.36	
Weight/Volume Data		
Wet Weight(pcf)	139.4	
Dry Weight(pcf)	121.9	
Vol.Voids(cc)	71.8	
Void Ratio	0.421	
Saturation(%)	94.8	
Cell(psi)	65	
Backpressure(psi)	60	

After Test

Specimin Data	
Length(in)	2.51
Diameter(in)	2.79
Length(cm)	6.38
Diameter(cm)	7.09
Wet Weight(gm)	563.54
Area(cm)	39.44
Volume(cc)	251.46
Moisture Data	R
Wet Wt. + Tare	124.85
Dry Wt. + Tare	113.6
Tare Weight	61.24
Moisture(%)	21.49
Weight/Volume Data	
Wet Weight(pcf)	139.9
Dry Weight(pcf)	115.2
Vol.Voids(cc)	85.0
Void Ratio	0.510
Saturation(%)	100.0
a-in (cm^2)	0.7671
a-out (cm^2)	0.0314

BEFORE		
DIA	LENGTH	
2.75	2.50	
2.74	2.50	
2.74	2.50	
2.74	2.50	Average
AFTER		
DIA	LENGTH	
2.79	2.51	
2.79	2.51	
2.79	2.51	
2.79	2.51	Average

Test Constants	
M1=	0.03018
M2=	1.040953
S=	0.161637
G=	12.542
C=	3.890E-04

Actual Date (mm/dd/yy)	Actual Time (hh:mm:ss)	Elapsed Time (seconds)	Temperature (Fahren.)	(Cels)	a - in Outflow (mm)	a - out Inflow (mm)	Gradient	Trial Constant T	Hydraulic Conductivity (20C,cm/sec)
10/12/2020	8:00:00 AM	0	73.4	23.0	120.5	12.76	22.9		
10/12/2020	10:00:00 AM	7200	73.4	23.0	111	13.15	20.8	0.09662	4.8E-09
10/12/2020	10:00:00 AM	0	73.4	23.0	111	13.15	20.8		
10/12/2020	12:00:00 PM	7200	73.4	23.0	103	13.48	19.0	0.10638	4.5E-09
10/12/2020	12:00:00 PM	0	73.4	23.0	103	13.48	19.0		
10/12/2020	2:00:00 PM	7200	73.4	23.0	96	13.76	17.5	0.11628	4.3E-09
10/12/2020	2:00:00 PM	0	73.4	23.0	96	13.76	17.5		
10/12/2020	4:00:00 PM	7200	73.4	23.0	90.5	13.99	16.3	0.12658	3.6E-09

Coefficient of permeability, $k_{20°}$ (cm/sec) **4.3E-09**

Terracon

Permeability Test
ASTM D 5084

EXHIBIT B-4

Project Number: 90205235 Undisturbed
Project : Beck Landfill - Southeast Section
Description: Gray Clay-Shale

Date: 10-15-2020
Location : FB-7, 18-20 ft.
Tested by: MM/Sam

Before Test

Specimin Data		
Length(in)	**2.51**	
Diameter(in)	**2.78**	
Length(cm)	**6.38**	
Diameter(cm)	**7.05**	
Specific Gravity	2.78	Assumed
Wet Weight(gm)	537.06	
Area(cm^2)	**39.07**	
Volume(cc)	**249.06**	
Moisture Data	**E16**	
Wet Wt.+Tare(gm)	179.64	
Dry Wt.+Tare(gm)	159.46	
Tare Weight(gm)	48.2	
Moisture(%)	**18.14**	
Weight/Volume Data		
Wet Weight(pcf)	**134.6**	
Dry Weight(pcf)	**113.9**	
Vol.Voids(cc)	**85.2**	
Void Ratio	**0.520**	
Saturation(%)	**97.0**	
Cell(psi)	72	
Backpressure(psi)	60	

After Test

Specimin Data	
Length(in)	**2.51**
Diameter(in)	**2.78**
Length(cm)	**6.38**
Diameter(cm)	**7.06**
Wet Weight(gm)	550.70
Area(cm)	**39.16**
Volume(cc)	**249.66**
Moisture Data	**B-1**
Wet Wt. + Tare	242.73
Dry Wt. + Tare	226.45
Tare Weight	158.28
Moisture(%)	**23.88**
Weight/Volume Data	
Wet Weight(pcf)	**137.7**
Dry Weight(pcf)	**111.2**
Vol.Voids(cc)	**90.1**
Void Ratio	**0.565**
Saturation(%)	**100.0**
a-in (cm^2)	**0.7671**
a-out (cm^2)	**0.0314**

BEFORE		
DIA	LENGTH	
2.78	2.51	
2.77	2.51	
2.78	2.51	
2.78	**2.51**	Average
AFTER		
DIA	LENGTH	
2.78	2.51	
2.78	2.51	
2.78	2.51	
2.78	**2.51**	Average

Test Constants	
M1=	**0.03018**
M2=	**1.040953**
S=	**0.162802**
G=	**12.542**
C=	**3.918E-04**

Actual Date (mm/dd/yy)	Actual Time (hh:mm:ss)	Elapsed Time (seconds)	Temperature (Fahren.)	(Cels)	a - in Outflow (mm)	a - out Inflow (mm)	Gradient	Trial Constant T	Hydraulic Conductivity (20C,cm/sec)
10/12/2020	**5:00:00 PM**	**0**	**73.4**	**23.0**	**240**	**7.87**	**49.3**		
10/13/2020	**9:00:00 AM**	**57600**	**73.4**	**23.0**	**147.5**	**11.65**	**28.9**	**0.04484**	**3.4E-09**
10/13/2020	**9:00:00 AM**	**0**	**73.4**	**23.0**	**147.5**	**11.65**	**28.9**		
10/13/2020	**4:00:00 PM**	**25200**	**73.4**	**23.0**	**121**	**12.74**	**23.0**	**0.07663**	**3.3E-09**
10/13/2020	**4:00:00 PM**	**0**	**73.4**	**23.0**	**121**	**12.74**	**23.0**		
10/14/2020	**9:00:00 AM**	**61200**	**73.4**	**23.0**	**82**	**14.34**	**14.4**	**0.09615**	**2.8E-09**
10/14/2020	**9:00:00 AM**	**0**	**73.4**	**23.0**	**82**	**14.34**	**14.4**		
10/14/2020	**4:00:00 PM**	**25200**	**73.4**	**23.0**	**71**	**14.79**	**11.9**	**0.15384**	**2.7E-09**

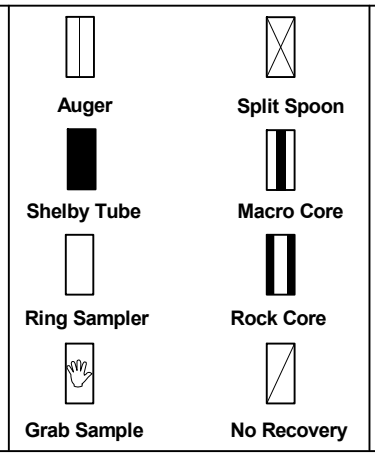
Coefficient of permeability, $k_{20°}$ (cm/sec) **3.0E-09**

APPENDIX C

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, tsf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.