APPENDIX E

GEOTECHNICAL AND SLOPE STABILITY REPORTS

APPENDIX E-1

GEOTECHNICAL INVESTIGATION REPORT FOR SMP-23 RECLAMATION

GEOTECHNICAL INVESTIGATION

SMP 23 Reclamation
Alameda County, California

PREPARED FOR:

CEMEX
2365 IRON POINT ROAD, SUITE 120
FOLSOM, CALIFORNIA 95630

PREPARED BY:

GEOCON CONSULTANTS, INC.
6671 BRISA STREET
LIVERMORE, CALIFORNIA 94550

GEOCON PROJECT NO. E9029-04-01

JANUARY 2019
REVISED DECEMBER 2019

GEOCON
CONSULTANTS, INC.
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. E9029-04-01
January 30, 2019
Revised December 31, 2019

CEMEX
2365 Iron Point Road, Suite 120
Folsom, California 95630

Attention: Ms. Antonella Turnbull

Subject: GEOTECHNICAL INVESTIGATION
CEMEX ELIOT – SMP 23 RECLAMATION PLAN AMENDMENT
1544 STANLEY BOULEVARD
ALAMEDA COUNTY, CALIFORNIA

Dear Ms. Turnbull:

In accordance with your authorization of our proposal dated October 9, 2017 and subsequent requests for additional services and peer review comments by Questa Engineering, we have updated our geotechnical investigation for the proposed amendment to the Surface Mining Permit (SMP) 23 Reclamation Plan for the CEMEX Eliot aggregate mining facility near Livermore and Pleasanton, Alameda County, California.

Our investigation was performed to observe the soil and geologic conditions relative to proposed finish mining cut slopes, existing slopes in selected areas, and proposed fill berms in selected areas. The accompanying report presents the results of our investigation and conclusions and recommendations pertaining to the proposed reclamation plan amendment. The findings of this study indicate the proposed finish mining slopes and related improvements are geotechnically feasible provided the recommendations of this report are implemented during design and construction. This report has been updated from its original version to reflect Alameda County review comments and subsequent analysis.

If you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Sincerely,

GEOCON CONSULTANTS, INC.

Shane Rodacker, PE, GE
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
SHANE A. RODACKER
No. 2915
GEOTECHNICAL
STATE OF CALIFORNIA

Jeremy Zorne, PE, GE
Senior Engineer

(1/e-mail) Addressee
(1/e-mail) CEMEX
Attention: Mr. Robert Walker
(1/e-mail) Compass Land Group
Attention: Mr. Yasha Saber
(1/e-mail) Mitchell Chadwick, LLP
Attention: Mr. Pat Mitchell

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed amendment to the Surface Mining Permit (SMP) 23 reclamation plan for the CEMEX Eliot aggregate mining facility at 1544 Stanley Boulevard in Alameda County, California (see Vicinity Map, Figure 1). A site plan of the overall Eliot facility is presented as Figure 2a. The purpose of our geotechnical investigation was to supplement previous explorations at the site, evaluate the stability of proposed mining and reclamation slopes, and provide geotechnical conclusions and recommendations for project design and construction, based on the conditions encountered in our study. This report is also intended to address the requirement of Condition of Approval No. 10 of SMP 23 Resolution No. 12-20, dated December 17, 2012.

The scope of this investigation included field exploration, laboratory testing, engineering analysis and the preparation of this report. Our field exploration was performed between October 23 and 30, 2017 and included drilling five exploratory borings (B1 through B5) to depths of approximately 150 feet or less and logging the subsurface conditions exposed in existing slopes in selected areas of the facility. The locations of our borings and pertinent explorations from past studies by others are depicted on the Site Plans, Figures 2b through 2d. A detailed discussion of our field investigation and boring logs are presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to evaluate pertinent geotechnical parameters. Appendix B presents the laboratory test results in tabular format and graphical format. Appendices C through H present our various slope stability and seepage analyses. Selected boring logs and laboratory test data from previous and current studies by others are included in Appendix I.

The opinions expressed herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section. If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE CONDITIONS AND PROJECT DESCRIPTION

CEMEX Construction Materials Pacific, LLC. ("CEMEX") owns and operates the Eliot Quarry, a ±920-acre sand and gravel mining facility, located between the cities of Livermore and Pleasanton, at 1544 Stanley Boulevard in unincorporated Alameda County. CEMEX and its predecessors-in-interest have been continuously mining for sand and gravel at the Eliot Quarry since at least 1906. In addition to mining and reclamation, existing permitted and accessory uses at the Eliot Quarry include aggregate, asphalt and ready-mix concrete processing, as well as ancillary uses such as aggregate stockpiling, load-out, sales, construction materials recycling, and equipment storage and maintenance. CEMEX's mining operations at the site are vested per pre-1957 mining activities and Alameda County Quarry Permits Q-1 (1957), Q-4 (1957), and Q-76 (1969). Surface mining reclamation activities at the site are currently conducted pursuant to Surface Mining Permit and Reclamation Plan No. SMP-23 ("SMP-23"), approved in 1987.

Under the Eliot Quarry SMP-23 Reclamation Plan Amendment Project ("Project"), CEMEX proposes a revised Reclamation Plan that serves to adjust reclamation boundaries and contours, enhance drainage and water conveyance facilities, incorporate a pedestrian and bike trail, and achieve current surface mining reclamation standards. The planned post-mining end uses are water management, open space, and agriculture (non-prime).

Consistent with prior approvals, the Project will develop Lake A and Lake B, which are the first two lakes in the Chain of Lakes pursuant to the *Alameda County Specific Plan for Livermore-Amador Valley Quarry Area Reclamation* adopted in 1981 ("Specific Plan"). Upon reclamation, Lake A and Lake B, along with their appurtenant water conveyance facilities, will be dedicated to the Zone 7 Water Agency ("Zone 7") for purposes of water storage, conveyance and recharge management.

Lake A reclamation will include installation of a surface water diversion from the Arroyo del Valle ("ADV") to Lake A; conversion of a berm that crosses the west side of the lake to a small island to allow water to flow across the lake; installation of a water conveyance pipeline from Lake A to future Lake C (located off-site to the northwest); and an overflow outlet to allow water to flow back into ADV when Lake A water levels are high to prevent flooding in the localized area. The final surface area of Lake A will be 81 acres as compared to 208 acres in SMP-23. No further mining will occur in Lake A.

Lake B reclamation will include installation of a pipeline turn-out from Lake A, a water pipeline conduit to future Lake C, and an overflow outlet to allow water to flow back into ADV when Lake B water levels are high. The final bottom elevation of Lake B is proposed at 150 feet above mean sea level ("MSL"), in order to maximize the available aggregate resource. The final surface area of Lake B will be 208 acres as compared to 243 acres in SMP-23.

To facilitate the southerly progression of Lake B, the Project includes realignment and restoration of a ±5,800 linear foot reach of the ADV. The proposed ADV realignment will result in an enhanced riparian corridor that flows around, rather than through (as currently anticipated in SMP-23), Lake B. The ADV realignment was contemplated in the Specific Plan and subject to environmental review in 1981.

Outside of Lake A and Lake B, reclamation treatment for other disturbed areas, including the Lake J excavation (not part of the Chain of Lakes), processing plant sites, and process water ponds will involve backfills and/or grading for a return to open space and/or agriculture.

The Project is a modification of an approved project. Except as outlined above, CEMEX proposes no change to any fundamental element of the existing operation (e.g., mining methods, processing operations, production levels, truck traffic, or hours of operation). A more complete description of the proposed Project is contained in CEMEX's Project Description, Revised Reclamation Plan, and other application materials provided to the County.

Lake J

Lake J is currently being created by mining activities within the area of the existing aggregate plant near the northwest corner of the overall CEMEX Eliot facility. Lake J will extend to an elevation of 130 feet MSL as a result of cuts of approximately 250 feet below existing grades. We understand the proposed cuts will be set back at least 150 feet from the nearby slope that descends to the eastern end of the offsite Shadow Cliffs Lake. Cut slopes of 2:1 (horizontal:vertical) are proposed. A haul road to the bottom of the Lake J mining pit will create a bench in some of the pit slopes. The existing aggregate processing plant will be moved to the south and the ready-mix plant relocated northward to accommodate the expanded Lake J mining pit (see Figure 2B).

Lake B

Mining operations in existing Lake B will progress deeper and to the south. Lake B will be mined to an elevation of 150 feet MSL with cuts from existing grades on the order of 150 to 250 feet deep. The eastern panhandle of Lake B will be mined to a bottom elevation of 220 feet MSL. After the planned realignment of ADV, the southern cut slope of Lake B will be pushed southward to be generally parallel to Vineyard Avenue. An embankment fill at the northern portion of Lake B (referred to as the “shark’s fin” area) will separate Lake B from an existing freshwater pond to the north. Fills on the order of 120 feet thick will be required for the embankment. The embankment prism will increase storage capacity in the freshwater pond and may allow the freshwater pond to be repurposed as a silt storage cell and filled to 370 feet MSL during mining operations. The embankment prism will ultimately be breached to merge the freshwater pond with Lake B in the reclaimed condition. An overflow spillway (top elevation 369 feet MSL) at the western end of Lake B will return impounded water to ADV during high groundwater conditions. New cut and fill slopes are proposed at 2:1 inclinations except where noted below. Maximum cut slope heights of approximately 230 feet are proposed. In addition, an approximately 120-foot-thick embankment fill is planned near the eastern end of Lake B. The embankment will create an overburden and silt storage cell for future mining activities. West of this embankment, the southern slope of Lake B will be constructed with a 40-foot horizontal bench at approximately elevation 260 feet MSL, or the slope will be cut at an inclination of 2 ¼:1. The proposed reclaimed condition of Lake B is shown on Figure 2C. However, the grades behind (to the east of) the embankment do not reflect than planned deposition of silts.

Lake A

No new mining activities are proposed at Lake A. Minor embankment fills on the order of 7 feet thick or less will be placed to establish a berm at the southern margin of Lake A. Localized excavations may be performed to remove and in-situ berm within the body of Lake A to promote water movement across the lake. A portion of the flow within ADV (up to 500 cfs) will be directed to Lake A via a near-stream infiltration bed and discharge culvert at the southeast corner of the lake. Reclamation at Lake A will include an outlet pipe at the northwestern end. The outlet pipe will convey flows from Lake A westward beneath Isabel Avenue through the eastern end of Lake B and turn north to connect to future Lake C. An overflow spillway (top elevation 424 feet MSL) at the western end of Lake A will return impounded water to ADV during high groundwater conditions. The configuration/details of the Lake A reclamation are shown on Figure 2D.

The Project will also include the construction of an approximately 45-foot-high embankment berm between Pond D and the western end of Pond C (See Figure 2b).

3. GEOLOGIC SETTING

The site is located within the Coast Ranges Geomorphic Province of California, which is characterized by a series of northwest trending mountains and valleys along the north and central coast of California. Topography is controlled by the predominant geological structural trends within the Coast Range that generally consist of northwest trending synclines, anticlines and faulted blocks. The dominant structure is a result of both active northwest trending strike-slip faulting, associated with the San Andreas Fault system, and east-west compression within the province.

The San Andreas Fault (SAF) is a major right-lateral strike-slip fault that extends from the Gulf of California in Mexico to Cape Mendocino in northern California. The SAF forms a portion of the boundary between two tectonic plates on the surface of the earth. To the west of the SAF is the Pacific Plate, which moves north relative to the

North American Plate, located east of the fault. In the San Francisco Bay Area, movement across this plate boundary is concentrated on the SAF but also distributed, to a lesser extent, across several other faults including the Hayward and Calaveras faults, among others. Together, these faults are referred to as the SAF system.

Basement rock west of the SAF is generally granitic, while to the east it consists of a chaotic mixture of highly deformed marine sedimentary, submarine volcanic and metamorphic rocks of the Franciscan Complex. Both are typically Jurassic to Cretaceous in age (205 to 65 million years old). Overlying the basement rocks are Cretaceous (about 140 to 65 million years old) marine, as well as Tertiary (about 65 to 1.6 million years old) marine and non-marine sedimentary rocks with some continental volcanic rock. These Cretaceous and Tertiary rocks have typically been extensively folded and faulted largely because of movement along the SAF system, which has been ongoing for about the last 25 million years, and regional compression during the last about 4 million years. The inland valleys, as well as the structural depression within which San Francisco Bay is located, are filled with unconsolidated to semi-consolidated deposits of Quaternary age (about the last 1.6 million years). Continental deposits (alluvium) consist of unconsolidated to semi-consolidated sand, silt, clay and gravel, while the bay deposits typically consist of soft organic-rich silt and clay (bay mud) or sand.

The site is located within the east-west trending Livermore-Amador Valley. The Livermore-Amador Valley is a tilt-block basin bounded on the south side by the Verona Thrust Fault and Las Positas Fault system. The valley was filled with late Tertiary and Quaternary alluvial deposits. The Livermore-Amador Valley is partially filled with alluvial fan, stream, and lake deposits, collectively referred to as alluvium that consists of interbedded/intermixed gravel, sand, silt, and clay. At the site, coarse alluvial fan deposits were formed by the ancestral and present ADV and Arroyo Mocho. The coarse alluvial fan deposits are the target of extensive aggregate mining in the area.

The alluvium in the area includes three major units, listed from youngest to oldest (top to bottom): Quaternary alluvium, Upper Livermore Gravels, and Lower Livermore Gravels. The characteristics of the individual units are similar (mixtures and layers of sand, silt, clay, gravel, and small cobble). The division between individual units is not distinct and generally coincides with gradual grain size transitions. For the purposes of this study, the natural deposits at the site are collectively termed “alluvium.”

4. SEISMICITY

Geologists and seismologists recognize the San Francisco Bay Area as one of the most seismically-active regions in the United States. The significant earthquakes that occur in the Bay Area are associated with crustal movements along well-defined active fault zones that generally trend in a northwesterly direction.

The table below presents approximate distances to active faults within approximately 20 miles of the site based on mapping by the California Geological Survey (CGS), as presented in an online fault database maintained by Caltrans. For the purposes of Table 4.1, site coordinates are N 37.6622°, W 121.8155°, at the approximate southeast corner of the main silt pond.

TABLE 4.1
REGIONAL FAULT SUMMARY

Fault Name	Approximate Distance to Site (miles)	Maximum Earthquake Magnitude, M_w
Las Positas	3	6.4
Pleasanton	3 ¼	6.6
Mt. Diablo Thrust	4 ¾	6.6
Calaveras (North)	5	6.9
Greenville	7 ¼	6.9
Hayward (South)	11	7.3
Clayton	13 ¾	6.9
Calaveras (Central)	14	6.9
Hayward (Southern Extension)	14 ¼	6.7
Silver Creek	15 ½	6.9
Great Valley 7	16 ¾	6.7
Great Valley 6	17	6.8
Hayward (North)	18 ¾	7.3
Concord	19	6.6

Faults tabulated above and many others in the Bay Area are sources of potential ground motion. However, earthquakes that might occur on other faults within the northern California area are also potential generators of significant ground motion and could cause ground shaking at the site.

The site is not within a currently established State of California Earthquake Fault Zone for surface fault rupture hazards. No active faults are known to pass directly beneath the site. By CGS definition, an active fault is one with surface displacement within the last 11,000 years. A potentially-active fault has demonstrated evidence of surface displacement with the past 1.6 million years. Faults that have not moved in the last 1.6 million years are typically considered inactive.

5. SOIL AND GROUNDWATER CONDITIONS

5.1 Fill

Our Boring B1, located near the southwestern edge of proposed Lake J encountered approximately 38 ½ feet of previously placed fill material. The fill materials were observed as medium dense to very dense gravels with variable amount with variable amounts of silt, sand and clay. Other areas of artificial fill are known to exist throughout the facility.

5.2 Alluvium

Each of our borings encountered alluvial deposits. The alluvial materials were predominantly gravels with occasional layers of lean clays and silts with variable amounts of sand and silty sand. Based on drilling and sampler resistance, the gravelly deposits were medium to very dense and consistently very dense at depth. The silts and clays were typically stiff to hard. We encountered alluvium to the maximum depth explored - approximately 240 feet below natural (pre-mining) grades at the site.

5.3 Groundwater

Groundwater was encountered in our Borings B1 through B4 at elevations ranging from approximately 265 feet MSL to 350 feet MSL or depths of approximately 30 to 75 feet below the ground surface. Groundwater levels within active mining areas at the Eliot facility are generally controlled by dewatering operations. Based on information from EMKO Environmental (EMKO), groundwater levels are locally influenced by water levels in ADV. Long-term cycles in groundwater levels are related to climatic changes such as wet periods and drought periods. Annual cycles are due to recharge during the wet season and extraction during the dry season. Peak groundwater levels generally occur between March and May and low groundwater levels generally occur in August and September. The long-term climatic cycles can result in groundwater level changes of up to 100 feet. The annual cycles typically range in magnitude from about 15 feet to 40 feet.

Actual groundwater levels will fluctuate seasonally and with variations in rainfall, temperature, dewatering operations, and other factors and may be higher or lower than observed during our study.

6. SLOPE STABILITY ANALYSES

6.1 General

We evaluated the stability of the proposed finish mining slopes using the computer program *SLOPE/W* (Version 7.23 by Geo-Slope International). Our analysis considered both circular and block failure modes under static and seismic conditions. Our analysis was performed in general accordance with CGS Special Publication 117A (SP117A) and an earlier, related guidance document published by the Southern California Earthquake Center (SCEC). Per the procedures recommended by SCEC, our analysis used Spencer's Method for both circular and block failure modes. Spencer's Method satisfies both force and moment equilibrium conditions and SCEC recommends it be used for the analysis of failure surfaces of any shape.

Our evaluation of the proposed slopes was based on the mining reclamation plans prepared by Spinardi and Associates (January 2019). Lithology at each cross-section was based on conditions encountered in our borings, previous explorations by others, and observed subsurface conditions on existing cut slopes at the site. Clay or silt layers were modeled as horizontal and conservatively assumed to extend infinitely behind the proposed slope faces.

Soil shear strength parameters for our analyses were developed through laboratory testing on soil samples obtained from our exploratory borings, past geotechnical studies by others (see List of References), published typical values for soil type and in-situ density or consistency, and engineering judgement. A general summary of the soil parameters used in our analysis is presented in Table 6.1. It should be noted that some past studies by others at the site have used higher strength parameters for gravels. Based on our professional judgement, and for conservatism, our analyses used lower shear strength values for the gravels.

TABLE 6.1
SOIL PARAMETERS FOR SLOPE STABILITY ANALYSES

Soil Type (USCS Classification)	Unit Weight	Internal Angle of Friction	Cohesion
Gravels (GC, GW, GM)	140 pcf	45°	200 psf
Clays and Silts (CL, ML)	130 pcf	34°	200 psf
Sands (SW)	135 pcf	36°	0 psf

Cross-sections for our slope stability analyses were generally selected to represent the most-critical geometry and the locations are depicted on Figures 2b through 2d. Where applicable, each cross-section was analyzed for the failure modes and conditions described above for both the fully-mined and post-mining (reclaimed) conditions.

Our evaluation of the proposed slopes under seismic conditions consisted of a pseudostatic analysis that applies a seismic coefficient representing a portion of the slide mass applied as an equivalent horizontal force through the slide mass centroid. Our analysis incorporated a pseudostatic (i.e. seismic) coefficient of 0.16, consistent with prior studies by others and our recent investigation for the ADV. We used a pseudostatic coefficient of 0.21 where residential structures will be located above the analyzed slopes. The increased coefficient is also consistent with that used in the various past studies by others. In response to Alameda County review comments, we also applied a 0.21 seismic coefficient in our updated analysis for the Lake J mining slope closest to Shadow Cliffs Lake.

Based on our review of the documentation provided by CEMEX and Compass Land Group, which included a variety of past geotechnical studies by others, we understand that acceptable factors of safety against slope instability are 1.5 or greater for static conditions and 1.0 or greater for seismic. Factor of safety is the ratio of the summation of driving forces divided by the summation of resisting forces. A factor of safety of 1.0 indicates that the driving and resisting forces are equal and the slope is in a state of equilibrium. A factor of safety greater than 1.0 indicates the presence of reserve strength; however, does not guarantee that failure will not occur. Rather, the probability of failure generally decreases as the factor of safety increases.

Where our analysis indicated a factor of safety less than 1.0 under seismic conditions, a second-tier analysis, which is referred to as a Newmark slope displacement analysis, was performed in accordance with SP117A. Newmark displacement analyses generally involve the determination of yield acceleration (i.e., the acceleration required to bring the factor of safety to 1.0), the determination of site-specific ground motion and, finally, the calculation of cumulative slope displacements. Displacements of less than 6 inches (i.e., 15 centimeters) are generally considered minor.

6.2 Lake J

Our slope stability analyses for Lake J evaluated three cross-sections – Lake J North, Lake J South and Lake J East – as shown on the attached Figure 2b. The Lake J South cross-section location was selected to represent the most-critical geometry between the existing offsite Shadow Cliffs Lake and the Lake J mining pit. The existing offsite slopes that descend to Shadow Cliffs Lake were not evaluated since the planned mining does not modify or otherwise impact those slopes. The results of our analyses are summarized in Table 6.2.

TABLE 6.2
SUMMARY OF SLOPE STABILITY ANALYSES – LAKE J

Stability Analysis Figures (Appendix C)	Cross Section	General Condition	Calculated Factor of Safety Circular Failure Surface		Calculated Factor of Safety Block Failure Surface	
			Static	Seismic	Static	Seismic
C1 through C4	Lake J North	Mined Condition	2.1	1.4	2.4	1.7
C5 through C8	Lake J North	Reclaimed Condition	2.3	1.3	2.2	1.4
C9 through C12	Lake J South	Mined Condition	2.0	1.3*	2.2	1.4*
C13 through C16	Lake J South	Reclaimed Condition	1.9	1.0*	2.0	1.2*
C17 though C20	Lake J East	Mined Condition	1.9	1.4	2.3	1.7
C21 through C24	Lake J East	Reclaimed Condition	2.0	1.2	2.1	1.3

*Updated from prior analysis to reflect 0.21 seismic coefficient as recommended by Alameda County.

Our analyses indicate the proposed finish mining slopes for Lake J possess factors of safety against deep-seated instability that meet or exceed the applicable minimums for static and seismic conditions.

6.3 Lake B

Three cross-sections were evaluated for the proposed mining and reclamation of Lake B (see figure 2c). The Lake B North cross-section models the proposed (interim) separation between the northern shark's fin of Lake B and the freshwater pond to the north. An embankment fill is planned to raise the current separation between these two areas and increase the capacity of freshwater storage. Our Lake B Southwest cross-section was located to model the most-critical geometry of the proposed mining cut slopes and to also incorporate the proximate realigned ADV and Vineyard Avenue. Updated analysis for the mined condition at the Lake B Southwest cross-section is presented herein. The updated analysis reflects two alternative configurations for the cut slope below realigned ADV – one with a 2 ¼:1 slope, and another with a 40-foot horizontal bench at elevation 260 feet MSL within a 2:1 slope. The results of our analyses are summarized in Table 6.3. We have not updated our analysis for the reclaimed condition at the Lake B Southwest cross-section since acceptable factors of safety were previously calculated for a more critical 2:1 slope inclination.

TABLE 6.3
SUMMARY OF SLOPE STABILITY ANALYSES – LAKE B

Stability Analysis Figures (Appendix D)	Cross Section	General Condition	Calculated Factor of Safety Circular Failure Surface		Calculated Factor of Safety Block Failure Surface	
			Static	Seismic	Static	Seismic
D1 through D4	Lake B North	Mined Condition	1.7	1.2	2.0	1.4
D5 through D8	Lake B North	Reclaimed Condition	2.0	1.1	2.3	1.3
D9 through D12	Lake B Southwest	Mined Condition – A	1.6*	1.0*	1.8*	1.1*
D13 through D16	Lake B Southwest	Mined Condition – B	1.6*	1.0*	1.7*	1.1*
D17 through D20	Lake B Southwest	Reclaimed Condition	2.0	1.2	2.4	1.3
D21 through D24	Lake B Southeast	Mined Condition	1.5**	1.0**	1.6**	1.0**
D25 through D28	Lake B Southeast	Reclaimed Condition	2.0	1.2	2.2	1.4
D29 through D32	Lake B Embankment	Mined Condition	1.7	1.2	2.2	1.6
D33 through D36	Lake B Embankment	Reclaimed Condition	1.7	1.1	2.1	1.3

*Updated from prior analysis to reflect Alameda County review comments and proposed changes to slope configuration.
Mined Condition – A: 2 ¼:1 (horizontal:vertical) mining cut slope below ADV
Mined Condition – B: 2:1 mining cut slope with 40-foot horizontal bench at 260 feet MSL below ADV
**New analysis in response to Alameda County review comments.

Our analyses indicate the proposed finish mining slopes for Lake B possess factors of safety against deep-seated instability that meet or exceed the applicable minimums for static and seismic conditions.

6.4 Lake D

Cross-section locations for our analysis were selected to evaluate the existing slopes in the area between the Eliot main silt pond and Vulcan Material’s Lake D (Lake D West cross-section), and the proposed slopes in the area between a freshwater pond and Lake D (Lake D South cross-section). See Figure 2A for cross-section locations. At the Lake D West cross-section, our analyses considered the potential for slope failure into existing Lake D, and slope failure into the main silt pond (denoted as “reverse” condition in the Table 6.4). The results of our analyses are summarized in Table 6.4.

TABLE 6.4
SUMMARY OF SLOPE STABILITY ANALYSES – LAKE D

Stability Analysis Figures (Appendix E)	Cross Section	General Condition	Calculated Factor of Safety Circular Failure Surface		Calculated Factor of Safety Block Failure Surface	
			Static	Seismic	Static	Seismic
E1 through E4	Lake D West	Ex. Condition	1.9	1.3	2.0	1.4
E5 through E8	Lake D West	Ex. Condition (reverse)	1.8	1.3	2.0	1.6
E9 through E12	Lake D West	Reclaimed Condition	1.9	1.3	2.0	1.4
E13 through E16	Lake D South	Water at 275 MSL	1.8	1.3	2.2	1.6

Our analyses indicate the existing and proposed mining slopes between the silt and freshwater ponds and Lake D possess factors of safety against deep-seated instability that meet or exceed the applicable minimums for static and seismic conditions.

6.5 Lake C

We analyzed the stability of an existing slope area between Vulcan Materials' Lake C (offsite) and Silt Pond C, northeast of Lake B. We also analyzed the 45-foot-high embankment berm proposed between Silt Pond C and D. See Figure 2b for the location of our Lake C South and Lake C West cross-sections. The results of our analyses are summarized in Table 6.5.

TABLE 6.5
SUMMARY OF SLOPE STABILITY ANALYSES – LAKE C

Stability Analysis Figures (Appendix F)	Cross Section	General Condition	Calculated Factor of Safety Circular Failure Surface		Calculated Factor of Safety Block Failure Surface	
			Static	Seismic	Static	Seismic
F1 through F4	Lake C South	Ex. Condition	1.5	1.1	1.7	1.3
F5 through F8	Lake C West	Mined Condition	1.7	1.2	2.0	1.4
F9 through F12	Lake C West	Reclaimed Condition	2.3	1.3	2.7	1.6

Our analyses indicate the existing slopes at Lake C possess factors of safety against deep-seated instability that meet or exceed the applicable minimums for static and seismic conditions. No future mining is proposed in this area; the reclaimed condition is essentially the same as the existing condition.

6.6 Lake A

Our scope of services included a verification and amplification of previous analyses (by others) of the slopes at Lake A. No new mining is proposed at Lake A and only minor reclamation improvements are planned. The proposed reclamation improvements include construction of minor berms along ADV and Lake A, construction of an infiltration structure to divert a portion of ADV flows into the southeast corner of Lake A, and minor excavation of slots in the existing in-situ berm near the west end of Lake A to promote water flow across the lake for reclamation. These reclamation improvements have negligible effect on the stability of existing slopes. As such, additional slope stability analyses were not warranted for Lake A. Nevertheless, existing slope conditions were analyzed. Our analyses were based on the lithological interpretation and shear strength parameters assigned in past studies by others, and not on the results of subsurface exploration and laboratory testing by Geocon.

Consistent with prior studies by others, our analysis incorporated the sheared clay layer at each analyzed section on the north side of Lake A, and for Sections C-C' and D-D' on the southern side of the lake. In addition, a recent borehole (by Zone 7 and Cemex) northeast of the intersection of Vineyard Avenue and Isabel Avenue encountered a sheared clay layer at an elevation of approximately 290 feet MSL, which generally agrees with a projection of the layer from the north side of Lake A at Section B-B'. As such, we have also modeled this sheared clay layer at Section B-B' on the southern side of Lake A. We also analyzed Section B-B' – North for a temporary equipment loading condition at the request of Cemex. We understand this analysis was requested by an Alameda County review in a recent meeting with Cemex representatives. Equipment loading was only evaluated for the static case as the likelihood of equipment loading coinciding with a major seismic event is remote. The results are of our analyses are summarized in Table 6.6.

TABLE 6.6
SUMMARY OF SLOPE STABILITY ANALYSES – LAKE A

Figures	Cross Section	General Condition	Calculated Factor of Safety Circular Failure Surface		Calculated Factor of Safety / Displacement Block Failure Surface	
			Static	Seismic	Static	Seismic Displacement
H1 through H4	Section B-B' – North	Existing Condition	2.4	1.2	1.8	<15 cm
H5 through H8	Section B-B' – South	Existing Condition	3.4	1.6	2.8	<15 cm
H9 through H12	Section C-C' – North	Existing Condition	2.7	1.2	2.0	<15 cm
H13 through H16	Section C-C' – South	Existing Condition	2.5	1.6	3.1	<15 cm
H17 through H20	Section D-D' – North	Existing Condition	2.8	1.4	2.3	<15 cm
H21 through H24	Section D-D' – South	Existing Condition	4.3	1.7	4.3	<15 cm
H25 and H26	Section B-B' North	Equipment Loading	3.0	n/a	3.4	n/a

Our analyses indicate the existing Lake A slopes possess factors of safety against deep-seated instability that meet or exceed the applicable minimums, at the sections analyzed, with the exception of the block failure modes in the seismic case. For block failure modes in the seismic case, we performed a Newmark slope displacement analysis in accordance with SP117A. Our analysis shows that all slope displacements under seismic conditions in Lake A will be less than approximately 15 centimeters (approximately 6 inches). SP117A indicates that displacements less than 15 cm are unlikely to correspond to serious damage and are considered small. Based on our review of Cotton Shires' 2006 and 2007 technical memorandum and Lake A Lakeside Circle Corrective Action Plan, our findings are generally consistent with that prior work that was approved by the County. Cotton Shires' analysis showed slope displacement would be less than 15 centimeters for each cross-section analyzed.

7. SEEPAGE ANALYSES

Our investigation included an evaluation of the potential for adverse seepage conditions along the berm proposed on the southern side of Lake A. Adverse seepage conditions are typically those where out-of-slope seepage occurs. The berm will essentially provide additional separation between the ADV alignment and Lake A by increasing the height of the southern bank of Lake A. Based on information provided by the project civil engineer, fill heights of approximately six feet or less will be required to reach planned crest elevations for the berm. Berm side slopes will be inclined at 2:1 or flatter. A gravel surfaced maintenance road is proposed atop the berm.

Our analyses considered two cross-sections that represent the most critical geometries along the proposed berm alignment. Our seepage analysis Section A-A' is located near the southwestern corner of Lake A, where a new fill berm will separate Lake A from ADV during periods of extreme high water in Lake A. Our seepage analysis Section

E-E' is located at the proposed infiltration bed near the southeastern corner of Lake A. The infiltration bed will divert up to 500 cfs from ADV into Lake A via an outlet pipe below the infiltration bed. The berm will separate the infiltration bed area from Lake A watershed.

We evaluated seepage conditions in the proposed berm using the computer program *SEEP/W* (Geo-Slope International). Our analysis incorporated soil hydraulic conductivity parameters from our study for the ADV realignment (see List of References) and soil lithology from past studies by others for Lake A. *SEEP/W* output for Sections A-A' and E-E' are presented as Figures G1 and G2, respectively. Our analysis indicates that adverse seepage conditions are not anticipated along the proposed berm at Lake A.

8. RECOMMENDATIONS

8.1 Fill Slope Geometry

Fill slopes for the proposed ADV berms, the embankment between Silt Pond C and Silt Pond D, the embankment for overburden and silt storage at the east end of Lake B, and the shark's fin embankment should be constructed at an inclination of 2:1 or flatter. Mid-height bench(es) should be considered for fill slopes exceeding 50 feet in height to provide access for slope maintenance.

8.2 Fill Materials

The proposed source of fill materials for the proposed ADV berms, the embankment between Silt Pond C and Silt Pond D, the embankment for overburden and silt storage at the east end of Lake B, and the shark's fin embankment had not been identified at the time of this report. Based on our study for the ADV realignment and recent discussions with CEMEX, the predominantly clayey materials from previously-identified borrow areas will be used as fill for the berms and embankment. We expect variability in the borrow materials and, therefore, periodic sampling and laboratory testing should be performed to verify that the following properties outlined in Tables 8.2A and 8.3A are met.

TABLE 8.2A
RECOMMENDED PROPERTIES FOR FILL – ADV BERMS AT LAKE A

Property / Parameter		Requirement
Percent Sand (between No. 4 and No. 200 Sieves)		25% Minimum
Percent Fines (Silt/Clay) (Finer than No. 200 Sieve)		10% Minimum
Liquid Limit		50 Maximum
Plasticity Index		7 Minimum, 25 Maximum
Acceptable USCS Soil Classifications		CL, SC, SC-SM, GC, GW-GC
Total Unit Weight (at 90% relative compaction)		120 pcf Minimum
Effective Cohesion, C	Saturated Conditions	150 pcf
Effective Friction Angle, Ø		23°
Saturated Hydraulic Conductivity		1 x 10^{-4} cm/sec (or slower)

TABLE 8.2B
RECOMMENDED PROPERTIES FOR FILL – LAKE B NORTH EMBANKMENT, LAKE B OVERBURDEN/SILT STORAGE EMBANKMENT AND SEPARATION EMBANKMENT BETWEEN SILT POND C AND SILT POND D

Property / Parameter		Requirement
Percent Sand (between No. 4 and No. 200 Sieves)		25% Minimum
Percent Fines (Silt/Clay) (Finer than No. 200 Sieve)		10% Minimum
Liquid Limit		50 Maximum
Plasticity Index		7 Minimum, 25 Maximum
Acceptable USCS Soil Classifications		CL, SC, SC-SM, GC, GW-GC
Total Unit Weight (at 95% relative compaction)		130 pcf Minimum
Effective Cohesion, C	Drained Conditions	200 pcf
Effective Friction Angle, Ø		36°
Saturated Hydraulic Conductivity		1 x 10^{-4} cm/sec (or slower)

8.3 Wet Weather Grading Considerations

If grading occurs in winter or spring, surface soils will likely be wet. The contractor should be aware of the moisture sensitivity of clayey and fine-grained soils and potential compaction/workability difficulties.

Earthwork operations in wet weather conditions will likely be difficult with low productivity. Often, a period of at least one month of warm and dry weather is necessary to allow the site to dry sufficiently so that heavy grading equipment can operate effectively. Conversely, during dry summer and fall months, dry clay soils may require additional grading effort (discing or other means) to attain proper moisture conditioning.

In-situ moisture content of the “clay” and “silt” soil is significantly higher than optimum moisture content. Due to the fine-grained nature of the soils and in-situ moisture contents well above optimum, additional drying effort to attain moisture contents suitable for compaction should be anticipated regardless of the time of year.

8.4 Berm and Embankment Grading

8.4.1 All earthwork operations should be observed and all fills tested for recommended compaction and moisture content by a representative of our firm. References to relative compaction and optimum moisture content in this report are based on the American Society for Testing and Materials (ASTM) D1557 Test Procedure, latest edition.

8.4.2 Prior to commencing grading, a pre-construction conference with representatives from CEMEX, the grading contractor, and Geocon should be held at the site. Site preparation, soil handling and/or the grading plans should be discussed at the pre-construction conference.

8.4.3 Prior to commencing grading within embankment and slope areas, surface vegetation should be removed by stripping to a sufficient depth to remove roots and organic-rich topsoil. We estimate stripping depth will be on the order of 2 to 4 inches. Material generated during stripping is not suitable for use as embankment or reclamation slope fill but may be stockpiled for future use as topsoil. Any existing trees and associated root systems should be removed. Roots larger than 1 inch in diameter should be completely removed. Smaller roots may be left in-place as conditions warrant and at the discretion of our field representative.

8.4.5 To increase stability and to provide a stable foundation for the berm embankments, the full length of the embankments should be provided with embankment-width keyways. The keyways should have a minimum embedment depth of 3 feet into firm, competent, undisturbed soil. The actual depth of the keyway should be evaluated during construction by a Geocon representative. Keyway back-slopes should be no flatter than 1:1.

8.4.6 In general, where fill is placed on sloping ground steeper than 5H:1V, the fill should be benched into the adjacent native materials as the fill is placed. Benches should roughly parallel slope contours and extend at least 2 feet into competent material. In addition, a keyway should be cut into the slope at the base of the fill. In general, keyways should be at least 15 feet wide and extend at least 2 feet into competent material. Bench and keyway criteria may need revision during construction based on the actual materials encountered and grading performed in the field.

8.4.7 Pipe penetrations through the planned berms and embankments should be avoided. If pipe penetrations are unavoidable, we recommend providing concrete cut-off collars at the penetration to reduce potential for seepage. Reinforced concrete cut-off collars should completely encircle the pipe and should be sized such that they are 12 to 18 inches larger than the nominal outside diameter of the pipe. Thickness should be at least 6 inches. Water-tight filler should be used between collars and pipes.

8.4.8 Bottoms of keyways and areas to receive fill should be scarified 12 inches, uniformly moisture-conditioned at or above optimum moisture content and compacted to at least 90% relative compaction. Scarification and recompaction operations should be performed in the presence of a Geocon representative to evaluate performance of the subgrade under compaction equipment loading.

8.4.9 Engineered fill consisting of onsite or approved import materials should be compacted in horizontal lifts not exceeding 8 inches (loose thickness) and brought to final subgrade elevations. Each lift should be moisture-conditioned at or above optimum and compacted to at least 90% relative compaction at least 2% above optimum moisture content. Fills for the eastern Lake B fill embankments and Pond C/D separation be compacted to at least 95% relative compaction above optimum moisture content.

8.4.10 Fill slopes should be built such that soils are uniformly compacted to at least 90% relative compaction at least 2% above optimum moisture content to the finished face of the completed slope. Fill slopes for the eastern Lake B fill embankments and Pond C/D separation should be compacted to at least 95% relative compaction above optimum moisture content.

8.5 Slope Maintenance

As with any slope, slopes along the project alignment will be susceptible to erosion and surficial degradation when exposed to rain and surface runoff. Proper surface drainage facilities directing runoff away from slopes, vegetation, erosion control measures, and best management practice (BMP) devices should be maintained to reduce long-term slope degradation from erosion. Periodic inspections should be performed on a regular basis to identify and address maintenance needs.

Geocon should be contacted to observe erosional features and provide specific maintenance and repair recommendations, as needed. In general, localized slumps deeper than about 2 to 3 feet should be excavated/removed and replaced with engineered fill (compacted to at least 90% relative compaction, or at least 95% relative compaction for the eastern Lake B embankments and Pond C/D separation) that is keyed and benched into the existing, intact slope. Significant erosional features such as deep rills and gullies should be re-graded (smoothed, backfilled, and tracked/compacted). Any repaired areas should be re-vegetated as soon as possible.

9. FURTHER GEOTECHNICAL SERVICES

9.1 Plan and Specification Review

9.1.1 We should review project plans and specifications prior to final design submittal to assess whether our recommendations have been properly implemented and evaluate if additional analysis and/or recommendations are required.

9.2 Testing and Observation Services

9.2.1 The recommendations provided in this report are based on the assumption that we will continue as Geotechnical Engineer of Record throughout the construction phase and provide compaction testing and observation services and foundation observations throughout the project. It is important to maintain continuity of geotechnical interpretation and confirm that field conditions encountered are similar to those anticipated during design. If we are not retained for these services, we cannot assume any responsibility for others interpretation of our recommendations, and therefore the future performance of the project.

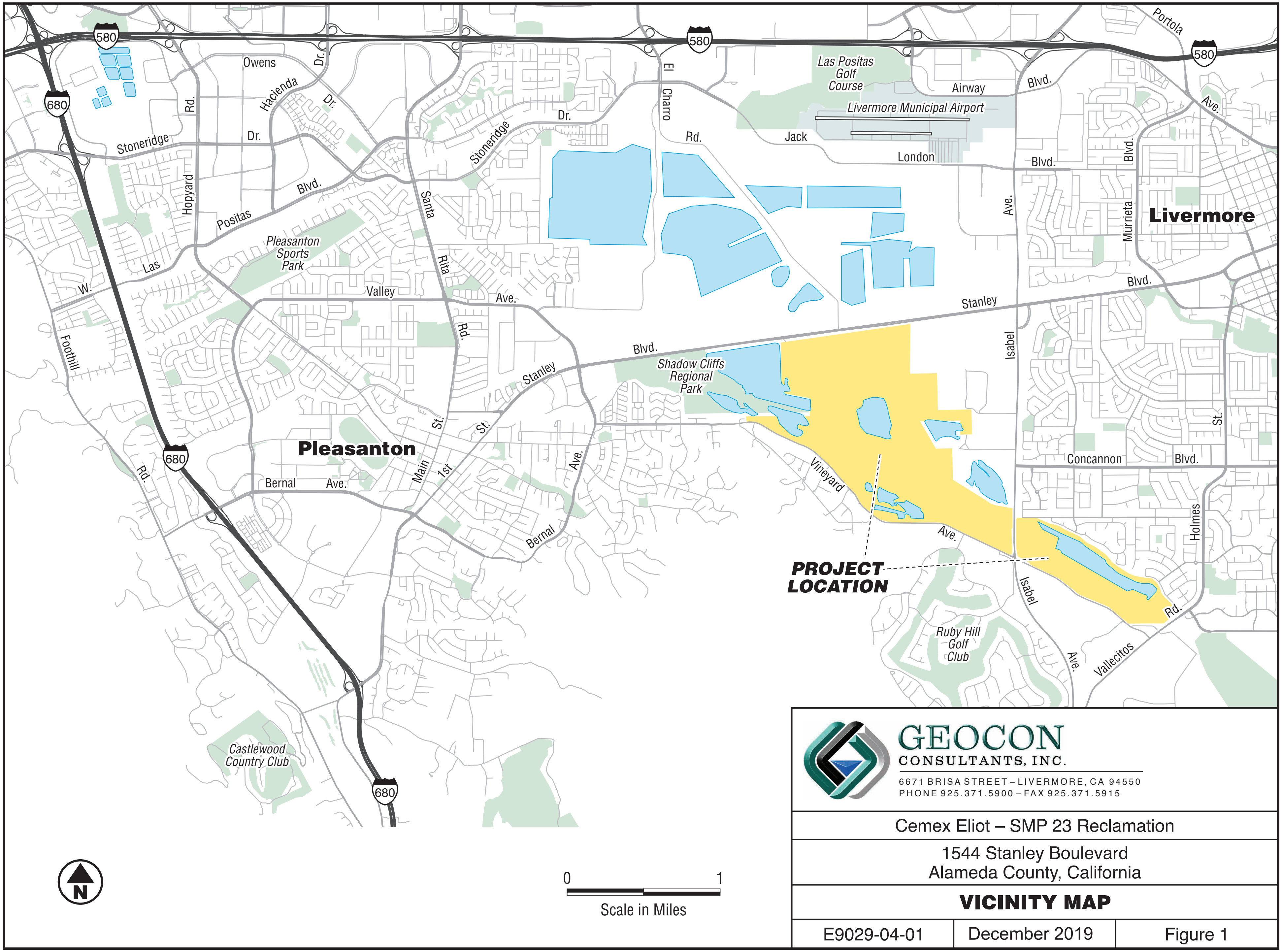
LIMITATIONS AND UNIFORMITY OF CONDITIONS

The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Consultants, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the geotechnical scope of services provided by Geocon Consultants, Inc.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

Our professional services were performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices used in the site area at this time. No warranty is provided, express or implied.



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

Cemex Eliot – SMP 23 Reclamation

1544 Stanley Boulevard
Alameda County, California

VICINITY MAP

E9029-04-01 | December 2019 | Figure 1

Ref: Spinardi Associates Civil and Environmental Engineering, January 2019

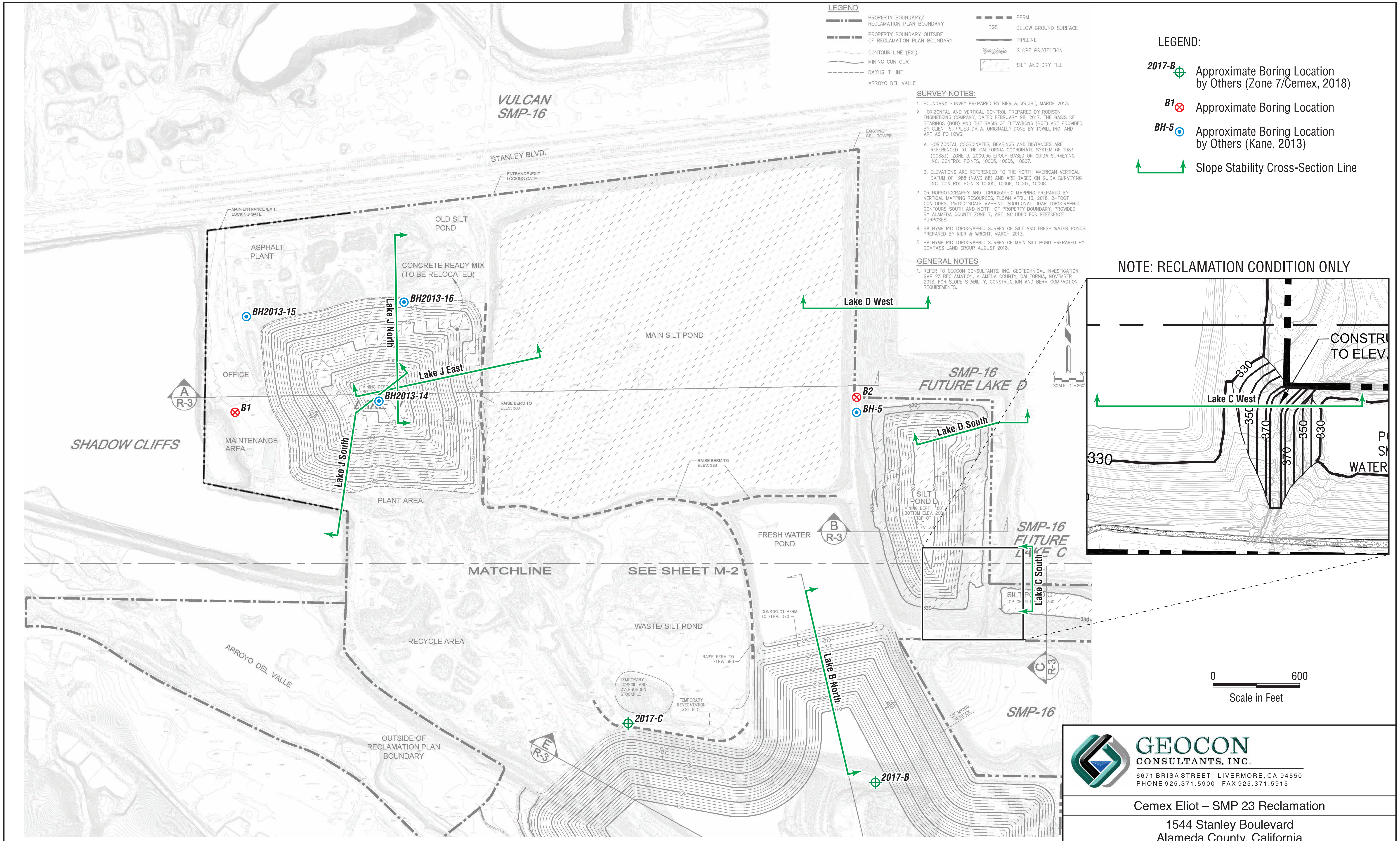
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

Cemex Eliot – SMP 23 Reclamation

1544 Stanley Boulevard
Alameda County, California

SITE PLAN

E9029-04-01
December 2019
Figure 2a



SURVEY NOTES:

1. BOUNDARY SURVEY PREPARED BY KIER & WRIGHT, MARCH 2013.
2. HORIZONTAL AND VERTICAL CONTROL PREPARED BY ROBISON ENGINEERING COMPANY, DATED FEBRUARY 28, 2017. THE BASIS OF BEARINGS (BOB) AND THE BASIS OF ELEVATIONS (BOE) ARE PROVIDED BY CLIENT SUPPLIED DATA, ORIGINALLY DONE BY TOWILL INC. AND ARE AS FOLLOWS:
   A. HORIZONTAL COORDINATES, BEARINGS AND DISTANCES ARE REFERENCED TO THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83), ZONE 3, 2000.35 EPOCH BASED ON GUIDA SURVEYING INC. CONTROL POINTS, 10005, 10006, 10007.
   B. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) AND ARE BASED ON GUIDA SURVEYING INC. CONTROL POINTS 10005, 10006, 10007, 10008.
3. ORTHOPHOTOGRAPHY AND TOPOGRAPHIC MAPPING PREPARED BY VERTICAL MAPPING RESOURCES, FLOWN APRIL 13, 2018, 2-FOOT CONTOURS, 1"=100' SCALE MAPPING. ADDITIONAL LIDAR TOPOGRAPHIC CONTOURS SOUTH AND NORTH OF PROPERTY BOUNDARY, PROVIDED BY ALAMEDA COUNTY ZONE 7, ARE INCLUDED FOR REFERENCE PURPOSES.
4. BATHYMETRIC TOPOGRAPHIC SURVEY OF SILT AND FRESH WATER PONDS PREPARED BY KIER & WRIGHT, MARCH 2013.
5. BATHYMETRIC TOPOGRAPHIC SURVEY OF MAIN SILT POND PREPARED BY COMPASS LAND GROUP AUGUST 2018.

GENERAL NOTES

1. REFER TO GEOCON CONSULTANTS, INC. GEOTECHNICAL INVESTIGATION, SMP 23 RECLAMATION, ALAMEDA COUNTY, CALIFORNIA, NOVEMBER 2018. FOR SLOPE STABILITY, CONSTRUCTION AND BERM COMPACTION REQUIREMENTS.

Ref: Spinardi Associates Civil and Environmental Engineering, January 2019

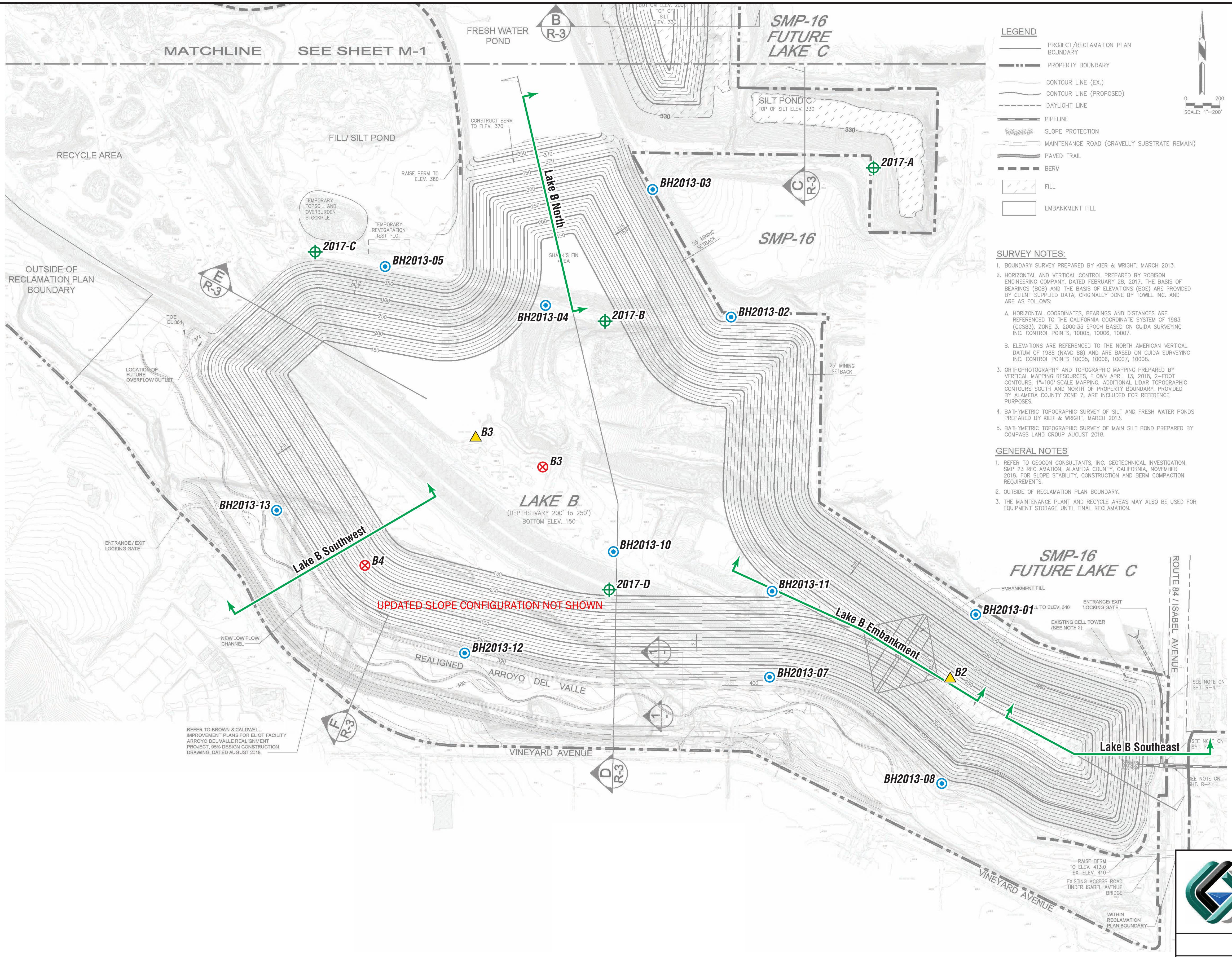
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

Cemex Eliot – SMP 23 Reclamation

1544 Stanley Boulevard
Alameda County, California

Site Plan – North Area Reclamation

E9029-04-01	December 2019	Figure 2b



SURVEY NOTES:

1. BOUNDARY SURVEY PREPARED BY KIER & WRIGHT, MARCH 2013.
2. HORIZONTAL AND VERTICAL CONTROL PREPARED BY ROBISON ENGINEERING COMPANY, DATED FEBRUARY 28, 2017. THE BASIS OF BEARINGS (BOB) AND THE BASIS OF ELEVATIONS (BOE) ARE PROVIDED BY CLIENT SUPPLIED DATA, ORIGINALLY DONE BY TOWILL INC. AND ARE AS FOLLOWS:
   - A. HORIZONTAL COORDINATES, BEARINGS AND DISTANCES ARE REFERENCED TO THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83), ZONE 3, 2000.35 EPOCH BASED ON GUIDA SURVEYING INC. CONTROL POINTS, 10005, 10006, 10007.
   - B. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) AND ARE BASED ON GUIDA SURVEYING INC. CONTROL POINTS 10005, 10006, 10007, 10008.
3. ORTHOPHOTOGRAPHY AND TOPOGRAPHIC MAPPING PREPARED BY VERTICAL MAPPING RESOURCES, FLOWN APRIL 13, 2018, 2–FOOT CONTOURS, 1"=100' SCALE MAPPING. ADDITIONAL LIDAR TOPOGRAPHIC CONTOURS SOUTH AND NORTH OF PROPERTY BOUNDARY, PROVIDED BY ALAMEDA COUNTY ZONE 7, ARE INCLUDED FOR REFERENCE PURPOSES.
4. BATHYMETRIC TOPOGRAPHIC SURVEY OF SILT AND FRESH WATER PONDS PREPARED BY KIER & WRIGHT, MARCH 2013.
5. BATHYMETRIC TOPOGRAPHIC SURVEY OF MAIN SILT POND PREPARED BY COMPASS LAND GROUP AUGUST 2018.

GENERAL NOTES

1. REFER TO GEOCON CONSULTANTS, INC. GEOTECHNICAL INVESTIGATION, SMP 23 RECLAMATION, ALAMEDA COUNTY, CALIFORNIA, NOVEMBER 2018. FOR SLOPE STABILITY, CONSTRUCTION AND BERM COMPACTION REQUIREMENTS.
2. OUTSIDE OF RECLAMATION PLAN BOUNDARY.
3. THE MAINTENANCE PLANT AND RECYCLE AREAS MAY ALSO BE USED FOR EQUIPMENT STORAGE UNTIL FINAL RECLAMATION.

LEGEND:

2017-B ⊕	Approximate Boring Location by Others (Zone 7/Cemex, 2018)
B1 ⊗	Approximate Boring Location
BH2013-01 ⊙	Approximate Boring Location by Others (Kane, 2013)
B2 ▲	Approximate Boring Location by Others (Berlogar, 2012)
↑—↑	Slope Stability Cross-Section Line

0 600
Scale in Feet

Ref: Spinardi Associates Civil and Environmental Engineering, December 2018

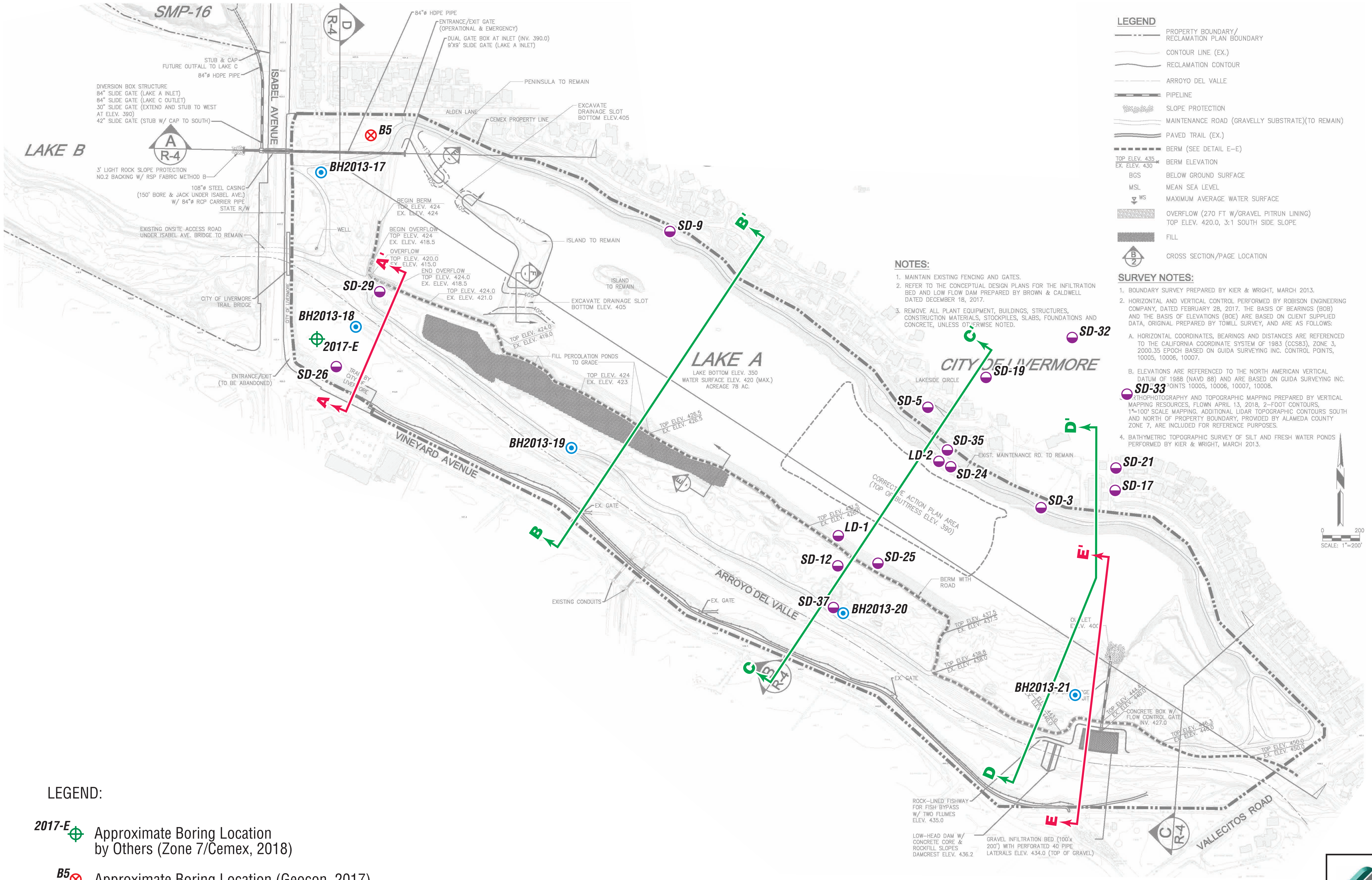
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

Cemex Eliot – SMP 23 Reclamation

1544 Stanley Boulevard
Alameda County, California

Site Plan – Lake B Reclamation

E9029-04-01	December 2019	Figure 2c



Ref: Spinardi Associates, January 2019

LEGEND:

2017-E ⊕ Approximate Boring Location by Others (Zone 7/Cemex, 2018)

B5 ⊗ Approximate Boring Location (Geocon, 2017)

BH2013-21 ⊙ Approximate Boring Location (Kane, 2013)

SD-33 ◒ Approximate Boring Location (CSA, 2004-2005)

B — B' Slope Stability Cross-Section Line

A — A' Approximate Seepage Cross-Section Line

0 600
Scale in Feet

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

Cemex Eliot – SMP 23 Reclamation

1544 Stanley Boulevard
Alameda County, California

Site Plan – Lake A Reclamation

E9029-04-01	December 2019	Figure 2d

APPENDIX A
FIELD EXPLORATION

Fieldwork for our investigation included site visits, slope logging, subsurface exploration, and soil sampling. The locations of our exploratory borings are shown on Figures 2b through 2d. Soil boring logs for our exploration are presented as figures following the text in this appendix. The borings were located by pacing from existing reference points. Therefore, the exploration locations shown on Figures 2b through 2d are approximate.

Our field exploration included drilling of five exploratory soil borings to maximum depths of approximately 150 ½ feet below the existing ground surface utilizing a truck-mounted BK-81 drill rig equipped with 8-inch hollow-stem augers and mud-rotary drilling equipment. Sampling in the borings was accomplished using a down-hole wire-line 140-pound hammer with a 30-inch drop. Samples were obtained with a 3-inch outside-diameter (OD), split spoon (California Modified) sampler, and a 2-inch OD, Standard Penetration Test (SPT) sampler. The number of blows required to drive the sampler the last 12 inches (or fraction thereof) of the 18-inch sampling interval were recorded on the boring logs. The blow counts shown on the boring logs should not be interpreted as standard SPT "N" values; corrections have not been applied.

Subsequent to our soil boring program in 2017, CEMEX and Zone 7 Water Agency partnered for a subsurface exploration that consisted of five pairs of deep soil borings advanced with sonic drilling equipment and mud-rotary drilling equipment in 2018. One pair of borings was performed near the northeast corner of the intersection of Isabel Avenue and Vineyard Avenue. The other borings were located within or near the planned footprint of Lake B. A Geocon geologist was onsite to log the cuttings generated during mud-rotary drilling, and to coordinate drilling activities and borehole grouting inspections. Soil samples were not obtained. Logs of those mud-rotary borings, based on the soils observed in the drilling cuttings, are included at the end of this appendix.

Subsurface conditions encountered in the exploratory borings were visually examined, classified and logged in general accordance with the American Society for Testing and Materials (ASTM) Practice for Description and Identification of Soils (Visual-Manual Procedure D2488). This system uses the Unified Soil Classification System (USCS) for soil designations. The log depicts soil and geologic conditions encountered and depths at which samples were obtained. The log also includes our interpretation of the conditions between sampling intervals. Therefore, the logs contain both observed and interpreted data. We determined the lines designating the interface between soil materials on the logs using visual observations, drill rig penetration rates, excavation characteristics and other factors. The transition between materials may be abrupt or gradual. Where applicable, the field logs were revised based on subsequent laboratory testing.

Upon completion, our exploratory borings were backfilled in accordance with the requirements of our drilling permit from Zone 7 Water Agency.

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISIONS			TYPICAL NAMES	
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	**GRAVELS** MORE THAN HALF COARSE FRACTION IS LARGER THAN NO.4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC	CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO.4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS WITH OR WITHOUT GRAVEL
			SC	CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	**SILTS AND CLAYS** LIQUID LIMIT 50% OR LESS		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL	ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
	HIGHLY ORGANIC SOILS		PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

BORING/TRENCH LOG LEGEND

- ▯ — No Recovery
- ▥ — Shelby Tube Sample
- ⊠ — Bulk Sample
- ◧ — SPT Sample
- ■ — Modified California Sample
- ▼ — Groundwater Level (At Completion)
- ▽ — Groundwater Level (Seepage)

PENETRATION RESISTANCE

SAND AND GRAVEL			SILT AND CLAY			
RELATIVE DENSITY	BLOWS PER FOOT (SPT)*	BLOWS PER FOOT (MOD-CAL)*	CONSISTENCY	BLOWS PER FOOT (SPT)*	BLOWS PER FOOT (MOD-CAL)*	COMPRESSIVE STRENGTH (tsf)
VERY LOOSE	0 - 4	0 - 6	VERY SOFT	0 - 2	0 - 3	0 - 0.25
LOOSE	5 - 10	7 - 16	SOFT	3 - 4	4 - 6	0.25 - 0.50
MEDIUM DENSE	11 - 30	17 - 48	MEDIUM STIFF	5 - 8	7 - 13	0.50 - 1.0
DENSE	31 - 50	49 - 79	STIFF	9 - 15	14 - 24	1.0 - 2.0
VERY DENSE	OVER 50	OVER 79	VERY STIFF	16 - 30	25 - 48	2.0 - 4.0
			HARD	OVER 30	OVER 48	OVER 4.0

*NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE LAST 12 INCHES OF AN 18-INCH DRIVE

MOISTURE DESCRIPTIONS

FIELD TEST	APPROX. DEGREE OF SATURATION, S (%)	DESCRIPTION
NO INDICATION OF MOISTURE; DRY TO THE TOUCH	S<25	DRY
SLIGHT INDICATION OF MOISTURE	25≤S<50	DAMP
INDICATION OF MOISTURE; NO VISIBLE WATER	50≤S<75	MOIST
MINOR VISIBLE FREE WATER	75≤S<100	WET
VISIBLE FREE WATER	100	SATURATED

QUANTITY DESCRIPTIONS

APPROX. ESTIMATED PERCENT	DESCRIPTION
<5%	TRACE
5 - 10%	FEW
11 - 25%	LITTLE
26 - 50%	SOME
>50%	MOSTLY

GRAVEL/COBBLE/BOULDER DESCRIPTIONS

CRITERIA	DESCRIPTION
PASS THROUGH A 3-INCH SIEVE AND BE RETAINED ON A NO. 4 SIEVE (#4 TO 3")	GRAVEL
PASS A 12-INCH SQUARE OPENING AND BE RETAINED ON A 3-INCH SIEVE (3"-12")	COBBLE
WILL NOT PASS A 12-INCH SQUARE OPENING (>12")	BOULDER

BEDDING SPACING DESCRIPTIONS

THICKNESS/SPACING	DESCRIPTOR
GREATER THAN 10 FEET	MASSIVE
3 TO 10 FEET	VERY THICKLY BEDDED
1 TO 3 FEET	THICKLY BEDDED
3 ⅝-INCH TO 1 FOOT	MODERATELY BEDDED
1 ¼-INCH TO 3 ⅝-INCH	THINLY BEDDED
⅜-INCH TO 1 ¼-INCH	VERY THINLY BEDDED
LESS THAN ⅜-INCH	LAMINATED

STRUCTURE DESCRIPTIONS

CRITERIA	DESCRIPTION
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS AT LEAST ¼-INCH THICK	STRATIFIED
ALTERNATING LAYERS OF VARYING MATERIAL OR COLOR WITH LAYERS LESS THAN ¼-INCH THICK	LAMINATED
BREAKS ALONG DEFINITE PLANES OF FRACTURE WITH LITTLE RESISTANCE TO FRACTURING	FISSURED
FRACTURE PLANES APPEAR POLISHED OR GLOSSY, SOMETIMES STRIATED	SLICKENSIDED
COHESIVE SOIL THAT CAN BE BROKEN DOWN INTO SMALLER ANGULAR LUMPS WHICH RESIST FURTHER BREAKDOWN	BLOCKY
INCLUSION OF SMALL POCKETS OF DIFFERENT SOIL, SUCH AS SMALL LENSES OF SAND SCATTERED THROUGH A MASS OF CLAY	LENSED
SAME COLOR AND MATERIAL THROUGHOUT	HOMOGENOUS

CEMENTATION/INDURATION DESCRIPTIONS

FIELD TEST	DESCRIPTION
CRUMBLES OR BREAKS WITH HANDLING OR LITTLE FINGER PRESSURE	WEAKLY CEMENTED/INDURATED
CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE	MODERATELY CEMENTED/INDURATED
WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE	STRONGLY CEMENTED/INDURATED

IGNEOUS/METAMORPHIC ROCK STRENGTH DESCRIPTIONS

FIELD TEST	DESCRIPTION
MATERIAL CRUMBLES WITH BARE HAND	WEAK
MATERIAL CRUMBLES UNDER BLOWS FROM GEOLOGY HAMMER	MODERATELY WEAK
⅛-INCH INDENTATIONS WITH SHARP END FROM GEOLOGY HAMMER	MODERATELY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **ONE** BLOW FROM GEOLOGY HAMMER	STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **COUPLE** BLOWS FROM GEOLOGY HAMMER	VERY STRONG
HAND-HELD SPECIMEN CAN BE BROKEN WITH **MANY** BLOWS FROM GEOLOGY HAMMER	EXTREMELY STRONG

IGNEOUS/METAMORPHIC ROCK WEATHERING DESCRIPTIONS

DEGREE OF DECOMPOSITION	FIELD RECOGNITION	ENGINEERING PROPERTIES
SOIL	DISCOLORED, CHANGED TO SOIL, FABRIC DESTROYED	EASY TO DIG
COMPLETELY WEATHERED	DISCOLORED, CHANGED TO SOIL, FABRIC MAINLY PRESERVED	EXCAVATED BY HAND OR RIPPING (Saprolite)
HIGHLY WEATHERED	DISCOLORED, HIGHLY FRACTURED, FABRIC ALTERED AROUND FRACTURES	EXCAVATED BY HAND OR RIPPING, WITH SLIGHT DIFFICULTY
MODERATELY WEATHERED	DISCOLORED, FRACTURES, INTACT ROCK-NOTICEABLY WEAKER THAN FRESH ROCK	EXCAVATED WITH DIFFICULTY WITHOUT EXPLOSIVES
SLIGHTLY WEATHERED	MAY BE DISCOLORED, SOME FRACTURES, INTACT ROCK-NOT NOTICEABLY WEAKER THAN FRESH ROCK	REQUIRES EXPLOSIVES FOR EXCAVATION, WITH PERMEABLE JOINTS AND FRACTURES
FRESH	NO DISCOLORATION, OR LOSS OF STRENGTH	REQUIRES EXPLOSIVES

IGNEOUS/METAMORPHIC ROCK JOINT/FRACTURE DESCRIPTIONS

FIELD TEST	DESCRIPTION
NO OBSERVED FRACTURES	UNFRACTURED/UNJOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1 TO 3 FOOT INTERVALS	SLIGHTLY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 4-INCH TO 1 FOOT INTERVALS	MODERATELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT 1-INCH TO 4-INCH INTERVALS WITH SCATTERED FRAGMENTED INTERVALS	INTENSELY FRACTURED/JOINTED
MAJORITY OF JOINTS/FRACTURES SPACED AT LESS THAN 1-INCH INTERVALS; MOSTLY RECOVERED AS CHIPS AND FRAGMENTS	VERY INTENSELY FRACTURED/JOINTED

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

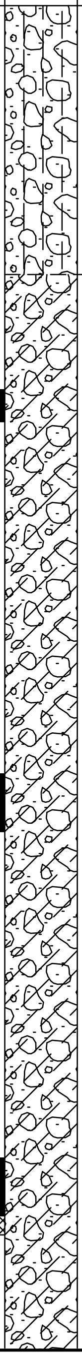
KEY TO LOGS

FIGURE A1

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B1

ELEV. (MSL.) **383**
DATE COMPLETED **10/27/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**



DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			GM	FILL Very dense, dry, brown, Silty (f-c) sub-angular to sub-rounded GRAVEL with (f-c) sand			
1							
2							
3							
4							
5							
6							
7			GC	Very dense, dry, dark brown, Clayey (f-c) sub-angular to sub-rounded GRAVEL with (f-c) sand			
8							
9							
10	■ B1-10						
11					50/4"		
12							
13							
14							
15							
16							
17							
18							
19							
20	■ B1-20						
21				-dense, brown to gray-brown	40		
22							
23							
24							
25							
26							
27							
28							
29							
30	■ B1-30						
31	■ B1-30.5			-medium dense, damp, varicolored, gravels (f-c) angular to sub-rounded, with AC fragments	39		
32	☒ B1-31 B1-31.5						
33							
34							

Figure A2, Log of Boring B1, page 1 of 4

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B1

ELEV. (MSL.) **383**
DATE COMPLETED **10/27/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
35								
36								
37								
38								
39				GW	ALLUVIUM Medium dense, moist, gray, (f-c) Sandy (f-c) GRAVEL			
40	■ B1-40 B1-40.5 B1-41							
41						44		
42								
43								
44								
45								
46				GM	Medium dense, damp, light olive brown, Silty (f-m) Sandy (f-c) angular to sub-rounded GRAVEL -clasts of strongly cemented olive-brown (f) sandstone, and strong olive-brown chert, quartz, and quartzite			
47								
48								
49								
50	■▨ B1-50							
51						22		
52								
53								
54								
55								
56								
57								
58			▼					
59								
60	■▨ B1-60							
61						57		
62								
63								
64								
65								
66								
67				GW-GC	Very dense, light yellow-brown and varicolored, (f-c) Sandy (f-c) sub-rounded GRAVEL with few clays -dark lithics, strong greywacke, dark green-gray and blue-gray very strong metabasalt, quartz, green-gray chert with white quartz veins			
68								
69								

Figure A2, Log of Boring B1, page 2 of 4

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B1

ELEV. (MSL.) **383**
DATE COMPLETED **10/27/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
70	B1-70							
71						50/6"		
72								
73								
74								
75	B1-75				-dark lithics (75-80%), red and yellow and green chert (10-15%), with trace weak siltstone (1%)			
76								
77								
78								
79								
80					-gravels (f-c)	50/4"		
81						50/3"		
82								
83								
84								
85	B1-85							
86								
87								
88								
89								
90	B1-90				-brown and varicolored, gravels (f-c) angular to sub-rounded -clasts of weak dark brown siltstone -strong to very strong dark lithics (90%), white quartz (10%), yellow chert (<1%)			
91						50/4"		
92	B1-92							
93								
94								
95								
96								
97				CL-ML	Very stiff, moist, light yellow-brown with strong brown and black, Sandy SILT			
98	B1-98							
99	B1-98.5					46	109.5	20.7
100	B1-99 B1-99.5							
101								
102								
103								
104								

Figure A2, Log of Boring B1, page 3 of 4

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

BORING B1

ELEV. (MSL.) **383**
DATE COMPLETED **10/27/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
105	☒ B1-105			GW-GC	Very dense, (f-c) Sandy (f-c) sub-angular to sub-rounded GRAVEL with few clays			
106								
107								
108								
109								
110	■ B1-110							
111						50/5"		
112	☒ B1-112-114							
113								
114								
115	☒ B1-115				-lithic fragments (75%); metabasalt (aphanitic), granitics (fine to very fine), ultramafic (black, olive, very fine) -clear and white and smokey quartz (15-20%) -red chert (1-2%) -red scoria (<1%) -other (3%)			
116								
117								
118								
119	☒ B1-119-120							
120								

END OF BORING AT APPROXIMATELY 120 FEET
GROUNDWATER ENCOUNTERED AT APPROXIMATELY 58 FEET
BACKFILLED WITH GROUT VIA TREMIE

Figure A2, Log of Boring B1, page 4 of 4

GEOCON

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B2

ELEV. (MSL.) **390**

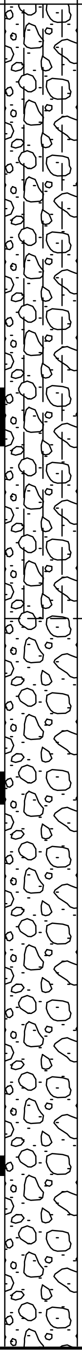
DATE COMPLETED **10/23/2017**

ENG./GEO. **JP**

DRILLER **V&W**

EQUIPMENT **BK81 w/ 8-inch HSA**

HAMMER TYPE **Downhole-Wireline**



DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0			GM	Dense, dry, brown, Silty (f-c) GRAVEL with (f-c) sand and trace cobbles and boulders			
2				-no cobbles and boulders			
6				-less silt			
11	B2-10.5 B2-11				79		
16			GW	Very dense, dry, brown and gray, (f-c) GRAVEL with (f-c) sand			
20	B2-20 B2-20.3				50/4"		
30	B2-30			-with trace fines	50/6"	116.2	6.5

Figure A3, Log of Boring B2, page 1 of 3

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

BORING B2

ELEV. (MSL.) **390**　　DATE COMPLETED **10/23/2017**
ENG./GEO. **JP**　　DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA**　　HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
35							
36							
37				-less sand, gravels (f-c) sub-angular to sub-rounded			
38							
39							
40	B2-40 ■☒		GM	Very dense, dry, brown, Silty (f-c) sub-angular to sub-rounded GRAVEL with (f-c) sand -clasts of chert, quartz, quartzite, slate, graywacke	59		
41							
42							
43							
44				-gravels (f-c), with trace clay			
45							
46			GW	Very dense, dry, brown, Sandy (f-c) GRAVEL			
47							
48							
49							
50	B2-50 ■ B2-50.5 ☒		GC	Very dense, dry, brown, Clayey (f-c) GRAVEL with (f-c) sand	50/6"		
51							
52							
53							
54							
55							
56							
57							
58							
59							
60	B2-60 ■			-sub-rounded to rounded gravels	57		
61							
62							
63							
64							
65							
66							
67							
68							
69							

Figure A3, Log of Boring B2, page 2 of 3

GEOCON

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ☒ ... DISTURBED OR BAG SAMPLE
- ◩ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B2

ELEV. (MSL.) **390**
DATE COMPLETED **10/23/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
70	B2-70				-yellow-brown, sub-angular to sub-rounded gravels	50/6"		
71	B2-70.5				-strong chert, weak siltstone, quartz, and sandstone	50/4"		
72	B2-70.7							
73								
74								
75			▼					
76								
77								
78								
79				CL	Very stiff, damp, yellow-brown, CLAY			
80	B2-80							
81						25		

END OF BORING AT APPROXIMATELY 81½ FEET
GROUNDWATER INITIALLY ENCOUNTERED AT 75 FEET
BACKFILLED WITH GROUT VIA TREMIE

Figure A3, Log of Boring B2, page 3 of 3

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B3

ELEV. (MSL.) **300**
DATE COMPLETED **10/30/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	Very stiff, damp, dark yellow-brown, CLAY			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11	B3-10.5 B3-11 B3-11.5				-dark yellow-brown with trace gray-brown vertical stringers and black mottling -blocky soil structure	30	113.5	14.7
12								
13								
14								
15								
16								
17								
18								
19								
20	B3-20			GC	Very dense, damp, strong brown mottle black, Clayey (f-c) GRAVEL with (f-c) sand -clasts are decomposed brown siltstone and diorite and strong to very strong sub-rounded to rounded brown sandstone	50/5"		
21								
22								
23								
24								
25								
26								
27								
28								
29								
30	B3-30		▼					
31					-wet, yellow-brown, more sand	50/6"		14.8
32								
33								
34								

Figure A4, Log of Boring B3, page 1 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

BORING B3

ELEV. (MSL.) **300**
DATE COMPLETED **10/30/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
35								
36								
37								
38								
39								
40	B3-40							
41					-gravels angular to sub-rounded -clasts are strong to very strong silica-rich metamorphics, chert, and quartz	50/6"		
42								
43								
44								
45					-gravel (f)			
46								
47								
48								
49								
50								
51	B3-50.5 B3-51					50/5"		
52								
53								
54								
55								
56								
57								
58								
59								
60	B3-60							
61	B3-60.5				-brown to strong brown, gravels (f-c) angular to sub-rounded -moderately indurated	50/3"		
62								
63								
64								
65								
66								
67								
68								
69				GW	Very dense, wet, (f-c) GRAVEL with (f-c) sand			

Figure A4, Log of Boring B3, page 2 of 5

GEOCON

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B3

ELEV. (MSL.) **300**
DATE COMPLETED **10/30/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
70	B3-70					50/6"		
71	B3-70.5							
72								
73								
74								
75				SW-SM	Very dense, wet, (f) Gravelly (f-c) SAND with few fines			
76								
77								
78								
79								
80	B3-80							
81						50/6"		
82								
83				CL	CLAY			
84								
85	B3-85-90							
86								
87								
88								
89								
90								
91								
92				GC	Very dense, brown, (f-c) Sandy (f-c) angular to sub-rounded GRAVEL with little clay			
93	B3-93							
94								
95								
96								
97	B3-97							
98								
99								
100	B3-100					50/5"		
101	B3-100.5							
102	B3-102							
103								
104								

Figure A4, Log of Boring B3, page 3 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B3

ELEV. (MSL.) **300**
DATE COMPLETED **10/30/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
105	B3-105							
106								
107								
108								
109								
110	B3-110				-gravels (f-c)			
111						50/4"		
112	B3-112							
113								
114								
115								
116	B3-116							
117								
118								
119								
120								
121	B3-120 B3-121					50/2"		
122								
123								
124								
125	B3-125				-cuttings show white and clear quartz, pink feldspar, lithic fragments: granitic, dioritic, mafic to ultramafic (olivine-rich), metabasalt, red chert			
126								
127	B3-127							
128								
129								
130	B3-130					80/6"		
131								
132								
133								
134								
135								
136								
137								
138								
139				GW	Very dense, GRAVEL with cobbles			

Figure A4, Log of Boring B3, page 4 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B3

ELEV. (MSL.) **300**
DATE COMPLETED **10/30/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA & 3.75-inch Mud Rotary**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
140		■				80/3"		
141						50/1"		
142								
143								
144								
145	B3-145	▨						
146								
147	B3-147	▨						
148				GC	Very dense, brown, Clayey GRAVEL with sand			
149								
150		■				90/4"		

END OF BORING AT APPROXIMATELY 150½ FEET
GROUNDWATER INITIALLY ENCOUNTERED AT 30 FEET
BACKFILLED WITH GROUT VIA TREMIE

Figure A4, Log of Boring B3, page 5 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B4

ELEV. (MSL.) **380**
DATE COMPLETED **10/24/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GC	Very dense, dry to damp, brown, Clayey (f-c) sub-angular to sub-rounded GRAVEL with (f-c) sand			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10	B4-10.5 B4-11				-moist, gravels (f-c) sub-rounded	50/6"		
11								
12								
13								
14								
15								
16								
17								
18								
19								
20	B4-20.3 B4-20.8				-gravels angular to sub-rounded -clasts are strong to very strong metasedimentary and metavolcanic rocks including quartzite, metabasalt, chert, and quartz	50/3"		
21								
22								
23								
24								
25								
26								
27								
28								
29								
30	B4-30.3 B4-30.8 B4-31		▼		-with interbedded layer of dark brown (f) sand	50/3" 71		
31								
32								
33								
34								

Figure A5, Log of Boring B4, page 1 of 3

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01**   PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B4

ELEV. (MSL.) **380**   DATE COMPLETED **10/24/2017**

ENG./GEO. **JP**   DRILLER **V&W**

EQUIPMENT **BK81 w/ 8-inch HSA**   HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
35				CL	Very stiff, moist, strong brown, CLAY			
36								
37								
38								
39								
40								
41	B4-40.5 B4-41					27	104.6	21.8
42								
43								
44								
45								
46								
47								
48								
49								
50								
51	B4-50.5 B4-51 B4-51.5				-stiff, light yellow-brown with strong brown and trace black mottling	20	106.5	23.3
52								
53								
54								
55								
56								
57								
58								
59								
60								
61	B4-60 B4-60.5 B4-61 B4-61.5				-same	39	107.4	20.9
62								
63								
64								
65								
66								
67				GW	Very dense, wet, gray-brown, (f) angular to subrounded GRAVEL with (m-c) sand -clasts are quartz, chert, dark metamorphics, including metabasalt and graywacke			
68								
69								

Figure A5, Log of Boring B4, page 2 of 3

GEOCON

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◩ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B4

ELEV. (MSL.) **380**
DATE COMPLETED **10/24/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
70								
71	B4-70.5 B4-71					50/6"		
72								
73								
74								
75								
76								
77								
78								
79								
80	B4-80							
81					-sand (f-c), with silt	50/5"		
82								
83								
84								
85								
86								
87								
88								
89								
90	B4-90							
91					-yellow-brown, gravel (f-c) -clasts are quartz, chert, metabasalt, and some weak sandstone	50/5"		
92								
93								
94								
95								
96								
97								
98								
99				SM	Medium dense, wet, brown, Silty SAND with (f) gravel			
100	B4-100			CL	Very stiff, moist, strong brown with pale brown mottling, CLAY with trace (m-c) sand			
101						52		

END OF BORING AT APPROXIMATELY 101½ FEET
GROUNDWATER INITIALLY ENCOUNTERED AT 30 FEET
BACKFILLED WITH GROUT VIA TREMIE

Figure A5, Log of Boring B4, page 3 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B5

ELEV. (MSL.) **424**
DATE COMPLETED **10/23/2017**
ENG./GEO. **JP**
DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA**
HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GW	Dense to very dense, dry, brown, (f-c) GRAVEL with (f-c) sand and few silts			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10	■ B5-10				-same	50/3"		
11	☒ B5-10.5					50/6"		
12								
13								
14								
15								
16								
17				GC	Very dense, dry to damp, brown, Clayey GRAVEL with sand			
18								
19								
20	■							
21						50/4"		
22								
23								
24								
25								
26								
27								
28								
29								
30				SC	Dense, dry to damp, brown (f-c) SAND with little clay and (f) gravel			
31	■ B5-30.5 B5-31 ☒ B5-31.5					53		
32								
33								
34								

Figure A6, Log of Boring B5, page 1 of 2

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-01** PROJECT NAME: **Cemex Eliot - SMP 23 Reclamation**

BORING B5

ELEV. (MSL.) **424** DATE COMPLETED **10/23/2017**
ENG./GEO. **JP** DRILLER **V&W**
EQUIPMENT **BK81 w/ 8-inch HSA** HAMMER TYPE **Downhole-Wireline**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
35								
36								
37								
38								
39								
40	■ B5-40 B5-41				-very dense, dry, multicolor brown and yellow-brown, gravel (f-c)	50/5"		
					END OF BORING AT APPROXIMATELY 41 FEET NO FREE WATER ENCOUNTERED BACKFILLED WITH GROUT			

Figure A6, Log of Boring B5, page 2 of 2

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

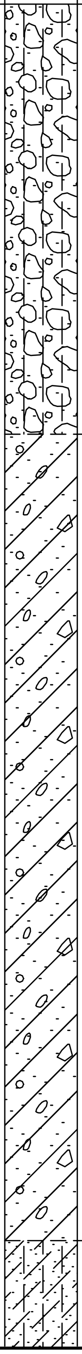
PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-A

ELEV. (MSL.) ____________ DATE COMPLETED **5/24/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GP	Medium dense, damp, Silty GRAVEL with sand and cobbles			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16				GP/GC	Medium dense to dense, moist, brown and gray, Clayey GRAVEL with sand			
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46				ML/CL	Stiff, wet, brown, (f) Sandy SILT/CLAY			
47								
48								
49								

Figure A2, Log of Boring 2017-A, Page 1 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02**　　PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-A

ELEV. (MSL.) ____________
DATE COMPLETED **5/24/2018**
ENG./GEO. **SMD**
DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary**
HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50								
51								
52								
53								
54								
55								
56								
57				GP/GC	Dense, wet, brown and gray, Clayey to Sandy GRAVEL			
58								
59								
60								
61								
62								
63								
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								
75								
76								
77								
78								
79								
80								
81								
82								
83								
84								
85								
86								
87								
88								
89								
90								
91								
92								
93								
94								
95								
96								
97								
98								
99								

Figure A2, Log of Boring 2017-A, Page 2 of 7

GEOCON

SAMPLE SYMBOLS

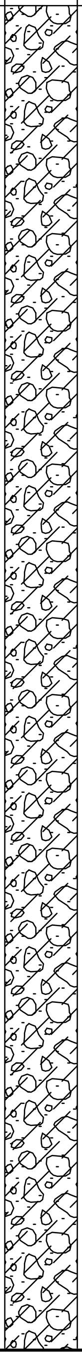
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING 2017-A

ELEV. (MSL.) ____________ DATE COMPLETED **5/24/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100					-producing larger gravel cuttings			
101								
102								
103								
104								
105								
106								
107								
108								
109								
110					-fine gravel and coarse sand cuttings			
111								
112								
113								
114								
115								
116								
117								
118								
119								
120								
121								
122								
123								
124								
125								
126								
127								
128								
129								
130								
131								
132								
133								
134								
135								
136								
137								
138								
139								
140								
141								
142								
143								
144								
145								
146								
147								
148								
149								

Figure A2, Log of Boring 2017-A, Page 3 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-A

ELEV. (MSL.) ____________ DATE COMPLETED **5/24/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
150								
151								
152								
153								
154								
155								
156								
157								
158								
159								
160								
161								
162								
163								
164								
165					-producing larger gravel cuttings			
166				CL	Stiff, wet, brown, CLAY			
167								
168								
169								
170								
171								
172								
173								
174								
175								
176								
177								
178								
179								
180								
181								
182								
183								
184								
185								
186								
187								
188				GP/GC	Dense, wet, brown and gray, Clayey to Sandy GRAVEL			
189								
190								
191								
192								
193								
194								
195								
196								
197								
198								
199								

Figure A2, Log of Boring 2017-A, Page 4 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-A

ELEV. (MSL.) ____________ DATE COMPLETED **5/24/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
200								
201								
202								
203								
204								
205								
206								
207								
208								
209								
210								
211					-with cobbles			
212								
213								
214								
215								
216								
217								
218								
219								
220								
221								
222								
223								
224								
225					-no cobbles			
226								
227								
228								
229								
230								
231								
232								
233								
234								
235					-bumpy, cobbly drilling			
236								
237								
238								
239								
240								
241								
242								
243					-no cobbles			
244								
245								
246								
247								
248								
249								

Figure A2, Log of Boring 2017-A, Page 5 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02**

PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-A

ELEV. (MSL.)

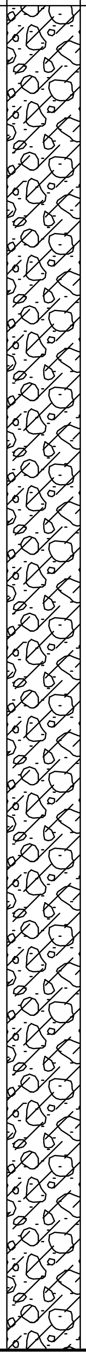
DATE COMPLETED **5/24/2018**

ENG./GEO. **SMD**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
250								
251								
252								
253					-cobbly drilling			
254								
255								
256								
257								
258								
259					-gravelly drilling			
260								
261								
262								
263								
264								
265								
266								
267								
268								
269								
270								
271								
272								
273								
274								
275								
276								
277								
278								
279								
280								
281								
282								
283								
284								
285								
286								
287								
288								
289								
290								
291					-with cobbles and gravel			
292								
293								
294								
295								
296								
297								
298								
299								

Figure A2, Log of Boring 2017-A, Page 6 of 7

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◩ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-A

ELEV. (MSL.) ____________ DATE COMPLETED **5/24/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
300								
301				CL	Stiff, wet, brown, CLAY			
302								
303								
304				GP/GC	Dense, wet, brown and gray Clayey to Sandy GRAVEL			
305								
306								
307								
308								
309								
310								
311								
312								
313								
314								
315								
316								
317								
318								
319								
320								
321								
322								
323								
324								
325								
326								
327					-cobbly drilling			
328								
329					-gravelly drilling			
330								
331								
332								
333								
334								
335					END OF BORING AT APPROXIMATELY 335 FEET BOREHOLE PREPPED FOR GEOPHYSICS			

Figure A2, Log of Boring 2017-A, Page 7 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

☒ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-B

ELEV. (MSL.) ____________

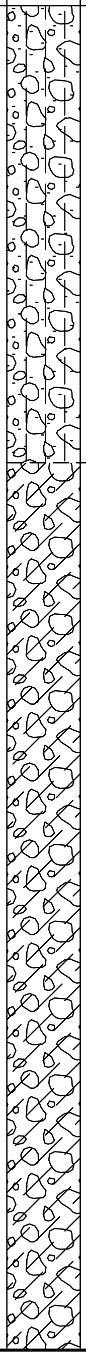
DATE COMPLETED **5/31/2018**

ENG./GEO. **SMD**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GW	Loose, damp to dry, gray, GRAVEL with sand and silt			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17				GC	Medium dense, moist, brown and gray, Clayey GRAVEL			
18								
19								
20								
21								
22								
23								
24					-with coarse sand cuttings			
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								

Figure A3, Log of Boring 2017-B, Page 1 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-B

ELEV. (MSL.) ____________ DATE COMPLETED **5/31/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50								
51								
52								
53								
54								
55								
56								
57								
58								
59								
60								
61								
62				GW/GC	Medium dense, moist, brown and gray, Sandy to Clayey GRAVEL			
63								
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								
75								
76								
77								
78								
79					-cuttings become pea gravel sized			
80								
81								
82								
83								
84								
85								
86								
87								
88								
89					-cobbly drilling begins			
90								
91								
92								
93					-cobbly drilling ends			
94								
95								
96								
97								
98				CL	Stiff, wet, brown, CLAY			
99								

Figure A3, Log of Boring 2017-B, Page 2 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-B

ELEV. (MSL.) ____________ DATE COMPLETED **5/31/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100								
101								
102				GC	Medium dense, wet, brown and gray, Clayey GRAVEL			
103								
104								
105								
106								
107								
108								
109								
110								
111								
112								
113					-cuttings are coarse sand sized			
114								
115								
116								
117								
118								
119								
120								
121								
122								
123								
124								
125								
126								
127								
128								
129								
130								
131								
132								
133								
134								
135								
136								
137								
138								
139								
140								
141								
142								
143								
144								
145								
146								
147								
148								
149								

Figure A3, Log of Boring 2017-B, Page 3 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-B

ELEV. (MSL.) ____________

DATE COMPLETED **5/31/2018**

ENG./GEO. **SMD**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
150								
151								
152								
153								
154								
155								
156								
157				CL	Stiff, wet, brown, CLAY			
158								
159								
160								
161								
162								
163								
164								
165								
166								
167				GC	Medium dense, wet, brown and gray, Clayey GRAVEL			
168								
169								
170								
171								
172								
173								
174								
175								
176								
177								
178								
179								
180								
181								
182								
183								
184								
185								
186								
187								
188								
189								
190								
191								
192								
193								
194								
195								
196								
197								
198								
199								

Figure A3, Log of Boring 2017-B, Page 4 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◩ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-B

ELEV. (MSL.) ____________

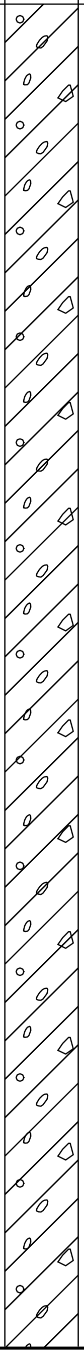
DATE COMPLETED **5/31/2018**

ENG./GEO. **SMD**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
200								
201								
202								
203								
204								
205								
206								
207								
208								
209								
210								
211								
212								
213								
214								
215								
216								
217								
218					-gravelly cuttings			
219								
220								
221								
222								
223								
224								
225								
226								
227								
228								
229								
230								
231								
232								
233								
234								
235								
236								
237								
238								
239								
240								
241								
242								
243								
244								
245								
246								
247								
248								
249								

Figure A3, Log of Boring 2017-B, Page 5 of 7

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-B

ELEV. (MSL.) ____________ DATE COMPLETED **5/31/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
250								
251								
252								
253								
254								
255								
256								
257								
258								
259								
260								
261								
262								
263								
264								
265								
266								
267								
268								
269								
270								
271								
272								
273								
274								
275								
276								
277								
278								
279								
280								
281								
282								
283								
284				CL	Stiff, wet, brown, CLAY			
285								
286								
287				GC				
288								
289								
290								
291								
292								
293								
294								
295				CL	Stiff, wet, brown, CLAY			
296								
297								
298								
299								

Figure A3, Log of Boring 2017-B, Page 6 of 7

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

BORING 2017-B

ELEV. (MSL.) ____________ DATE COMPLETED **5/31/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
300								
301								
302								
303								
304								
305				GC	Medium dense, wet, brown and gray, Clayey GRAVEL			
306								
307								
308								
309								
310								
311								
312								
313								
314								
315								
316								
317								
318								
319								
320								
321								
322								
323								
324								
325								
326								
327								
328								
329								
330								
331								
332								
333					-cobbly drilling			
334								
335								
336								
337								
338								
339								
340								

END OF BORING AT APPROXIMATELY 340 FEET
E LOG PERFORMED TO APPROXIMATELY 333 FEET
BACKFILLED WITH CEMENT GROUT

Figure A3, Log of Boring 2017-B, Page 7 of 7

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-C

ELEV. (MSL.)
DATE COMPLETED **6/22/2018**
ENG./GEO. **SMD**
DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary**
HAMMER TYPE

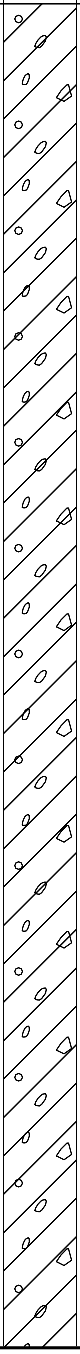
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	Medium stiff, moist, brown, CLAY with gravel			
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14					-stiff, no gravels			
15								
16								
17								
18								
19								
20					-casing installed to approximately 20 feet			
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								

Figure A4, Log of Boring 2017-C, Page 1 of 8

GEOCON

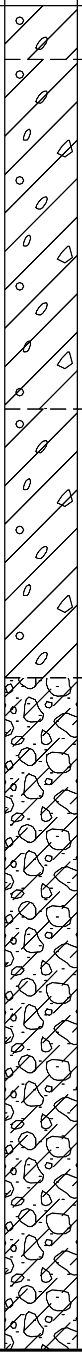
SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING 2017-C

ELEV. (MSL.) ____________
DATE COMPLETED **6/22/2018**
ENG./GEO. **SMD**
DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary**
HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50								
51								
52				GC	Medium dense, moist, brown, Clayey GRAVEL			
53								
54								
55								
56								
57								
58								
59								
60								
61								
62								
63								
64								
65				CL	-more clay cuttings with gravel			
66								
67								
68								
69								
70								
71								
72								
73								
74								
75				GC	Medium dense to dense, wet, brown, Clayey to Sandy GRAVEL			
76								
77								
78								
79								
80								
81								
82								
83								
84								
85								
86								
87								
88								
89								
90								
91								
92								
93								
94								
95								
96								
97								
98								
99								

Figure A4, Log of Boring 2017-C, Page 2 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING 2017-C

ELEV. (MSL.) ____________ DATE COMPLETED **6/22/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100								
101								
102								
103								
104								
105								
106								
107								
108								
109								
110								
111								
112								
113								
114								
115								
116								
117								
118								
119								
120								
121								
122								
123					-brown and gray			
124								
125								
126								
127								
128								
129								
130								
131								
132								
133								
134								
135								
136								
137								
138								
139								
140				CL	Stiff, wet, brown, CLAY			
141								
142								
143								
144								
145								
146								
147								
148								
149								

Figure A4, Log of Boring 2017-C, Page 3 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

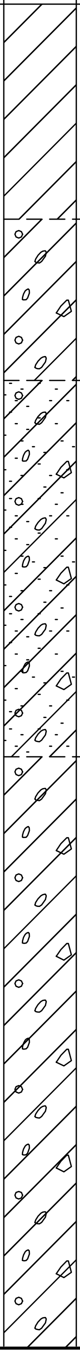
PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-C

ELEV. (MSL.) ____________ DATE COMPLETED **6/22/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
150								
151								
152								
153								
154								
155								
156								
157								
158				GC	Dense, wet, brown and gray, Clayey GRAVEL			
159								
160								
161								
162								
163								
164				CL	Stiff, wet, brown, CLAY with sand and some gravel			
165								
166								
167								
168								
169								
170								
171								
172								
173								
174								
175								
176								
177								
178				GC	Dense, wet, brown and gray, Clayey GRAVEL			
179								
180								
181								
182								
183								
184								
185								
186								
187								
188								
189								
190								
191								
192								
193								
194								
195								
196								
197								
198								
199								

Figure A4, Log of Boring 2017-C, Page 4 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

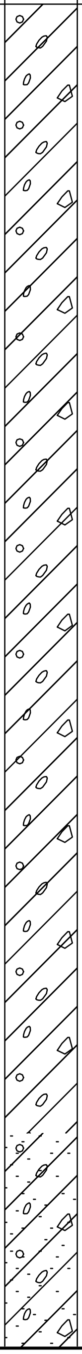
◩ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-C

ELEV. (MSL.) ____________
DATE COMPLETED **6/22/2018**
ENG./GEO. **SMD**
DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary**
HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
200								
201								
202								
203								
204								
205								
206								
207								
208								
209								
210								
211								
212								
213								
214								
215								
216								
217								
218								
219								
220								
221								
222								
223								
224								
225								
226								
227								
228								
229								
230								
231								
232								
233								
234								
235								
236								
237								
238								
239								
240								
241								
242								
243					-with sand			
244								
245								
246								
247								
248								
249								

Figure A4, Log of Boring 2017-C, Page 5 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-C

ELEV. (MSL.) ____________ DATE COMPLETED **6/22/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

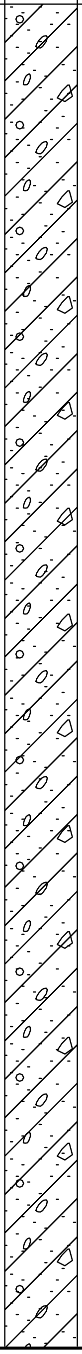
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
250								
251								
252								
253								
254								
255								
256								
257								
258								
259								
260								
261								
262								
263								
264								
265								
266								
267								
268								
269								
270								
271								
272								
273								
274								
275								
276								
277								
278								
279								
280								
281								
282								
283								
284								
285								
286								
287								
288								
289								
290								
291								
292								
293								
294								
295								
296								
297								
298								
299								

Figure A4, Log of Boring 2017-C, Page 6 of 8

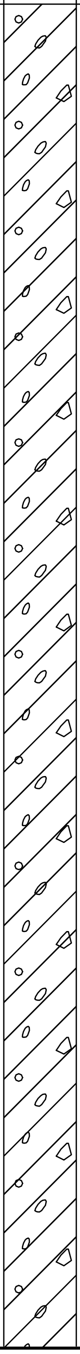
GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

BORING 2017-C

ELEV. (MSL.) ____________ DATE COMPLETED **6/22/2018**
ENG./GEO. **SMD** DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
300					-no sand			
301								
302								
303								
304								
305								
306								
307								
308								
309								
310								
311								
312								
313								
314								
315								
316								
317								
318								
319								
320								
321								
322								
323								
324								
325								
326								
327								
328								
329								
330								
331								
332								
333								
334								
335								
336								
337								
338								
339								
340								
341								
342								
343								
344								
345								
346								
347								
348								
349								

Figure A4, Log of Boring 2017-C, Page 7 of 8

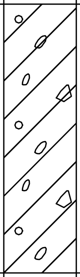
GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING 2017-C

ELEV. (MSL.) ____________
DATE COMPLETED 6/22/2018
ENG./GEO. SMD
DRILLER Cascade
EQUIPMENT Getco 30k, Mud Rotary
HAMMER TYPE ____________



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
350								
351								
352								
353								
354								
355								
356								
357								
358								
359								
360					END OF BORING AT APPROXIMATELY 360 FEET E LOG PERFORMED 6/22/2018 AT APPROXIMATELY 1300 BACKFILLED WITH GROUT 6/25/2018 AT APPROXIMATELY 1400			

Figure A4, Log of Boring 2017-C, Page 8 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-D

ELEV. (MSL.) ____________
ENG./GEO. **SMD**
EQUIPMENT **Getco 30k, Mud Rotary**
DATE COMPLETED **6/27/2018**
DRILLER **Cascade**
HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				GW	Medium dense, damp, gray, GRAVEL with sand and silt			
1								
2								
3				ML	Medium stiff, brown and gray SILT			
4								
5								
6								
7								
8				GC	Loose, moist, brown and gray, Clayey to Sandy GRAVEL			
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								

Figure A5, Log of Boring 2017-D, Page 1 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-D

ELEV. (MSL.) ____________

DATE COMPLETED **6/27/2018**

ENG./GEO. **SMD**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50								
51								
52								
53								
54								
55								
56								
57								
58								
59								
60								
61								
62								
63					-loose to medium dense			
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								
75								
76								
77								
78								
79								
80								
81								
82								
83								
84								
85								
86								
87								
88								
89								
90								
91				CL	Very stiff, wet, brown, Silty CLAY			
92								
93								
94								
95								
96								
97								
98								
99								

Figure A5, Log of Boring 2017-D, Page 2 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

BORING 2017-D

ELEV. (MSL.) ____________ DATE COMPLETED **6/27/2018**
ENG./GEO. **SMD** DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100								
101								
102								
103								
104								
105								
106								
107								
108								
109								
110								
111								
112								
113								
114								
115								
116								
117								
118								
119								
120				GC	Medium dense to dense, wet, brown and gray, Clayey to Sandy GRAVEL			
121								
122								
123								
124								
125								
126								
127								
128								
129								
130								
131								
132								
133								
134								
135								
136								
137								
138								
139								
140								
141								
142								
143								
144								
145								
146								
147								
148								
149								

Figure A5, Log of Boring 2017-D, Page 3 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. **E9029-04-02**　　PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-D

ELEV. (MSL.) ____________

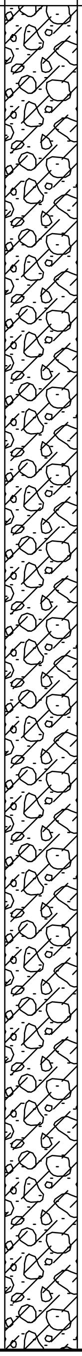
DATE COMPLETED **6/27/2018**

ENG./GEO. **SMD**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
150								
151								
152								
153								
154								
155								
156								
157								
158								
159								
160								
161								
162								
163								
164								
165								
166								
167								
168								
169								
170								
171								
172								
173								
174								
175								
176								
177								
178								
179								
180								
181								
182								
183								
184								
185								
186								
187								
188								
189								
190								
191								
192								
193								
194								
195								
196								
197								
198								
199								

GEOCON

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

BORING 2017-D

ELEV. (MSL.) ____________ DATE COMPLETED **6/27/2018**

ENG./GEO. **SMD** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
200								
201								
202								
203								
204								
205								
206								
207								
208								
209								
210								
211								
212								
213								
214								
215								
216								
217								
218								
219								
220								
221								
222								
223								
224								
225								
226								
227								
228								
229								
230								
231								
232								
233								
234								
235								
236								
237								
238								
239								
240								
241								
242								
243								
244								
245								
246								
247								
248								
249								

Figure A5, Log of Boring 2017-D, Page 5 of 8

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

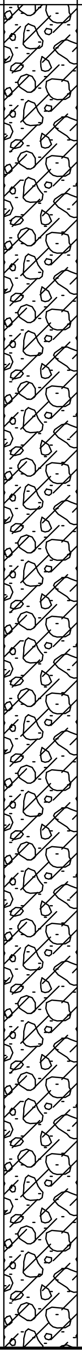
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING 2017-D** ELEV. (MSL.) ____ DATE COMPLETED **6/27/2018** ENG./GEO. **SMD** DRILLER **Cascade** EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
250								
251								
252								
253								
254								
255								
256								
257								
258								
259								
260								
261								
262								
263								
264								
265								
266								
267								
268								
269								
270								
271								
272								
273								
274								
275								
276								
277								
278								
279								
280								
281								
282								
283								
284								
285								
286								
287								
288								
289								
290								
291								
292								
293								
294								
295								
296								
297								
298								
299								

Figure A5, Log of Boring 2017-D, Page 6 of 8

GEOCON

SAMPLE SYMBOLS		
☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING 2017-D

ELEV. (MSL.) ________

DATE COMPLETED **6/27/2018**

ENG./GEO. **SMD**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
300								
301								
302								
303								
304								
305								
306								
307								
308								
309								
310								
311								
312								
313								
314								
315								
316								
317								
318								
319								
320				CL	Stiff, wet, light brown, CLAY			
321								
322								
323								
324								
325								
326								
327								
328								
329								
330				GC	Dense, wet, brown and gray, Clayey to Sandy GRAVEL			
331								
332								
333								
334								
335								
336								
337								
338								
339								
340								
341								
342								
343								
344								
345								
346								
347								
348								
349								

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING 2017-D

ELEV. (MSL.)
DATE COMPLETED **6/27/2018**
ENG./GEO. **SMD**
DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary**
HAMMER TYPE

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
350								
351								
352								
353								
354								
355								
356								
357								
358								
359								
360					END OF BORING AT APPROXIMATELY 360 FEET E LOG PERFORMED ON 6/28/2018 BACKFILLED WITH GROUT ON 6/29/2018			

Figure A5, Log of Boring 2017-D, Page 8 of 8

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-E

ELEV. (MSL.) ____________

DATE COMPLETED **7/13/2018**

ENG./GEO. **TMH**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	Soft, dry, brown, SILT			
1								
2								
3								
4								
5								
6								
7								
8				GW	Damp, brown, Sandy GRAVEL			
9								
10								
11								
12					-wet			
13								
14								
15								
16								
17								
18								
19								
20				GP/GC	Wet, brown, Clayey to Sandy GRAVEL			
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								

Figure A6, Log of Boring 2017-E, Page 1 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-E

ELEV. (MSL.) ____________

DATE COMPLETED **7/13/2018**

ENG./GEO. **TMH**

DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary**

HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50								
51								
52				GW	Wet, brown, Sandy GRAVEL			
53								
54								
55								
56								
57								
58								
59								
60								
61								
62								
63								
64								
65								
66								
67								
68								
69								
70								
71								
72								
73								
74								
75								
76								
77								
78								
79								
80				GP/GC	Wet, brown, Clayey to Sandy GRAVEL			
81								
82								
83								
84								
85								
86								
87								
88								
89								
90								
91								
92								
93								
94								
95								
96								
97								
98								
99								

Figure A6, Log of Boring 2017-E, Page 2 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-E

ELEV. (MSL.) ____________ DATE COMPLETED **7/13/2018**

ENG./GEO. **TMH** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100				GW	Wet, brown, Sandy GRAVEL			
101								
102								
103								
104								
105								
106								
107								
108								
109								
110								
111								
112								
113				SW	Brown, SAND			
114								
115								
116								
117				GW	Brown, Sandy GRAVEL			
118								
119								
120								
121								
122				CL	Very stiff, grayish brown, CLAY			
123								
124								
125								
126								
127								
128								
129								
130								
131								
132								
133								
134								
135								
136								
137								
138								
139								
140								
141					-stiff, gray			
142								
143								
144								
145								
146								
147								
148								
149								

Figure A6, Log of Boring 2017-E, Page 3 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-E

ELEV. (MSL.) ____________ DATE COMPLETED **7/13/2018**

ENG./GEO. **TMH** DRILLER **Cascade**

EQUIPMENT **Getco 30k, Mud Rotary** HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
150								
151								
152								
153								
154								
155								
156								
157								
158								
159								
160								
161								
162								
163								
164								
165								
166								
167					-blue			
168								
169								
170								
171								
172								
173								
174								
175								
176								
177								
178								
179								
180								
181								
182								
183								
184								
185								
186								
187								
188				SP	Loose, blue, fine to medium coarse SAND			
189								
190								
191								
192								
193								
194								
195								
196								
197								
198								
199								

Figure A6, Log of Boring 2017-E, Page 4 of 5

GEOCON

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. **E9029-04-02** PROJECT NAME: **Cemex Eliot - Mud Logging**

BORING 2017-E

ELEV. (MSL.) ____________
DATE COMPLETED **7/13/2018**
ENG./GEO. **TMH**
DRILLER **Cascade**
EQUIPMENT **Getco 30k, Mud Rotary**
HAMMER TYPE ____________

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
200								
201								
202								
203				CL	Stiff, gray, CLAY			
204								
205								
206								
207								
208								
209								
210								
211								
212								
213								
214								
215								
216								
217								
218								
219								
220								

END OF BORING AT APPROXIMATELY 220 FEET
E LOG FROM APPROXIMATELY 100 TO 219 FEET PERFORMED
ON 7/13/2018 AT APPROXIMATELY 1635
WELL COMPLETED ON 7/27/2018

Figure A6, Log of Boring 2017-E, Page 5 of 5

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B
LABORATORY TESTING

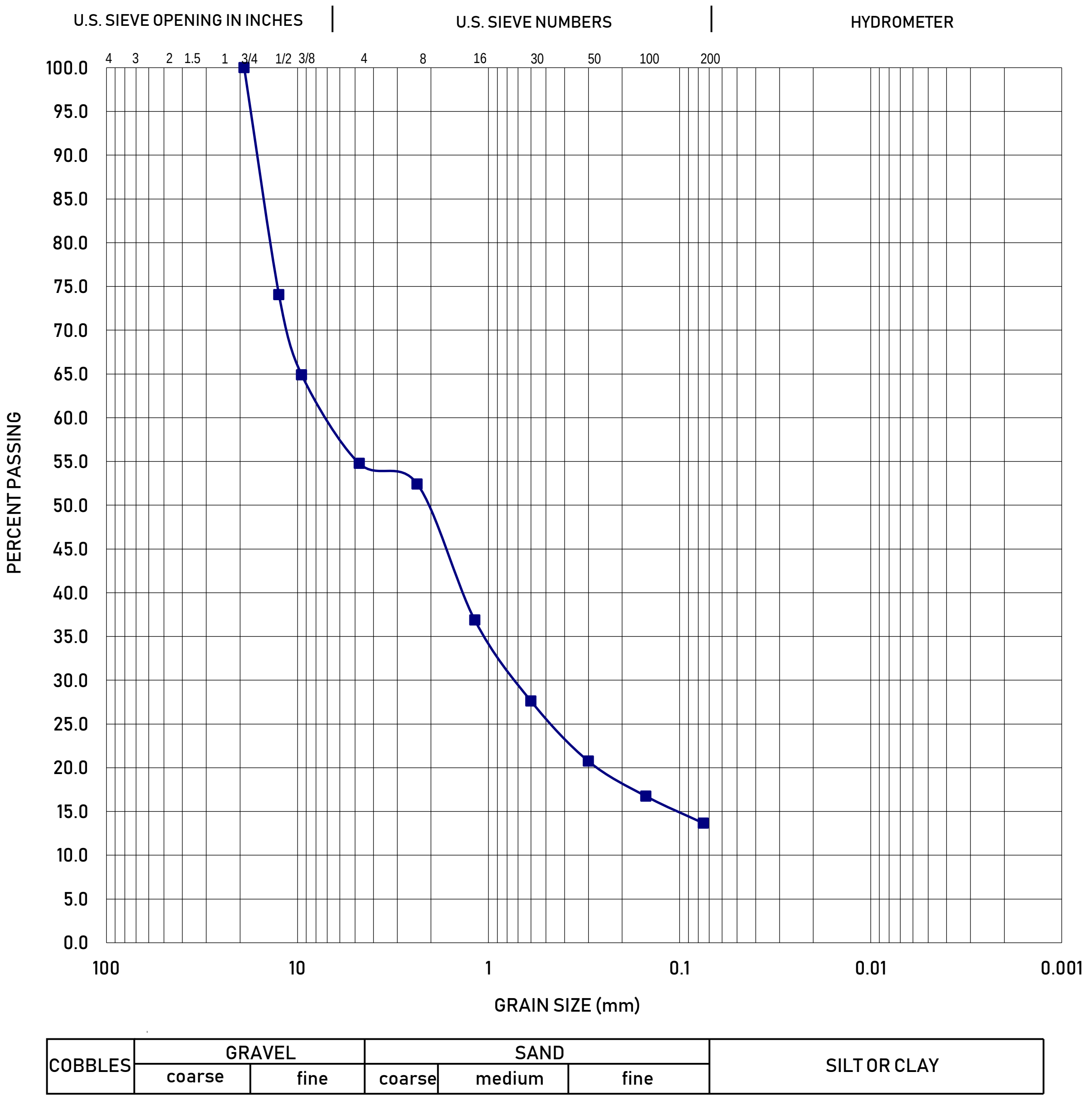
Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for in-situ dry density and/or moisture content, grain size distribution, Atterberg Limits and triaxial shear strength. The results of our testing are summarized in tabular format below and the following figures. In-situ dry density and/or moisture content test results are included on the boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit	Plastic Limit	Plasticity Index
B1-98.5	26	21	5
B2-80	33	19	14
B4-50.5	26	21	5
B4-100	34	15	19

TABLE B-II
SUMMARY OF LABORATORY GRAIN SIZE ANALYSIS – NO. 200 WASH
ASTM D1140

Boring No.	Sample Depth (feet)	Fraction Passing No. 200 Sieve (%)
B3	40	15



Boring: B1

Depth To Sample: 70'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	74.1	64.9	54.8	52.4	36.9	27.6	20.7	16.7	13.7	11.2	9.6

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

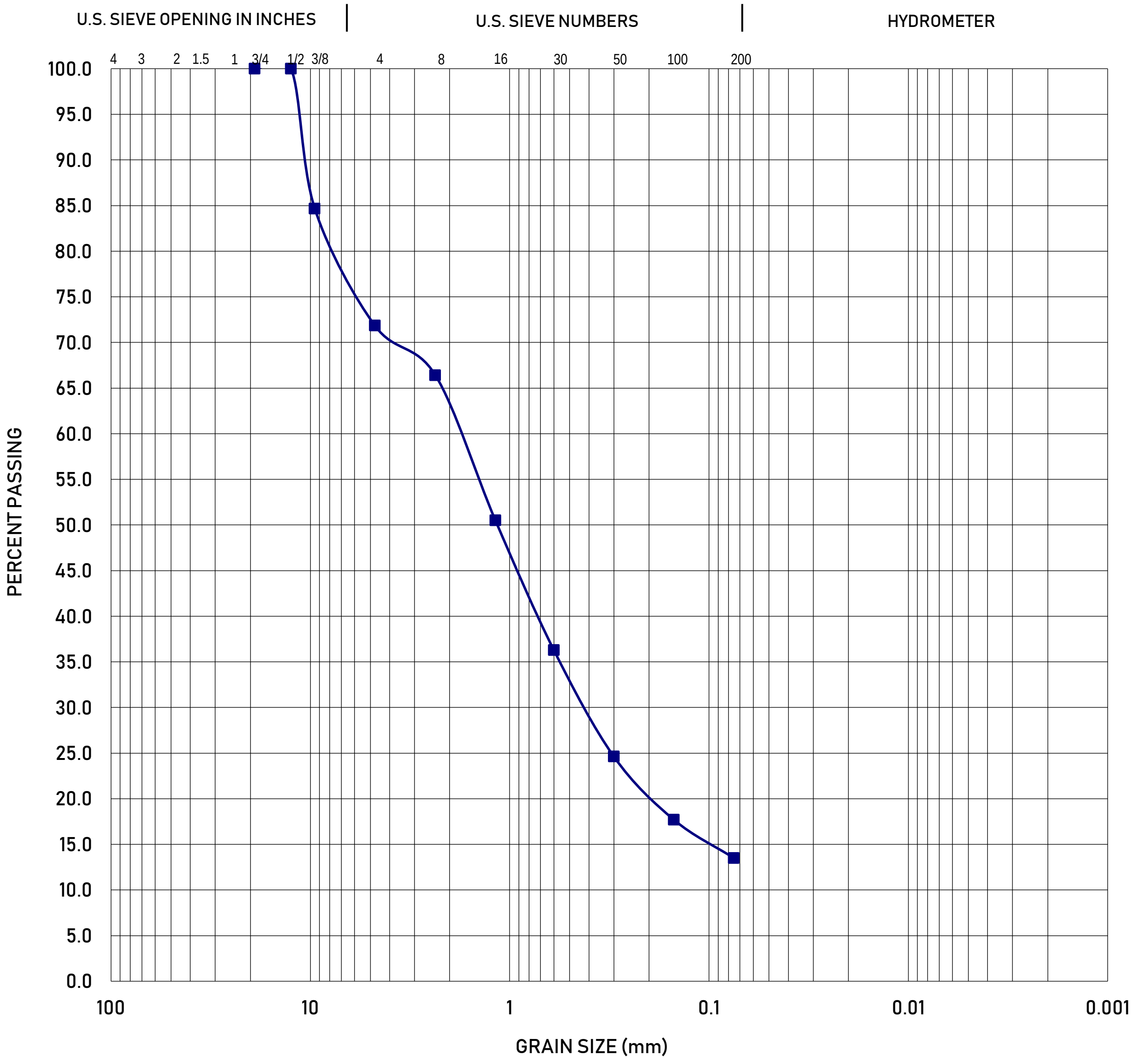
Particle Size Analysis - ASTM D422

Project: Cemex Eliot

Location: Alameda County

Project No.: E9029-04-01

Figure B1



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring: B1

Depth To Sample: 110'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

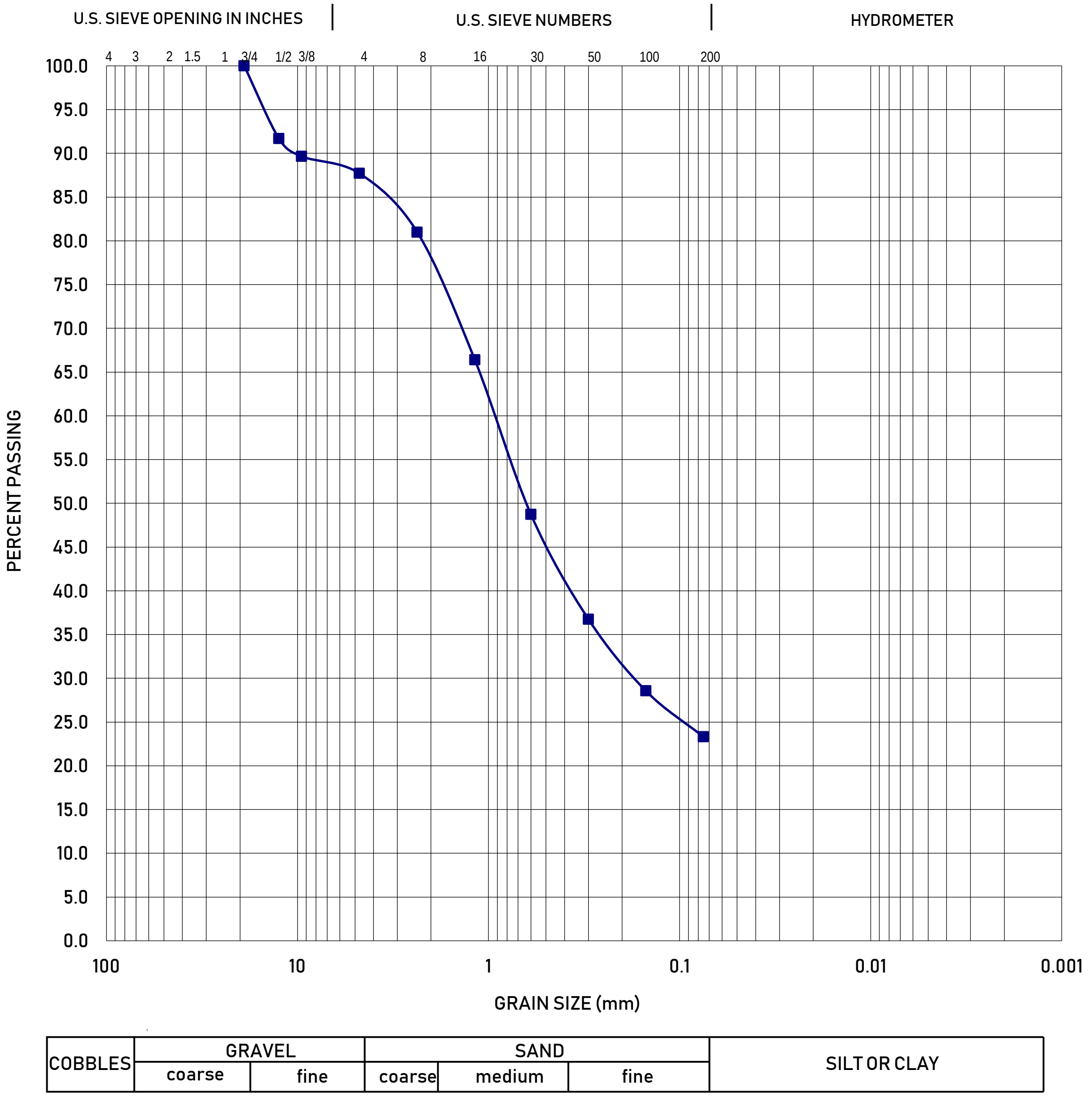
Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100.0	84.7	71.9	66.4	50.5	36.3	24.6	17.7	13.5	10.6	8.8

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

Particle Size Analysis - ASTM D422

Project: Cemex Eliot
Location: Alameda County
Project No.: E9029-04-01

Figure B2



Boring: B2

Depth To Sample: 60'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

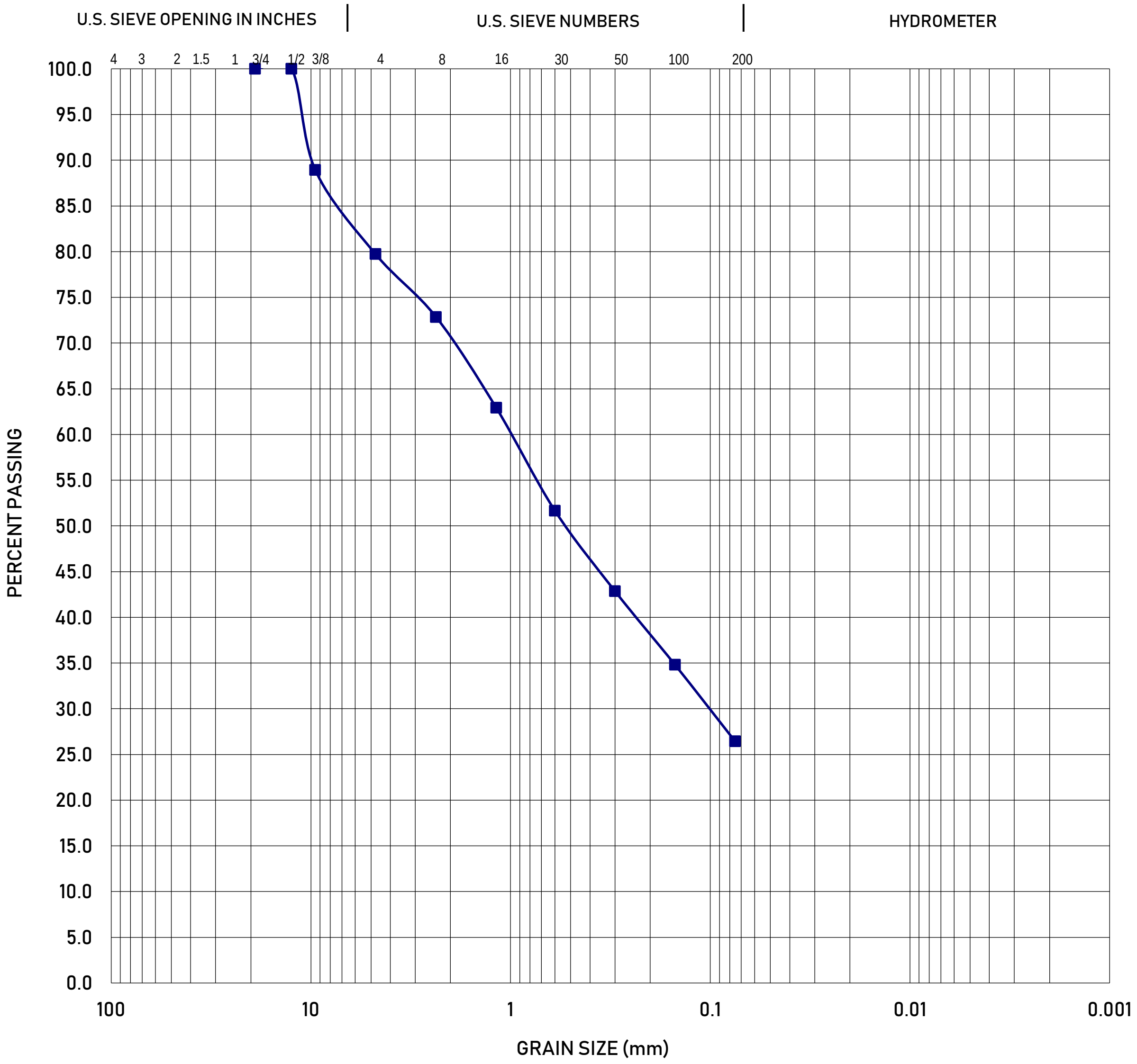
Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	91.7	89.7	87.7	81.0	66.4	48.7	36.8	28.6	23.3	19.6	17.1

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

Particle Size Analysis - ASTM D422

Project: Cemex Eliot
Location: Alameda County
Project No.: E9029-04-01

Figure B4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring: B3

Depth To Sample: 20'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100.0	88.9	79.7	72.8	62.9	51.7	42.9	34.8	26.4	20.5	16.5

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

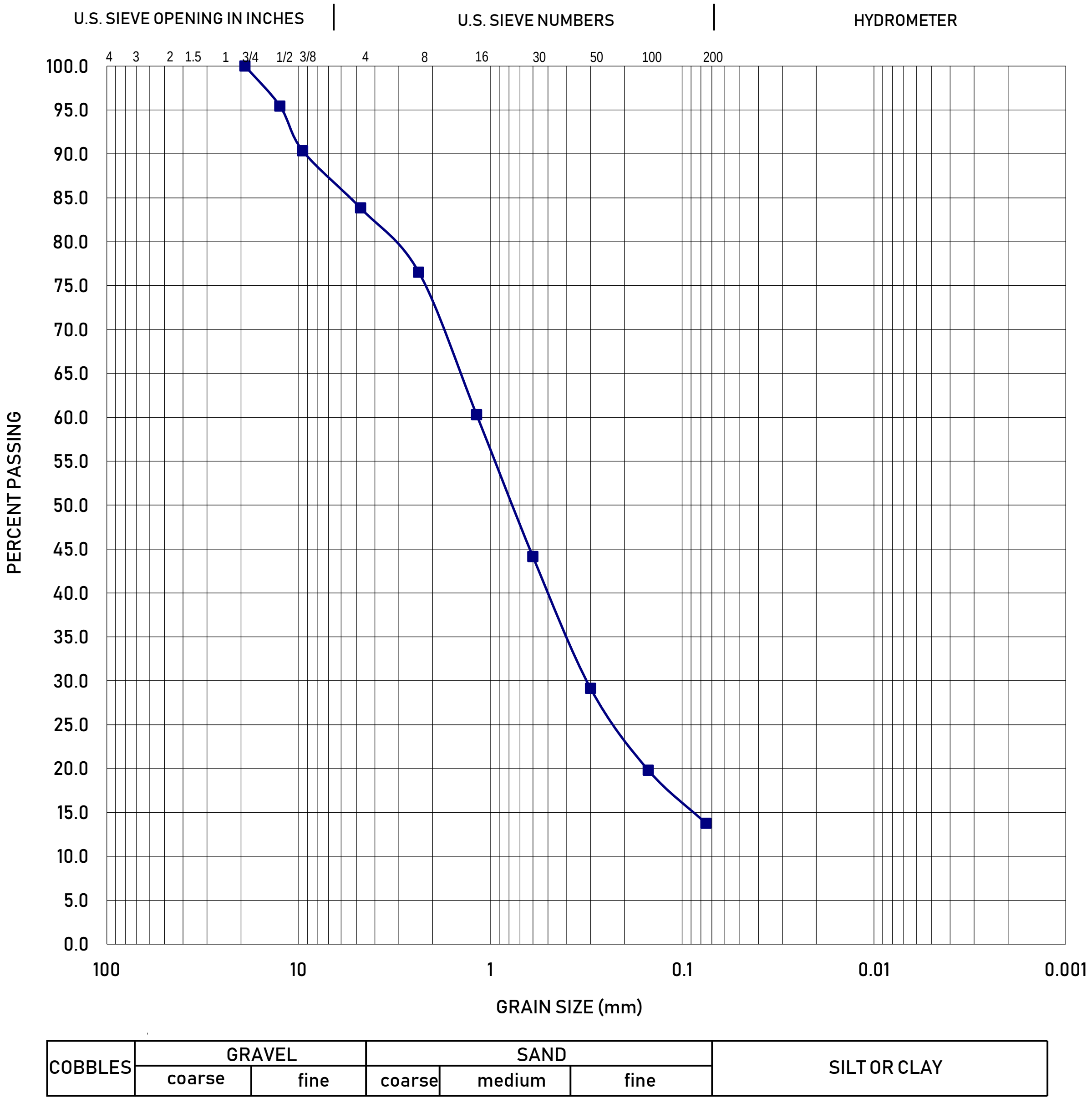
Particle Size Analysis - ASTM D422

Project: Cemex Eliot

Location: Alameda County

Project No.: E9029-04-01

Figure B4



Boring: B3

Depth To Sample: 80'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	95.4	90.3	83.8	76.5	60.3	44.1	29.1	19.8	13.7	10.3	8.3

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

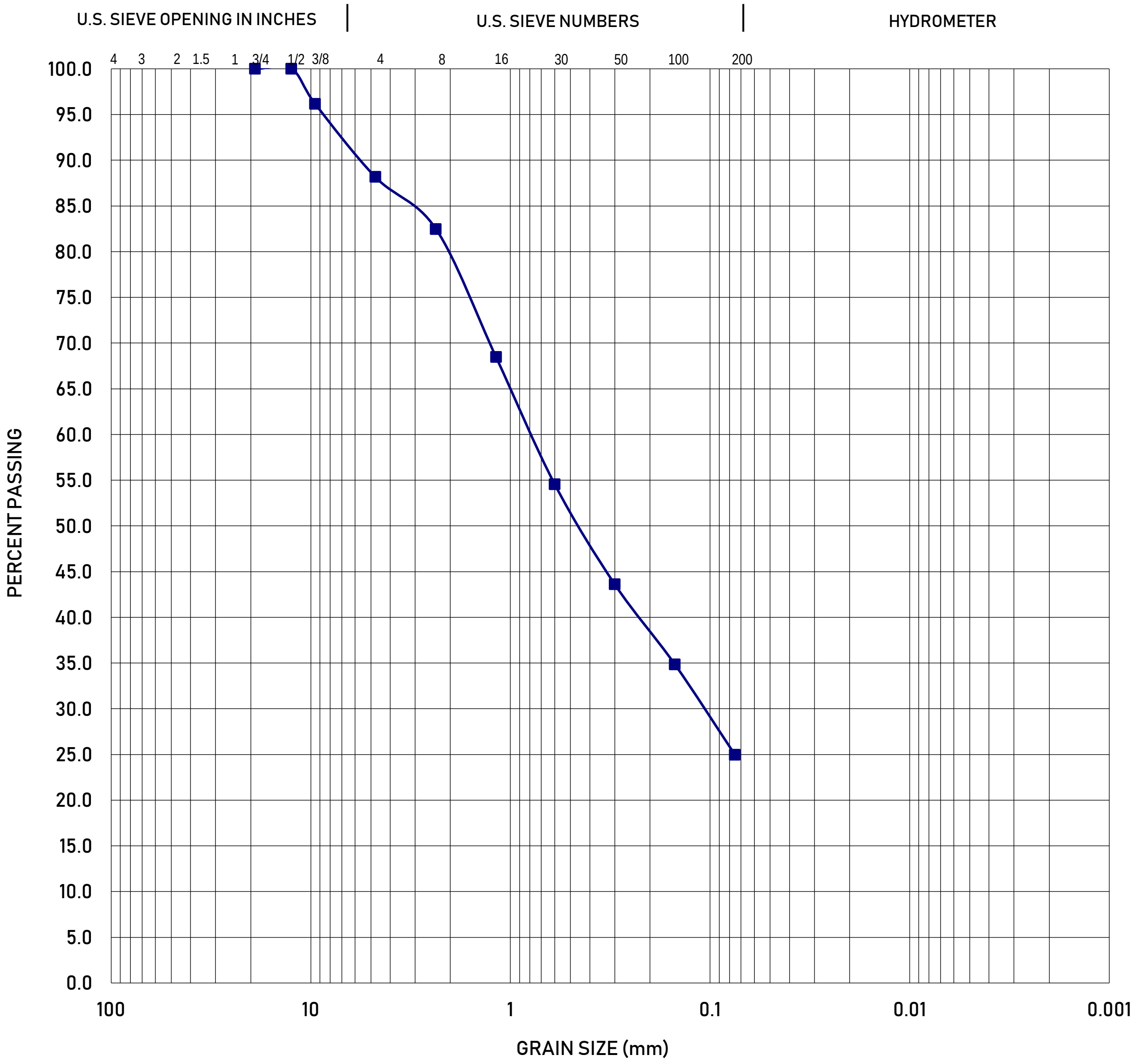
Particle Size Analysis - ASTM D422

Project: Cemex Eliot

Location: Alameda County

Project No.: E9029-04-01

Figure B5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring: B3

Depth To Sample: 110'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100.0	96.2	88.2	82.5	68.5	54.6	43.6	34.9	25.0	20.0	17.4

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

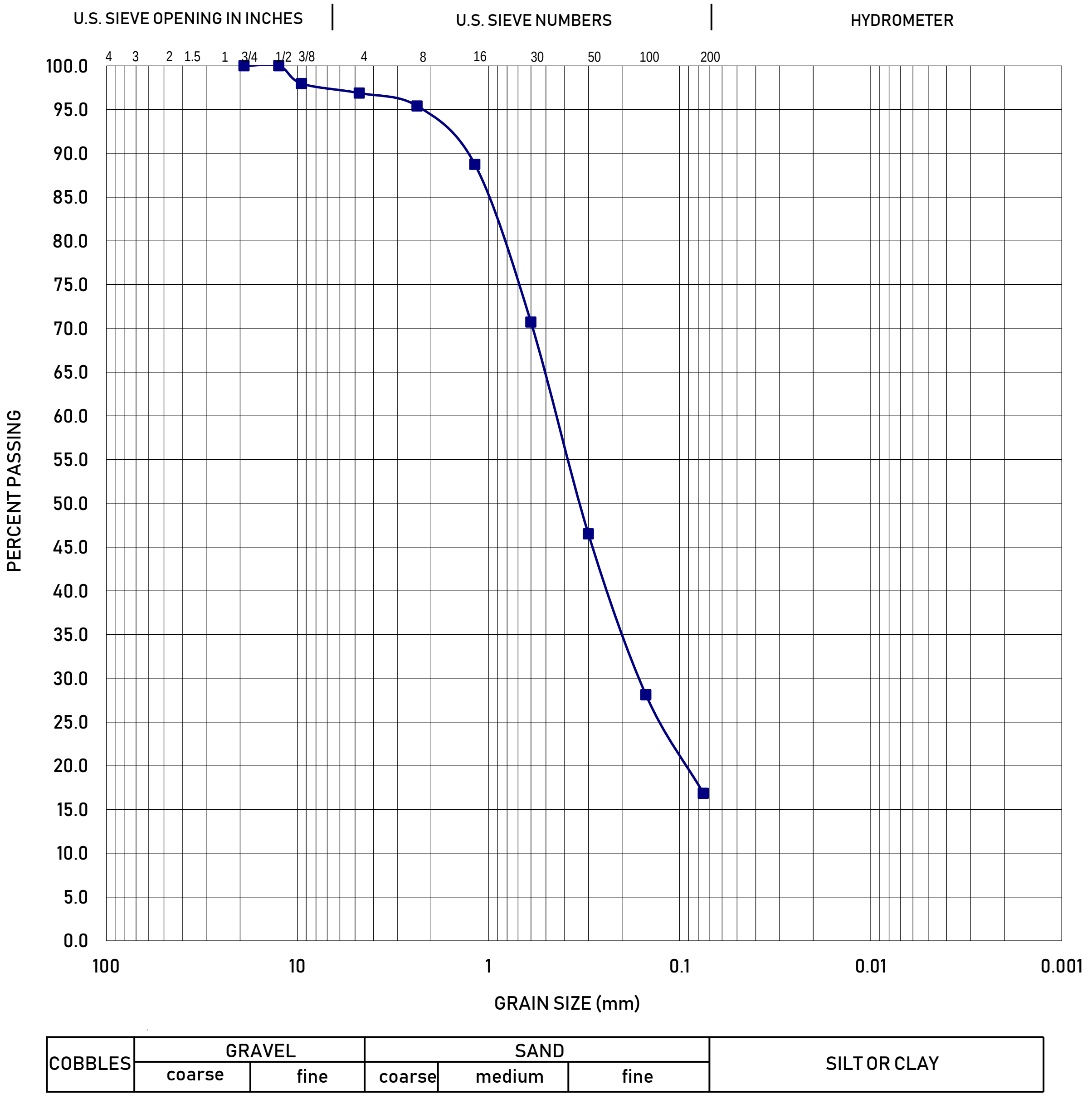
Particle Size Analysis - ASTM D422

Project: Cemex Eliot

Location: Alameda County

Project No.: E9029-04-01

Figure B6



Boring: B5

Depth To Sample: 30.5'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

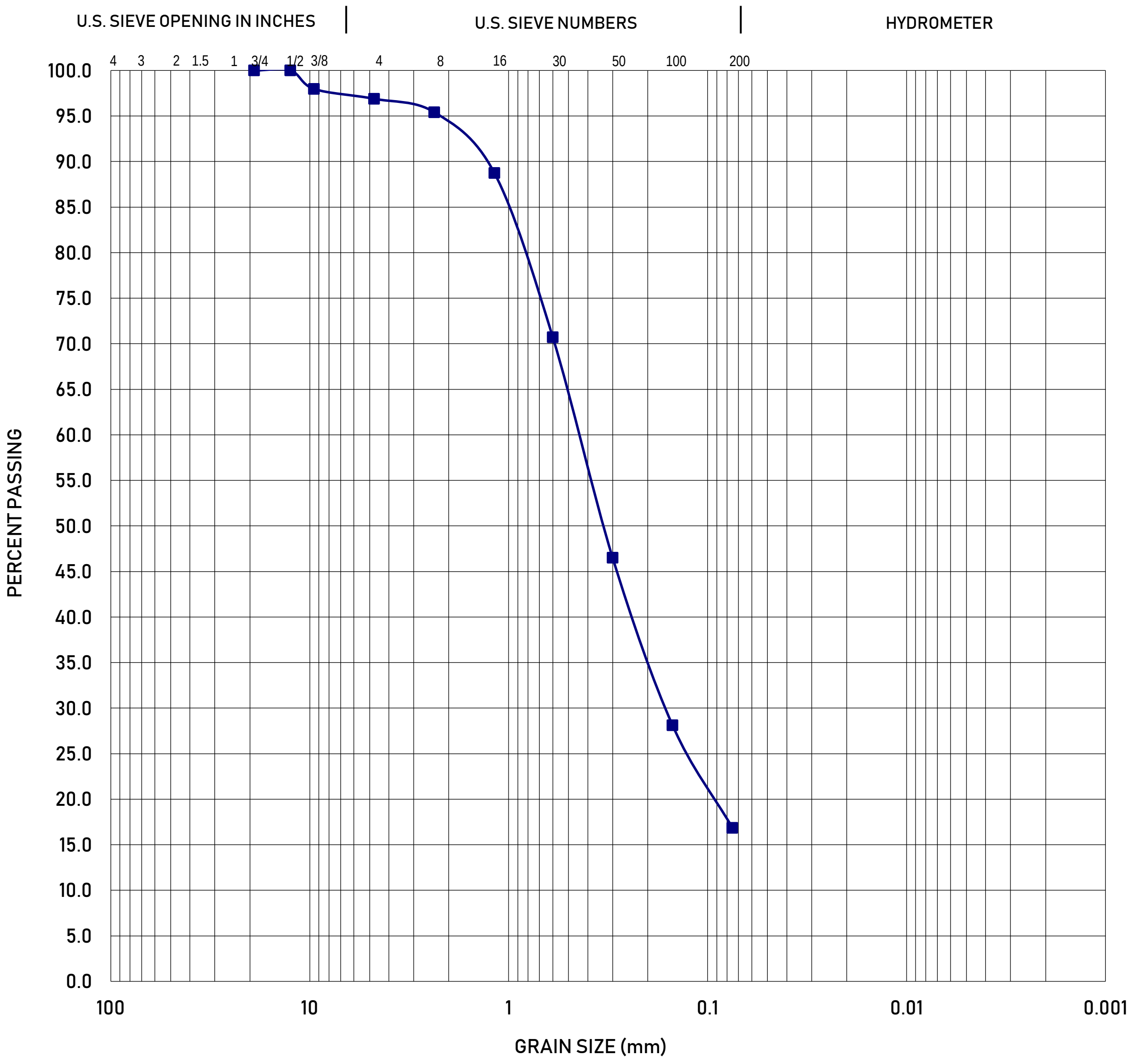
Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100.0	98.0	96.9	95.4	88.7	70.7	46.5	28.1	16.9	13.9	12.6

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

Particle Size Analysis - ASTM D422

Project: Cemex Eliot
Location: Alameda County
Project No.: E9029-04-01

Figure B8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring: B5

Depth To Sample: 30.5'

Sieve Date: 1/9/18

Tested and Computed by: AC

Test Data

Sieve Number	11/2"	1"	3/4"	1/2"	3/8"	#4	#8	#16	#30	#50	#100	#200
% Passing	100	100.0	98.0	96.9	95.4	88.7	70.7	46.5	28.1	16.9	13.9	12.6

Geocon Consultants, Inc.
6671 Brisa Street
Livermore, CA 94550
Telephone: (925) 371-5900
Fax: (925) 371-5915

Particle Size Analysis - ASTM D422

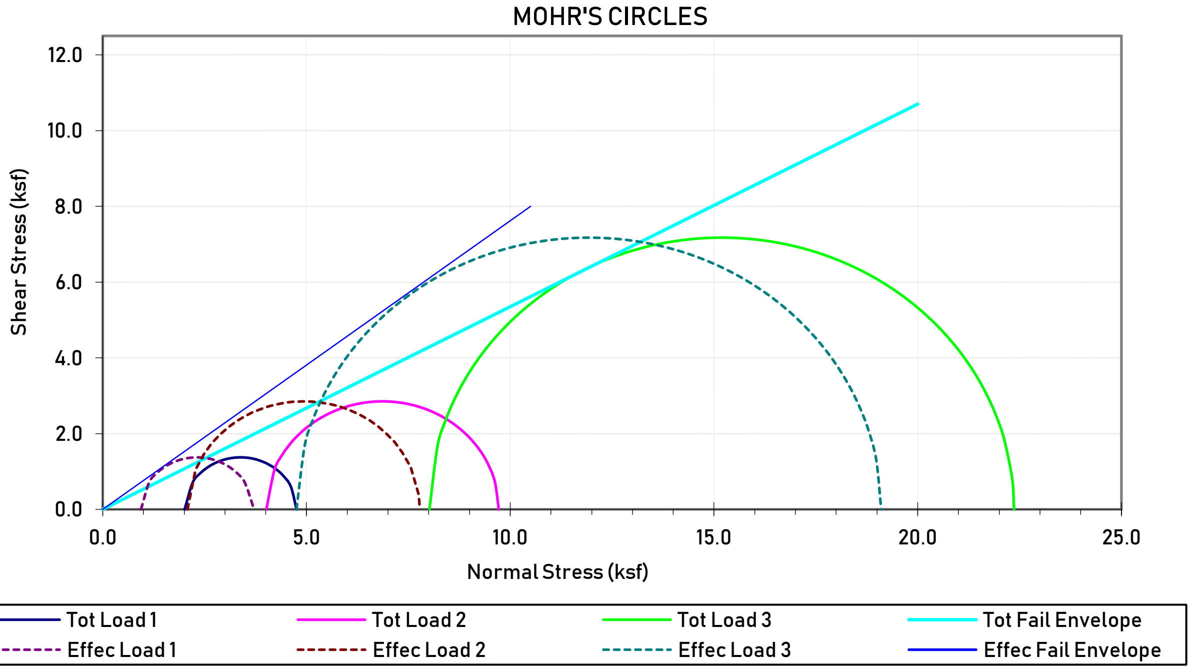
Project: Cemex Eliot

Location: Alameda County

Project No.: E9029-04-01

Figure B8

Boring Number	B1
Sample Number	B1-99
Sample Description	Olive Brown Sandy SILT



Test Results, At Maximum Principal Stress Ratio	Total	Effective
Friction Angle f (degrees)	28.1	37.3
cohesion (psf)	0	0

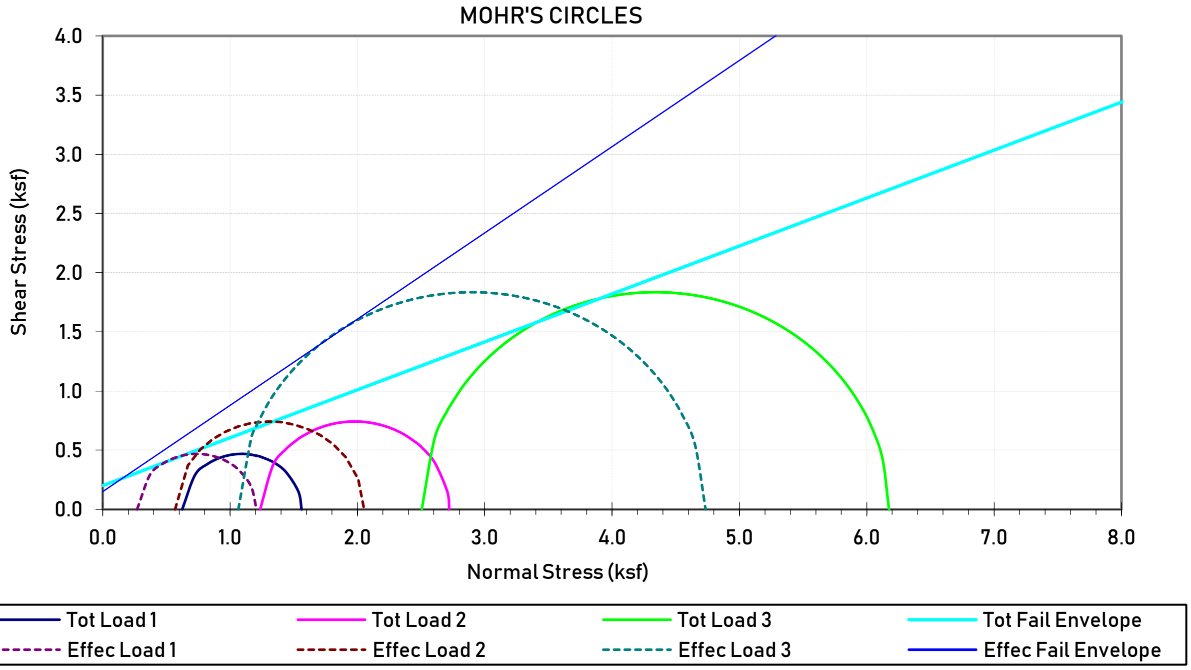
Initial Conditions at Start of Test	stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure	2000	4000	8000
Height (inch)	4.890	4.798	4.694
Diameter (inch)	2.417	2.412	2.427
Moisture Content (%)	20.7	--	--
Dry Density (pcf)	109.5	--	--
Saturation (%)	104.1	--	--
After Saturation			
Dry Density (pcf)	109.5	--	--
After Consolidation			
Dry Density (pcf)	112.1	--	--
Shear Test Conditions			
Dry Density (pcf)	112.1	113.1	114.3
Moisture Content (%)	--	--	17.3
Saturation (%)	--	--	98.5
Strain rate (%/hr)	3.14	3.17	3.13
Cell pressure (psf)	7830	9830	13820
Initial Back Pressure (psf)	5820	5820	5800
Initial Effective Confining Pressure (psf)	2010	4020	8020
Total Major Principal Stress At Failure (psf)	4750	9720	22360
Effective Major Principal Stress At Failure (psf)	3680	7780	19100
Pore Pressure At Failure (psf)	1070	1940	3260
Effective Minor Principal Stress At Failure (psf)	940	2080	4760

Geocon Consultants, Inc.
3160 Gold Valley Drive, Suite 800
Rancho Cordova, California 95742
Telephone: (916) 852-9118

Triaxial Shear Strength - CU Test, ASTM D4767 with Pore Pressure Measurements (staged)

Project: Cemex Eliot
Location:
Number: E9029-04-01
Figure: B9

Boring Number	B3
Sample Number	B3-10.5
Sample Description	Dark yellowish brown lean CLAY



Test Results, At Maximum Principal Stress Ratio		Total	Effective
	Friction Angle f (degrees)	22.0	36.1
	cohesion (psf)	200	150

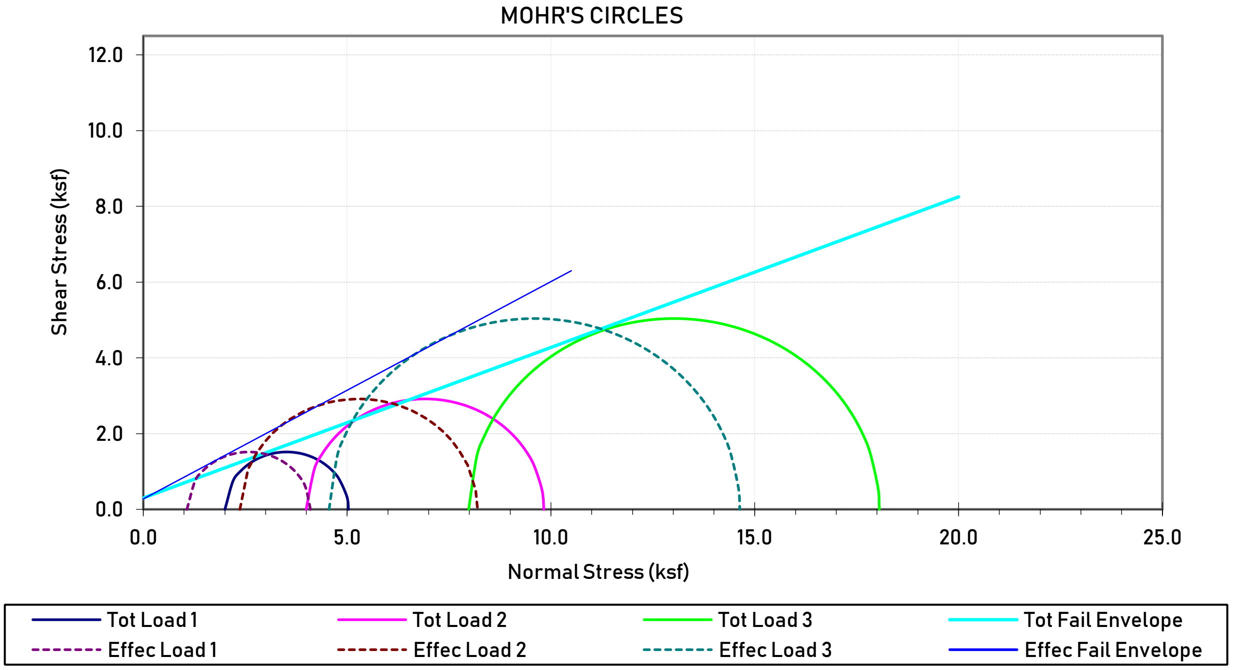
Initial Conditions at Start of Test		stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure		600	1200	2500
	Height (inch)	4.840	4.792	4.713
	Diameter (inch)	2.371	2.378	2.388
	Moisture Content (%)	14.7	--	--
	Dry Density (pcf)	113.5	--	--
	Saturation (%)	80.8	--	--
After Saturation				
	Dry Density (pcf)	113.5	--	--
After Consolidation				
	Dry Density (pcf)	114.0	--	--
Shear Test Conditions				
	Dry Density (pcf)	114.0	114.6	116.0
	Moisture Content (%)	--	--	17.0
	Saturation (%)	--	--	99.8
	Strain rate (%/hr)	1.60	1.94	1.56
	Cell pressure (psf)	10740	11380	12610
	Initial Back Pressure (psf)	10110	10150	10100
	Initial Effective Confining Pressure (psf)	620	1240	2510
	Total Major Principal Stress At Failure (psf)	1560	2720	6170
	Effective Major Principal Stress At Failure (psf)	1210	2050	4730
	Pore Pressure At Failure (psf)	350	670	1440
	Effective Minor Principal Stress At Failure (psf)	270	570	1060

Geocon Consultants, Inc.
3160 Gold Valley Drive, Suite 800
Rancho Cordova, California 95742
Telephone: (916) 852-9118

Triaxial Shear Strength - CU Test, ASTM D4767 with Pore Pressure Measurements (staged)

Project: Cemex Eliot
Location:
Number: E9029-04-01
Figure: B10

Boring Number	B4
Sample Number	B4-51
Sample Description	Olive brown lean CLAY



Test Results, At Maximum Principal Stress Ratio	Total	Effective
Friction Angle f (degrees)	21.7	29.8
cohesion (psf)	300	275

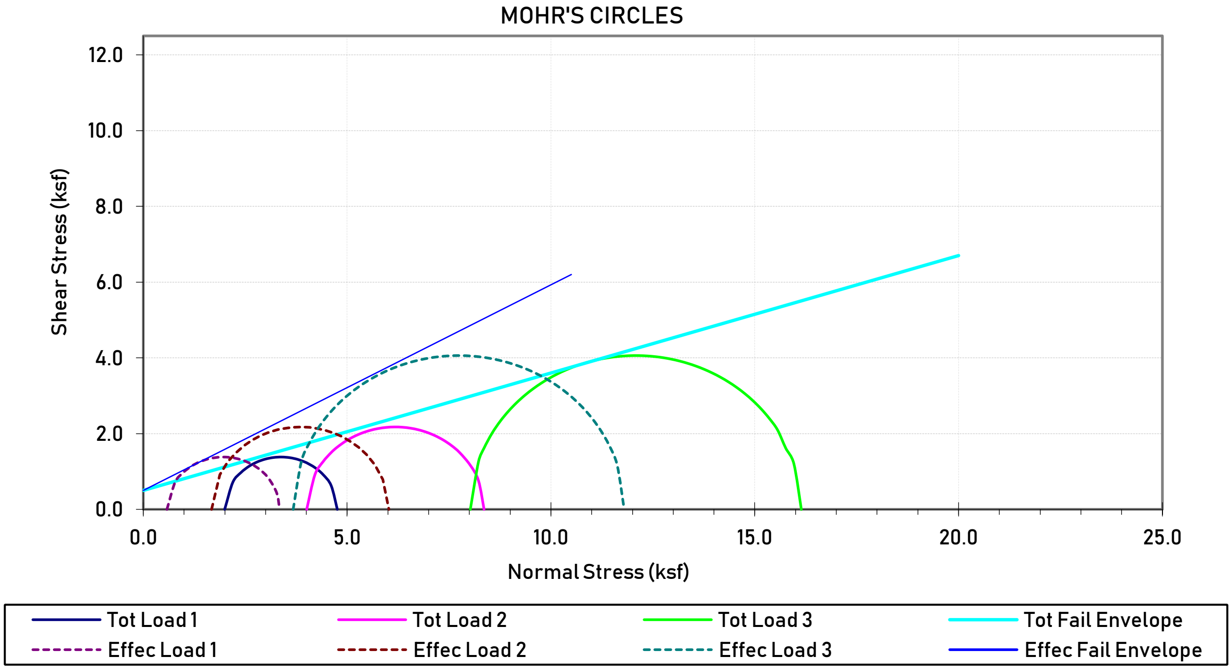
Initial Conditions at Start of Test	stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure	2000	4000	8000
Height (inch)	4.833	4.673	4.517
Diameter (inch)	2.413	2.427	2.449
Moisture Content (%)	23.3	--	--
Dry Density (pcf)	106.5	--	--
Saturation (%)	94.2	--	--
After Saturation			
Dry Density (pcf)	106.5	--	--
After Consolidation			
Dry Density (pcf)	108.8	--	--
Shear Test Conditions			
Dry Density (pcf)	108.9	110.5	112.4
Moisture Content (%)	--	--	21.6
Saturation (%)	--	--	100.0
Strain rate (%/hr)	1.98	2.02	2.06
Cell pressure (psf)	9340	11310	15300
Initial Back Pressure (psf)	7340	7310	7320
Initial Effective Confining Pressure (psf)	2000	4000	7980
Total Major Principal Stress At Failure (psf)	5030	9830	18060
Effective Major Principal Stress At Failure (psf)	4100	8200	14630
Pore Pressure At Failure (psf)	930	1630	3430
Effective Minor Principal Stress At Failure (psf)	1070	2370	4560

Geocon Consultants, Inc.
3160 Gold Valley Drive, Suite 800
Rancho Cordova, California 95742
Telephone: (916) 852-9118

Triaxial Shear Strength - CU Test, ASTM D4767 with Pore Pressure Measurements (staged)

Project: Cemex Eliot
Location:
Number: E9029-04-01
Figure: B11

Boring Number	B4
Sample Number	B4-61
Sample Description	Olive Brown lean CLAY



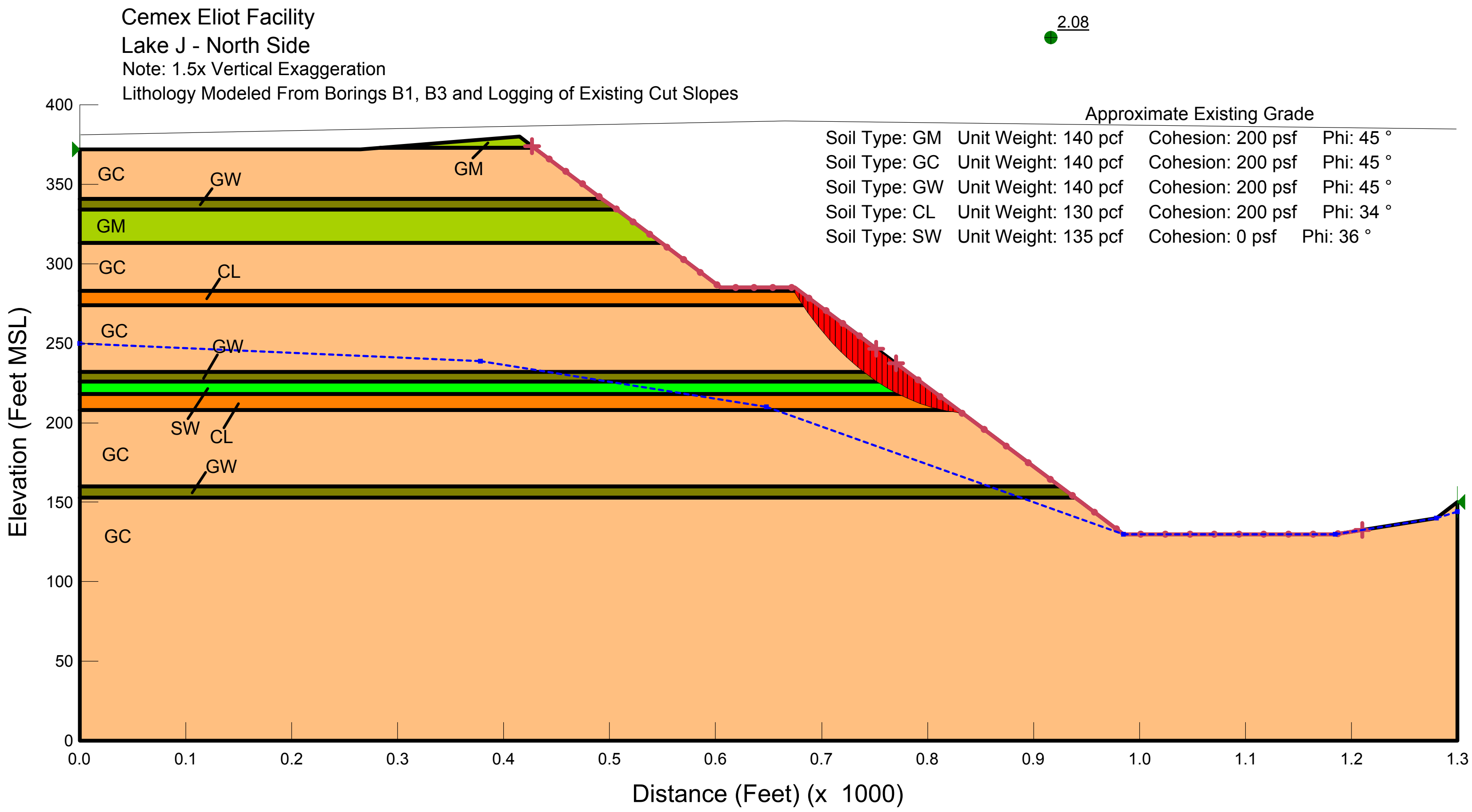
Test Results, At Maximum Principal Stress Ratio		Total		Effective
	Friction Angle f (degrees)	17.2		28.5
	cohesion (psf)	500		500
Initial Conditions at Start of Test		stage 1	stage 2	stage 3
Sample ID (psf), Initial Confining Pressure		2000	4000	8000
	Height (inch)	4.810	4.704	4.604
	Diameter (inch)	2.385	2.385	2.386
	Moisture Content (%)	20.9	--	--
	Dry Density (pcf)	107.4	--	--
	Saturation (%)	92.3	--	--
After Saturation				
	Dry Density (pcf)	107.4	--	--
After Consolidation				
	Dry Density (pcf)	109.8	--	--
Shear Test Conditions				
	Dry Density (pcf)	109.9	111.7	114.4
	Moisture Content (%)	--	--	19.1
	Saturation (%)	--	--	100.4
	Strain rate (%/hr)	2.77	2.10	2.11
	Cell pressure (psf)	9270	11290	15290
	Initial Back Pressure (psf)	7280	7280	7270
	Initial Effective Confining Pressure (psf)	2000	4010	8020
	Total Major Principal Stress At Failure (psf)	4760	8360	16140
	Effective Major Principal Stress At Failure (psf)	3340	6020	11800
	Pore Pressure At Failure (psf)	1420	2330	4350
	Effective Minor Principal Stress At Failure (psf)	580	1670	3680

Geocon Consultants, Inc.
3160 Gold Valley Drive, Suite 800
Rancho Cordova, California 95742
Telephone: (916) 852-9118

Triaxial Shear Strength - CU Test, ASTM D4767 with Pore Pressure Measurements (staged)

Project: Cemex Eliot
Location:
Number: E9029-04-01
Figure: B12

APPENDIX C
SLOPE STABILITY ANALYSIS – LAKE J



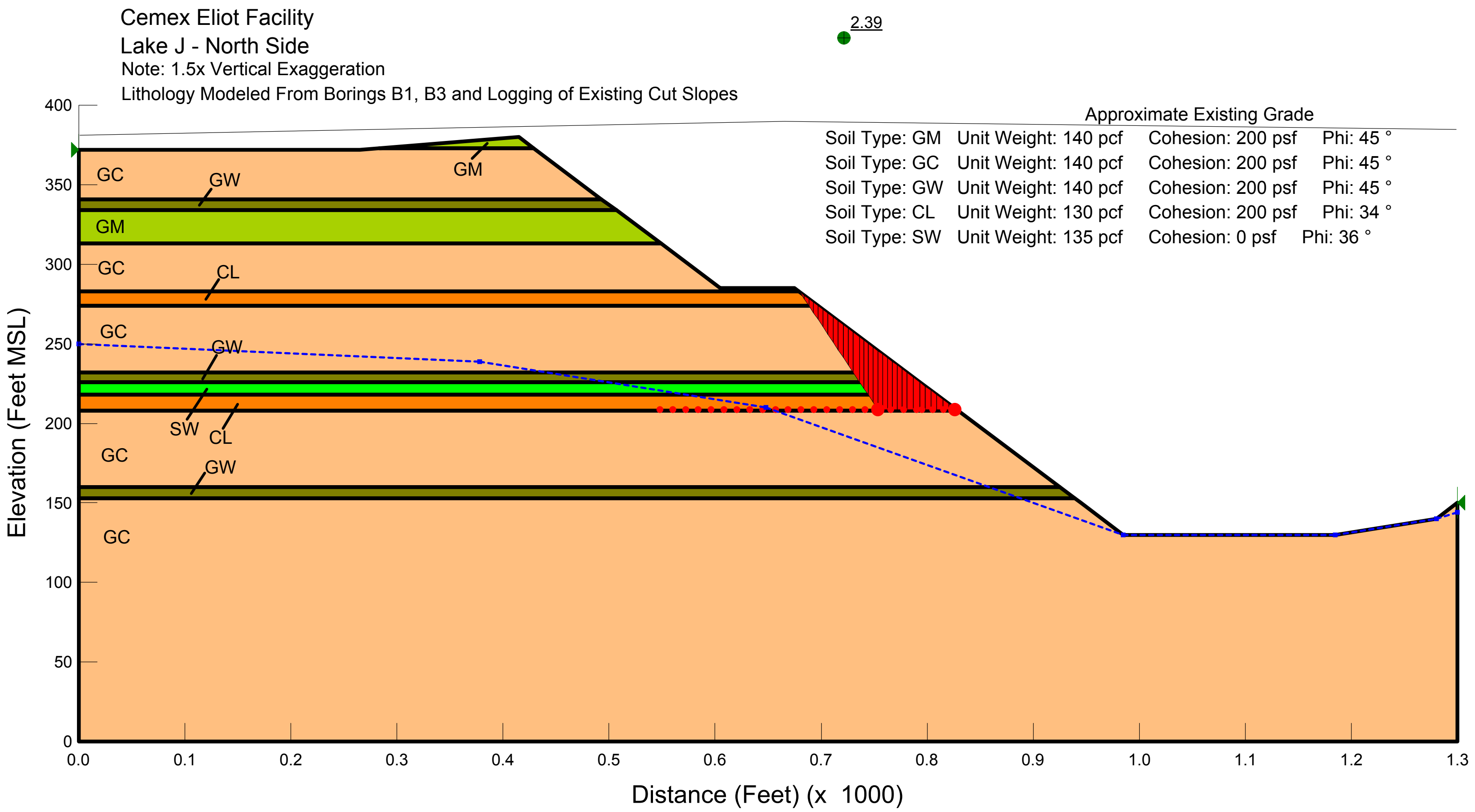
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J NORTH - MINED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C1

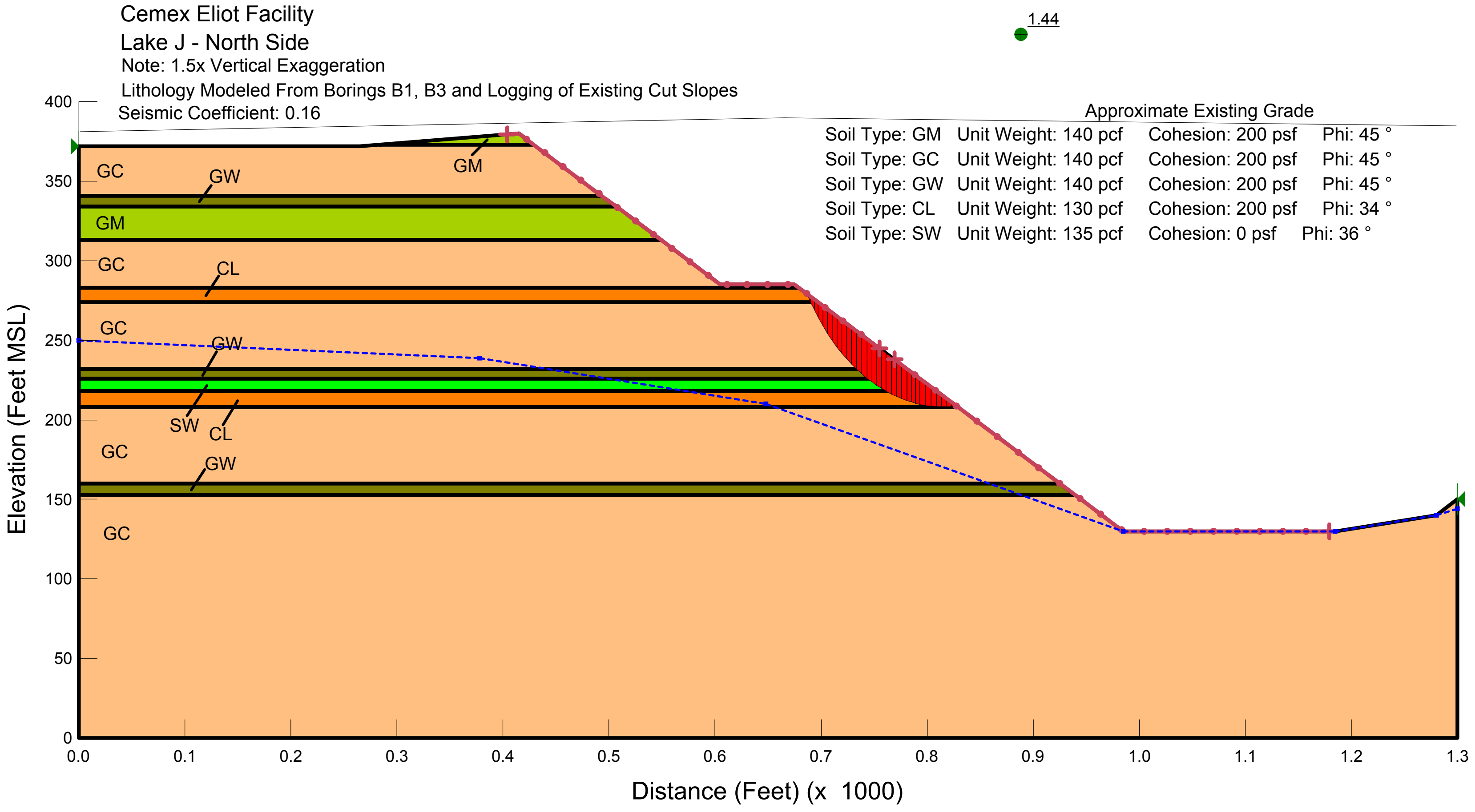


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925 371.5900 - FAX 925 371.5915

LAKE J NORTH - MINED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C2



Cemex Eliot Facility

Lake J - North Side

Note: 1.5x Vertical Exaggeration

Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes

Seismic Coefficient: 0.16

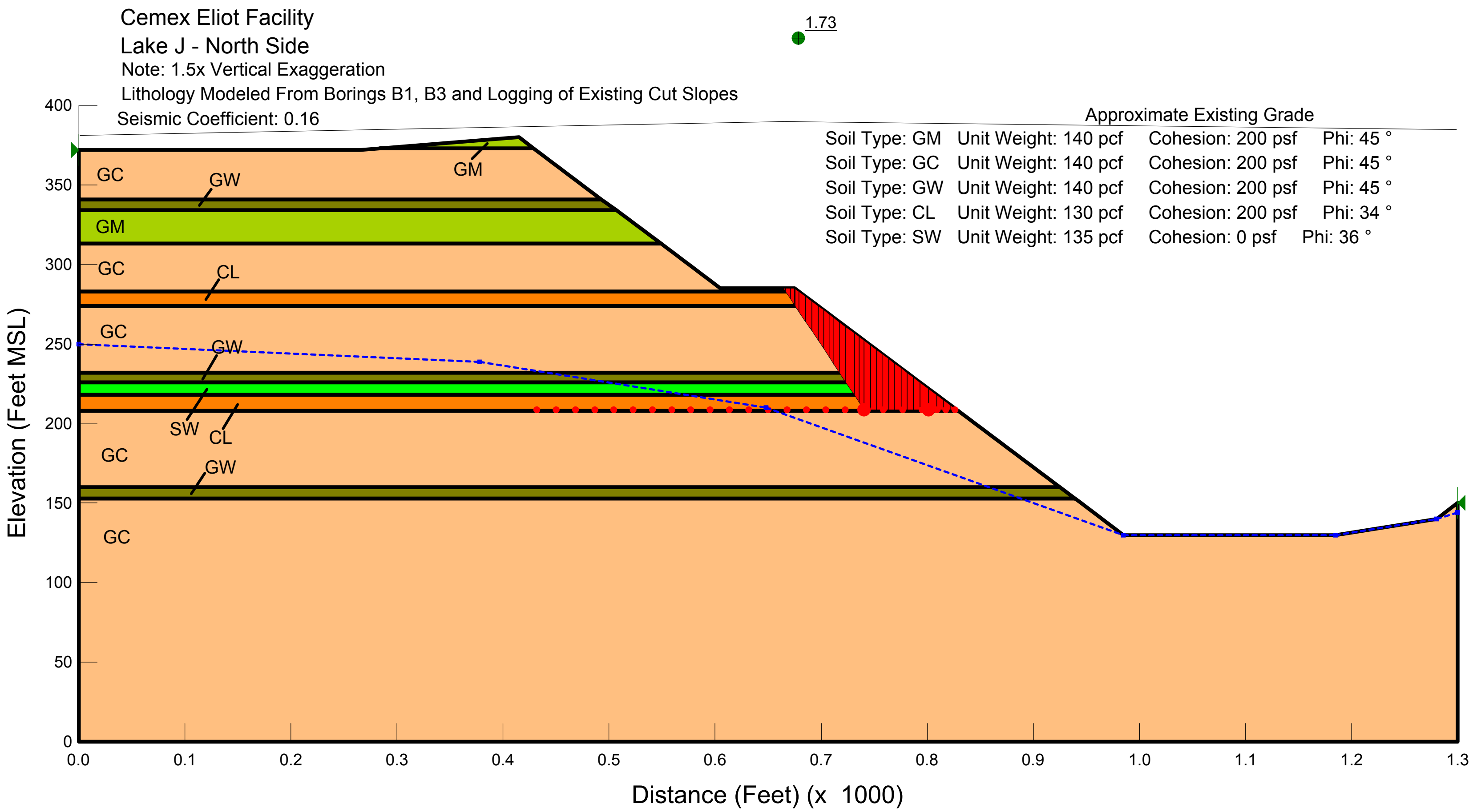
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J NORTH - MINED CONDITION
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C3



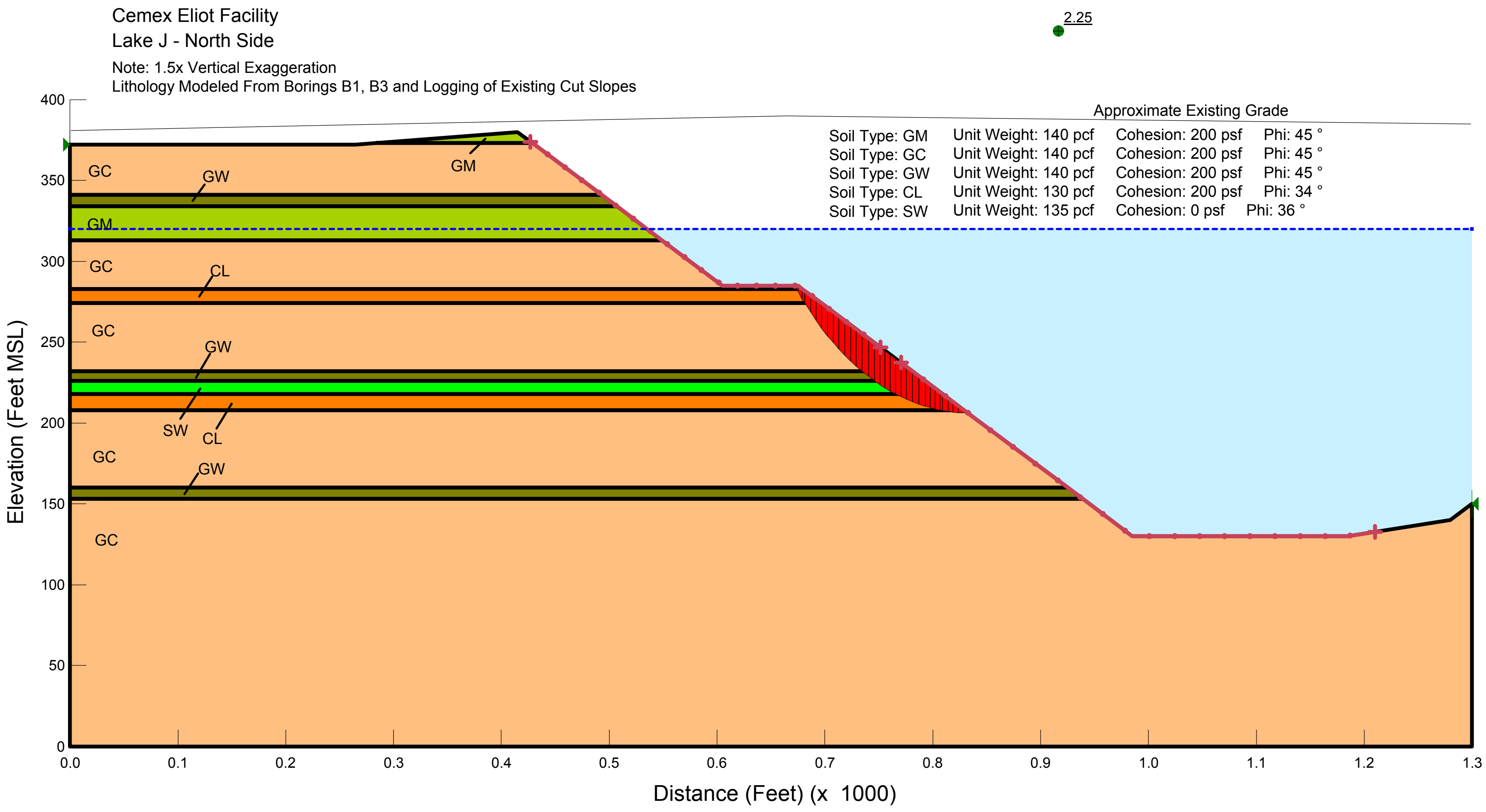
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J NORTH - MINED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C4

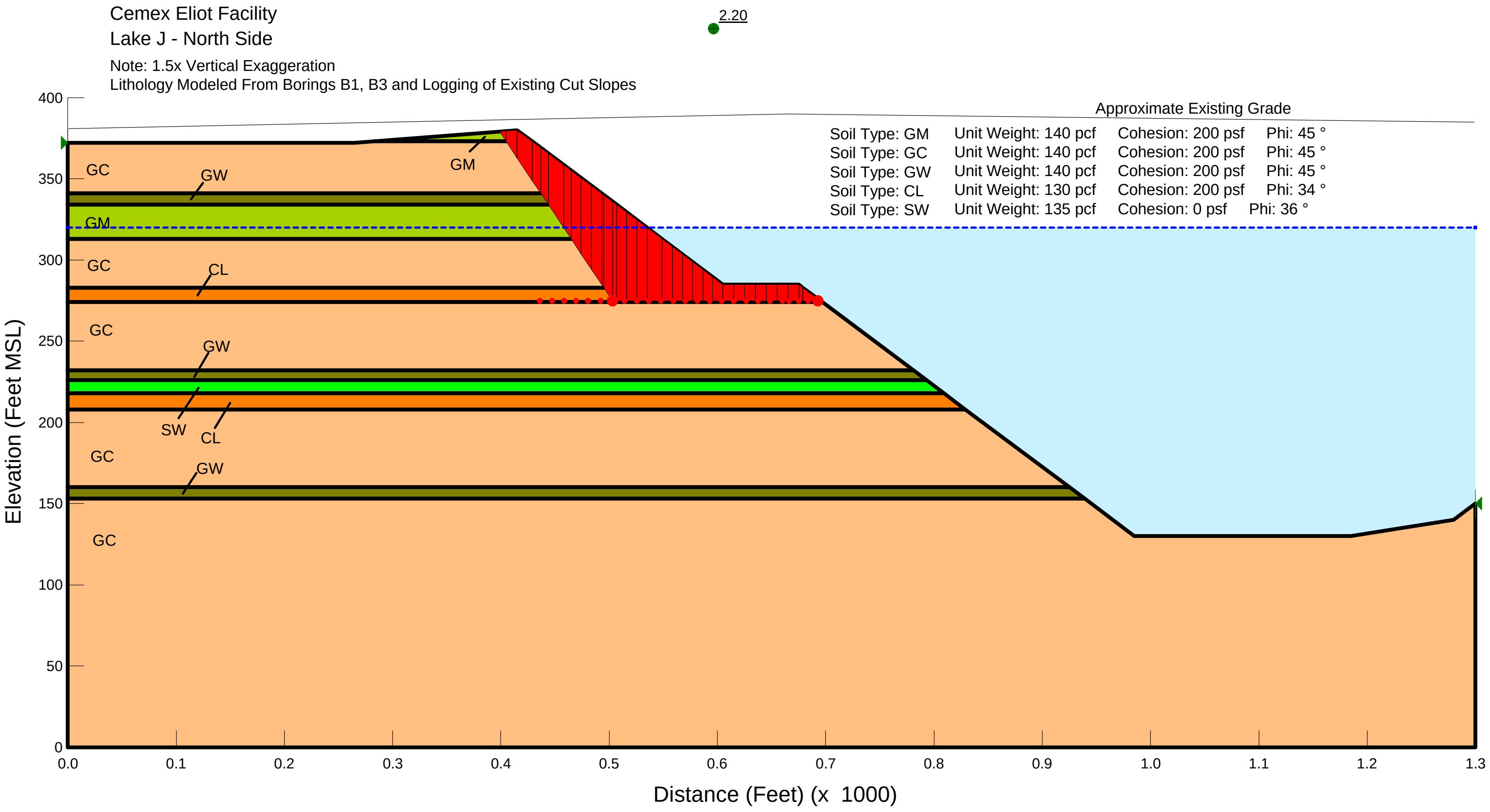


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J NORTH - RECLAIMED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C5



Cemex Eliot Facility
Lake J - North Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes

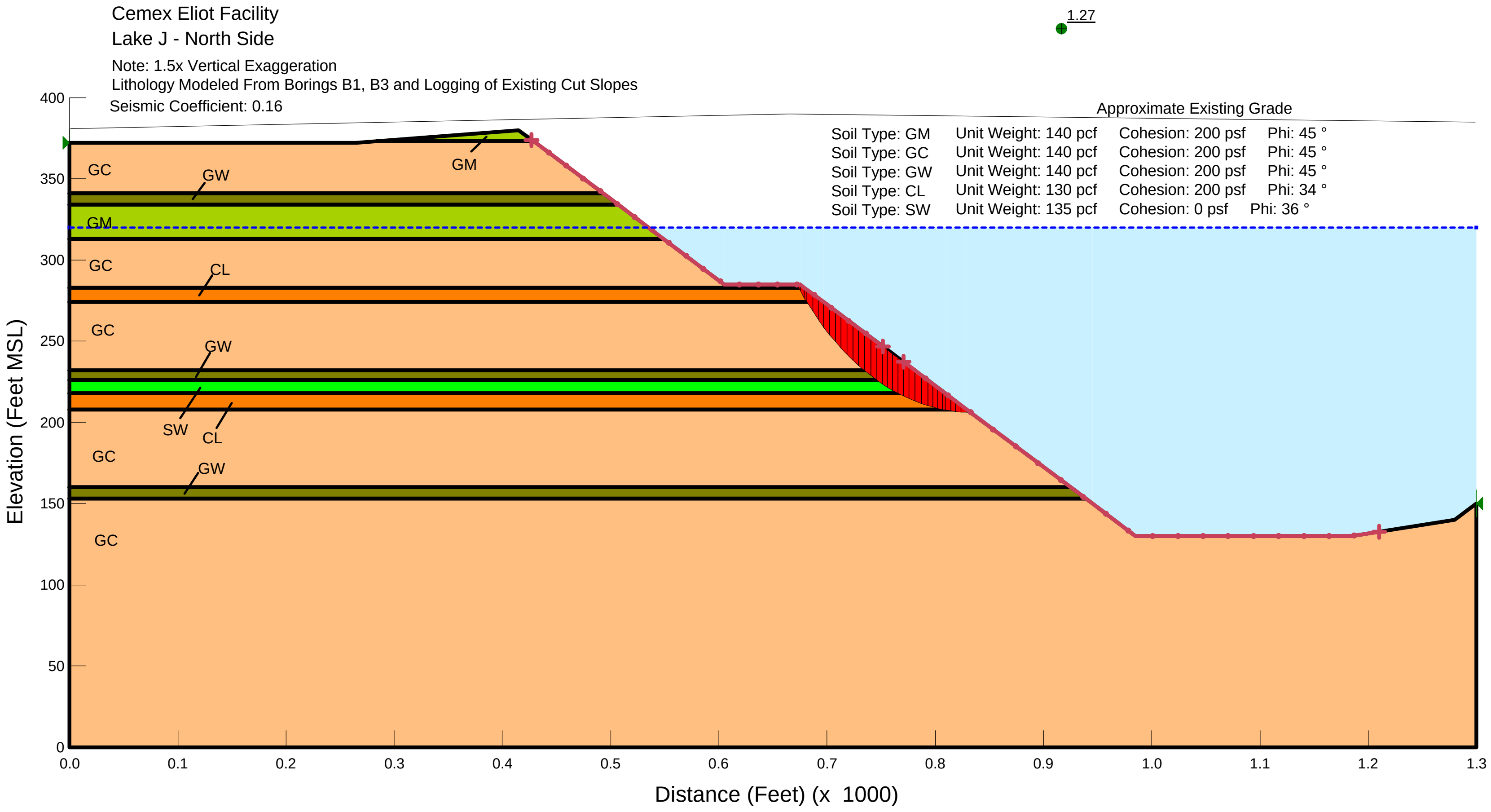
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J NORTH – RECLAIMED CONDITION
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C6



Cemex Eliot Facility
Lake J - North Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

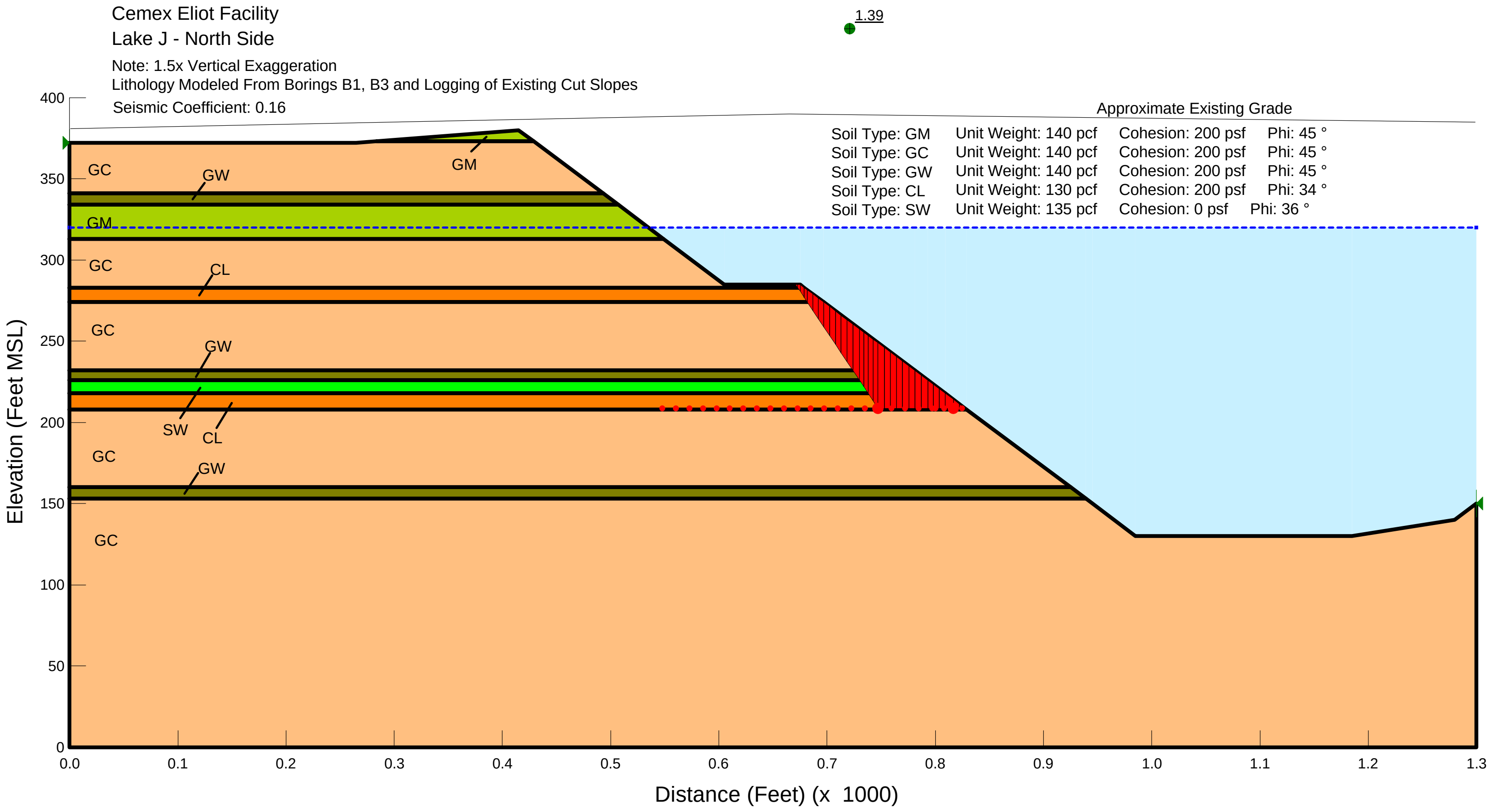
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J NORTH – RECLAIMED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C7



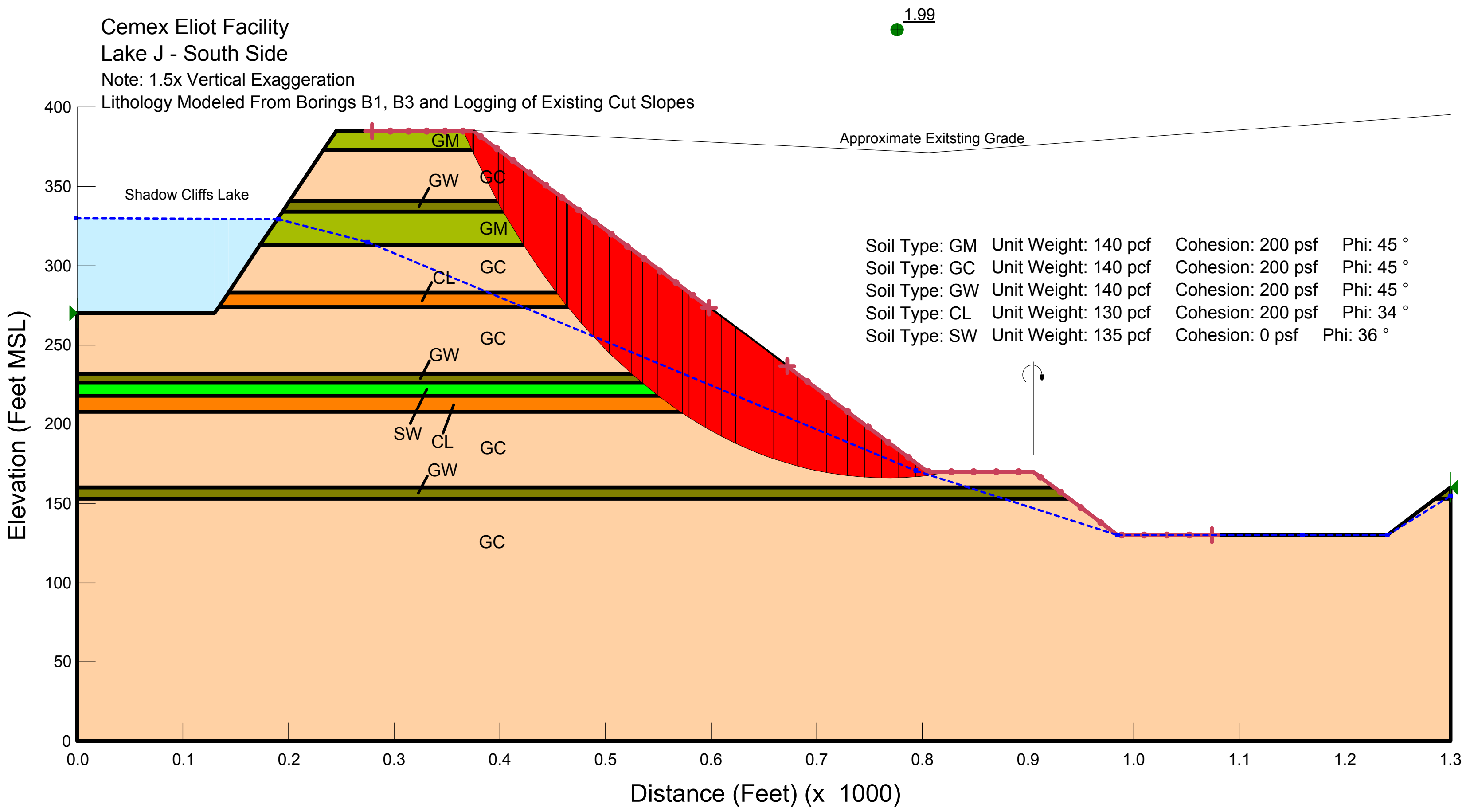
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J NORTH – RECLAIMED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C8

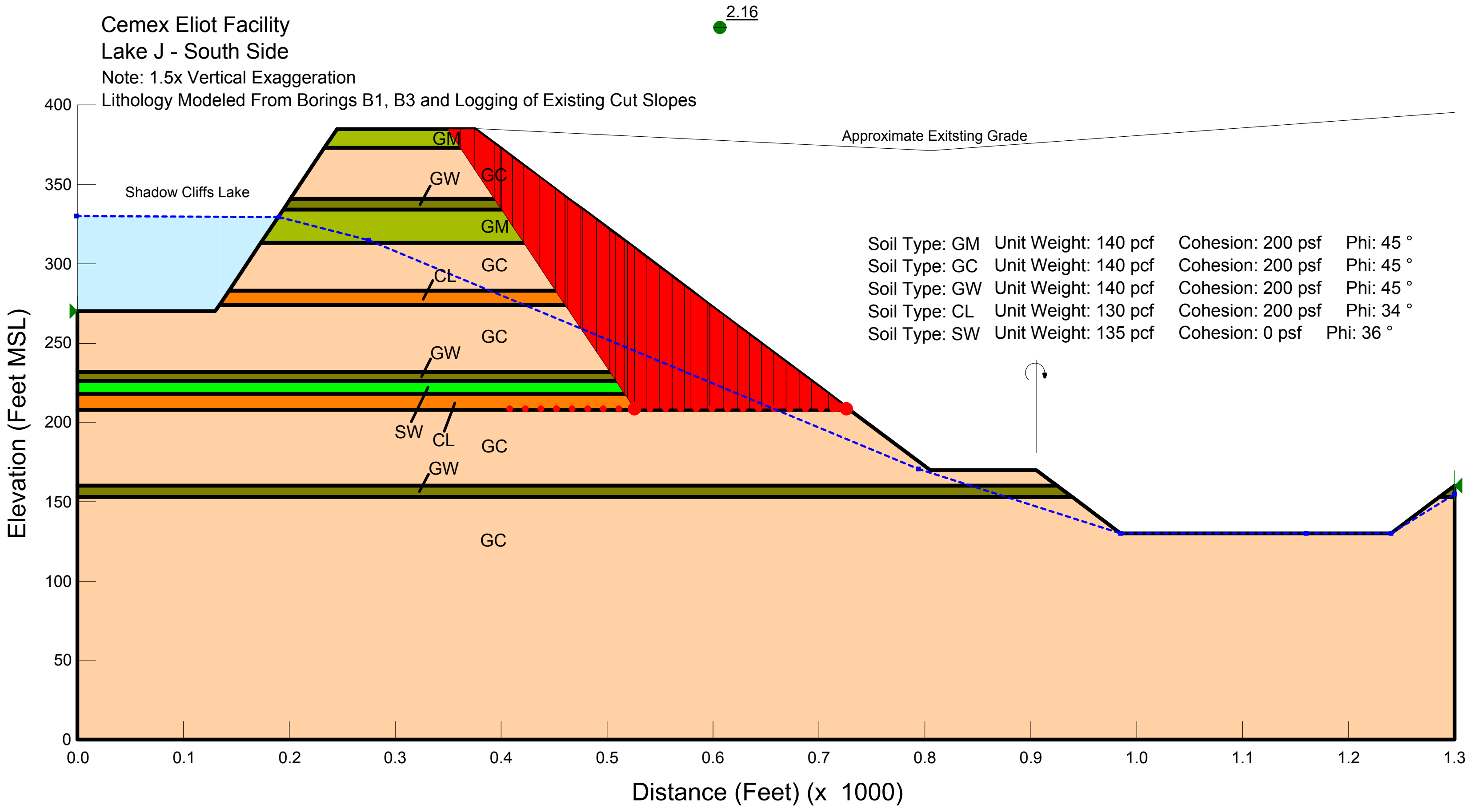


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J SOUTH - MINED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C9



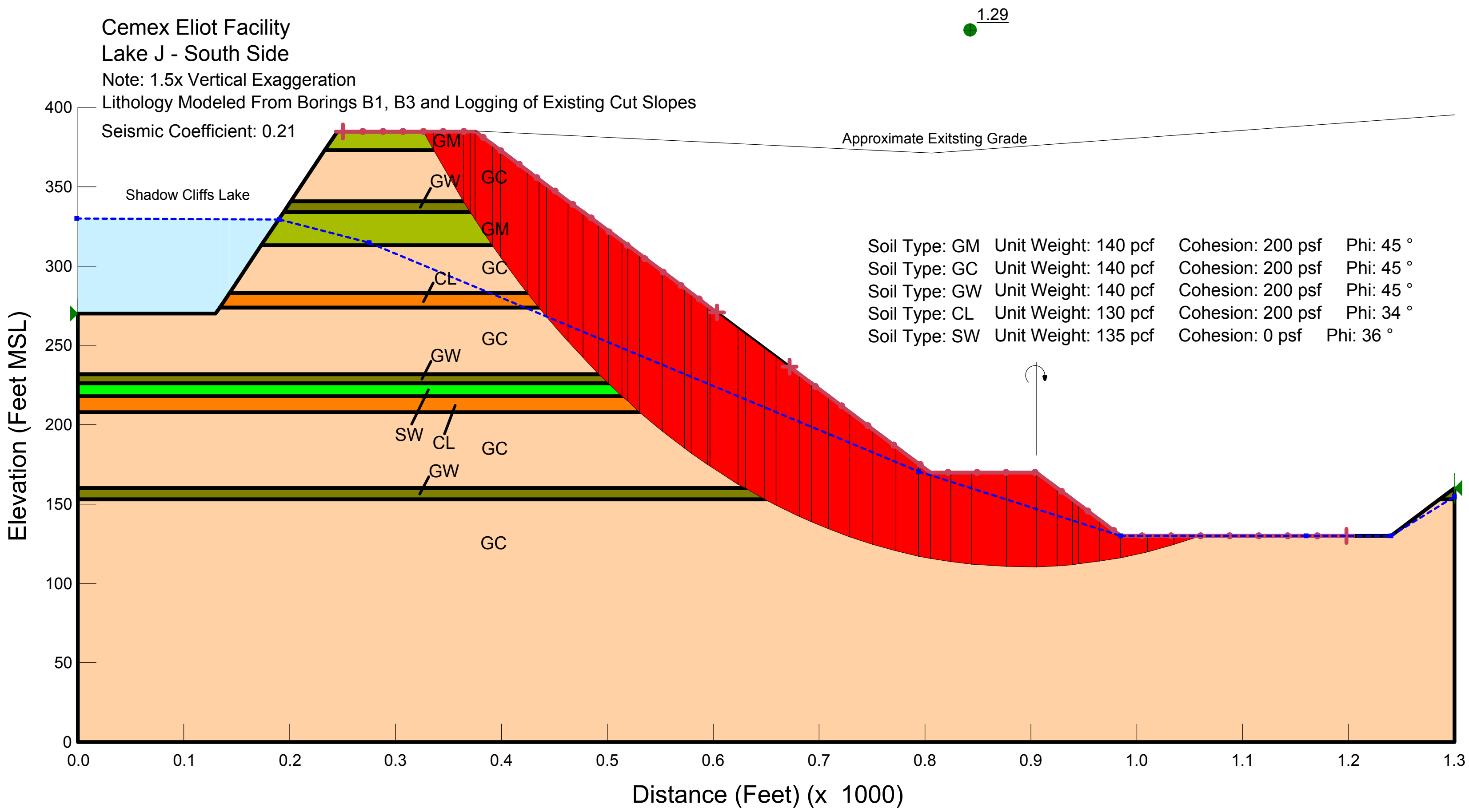
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET–LIVERMORE, CA 94550
PHONE 925.371.5900–FAX 925.371.5915

LAKE J SOUTH - MINED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C10



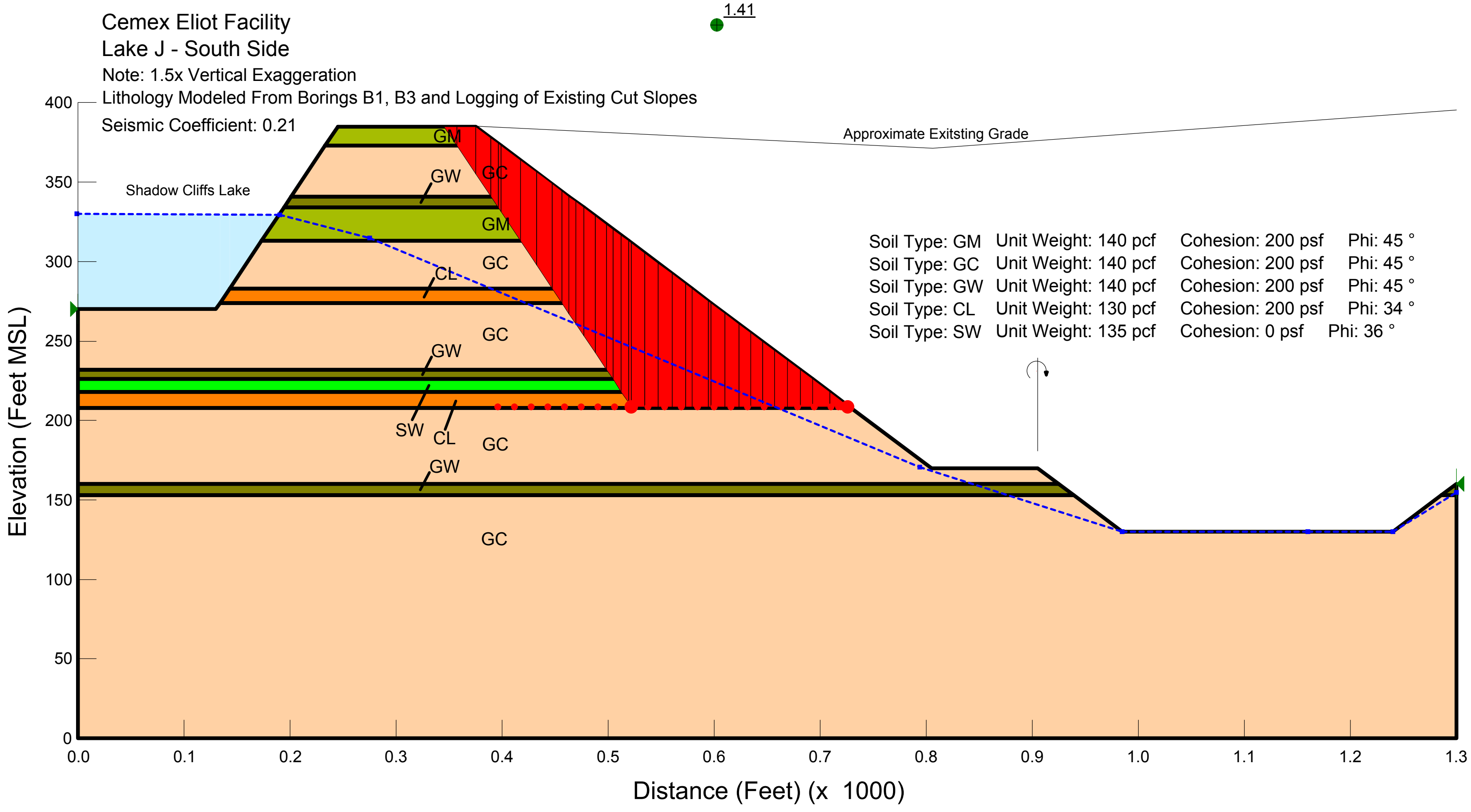
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J SOUTH - MINED CONDITION
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2019

FIGURE C11



Cemex Eliot Facility
Lake J - South Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.21

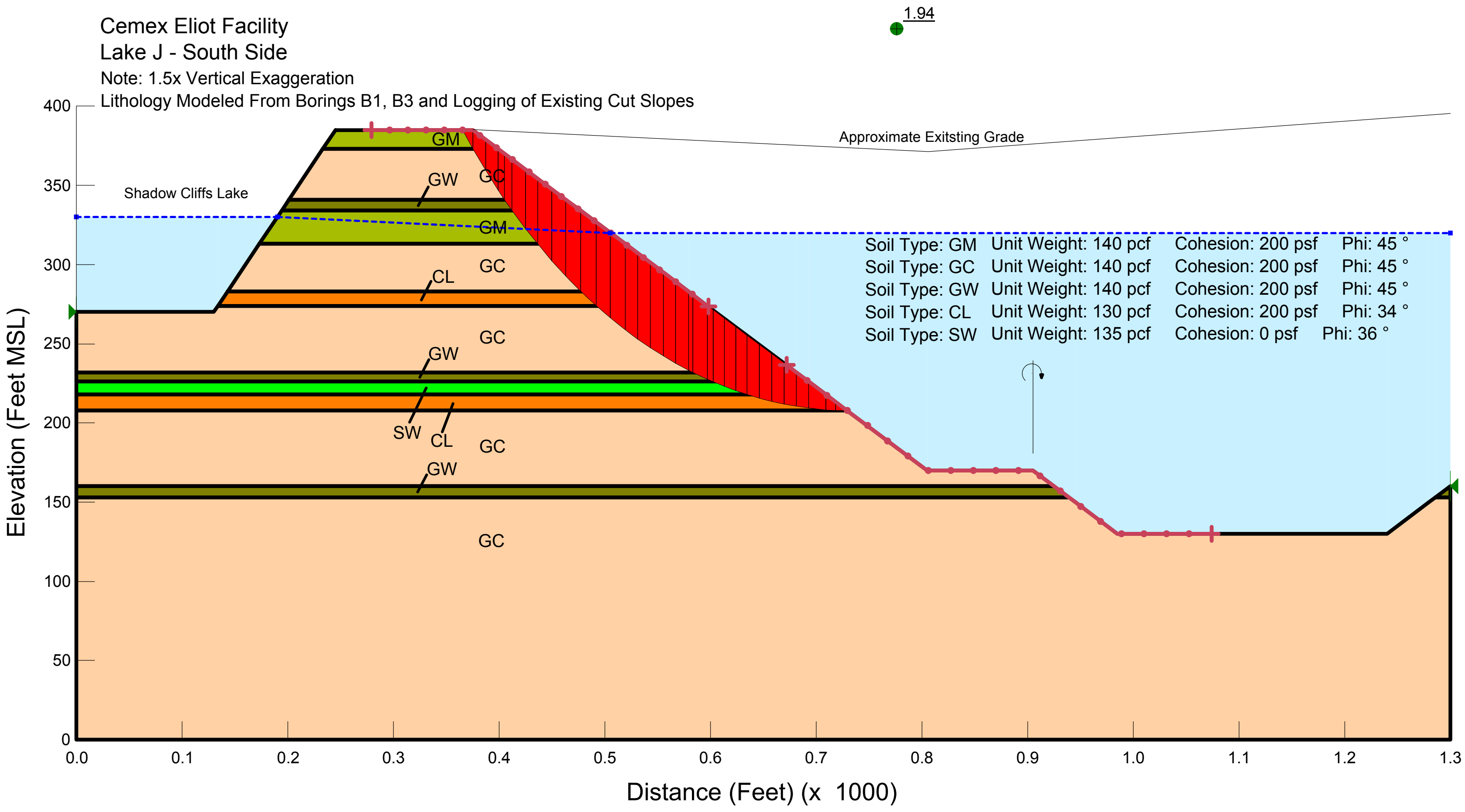
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J SOUTH - MINED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2019

FIGURE C12

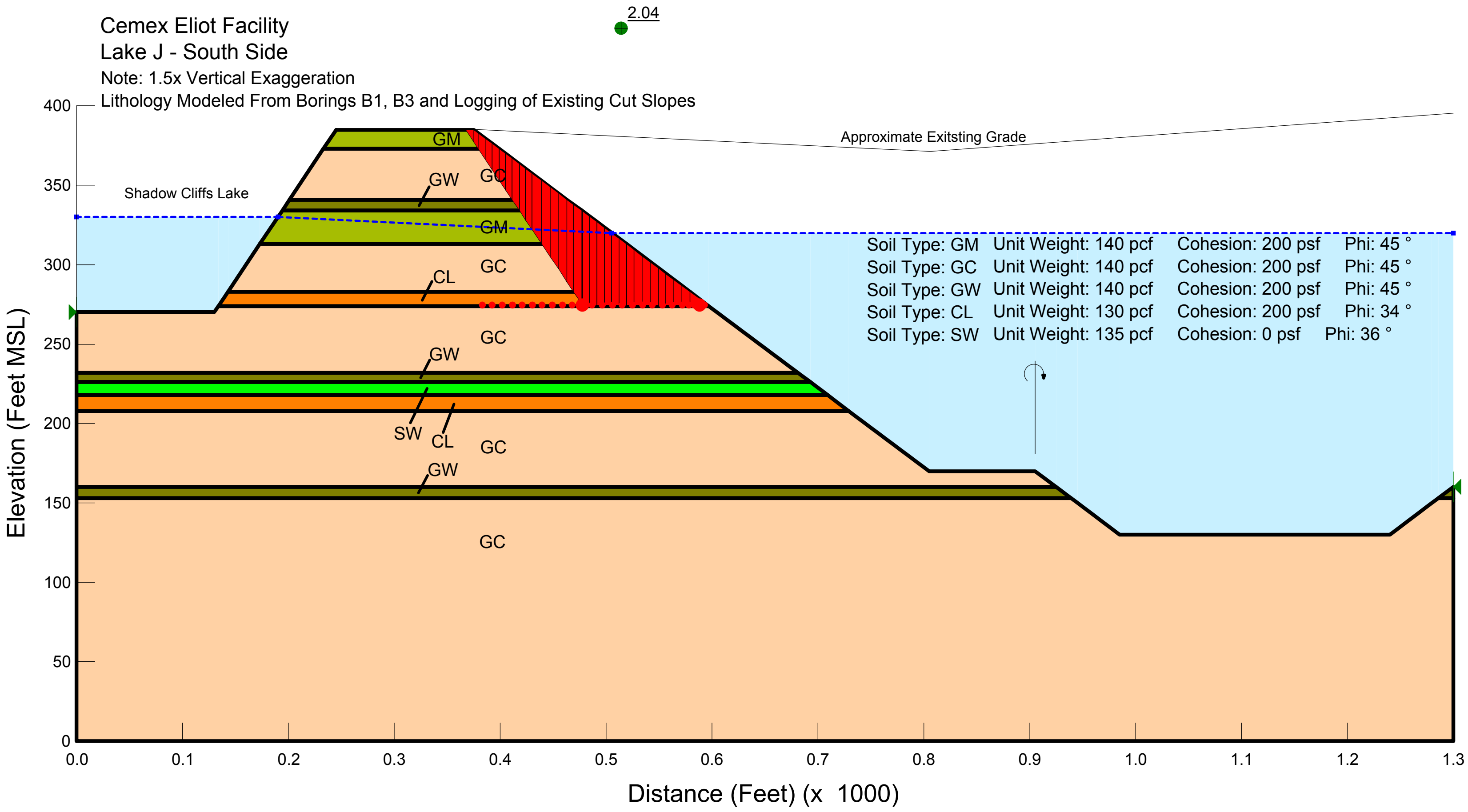


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J SOUTH - RECLAIMED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C13



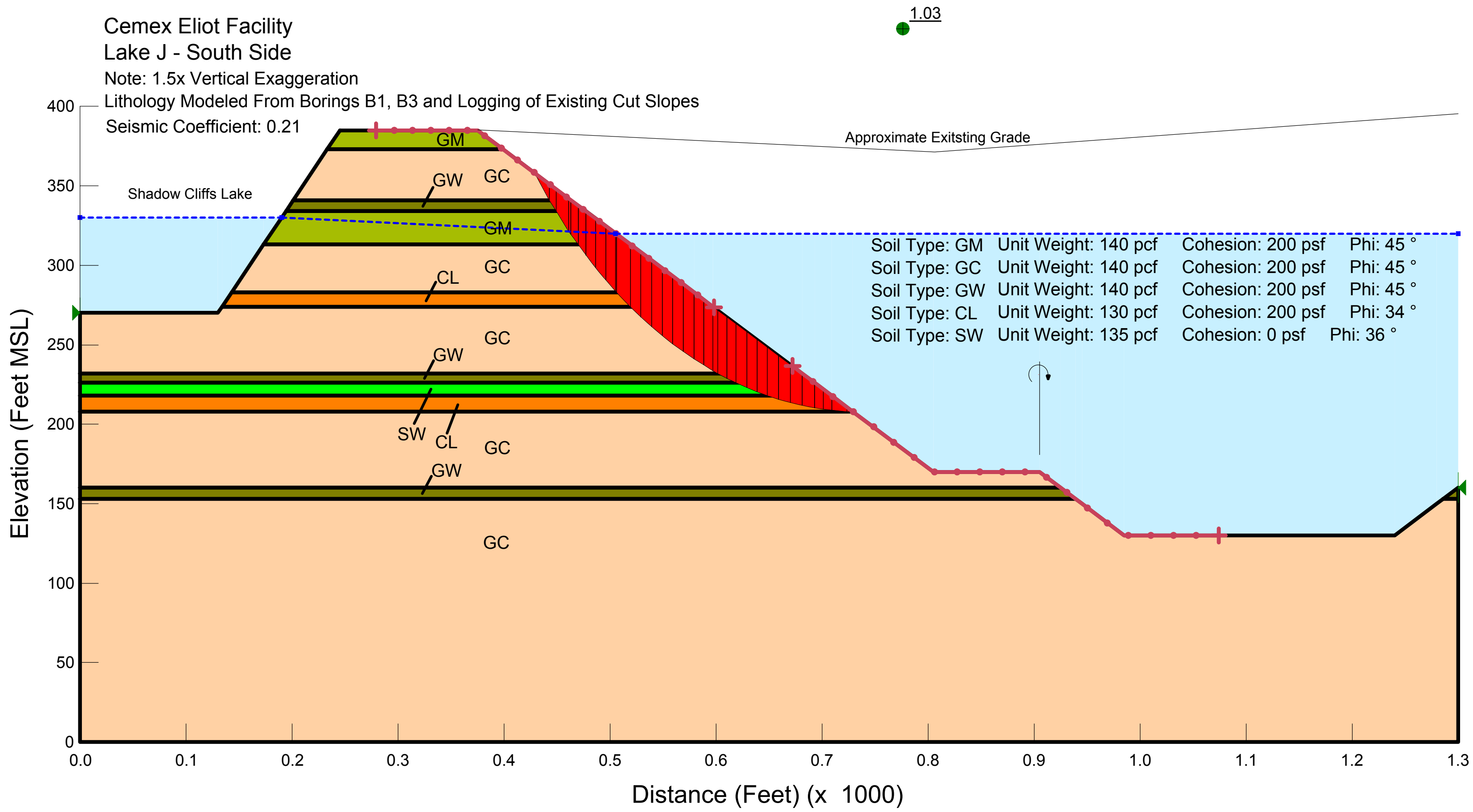
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J SOUTH - RECLAIMED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C14



Cemex Eliot Facility
Lake J - South Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.21

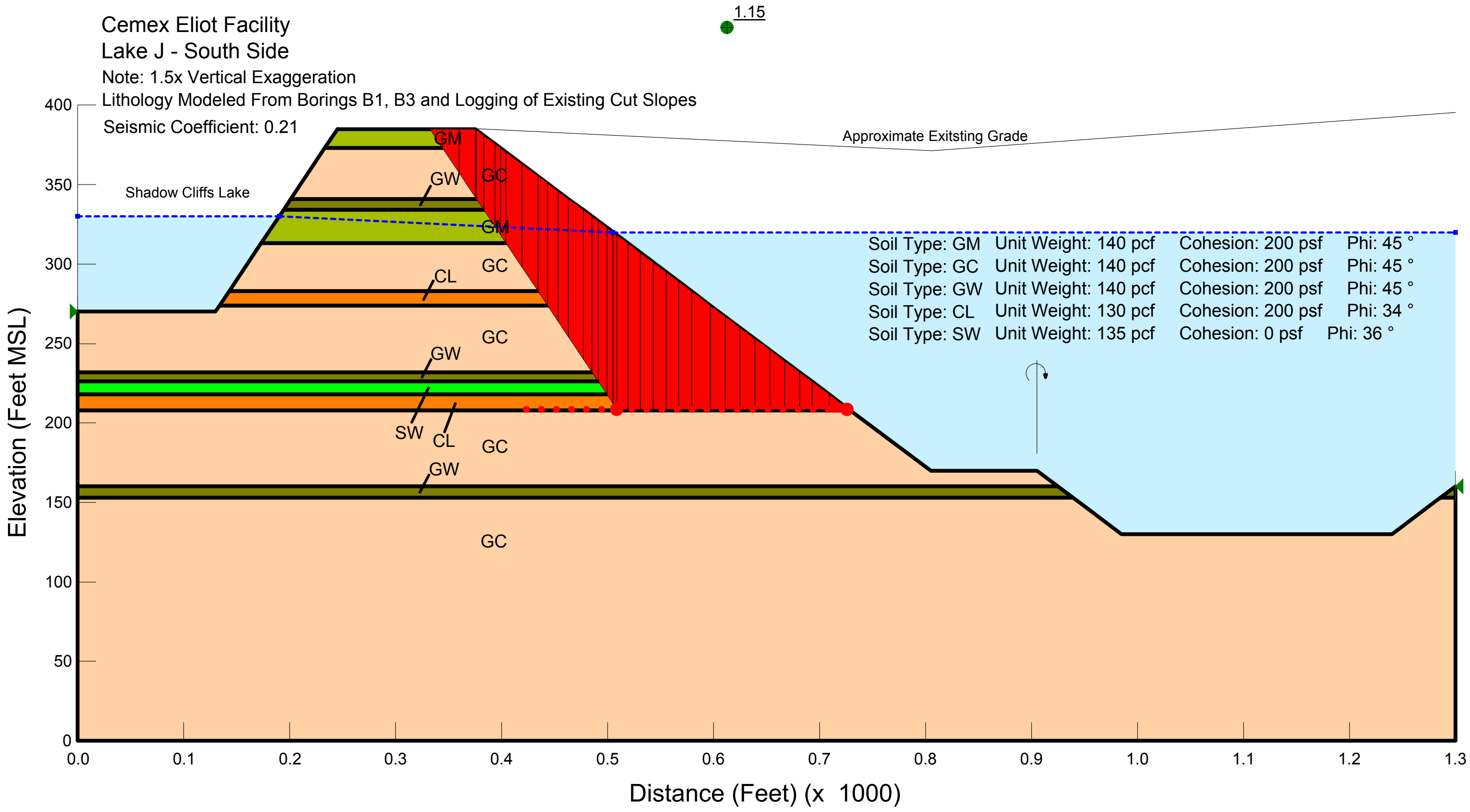
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET–LIVERMORE, CA 94550
PHONE 925.371.5900–FAX 925.371.5915

LAKE J SOUTH - RECLAIMED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2019

FIGURE C15


Cemex Eliot Facility
Lake J - South Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.21

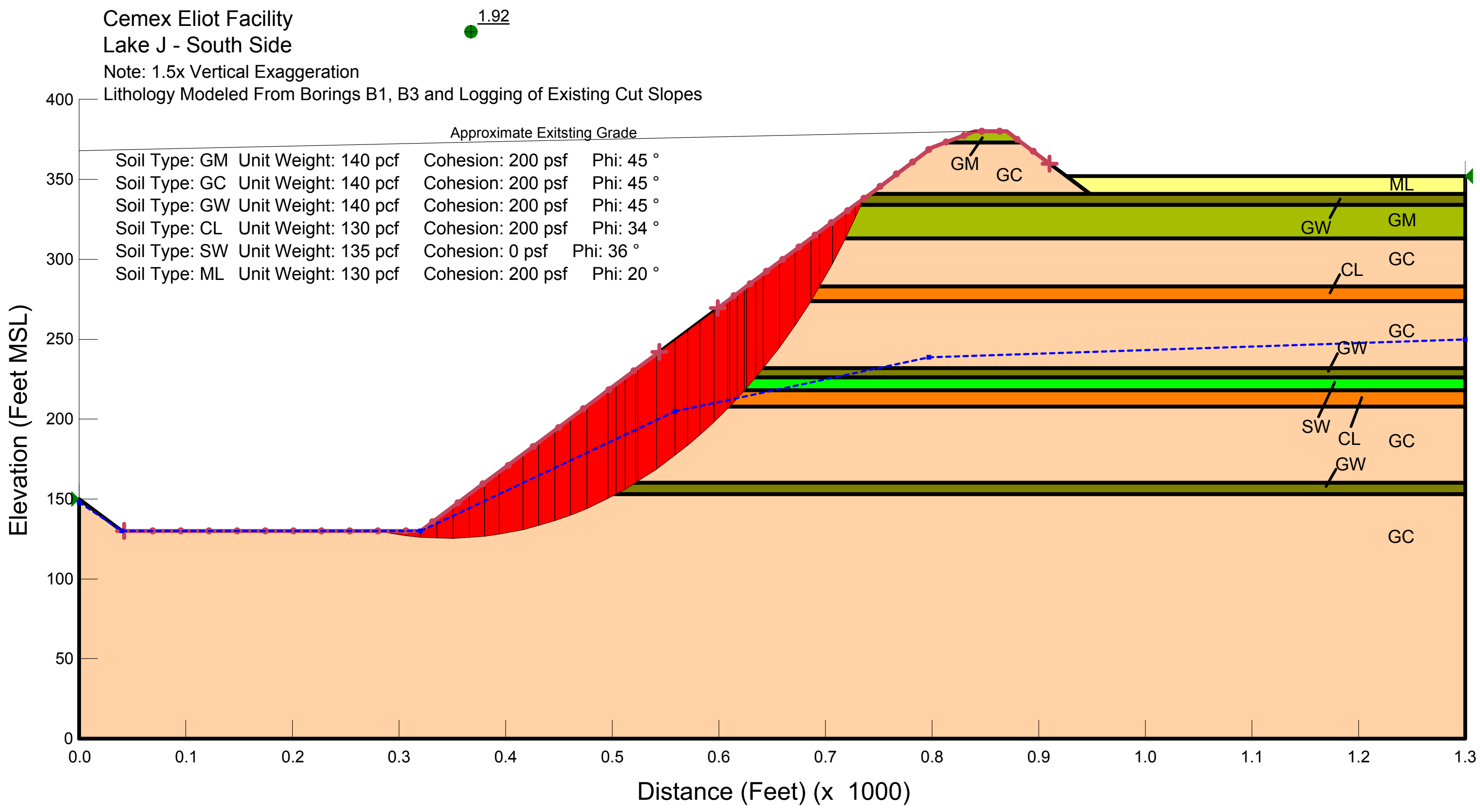
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE J SOUTH - RECLAIMED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2019

FIGURE C16

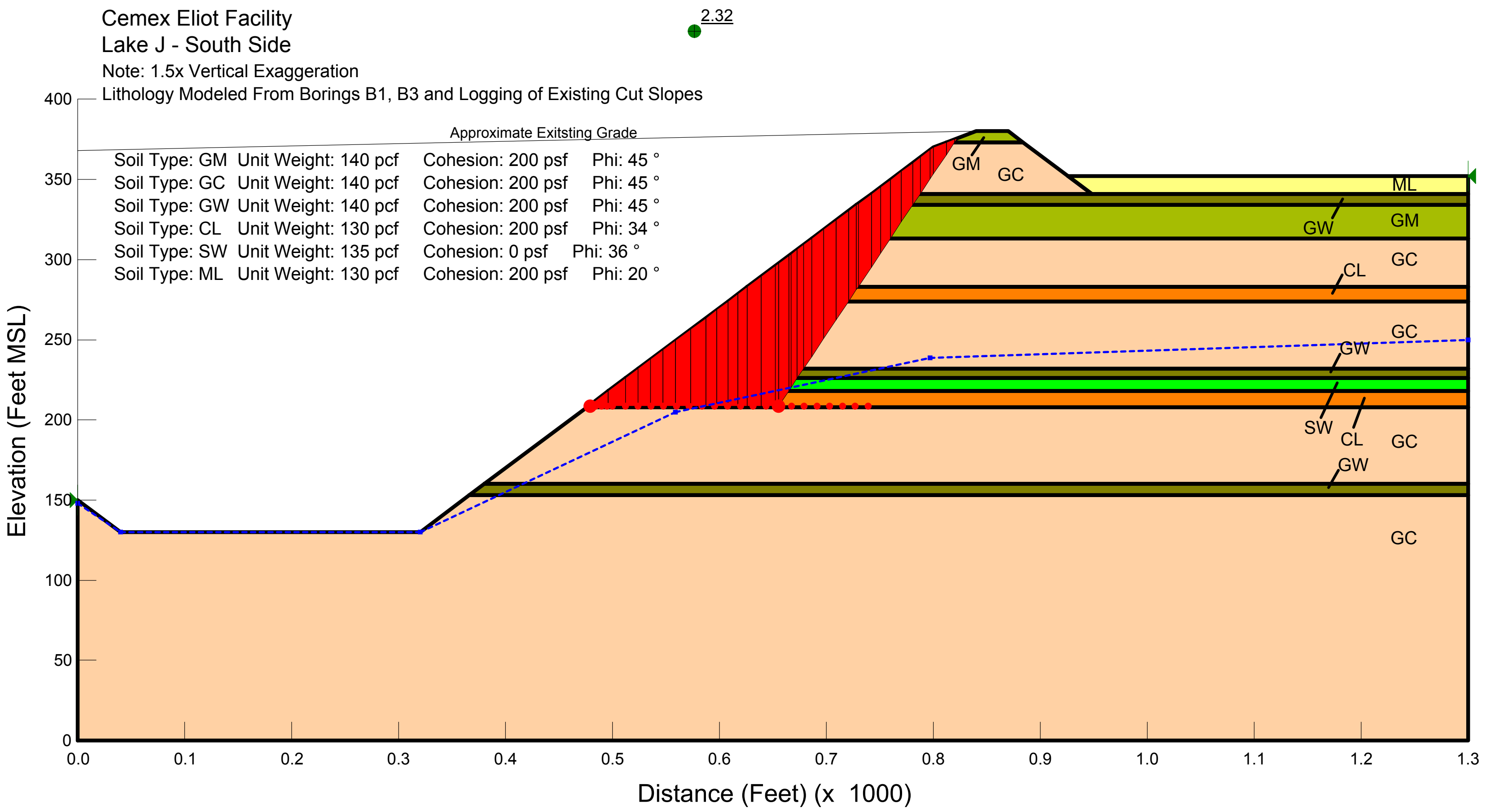


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - MINED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C17

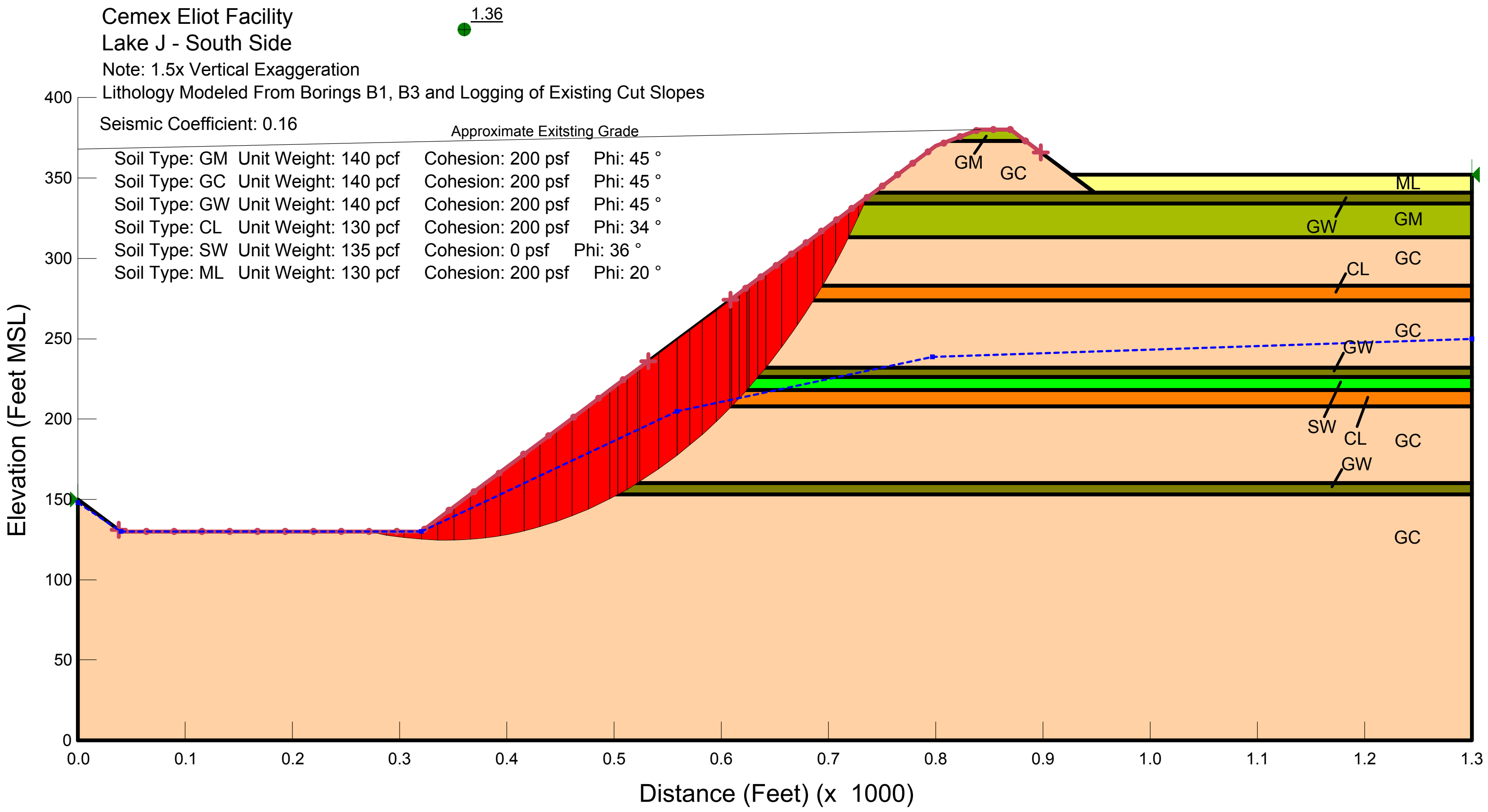


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - MINED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C18



Cemex Eliot Facility
Lake J - South Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

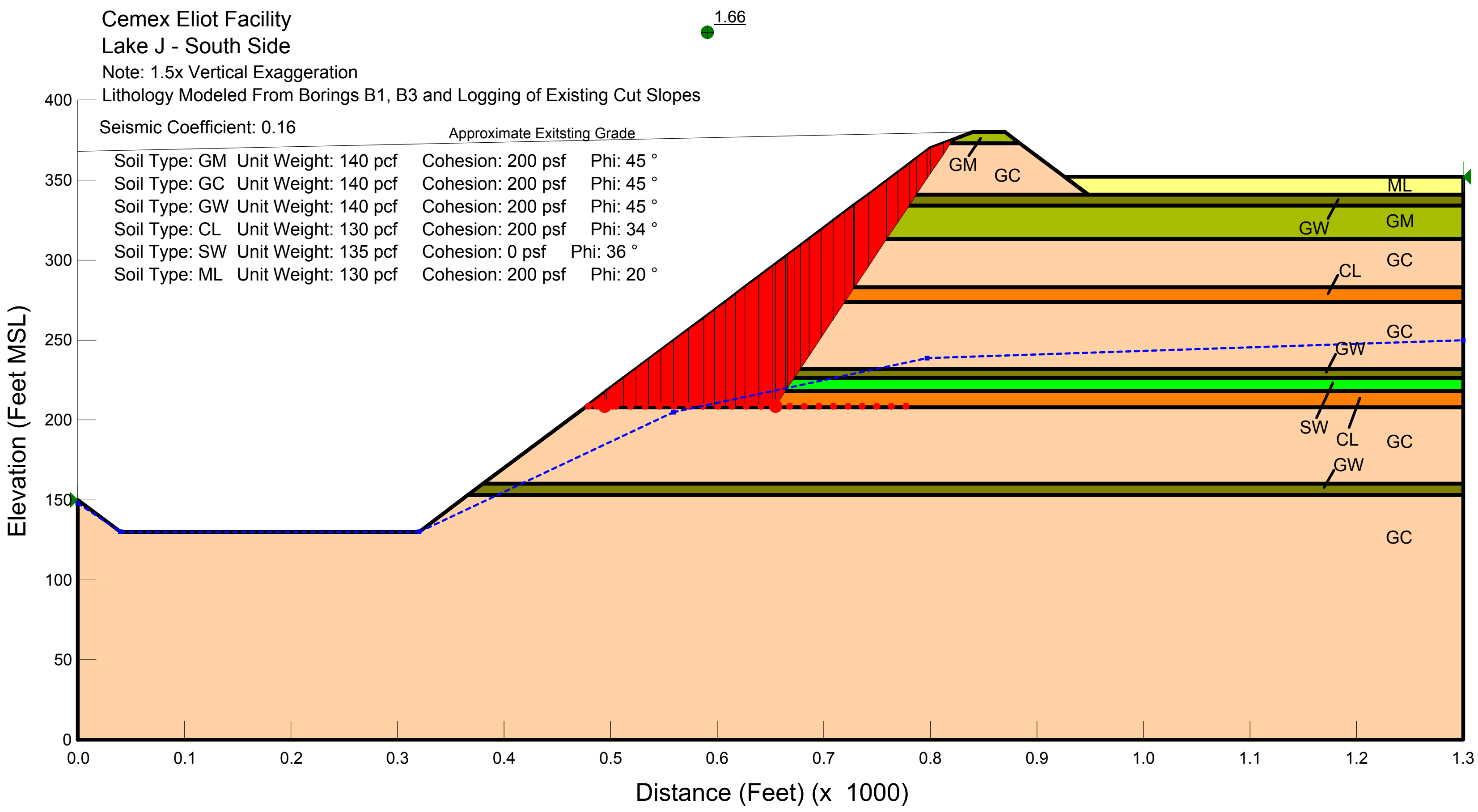
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - MINED CONDITION
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C19



Cemex Eliot Facility
Lake J - South Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes

Seismic Coefficient: 0.16

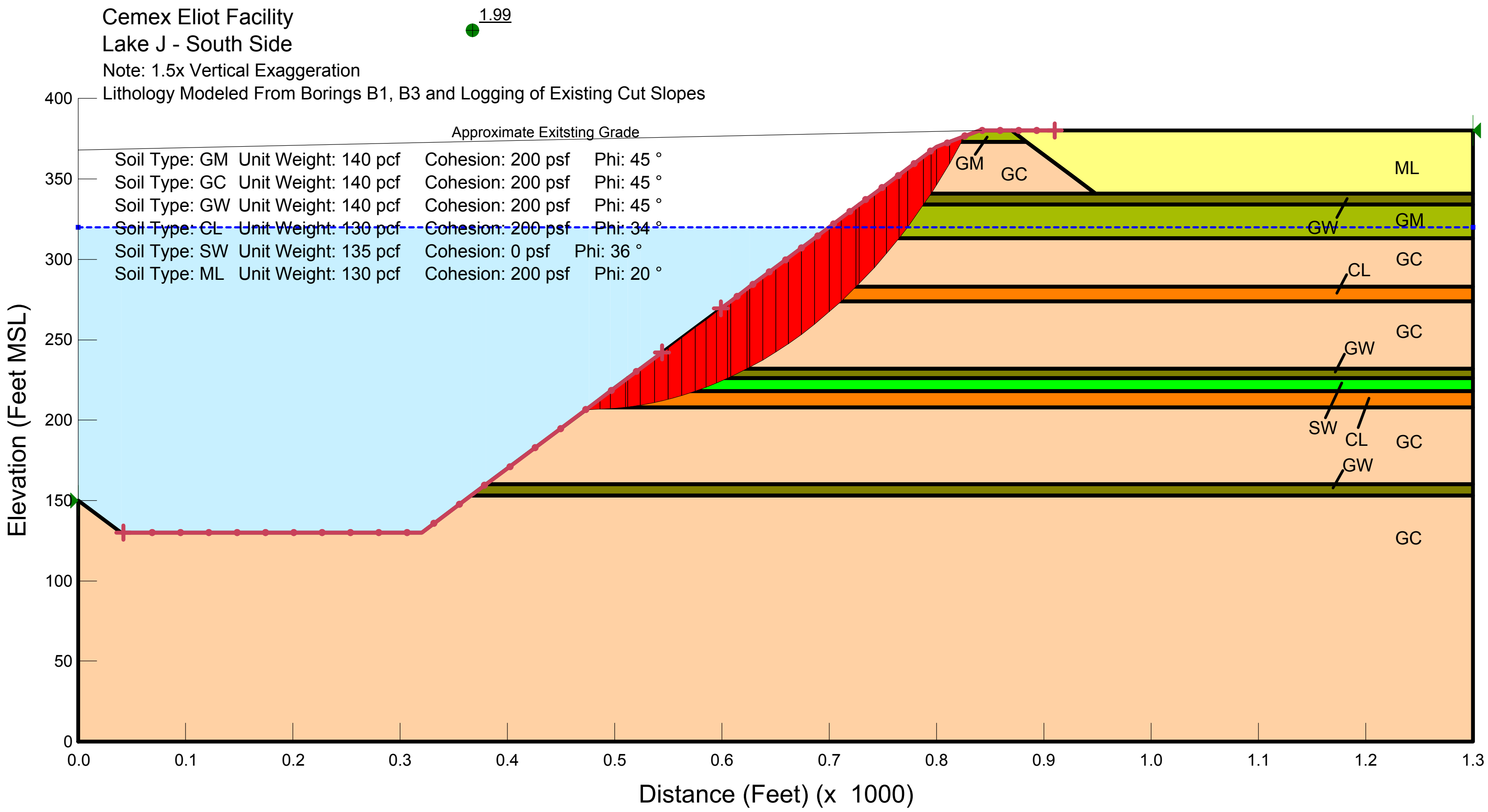
Soil Type: GM	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - MINED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C20

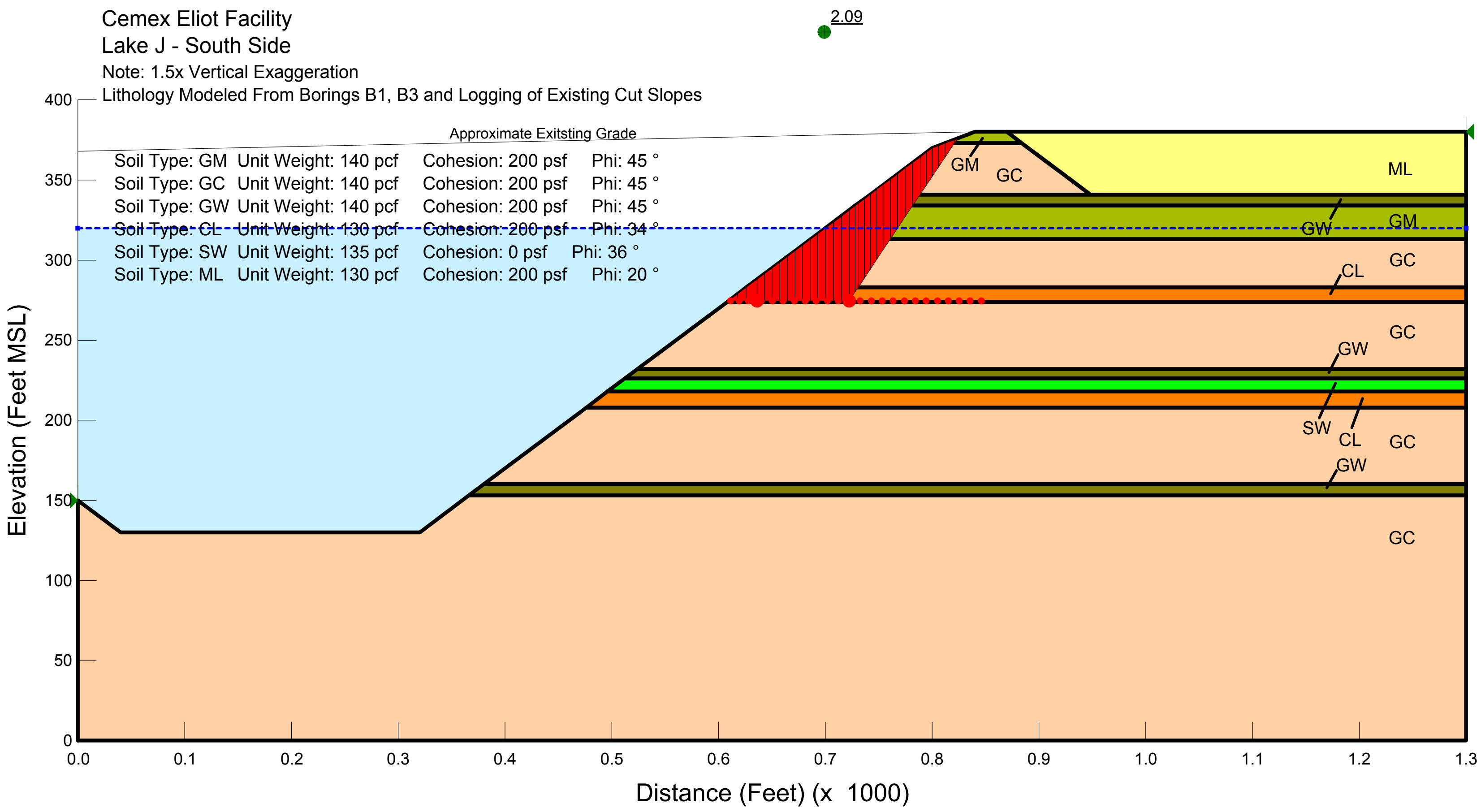


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - RECLAIMED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C21

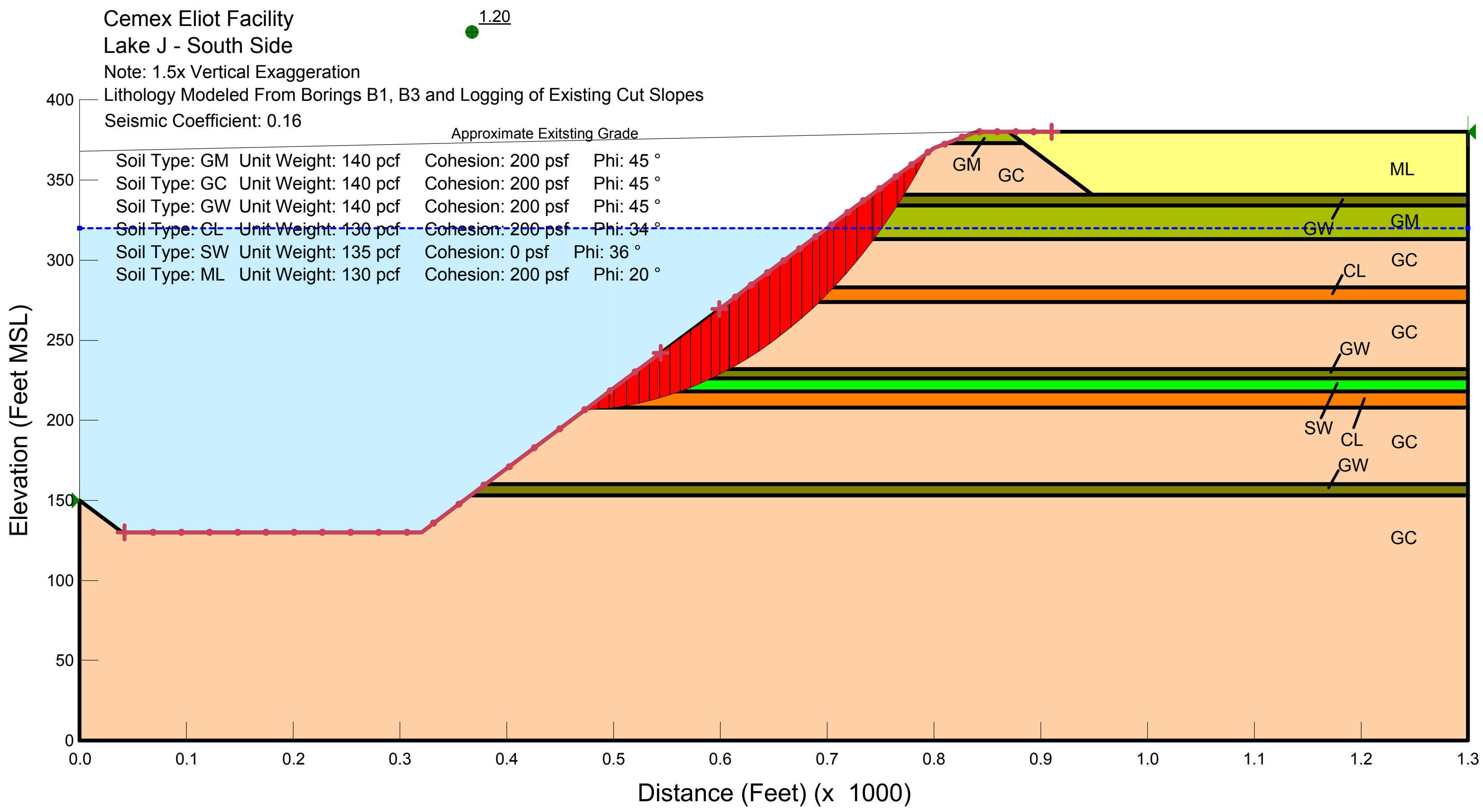


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - RECLAIMED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C22

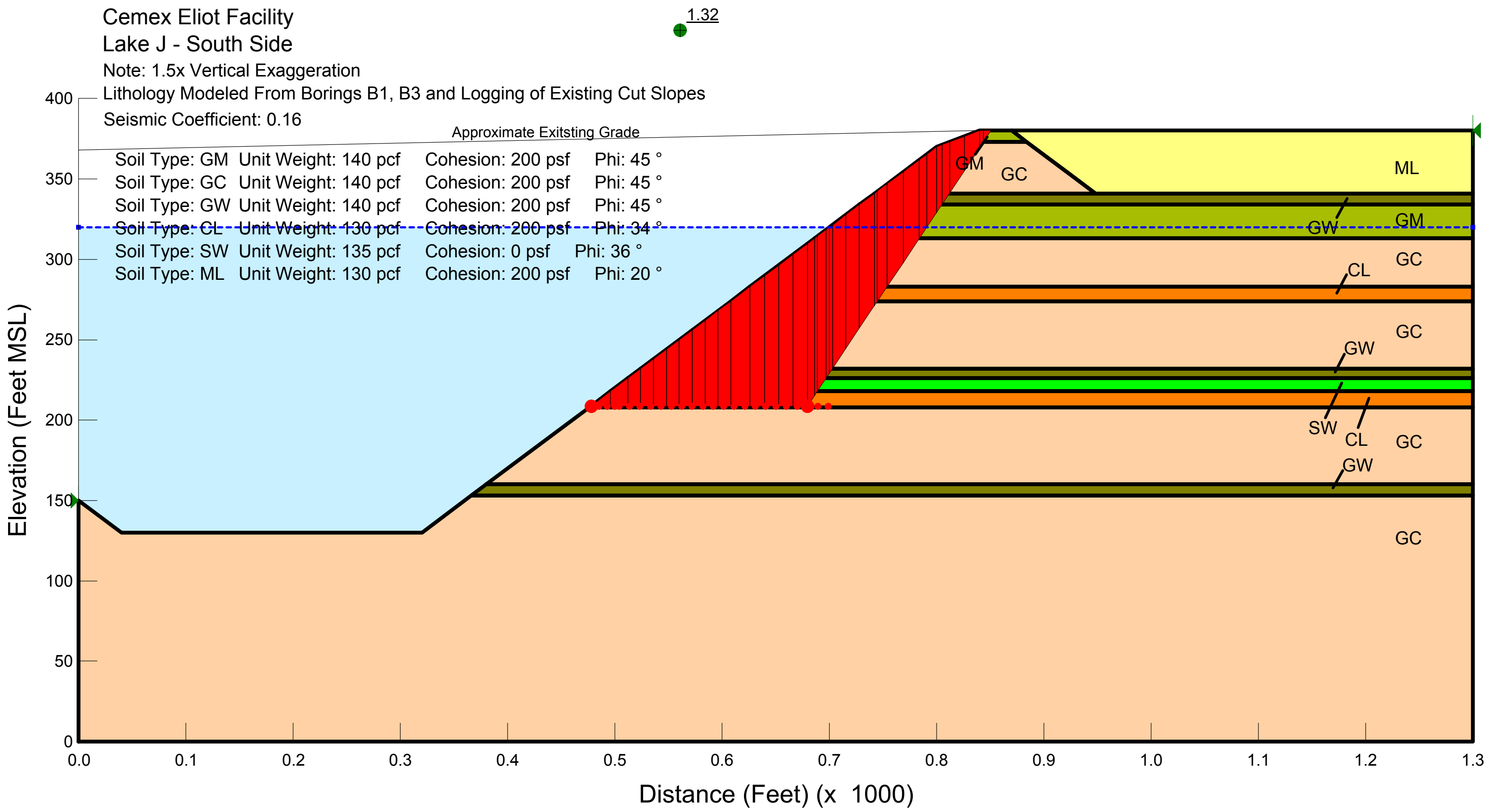


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - RECLAIMED CONDITION
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C23



Cemex Eliot Facility
Lake J - South Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B1, B3 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

Soil Type: GM Unit Weight: 140 pcf Cohesion: 200 psf Phi: 45 °
Soil Type: GC Unit Weight: 140 pcf Cohesion: 200 psf Phi: 45 °
Soil Type: GW Unit Weight: 140 pcf Cohesion: 200 psf Phi: 45 °
Soil Type: CL Unit Weight: 130 pcf Cohesion: 200 psf Phi: 34 °
Soil Type: SW Unit Weight: 135 pcf Cohesion: 0 psf Phi: 36 °
Soil Type: ML Unit Weight: 130 pcf Cohesion: 200 psf Phi: 20 °

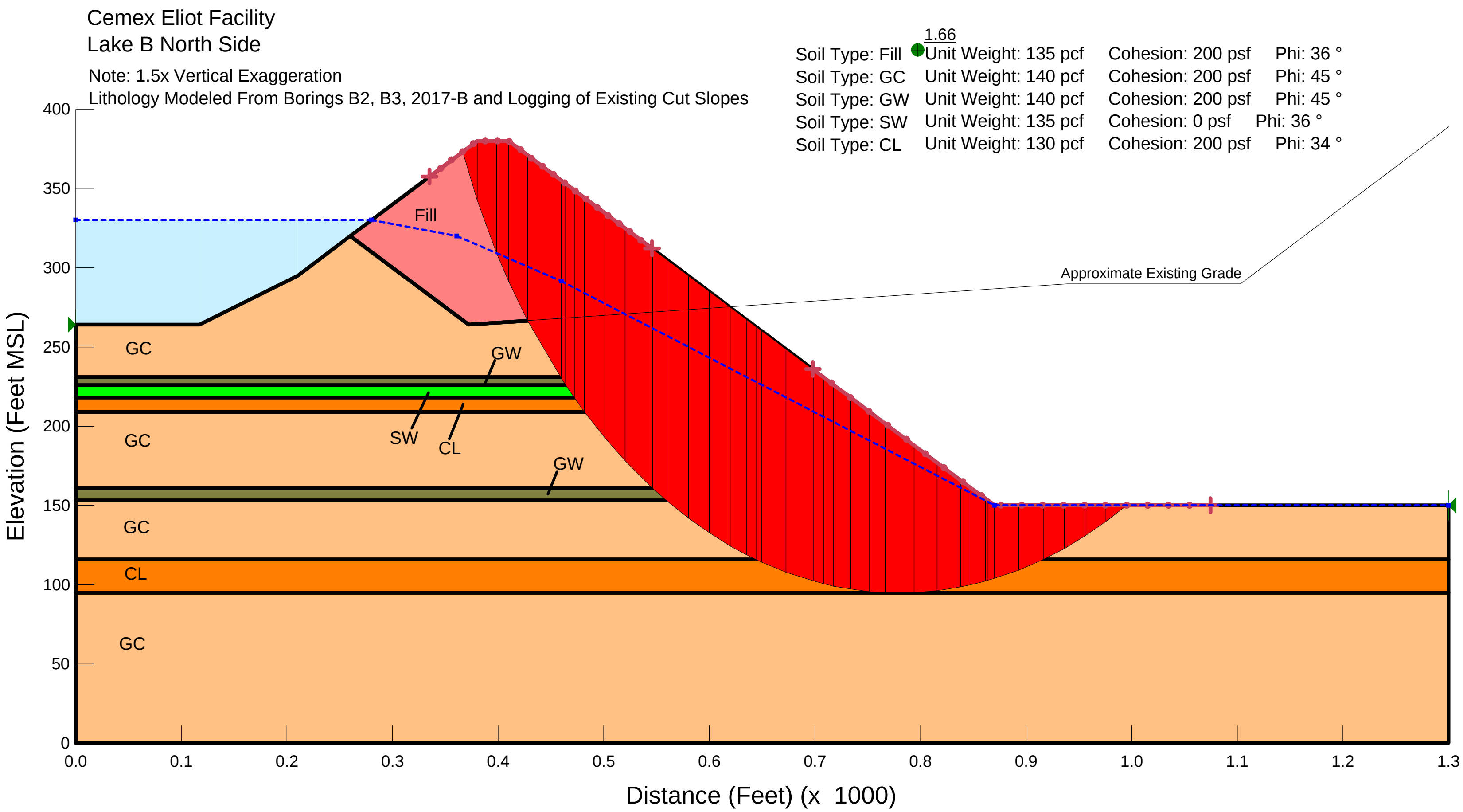
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE J EAST - RECLAIMED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE C24

APPENDIX D
SLOPE STABILITY ANALYSIS – LAKE B



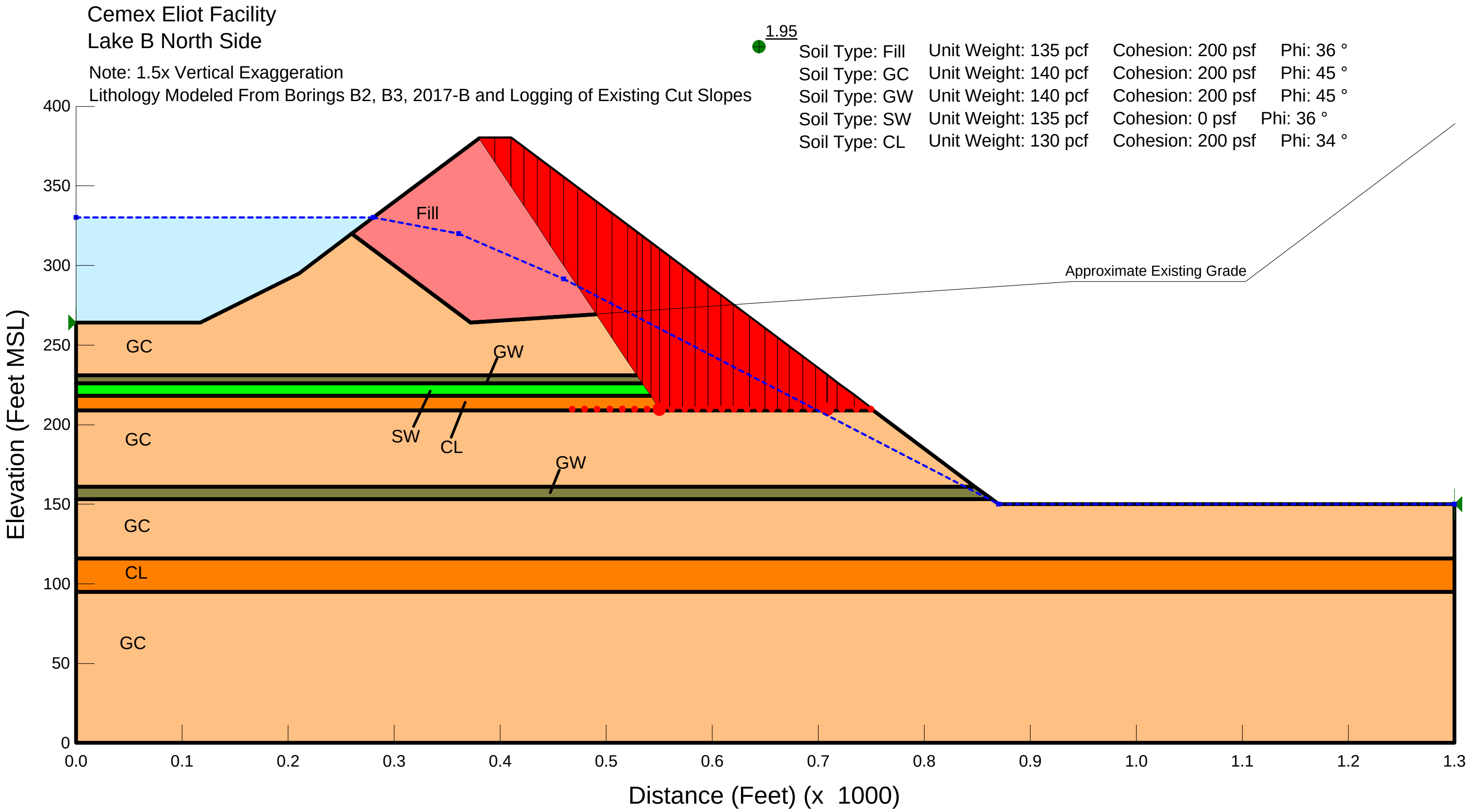
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B NORTH – MINED CONDITION
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D1


Cemex Eliot Facility
Lake B North Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, B3, 2017-B and Logging of Existing Cut Slopes

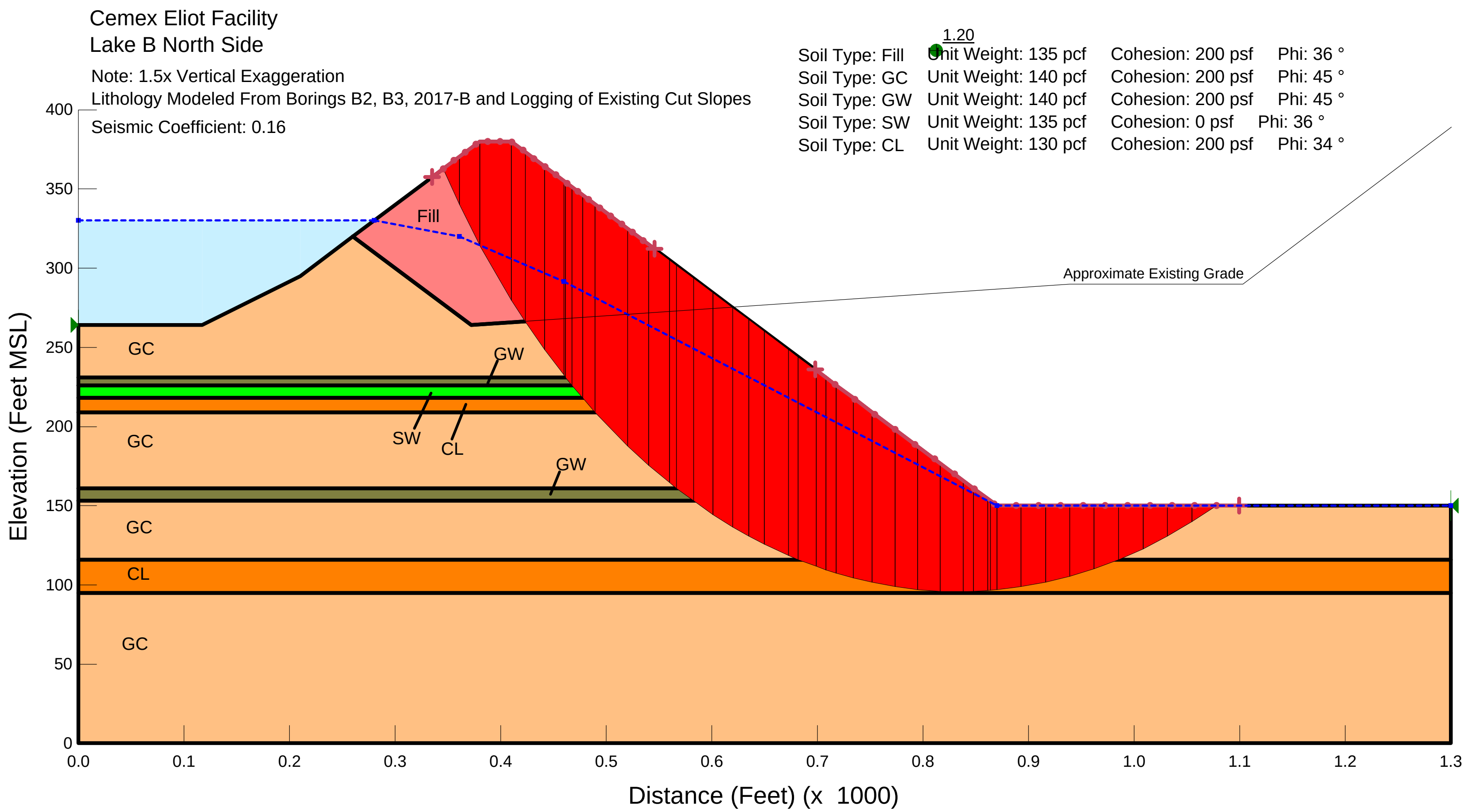
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B NORTH – MINED CONDITION
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D2

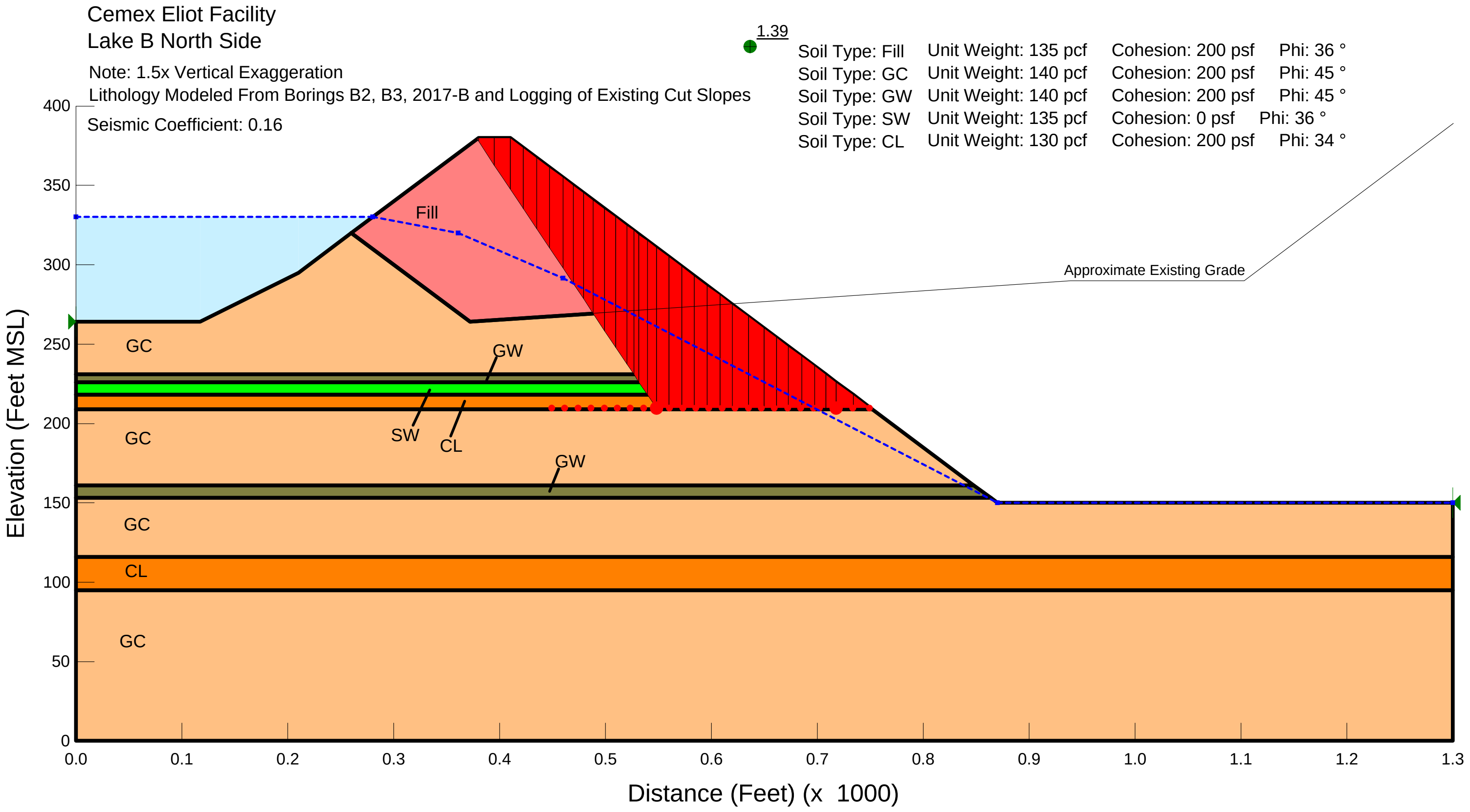


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B NORTH – MINED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D3



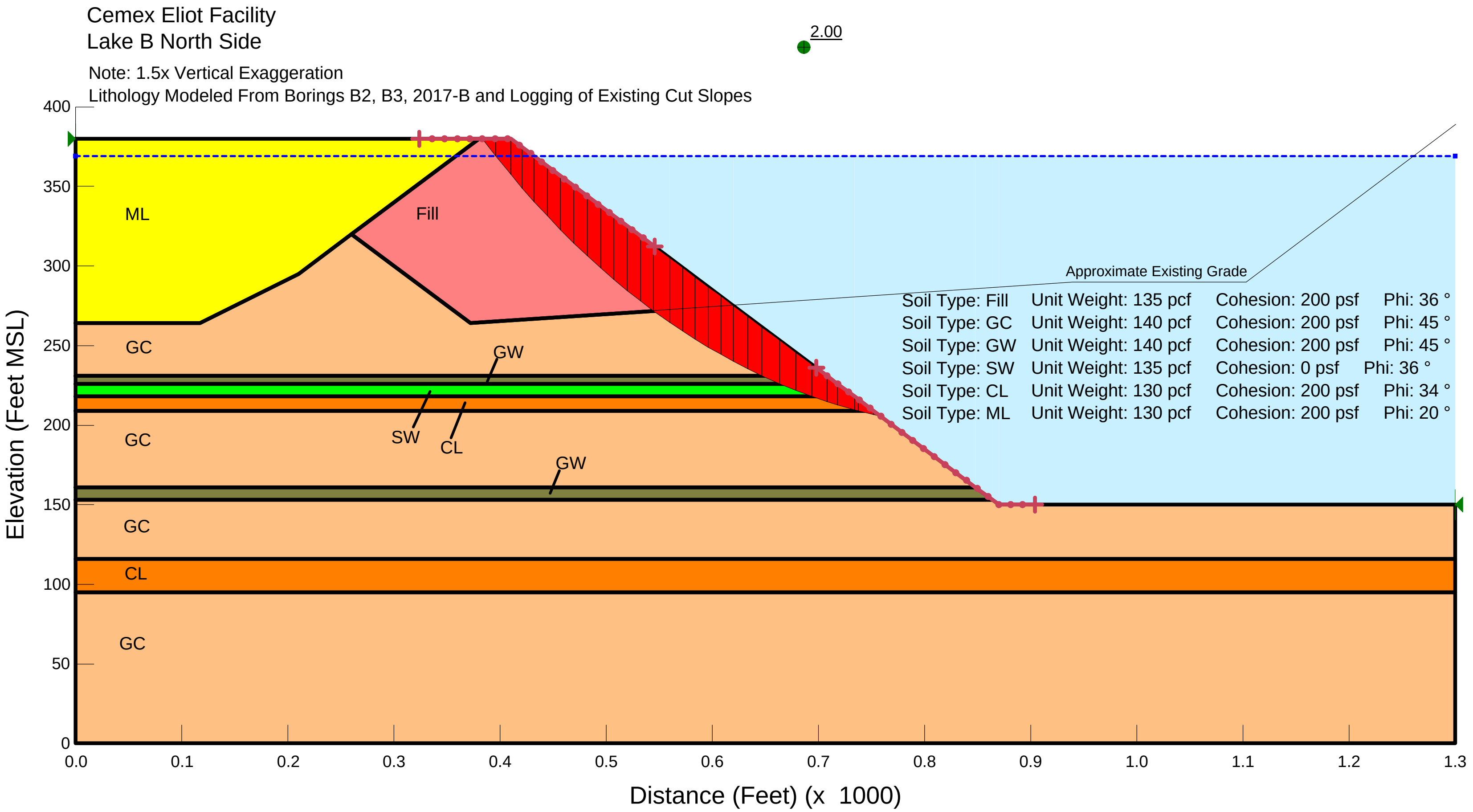
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B NORTH – MINED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D4



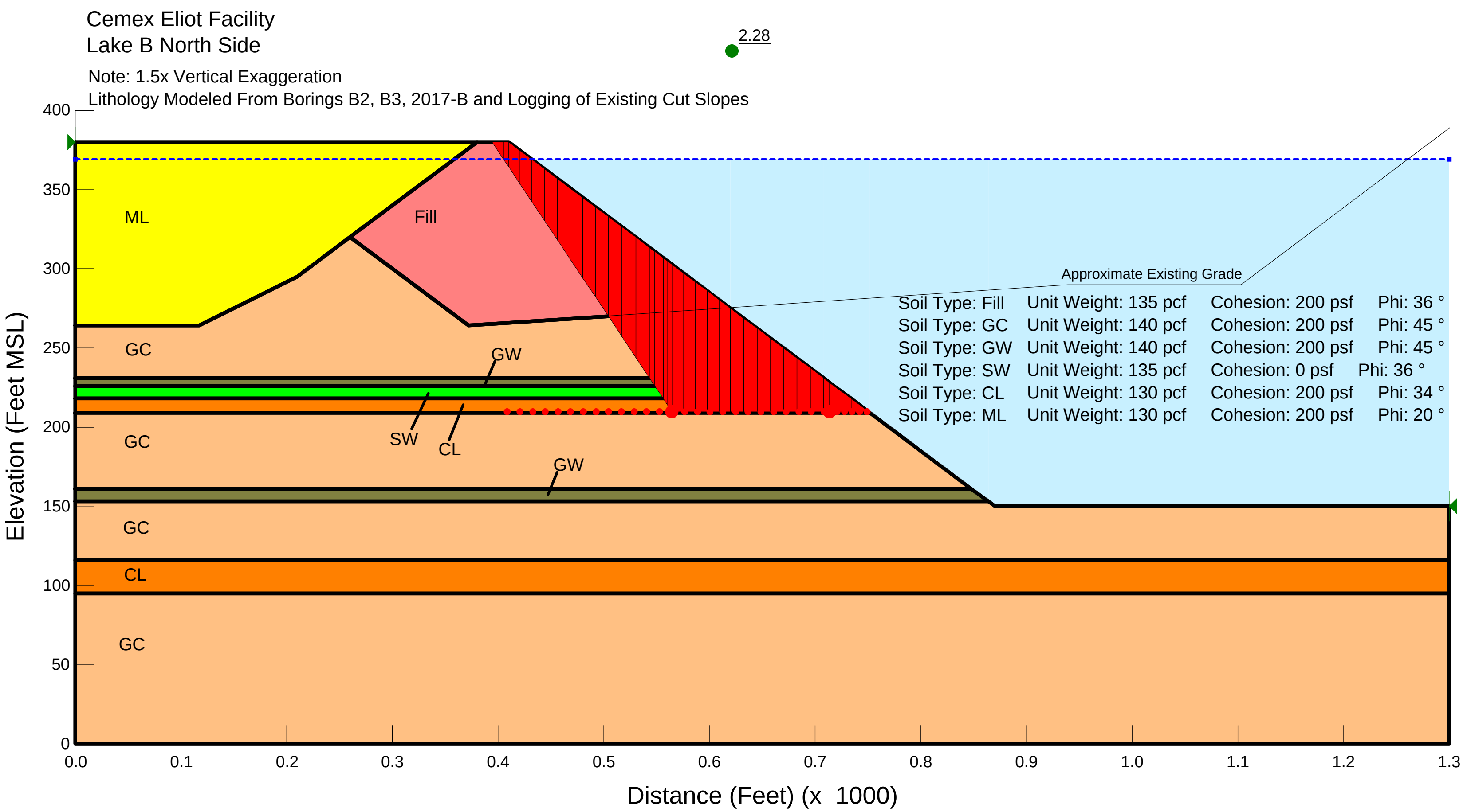
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B NORTH - RECLAIMED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D5



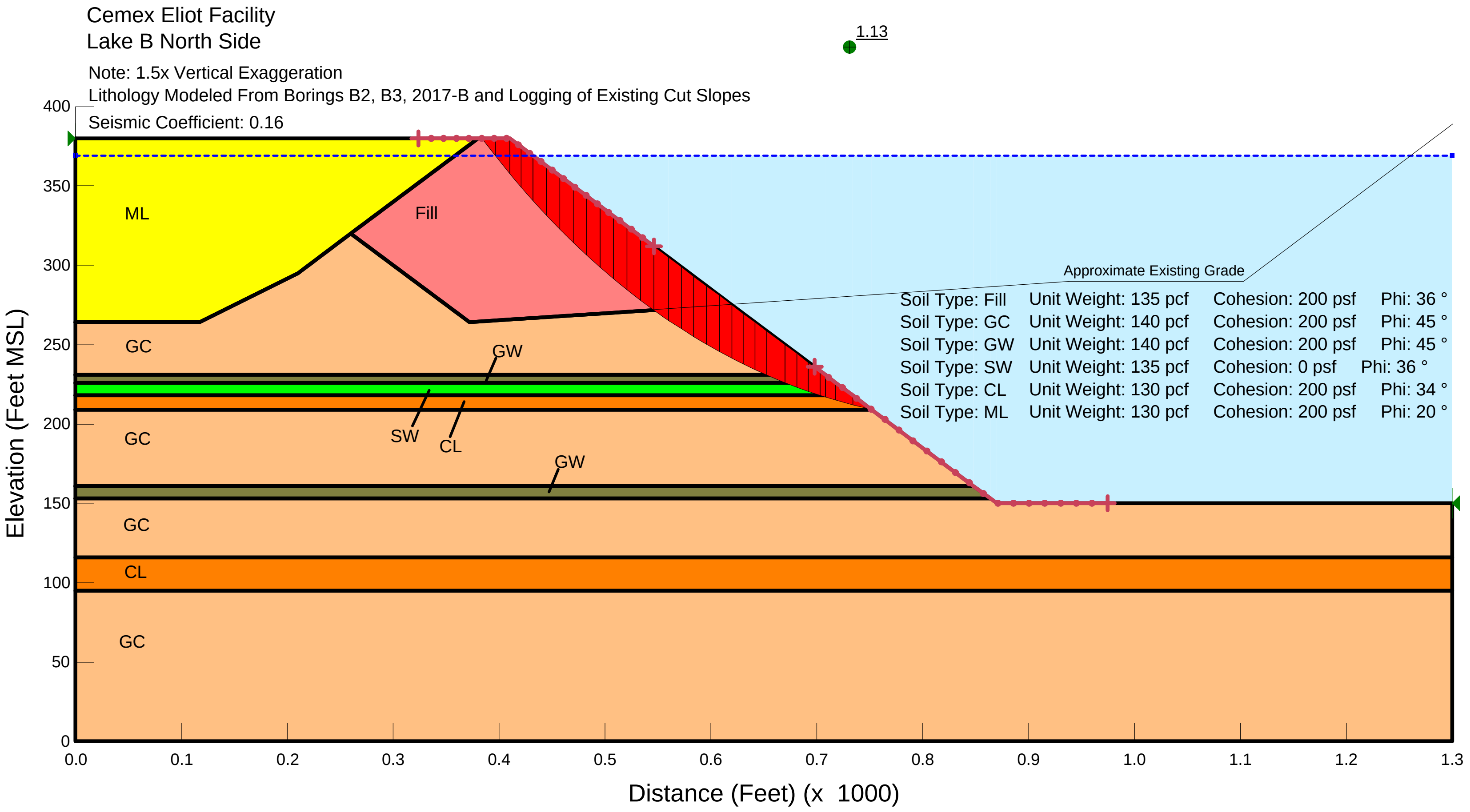
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B NORTH - RECLAIMED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D6



Cemex Eliot Facility
Lake B North Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, B3, 2017-B and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

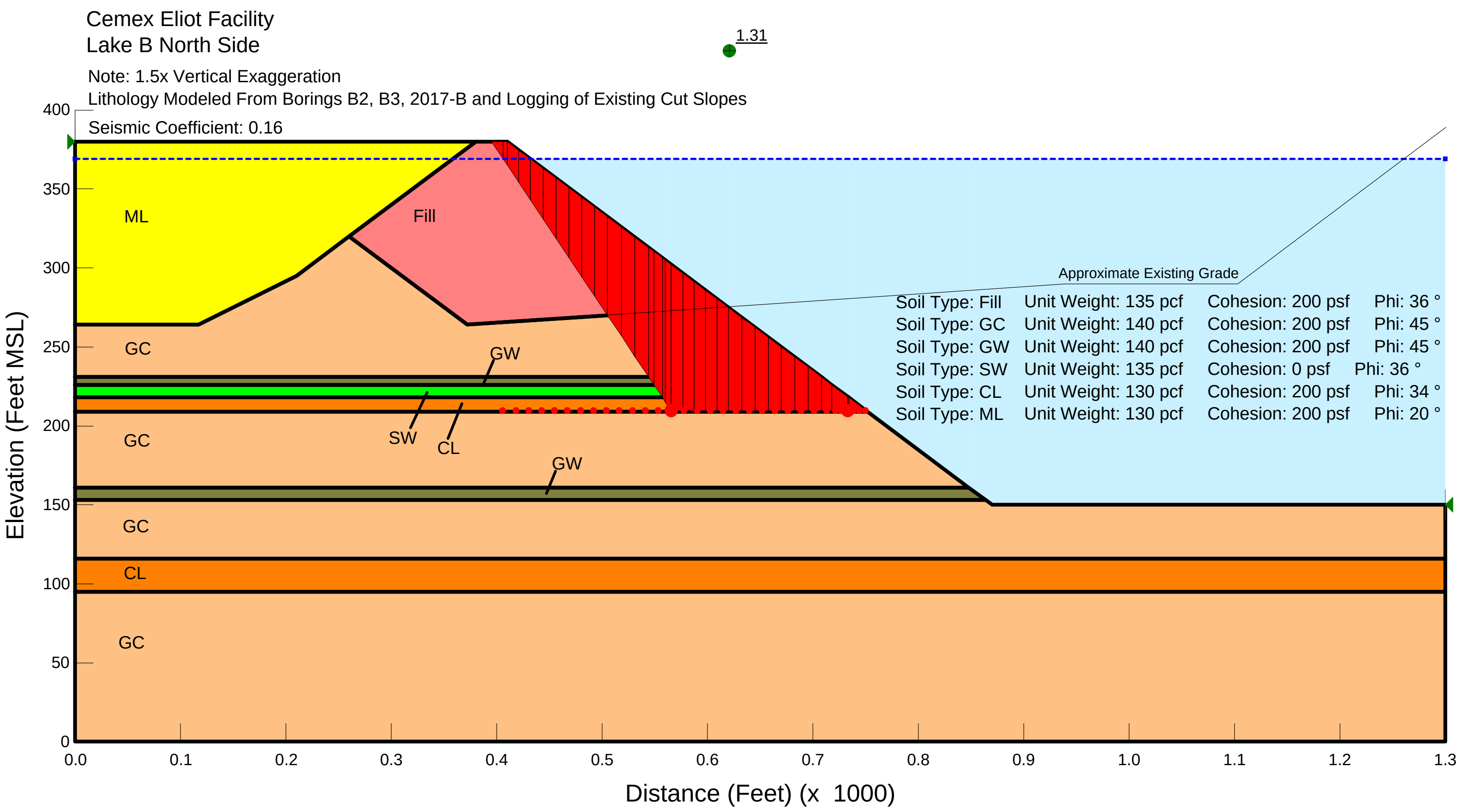
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B NORTH – RECLAIMED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D7



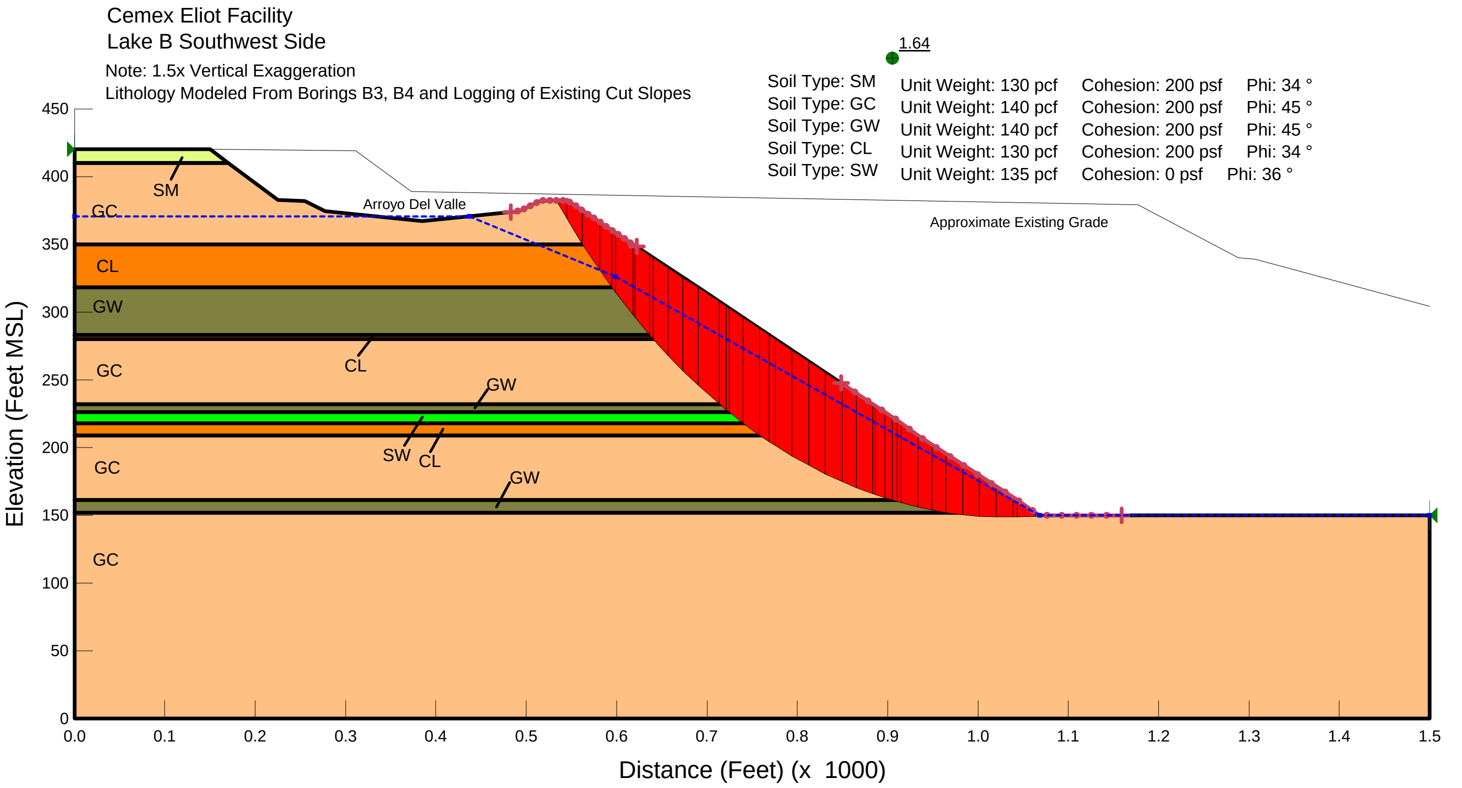
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B NORTH – RECLAIMED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D8



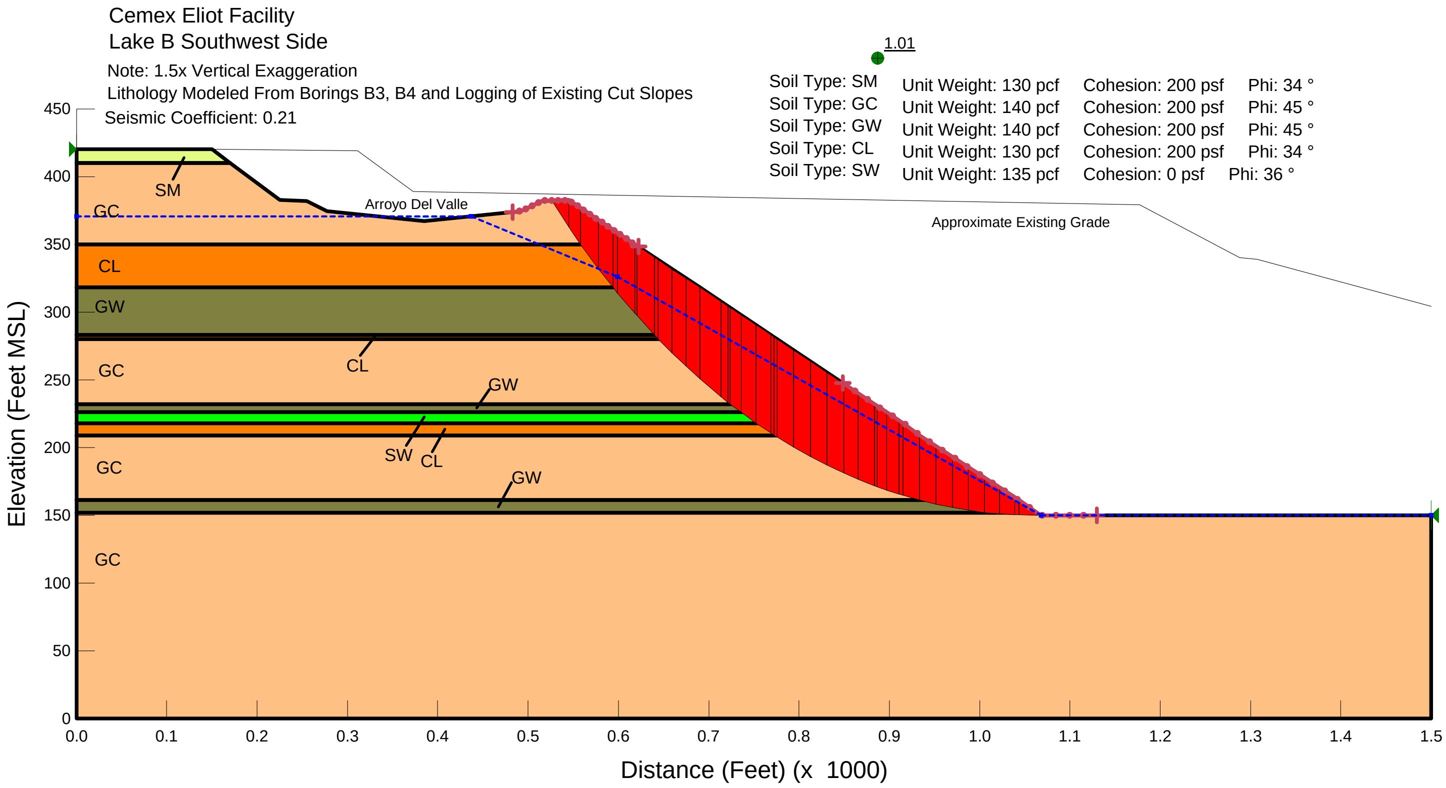
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – MINED CONDITION A
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D9



Cemex Eliot Facility
Lake B Southwest Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, B4 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.21

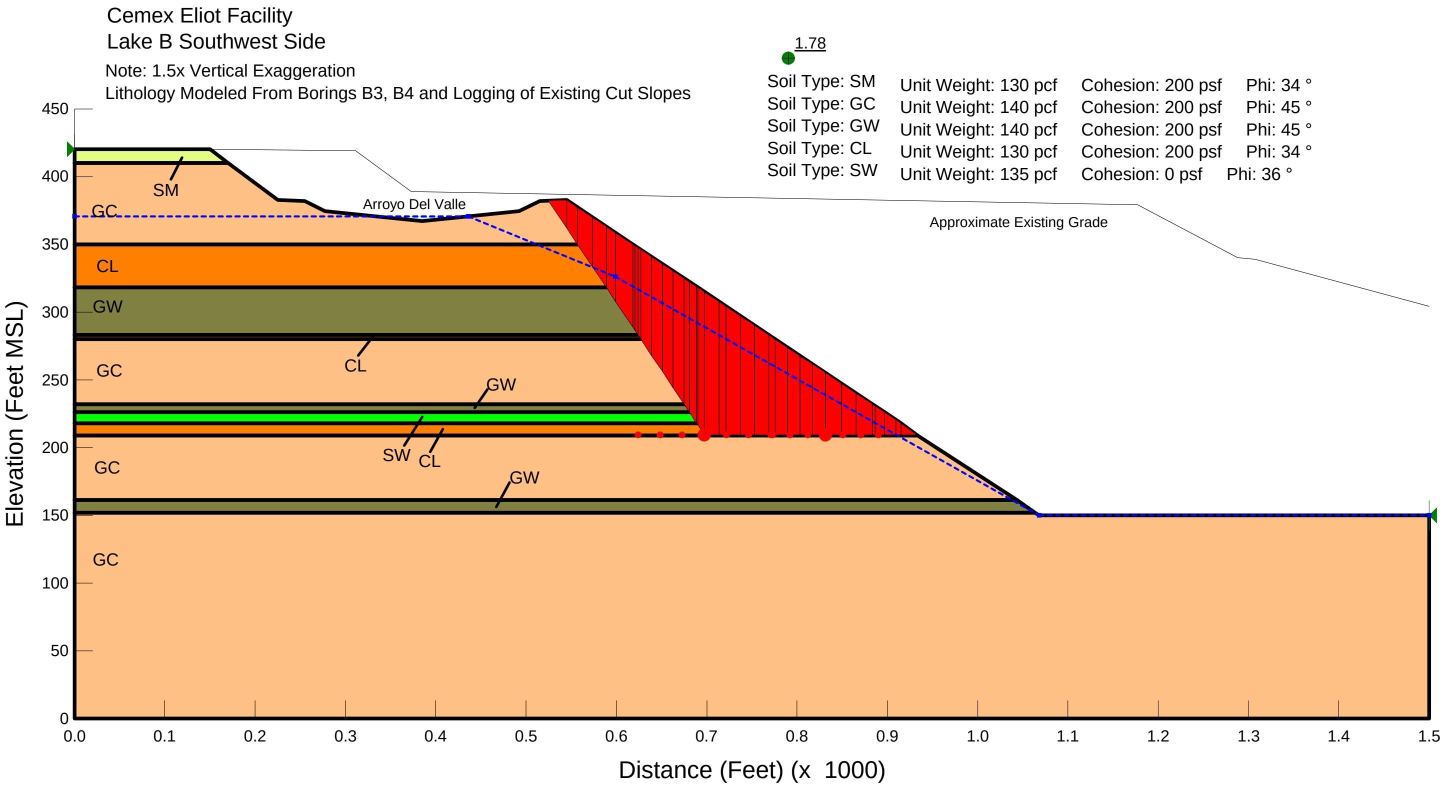
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – MINED CONDITION A
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D10



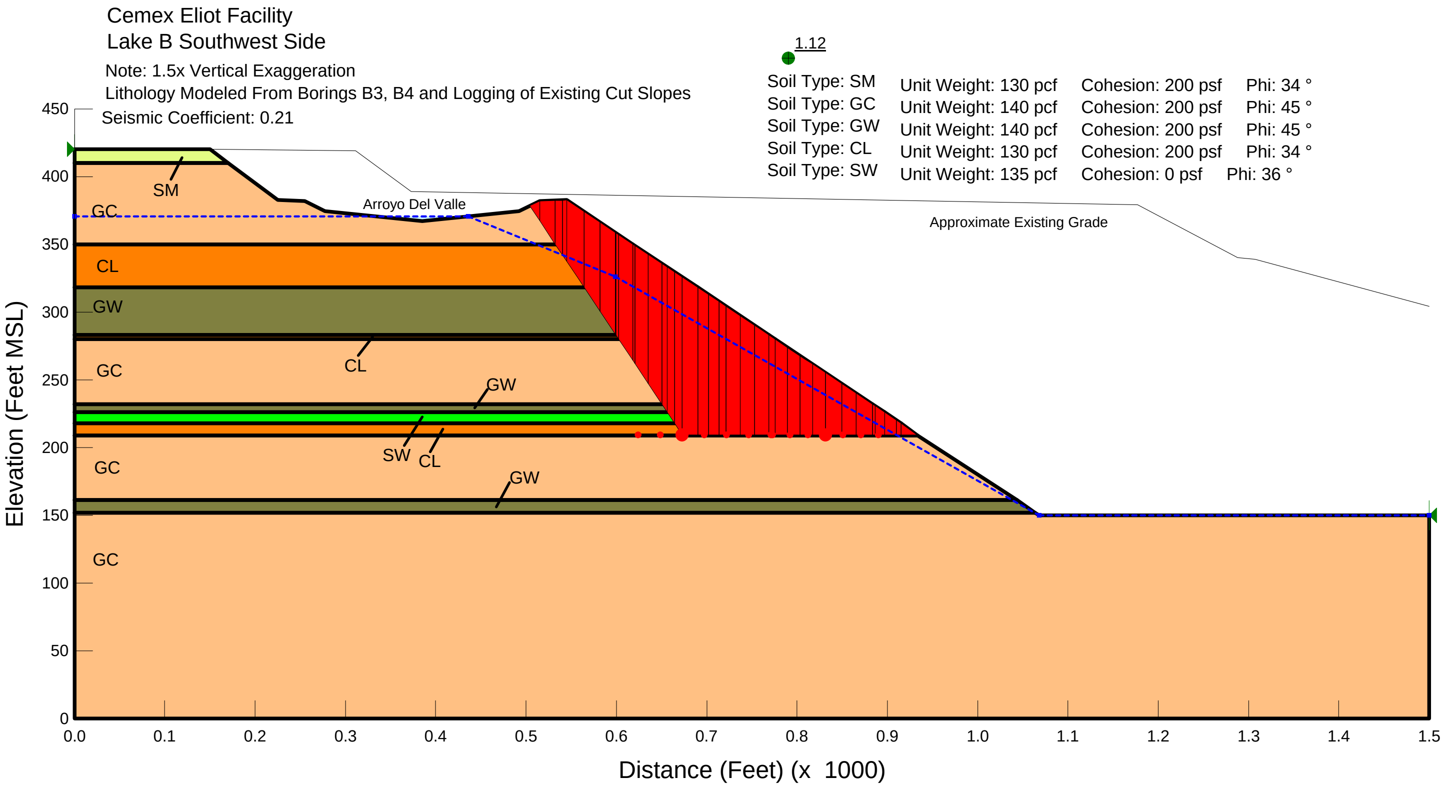
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – MINED CONDITION A
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D11



Cemex Eliot Facility
Lake B Southwest Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, B4 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.21

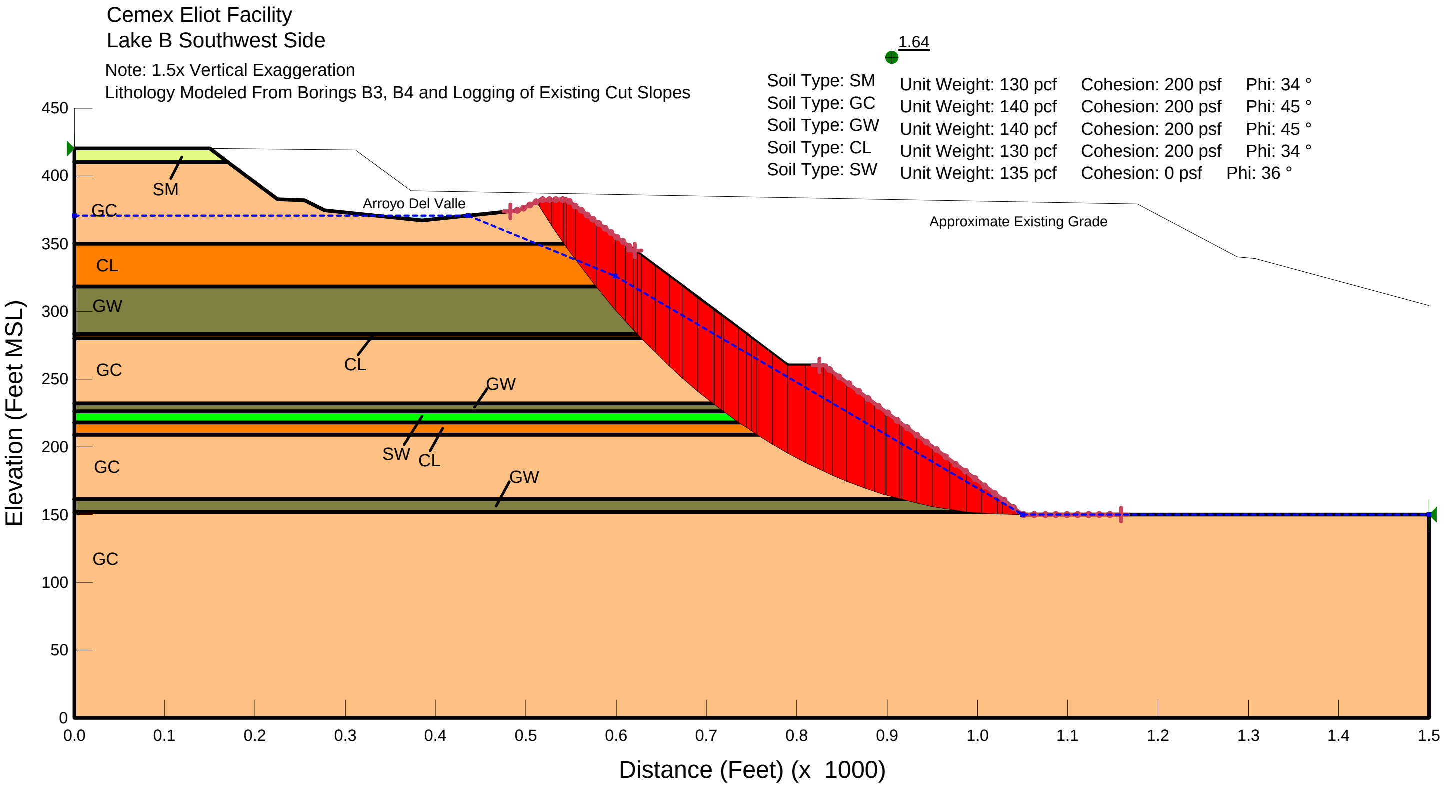
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHWEST - MINED CONDITION A
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D12



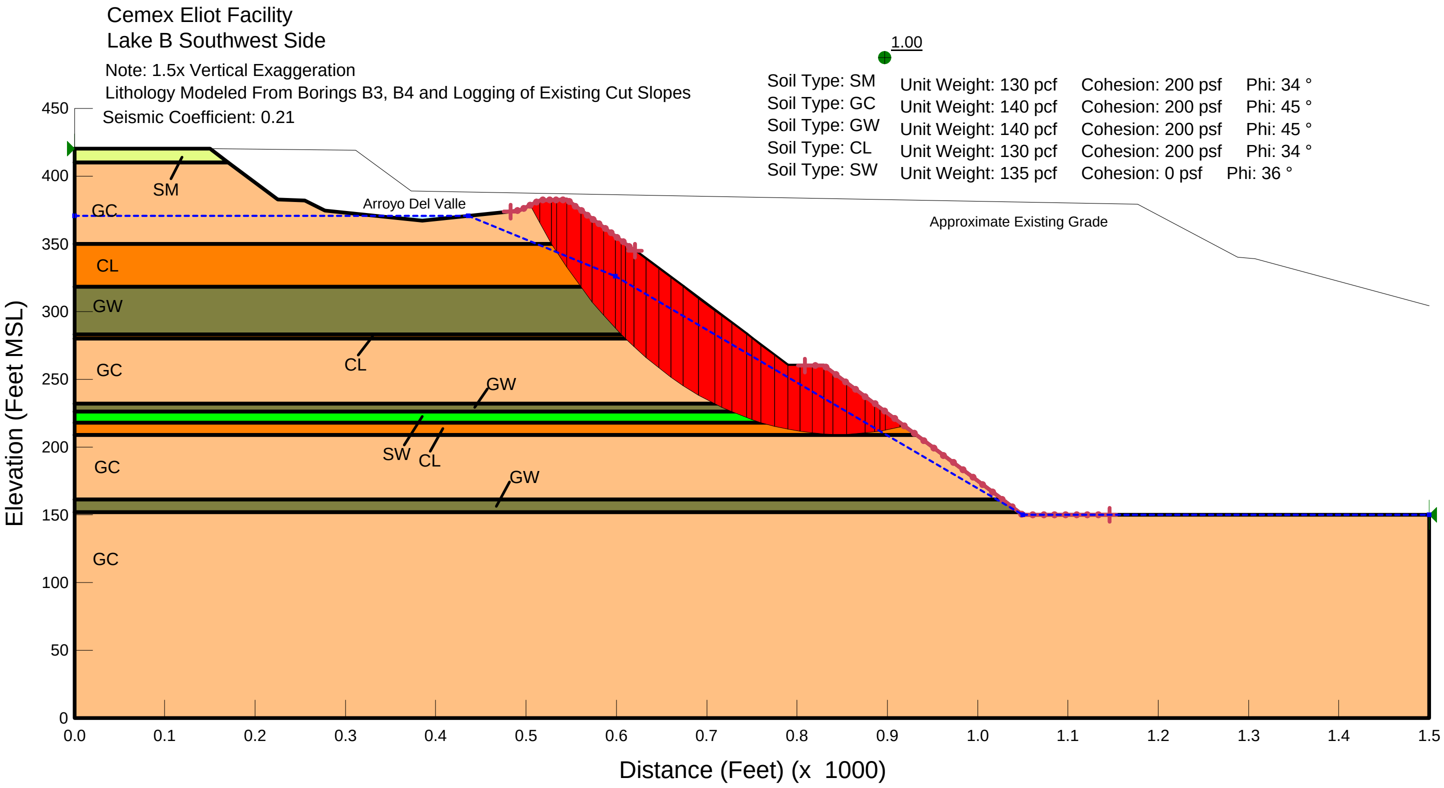
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – MINED CONDITION B
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D13



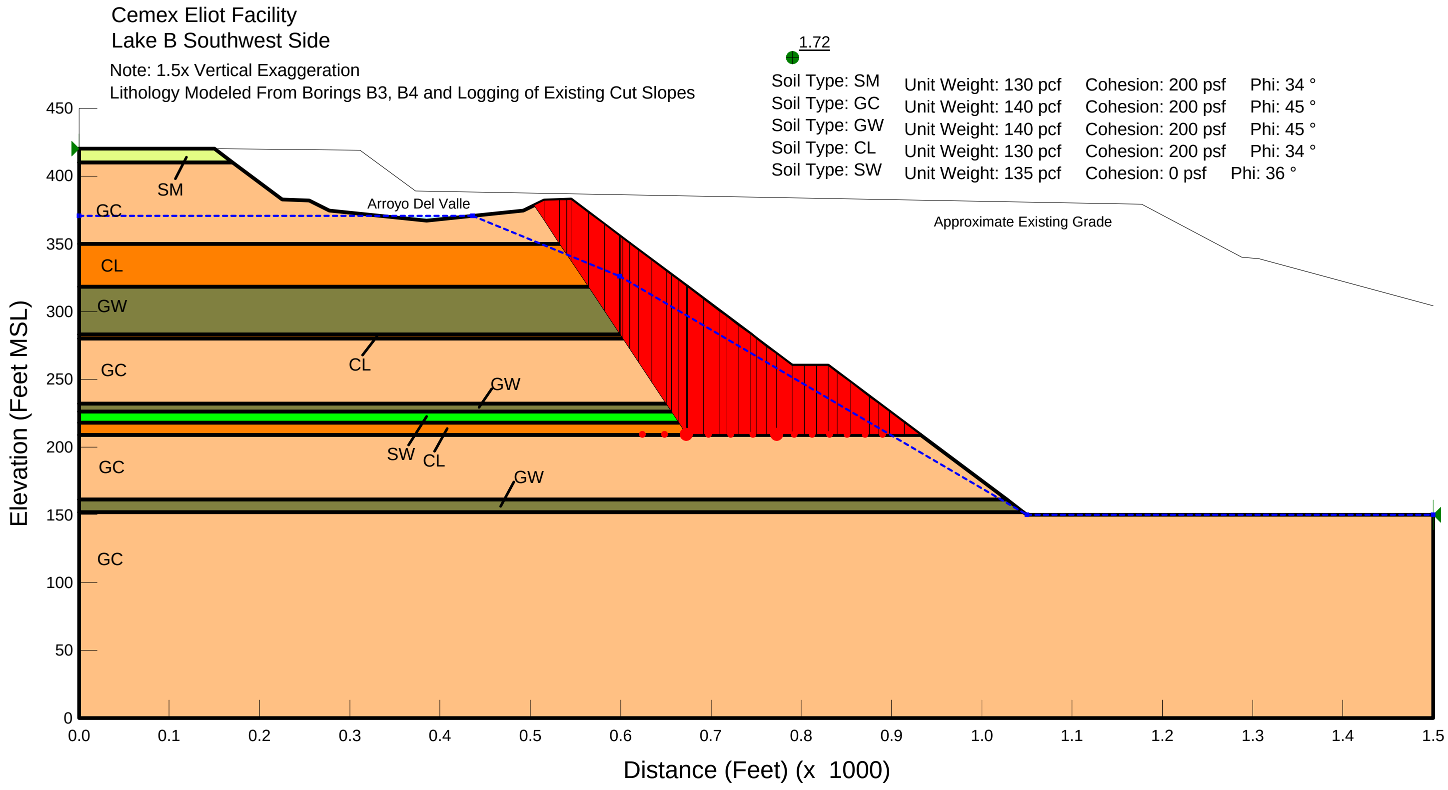
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – MINED CONDITION B
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D14



Cemex Eliot Facility
Lake B Southwest Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, B4 and Logging of Existing Cut Slopes

1.72

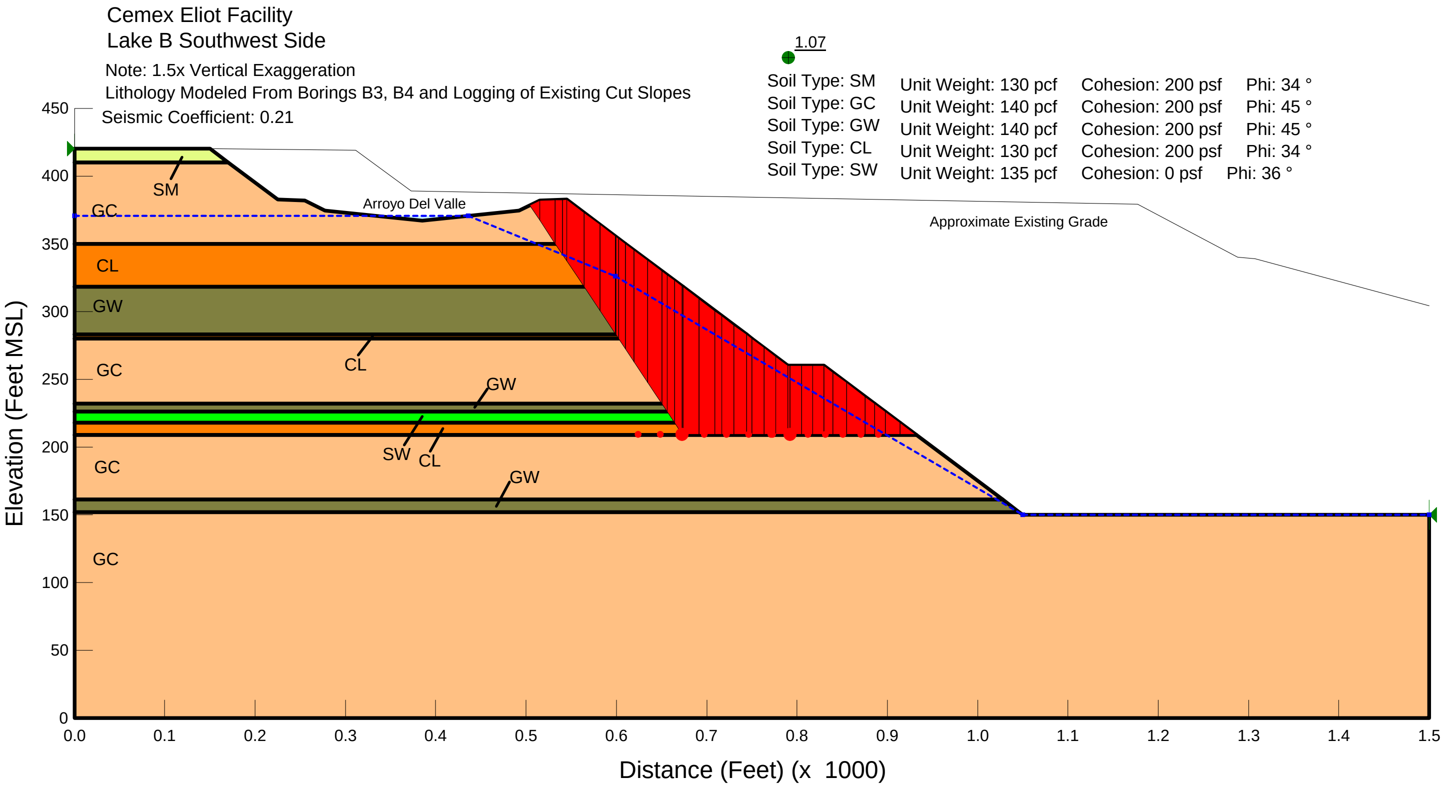
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – MINED CONDITION B
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D15



Cemex Eliot Facility
Lake B Southwest Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, B4 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.21

1.07

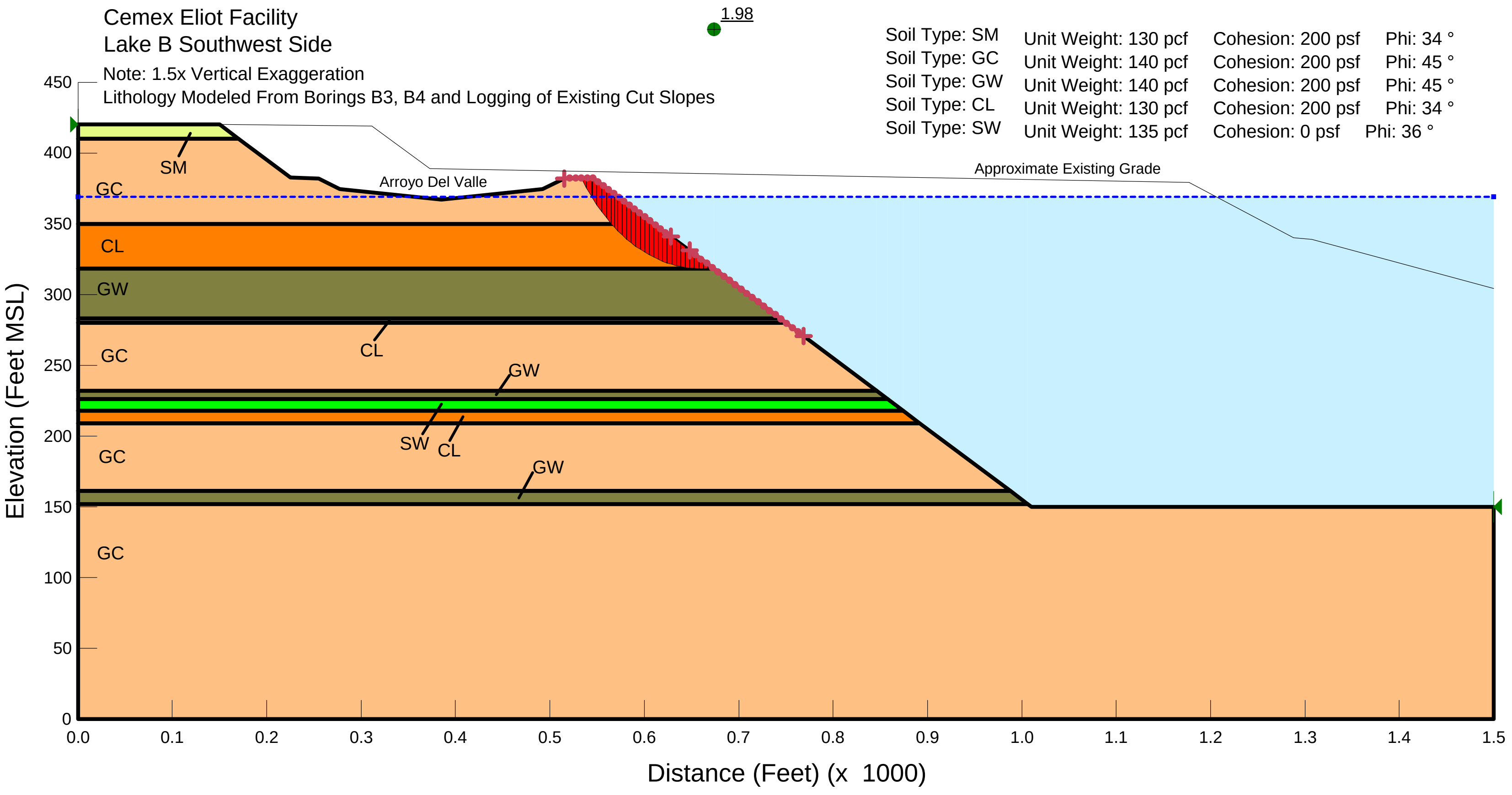
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – MINED CONDITION B
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D16


Cemex Eliot Facility
Lake B Southwest Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, B4 and Logging of Existing Cut Slopes

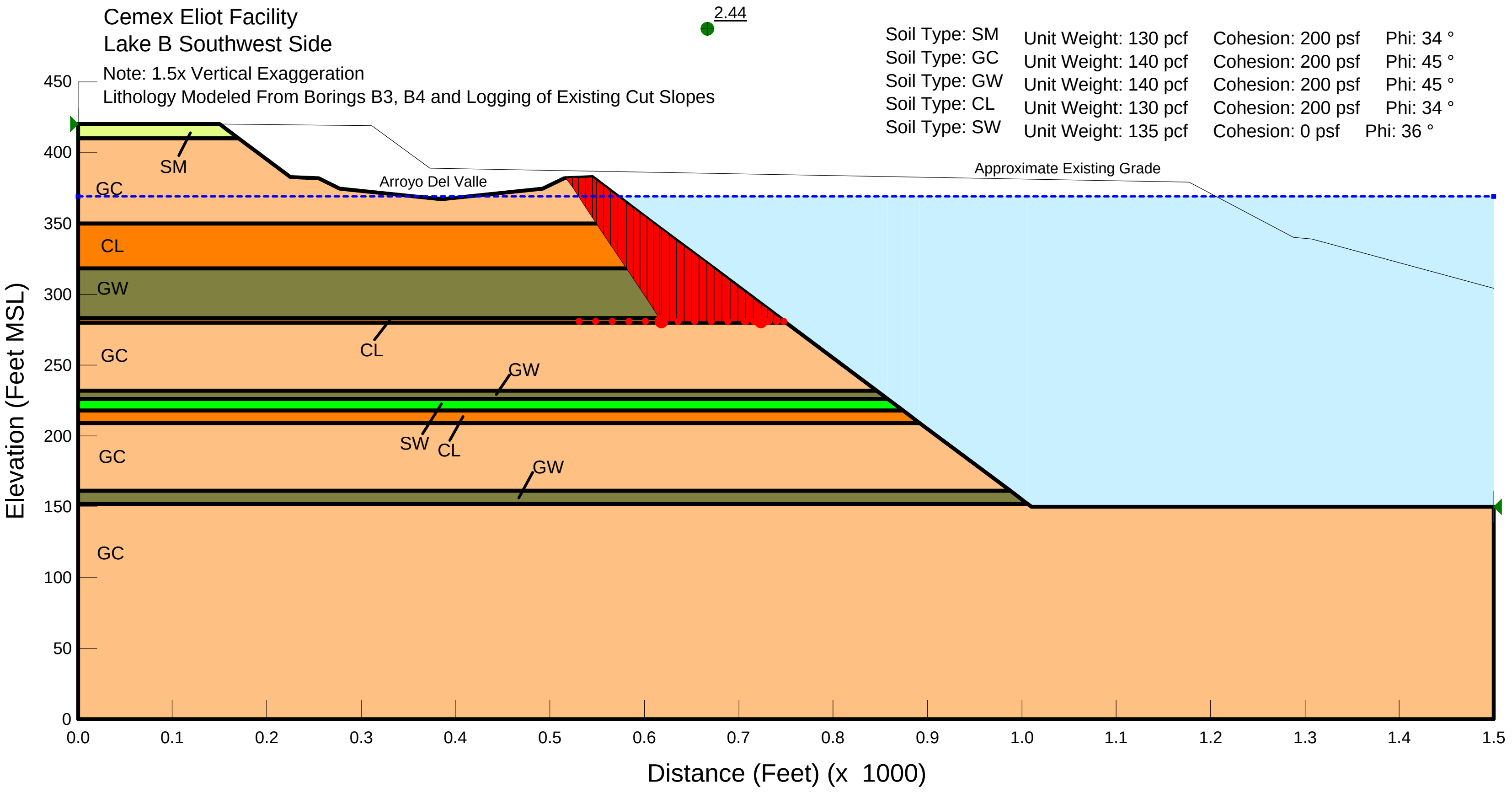
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHWEST – RECLAIMED CONDITION
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D17



Cemex Eliot Facility
Lake B Southwest Side

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, B4 and Logging of Existing Cut Slopes

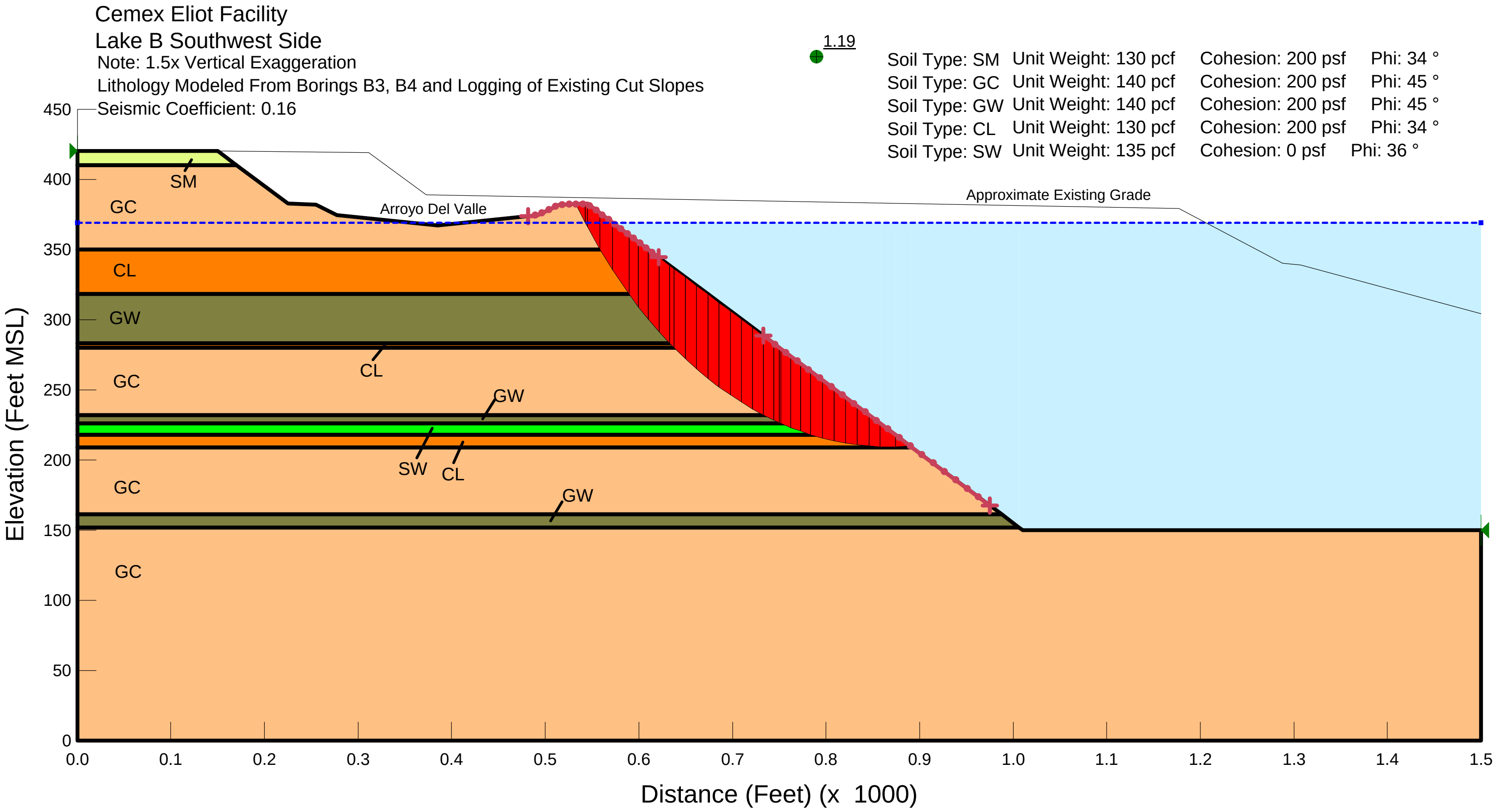
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHWEST - RECLAIMED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D18

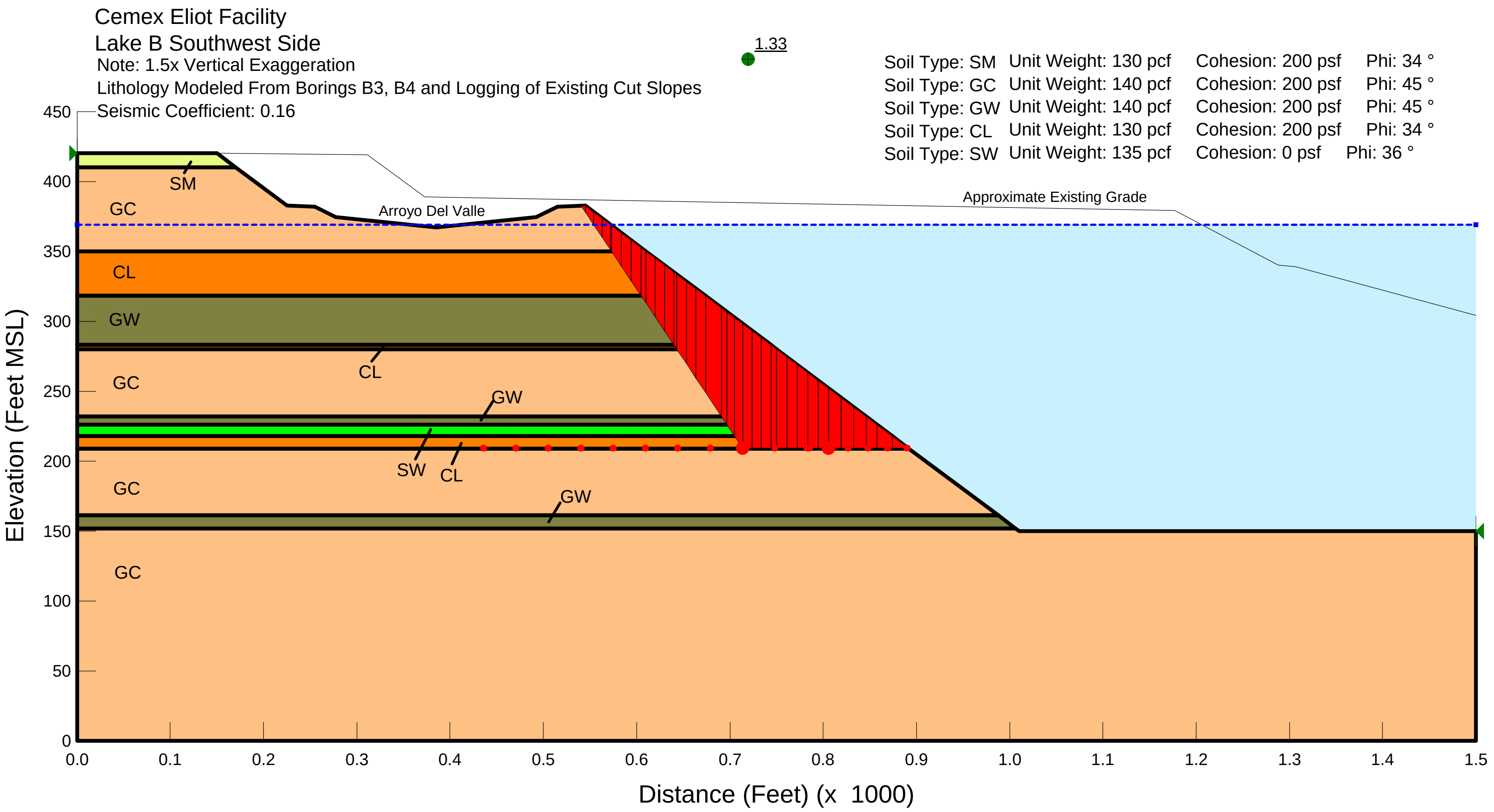


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHWEST - RECLAIMED CONDITION
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D19



Cemex Eliot Facility

Lake B Southwest Side

Note: 1.5x Vertical Exaggeration

Lithology Modeled From Borings B3, B4 and Logging of Existing Cut Slopes

Seismic Coefficient: 0.16

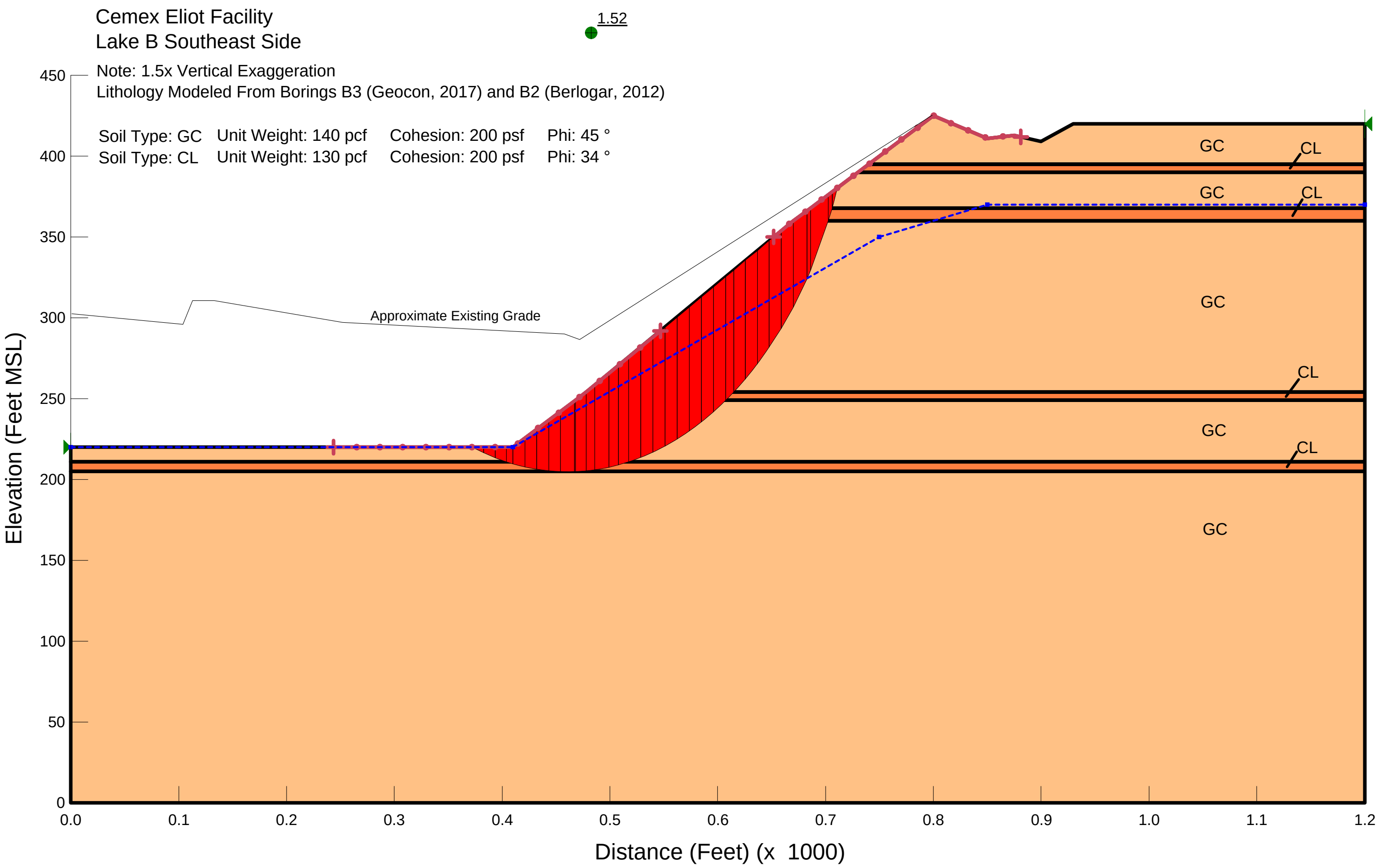
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: SW	Unit Weight: 135 pcf	Cohesion: 0 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHWEST - RECLAIMED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D20

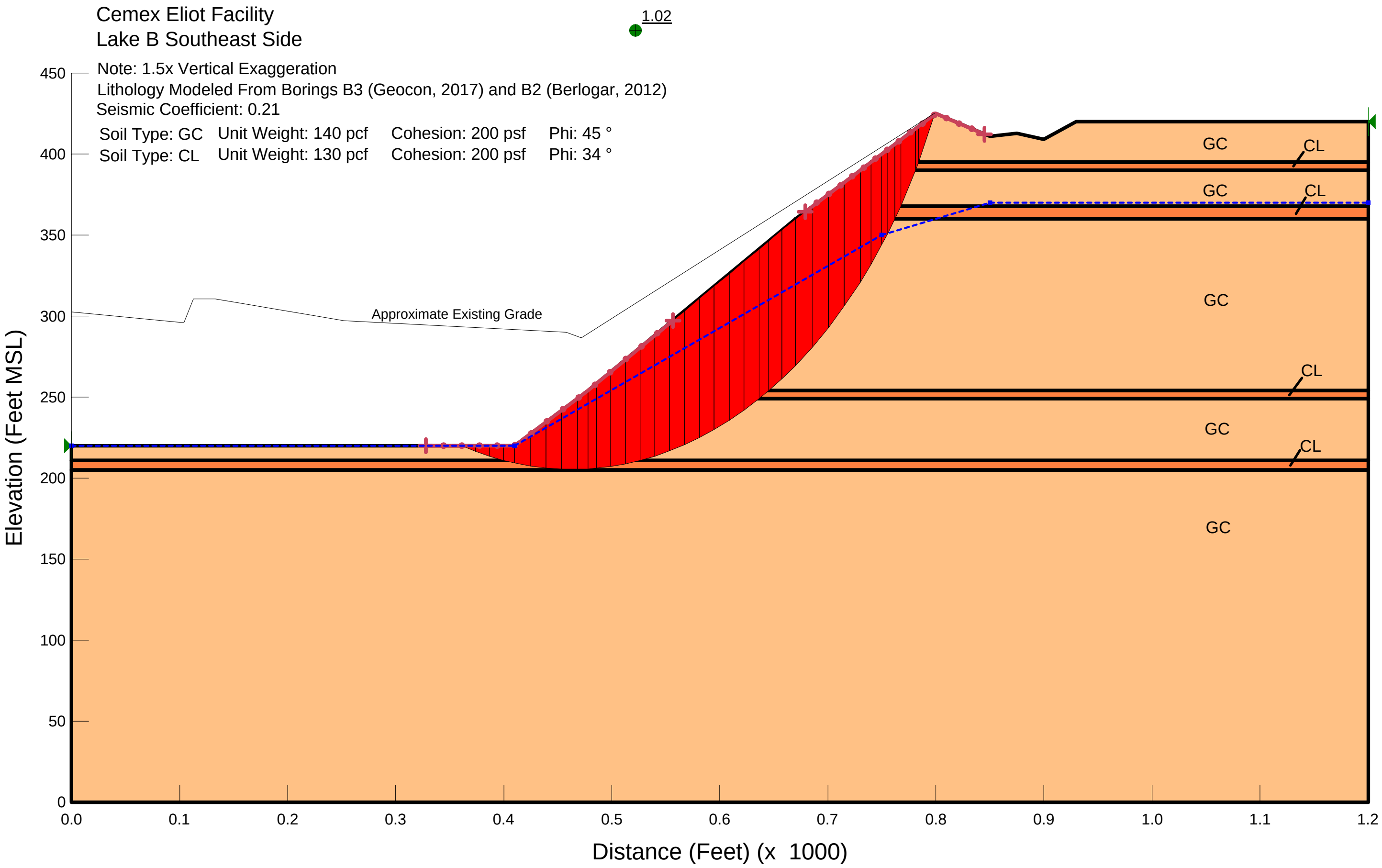


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHEAST – MINED CONDITION
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D21

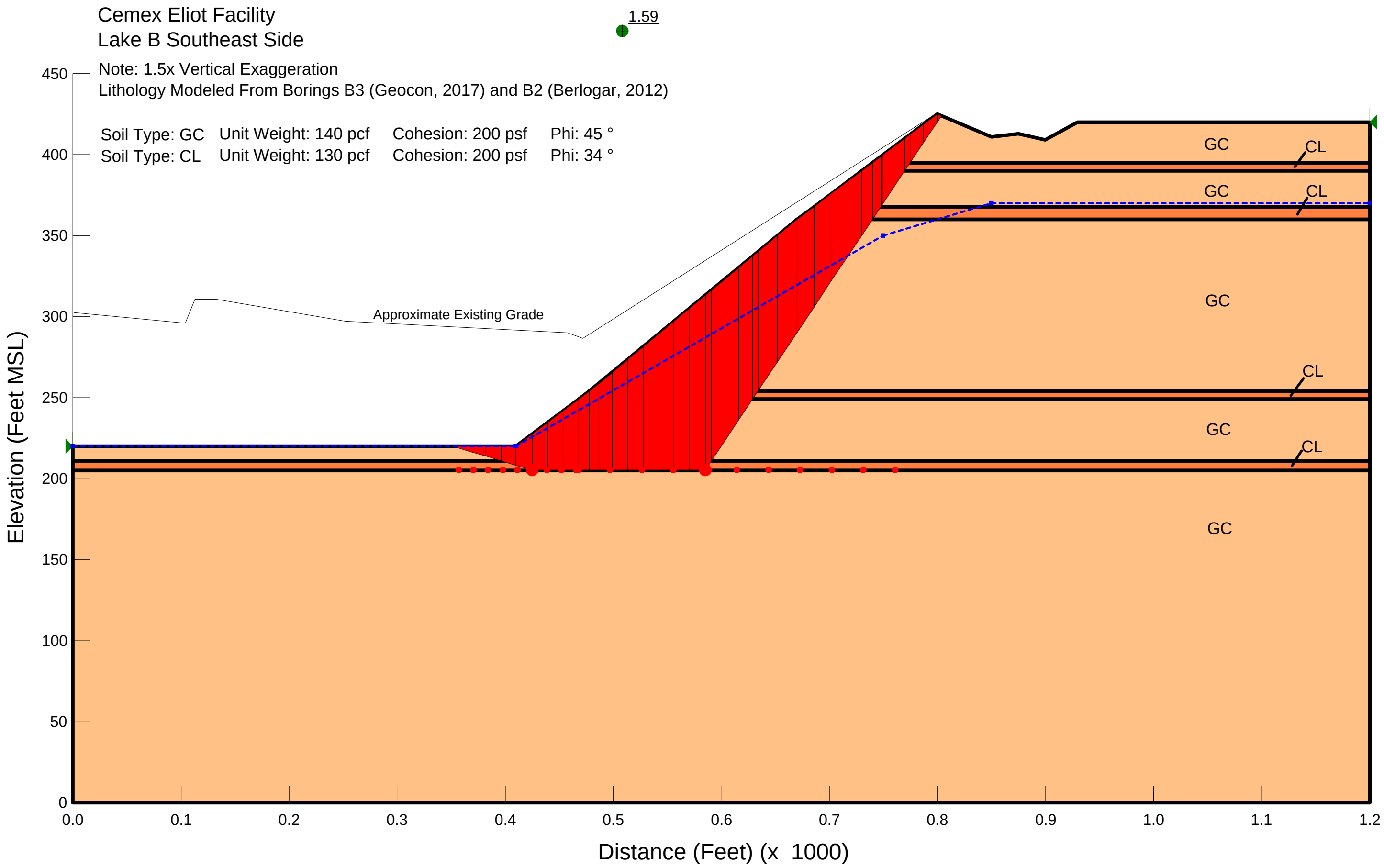


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHEAST – MINED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D22

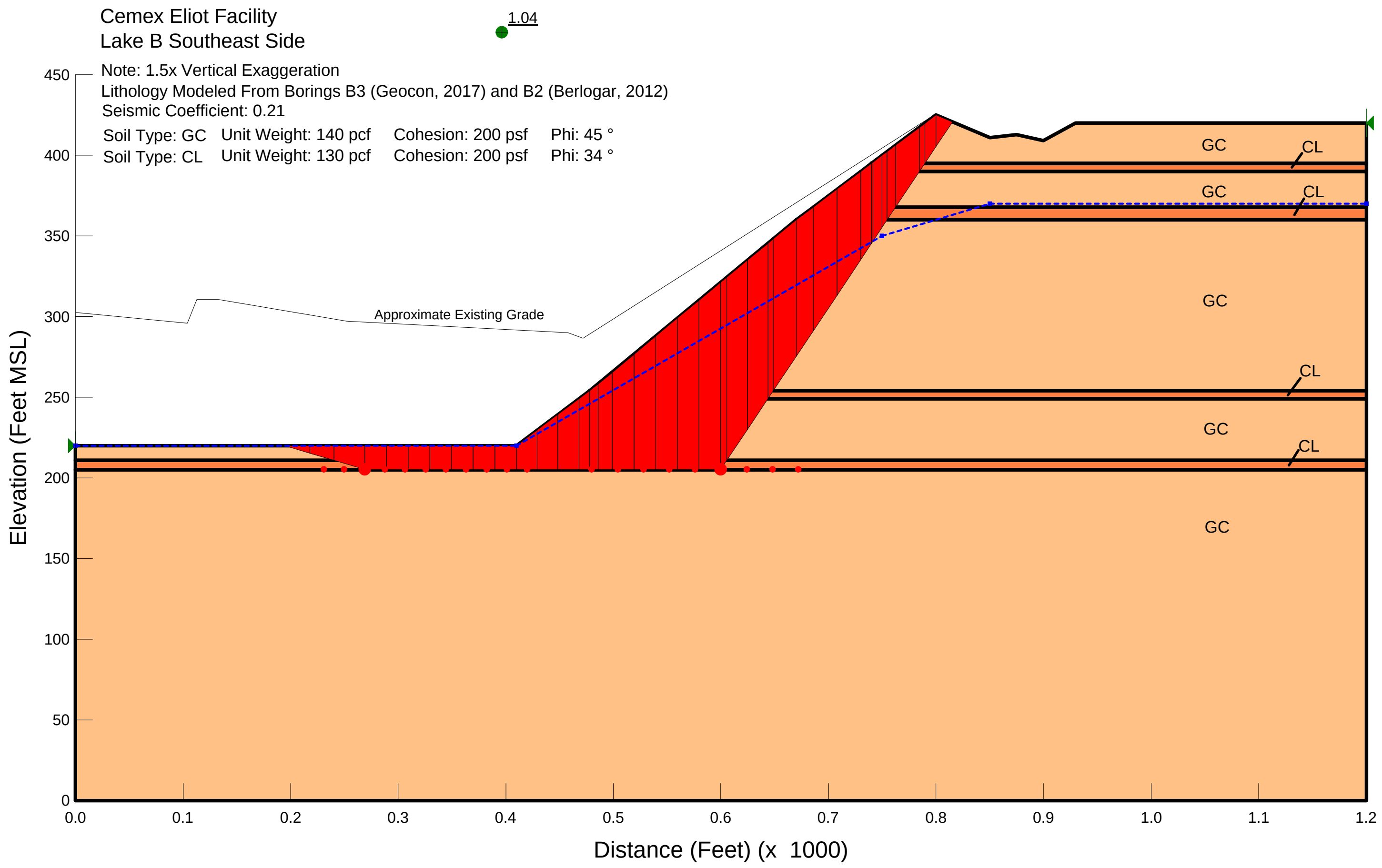


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHEAST – MINED CONDITION
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D23

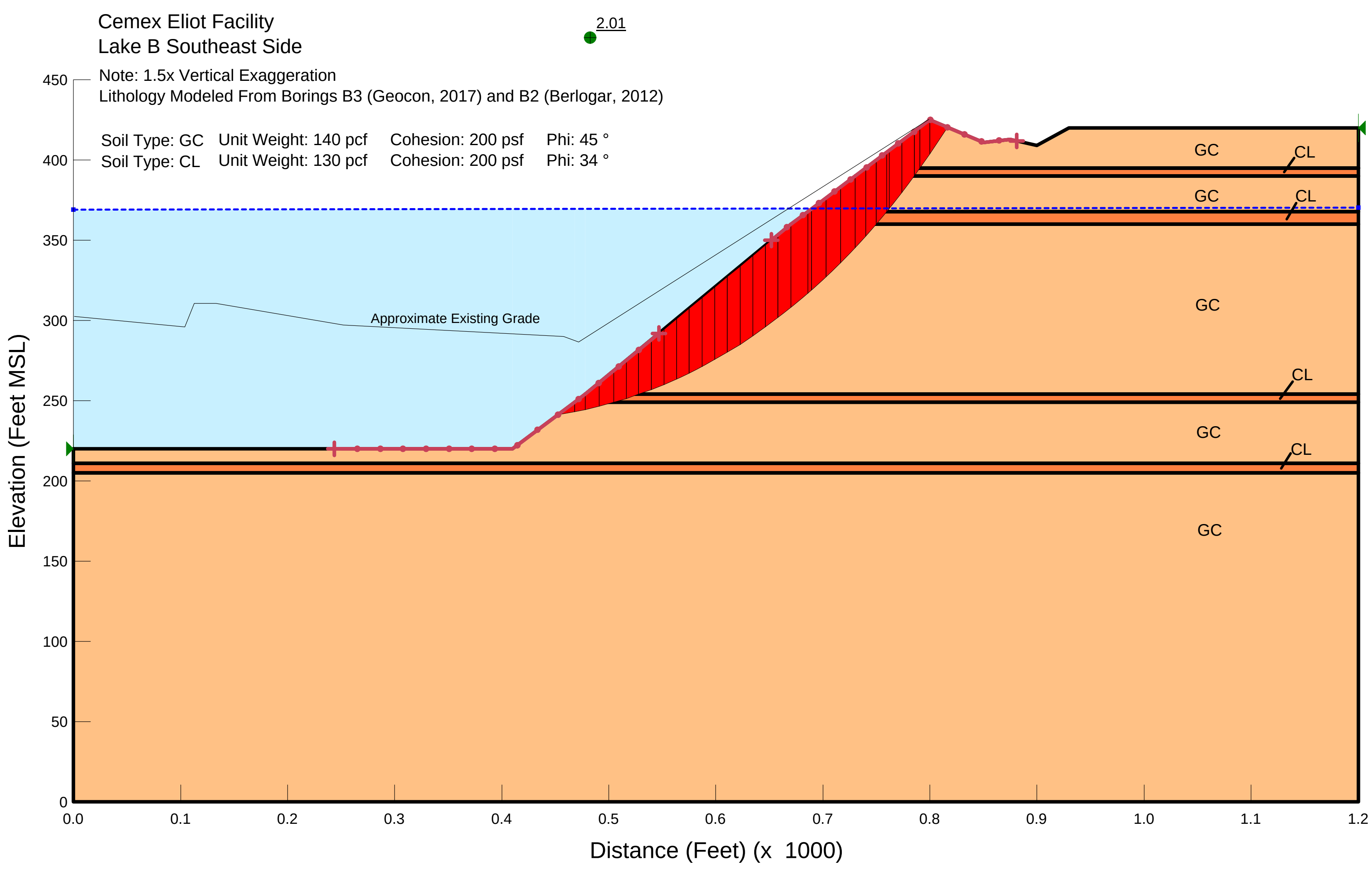


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B SOUTHEAST – MINED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: August 2019

FIGURE D24

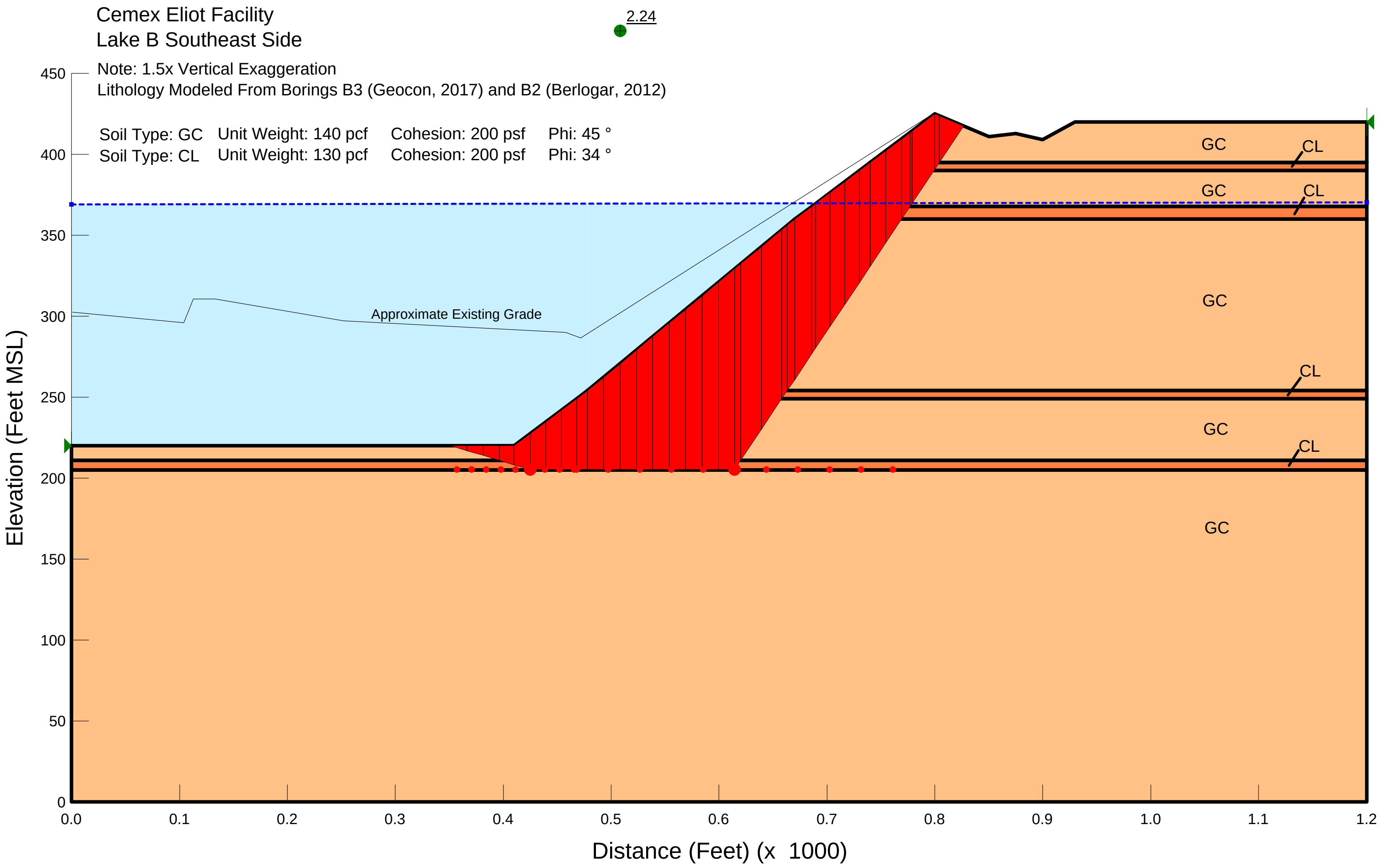


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHEAST - RECLAIMED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D25

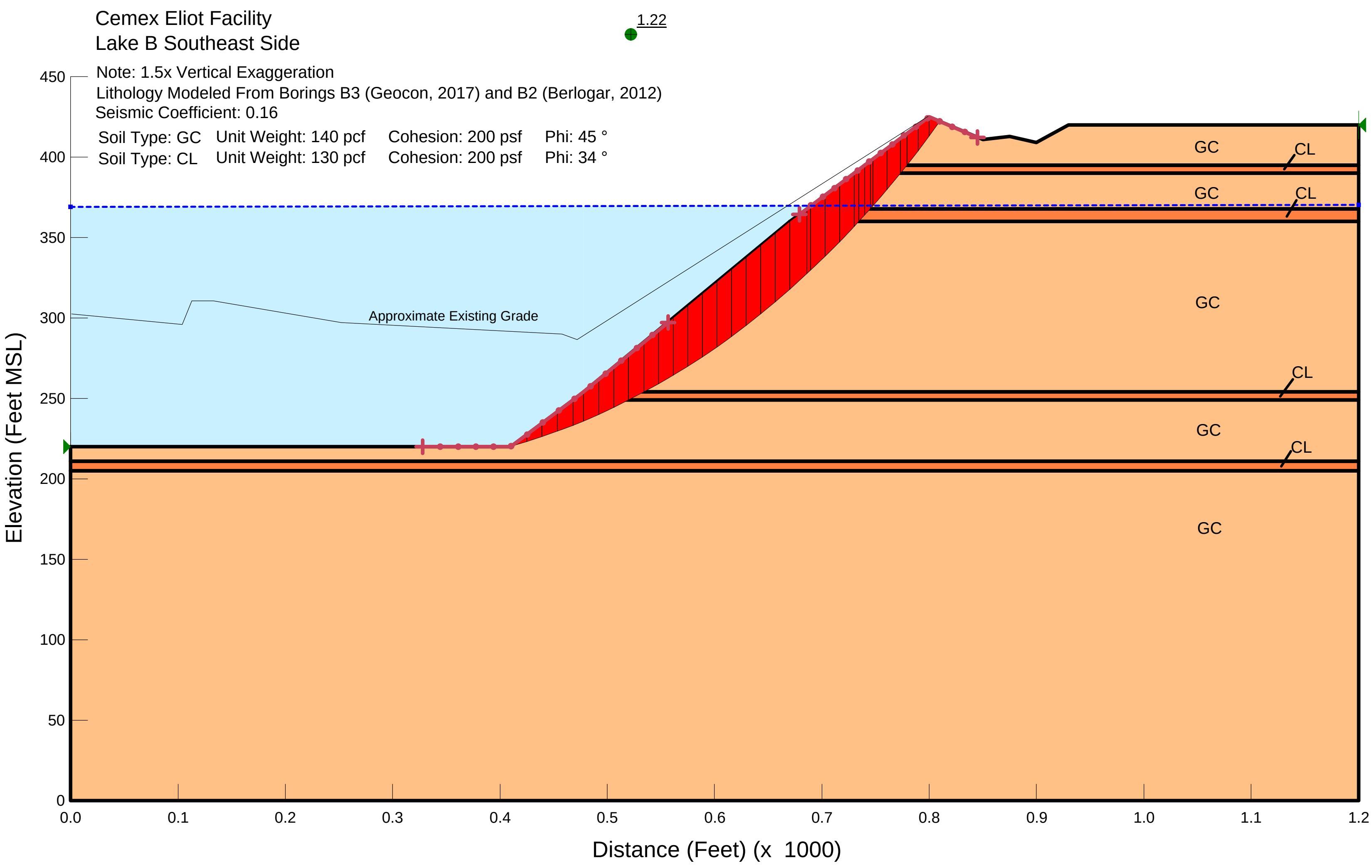


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHEAST - RECLAIMED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D26

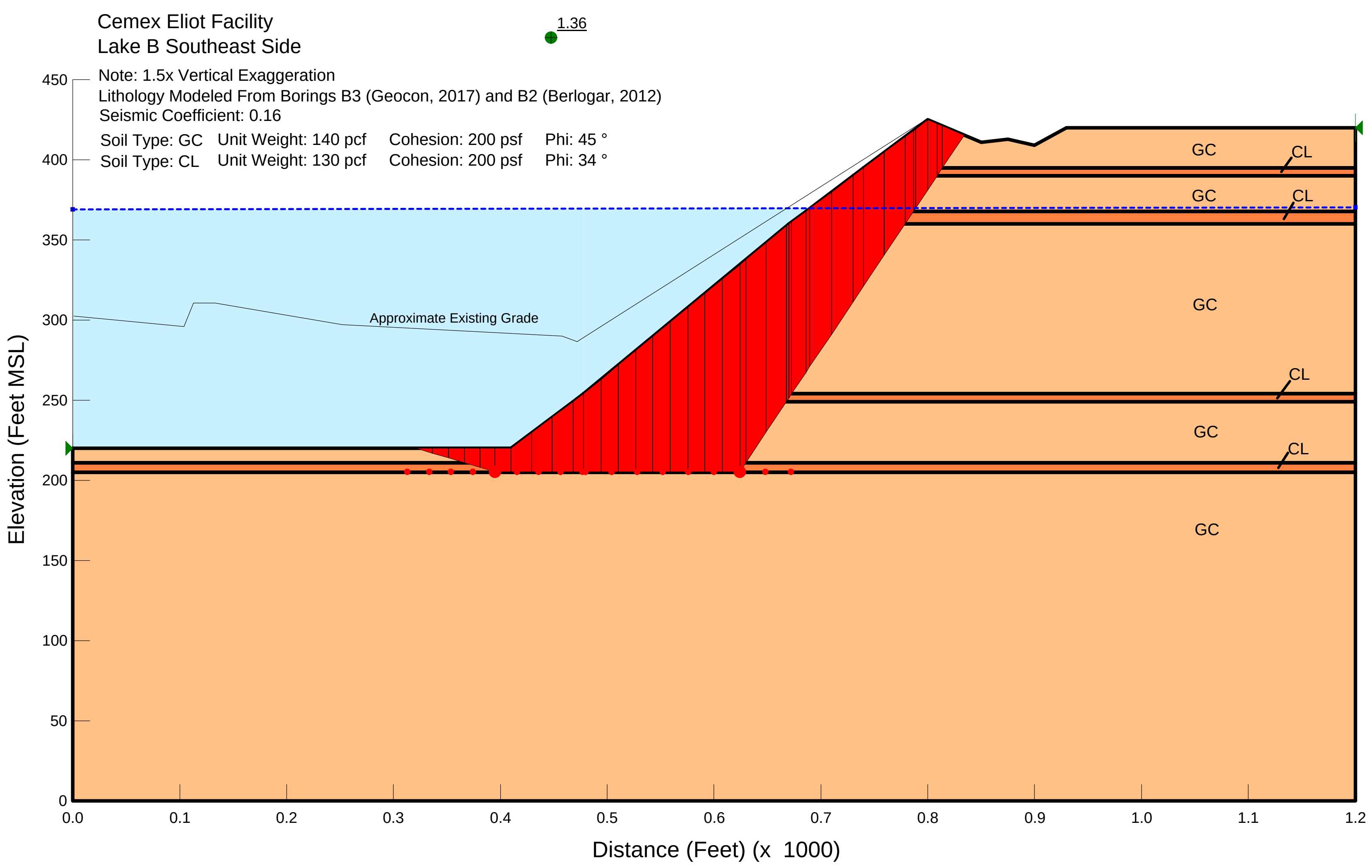


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHEAST - RECLAIMED CONDITION
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D27

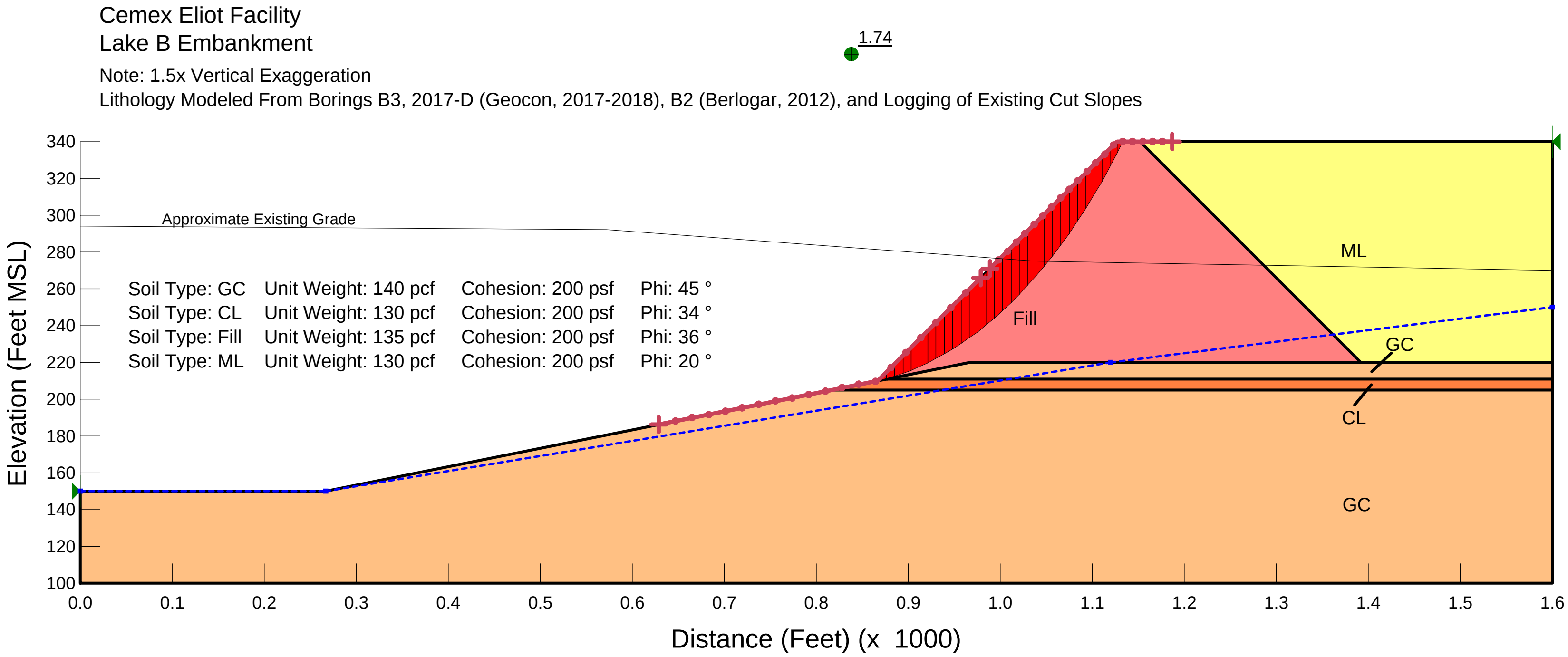


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B SOUTHEAST - RECLAIMED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE D28



Cemex Eliot Facility
Lake B Embankment

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, 2017-D (Geocon, 2017-2018), B2 (Berlogar, 2012), and Logging of Existing Cut Slopes

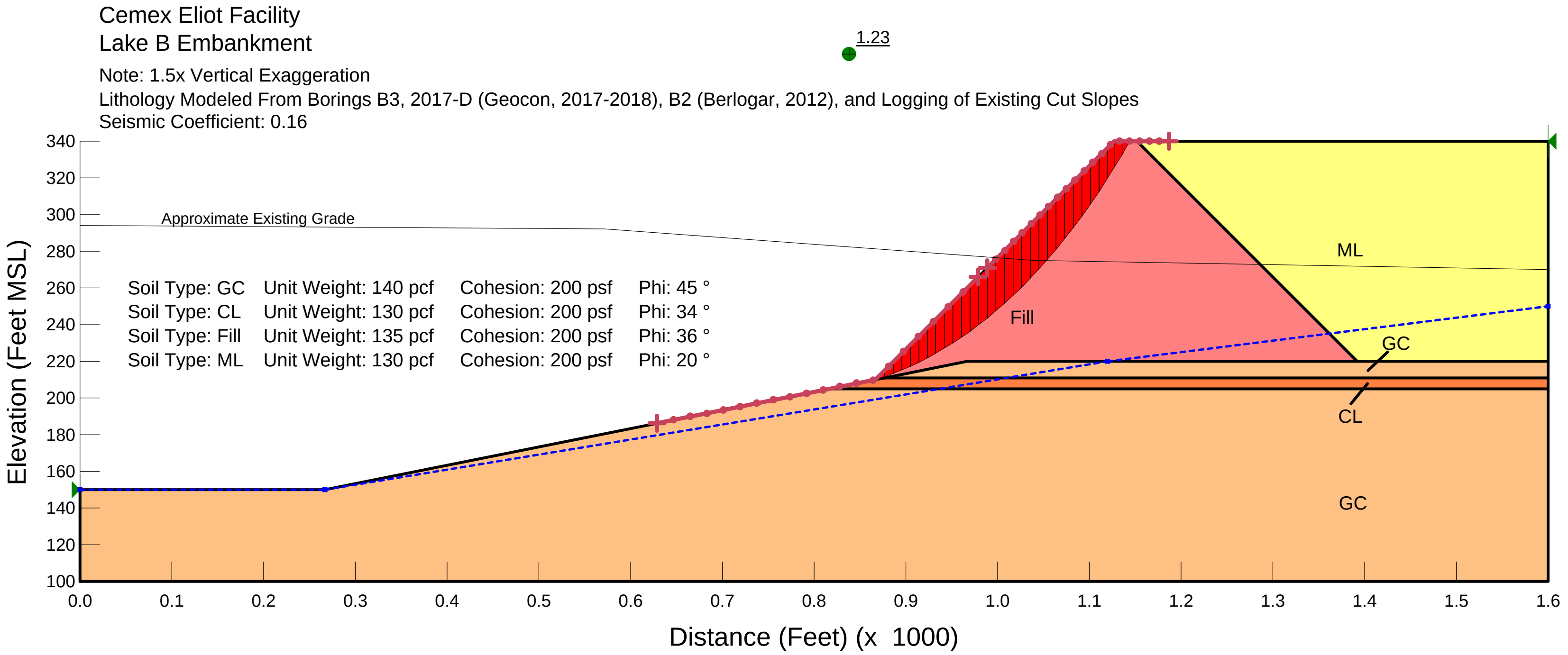
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B EMBANKMENT – MINED CONDITION
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D29



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

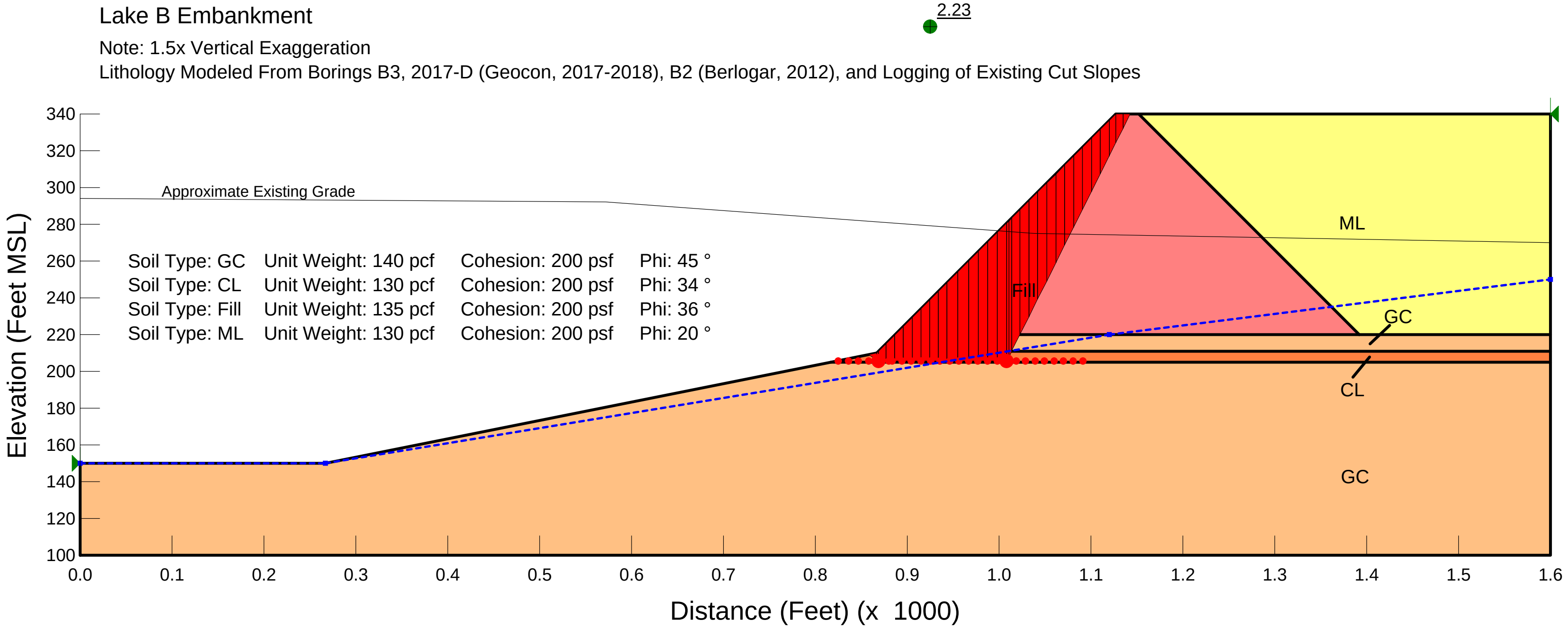
LAKE B EMBANKMENT – MINED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D30

Cemex Eliot Facility
Lake B Embankment

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, 2017-D (Geocon, 2017-2018), B2 (Berlogar, 2012), and Logging of Existing Cut Slopes



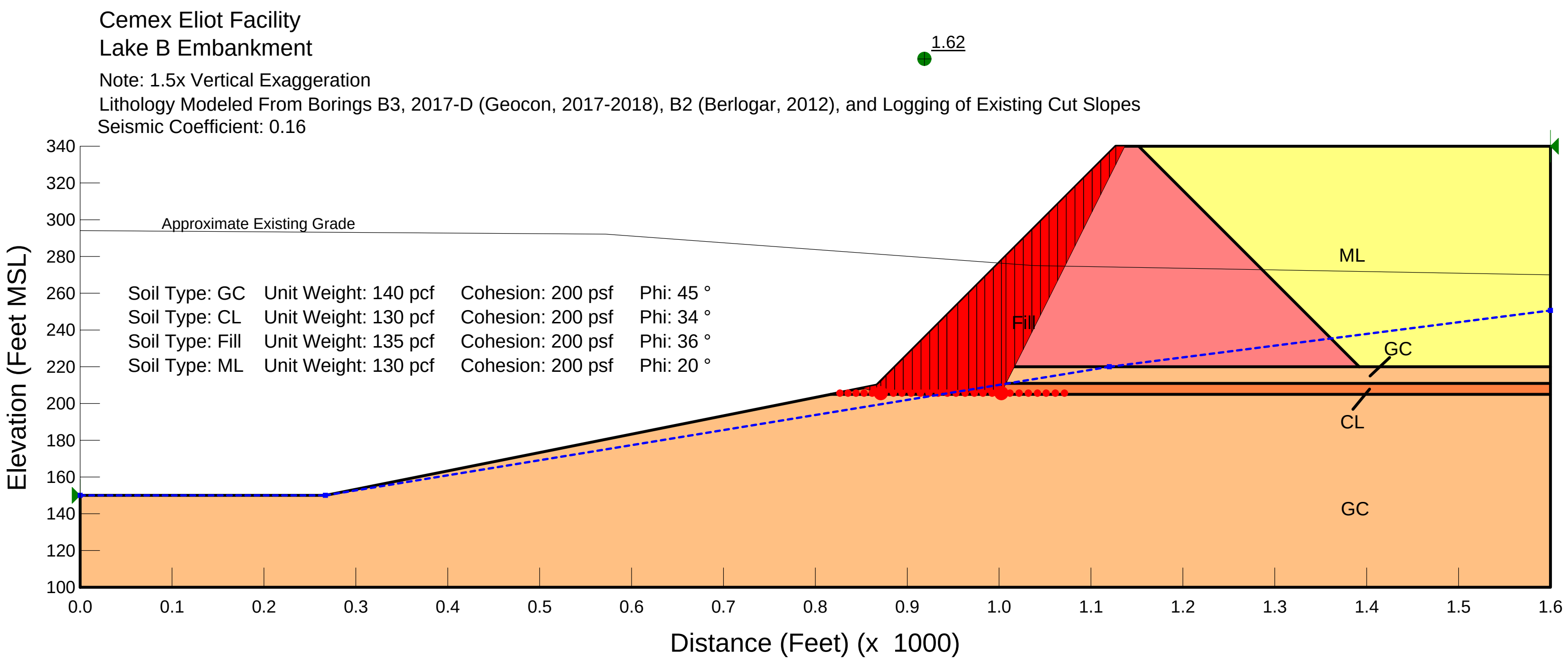
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE B EMBANKMENT - MINED CONDITION
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D31


Cemex Eliot Facility
Lake B Embankment
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, 2017-D (Geocon, 2017-2018), B2 (Berlogar, 2012), and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

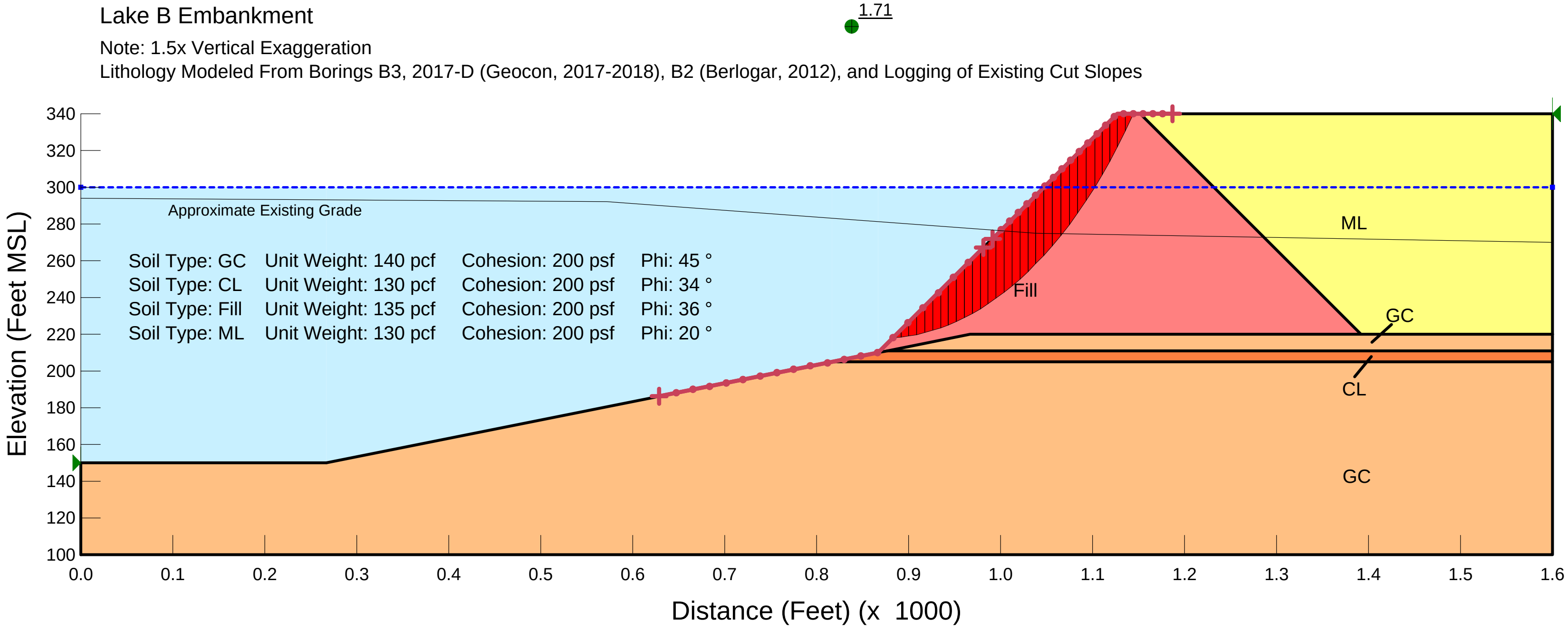
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B EMBANKMENT – MINED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D32


Cemex Eliot Facility
Lake B Embankment

Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B3, 2017-D (Geocon, 2017-2018), B2 (Berlogar, 2012), and Logging of Existing Cut Slopes

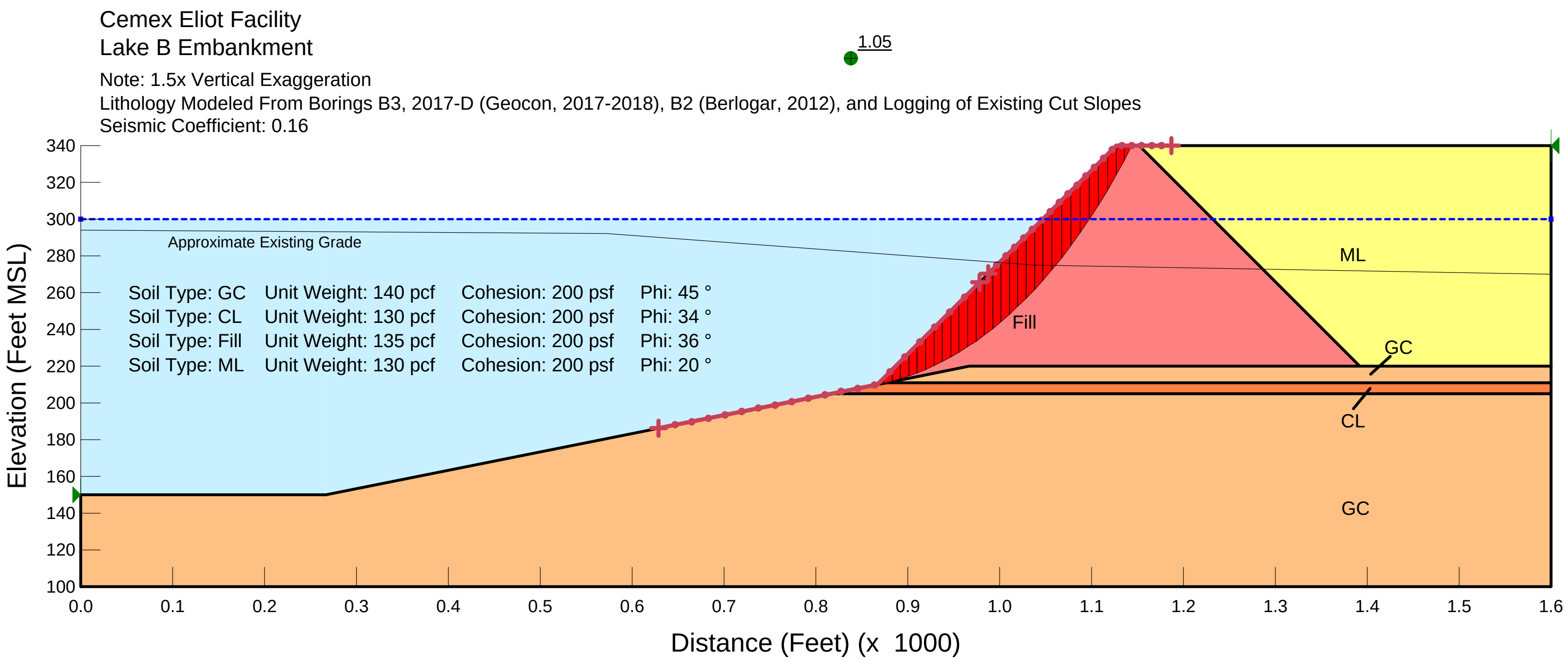
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B EMBANKMENT – RECLAIMED CONDITION
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D25



Cemex Eliot Facility

Lake B Embankment

Note: 1.5x Vertical Exaggeration

Lithology Modeled From Borings B3, 2017-D (Geocon, 2017-2018), B2 (Berlogar, 2012), and Logging of Existing Cut Slopes

Seismic Coefficient: 0.16

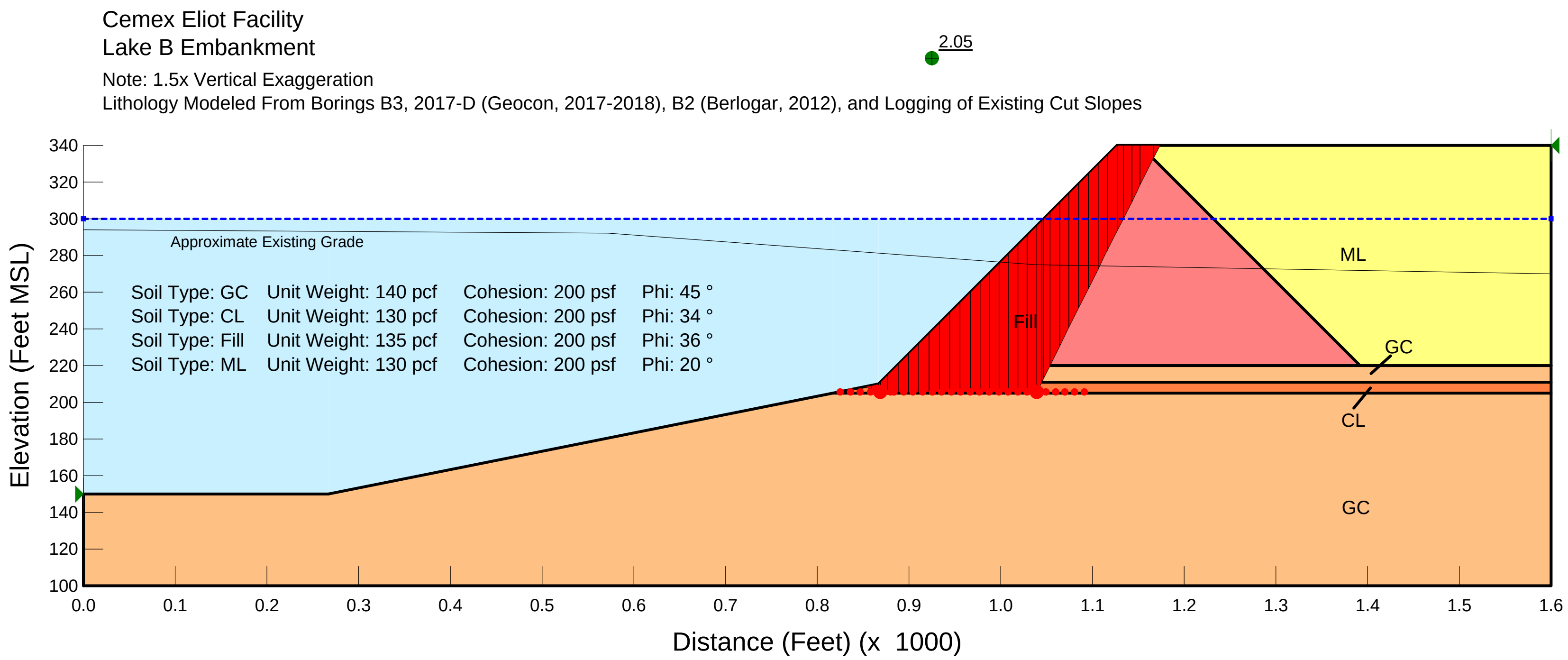
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B EMBANKMENT – RECLAIMED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D26

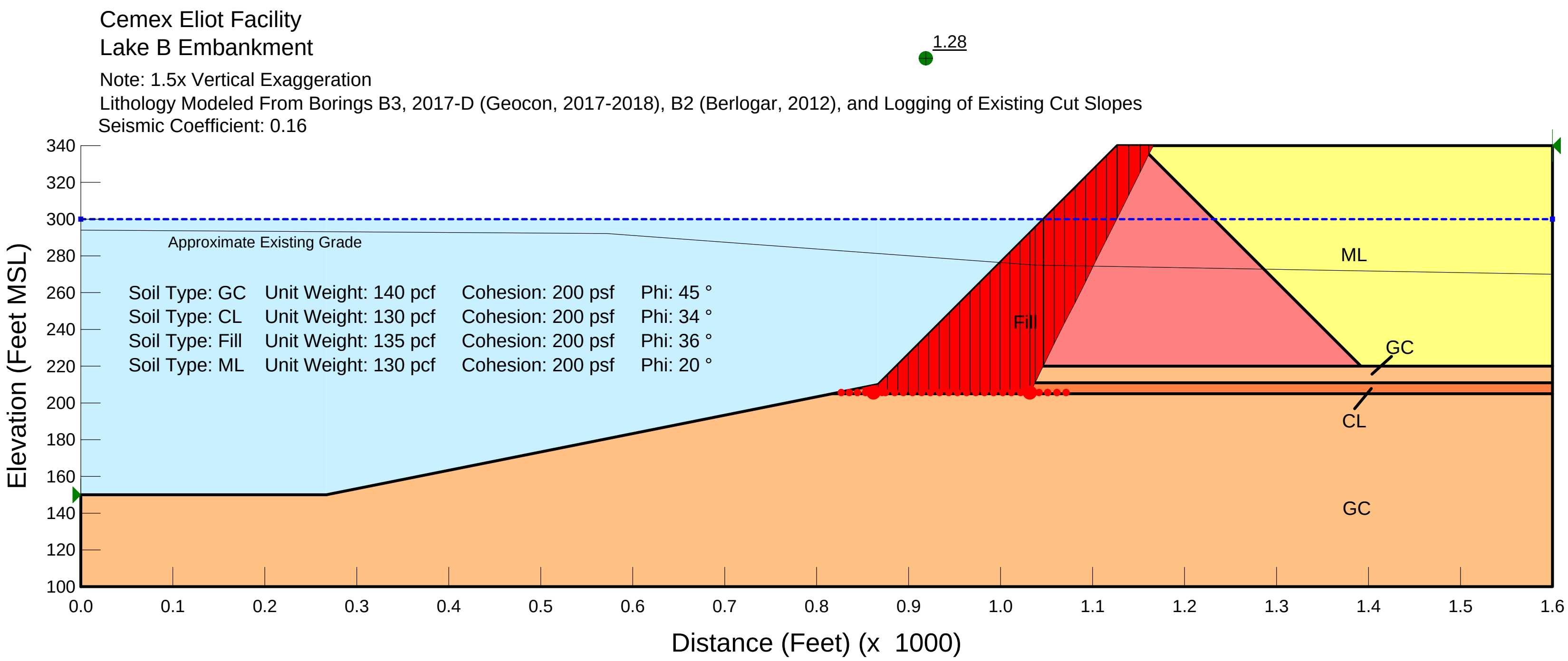


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B EMBANKMENT – RECLAIMED CONDITION
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D27



Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °

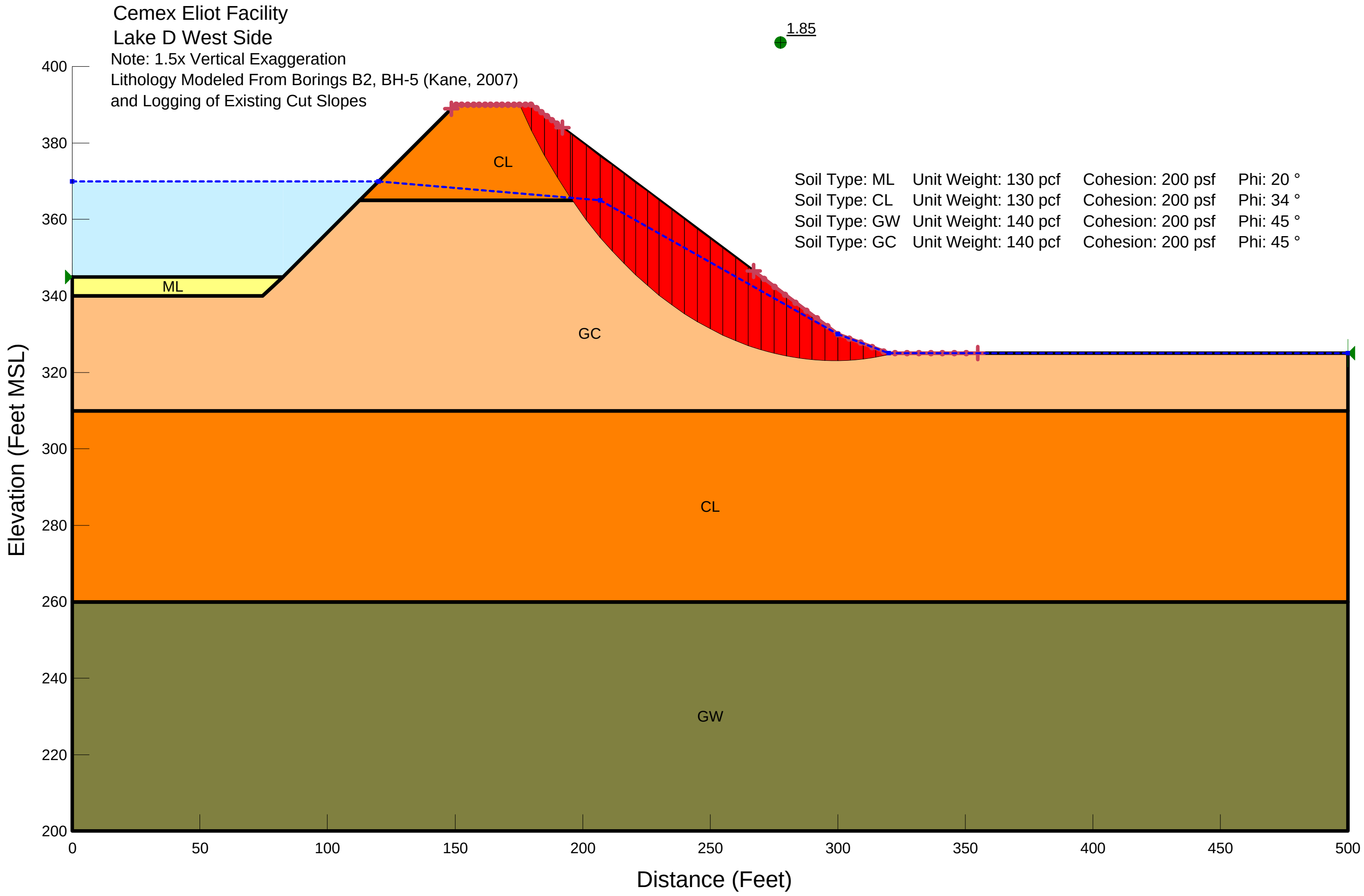
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE B EMBANKMENT – RECLAIMED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE D28

APPENDIX E
SLOPE STABILITY ANALYSIS – LAKE D



Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes

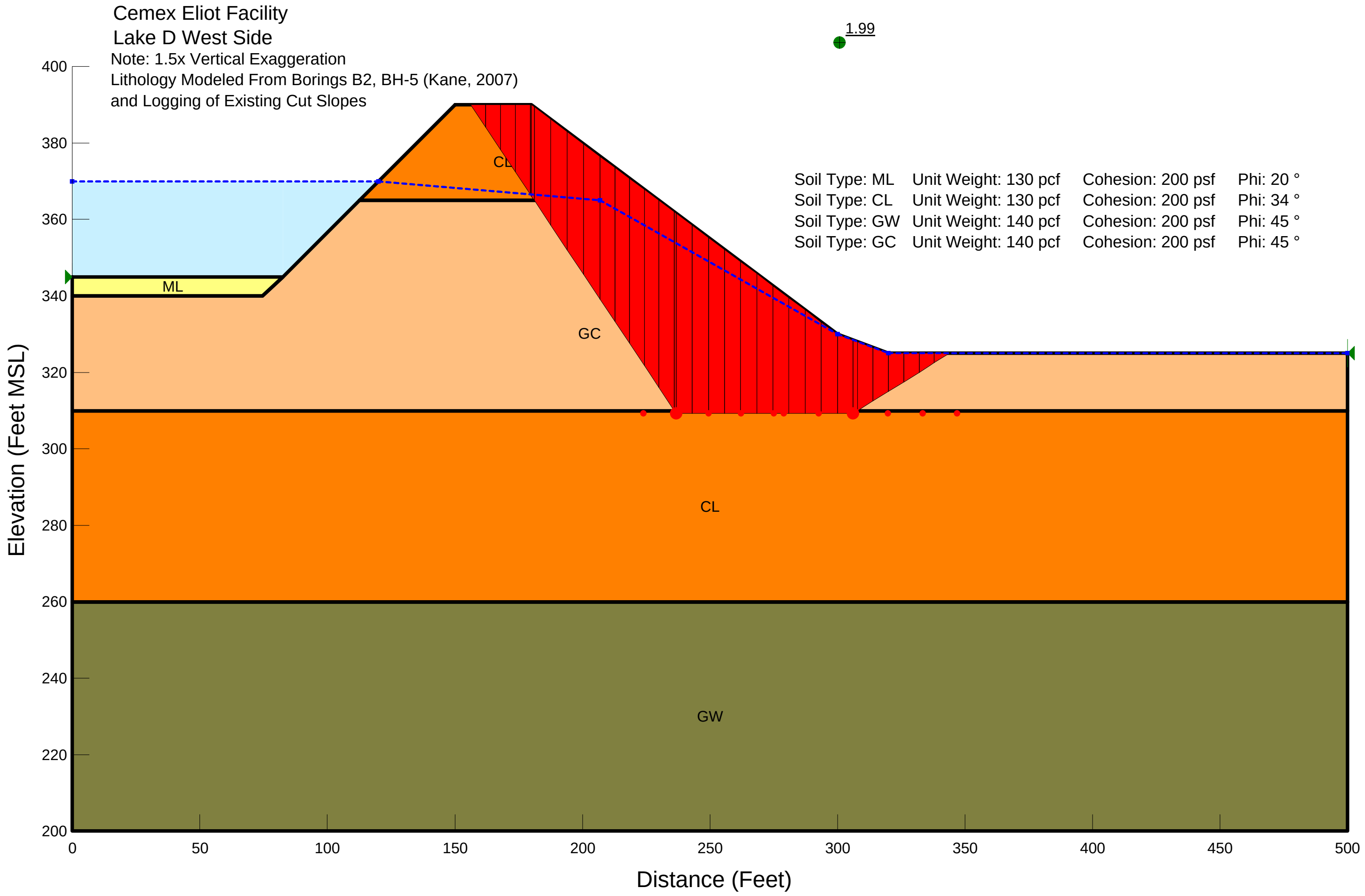
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST - ADJ. SITL POND WATER LEVEL AT 370
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E1



Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes

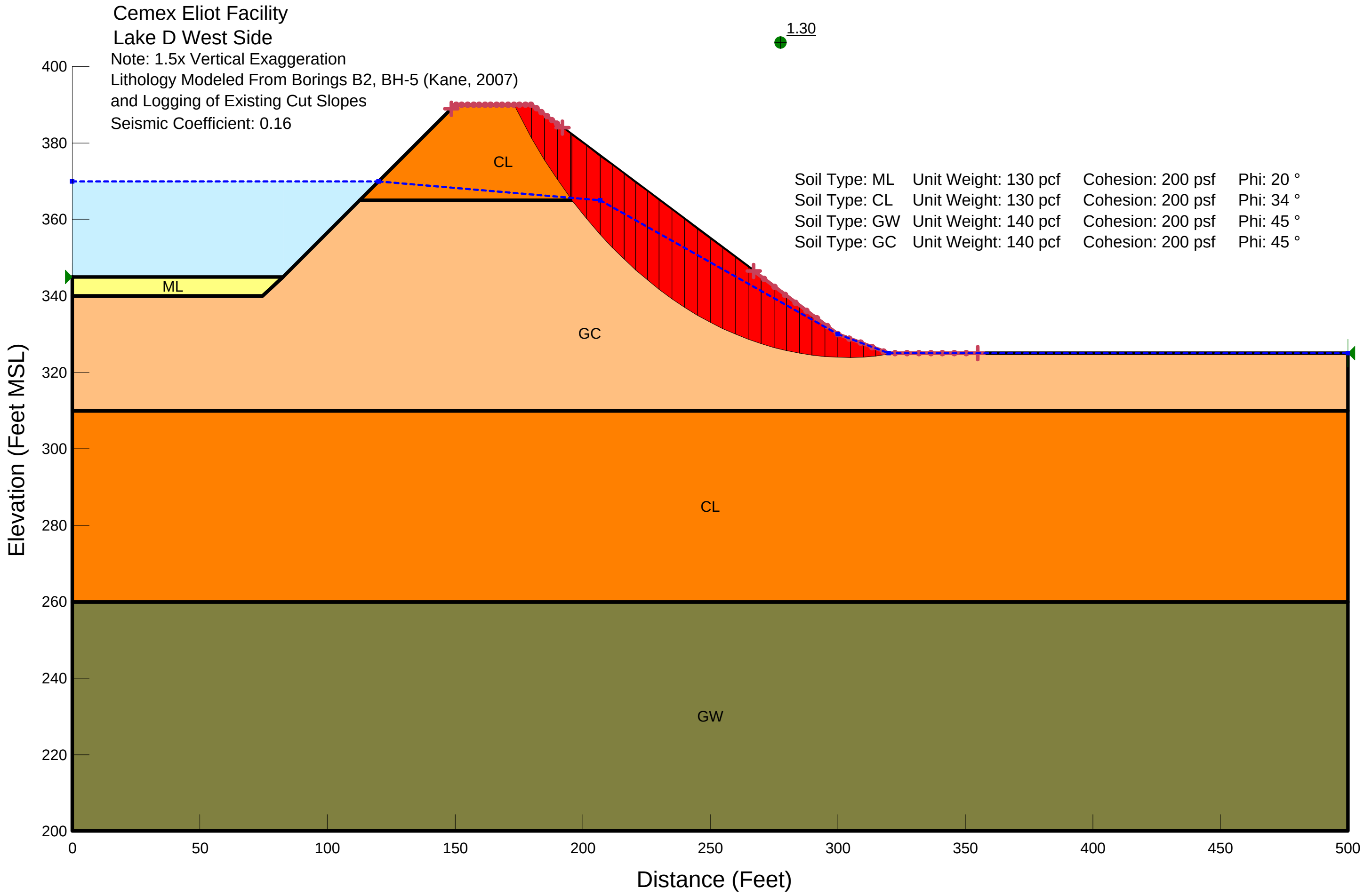
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST - ADJ. SITL POND WATER LEVEL AT 370
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E2



Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

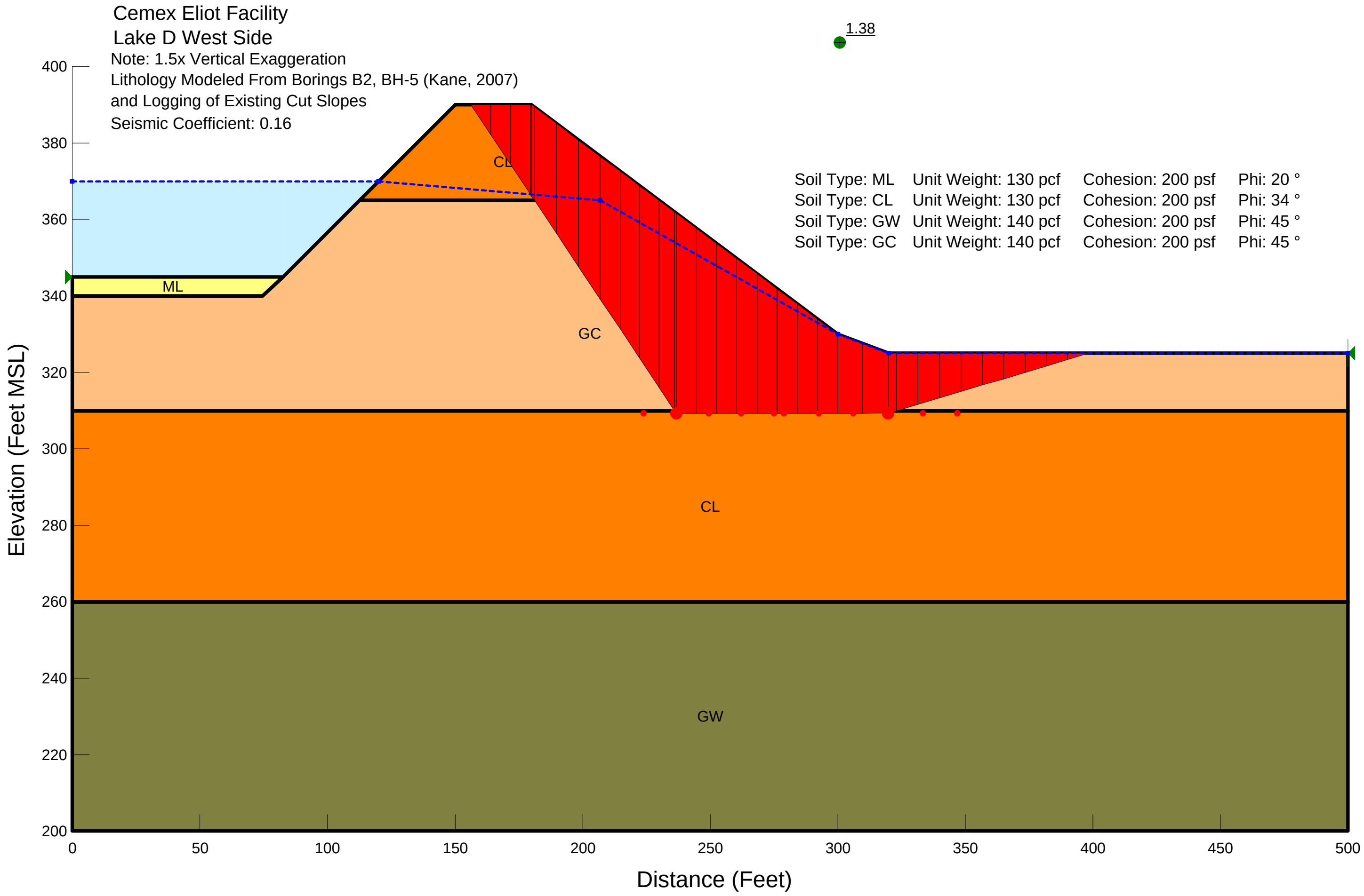
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE D WEST - ADJ. SITL POND WATER LEVEL AT 370
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E3


Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

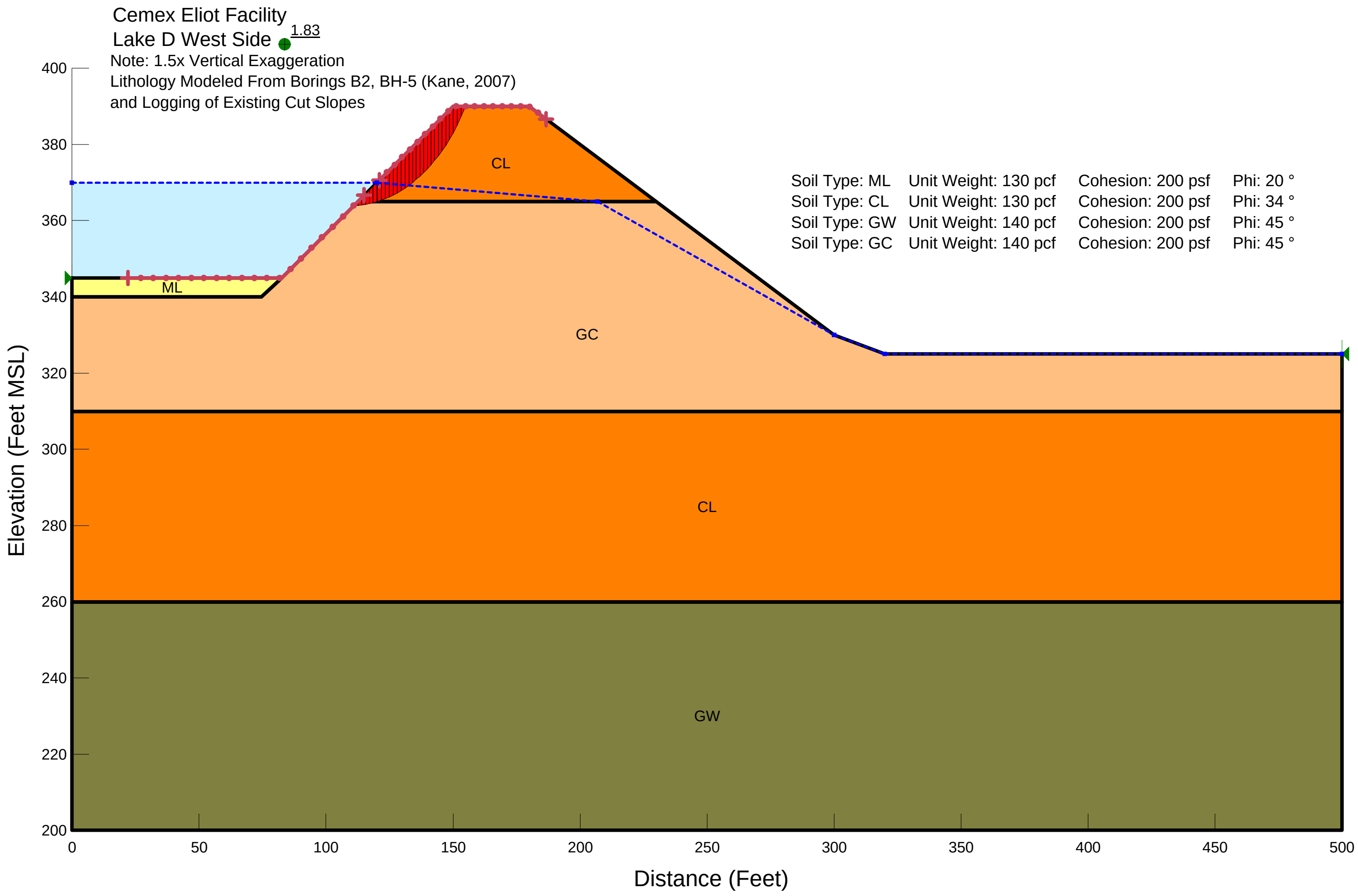
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE D WEST - ADJ. SITL POND WATER LEVEL AT 370
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E4



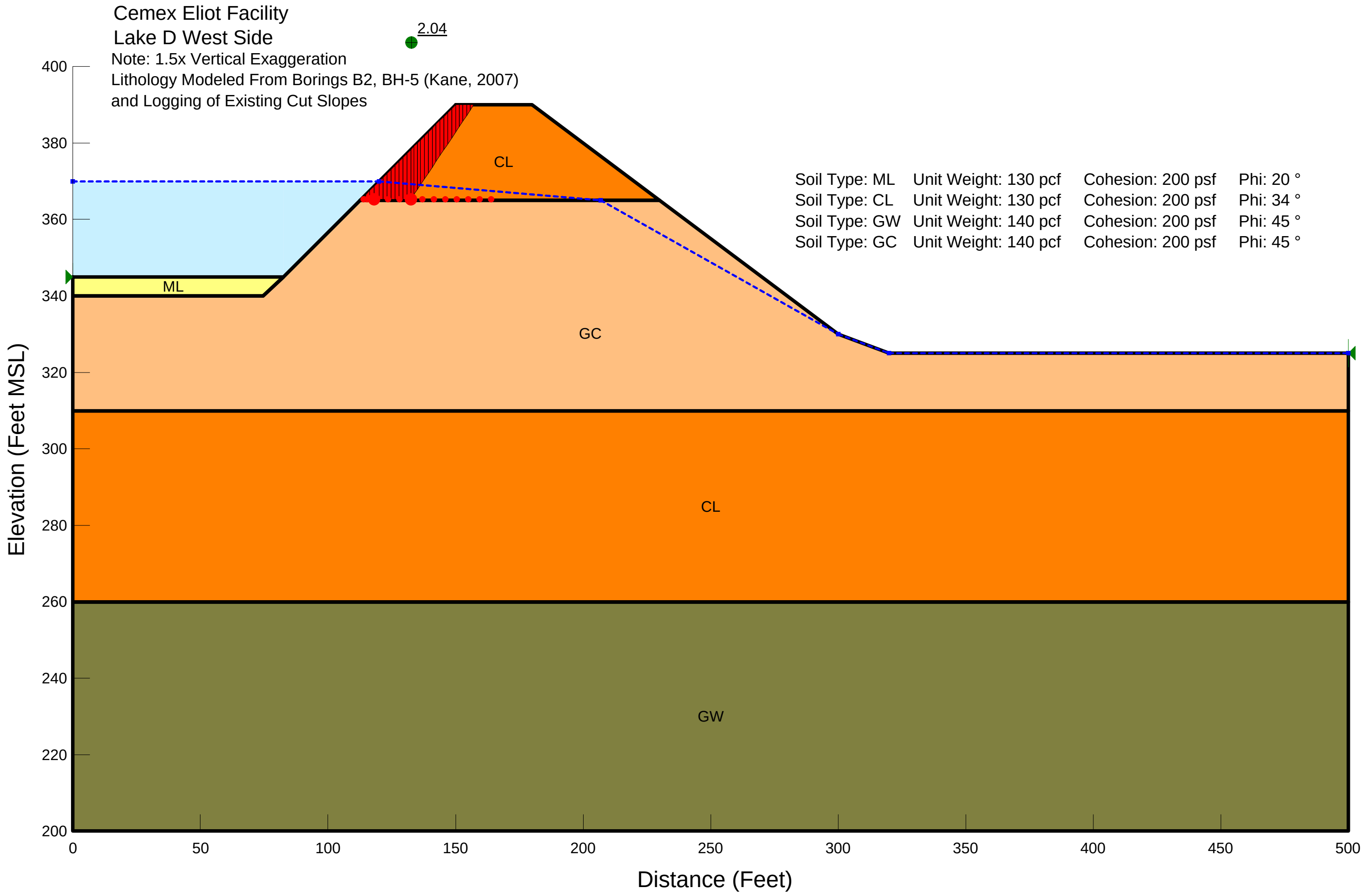
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST – ADJ. SITL POND WATER LEVEL AT 370
STATIC – CIRCULAR FAILURE (REVERSE)

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E5


Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes

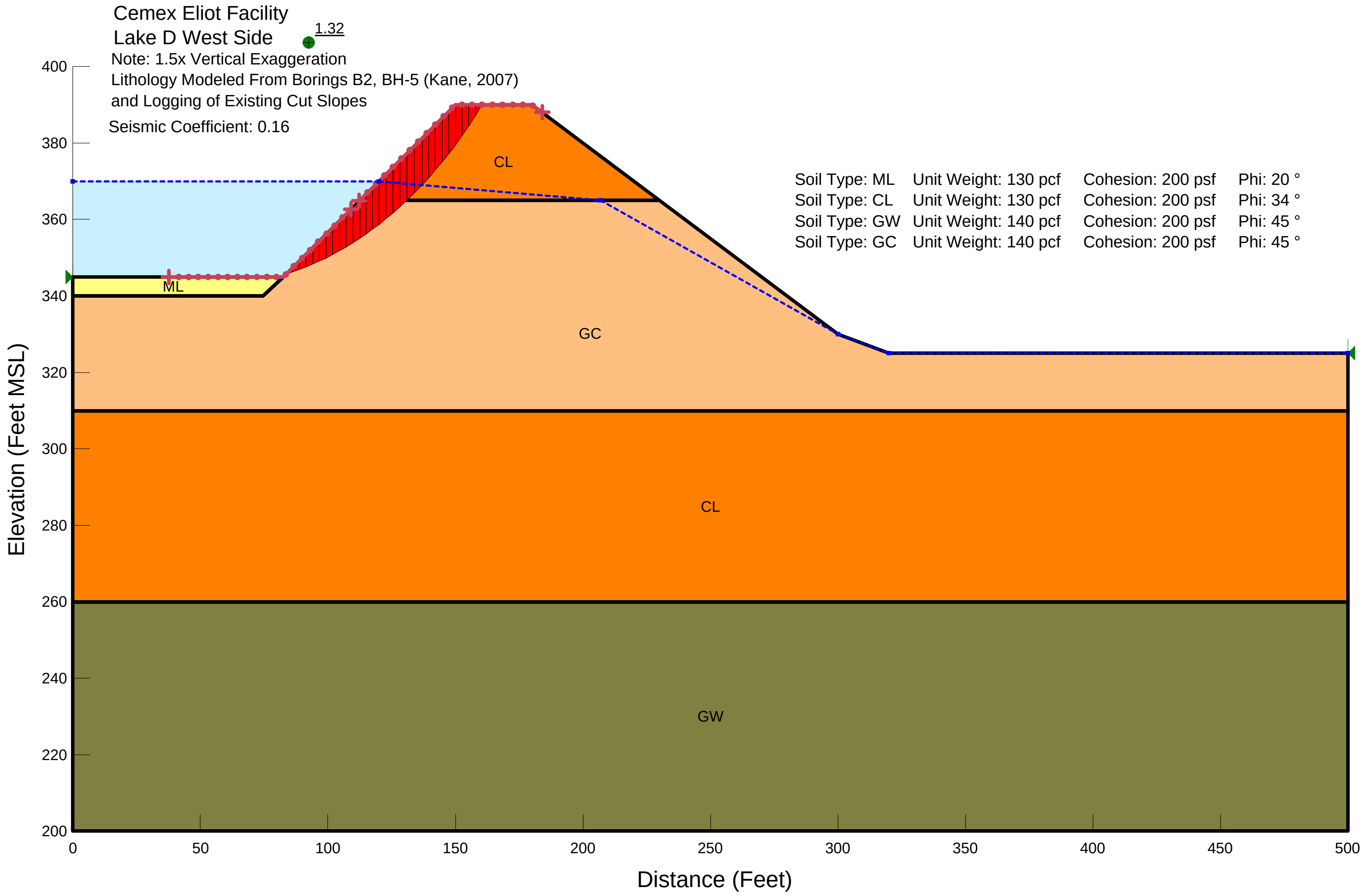
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST - ADJ. SITL POND WATER LEVEL AT 370
STATIC - BLOCK FAILURE (REVERSE)

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E6

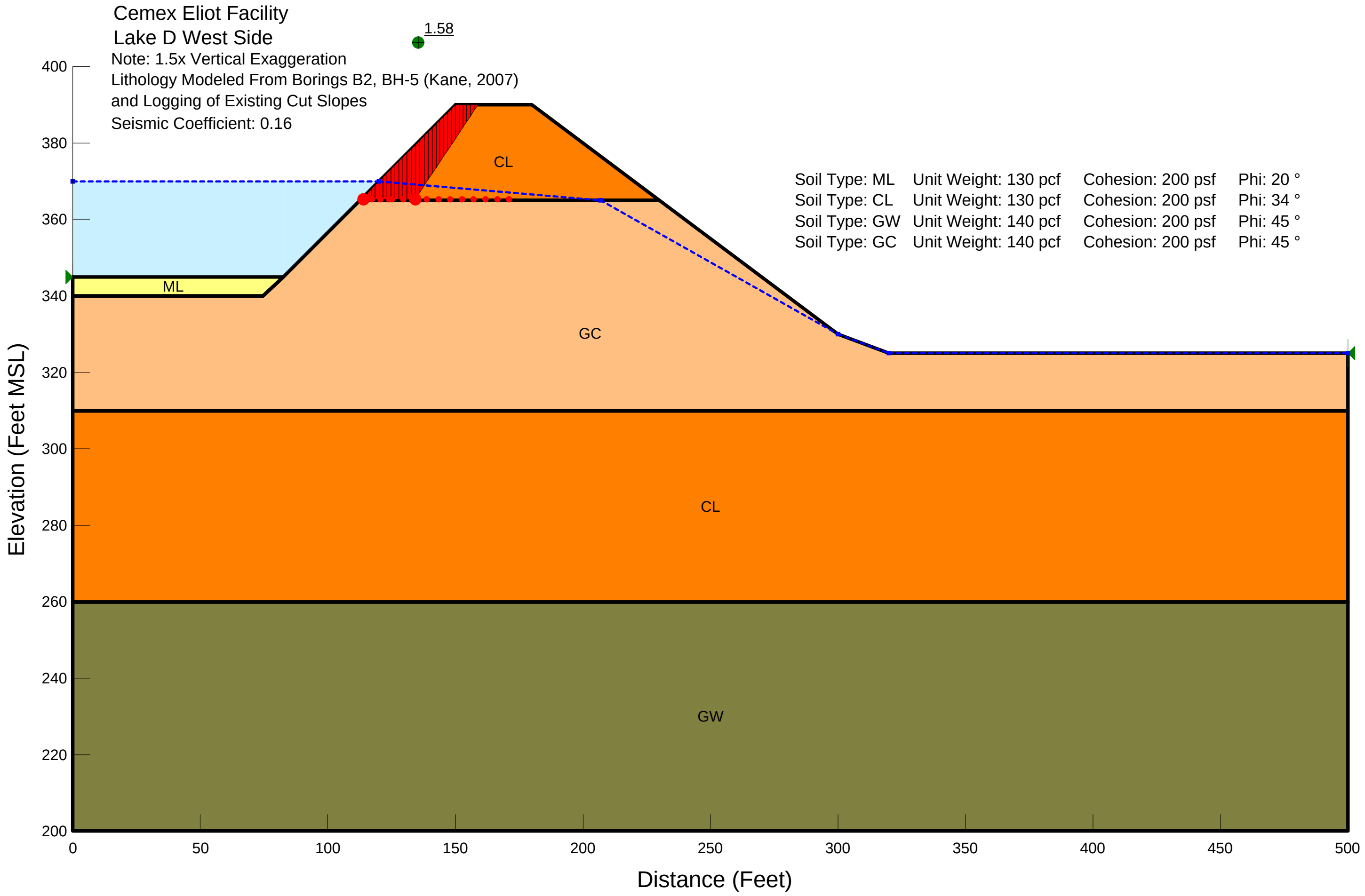


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE D WEST - ADJ. SITL POND WATER LEVEL AT 370
SEISMIC - CIRCULAR FAILURE (REVERSE)

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E7



Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

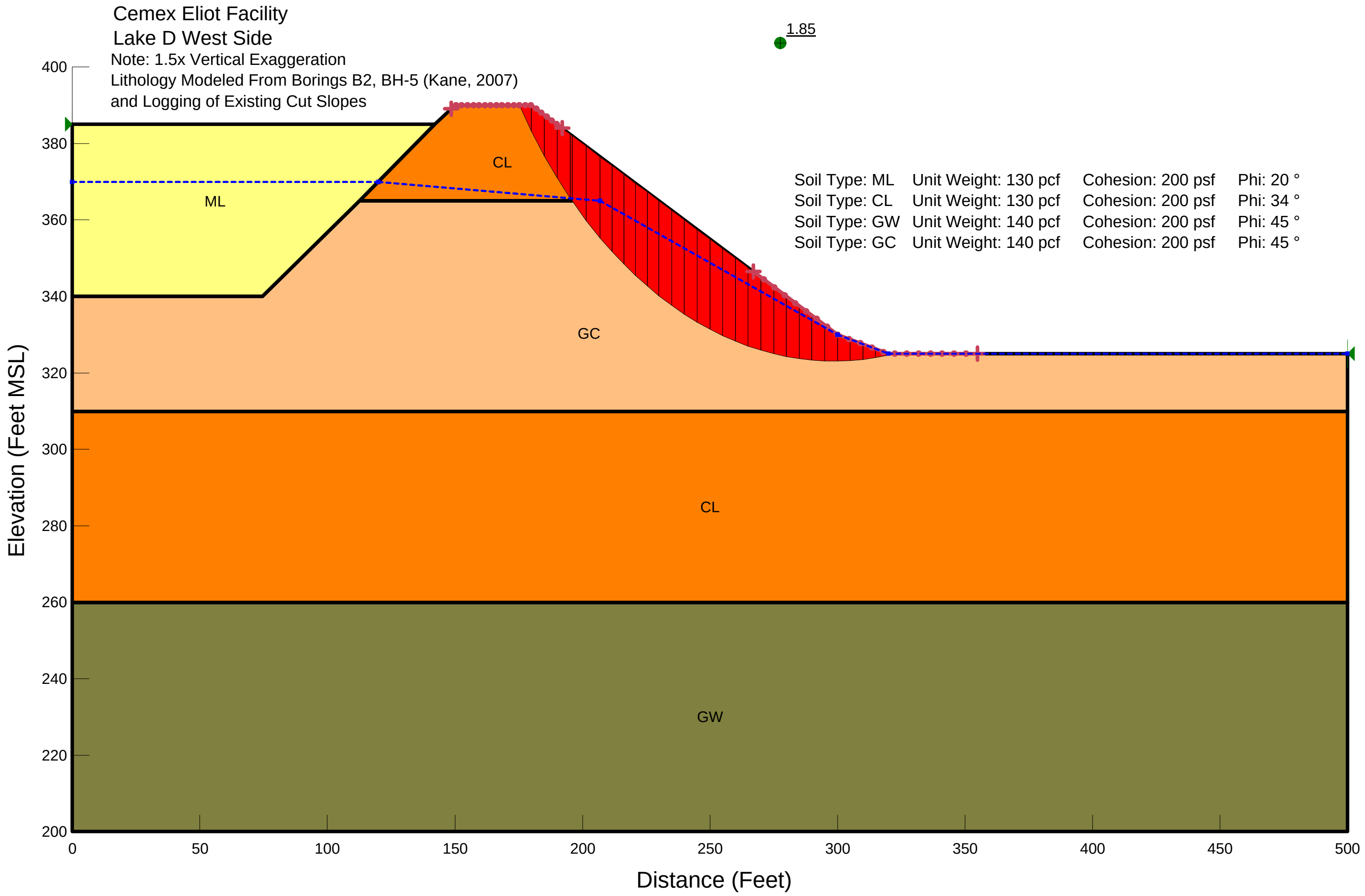
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST - ADJ. SITL POND WATER LEVEL AT 370
SEISMIC - BLOCK FAILURE (REVERSE)

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E8



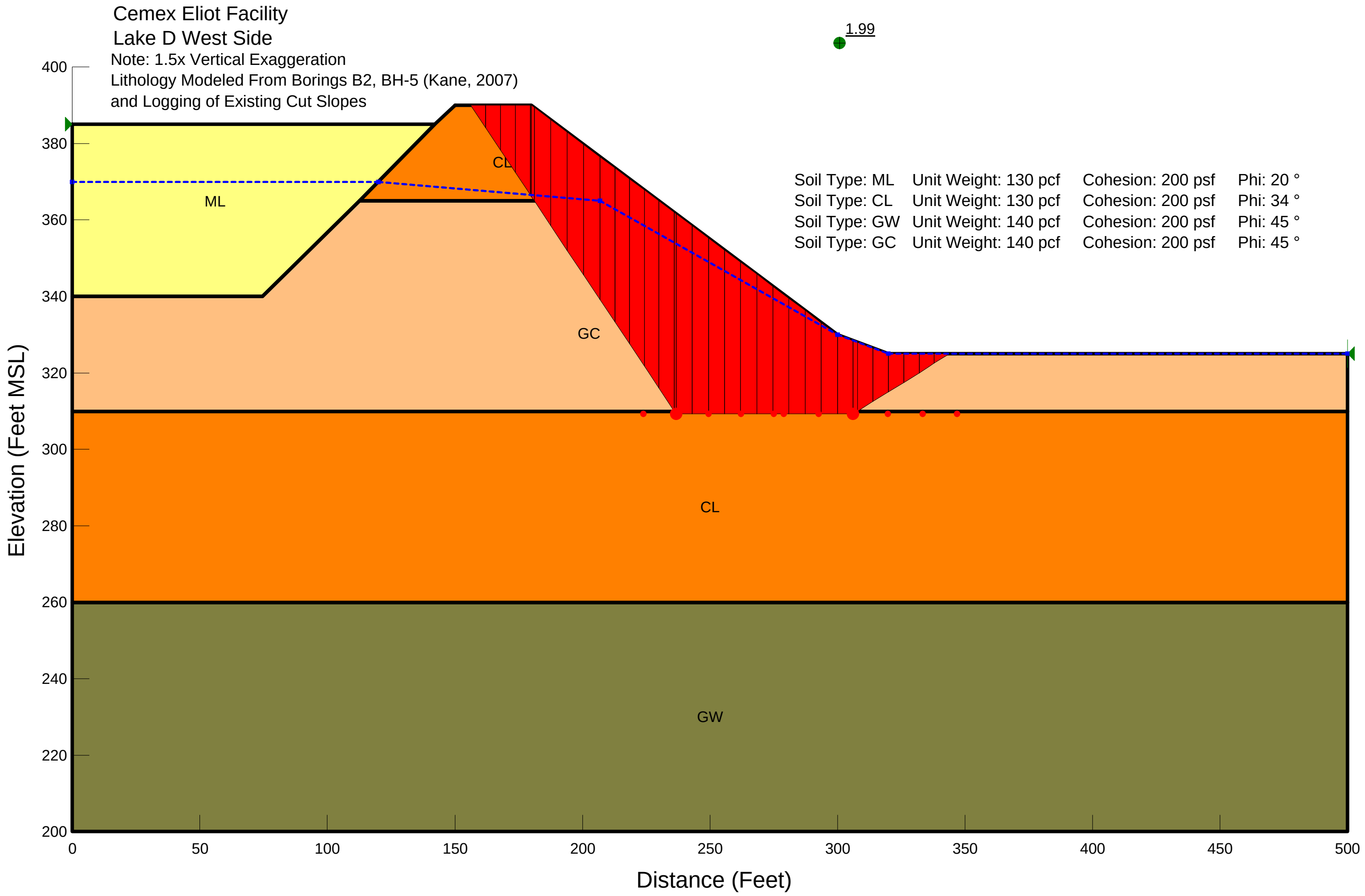
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST - RECLAIMED CONDITION
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E9



Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes

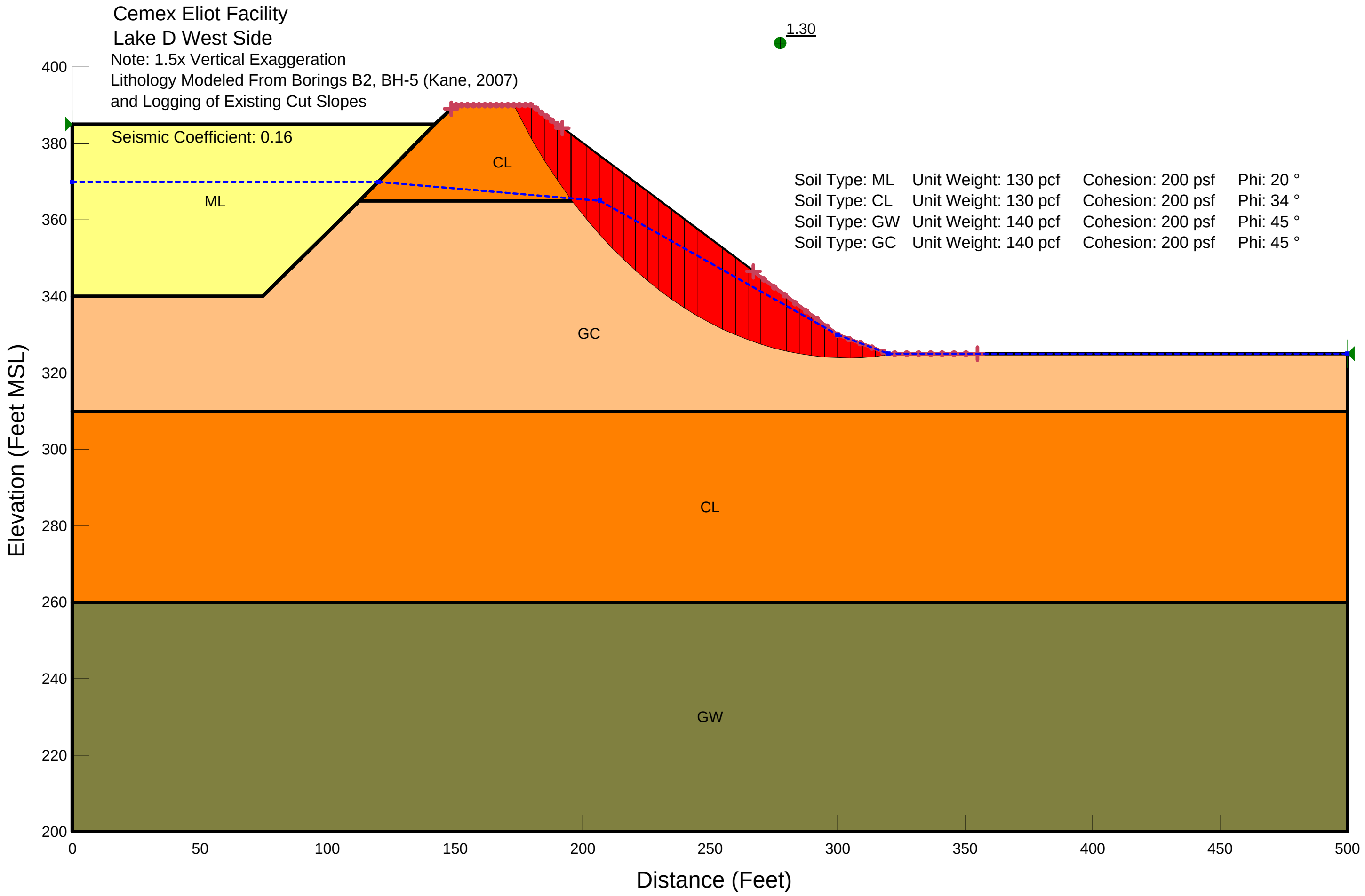
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST – RECLAIMED CONDITION
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E10



Cemex Eliot Facility
Lake D West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled From Borings B2, BH-5 (Kane, 2007)
and Logging of Existing Cut Slopes

Seismic Coefficient: 0.16

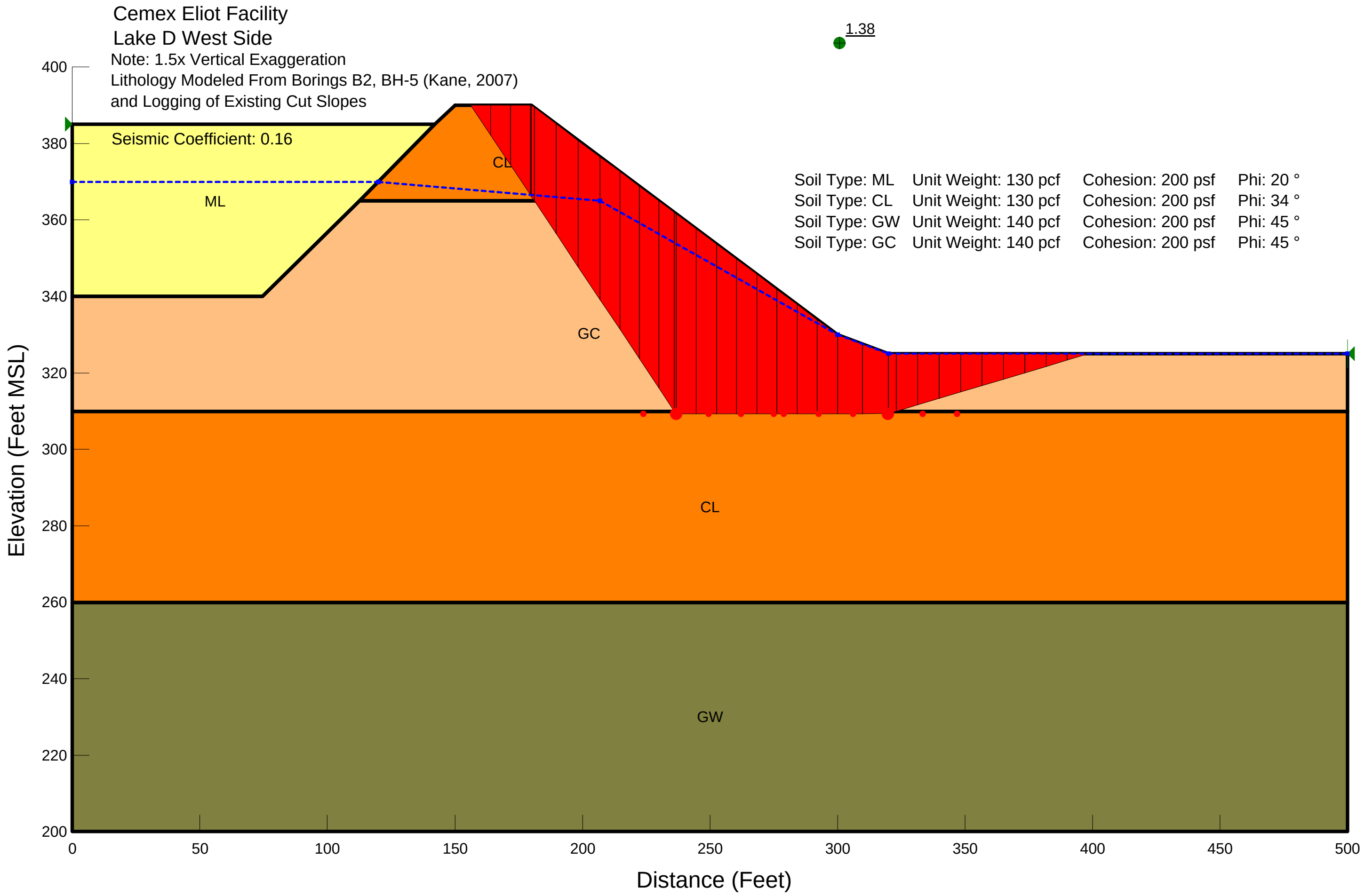
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D WEST – RECLAIMED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E11



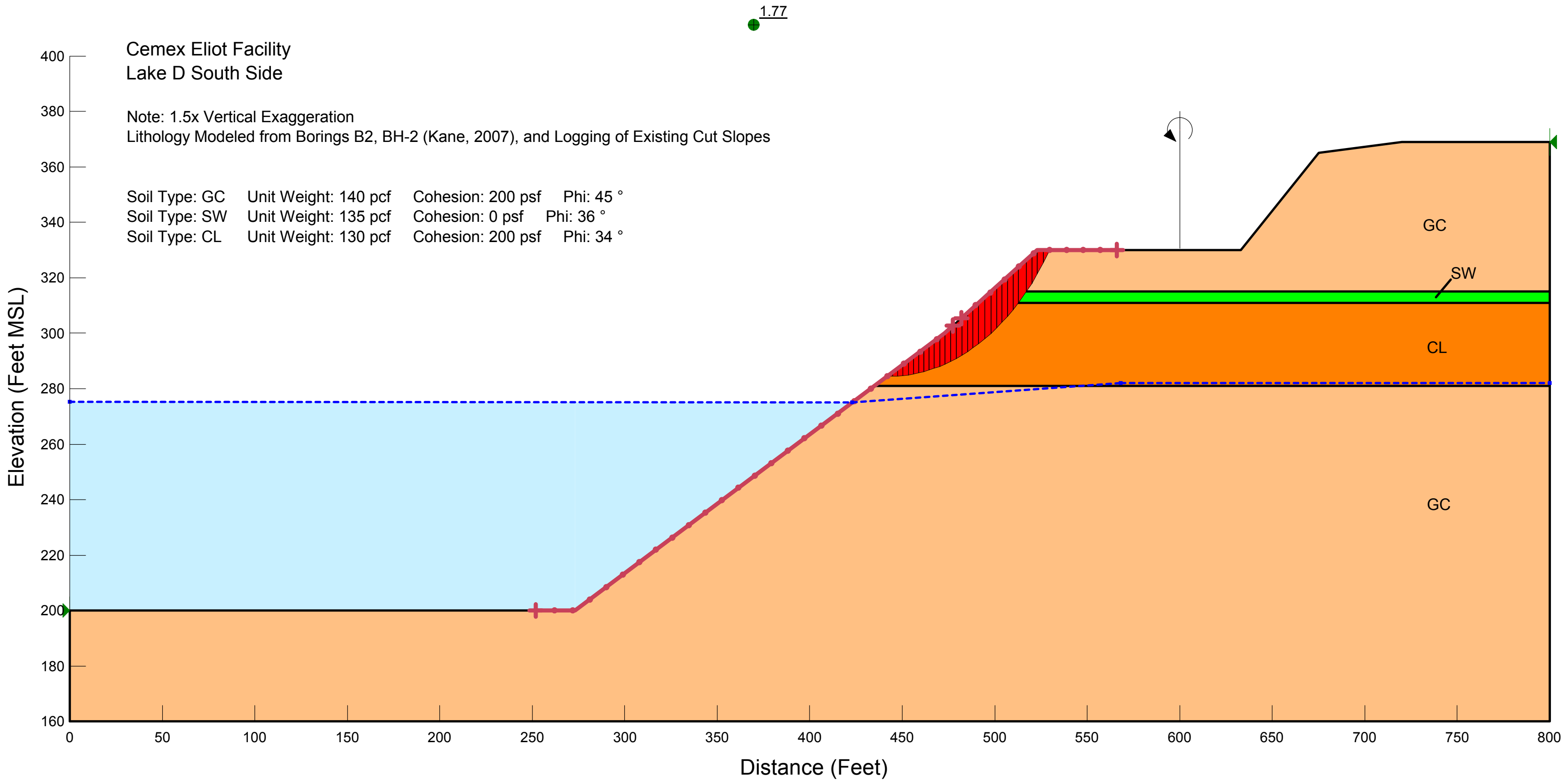
Soil Type: ML	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 20 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GW	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE D WEST - RECLAIMED CONDITION
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE E12

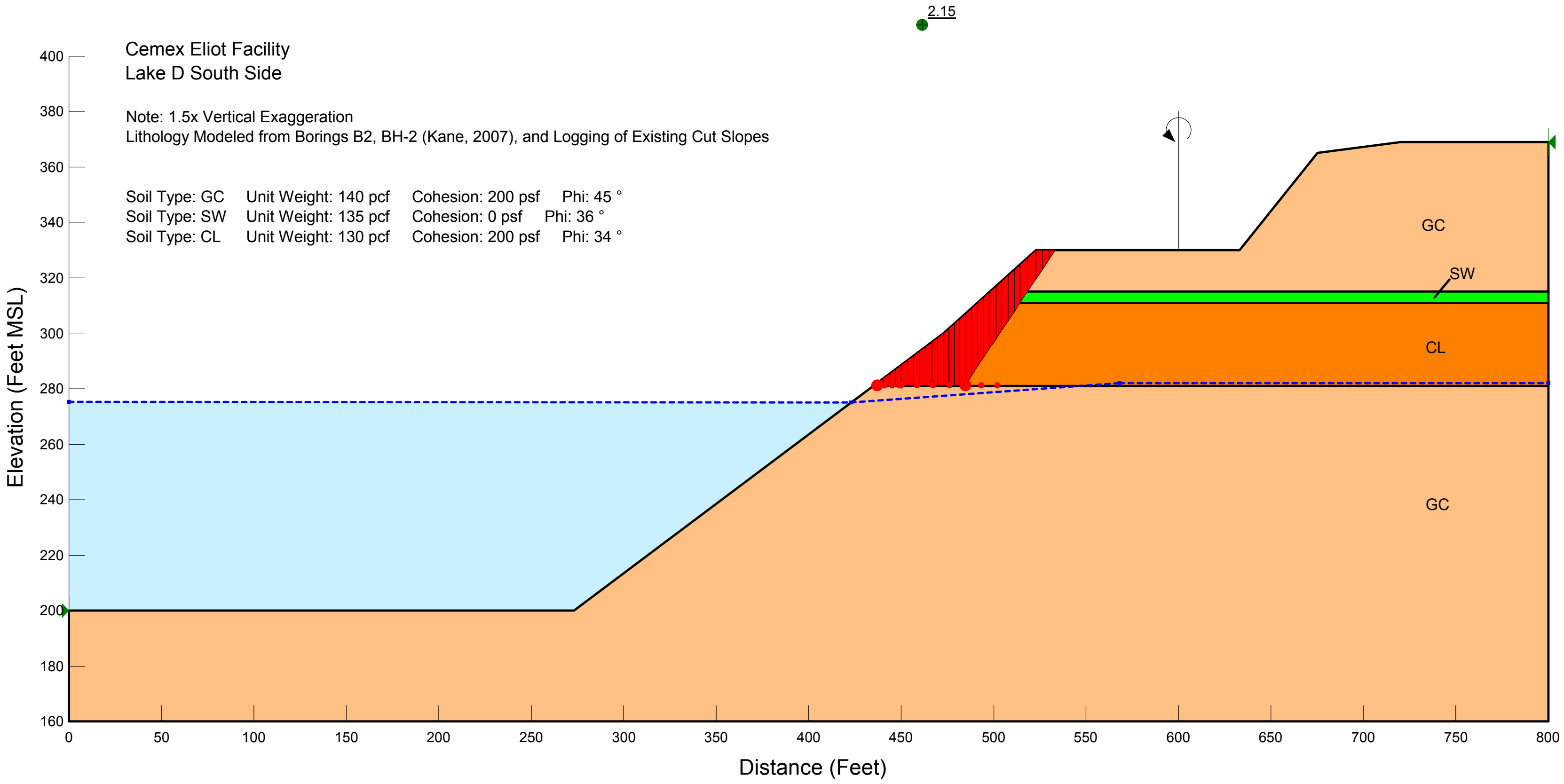


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D SOUTH - FRESHWATER POND AT 275 MSL
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE E13

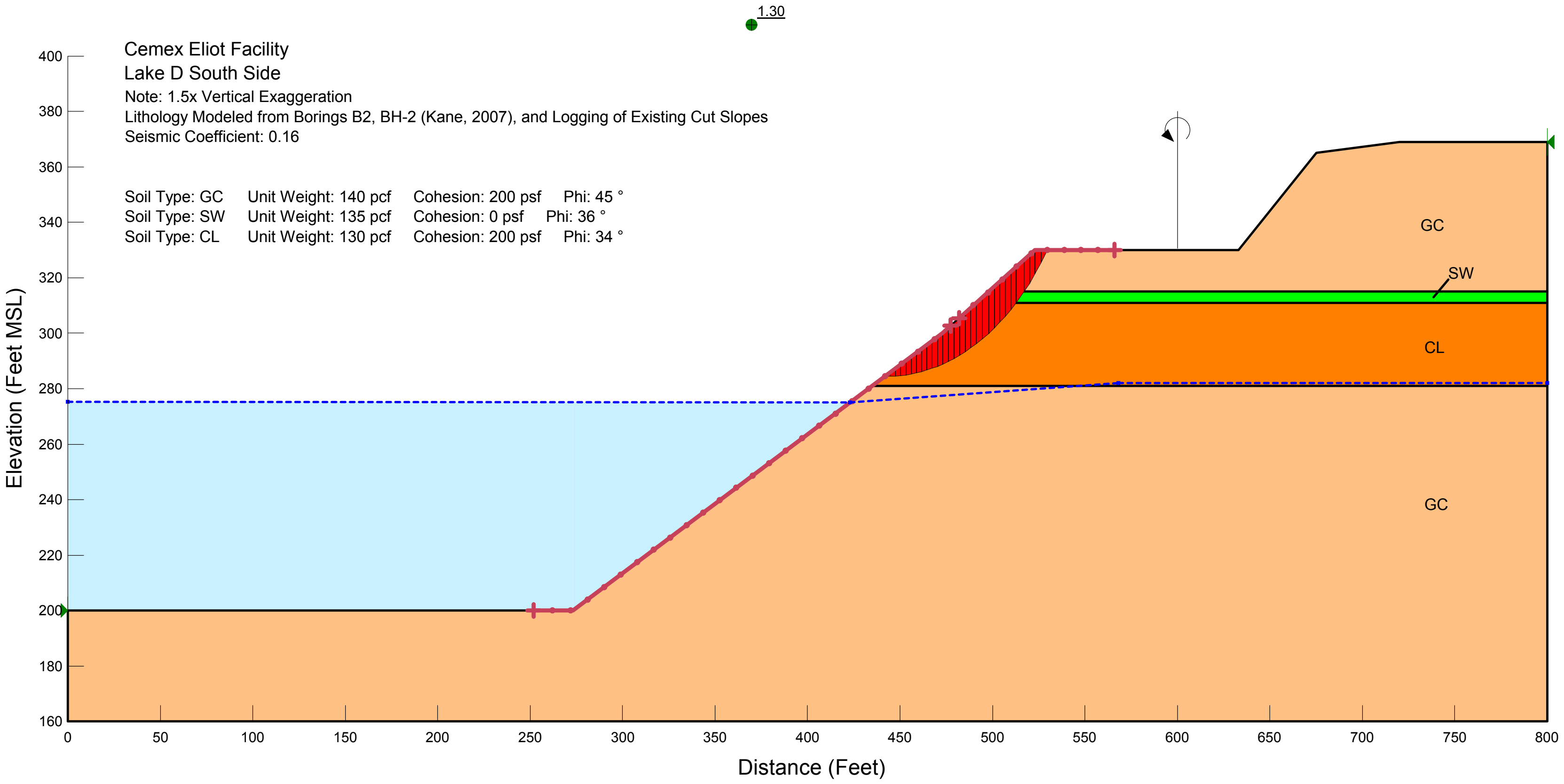


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D SOUTH - FRESHWATER POND AT 275 MSL
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE E14



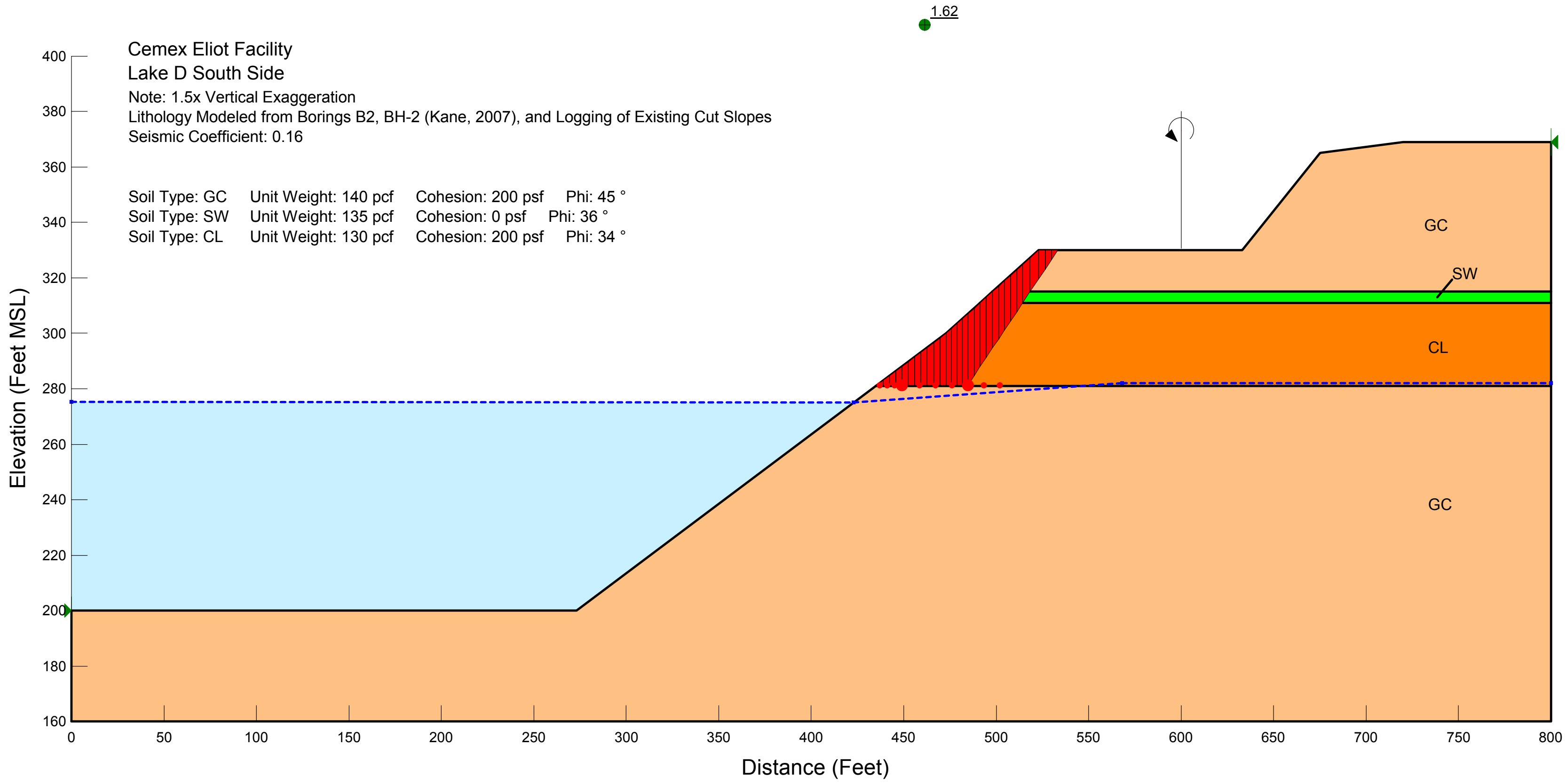
GEOCON
CONSULTANTS, INC.

6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE D SOUTH - FRESHWATER POND AT 275 MSL
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE E15



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

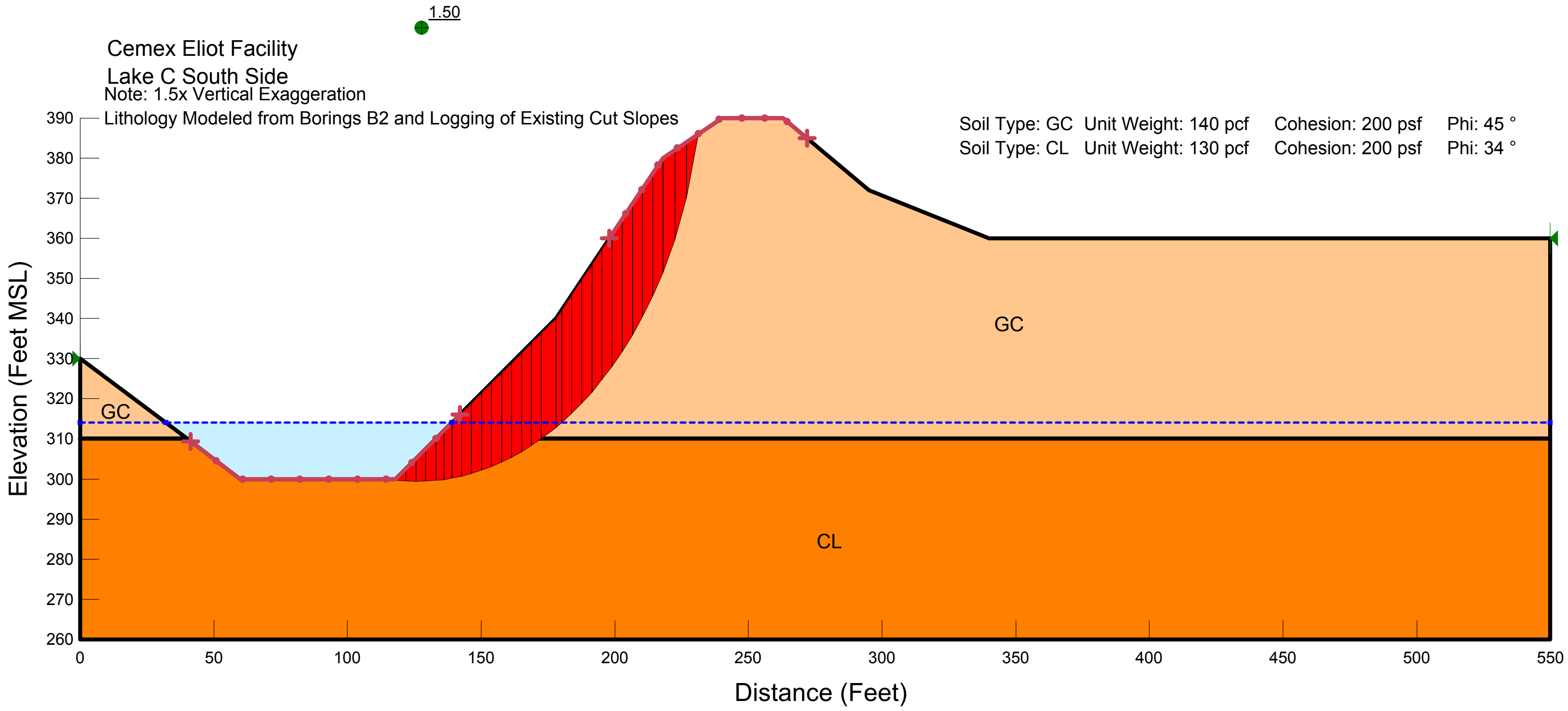
LAKE D SOUTH - FRESHWATER POND AT 275 MSL
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE E16

APPENDIX F
SLOPE STABILITY ANALYSIS – LAKE C

Cemex Eliot Facility
Lake C South Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled from Borings B2 and Logging of Existing Cut Slopes



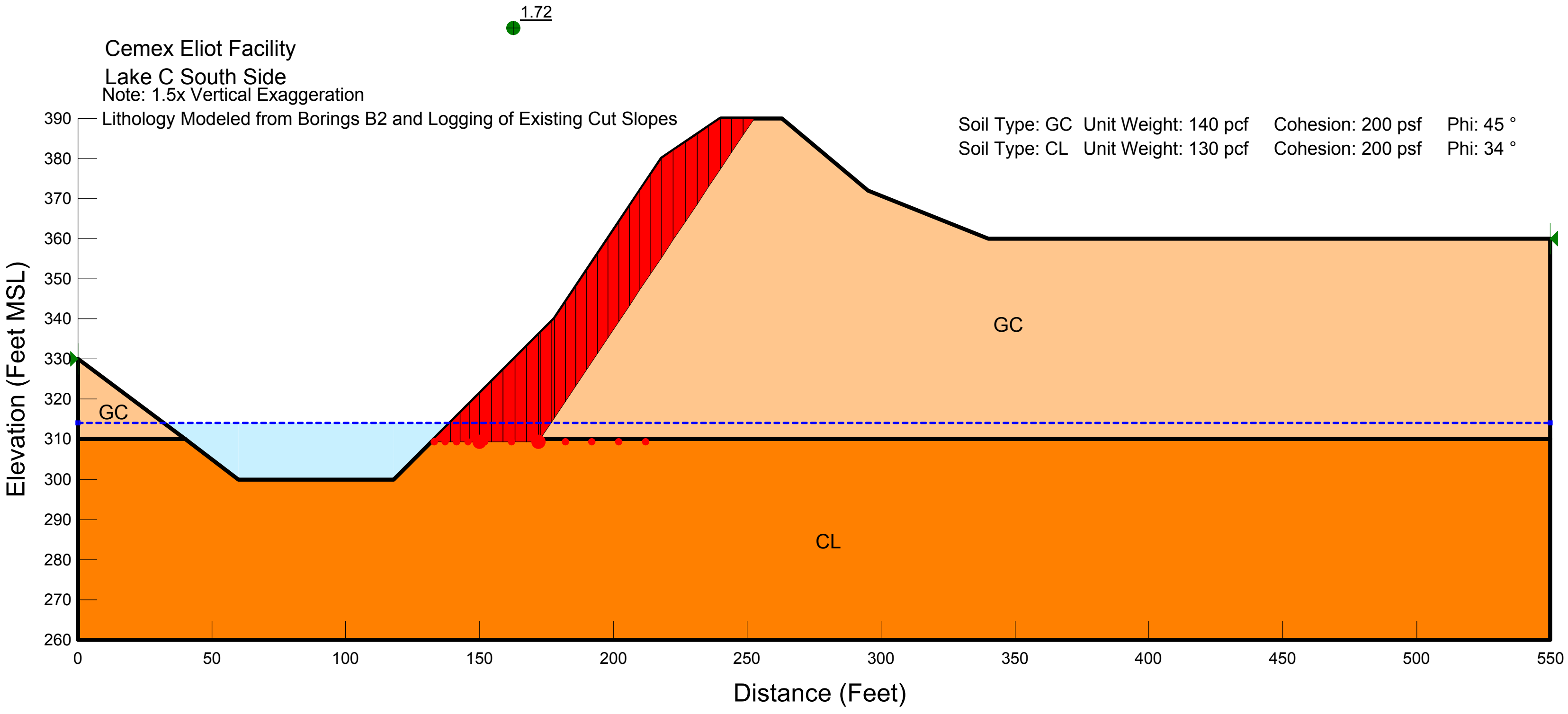
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C SOUTH - WATER LEVEL AT 315 MSL
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE F1

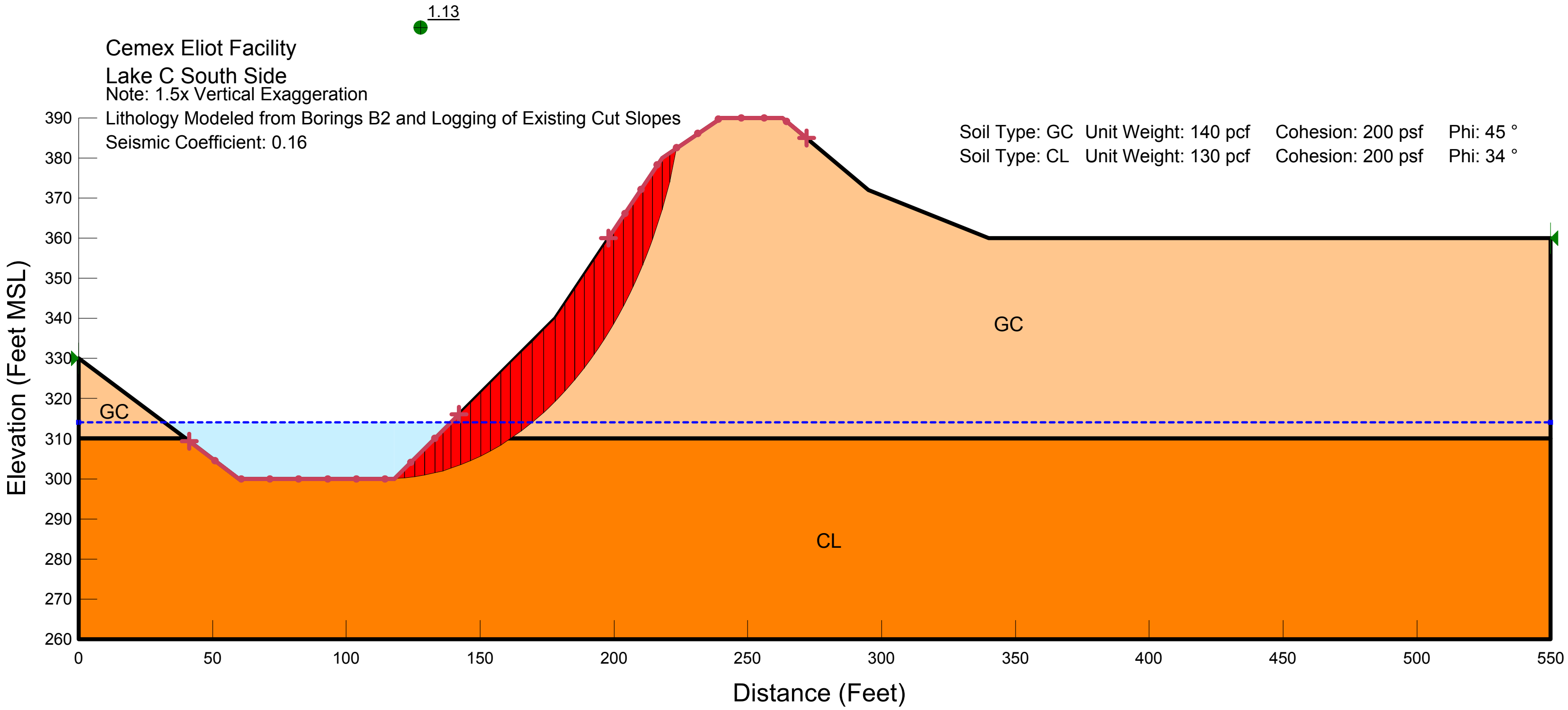


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C SOUTH - WATER LEVEL AT 315 MSL
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE F2

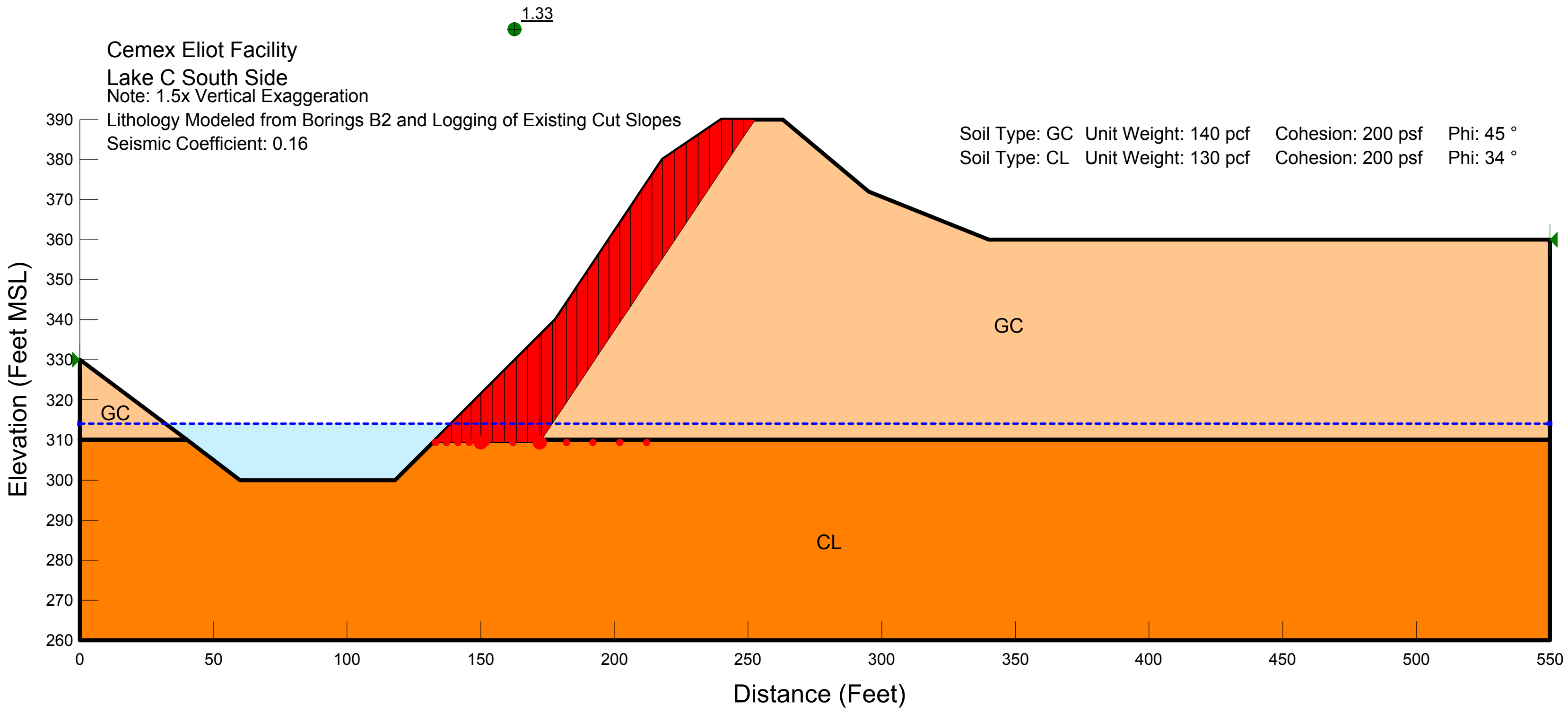


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE C SOUTH - WATER LEVEL AT 315 MSL
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE F3

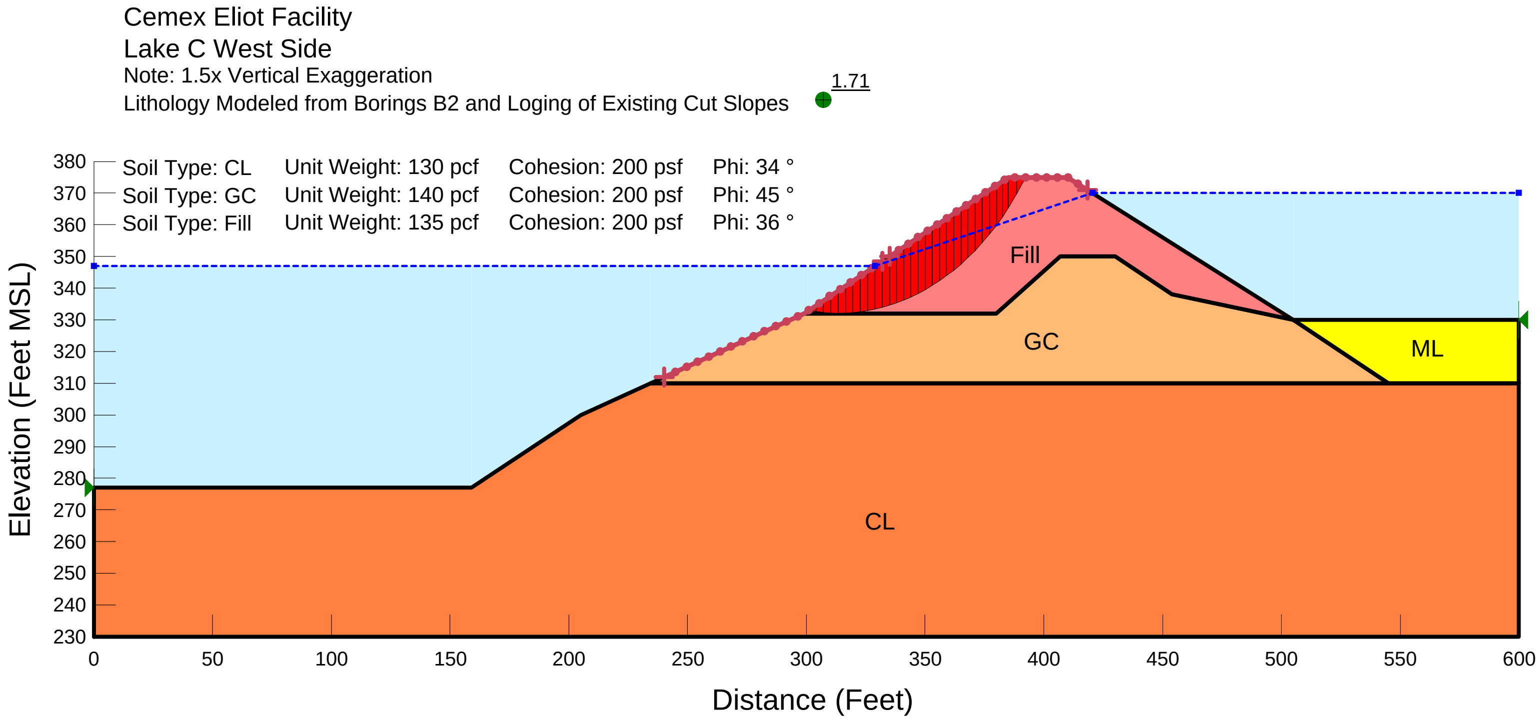


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C SOUTH - WATER LEVEL AT 315 MSL
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE F4



Cemex Eliot Facility

Lake C West Side

Note: 1.5x Vertical Exaggeration

Lithology Modeled from Borings B2 and Loging of Existing Cut Slopes

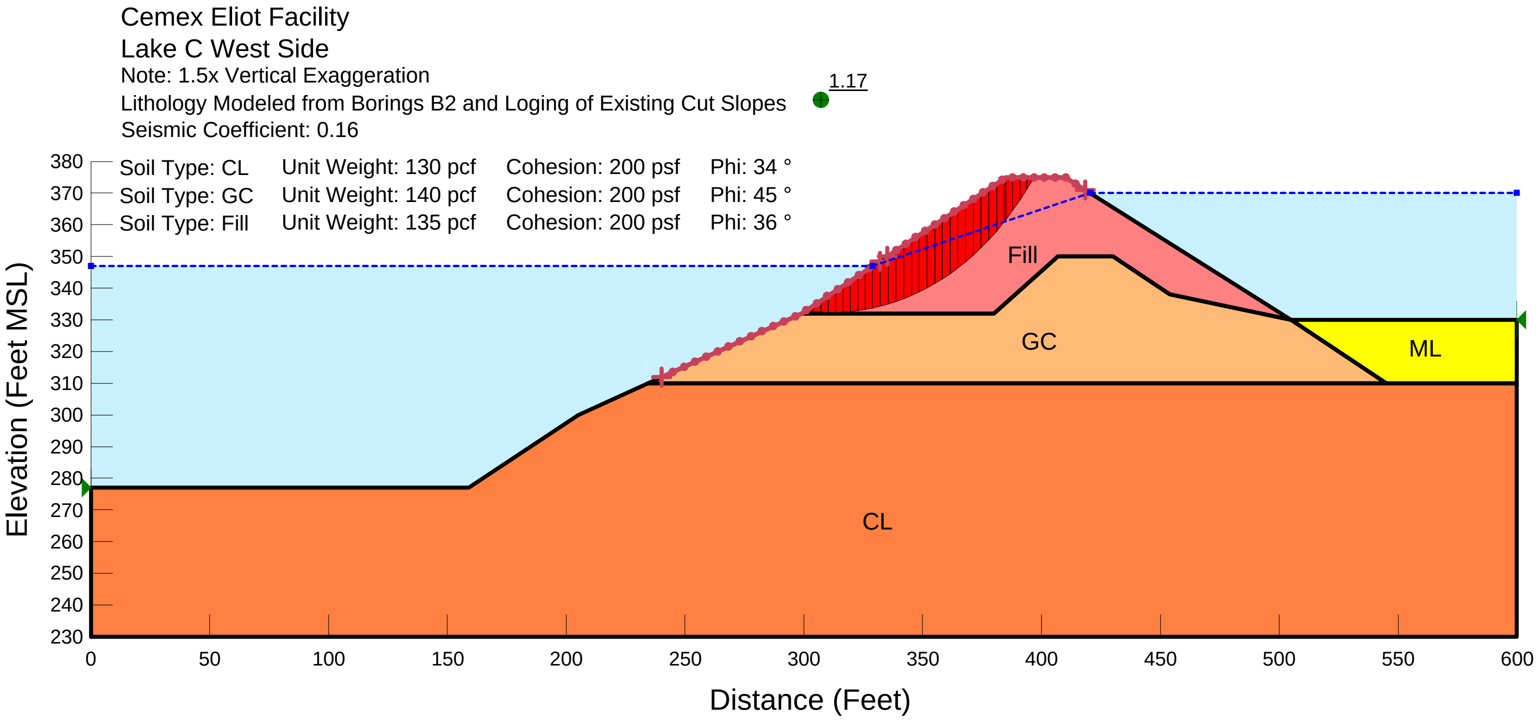
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – MINED CONDITION
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F5

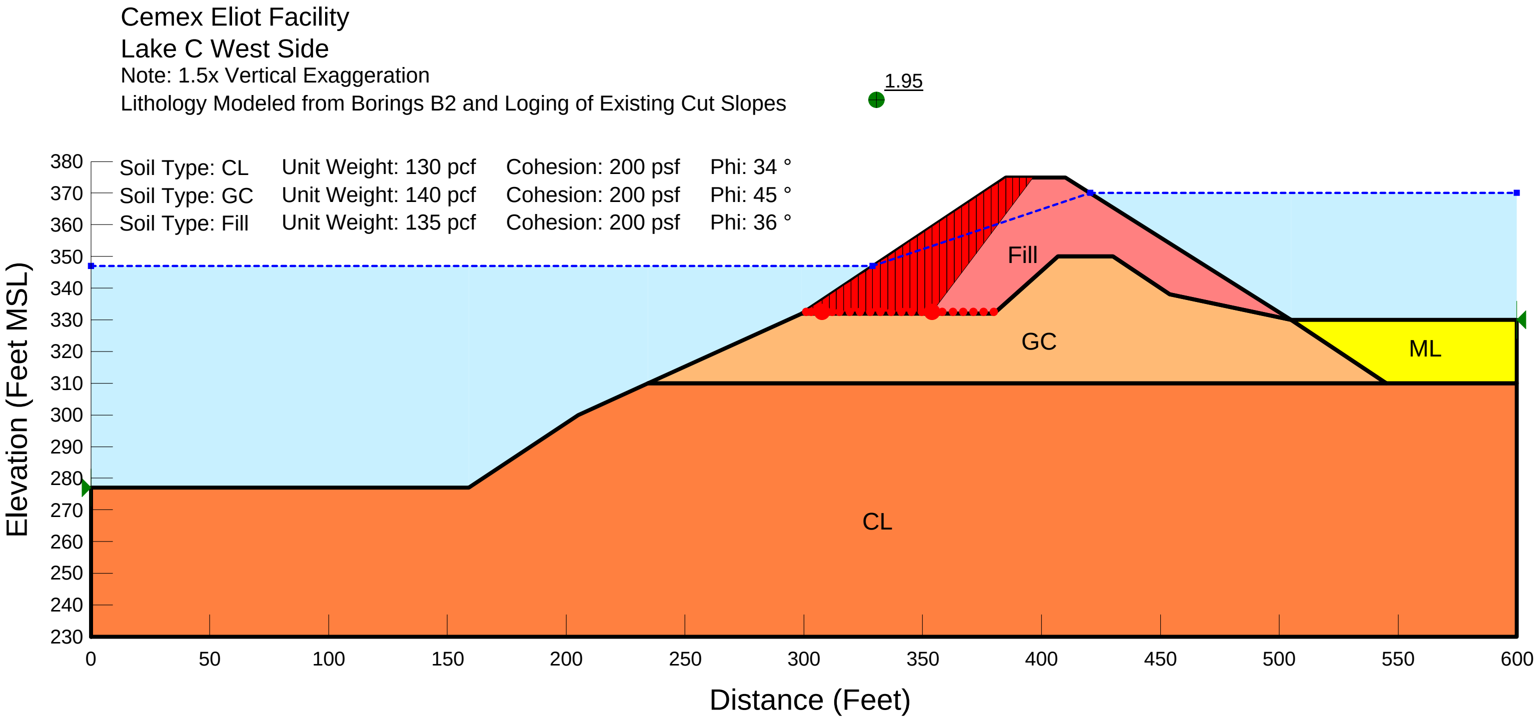


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – MINED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F6



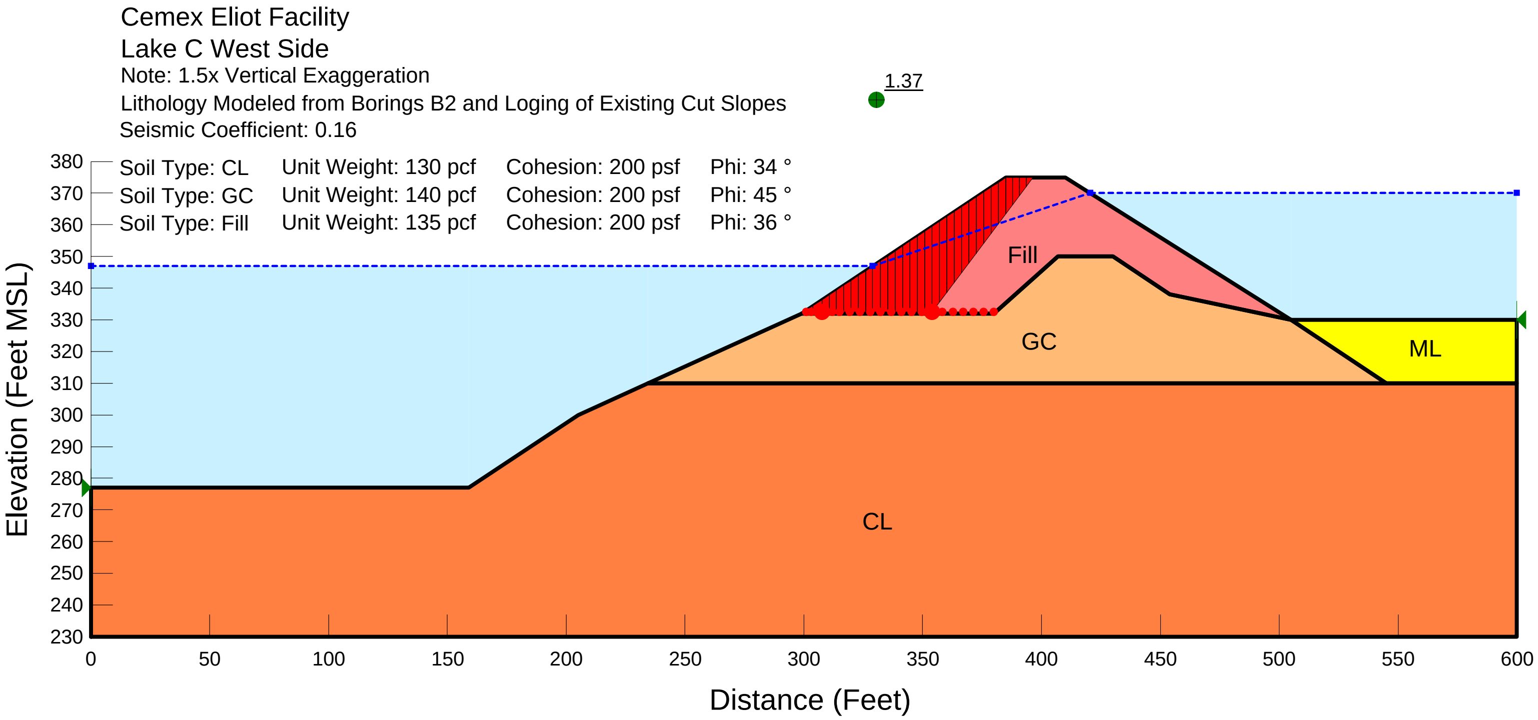
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – MINED CONDITION
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F7



Cemex Eliot Facility

Lake C West Side

Note: 1.5x Vertical Exaggeration

Lithology Modeled from Borings B2 and Loging of Existing Cut Slopes

Seismic Coefficient: 0.16

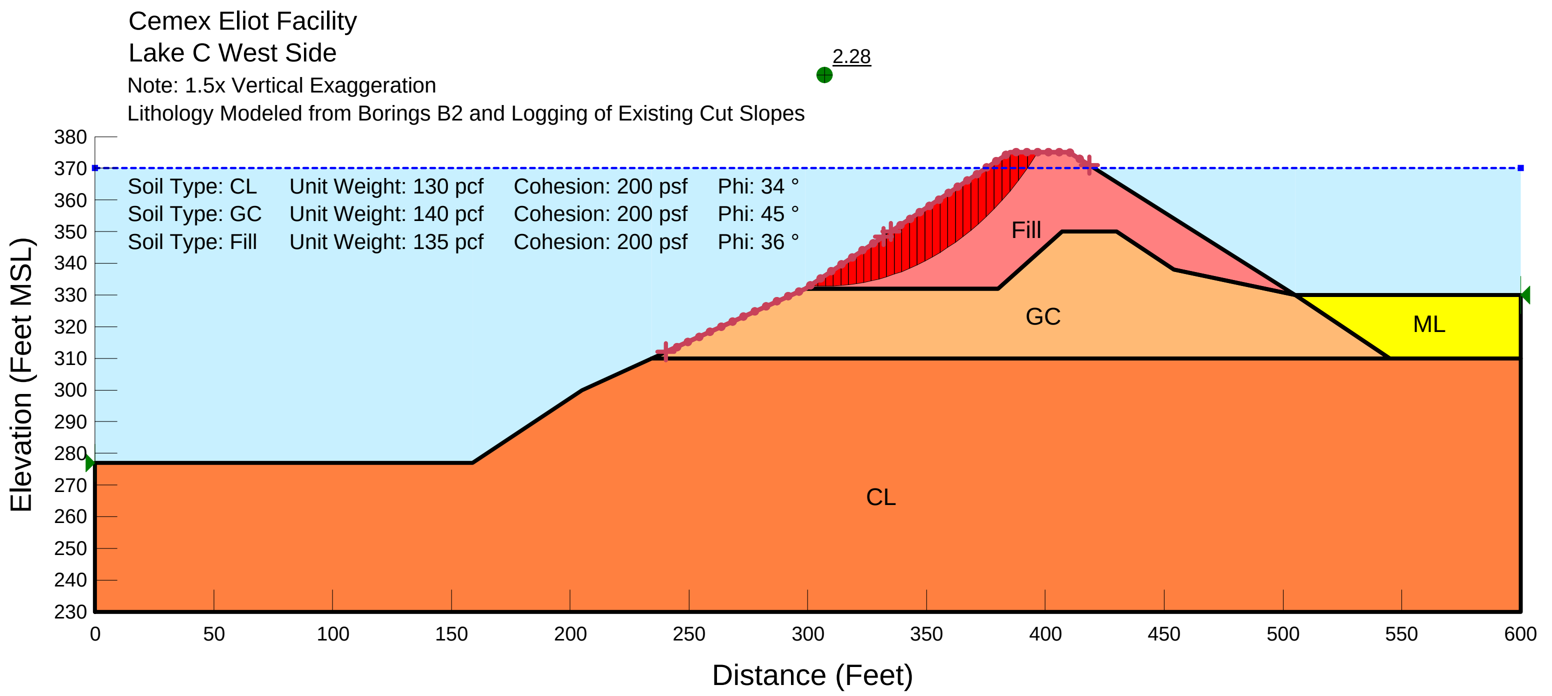
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – MINED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F8

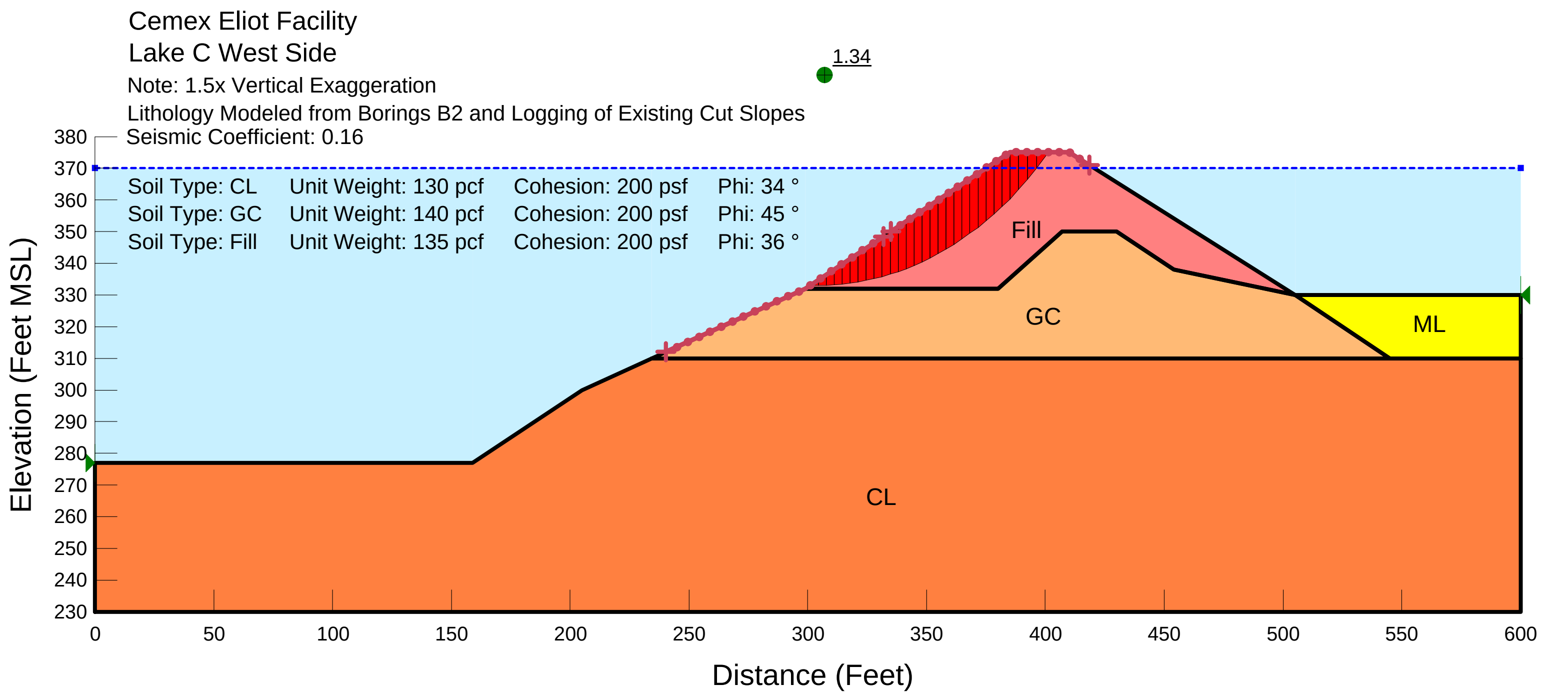


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – RECLAIMED CONDITION
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F9



Cemex Eliot Facility
Lake C West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled from Borings B2 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

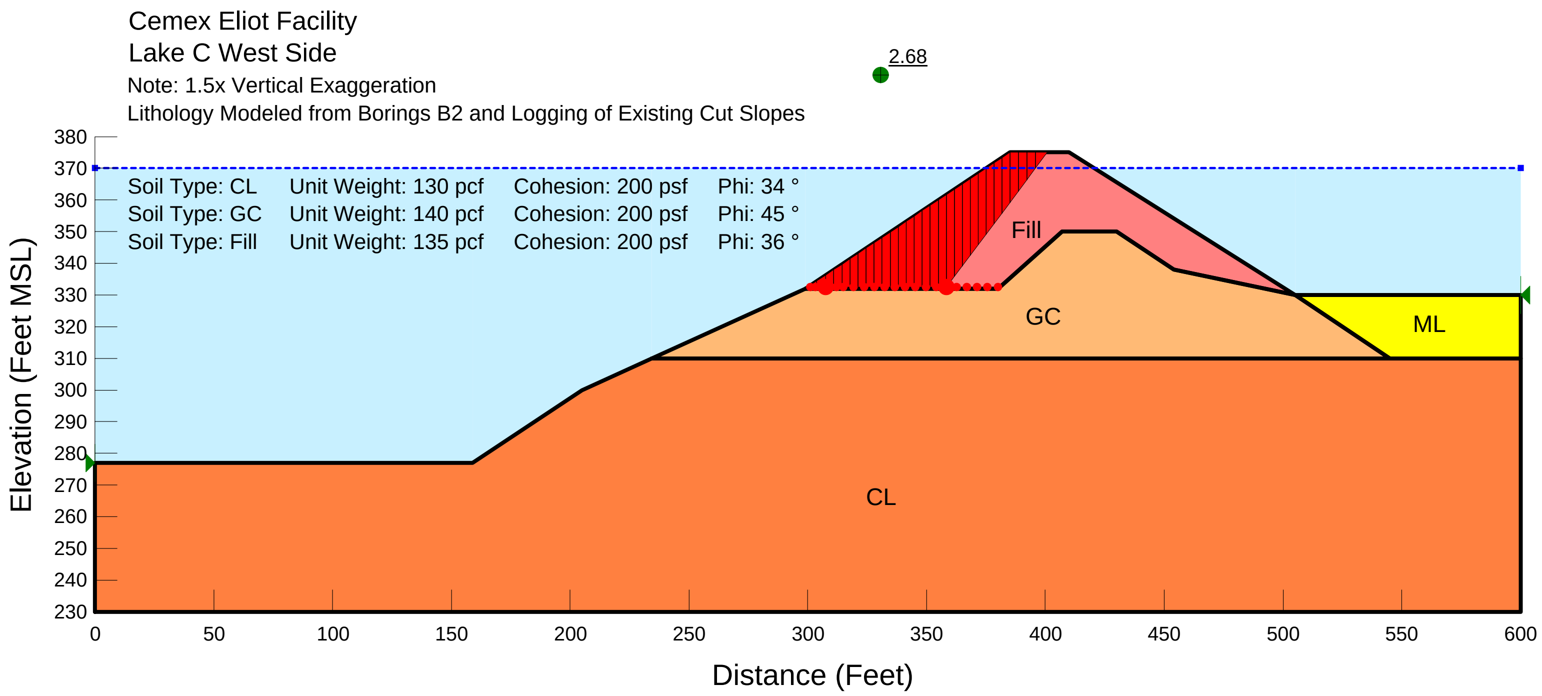
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – RECLAIMED CONDITION
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F10



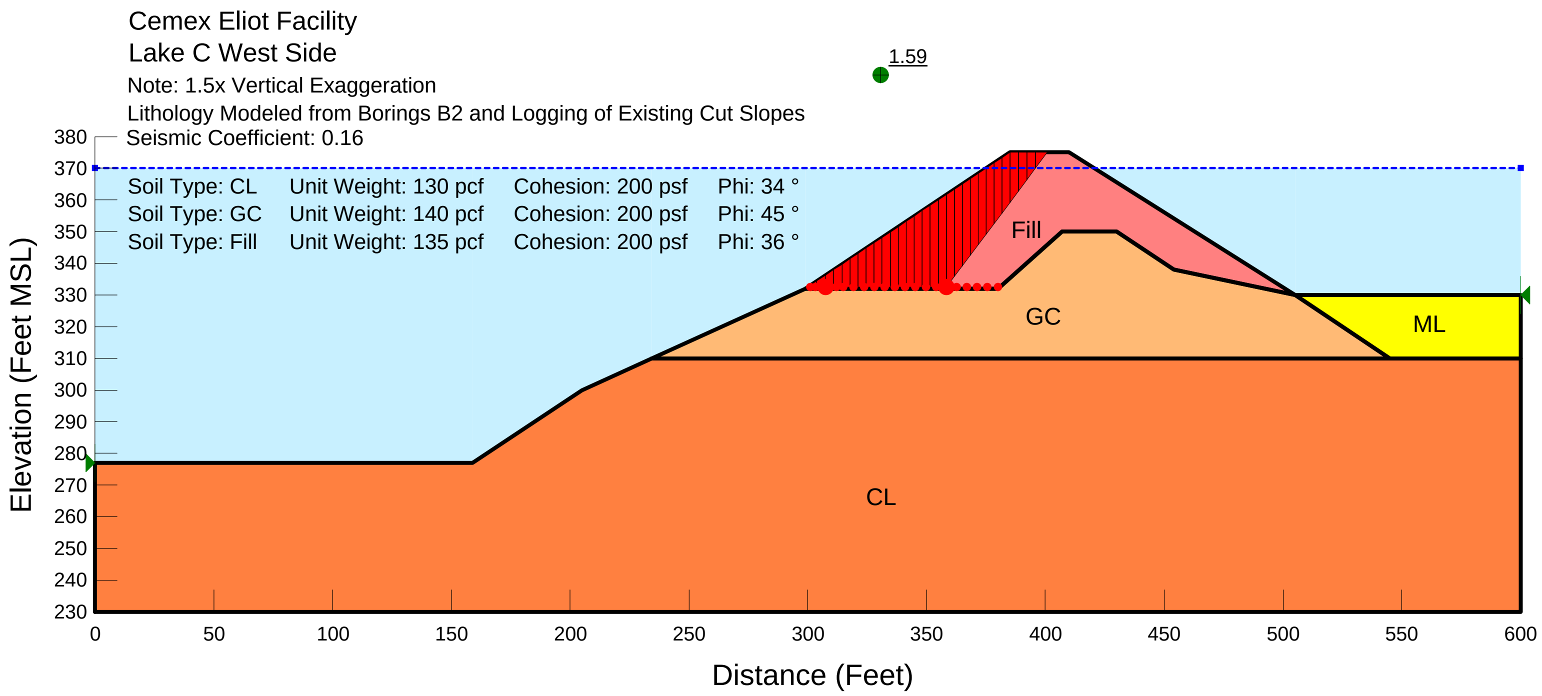
Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – RECLAIMED CONDITION
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F11



Cemex Eliot Facility
Lake C West Side
Note: 1.5x Vertical Exaggeration
Lithology Modeled from Borings B2 and Logging of Existing Cut Slopes
Seismic Coefficient: 0.16

Soil Type: CL	Unit Weight: 130 pcf	Cohesion: 200 psf	Phi: 34 °
Soil Type: GC	Unit Weight: 140 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: Fill	Unit Weight: 135 pcf	Cohesion: 200 psf	Phi: 36 °

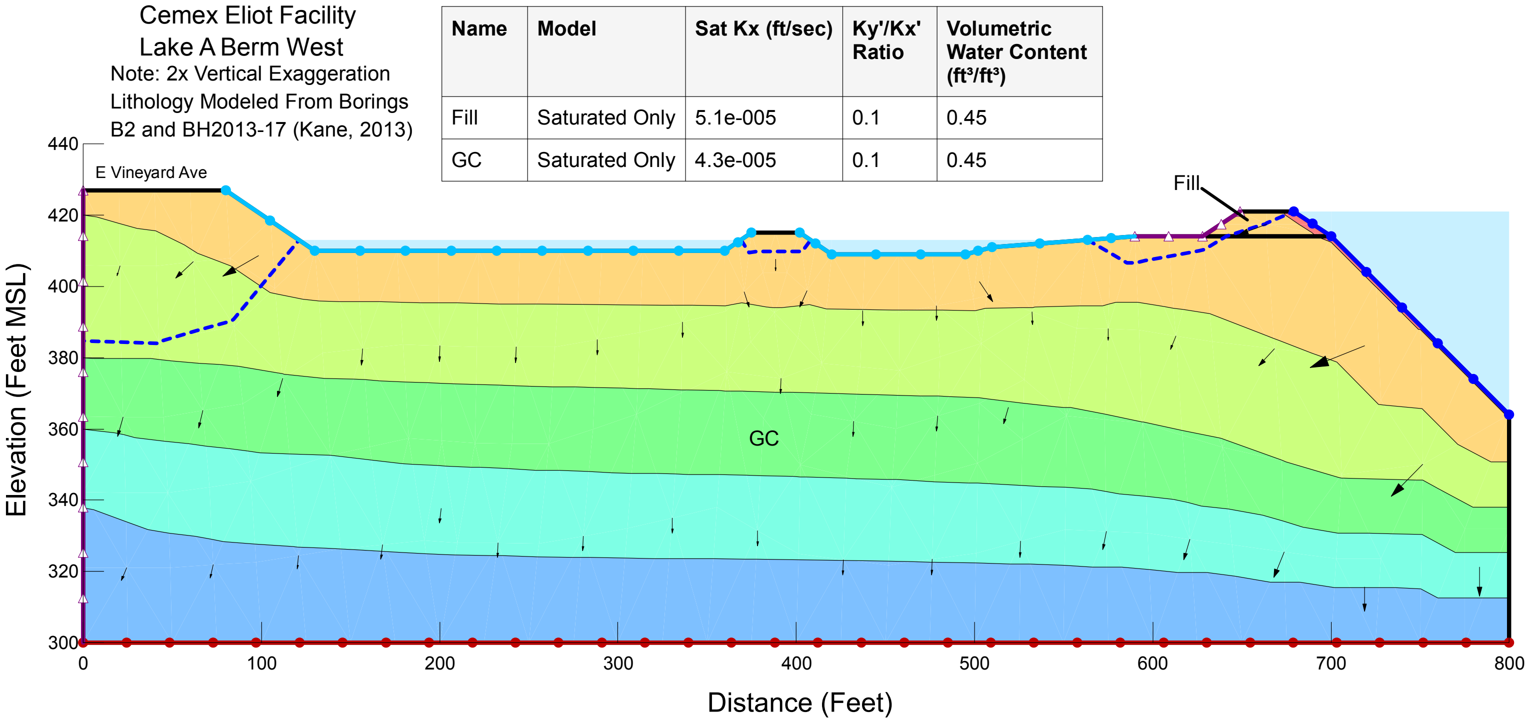
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE C WEST – RECLAIMED CONDITION
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: December 2018

FIGURE F12

APPENDIX G
SEEPAGE ANALYSIS



Cemex Eliot Facility
Lake A Berm West
Note: 2x Vertical Exaggeration
Lithology Modeled From Borings
B2 and BH2013-17 (Kane, 2013)

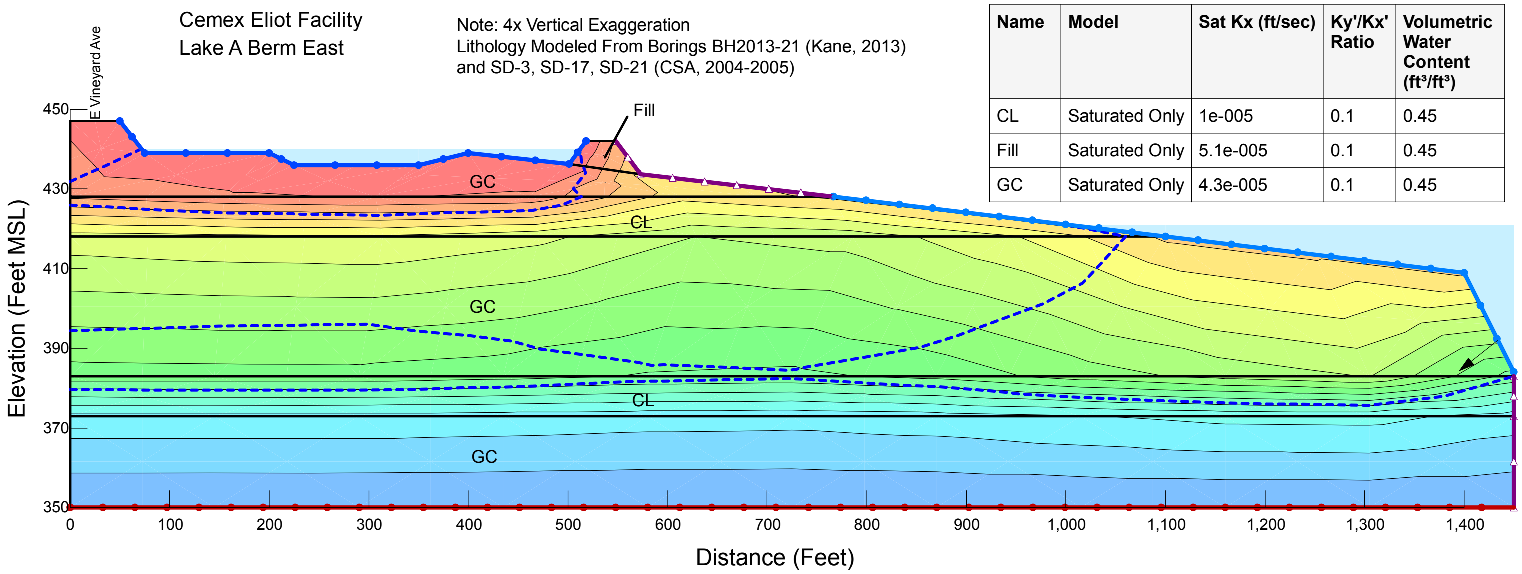
Name	Model	Sat Kx (ft/sec)	Ky'/Kx' Ratio	Volumetric Water Content (ft³/ft³)
Fill	Saturated Only	5.1e-005	0.1	0.45
GC	Saturated Only	4.3e-005	0.1	0.45

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - BERM AT SOUTHWEST CORNER
SEEPAGE ANALYSIS

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE G1



Cemex Eliot Facility
Lake A Berm East

Note: 4x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013)
and SD-3, SD-17, SD-21 (CSA, 2004-2005)

Name	**Model**	**Sat Kx (ft/sec)**	**Ky'/Kx' Ratio**	**Volumetric Water Content (ft³/ft³)**
CL	Saturated Only	1e-005	0.1	0.45
Fill	Saturated Only	5.1e-005	0.1	0.45
GC	Saturated Only	4.3e-005	0.1	0.45

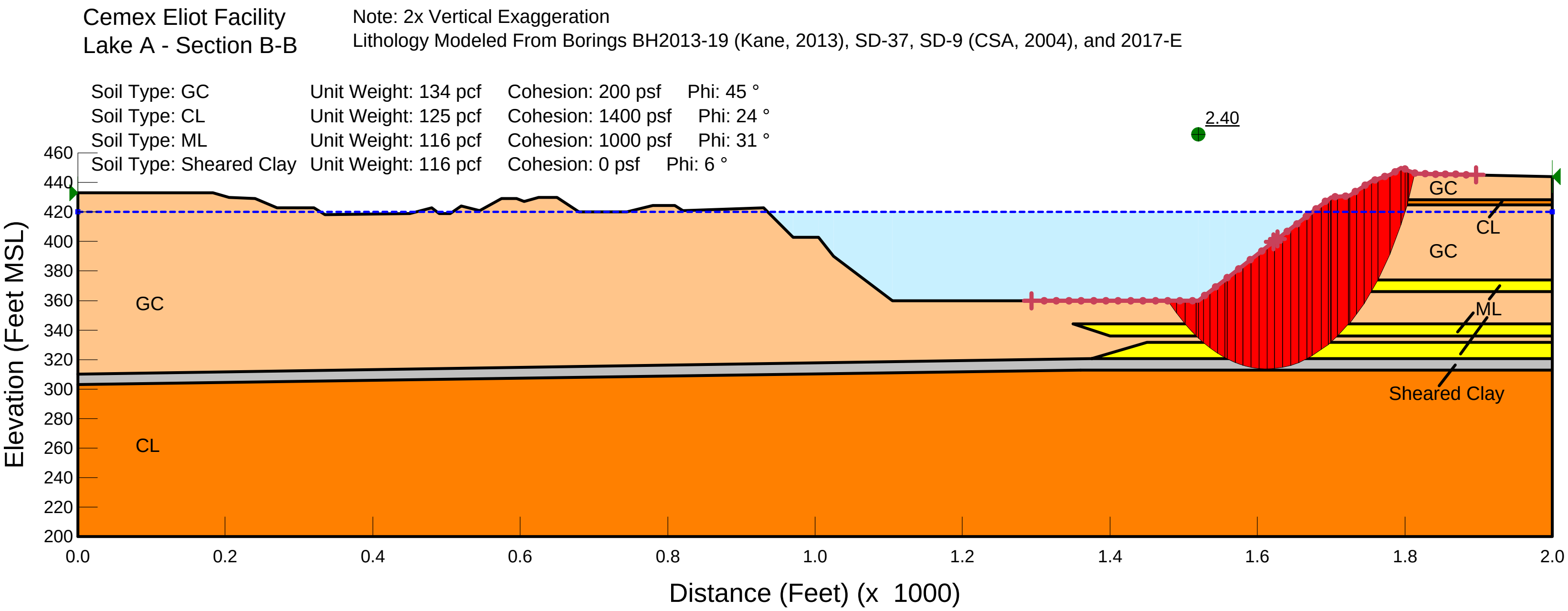
GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

ARROYO DEL VALLE AT SE CORNER LAKE A
SEEPAGE ANALYSIS

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: April 2018

FIGURE G2

APPENDIX H
SLOPE STABILITY ANALYSIS – LAKE A



Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E

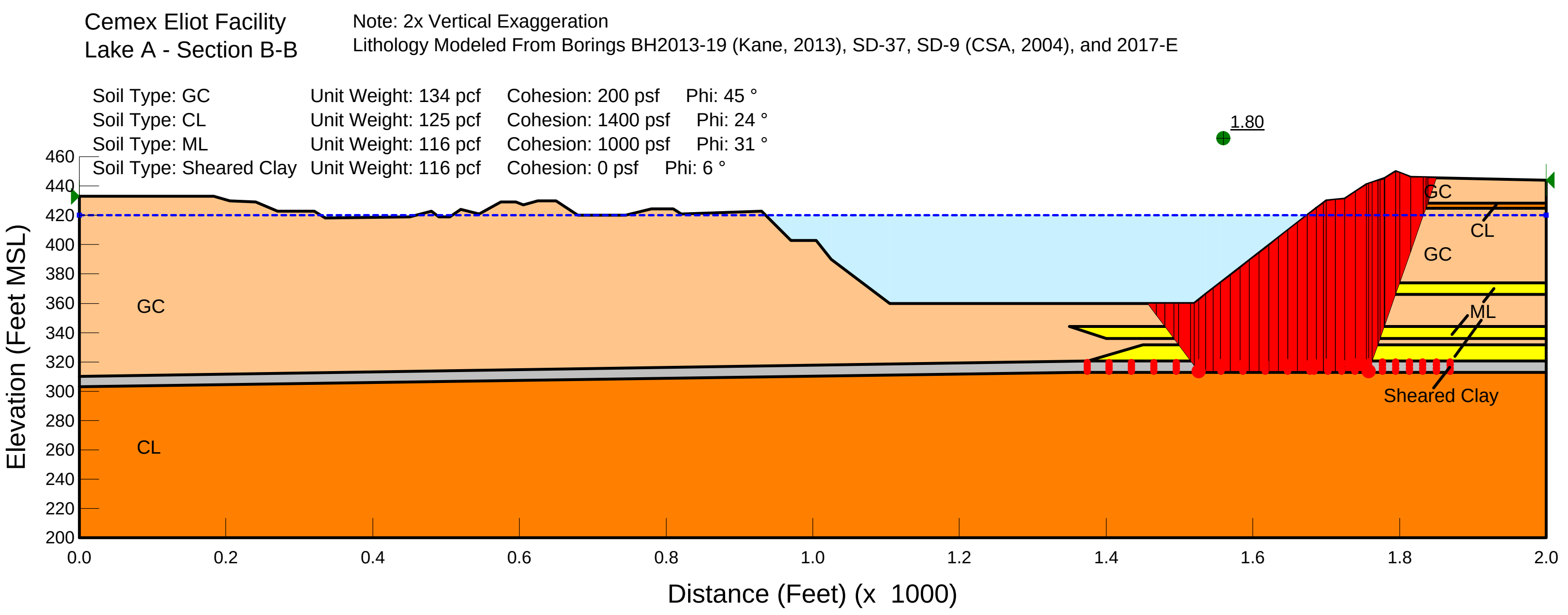
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION B-B' - NORTH SIDE
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H1



Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E

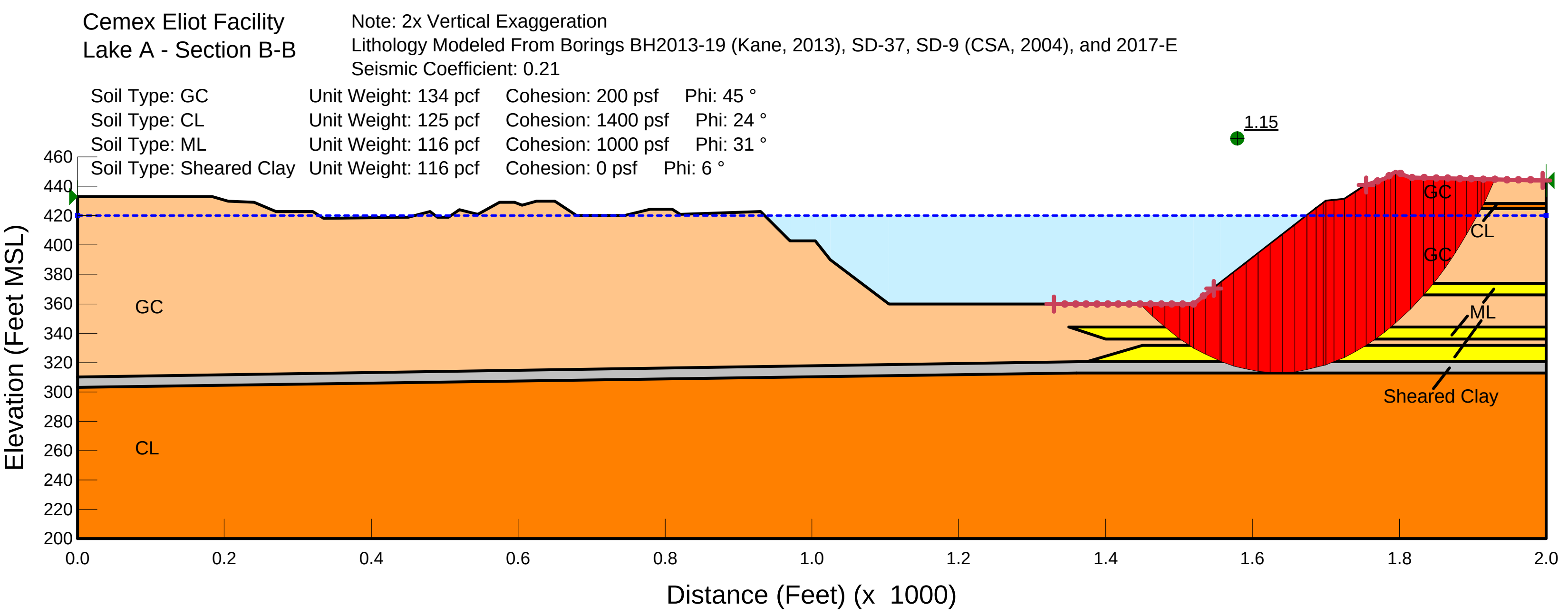
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION B-B' - NORTH SIDE
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H2



Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E
Seismic Coefficient: 0.21

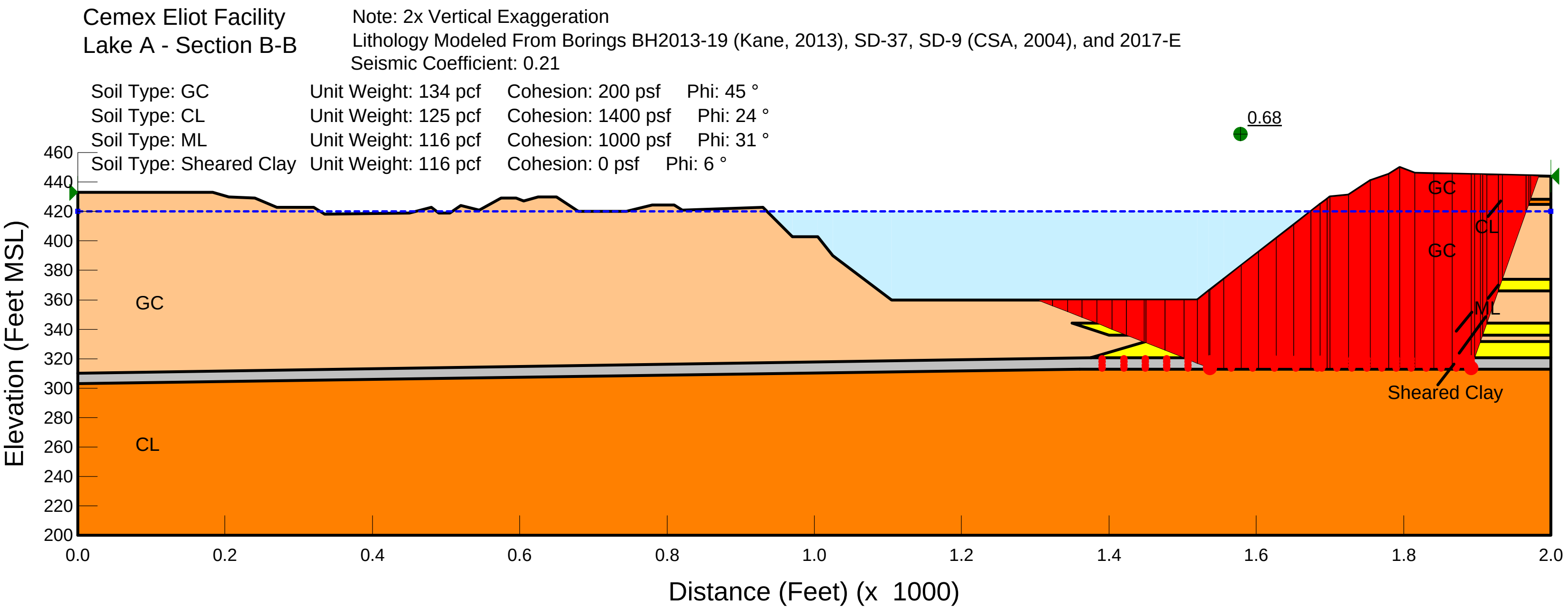
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION B-B' – NORTH SIDE
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H3



Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E
Seismic Coefficient: 0.21

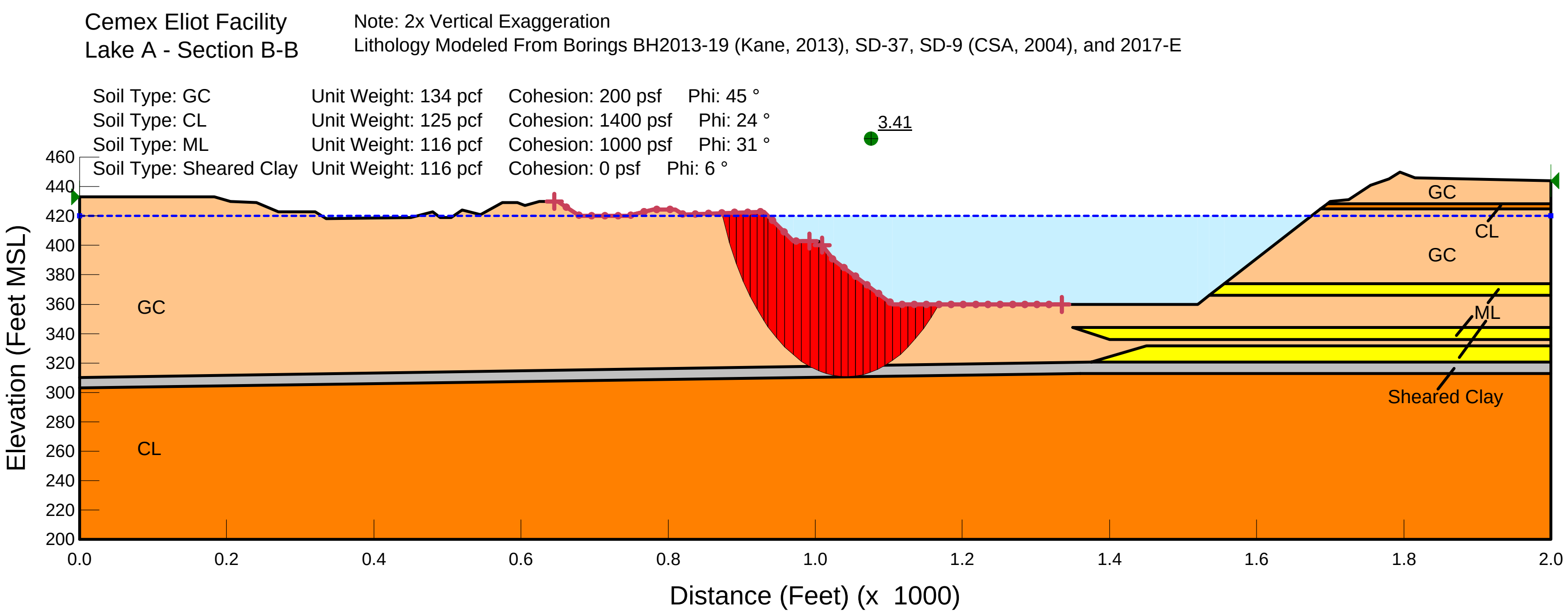
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A - SECTION B-B' - NORTH SIDE
SEISMIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H4



Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E

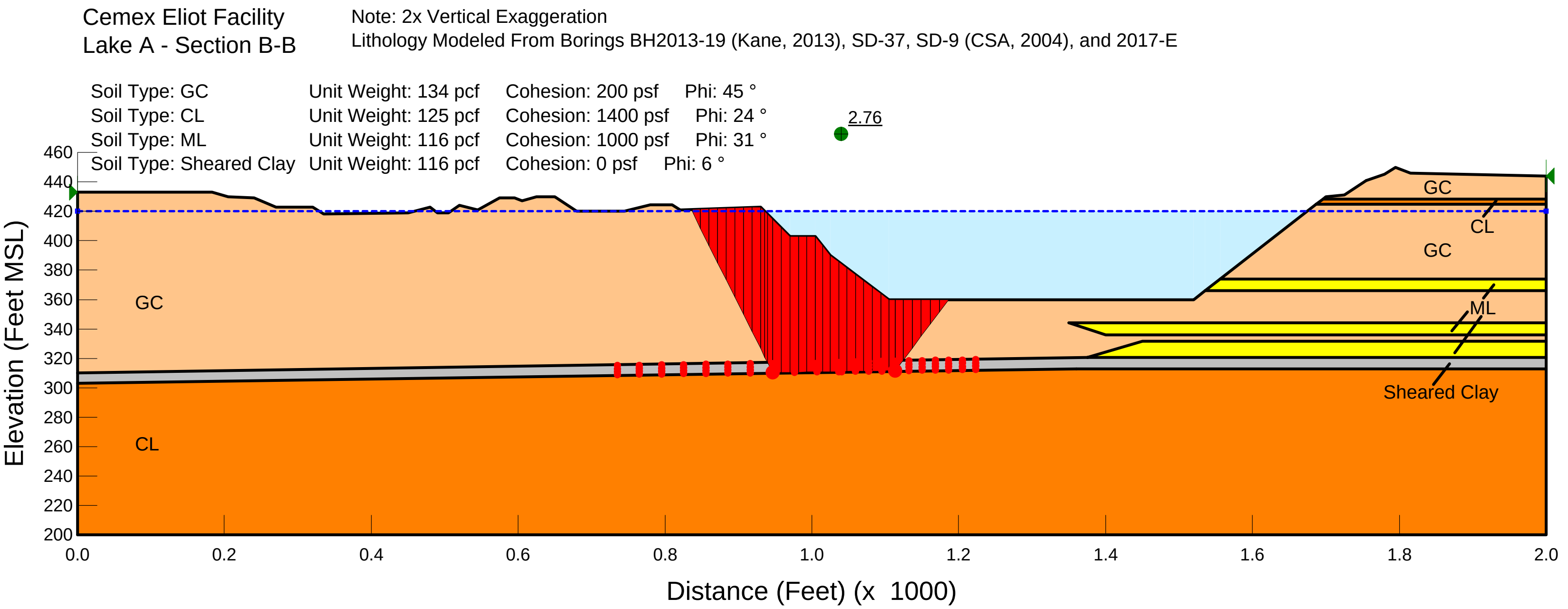
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION B-B' - SOUTH (ADV) SIDE
STATIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H5


Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E

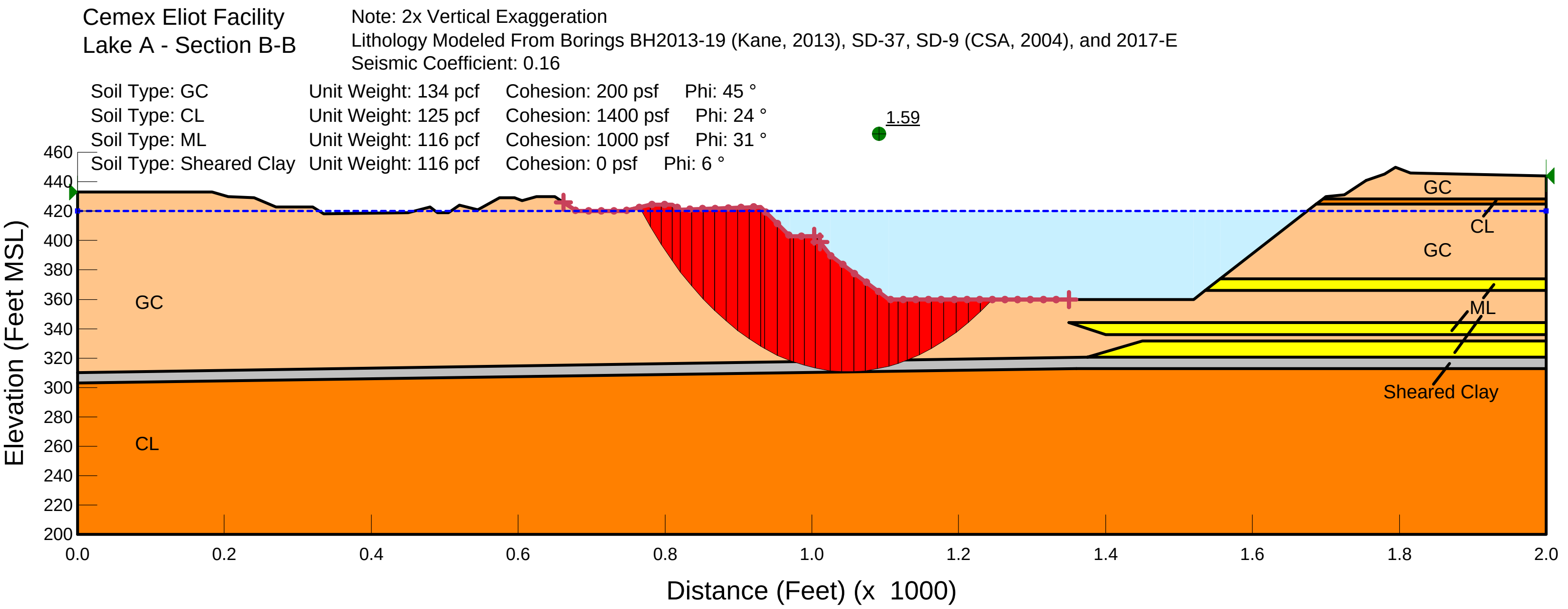
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION B-B' - SOUTH (ADV) SIDE
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H6



Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E
Seismic Coefficient: 0.16

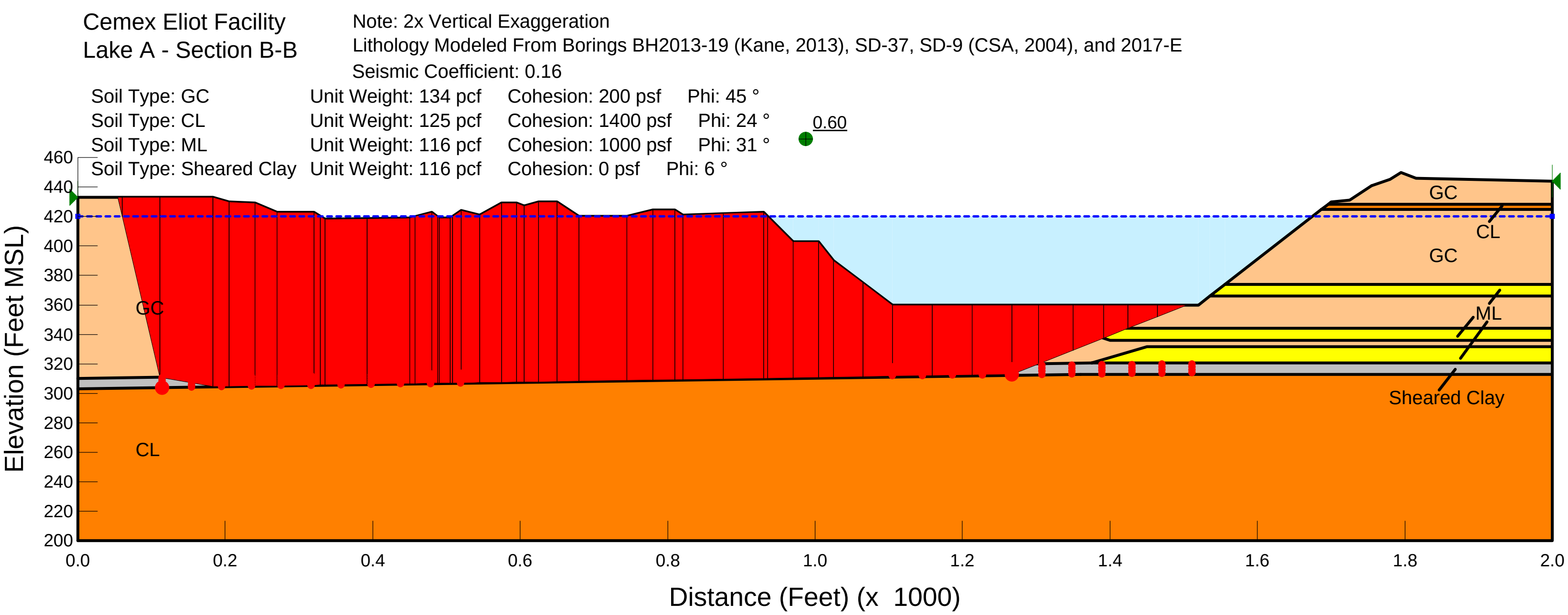
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION B-B' - SOUTH (ADV) SIDE
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H7



Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E
Seismic Coefficient: 0.16

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION B-B' - SOUTH (ADV) SIDE
SEISMIC - BLOCK FAILURE

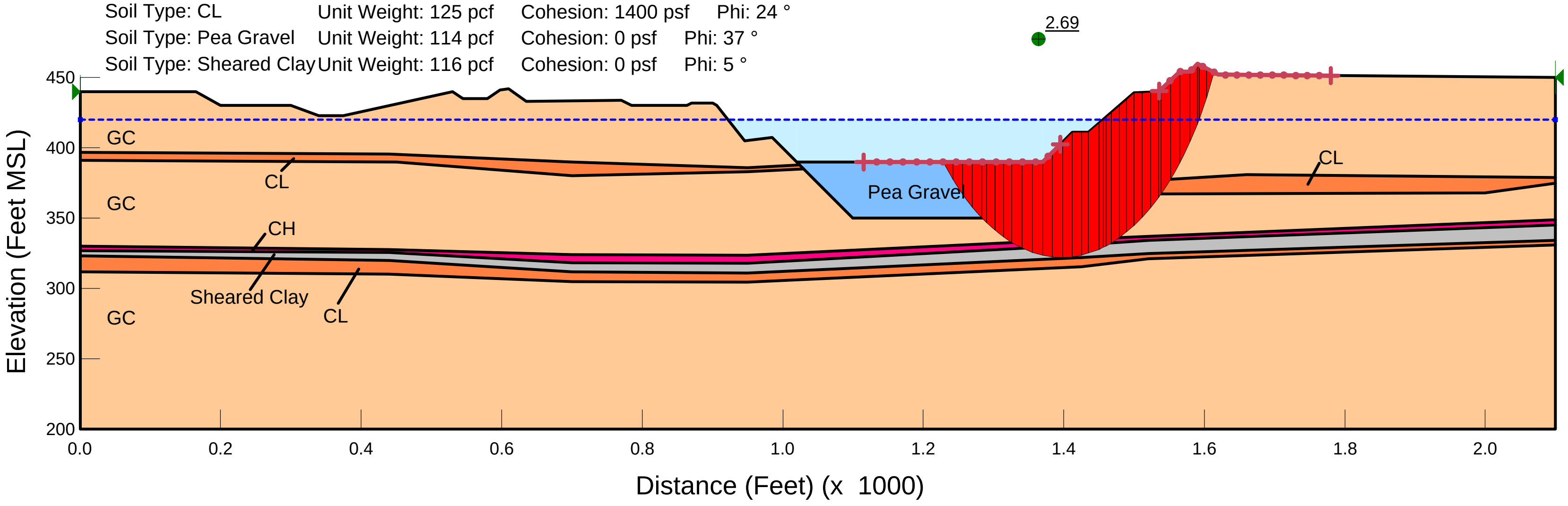
Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H8

Cemex Eliot Facility
Lake A - Section C-C

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-20 (Kane, 2013) and SD-5, SD-12, SD-19, SD-24, SD-35, SD37, LD-1, LD-2 (CSA, 2004-2005)

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

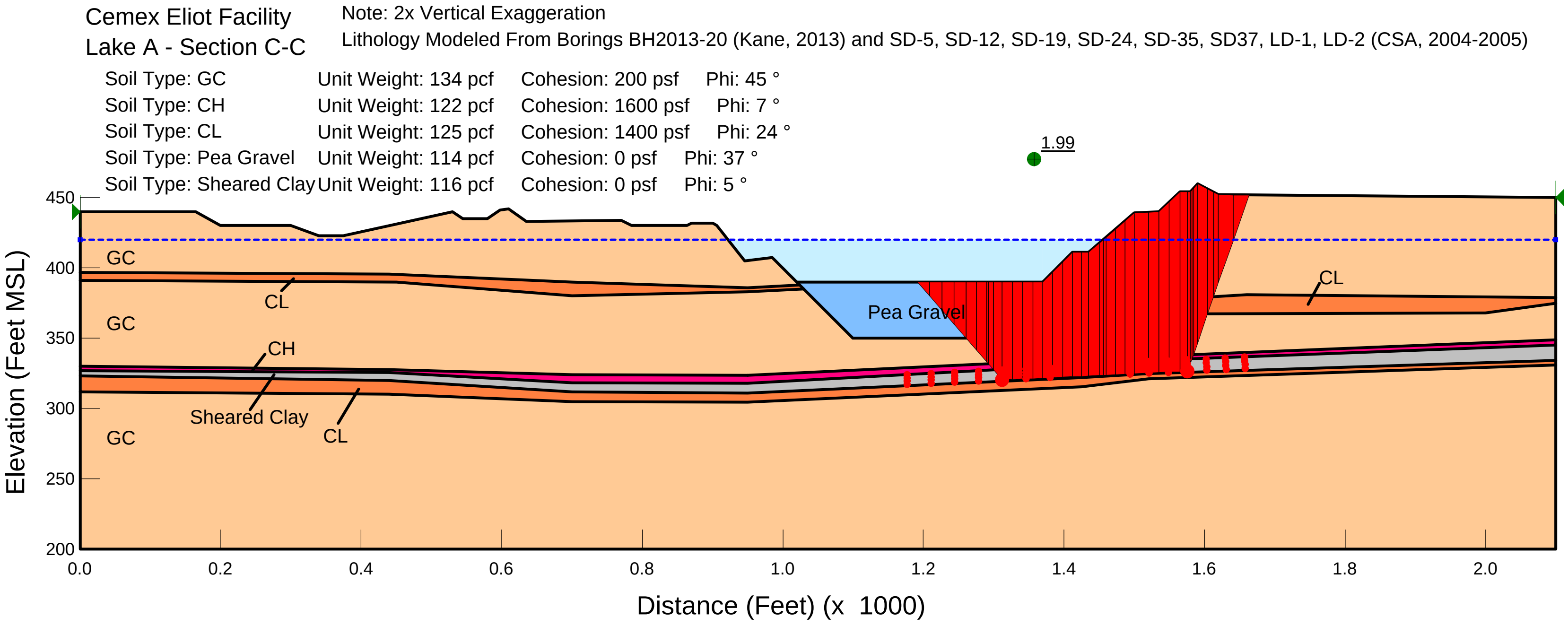


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION C-C' – NORTH SIDE
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H9



Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION C-C' - NORTH SIDE
STATIC - BLOCK FAILURE

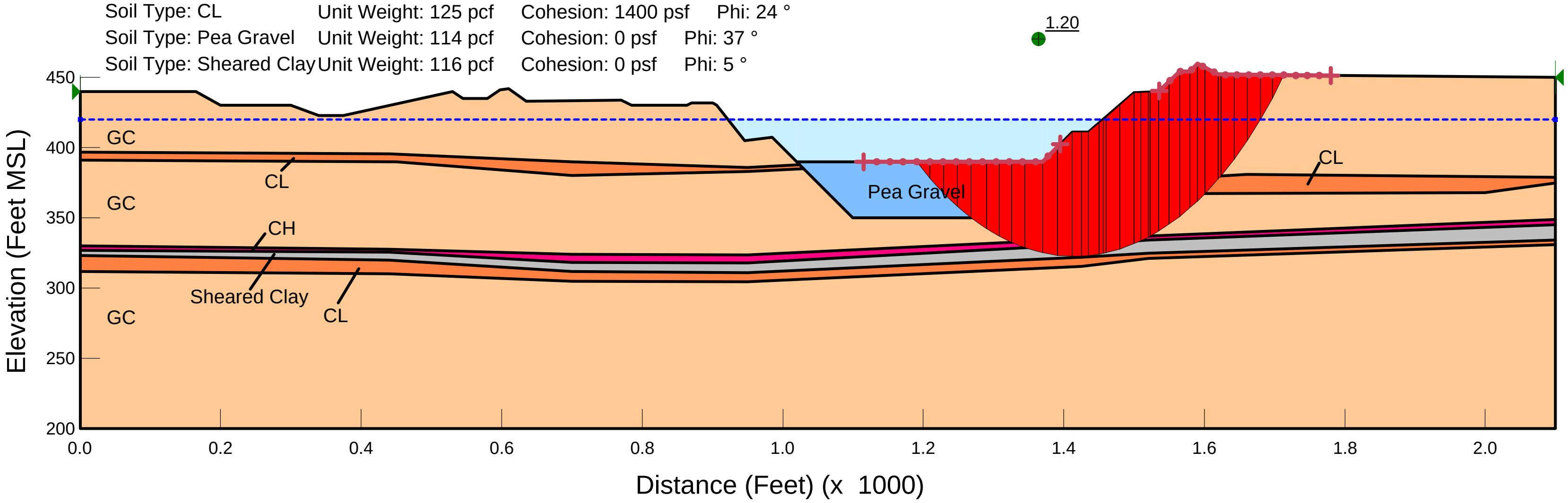
Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H10

Cemex Eliot Facility
Lake A - Section C-C

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-20 (Kane, 2013) and SD-5, SD-12, SD-19, SD-24, SD-35, SD37, LD-1, LD-2 (CSA, 2004-2005)
Seismic Coefficient: 0.21

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

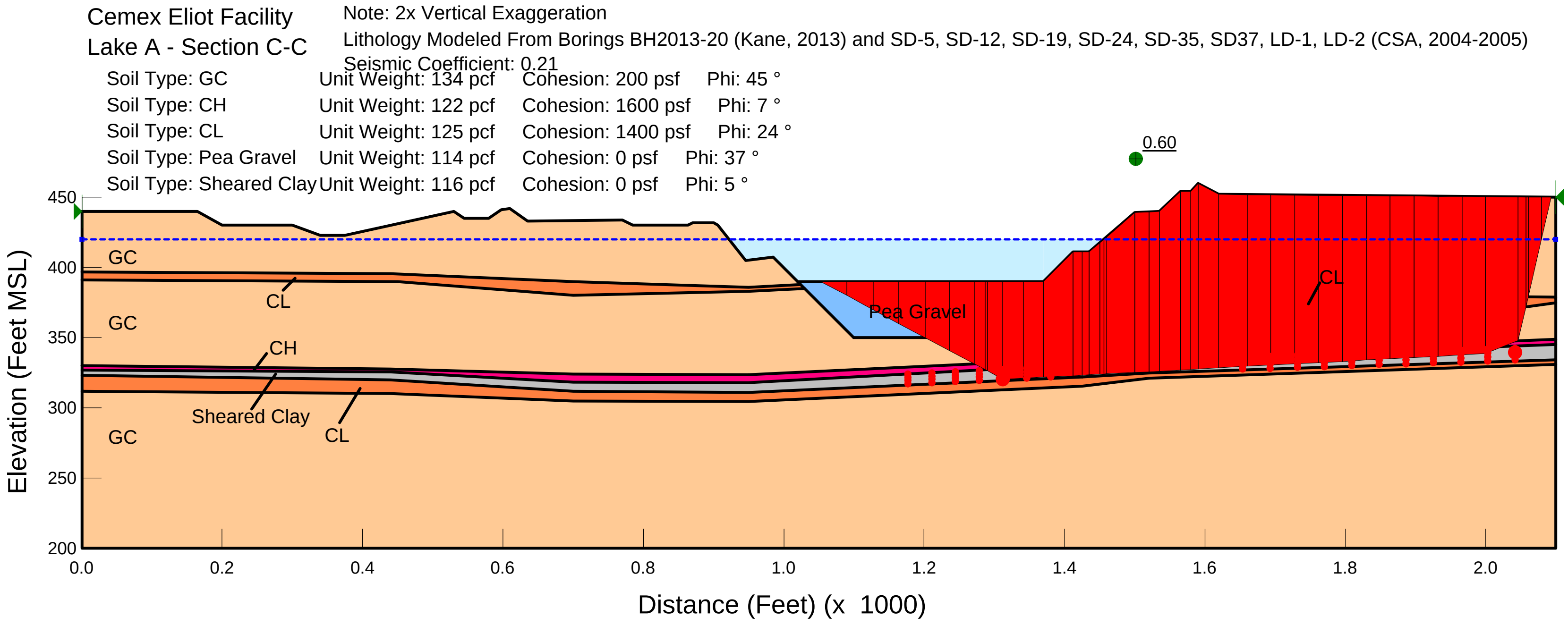


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION C-C' – NORTH SIDE
SEISMIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H11



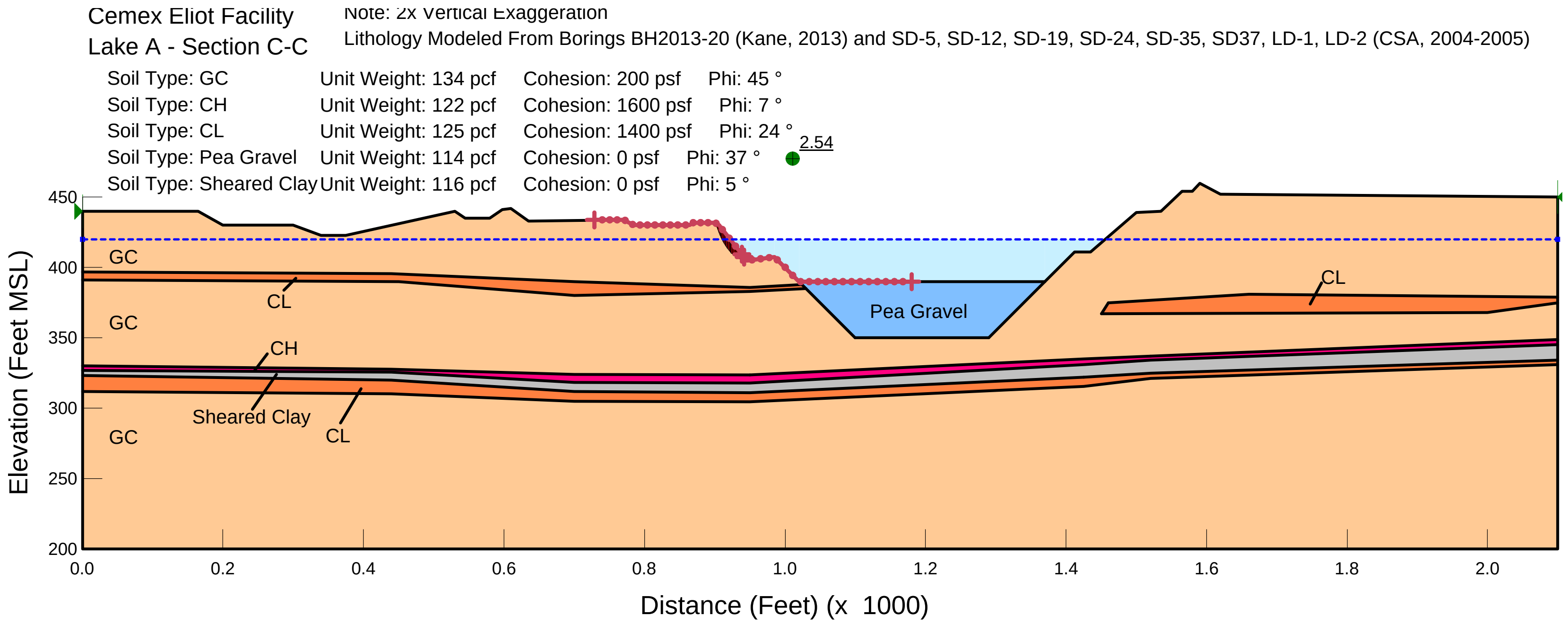
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION C-C' – NORTH SIDE
SEISMIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H12



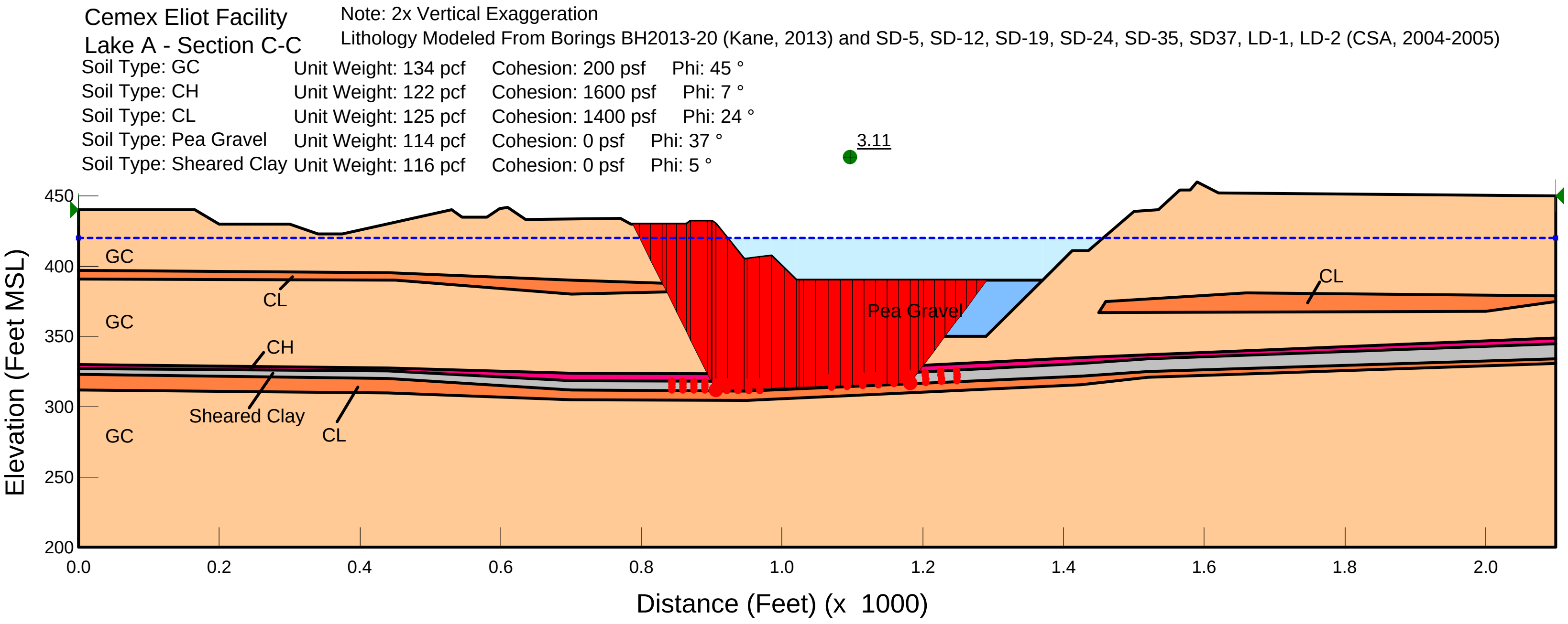
Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION C-C' – SOUTH (ADV) SIDE
STATIC – CIRCULAR FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H13



Cemex Eliot Facility
Lake A - Section C-C

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-20 (Kane, 2013) and SD-5, SD-12, SD-19, SD-24, SD-35, SD37, LD-1, LD-2 (CSA, 2004-2005)

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION C-C' – SOUTH (ADV) SIDE
STATIC – BLOCK FAILURE

Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H14

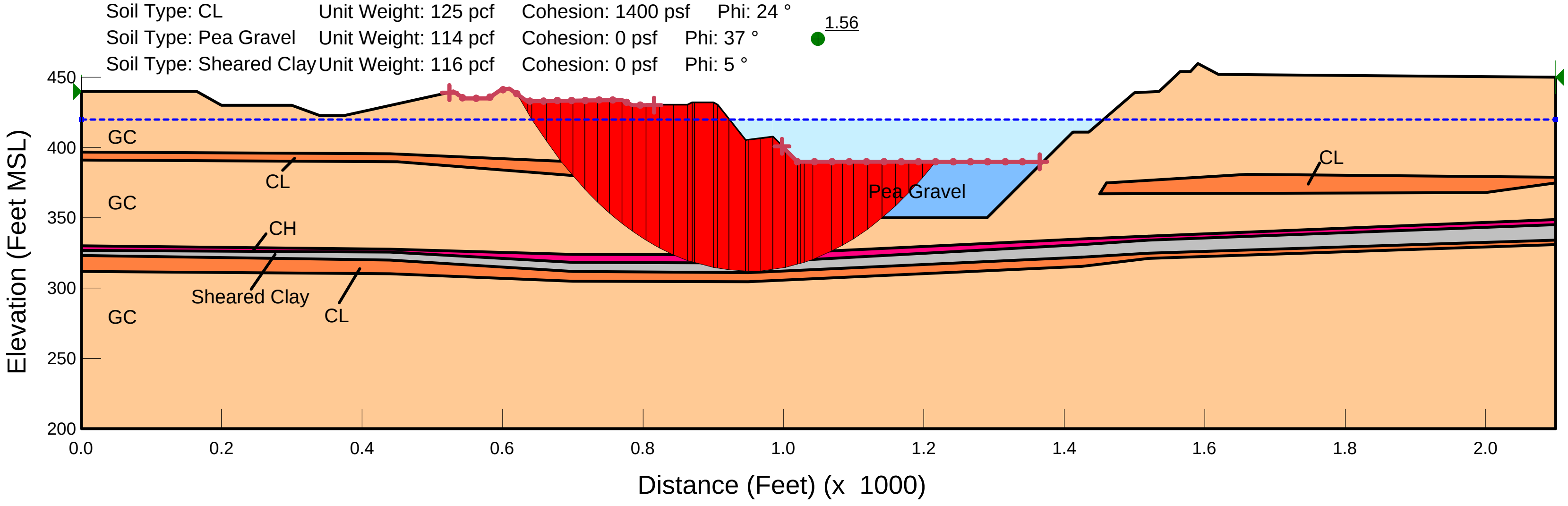
Cemex Eliot Facility
Lake A - Section C-C

Note: 2x Vertical Exaggeration

Lithology Modeled From Borings BH2013-20 (Kane, 2013) and SD-5, SD-12, SD-19, SD-24, SD-35, SD37, LD-1, LD-2 (CSA, 2004-2005)

Seismic Coefficient: 0.16

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

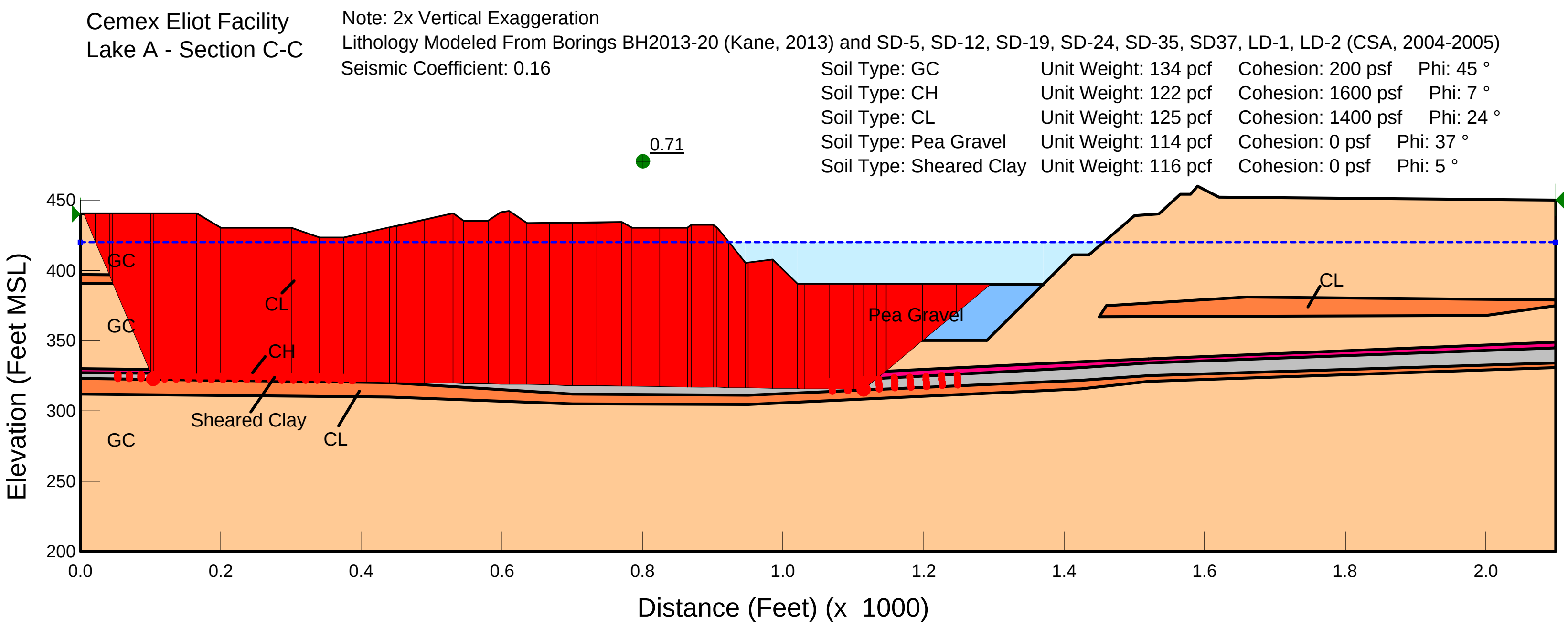


GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION C-C' - SOUTH (ADV) SIDE
SEISMIC - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H15



Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: Pea Gravel	Unit Weight: 114 pcf	Cohesion: 0 psf	Phi: 37 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION C-C' – SOUTH (ADV) SIDE
SEISMIC – BLOCK FAILURE

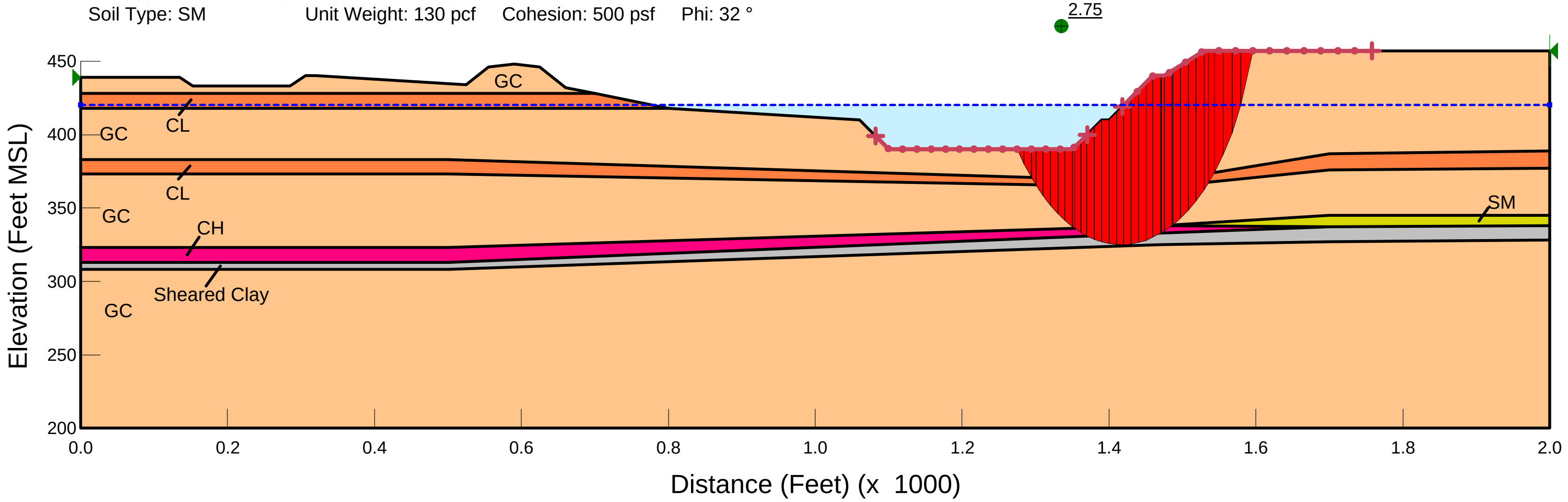
Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H16

Cemex Eliot Facility
Lake A - Section D-D

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION D-D' - NORTH SIDE
STATIC - CIRCULAR FAILURE

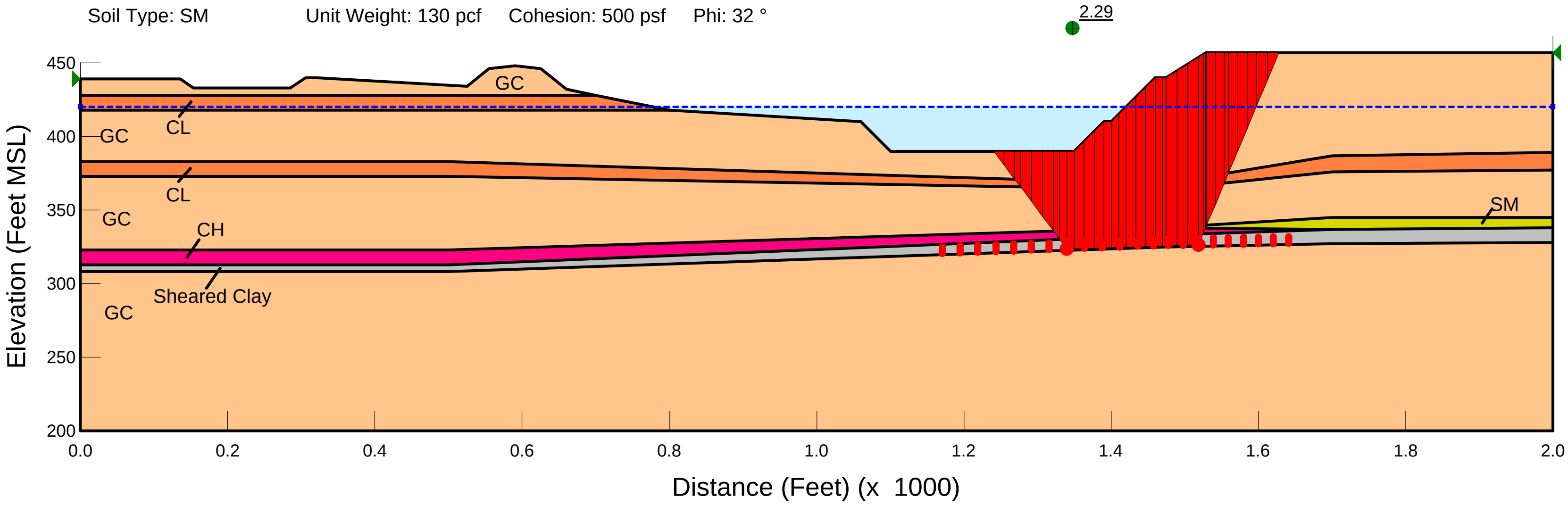
Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H17

Cemex Eliot Facility
Lake A - Section D-D

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION D-D' - NORTH SIDE
STATIC - BLOCK FAILURE

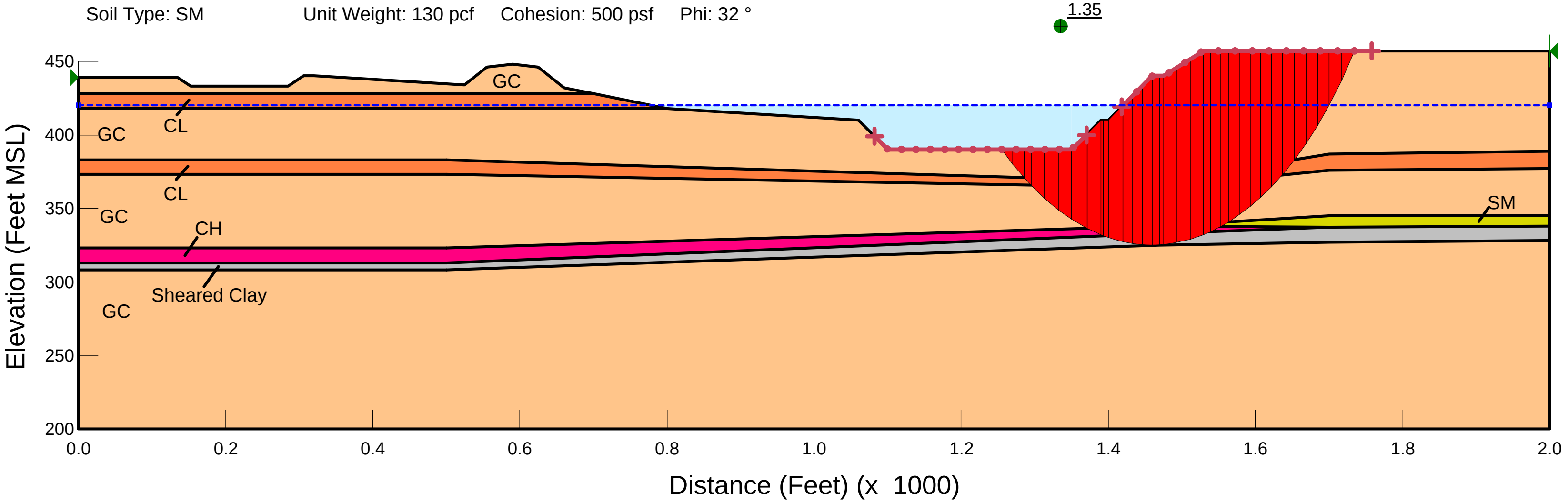
Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H18

Cemex Eliot Facility
Lake A - Section D-D

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)
Seismic Coefficient: 0.21

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A - SECTION D-D' - NORTH SIDE
SEISMIC - CIRCULAR FAILURE

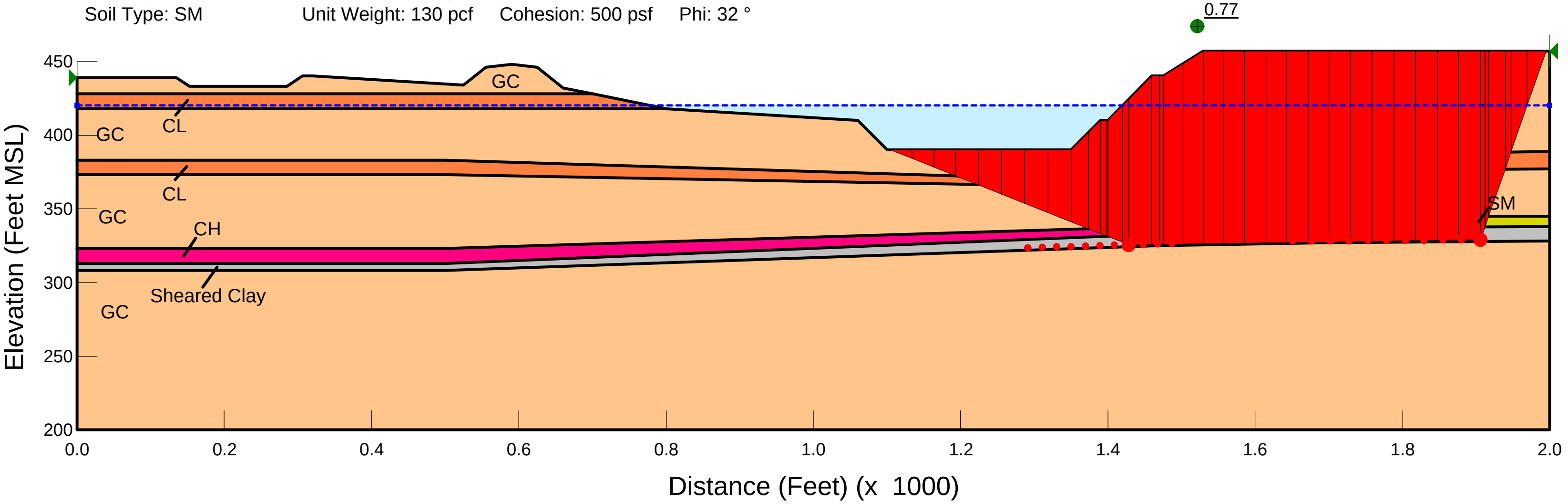
Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H19

Cemex Eliot Facility
Lake A - Section D-D

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)
Seismic Coefficient: 0.21

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION D-D' – NORTH SIDE
SEISMIC – BLOCK FAILURE

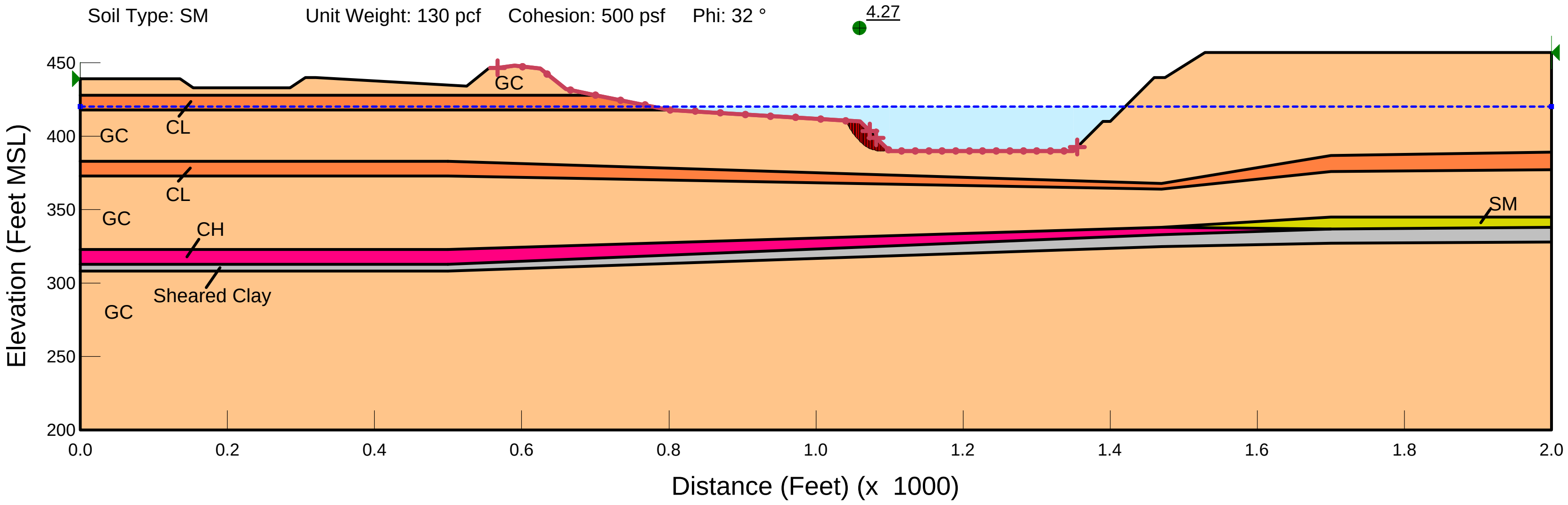
Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H20

Cemex Eliot Facility
Lake A - Section D-D

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION D-D' – SOUTH (ADV) SIDE
STATIC – CIRCULAR FAILURE

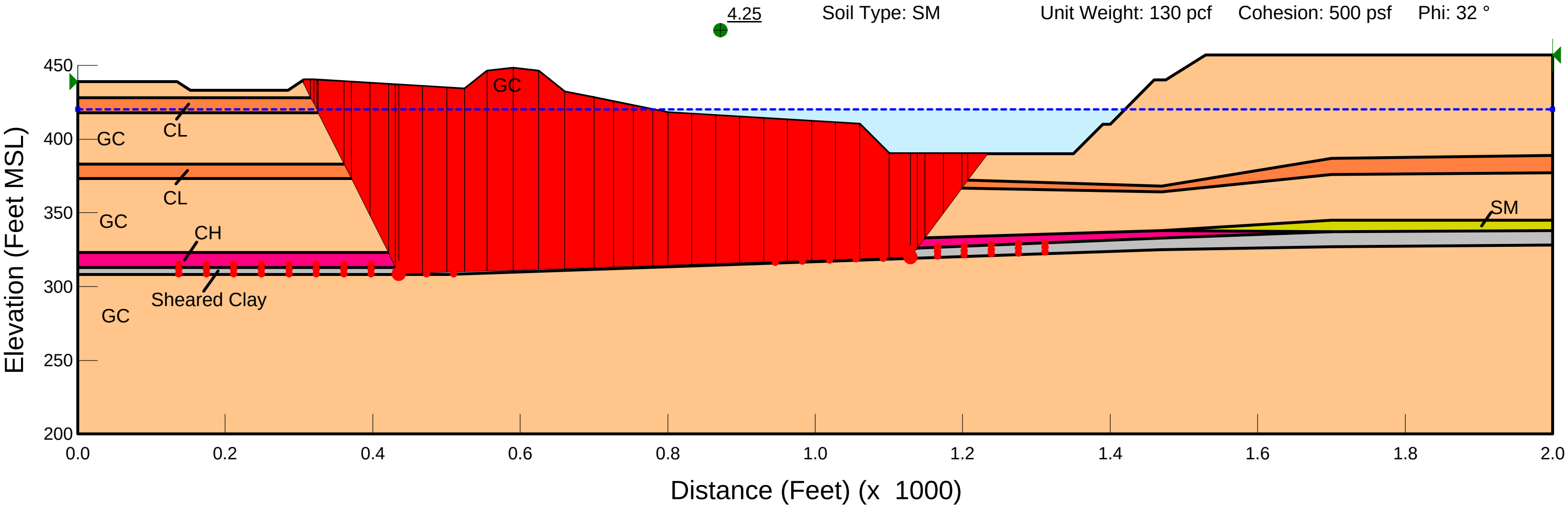
Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H21

Cemex Eliot Facility
Lake A - Section D-D

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION D-D' - SOUTH (ADV) SIDE
STATIC - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H22

Cemex Eliot Facility

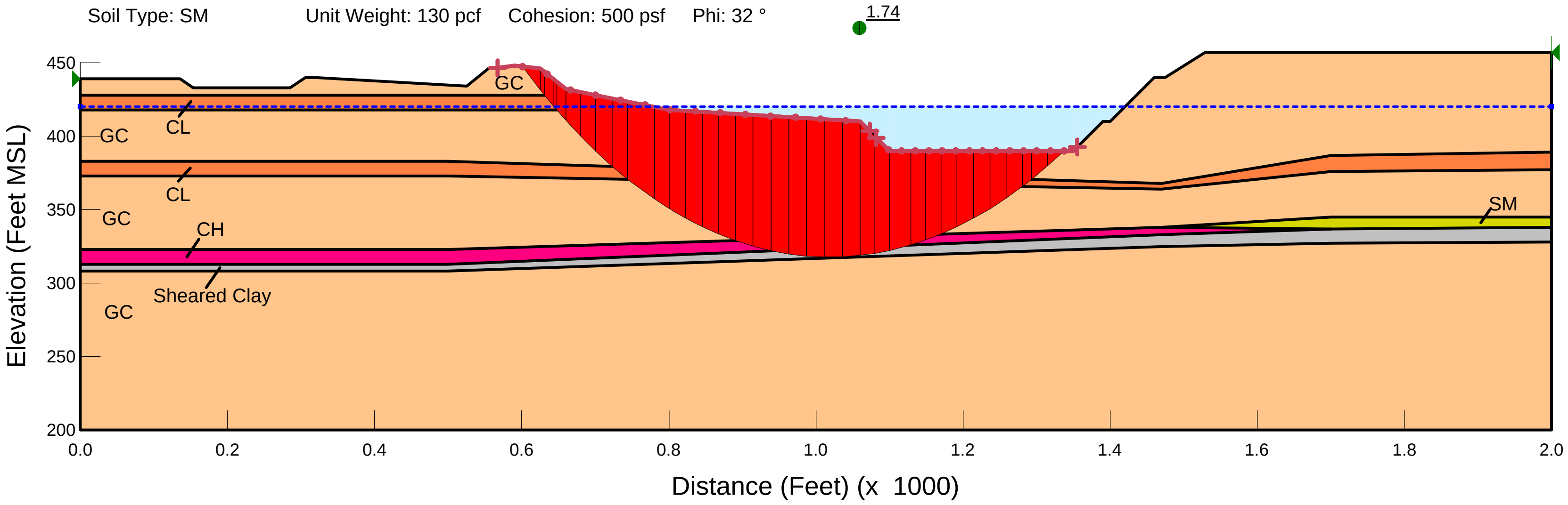
Lake A - Section D-D

Note: 2x Vertical Exaggeration

Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)

Seismic Coefficient: 0.16

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A – SECTION D-D' – SOUTH (ADV) SIDE
SEISMIC – CIRCULAR FAILURE

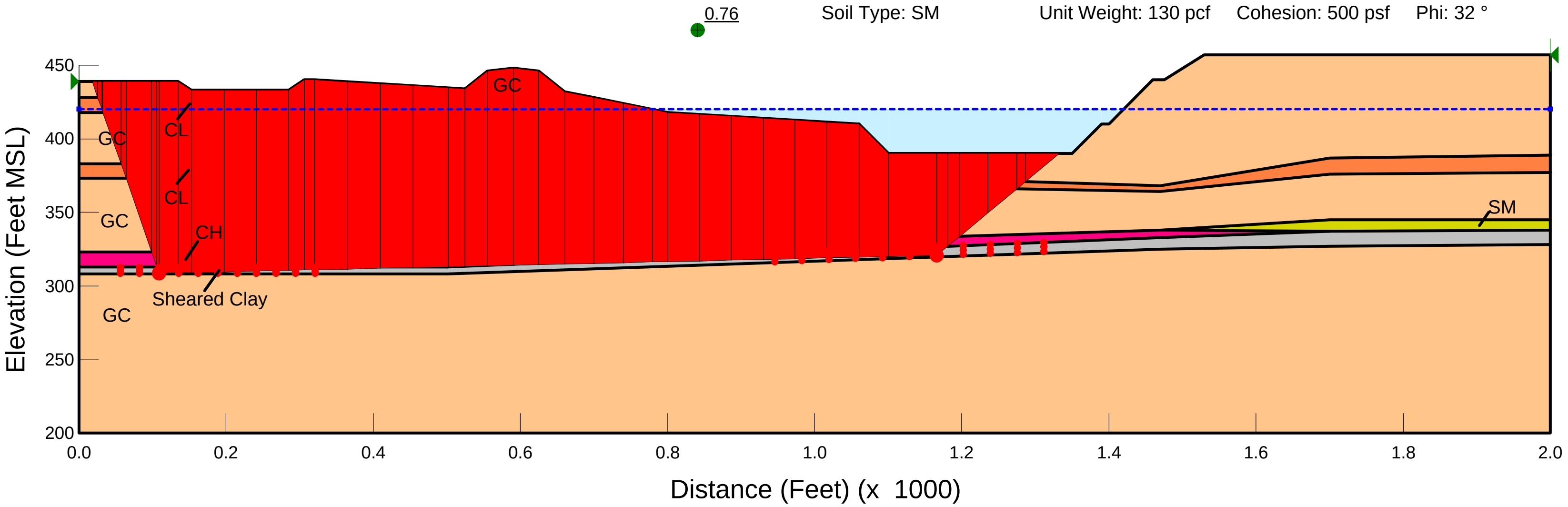
Project: Cemex Eliot – SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H23

Cemex Eliot Facility
Lake A - Section D-D

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-21 (Kane, 2013) and SD-3, SD-17, SD-21 (CSA, 2004-2005)
Seismic Coefficient: 0.16

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: CH	Unit Weight: 122 pcf	Cohesion: 1600 psf	Phi: 7 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 5 °
Soil Type: SM	Unit Weight: 130 pcf	Cohesion: 500 psf	Phi: 32 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

LAKE A - SECTION D-D' - SOUTH (ADV) SIDE
SEISMIC - BLOCK FAILURE

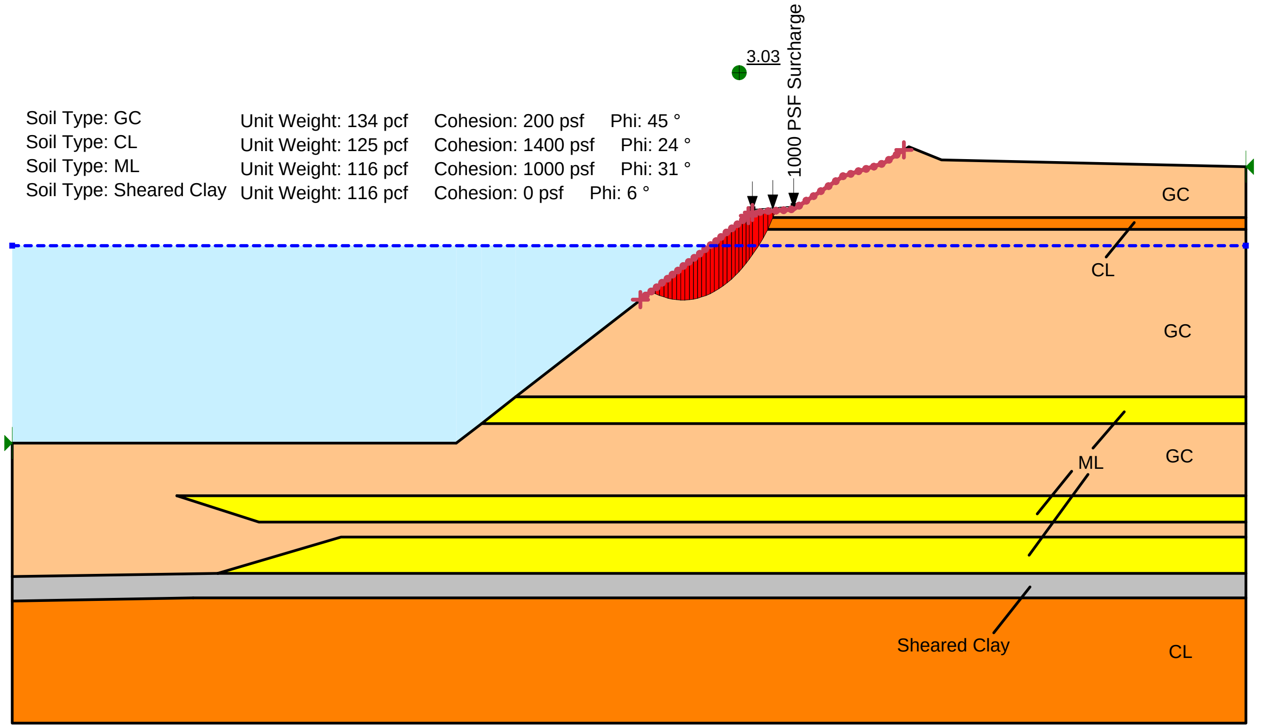
Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H24

Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E

Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °



GEOCON
CONSULTANTS, INC.
6671 BRISA STREET - LIVERMORE, CA 94550
PHONE 925.371.5900 - FAX 925.371.5915

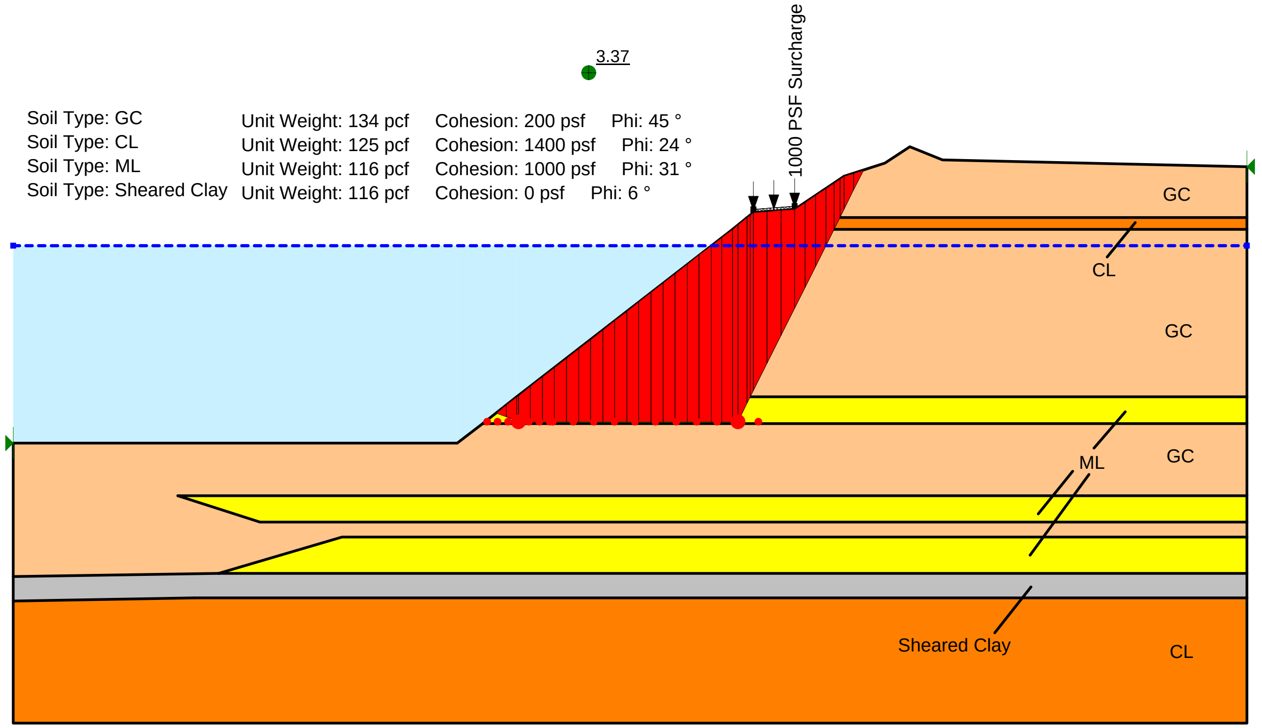
LAKE A - SECTION B-B' - NORTH SIDE
EQUIPMENT LOADING - CIRCULAR FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H25

Cemex Eliot Facility
Lake A - Section B-B

Note: 2x Vertical Exaggeration
Lithology Modeled From Borings BH2013-19 (Kane, 2013), SD-37, SD-9 (CSA, 2004), and 2017-E



Soil Type: GC	Unit Weight: 134 pcf	Cohesion: 200 psf	Phi: 45 °
Soil Type: CL	Unit Weight: 125 pcf	Cohesion: 1400 psf	Phi: 24 °
Soil Type: ML	Unit Weight: 116 pcf	Cohesion: 1000 psf	Phi: 31 °
Soil Type: Sheared Clay	Unit Weight: 116 pcf	Cohesion: 0 psf	Phi: 6 °

GEOCON
CONSULTANTS, INC.
6671 BRISA STREET – LIVERMORE, CA 94550
PHONE 925.371.5900 – FAX 925.371.5915

LAKE A - SECTION B-B' - NORTH SIDE
EQUIPMENT LOADING - BLOCK FAILURE

Project: Cemex Eliot - SMP 23 Reclamation
Location: 1544 Stanley Boulevard
Project No. E9029-04-01
Date: July 2018

FIGURE H26

APPENDIX I

SELECTED BORING LOGS AND LABORATORY TEST RESULTS FROM PREVIOUS AND CURRENT STUDIES BY OTHERS

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-01

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/12/13 **COMPLETED** 4/14/13

GROUND ELEVATION 416 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

∇ **AT TIME OF DRILLING** 230.00 ft / Elev 186.00 ft

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250	410 400 390 380 370 360 350 340 330 320 310 300 290 280 270 260 250 240 230 220 210 200 190 180 170											GC	Gravel, 0.25" to 4" rounded, sand, and sticky tan clay ∇
260 270	160 150	SS 1	100	1-8-18 (26)	1.33							CL	Brown, sticky clay
280	140	SS 2	100	1-2-2 (4)	4.5+	90.3 90	32.1 32.2	58.4 68.3	29 28.9	29 39		CH	Blue Clay, sticky, moist. Sample 1 Unconfined Compressive Strength: 10,076 psf Sample 2 Unconfined Compressive Strength: 7,629 psf

Refusal at 275.0 feet.
Bottom of borehole at 280.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

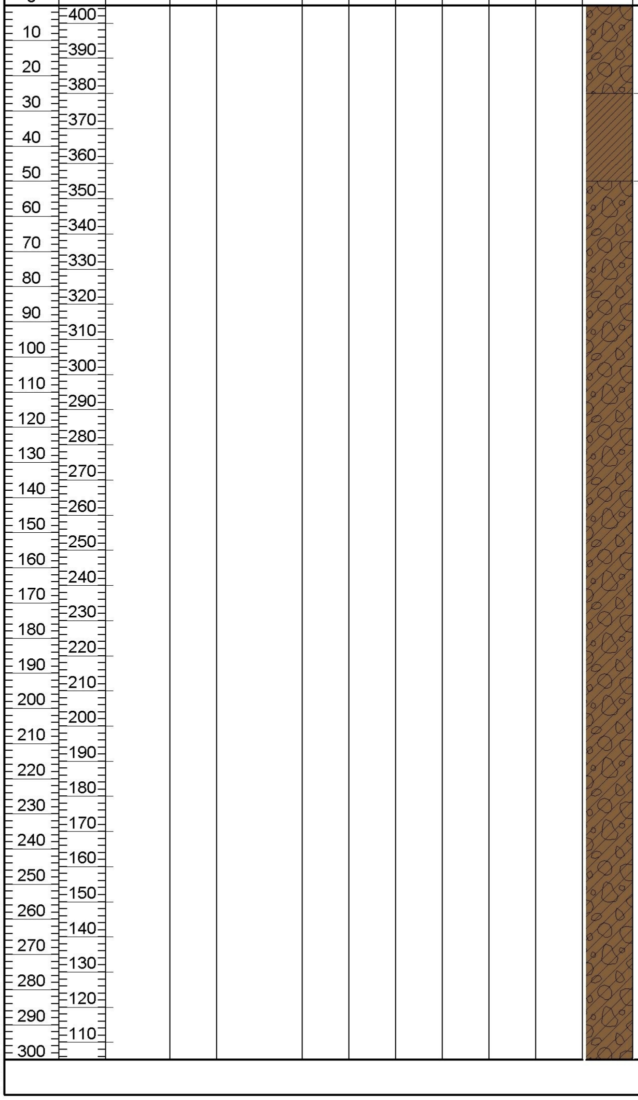
KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-02

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/6/13 **COMPLETED** 4/6/13
GROUND ELEVATION 405 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 118.00 ft / Elev 287.00 ft
LOGGED BY SPB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---



DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0												GC	Gravel, sand, and brown clay
												CL	Brown Clay
												GC	Gravel, sand, and brown clay ▽

Bottom of borehole at 300.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-03

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/8/13 **COMPLETED** 4/8/13
GROUND ELEVATION 401 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
AT TIME OF DRILLING ---
LOGGED BY TJB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	400											GC	Gravel, sand, and clay, brown, dry to moist.
		SS 1	100	1-1-2 (3)	2.81							CL	Clay and gravel, light brown, moist.
												GW	Gravel and sand, light grey, wet

Bottom of borehole at 295.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-04

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/10/13 **COMPLETED** 4/10/13

GROUND ELEVATION 397 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

∇ **AT TIME OF DRILLING** 83.00 ft / Elev 314.00 ft

LOGGED BY TJB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0													
10	390												Gravel, well rounded, up to 4", sand and clay, light brown, dry to moist
20	380												
30	370												
40	360											GC	
50	350												
60	340												
70	330												
80	320												∇
90	310												Clay, sandy clay, and gravel layers, light brown, moist
100	300	SS 1	0	6-9-15 (24)									
110	290	SS 2	100	7-7-9 (16)	1.83			28.8	16.8	12		CL	
120	280												
130	270	SS 3	100	5-6-8 (14)	3.11								Gravel, sand, and clay. Light brown. Gravel well rounded, up to 4" in diameter
140	260												
150	250												
160	240												
170	230												
180	220											GC	
190	210												
200	200												
210	190												
220	180												
230	170											CL	Clay, light brown
240	160												Gravel, sand, and clay, light brown, wet. Gravel up to 4" in diamter, well rounded
250	150												
260	140												
270	130											GC	
280	120												
290	110												

Bottom of borehole at 295.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-05

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/13/13 **COMPLETED** 4/15/13
GROUND ELEVATION 378 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
∇ **AT TIME OF DRILLING** 55.00 ft / Elev 323.00 ft
LOGGED BY JFR **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0											░	GC	Gravel, 0.5" to 2", rounded. Sand and tan clay ∇
											▨	CL	Clay. Brown with some gravel.
		SS 1	0	18							░	GC	Gravel, up to 3" diameter, sand, tan clay
											▨	CL	Brown clay, coarse sand
		SS 2	94	11-17-13 (30)	3.19						░	GC	Gravel, up to 2" diameter, coarse sand
		GB 3									▨	CL	Brown clay
											░	GC	Gravel, up to 2" diameter, sand, tan clay
		GB 4									▨	CL	Brown clay
											░	GC	Gravel, up to 2" diameter, sand, tan clay

DEPTH (ft): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280

Elevation (ft): 370, 360, 350, 340, 330, 320, 310, 300, 290, 280, 270, 260, 250, 240, 230, 220, 210, 200, 190, 180, 170, 160, 150, 140, 130, 120, 110, 100

Bottom of borehole at 280.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-06

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/12/13 **COMPLETED** 4/12/13

GROUND ELEVATION 380 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

AT TIME OF DRILLING ---

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	380												Brown sand, gravel, and clay
10	370												
20	360												
30	350												
40	340												
50	330												
60	320												
70	310											GC	
80	300												
90	290												
100	280												
110	270												
120	260												
130	250												
140	240	SS 1	100	6-14-19 (33)	3.36							CL	Brown clay, moist, sticky
150	230											GC	Gravel
160	220											CL	Brown clay, sticky, moist
170	210												
180	200												Gravel, sand, and clay
190	190												
200	180											GC	
210	170												
220	160												
230	150											CL	Clay, brown
240	140												Gravel, sand, and clay
250	130												
260	120											GC	
270	110												
280	100												

Bottom of borehole at 280.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-07

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/6/13 **COMPLETED** 4/8/13
GROUND ELEVATION 392 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 65.00 ft / Elev 327.00 ft
LOGGED BY JFR **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	390												Gravel, up to 3" diameter, sand, and tan clay
10	380												
20	370												
30	360												
40	350												
50	340											GC	
60	330												▽
70	320												
80	310												
90	300	SS 1	0	27								CL	Brown clay, some gravel
100	290											GC	Gravel, up to 3" diameter, sand, tan clay
110	280												
120	270	SS 2	100	6-12-24 (36)	3.13							CL	Brown clay
130	260												Gravel, sand, and clay, light brown, up to 4" diameter clasts
140	250											GC	
150	240												
160	230												
170	220											GC	Clayey gravel/gravel and clay layers
180	210												Gravel, sand, and clay, light brown
190	200												
200	190												
210	180												
220	170											GC	
230	160												
240	150												
250	140												
260	130												
270	120											GC	Gravel and clay, light brown
280	110												Gravel, sand, and clay, light brown
290	100											GC	
300													

Bottom of borehole at 300.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-08

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/4/13 **COMPLETED** 4/5/13
GROUND ELEVATION 401 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
∇ **AT TIME OF DRILLING** 70.00 ft / Elev 331.00 ft
LOGGED BY JFR **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	400											GC	Gravel, rounded, up to 4" diameter, sand, brown clay
70	330												∇
160	240											GC	Gravel, rounded, up to 2" diameter, sand, tan clay
300	100												Bottom of borehole at 300.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-09

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/2/13 **COMPLETED** 4/3/13
GROUND ELEVATION 300 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
∇ **AT TIME OF DRILLING** 49.40 ft / Elev 250.60 ft
LOGGED BY SPB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	300											GC	Gravel
10	290	SS 1	100	20	2.81						▨	CL	Clay, brown, moist
20	280	SS 2	100	21-72-35 (107)	2.67						▨		
30	270											GC	Gravel, sub-angular, sand, brown clay
50	250												∇
70	230	GB 3									▨	CL	Clay, brown, moist
80	220											GC	Gravel, sub-angular to round, sand, brown clay
100	200	GB 4											
200	100												

Bottom of borehole at 200.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-10 A

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/14/13 **COMPLETED** 4/14/13

GROUND ELEVATION 304 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

▽ **AT TIME OF DRILLING** 2.00 ft / Elev 302.00 ft

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0											▨	GW	▽ Gravel
	300												
		SS 1	89	19-34-103 (137)	4.29						▨	CL	Clay- brown, sticky, moist
10											▨	GC	Gravel, sticky brown clay, sand
	290										▨	CL	Clay- brown, sticky, moist
		SS 2	67	37-82	4.38								
20													
		SS 3	100	26-47-57 (104)	2.75								
											▨	GC	Gravel, sand, and clay-brown, sticky, moist
	280												
30													
	270												
40													
	260												
50													

Bottom of borehole at 50.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-10 B

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/14/13 **COMPLETED** 4/14/13

GROUND ELEVATION 304 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

▽ **AT TIME OF DRILLING** 4.70 ft / Elev 299.30 ft

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0												GW	Gravel
	300												
		SS 1	0	34-72								CL	▽ Clay- brown, sticky, moist. Unconfined Compressive Strength: 5,111 psf
10		SS 2	94	24-20-98 (118)	2.92	106.8	21.4	34.1	19.3	15			
	290												
												GC	Gravel, tan clay, sand.
20													
	280												
30													
	270												
40													
	260												
50													

Bottom of borehole at 50.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE
GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-11

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/5/13 **COMPLETED** 4/5/13
GROUND ELEVATION 320 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 6.50 ft / Elev 313.50 ft
LOGGED BY SPB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	320											GC	▽ Gravel, sand, and clay- brown, moist and sticky
10	310												
20	300											CL	Clay- brown, moist, sticky
30	290	SS 1	100	9-17-35 (52)	4.5+								Gravel, sand, and clay- brown, moist, sticky
40	280												
50	270												
60	260												
70	250												
80	240												
90	230												
100	220												
110	210												
120	200											GC	
130	190												
140	180												
150	170												
160	160												
170	150												
180	140												
190	130												
200	120												
210	110												
220	100												

Bottom of borehole at 220.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-12

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/9/13 **COMPLETED** 4/10/13
GROUND ELEVATION 376 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 4.00 ft / Elev 372.00 ft
LOGGED BY TJB **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0												GC	▽ Gravel, and and clay- light brown
												CH	Clay and gravel- dark gray
		SS 1	0 92	17-17-40 (57)	1.86	98.6	26.1	39	20	19		CL	Clay and sand, light brown. Unconfined Compressive Strength: 1,408 psf
		SS 2	100	38-38	2.47								
		SS 3		7-13-18 (31)									
												GC	Sand, gravel, and clay- light grey
		SS 4	100	6-18-19 (37)	2.36							CL	Clay and gravel- light brown
												GC	Gravel, sand, and clay- light brown. Clasts well rounded

Bottom of borehole at 280.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-13

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/11/13 **COMPLETED** 4/12/13

GROUND ELEVATION 412 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

▽ **AT TIME OF DRILLING** 59.50 ft / Elev 352.50 ft

LOGGED BY TJB **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	410											GC	Gravel, sand, and clay. Light brown, dry to moist. Gravel to 4" diameter and well rounded
10	400												
20	390												
30	380												
40	370												
50	360												
60	350												▽
70	340	SS 1	67	11-39-39 (78)	3.21							CL	Clay, light brown, moist
80	330											GC	Gravel, sand, and clay. Light brown, wet. Gravel to 4" diameter, well rounded.
90	320												
100	310												
110	300												
120	290												
130	280												
140	270	SS 2	100	9-16-21 (37)	2.08			46.7	21.7	25		CL	Clay and sand. Light brown, moist.
150	260												
160	250	SS 3	100	5-17-17 (34)	1.00								
170	240												
180	230											GC	Gravel, sand, and clay. Light brown. Gravel up to 4" diameter and well rounded.
190	220												
200	210												
210	200												
220	190												
230	180												
240	170												
250	160												
260	150												
270	140												
280	130												
290	120	SS 4	67	1-1	3.83							CL	Sandy brown clay.
300													

Bottom of borehole at 300.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-14

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/17/13 **COMPLETED** 4/17/13

GROUND ELEVATION 370 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

AT TIME OF DRILLING ---

LOGGED BY JFR **CHECKED BY**

AT END OF DRILLING ---

NOTES

▽ **AFTER DRILLING** 28.00 ft / Elev 342.00 ft

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	370												Gravel, sand, tan clay. Gravel up to 3" diameter, sub-rounded.
10	360												
20	350												
30	340												▽
40	330												
50	320												
60	310											GC	
70	300												
80	290												
90	280												
100	270												
110	260												
120	250	GB 1											
130	240												Gravelly clay, brown. Gravel up to 1" diameter.
140	230											GC	Gravel, coarse sand, tan clay. Gravel up to 2" diameter, sub-rounded.
150	220												
160	210												
170	200												Gravel, sand, tan clay. Gravel up to 3" diameter, sub-rounded.
180	190											GC	
190	180												
200	170												Gravelly clay. Brown, gravel up to 2" diameter.
210	160												
220	150												Gravel, sand, tan clay. Gravel up to 2" diameter.
230	140												
240	130											GC	
250	120												
260	110												
270	100												
280	90												Bottom of borehole at 280.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-15

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/16/13 **COMPLETED** 4/16/13
GROUND ELEVATION 390 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
AT TIME OF DRILLING ---
LOGGED BY JFR **CHECKED BY**
AT END OF DRILLING ---
NOTES
▼ **AFTER DRILLING** 59.00 ft / Elev 331.00 ft

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	390												Gravel, coarse sand, clay. Gravel up to 3" diameter, rounded.
10	380												
20	370												
30	360												
40	350												
50	340												
60	330												▼
70	320												
80	310											GC	
90	300												
100	290												
110	280												
120	270												
130	260												
140	250												
150	240	SS 1	0	7-18								CL	Brown clay.
160	230												Gravel, coarse sand, tan clay. Gravel up to 2" diameter.
170	220												
180	210												
190	200												
200	190											GC	
210	180												
220	170												
230	160												
240	150												
250	140	GB 2										CL	Brown clay
260	130												Gravel, coarse sand, tan clay. Gravel up to 2" diameter.
270	120											GC	
280	110												
290	100												

Bottom of borehole at 290.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-16

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/18/13 **COMPLETED** 4/18/13
GROUND ELEVATION 390 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ **AT TIME OF DRILLING** 80.00 ft / Elev 310.00 ft
LOGGED BY JFR **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX			
0	390												
10	380										▨		Gravel, coarse sub-angular sand, clay. Gravel up to 3" diameter.
20	370												
30	360												
40	350												
50	340												
60	330												
70	320												
80	310												▽
90	300												
100	290											GC	
110	280												
120	270												
130	260												
140	250												
150	240												
160	230												
170	220												
180	210												
190	200												
200	190												
210	180	SS 1	100	4-6-4 (10)	4.19						▩	CH	Clay- mottled grey and orange
220	170										▨		Gravel, sand, tan clay. Gravel up to 3" diameter.
230	160												
240	150												
250	140											GC	
260	130												
270	120												
280	110												
290	100												

Bottom of borehole at 290.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-17

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/11/13 COMPLETED 4/12/13
GROUND ELEVATION 421 ft MSL HOLE SIZE 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
▽ AT TIME OF DRILLING 25.00 ft / Elev 396.00 ft
LOGGED BY TJB CHECKED BY
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft) 0	Elevation (ft) 420	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	U.S.C.S.	MATERIAL DESCRIPTION
											GC	Gravel, sand, and clay. Light brown, dry to moist. Gravel up to 4" diameter, well rounded. ▽
		SS 1	67	3-4-8 (12)	1.83						SC-SM	Clay and sand. Light brown, moist. Some parts mottled brown/orange.
											GC	Gravel, sand, and clay. Light brown, moist. Gravel up to 4" diameter, well-rounded.
												Gravel with Granular clay, mottled gray and yellow.
		SS 2	33	8-12-12 (24)							GC	Sand and gravel, up to 2" diameter, sub-angular to rounded.
		SS 3	100	3-3-3 (6)	2.97						CH	Gray clay.
		SS 4	67	1-4-5 (9)	3.28	104.6	22.6	47	22	25	CH	Blue clay. Wet. Unconfined Compressive Strength: 8,889 psf

Depth (ft): 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200

Elevation (ft): 410, 400, 390, 380, 370, 360, 350, 340, 330, 320, 310, 300, 290, 280, 270, 260, 250, 240, 230

Bottom of borehole at 200.0 feet.

5/3/13 15:23 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-18

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry
PROJECT NAME Eliot Quarry Geotechnical Investigation
PROJECT NUMBER GT13-16
PROJECT LOCATION Pleasanton, California
DATE STARTED 4/12/13 **COMPLETED** 4/12/13
GROUND ELEVATION 411 ft MSL **HOLE SIZE** 12 in
DRILLING CONTRACTOR Layne
GROUND WATER LEVELS:
DRILLING METHOD Becker Hammer Drill
AT TIME OF DRILLING ---
LOGGED BY SPB **CHECKED BY**
AT END OF DRILLING ---
NOTES
▽ **AFTER DRILLING** 5.50 ft / Elev 405.50 ft

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	410											GC	Gravel, sand, and clay ▽
100	310											CH	Gray clay.
110	300	SS 1	100	3-3-10 (13)	3.32								
130													Bottom of borehole at 130.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-19

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/13/13 **COMPLETED** 4/13/13

GROUND ELEVATION 424 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

AT TIME OF DRILLING ---

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

▽ **AFTER DRILLING** 10.50 ft / Elev 413.50 ft

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	420											GC	Gravel, sand, and clay. Gray.
10	410												▽ Gravel, sand, and clay. Brown.
20	400												
30	390												
40	380												
50	370												
60	360											GC	
70	350												
80	340												
90	330												
100	320												
110	310											CL	Brown clay
120	300	SS 1	100	4-7-10 (17)	3.39								

Bottom of borehole at 125.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

KANE GeoTech, Inc.
Geoengineering Consultants

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-20

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/13/13 **COMPLETED** 4/15/13

GROUND ELEVATION 432 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

AT TIME OF DRILLING ---

LOGGED BY SPB **CHECKED BY**

AT END OF DRILLING ---

NOTES

▽ **AFTER DRILLING** 10.00 ft / Elev 422.00 ft

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0	430											GP	Gravel.
10	420											GC	▽ Gravel, sand, and clay
20	410												
30	400											CL	Clay, brown, moist
40	390											GC	Gravel, sand, and clay
50	380												
60	370												
70	360												
80	350												
90	340												
100	330	SS 1	67	3-4-8 (12)								CH	Clay, gray, moist, slickensided.
110													

Bottom of borehole at 110.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.

Kane GeoTech Inc.
7400 Shoreline Drive, Suite 6
Stockton, California 95219
209-472-1822

BORING NUMBER BH2013-21

PAGE 1 OF 1

CLIENT CEMEX Eliot Quarry

PROJECT NAME Eliot Quarry Geotechnical Investigation

PROJECT NUMBER GT13-16

PROJECT LOCATION Pleasanton, California

DATE STARTED 4/15/13 **COMPLETED** 4/15/13

GROUND ELEVATION 438 ft MSL **HOLE SIZE** 12 in

DRILLING CONTRACTOR Layne

GROUND WATER LEVELS:

DRILLING METHOD Becker Hammer Drill

∇ **AT TIME OF DRILLING** 5.00 ft / Elev 433.00 ft

LOGGED BY SPB **CHECKED BY**

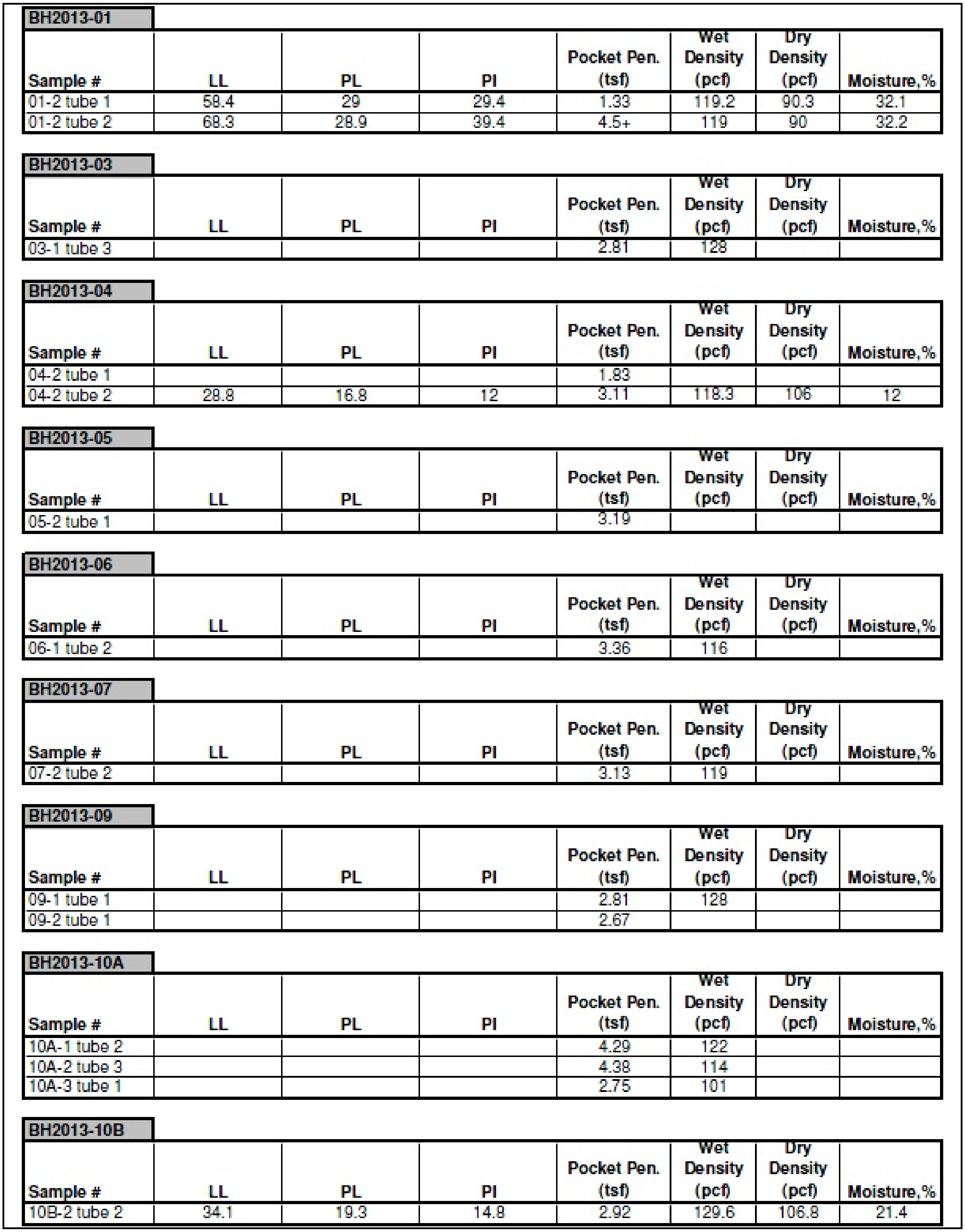
AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

DEPTH (ft)	Elevation (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	GRAPHIC LOG	U.S.C.S.	MATERIAL DESCRIPTION
0												GC	∇ Gravel, sand, and clay.
												CL	Brown clay.
		SS 1	67	9	3.34							GC	Gravel, sand, and clay.
												GC	Reddish gravel, sand, and clay
												GC	Gravel, sand, and clay. Brown.
												CL	Clay, brown.
												GC	Gravel, sand, and clay. Brown.
	320											CH	Gray clay
120		SS 2	67	5-9-12 (21)	3.21								Bottom of borehole at 120.0 feet.

5/13/13 13:49 Blow count considered unreliable. See text.



BH2013-01

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
01-2 tube 1	58.4	29	29.4	1.33	119.2	90.3	32.1
01-2 tube 2	68.3	28.9	39.4	4.5+	119	90	32.2

BH2013-03

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
03-1 tube 3				2.81	128		

BH2013-04

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
04-2 tube 1				1.83			
04-2 tube 2	28.8	16.8	12	3.11	118.3	106	12

BH2013-05

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
05-2 tube 1				3.19			

BH2013-06

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
06-1 tube 2				3.36	116		

BH2013-07

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
07-2 tube 2				3.13	119		

BH2013-09

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
09-1 tube 1				2.81	128		
09-2 tube 1				2.67			

BH2013-10A

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
10A-1 tube 2				4.29	122		
10A-2 tube 3				4.38	114		
10A-3 tube 1				2.75	101		

BH2013-10B

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
10B-2 tube 2	34.1	19.3	14.8	2.92	129.6	106.8	21.4

BH2013-11

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
11-1 tube 1				4.5	127		

BH2013-12

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
12-1 tube 1				1.86			
12-2 tube 2	39.3	20	19.3	2.47	124.3	98.6	26.1
12-4 tube 1				2.36	123		

BH2013-13

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
13-1 tube 1				3.21			
13-2 tube 3	46.7	21.7	25	2.08	115	98.6	16.6
13-3 tube 1				1	117		
13-4 tube 3				3.83	120		

BH2013-16

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
16-1 tube 1				4.19	121		

BH2013-17

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
17-1 tube 2				1.83	119		
17-3 tube 1				2.97	98		
17-4 tube 3	47.1	21.9	25.2	3.28	128	105	23

BH2013-18

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
18-1 tube 1				3.32	90		

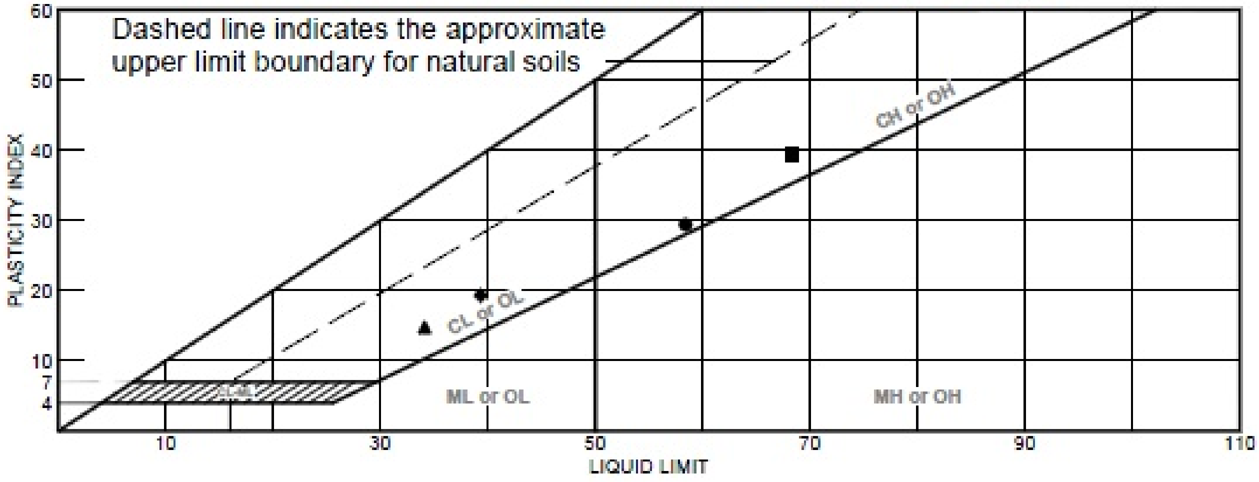
BH2013-19

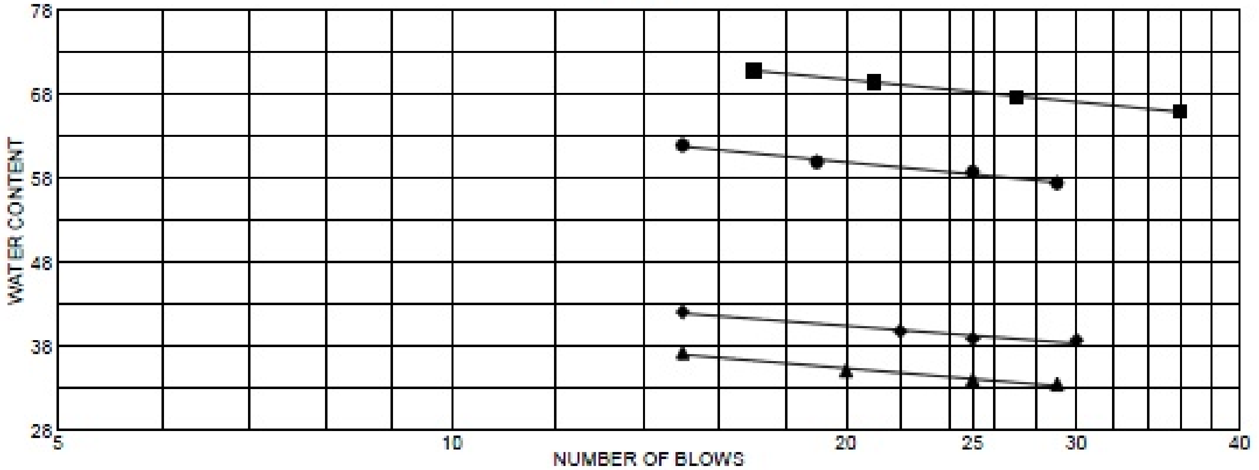
Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
19-1 tube 2				3.39	117		

BH2013-21

Sample #	LL	PL	PI	Pocket Pen. (tsf)	Wet Density (pcf)	Dry Density (pcf)	Moisture,%
21-1 tube 1				3.34	102		
21-2 tube 1				3.21	109		

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Dark Bluish Gray Fat CLAY	58.4	29.0	29.4			
■	Dark Bluish Gray Fat CLAY	68.3	28.9	39.4			
▲	Dark Yellowish Brown Lean CLAY w/ Sand	34.1	19.3	14.8			
◆	Dark Yellowish Brown CLAY w/ Sand	39.3	20.0	19.3			

Project No. 808-001 **Client:** KANE GeoTech

Project: Eliot Quarry Geotechnical Investigation - GT13-16

● **Source:** BH2013-01 **Sample No.:** 01-2 tube 1 **Elev./Depth:** 270'
■ **Source:** BH2013-01 **Sample No.:** 01-2 tube 2 **Elev./Depth:** 270'
▲ **Source:** BH2013-10B **Sample No.:** 10B-2 tube 2 **Elev./Depth:** 9'
◆ **Source:** BH2013-12 **Sample No.:** 12-2 tube 2 **Elev./Depth:** 30'

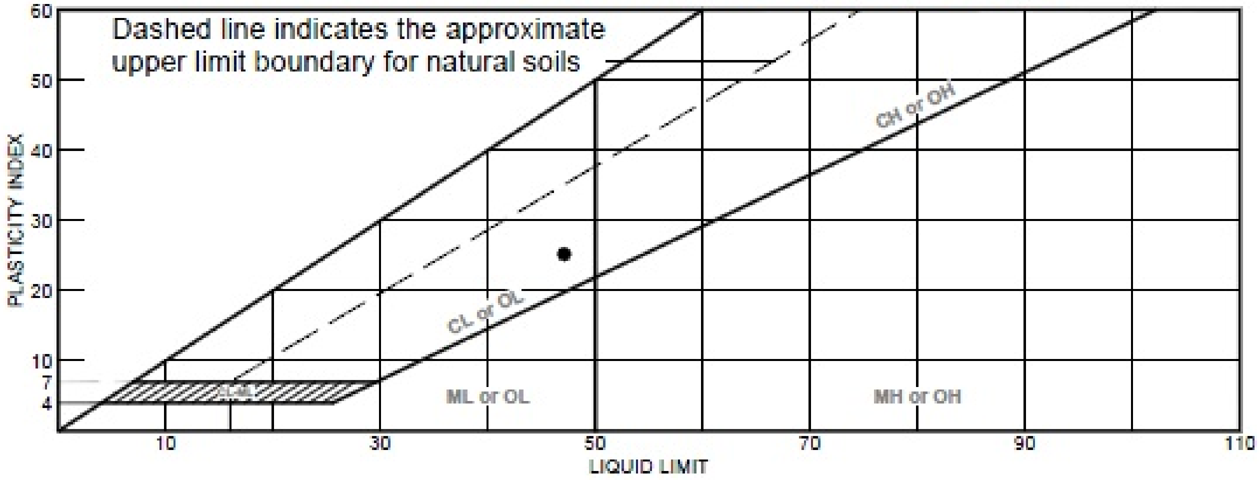
Remarks:
- ● Sample was prepared using the wet prep method.
- ■ Sample was prepared suing the wet prep method.
- ▲ Sample was prepared using the wet prep method.
- ◆ Sample was prepared using the wet prep method.

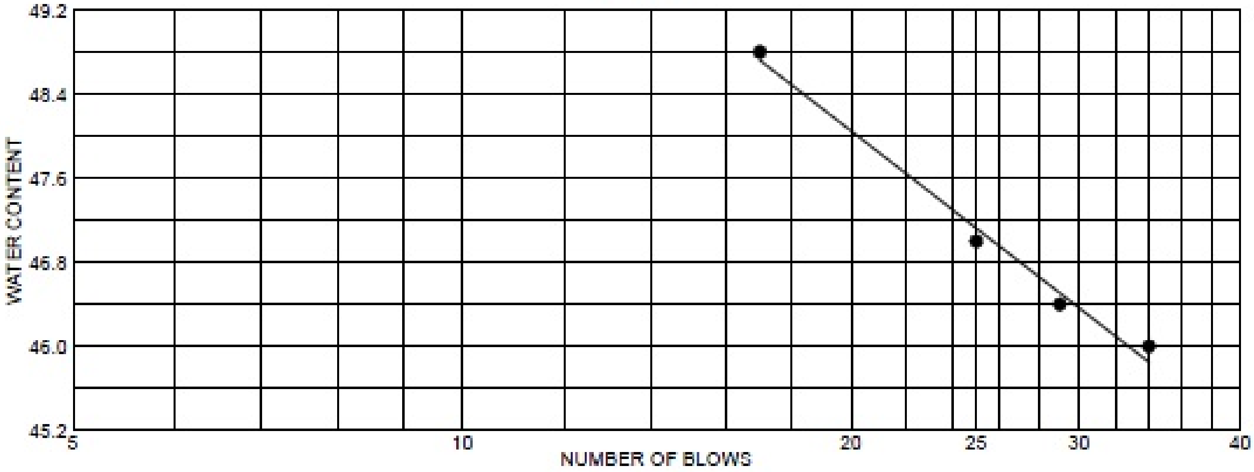
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Very Dark Bluish Gray CLAY	47.1	21.9	25.2			

Project No. 808-001 **Client:** KANE GeoTech

Project: Eliot Quarry Geotechnical Investigation - GT13-16

● **Source:** BH2013-17 **Sample No.:** 17-4 tube 3 **Elev./Depth:** 162'

Remarks:

● Sample was prepared using the wet prep method.

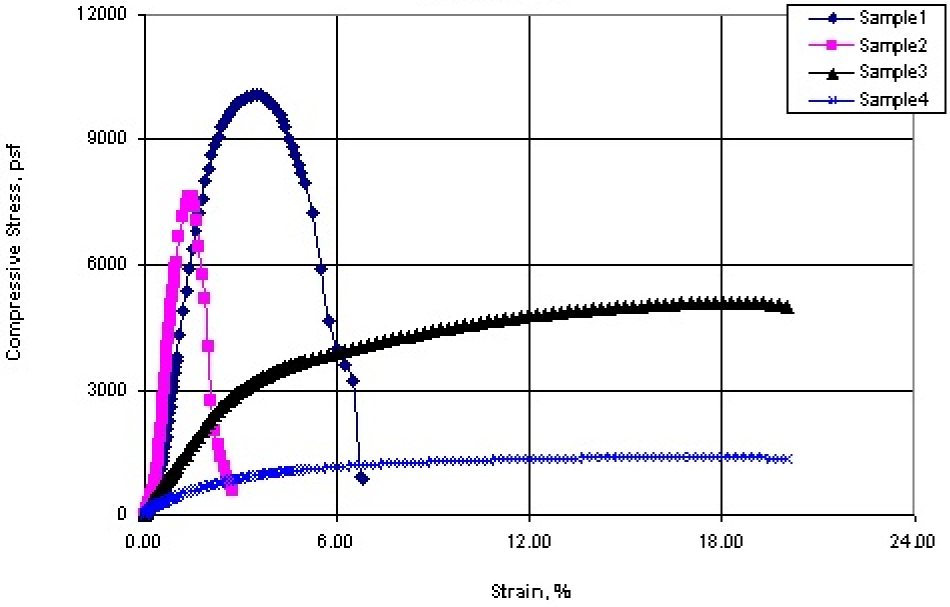
LIQUID AND PLASTIC LIMITS TEST REPORT

COOPER TESTING LABORATORY

Figure

Unconfined Compressive Strength

ASTM D2166



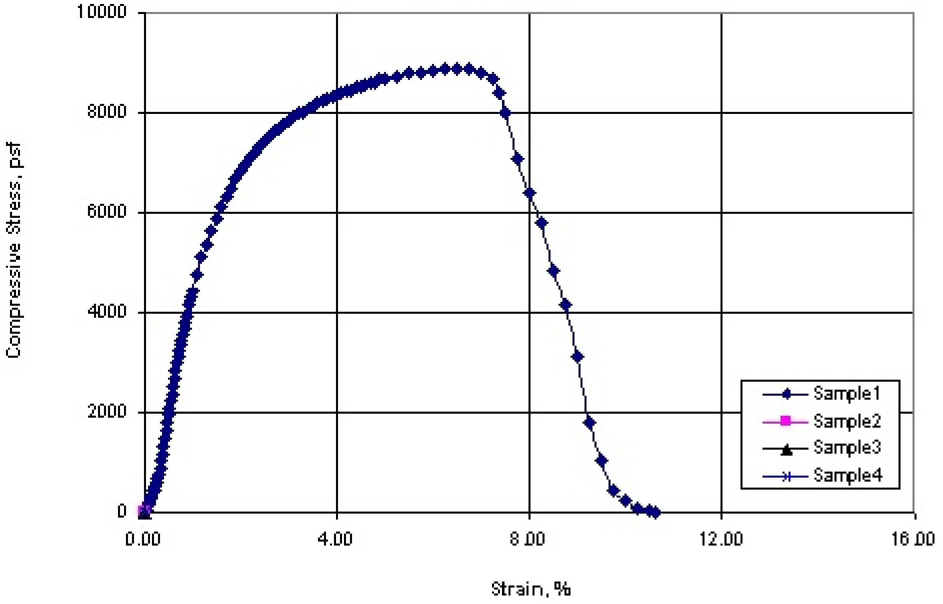
Sample No.:	1	2	3	4	
Unconfined Compressive Strength, psf	10076	7629	5111	1408	
Unconfined Compressive Strength, psi	70.0	53.0	35.5	9.8	
Undrained Shear Strength, psf	5038	3815	2556	704	
Failure Strain, %	3.4	1.4	18.0	16.5	
Strain Rate, % per minute	1.0	1.0	1.0	1.0	
Strain Rate, inches/minute	0.04	0.04	0.04	0.04	
Moisture Content, %	32.1	32.2	21.4	26.1	
Dry Density, pcf	90.3	90.0	106.8	98.6	
Saturation, %	99.8	99.6	99.7	99.1	
Void Ratio	0.867	0.874	0.579	0.710	
Specimen Diameter, inches	1.930	1.930	1.917	1.930	
Specimen Height, inches	3.99	3.99	3.99	4.00	
Height to Diameter Ratio	2.1	2.1	2.1	2.1	
Assumed Specific Gravity	2.70	2.70	2.70	2.70	

	Sample Location			
	Boring	Sample	Depth, ft.	Soil Description
1	BH2013-01	01-2 tube 1	270	Dark Bluish Gray Fat CLAY
2	BH2013-01	01-2 tube 2	270	Very Dark Bluish Gray Fat CLAY
3	BH2013-10B	10B-2 tube 2	9	Dark Yellowish Brown Lean CLAY w/ Sand
4	BH2013-12	12-2 tube 2	30	Dark Yellowish Brown Lean CLAY w/ Sand

Job No.:	808-001a		**Type of Sample**	Undisturbed
Client:	KANE GeoTech			
Project:	Eliot Quarry Geotechnical Investigation - GT13-16		Remarks:	
Date:	4/30/2013	**By:** MD/RU		

Unconfined Compressive Strength

ASTM D2166



Sample No.:	1	2	3	4	
Unconfined Compressive Strength, psf	8889				
Unconfined Compressive Strength, psi	61.7				
Undrained Shear Strength, psf	4445				
Failure Strain, %	6.5				
Strain Rate, % per minute	1.0				
Strain Rate, inches/minute	0.04				
Moisture Content, %	22.6				
Dry Density, pcf	104.6				
Saturation, %	99.9				
Void Ratio	0.612				
Specimen Diameter, inches	1.767				
Specimen Height, inches	4.00				
Height to Diameter Ratio	2.3				
Assumed Specific Gravity	2.70				

Sample Location				
	Boring	Sample	Depth, ft.	Soil Description
1	BH2013-17	17-4 tube 3	162	Very Dark Bluish Gray Lean CLAY
2				
3				
4				

Job No.:	808-001b	Type of Sample	Undisturbed
Client:	KANE GeoTech		
Project:	Elliot Quarry Geotechnical Investigation - GT13-16	Remarks:	
Date:	4/30/2013 **By:** MD/RU		

COOPER
TESTING LABORATORY

BORING LOG B-1

Job No.: 3415.000	**Client:** Cemex	**Elevation:** 277 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method:** Rotary-Wash	**Date Drilled:** 5-14-12

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
■ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		GC	CLAYEY GRAVEL, gray-brown, moist to wet, medium dense, medium-to coarse gravel, trace cobbles up to 8 inch diameter, trace to some fine-to coarse-grained sand	277
			5				272
18.6 17.2	112 113	35		■	CL	SILTY CLAY, gray-brown, moist, very stiff, trace fine-grained sand, dark brown and light brown-gray mottling PI=16 LL=33 SU=2,700 psf	
			10		CL	SANDY CLAY, gray-brown, moist to wet, very stiff, fine-grained sand, trace fine gravel, some silt	267
21.5 20.5	109 106	48		■	CL	SILTY CLAY, light to medium gray-brown, moist, very stiff to hard, trace fine-grained sand, minor dark brown and light brown-gray mottling PI=29 LL=49 SU=3,300 psf	
			15				262
					CL	SANDY CLAY, gray-brown, wet, hard, fine-to coarse-grained sand, some fine gravel	
9.8	131	79		■	SC	CLAYEY SAND, gray-brown, wet, very dense, fine-to coarse-grained sand, trace fine to coarse gravel PI=14 LL=29 below 19-1/2 feet, more clayey	
			20		CL	SILTY CLAY, light to medium gray-brown, moist to wet, very stiff, some fine-grained sand	257

BORING LOG B-1

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 277 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-14-12

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
■ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	**Dry Unit Weight (PCF)**	**Penetration Resistance (blows/foot)**	**Depth (feet)**	**Sample Symbol**	**USCS Classification**	**DESCRIPTION AND REMARKS**	**Elevation (in feet above MSL)**
					SC	CLAYEY SAND, gray-brown, wet, very dense, fine-to coarse-grained sand, trace fine to coarse gravel	
			20				257
			-		CL	SILTY CLAY, light to medium gray-brown, moist to wet, very stiff, some fine-grained sand	-
18.6	111	44	-	■	CL	SILTY CLAY with SAND, light to medium gray-brown, moist to wet, very stiff, fine-grained sand SU=2,100 psf	-
			-	■			-
			-				-
			25			below 25 feet, more sandy	252
			-		SC	CLAYEY SAND, light to medium gray-brown, wet, very dense, fine-to medium-grained sand, some silt, trace fine to coarse gravel	-
8.5	138	100	-	■			-
			-	■	CL	SANDY CLAY, light gray-brown, moist to wet, hard, fine-grained sand, some silt, light brown-gray mottlling	-
			-				-
			30				247
			-				-
		87	-	■	SC	CLAYEY SAND, mottled gray-brown and green-brown, wet, very dense, fine-to coarse-grained sand, trace fine gravel, some silt Ø=27° C=1,100 psf	-
			-	■			-
			-				-
			35		GP/SP	SANDY GRAVEL/GRAVELLY SAND, gray-brown, moist to wet, very dense, fine-to coarse-grained sand, fine to coarse gravel, trace clay and silt	242
			-				-
		110	-	■		12.8% passing #200 sieve Ø=37° C=40 psf	-
			-	■			-
			-				-
			40				237

BORING LOG B-1

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 277 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-14-12

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
█ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	**Dry Unit Weight (PCF)**	**Penetration Resistance (blows/foot)**	**Depth (feet)**	**Sample Symbol**	**USCS Classification**	**DESCRIPTION AND REMARKS**	**Elevation (in feet above MSL)**
					GP/SP	SANDY GRAVEL/GRAVELLY SAND, gray-brown, moist to wet, very dense, fine-to coarse-grained sand, fine to coarse gravel, trace clay and silt	
			40				237
			45				232
		50/3”	50	█			227
			55				222
		65/6”		█			
			60				217
						Boring terminated at 60 feet, No groundwater encountered	

BORING LOG B-2

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 324 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-15-12

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
█ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		GP/SP	SANDY GRAVEL/GRAVELLY SAND, gray-brown, moist, dense to very dense, fine-to coarse-grained sand, fine to coarse gravel, some clay and silt, occasional cobbles	324
			-				-
			-				-
			-				-
			-				-
		67	5	█		13.6% passing #200 sieve	319
			-	█			-
			-				-
			-				-
			-				-
			10				314
			-				-
			-				-
			-				-
			-				-
			15			below 15 feet, very dense	309
			-				-
			-				-
			-			below 18 feet, slightly less gravel	-
			-				-
			20				304

BORING LOG B-2

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 324 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-15-12

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
█ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	**Dry Unit Weight (PCF)**	**Penetration Resistance (blows/foot)**	**Depth (feet)**	**Sample Symbol**	**USCS Classification**	**DESCRIPTION AND REMARKS**	**Elevation (in feet above MSL)**
					GP/SP	SANDY GRAVEL/GRAVELLY SAND, gray-brown, moist, dense to very dense, fine-to coarse-grained sand, fine to coarse gravel, some clay and silt, occasional cobbles	
			20				304
			-				-
		60/6”	-	█			-
			-				-
			-				-
			25				299
			-				-
			-				-
			-				-
			-				-
			30				294
			-				-
			-				-
			-				-
			-				-
			35				289
			-				-
		90	-	█			-
			-	█			-
			-				-
			40				284

BORING LOG B-2

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 324 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-15-12

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
■ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	**Dry Unit Weight (PCF)**	**Penetration Resistance (blows/foot)**	**Depth (feet)**	**Sample Symbol**	**USCS Classification**	**DESCRIPTION AND REMARKS**	**Elevation (in feet above MSL)**
					GP/SP	SANDY GRAVEL/GRAVELLY SAND, gray-brown, moist, dense to very dense, fine-to coarse-grained sand, fine to coarse gravel, some clay and silt, occasional cobbles	
			40				284
			-				-
			-				-
			-				-
			-				-
			45				279
			-				-
			-				-
			-				-
			-		GC	CLAYEY GRAVEL/GRAVEL in SANDY CLAY matrix, gray-brown, moist, very dense, fine-to medium-grained sand, fine-to coarse-gravel, some clay and silt	-
			50				274
			-				-
		62/6”	-	■		17.0% passing #200 sieve	-
			-				-
			-				-
			55				269
			-				-
			-				-
			-				-
			-				-
			60				264

BORING LOG B-2

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 324 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-15-12

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
■ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			60		GC	CLAYEY GRAVEL/GRAVEL in SANDY CLAY matrix, gray-brown, moist, very dense, fine-to medium-grained sand, fine-to coarse-gravel, some clay and silt	264
			65				259
		70/6”		■	SP	GRAVELLY SAND in CLAY matrix, light to medium gray-brown, moist to wet, very dense, medium-to coarse-grained sand, fine gravel, some clay and silt 18.2% passing #200 sieve	
			70		CL	SANDY CLAY, gray-brown, moist, hard, fine-to medium-grained sand	254
					SP	GRAVELLY SAND in CLAY matrix, gray-brown, moist to wet, very dense, fine-to coarse-grained sand, fine gravel, some clay and silt	
					CL	SANDY CLAY, gray-brown, moist, hard, fine-to medium-grained sand	
			75		SC	CLAYEY SAND, gray-brown, moist to wet, very dense, fine-to coarse-grained sand, trace fine gravel	249
		50/4”		■	GC	CLAYEY GRAVEL, gray-brown, moist, very dense, some fine-to coarse-grained sand, fine to coarse gravel, some clay and silt	
			80				244

BORING LOG B-2

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 324 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-15-12

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
■ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	**Dry Unit Weight (PCF)**	**Penetration Resistance (blows/foot)**	**Depth (feet)**	**Sample Symbol**	**USCS Classification**	**DESCRIPTION AND REMARKS**	**Elevation (in feet above MSL)**
					GC	CLAYEY GRAVEL, gray-brown, moist, very dense, some fine-to coarse-grained sand, fine to coarse gravel, some clay and silt	
			80				244
			-				-
			-				-
			-				-
			-				-
			85				239
			-				-
			-				-
			-				-
			-				-
			90				234
			-				-
		50/4”	-	■		14.6% passing #200 sieve	-
			-				-
			-				-
			95			below 95 feet, more coarse gravel and occasional cobbles	229
			-				-
			-				-
			-				-
			-				-
			100				224

BORING LOG B-2

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 324 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-15-12

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
■ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			100		GC	CLAYEY GRAVEL, gray-brown, moist, very dense, some fine-to coarse-grained sand, fine to coarse gravel, some clay and silt	224
11.3	112	50/4”	105	■	SC	CLAYEY SAND, gray-brown, moist, very dense, fine-to coarse-grained sand, trace fine gravel and silt	219
			110		GC	CLAYEY GRAVEL, gray-brown, moist, fine-to coarse-grained sand, fine-to coarse gravel, trace silt	214
17.7	116	60/6”		■	CL	SILTY CLAY, light to medium gray-brown, moist, hard, minor dark brown mottling PI=21 LL=37	
			115		ML	CLAYEY SILT, light gray-brown, moist, hard	209
					CL	SILTY CLAY, light to medium gray-brown, moist, hard, minor dark brown mottling	
		60/6”	120	■	GC	CLAYEY GRAVEL, gray-brown, moist to wet, very dense, trace fine-to coarse-grained sand, fine to coarse gravel, trace silt	204

BORING LOG B-2

Job No.: 3415.000	**Client:** Cemex	**Elevation**: 324 feet
Job Name: Lake B - Corrective Action Plan	**Drill Method**: Rotary-Wash	**Date Drilled**: 5-15-12

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
▮ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	**Dry Unit Weight (PCF)**	**Penetration Resistance (blows/foot)**	**Depth (feet)**	**Sample Symbol**	**USCS Classification**	**DESCRIPTION AND REMARKS**	**Elevation (in feet above MSL)**
					GC	CLAYEY GRAVEL, gray-brown, moist to wet, very dense, trace fine-to coarse-grained sand, fine to coarse gravel, trace silt	
			120				204
			-		SC	CLAYEY SAND, gray-brown, moist to wet, very dense, fine-to coarse-grained sand, trace fine gravel, trace silt	-
			-				-
			-				-
			-				-
12.1	121	55/6”	125	■			199
						Boring terminated at 125 feet No groundwater encountered	
			-				-
			-				-
			-				-
			-				-
			130				194
			-				-
			-				-
			-				-
			-				-
			135				189
			-				-
			-				-
			-				-
			-				-
			140				184

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			CLASSIFICATION SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE TO NO FINES	GW	WELL GRADED GRAVELS, GRAVEL/SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL/SAND MIXTURES
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL/SAND/SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL/SAND/CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE TO NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND/SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND/CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SILTS

KEY TO BORING LOG SYMBOLS

Depth in Feet	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per foot	Unified Soil Classification System	
				▨	Bulk Sample
				■	2.5-inch I.D. Split Barrel Sample
				▦	2.8-inch I.D. Shelby Tube Sample
				□	No Sample recovered
				◩	Standard Penetration Test interval
				─	Well-defined stratum change
				╲	Gradual stratum change
				- - -	Interpreted stratum change
				▽	Apparent ground water level measured at date noted; seasonal weather conditions, site topography, etc., may cause fluctuations in water level indicated on boring logs
				▼	Stabilized ground water level measured at date noted

Note: Soils described as dry, moist, and wet are estimated to be dry of optimum, near optimum, and more wet than optimum moisture content, respectively. Saturated soils are estimated to be within areas of free groundwater.

BY: CC

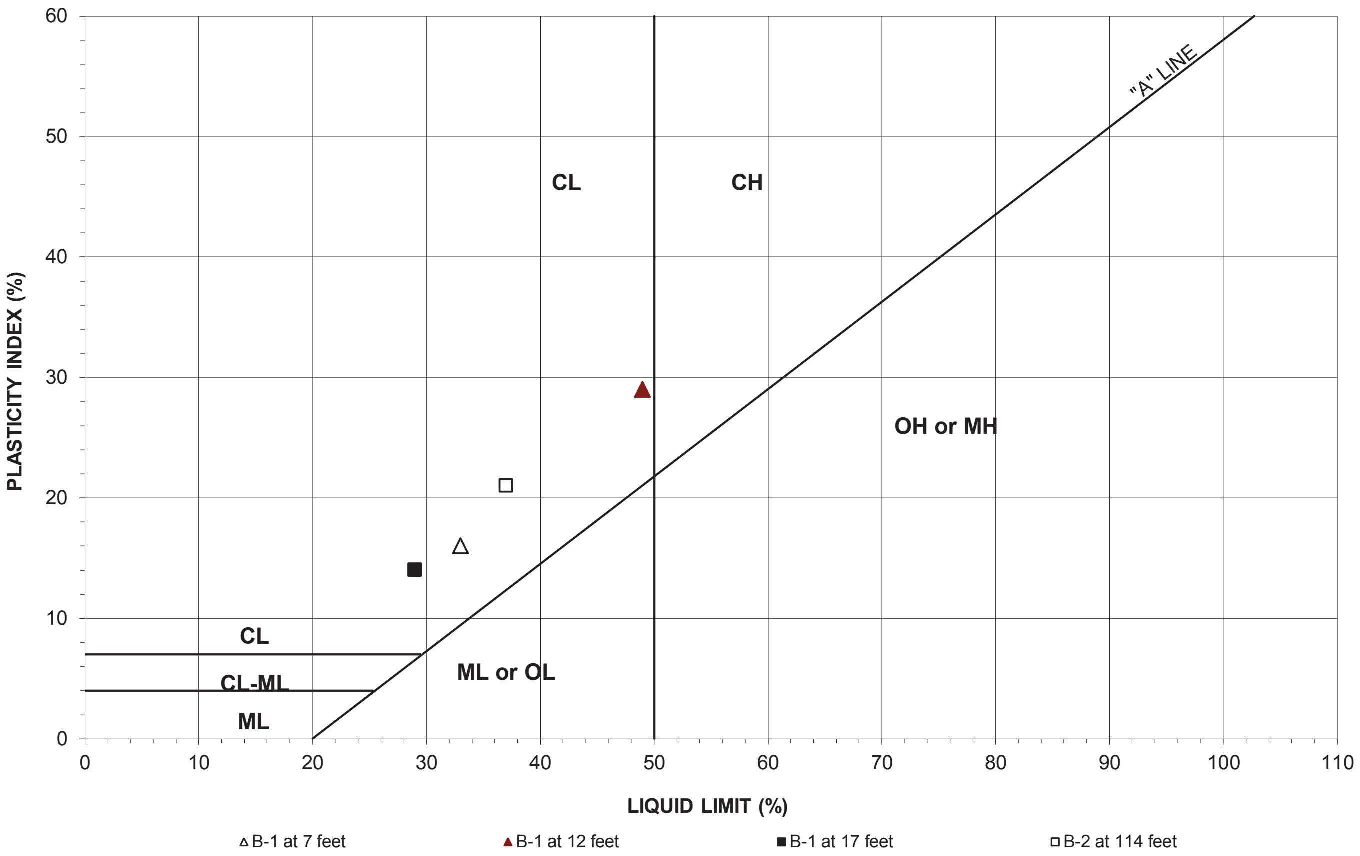
DATE: 5-18-12

JOB NUMBER: 3415.000

APPENDIX B

Laboratory Test Results

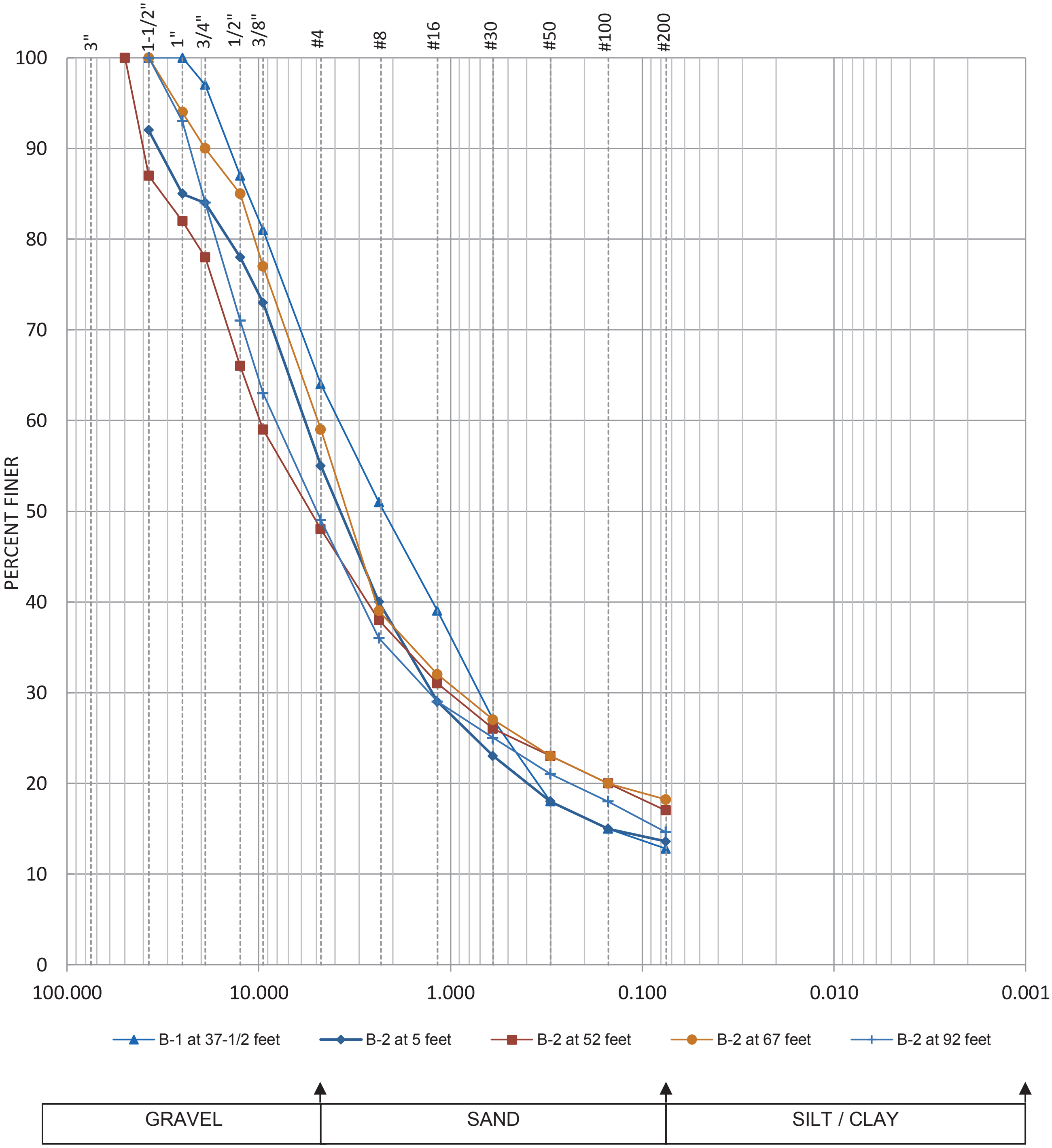
JOB NUMBER: 3415.700
DATE: 6-5-12
BY: CC



LOCATION	LIQUID LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION
B-1 at 7 feet	33	16	**C L**
B-1 at 12 feet	49	29	**C L**
B-1 at 17 feet	29	14	**C L**
B-2 at 114 feet	37	21	**C L**

ATTERBERG LIMITS TEST

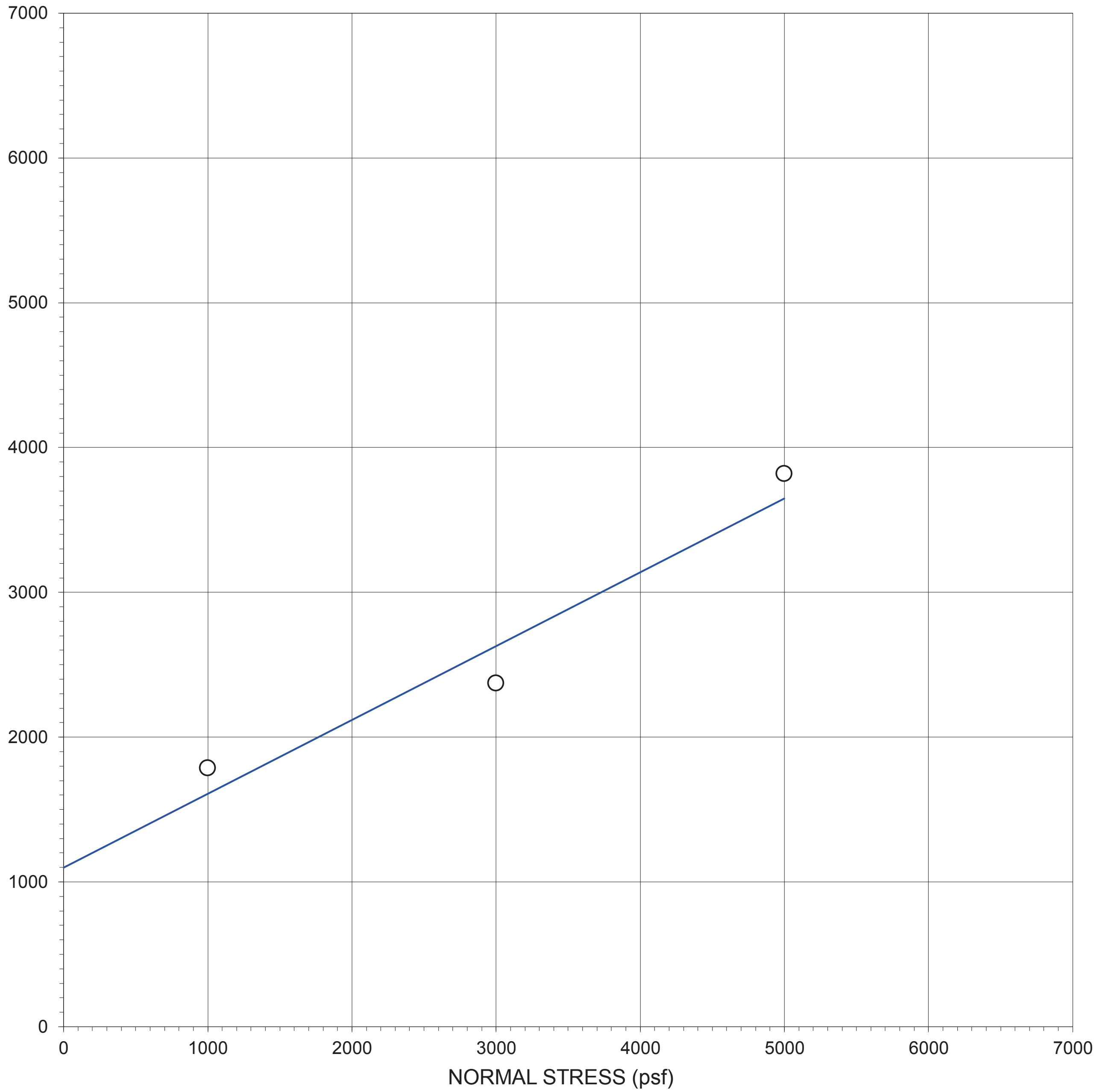
JOB NUMBER: 3415.700 DATE: 6-5-12 BY: CC



LOCATION	DESCRIPTION
B-1 at 37-1/2 feet	CLAYEY SAND with GRAVEL, brown
B-2 at 5 feet	CLAYEY GRAVEL with SAND, brown
B-2 at 52 feet	CLAYEY GRAVEL, dark brown
B-2 at 67 feet	CLAYEY GRAVEL with SAND, dark yellow-brown
B-2 at 92 feet	CLAYEY GRAVEL, brown

GRADATION TEST DATA

JOB NUMBER: 3415.700 DATE:6-5-12 BY: CC



LOCATION: B-1 at 32 feet

SAMPLE: CLAYEY SAND with GRAVEL, brown

TEST TYPE: Consolidated Drained

RATE OF SHEAR (in/min): 0.00099

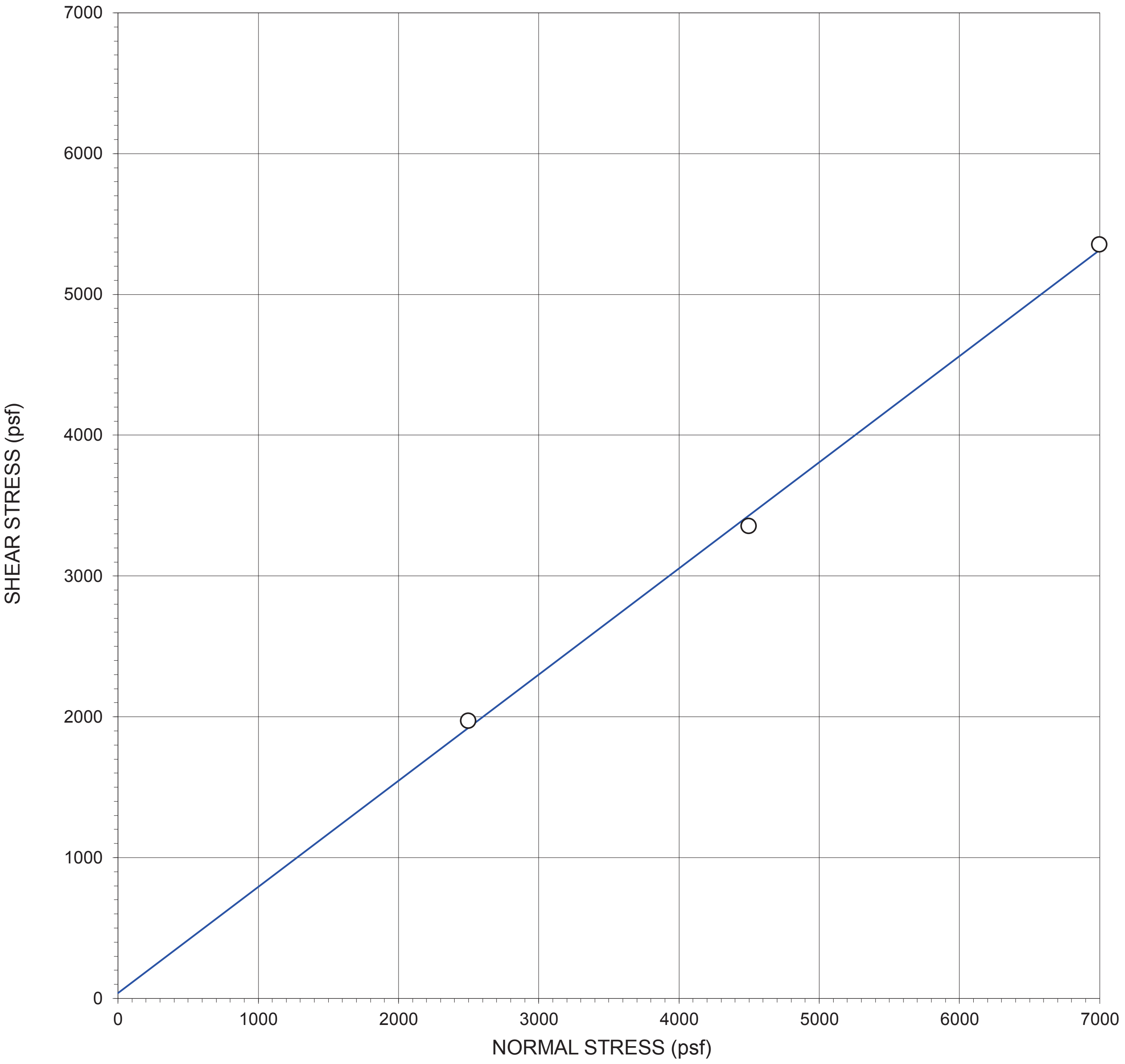
FRICTION ANGLE: 27

COHESION (psf): 1,100

SPECIMEN	A	B	C
DRY DENSITY (psf)	127.1	123.7	123.4
INITIAL WATER CONTENT (%)	10.1	10.1	10.1
FINAL WATER CONTENT (%)	11	13.7	11
NORMAL STRESS (psf)	1000	3000	5000
MAXIMUM SHEAR (psf)	1785	2373	3819

DIRECT SHEAR TEST

JOB NUMBER: 3415.700 DATE:6-5-12 BY: CC



LOCATION: B-1 at 37 feet

SAMPLE: CLAYEY SAND with GRAVEL, red-brown

TEST TYPE: Consolidated Drained

RATE OF SHEAR (in/min): 0.00099

FRICTION ANGLE: 37

COHESION (psf): 40

SPECIMEN	A	B	C
DRY DENSITY (psf)	125.8	113.8	122.3
INITIAL WATER CONTENT (%)	9.2	9.2	9.2
FINAL WATER CONTENT (%)	11.4	11	10.4
NORMAL STRESS (psf)	2500	4500	7000
MAXIMUM SHEAR (psf)	1969	3353	5354

DIRECT SHEAR TEST

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD3
Location OUTBOARD EDGE OF RMC QUARRY ACCESS ROAD
Project No. E0303B
Drilling Contractor/Rig Pitcher Drilling Co., FRASTE TRACKED RIG
Date of Drilling 12/16/03
Ground Surface Elev. 438.2' (437.7' TOC) **Logged By** DD
Hole Diameter 6"ø
Surface BARE SOIL & GRAVEL
Weather CLEAR, COLD

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
		ML	0.0'-1.0': GRAVELLY CLAYEY SILT; DARK YEL BRN (10 YR 4/2), GRAVELS UP TO 4", SUB-ANG TO SUB-ROUNDED, GRAVELS ~20%, DAMP, SLIGHTLY PLASTIC CLAYEY SILT.							DRILLER: MARK LOVDAHL OILER: JASON 8:25AM - START DRILLING w/ 6"ø CORE BARREL
2			1.0'-8.0': GRAVEL W/ CLAY; DK YEL BRN, GRAVELS UP TO 4", SUB-ROUND TO SUB-ANG. ~10% CLAY BINDER, LOTS OF RIG CHATTER.							8:40AM - SET 6"ø CASING DOWN TO 2.5' 8:50AM - DRILLING w/ 6" TRI CONE BIT
4		GP								7:40AM 12/17/03 FLUID LEVEL @ 13.8'
6										
			@7.5': LOTS OF RIG CHATTER.							
8			8.0'-71.5': CLAYEY GRAVEL; MOD YEL BRN (10YR 5/4), GRAVELS UP TO 3", SOME COARSE SAND (MAY BE GROUND UP COBBLES), MOST GRAVEL IS ~1"-2".							
10										9:11AM 9:20AM
12			RIG CHATTER @ 10.5' AND 13.0'.							SMOOTHER DRILLING
14								TC		9:29AM 9:32AM
16										
18		GC								
			@19.0': RIG CHATTER ON ~3" COBBLES							
20										9:41AM 9:46AM
			CUTTINGS: SOME CLAY BINDER IS DARK YELLOW ORANGE (10 YR 6/6) w/ COARSE SAND.							
22										RELATIVELY SMOOTH RUN
24										9:54AM 9:57AM
26			@26.0': RIG CHATTER ON SMALL COBBLES							
28			@28.0': RIG CHATTER ON SMALL COBBLES							
										10:06AM

UPPER GRAVEL
Braided Stream Deposits
TMQ 12/21/05

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303B **Date** 12/16/03 **Boring** CSA/SD3

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
			@31.0': RIG CHATTER ON 2"-3" COBBLES							10:10AM
32										
34			- RIG CHATTER ON 2" COBBLES @ 34.5'-35.0'							
								TC		10:20AM 10:24AM
36			36.0'-36.5': RIG CHATTER ON SMALL COBBLES							
38										
40			@40.0': RIG CHATTER							10:33AM 10:46AM R=47%
			@41.5": CLAYEY SANDY GRAVEL; MOD YEL BROWN, GRAVELS UP TO 3", ANG. TO SUB-ROUND, MED TO VY COARSE SANDS. GRAVEL 60%, SAND 30%, CLAY 10%, MED DENSE TO DENSE.	PB-1				PB	R= 14"/30'	ROUGH @ 15" IN ←SAMPLER END SLIGHTLY WORN DOWN
42										10:50AM HARD @ 41.5' 10:57AM BELOW IS TIGHT, SLOW DRILLING.
44										11:12AM 11:17AM
46		GC								DRILLER SAYS THIS HOLE IS TAKING A LITTLE WATER LIKE SD1; SD2 NOT SO MUCH WATER.
48										←SMOOTH RUN
										←BIT PLUGGED UP>
50										11:26AM 11:48AM
52								TC		
			@ 53.0': RIG CHATTER ON SMALL GRAVELS							
54										
										11:57AM @57.25' VW PIEZO 12:02PM S/N 78127
56										
SOFT ZONE			57.0'-57.5': SOFT ZONE; DRILL RATE SPED UP. BELOW IS STIFFER							DRILLER SAYS MORE SANDY @57.0'-57.5'
58										
60			@60.0': LOTS OF RIG CHATTER ON COBBLES							12:10PM 12:15PM
62										
			@ 63.5': RIG CHATTER ON COARSE COBBLES							

Braided Stream Deposits

UPPER GRAVEL

Project RMC Quarry/E0303B Date 12/16/03 Boring CSA/SB3

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
			-VERY COARSE DRILLING.							12:25 PM 12:29 PM
66		GC	65.0'-70.0': STILL IN COARSE SANDS & COBBLES W/ CLAY BINDER					TC		
68										
70		SM	69.5'-71.5': SILTY SANDIER, SOFT	PB-2				PB	R= 26"/30"	12:40 PM 12:50 PM 150 PSI, FIRST 20" SOFT STIFF, 420 PSI, HARD R=87%
72		CL	71.5'-74.0': SILTY CLAY; MOTTLED MOD YEL BRN AND DUSKY YEL (5Y6/4), STIFF-VERY STIFF, MOIST, HIGHLY PLASTIC, ROLLED TO 1/8".							1:00 PM 1:17 PM
74		GC	74.0'-99.5': CLAYEY SANDY GRAVEL; MOD YEL BRN, HIGHLY PLASTIC CLAY.							1:24 PM 1:26 PM
76			-CHATTERING ON SMALL COBBLES.							
78										
80			@ 80.0': RIG CHATTERING ON SMALL COBBLES							1:35 PM 1:40 PM
82										
84								TC		1:49 PM 87.25' VW PIEZO 1:54 PM S/N 78137
86										
88		SM/GC	87.0'-89.5': SANDIER, SMOOTH & FAST DRILLING, LESS CLAY							BELOW 87.0' DRILLING RATE PICKS UP DRILLER SAYS SANDIER
90			@ 90.0': CHATTERING ON SMALL COBBLES							1:58 PM 2:03 PM
92		GC	90.0'-95.0': MORE GRAVELLY							-RIG CHATTER THROUGH MOST OF RUN
94										2:12 PM 2:18 PM
96										
		SM								97.5': DRILLING RATE PICKS UP, SILTIER

~~UPPER GRAVEL~~ Braided Stream Deposits

"UPPER CLAY"

~~LOWER GRAVEL~~ Braided Stream Deposits

Sheet 3 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303B **Date** 12/16/03 **Boring** CSA/S03

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		SM	97.5'-99.5': SILTIER, SOFT - FASTER DRILLING					TC		99.5' VERY STIFF, 500PSI, CLAYSTONE 2:26PM END OF DAY
100			<u>99.5'-127.5'</u>: <u>SILTY CLAY W/CALICHE NODULES</u>; LT OL GRY (5Y5/2), SOFT-LOW HARDNESS, PLASTIC STRENGTH, WAXY (SEE 107.5) HARD CALICHE NODULES. 100.0'-102.5': CLAYEY SILT; MOTTLED MOD YEL BRN AND LT OL GRY, VERY STIFF TO HARD, MOIST, SOME CALCITIC CEMENT, MOD CEMENTED, UNIFORM TEXTURE.	PB-3				PB	8:00AM R= 25"/30" 8:11AM	7:40AM 12/17/03 CIRCULATE @ 100' BEFORE SAMPLING VERY TIGHT, HARD, SLOW R=83%
102										
104				PB-4				PB	R= 18.5"/30"	8:23AM R=62%
106			@105.0': SILTY CLAY W/ CALICHE NODULES; LT OL GRY, HIGHLY PLASTIC, WAXY, SOFT-LOW HARD, PLASTIC STRENGTH. CALICHE NODULES ARE HARD, STRONG. MICRO-CORNFLAKE SHEARS, SHINY AND VITREOUS. SAME @ 107.5'	PB-5				PB	22.5"/30"	8:52AM R=75% 9:07AM
108		CH	107.5'-110.0': SHEARED CLAY; DK GRN GRY (5GY4/1), VERY STIFF, MOIST, SOME CALCITIC CEMENT AND CALICHE NODULES IN LOWER PORTION OF SAMPLE, ABUNDANT SHINY, GLASSY, WAXY, WAVY SHEARS IN UPPER PORTION. LOWER PORTION HARDER AND LESS SHEARED.	PB6				PB	26.5"/36"	9:17AM TAKING A LITTLE BIT OF FLUID. R=88% 9:32AM
110										
112										
114										
116										
118			@117.5': RIG CHATTER ON SMALL GRAVELS, SILTY SANDY CLAY							
120			120.0'-124.0': CHANGE FROM LT OL GRY TO MOD YEL BRN					TC		
122										
124			@124': DRILLER SAYS VERY HARD							
126										
128			@127.5': BECOMES SANDIER, LT OL GRY CLAY IN CUTTINGS <u>127.5'-141.6'</u>: <u>INTERBEDDED SANDY SILT AND CLAY</u>; LT OL GRY, PLASTIC CLAY							DRILL RATE PICKS UP DRILLER SAYS THERE ARE INTERVALS WHERE DRILL RATE SPEEDS UP AND SLOWS DOWN (SANDY LAYERS)
130		ML/CL								

Braided Stream Deposits

Oxidized Lacustrine Clay

Unoxidized Lacustrine Clay (sheared)

Marl

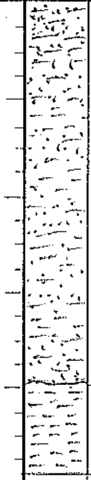
~~LOWER CLAY~~

Shallow Lacustrine Sand and Silt

Sheet 4 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303B **Date** 12/17/03 **Boring** CSA/SD3

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
134										137.25' VW PIEZO S/N 78141
136		ML/CL						TC		
138										
140		CL	@141.6': SILTY CLAY; DARK GRN GRY (5GY4/1), SOFT-LOW HARD, PLASTIC - MOD STRENGTH, NO FRACTURING, FRESH WEATHERING, VRY STIFF UNIFORM COLOR/TEXTURE, WAXY	PB-7				PB	R= 16"/20"	11:35AM R= 80%
142			TD @ 140.0' AND PITCHER BARREL SAMPLE TO 141.6'							△12:02PM 7:00PM - 2.75"Ø EPIC INCLINOMETER CASING SET TO 141.6' IN PB SAMPLE HOLE
144										CEMENT/BENTONITE GROUT MIX: FOR 50 GAL DRUM 45 GALS H_2O 3, 47lb BAGS CEMENT 1, 50lb BAG BENTONITE APPROXIMATELY 3.2 DRUMS NEEDED ~ 160 GALS 1/2.5/0.3 CEMENT/H_2O/BENTONITE RATIO BY WEIGHT
146										
148										
150										
152										
154										TOP OF CASING @ 437.7'
156										
158										
160										VIBRATING WIRE PIEZOMETERS: 57.25' S/N 78127 87.25' S/N 78137 137.25' S/N 78141
162										
164										

~~LOWER CLAY~~

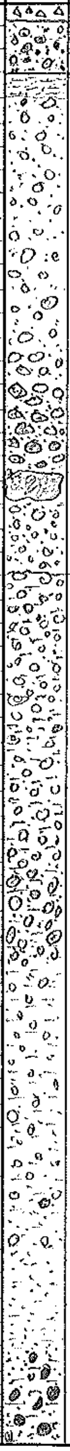
shallow Lacustrine Sand and Silt

Cotton, Shires & Associates, Inc.
Consulting Engineers and Geologists

Sheet 5 of 5

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD5
Location WEST SIDE OF LAKESIDE CIRCLE
Project No. E0303B
Drilling Contractor/Rig Pitcher Drilling Co., FAILING 1500 TRUCK MOUNT ROTARY WASH RIG
Date of Drilling 1/5/04
Ground Surface Elev. 449.7' (449.0' TOC) **Logged By** JD
Hole Diameter 6"
Surface ASPHALT CONCRETE
Weather CLEAR, COLD, BREEZY

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
2			0.0'-0.25': ASPHALTIC CONCRETE. 0.25'-1.5': LIME TREATED BASEROCK; SANDY GRAVEL, DARK GRAY, DRY, VERY DENSE, ANG TO SUB ANG GRAVEL .2" TO 0.75". FIZZES W/ HCL. 1.5'-12.0': SANDY GRAVEL W/CLAY; DARK ORANGE BROWN, MOIST TO WET, DENSE. 65% GRAVELS, SUB ANG TO SUB ROUND UP TO 6". 20% COARSE SAND, 15% CLAY, LOW PLASTICITY.					CB		DRILLER: RODGER HELPER: LEE 8:47AM - FLIGHT AUGER 6"Ø 9:00 AM - START DRILLING W/ 5"Ø TRI CONE
4								TC		HAMMER WEIGHT = 140lbs W/ 30" DROP 5"Ø CASING TO 19'
6		GP								
8				SS-1			9 29 34	SPT	12/18	9:17AM ROCK STUCK IN SHOE R = 67% 9:29AM
10										
12			12.0'-69.0': CLAYEY SANDY GRAVEL; MOD YEL BRN (10 YR 5/4), SUB-ANG TO SUB-ROUND COBBLES UP TO 2", COARSE ANG SAND, SILTY CLAY, MED DENSE, WET @14.0': COARSE SANDY GRAVEL CUTTINGS, SOME WELL-ROUNDED PEBBLES. DRILLER SAYS SOME CLAY BINDER IN LAST 2'.							
14								TC		@14' LOSING CIRCULATION SWICH TO 6"Ø TRI CONE @15' 10:00AM LOTS OF CUTTINGS IN MUD TUB 10:12AM DRILLING AGAIN LOTS OF RIG CHATTER
16										
18										10:25AM SETTING 6" CASING DOWN TO 19'. 10:50AM FINISHED 11:14AM
20				SS-2			10 21 28	SPT	12"/18	R = 67%
22		GC								
24								TC		LESS GRAVEL, MORE SAND W/ CLAY BINDER
26										
28			@30.5': CLAYEY SANDY GRAVEL; MOD YEL BROWN, 3" COBBLE BOTTOM OF SAMPLER, MED DENSE - LOOSE, MOIST, SUB ROUND GRAVEL (50%), COARSE SAND (35%), PLASTIC CLAY (15%)	PB-1				PB	30"/30	11:40AM SAMPLER END DENTED R = 100%

UPPER GRAVEL KLP 12/21/05

Braided Stream Deposits

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303B **Date** 1/5/04 **Boring** CSA/SDS

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
				PB-1				PB		11:55
32										
34								TC		
36										
38			38.0'-39.5': SAME AS ABOVE, VERY DENSE	SS-3			37 50(4.5")	SPT	12"/18"	12:11 PM R= 67% TIME OUT RIG PROBLEMS
40										12:38 PM DRILLING AGAIN
			@41.0': RIG CHATTER ON COBBLES							
42										
		GC								
44								TC		
46										
			@47.0': RIG CHATTER							
48			48.0'-50.5': SANDY GRAVEL W/ CLAY; MOD YEL BRN (CLAY), LOOSE TO MED DENSE, MOIST. SUB ANG TO SUB ROUND GRAVEL UP TO 3" (60%), COARSE ANG SAND (30%), CREAMY PLASTIC CLAY BINDER (10%)	PB-2				PB	29/30	12:53 PM R= 97% SAMPLE END DENTED
50										1:16 PM
52										
54			@54.0': RIG CHATTER ON SMALL COBBLES.					TC		
56										
58			@58.0': CLAYEY SANDY GRAVEL; MOD YEL BROWN, VERY DENSE, COARSE SAND, ANG TO SUB-ROUND COBBLES/PEBBLES UP TO 1" @59.0': GRINDING ON A BOULDER	SS-4			50/6	SPT	3"/18"	1:38 PM R= 17%
60										
62			. MORE SANDY					TC		

~~UPPER GRAVEL~~
Braided Stream Deposits

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303B **Date** 1/5/04 **Boring** CSA/SO5

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										65.55′ VW PIEZO S/N 78129
66		GC						TC		
68										2:20 PM 2:28 PM
			69.0′-82.5′: SILTY CLAY; MOTTLED MOD YEL BRN AND LT OL GRY, MOIST, VERY STIFF TO STIFF, UNIFORM TEXTURE, SOME DK YEL ORN MOTTLING. HIGHLY PLASTIC	PB-3				PB	30″/30′	R=100%
70								TC		2:32 PM 3:00 PM END OF DAY 7:53AM START DRILLING 1/5/04
72			71.0′-73.5′: CLAYEY SILT; MOTTLED DK YEL ORN (10 YR 6/6) AND YEL GRY (5Y7/2) w/ DSKY YEL BRN (10YR 2/2) SPECKS, VERY STIFF, MOIST, UNIFORM TEXTURE, MED PLASTICITY.	PB-4				PB	30″/30″	NEW HELPER: RANDY FLUID LEVEL DID NOT DRIP MUCH OVERNIGHT, DOWN AROUND 10′-12′ R=100% 8:08AM
74		ML/CL								
76								TC		SMOOTH DRILLING
78										8:32AM
				MC-1			23			
80			@80.0′: SILTY CLAY; MOTTLED LIMONITE STAINS AND DUSKY YEL w/ DARK SPECKS, VERY STIFF - HARD, MOIST, MED-HIGH PLASTICITY	MC-2			50(5.5″)	MC	12″/18	R=67%
				MC-3			☒			DRILLING W/ DRAG BIT
82			82.5′-100.25′: CLAYEY SANDY GRAVEL; MOD YEL BRN, DENSE - VY DENSE, WET, COURSE SAND, GRAVELS UP TO 1.5″, SUB-ROUND - SUB ANG.							82.5′: RIG CHATTER IN GRAVELS
84								DB		
86										
88										9:02AM
90		GC		SS-5			50(4″) ☒	SPT	6″/18″	R=33%
										DRILLING W/ TRI CONE
92								TC		
94										
96										
										9:27AM

UPPER GRAVEL
Braided Stream Deposits

"UPPER CLAY"

LOWER GRAVEL
Braided Stream Deposits

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303B **Date** 1/6/04 **Boring** CSA/SD5

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		GC	98.0'-100.5': SANDY GRAVEL w/ CLAY; MOD YEL BRN, MED DENSE, MOIST, SUB ANG GRAVEL UP TO 2.5" (50%), COARSE SUB ANG SAND (40%), CREAMY PLASTIC CLAY (10%). SILTY CLAY IN BOTTOM OF SAMPLER	PB-5				PB	16"/30"	9:37AM END OF SAMPLER DENTED R = 53%
100		CL	100.25'-103.0': SILTY CLAY; MOTTLED DK YELBRN, MOD YEL BRN, LT OL GRY, VY STIFF, MOIST. SOME BLACK SPECKS. UNIFORM TEXTURE.							9:40AM
102										
104		SC	103.0'-115.0': CLAYEY SAND W/GRAVEL; MOD YEL BRN, VERY DENSE, COARSE ANG SAND, SMALL SUB ANG GRAVEL, WET					TC		105.55' VW PIEZO S/N 78135 @106: TAKING A LITTLE WATER
106										
108										10:06AM
110				SS-6			50(5")	SPT	6"/18"	R = 33%
112										
114								TC		
116		CH	115.0'-118.0': CLAY; LT OL GRY (5Y 5/2) TO YEL GRY (5Y 7/2), STIFF TO VY STIFF, HIGHLY PLASTIC, WET, WAXY TEXTURE, MINOR SILT							@115': SLOW, SMOOTHER DRILLING, STIFF
118		ML	118.0'-138.0': CLAYEY SILT W/ SAND; YEL GRY BRN, VY STIFF, VF SAND, MOIST. (AS BELOW)	PB-6				PB	30"/30	10:59AM 11:07AM R=100% SAMPLER END DENTED @119: RIG CHATTER ON GRAVEL
120			@120.5': CLAYEY SILT W/ TRACE FINE SAND; YEL GRY BRN, VY STIFF, SLIGHTLY MOTTLED COLOR, WET-MOIST, SOME $CaCO_3$ CEMENT.							11:12AM
122			@123.0': SAME AS ABOVE; YEL GRY (5Y 7/2) TO DUSKY YEL (5Y 6/4). CALICHE NODULES. VERY STIFF, MOIST.	PB-7				PB	18"/30	R = 60% 11:35AM WATER TRIP 12:44PM
124										
126			@126.0' CUTTINGS: CLAYEY SILT w/ FINE SAND, YELLOW GRAY, HIGHLY PLASTIC.					TC		
128			@128.0' CUTTINGS: CLAYEY SILT W/ VY FINE SAND, MOD TO DARK YEL BRN (10 YR 4-5/2) SOFT AND SPONGY WHEN REMOLDED W/ THE FINGERS							
130										

Braided Stream Deposits

"upper" clay

LOWER GRAVEL

Braided Stream Deposits

Oxidized Lacustrine clay (?)

Unoxidized Lacustrine clay (sheared) (?)

LOWER CLAY

Marl (?)

Shallow Lacustrine Sand and Silt

Sheet 4 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303B **Date** 1/6/04 **Boring** CSA/505

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										SLOW BUT SMOOTH DRILLING
134										134': DRILL RATE PICKED UP A LITTLE
		ML						TC		1:24PM 135.55' VW PIEZO S/N 79139 1:27PM
136										136.5' - DRILL RATE SLOWER STIFF AGAIN.
138										1:31PM 1:41PM
140		SP	138.0' - 140.0': FINE - MED SAND, DARK YEL BRN (10 YR 4/2), LOOSE, WET, TRACE PEBBLES UP TO 1" AND SUB-ROUNDED,	PB-8				PB	12"/30"	R=40%
			TD @ 140.5' w/ 6"ø TRICONE							1:45PM PULL 5"ø CASING AND PUSH 6"ø TO 19' REAM HOLE W/ 6" TRICONE 3:15PM REAMED TO 55' 1/7/04 8:00AM CONTINUE REAMING W/ 6" TRICONE 9:30AM TD @ 140
142										
144										2.75"ø EPIC INCLINOMETER CASING SET TO 140.5'
146										
148									11:20AM	- NO DRILLING FLUID COMING OUT THE TOP OF THE CASING WHILE INSTALLING SI CASING
150										- CEMENT/BENTONITE GROUT MIX: - 45 GALS H_2O
152										- 3, 47 lb BAGS CEMENT - 1, 50 lb BAG BENTONITE
154										- APPROXIMATELY 4.25, 50 GAL DRUMS OF GROUT. - FLUID LEVEL DROPS BELOW TOP CASING AFTER EACH DRUM LOAD.
156										1:00PM. FINISHED GROUTING 1/2.5/0.3 CEMENT/ H_2O/ BENTONITE RATIO BY WEIGHT
158										TOP OF CASING @ 449.0'
160										VIBRATING WIRE PIEZOMETERS:
162										65.55' S/N 78129 105.55' S/N 78135
164										135.55' S/N 78139

Shallow Lacustrine Sand and Silt

LOWER ~~CLAY~~

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD9
Location NW END OF RMC ACCESS ROAD
Project No. E0303T
Drilling Contractor/Rig Pitcher Drilling Co., FRASTE TRACKED RIG
Date of Drilling 4/9/04
Ground Surface Elev. 433.7'(433.7'TOC) **Logged By** SD
Hole Diameter 6"ø TRI CONE
Surface BARE GRAVELLY SOIL
Weather FOG, COOL

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
2		GC	0.0'-5.5': CLAYEY SANDY GRAVEL; MOD YEL BRN, DRY, SUB ANG-SUB ROUND COBBLES UP TO 4"(IN GENERAL 2"), ANG-SUBANG COARSE SAND, CLAY BINDER STIFF TO VY STIFF.					CB		DRILLER: MARK HELPER: JASON 8:07AM START DRILLING W/ 6"ø CORE BARREL TO 2'.
4								TC		
6			GRINDING ON LARGE COBBLE, TIGHT -DK YEL BRN(10YR 4/6) CLAY SILT BINDER 5.5'-9.0': CLAYEY SILT; DK YEL BRN, MOD PLASTIC, NO SAND; GRAVEL, STIFF							8:43AM DRILLING W/ 5⅞"ø TRI CONE
8		CL/ML								
10			9.0'-60.0': CLAYEY SANDY GRAVEL; DK YEL BRN; COBBLES UP TO 4", COARSE SAND, STIFF TO VERY STIFF. -SILTY CLAY BINDER BECOMING MOD YEL BRN							9:05AM 9:14AM 9:15-9:54AM RIG PROBLEMS
12										
14			-LOTS OF RIG CHATTER ON COBBLES							
16										10:05AM 10:11AM
18										
20										10:27AM 10:47AM
22		GC								
24										
26			-LOTS OF CHATTER ON COBBLES							
28										11:14AM

~~UPPER GRAVEL~~ Braided Stream Deposits MD 12/2/05

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303T **Date** 4/9/04 **Boring** CSA/SD9

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
			LOTS OF RIG CHATTER							11:19AM
32										500PSI DOWNPRESSURE HARD DRILLING
34			-DK GRN GRY SILTY CLAY CHIPS MIXED IN w/ MOD YEL BRN CLAY IN CUTTINGS							11:40AM 11:44AM
36										
38										
40										11:56AM, 40.10' VW PIEZO S/N 78988
42										
44										
46		GC	-LITTLE SILTIER AND SANDY, DRILL RATE PICKS UP A LITTLE.							12:15PM 12:20PM
48			-LITTLE CHATTER							
50								TC		12:31PM 12:32PM
52										
54										12:54PM 12:56PM
56										
58										
60			60.0'-68.0': SANDY CLAYEY SILT; MOD YEL BRN, STIFF.							1:04PM
62		SM/ML								

~~UPPER GRAVEL~~ ? Braided Stream Deposits

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303T **Date** 4/9/04 **Boring** CSA/SD9

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		SM/ML								1:21 PM
66										
68			68.0'–90.0': CLAYEY SAND W/ VARYING AMOUNTS OF GRAVEL; MOD YEL BRN, VERY STIFF.							
70										1:36PM 7:10AM
72			@72.0': LITTLE CHATTER ON COBBLES							
74		SC/GC	MOSTLY CLAYEY SAND W/ GRAVELLY ZONES							7:24AM 7:27AM
76								TC		
78										
80										7:37AM 7:44AM 80.10' VW PIEZO S/N 78992
82										
84										7:51AM 7:56AM
86										
88										
90			@90.0': DRILLING FASTER, SMOOTHER. MORE SILTY, NO SAND & GRAVEL. MOD YEL BROWN.							8:05AM 8:12AM
92			@92.5': STIFFER DRILLING. 90.0'–98.0': CLAYEY SILT; MOD YEL BRN TO LT OL GRY, STIFF TO VERY STIFF.							
94		ML								
96										8:21AM 8:27AM

~~UPPER GRAVEL~~? Braided Stream Deposits

"UPPER CLAY"

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303T **Date** 4/12/04 **Boring** CSA/SD9

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
			98.0'-102.5: SILTY CLAY W/GRAVEL; MOD YEL BRN W/ LT OL GRY TINGE, STIFF TO VY STIFF							@98' GRINDING ON COBBLE
100		GC	- A FEW LT OL GRY CLAYEY CHIPS IN CUTTINGS, NO DK GRY CLAY, TIGHT							8:41AM 8:48AM
102			- BECOMES SLIGHTLY GRAVELLY FROM 102-104 DRILL RATE SPEEDS UP							
104			102.5'-113.5': CLAYEY SILT; MOD YEL BRN W/ TINGE OF LT OL GRY, VY STIFF.							9:02AM 9:08AM
106			FROM 106-108' DRILL RATE SPEEDS UP RAPIDLY, SANDY INTERVAL STILL MOD YEL BRN W/ TINGE OF LT OL GRY CLAY SILT/SILTY CLAY,							
108			@108.0' - STIFFER.					TC		
110		ML								9:19AM 9:32AM
112										
			113.5': LT OL GRY CLAYEY CHIPS MORE ABUNDANT IN CUTTINGS.							
114			113.5'-121.0': SILTY CLAY; LT OL GRY/BRN (5Y 5/2), VERY STIFF TO STIFF, ABUNDANT MICROSHEARS, PULVERIZED, CRUMBLES EASILY, HIGHLY PLASTIC, MOIST, SHINY SURFACES, UNIFORM COLOR							9:51AM 10:05AM
116		CL/CH		PB-1				PB	R=8"/30"	POOR RECOVERY END SLIGHTLY WORN NO DENT
118			@119.5': SAME AS ABOVE, BUT MORE PLASTIC AND LESS MICROSHEARS.	PB-2				PB	R=23.5'/24'	10:15AM 11:31AM END IN GREAT CONDITION
120				PB-3				PB	R=28/30	10:37AM 10:52AM END IN GREAT CONDITION
122			121.0'-135.0': SILTY CLAY W/ SAND; LT OL GRY, VERY STIFF, COARSE SAND <10%, TRACE 1/2" SUB ROUND PEBBLES <5%.	PB-4				PB	R=26"/24"	11:11AM 11:15AM
124			@123.5': COARSE, GRINDING ON CALICHE SILTY CLAY W/CALICHE; YEL GRY (5Y 7/2), MOIST, VERY STIFF TO HARD.							11:23AM DRIVE BEARING 12:30PM BLEW OFF. HARD DRILLING 720 PSI DOWN PRESSURE
126			ABUNDANT CALICHE, VERY HARD							
		CL								
128								TC		
130										12:42PM 12:48PM 130.10' VW PIEZO S/N 78998

LOWER GRAVEL

Braided Stream Deposits

Shallow Lacustrine Silt & Sand(?) or Oxidized Lacustrine Clay (?)

LOWER CLAY

Unoxidized Lacustrine Clay (sheared)

Marl

Project RMC Quarry/E0303T **Date** 4/12/04 **Boring** CSA/SD9

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
134		CL	SILTY CLAY BECOMING MOD YEL BRN w/ TRACE COBBLES OR PEBBLES.					TC		
136			TD @ 135' w/ 6"ø TRI CONE							1:07PM 2:05PM SET 2.75"ø QUICK CONNECT SLOPE INCLINOMETER CASING TO 135'. GLUED @ JOINTS w/ ABS CEMENT. 2:15PM. RIG WON'T STAY RUNNING WHILE MIXING GROUT.
138										
140										CEMENT/BENTONITE GROUT MIX: 1/2.5/0.3 CEMENT/H_2O/BENTONITE RATIO BY WEIGHT
142										FOR A 50-GAL DRUM: -45 GALS H_2O -3, 47-lb BAGS CEMENT
144										-1, 50-lb BAG BENT. 3 DRUMS NEEDED
146										TOP OF CASING @ 433.7'
148										
150										
152										
154										
156										
158										VIBRATING WIRE PIEZOMETERS @: 40.10' S/N 78988 80,10' S/N 78992
160										130,10' S/N 78998
162										
164										

LOWER CLAY

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD12
Location SOUTH SIDE OF LAKE "A", UPPER BENCH
Project No. E0134G
Drilling Contractor/Rig ResonantSonic Int., BARBER 116 RIG W/ INTERNATIONAL MOUNT
Date of Drilling 7/19/04
Ground Surface Elev. 432.6' (437.0' TOC) **Logged By** JD
Hole Diameter 4"Ø CORE W/ 6"Ø CASING
Surface BARE GRAVELLY SOIL
Weather CLEAR, BREEZY, MILD

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
			<u>0.0'–14.0'</u>: <u>SANDY GRAVEL W/ CLAY</u>; DK YEL BRN (10YR 4/2) TO DSKY YEL BRN (10 YR 2/2), DRY TO DAMP, MED DENSE. SUB ANG TO SUB ROUND GRAVEL UP TO 4", GENERALLY 1"–2" (~60%); COARSE SUB ANG SAND (~30%), CLAY & FINES (<10%).							DRILLER: SHAWN HELPERS: SIMON & MARCO 10:03AM START DRILLING
2										1M RUN MATERIAL IS DRY, EXTRUDED INTO CLEAR PLASTIC BAG SONIC CORING
4		GW/GC								HOLE CAVING TO 8'
				CB-1					RUN 1 TO 8'	10:35AM START WASHING IN 6"Ø CASING
6										11:35AM SETTING UP MUD TUB
				CB-2						
8										10:12 AM CORED TO 5' 10:17 AM 12:10PM DRILLING AGAIN
10										
12										
14			<u>14.0'–42.5'</u>: <u>CLAYEY SANDY GRAVEL</u>; MOD YEL BRN (10 YR 5/4) TO DK YEL BRN (10YR 4/2), DAMP TO MOIST, MED DENSE. SUB ANG TO SUB ROUND GRAVELS (60%), COARSE SAND (25%), CREAMY PLASTIC CLAY BINDER (15%).	CB-3				SC		
16									RUN 2 TO 19'	
				CB-4						12:20PM WASHING DOWN CASING
18										12:15PM 12:25PM CASING@19' 12:39PM CORING 12:50PM CASING
				CB-5						
20										
		GC		CB-6						
22										
				CB-7					RUN 3 TO 28'	
24										
			@25.0': MORE SILTY CLAY (30%), GRAVEL (55%), SAND (15%), MORE COHESIVE. VERY STIFF (DENSE), DAMP	CB-8						
26										
				CB-9						
28										12:45PM (12:57PM) 1:00PM CORING

~~UPPER GRAVELS~~ Braided Stream Deposits THD 12/22/05

Project RMC Quarry/E0134G **Date** 7/20/04 **Boring** CSA/SD12

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
			30.0'-33.0': LOOSE TO MED DENSE, LESS CLAY, LESS COHESIVE.							7:50AM 7/21/04 CASING DAY 2
32				CB-10					RUN 4 TO 37'	
			@ 33.0': MORE COHESIVE AND CLAY RICH, VY STIFF, MOIST							
34										
		GC								
36				CB-11						HITTING BOULDER
										1:30PM CORED RIG PROBLEMS 3:15PM END DAY 1 @ 37'
38										
40										
42				CB-12						
			<u>42.5'-52.5'</u>: <u>CLAYEY SILT</u>; MOTTLED MOD YEL BRN (10 YR 5/4), DUSKY YEL (5 Y6/4) AND MOD PD BRN (10YR 4/6); MOIST, VY STIFF TO HARD, MED PLASTICITY, TRACE ½"-1" SUB ROUND GRAVEL. MOTTLED TEXTURE/COLOR.							
44										
46				CB-13						
								SC	RUNS TO 56'	
48		ML								
50			52.5'-53.0': GRADATIONAL CONTACT TO CLAYEY SANDY GRAVEL.	CB-14						
52										
			<u>52.5'-78.0'</u>: <u>CLAYEY SANDY GRAVEL</u>; MOD YEL BRN (10YR5/4) TO MOD RD BRN, MOIST, DENSE TO VY DENSE. SUB ANG TO SUB ROUND GRAVEL UP TO 3" GENERALLY ~1" (60%), COARSE ANG SAND (25%), SILTY CLAY BINDER (~15%).							
54		GC		CB-15						
56										
58										
60				CB-16					RUN 6 TO 78'	
62										
				CB-17						

~~UPPER GRAVELS~~ Braided Stream Deposits

"UPPER CLAY"

~~LOWER GRAVELS~~ Braided Stream Deposits

Sheet 2 of 5

Project RMC Quarry/E0134G **Date** 7/20/04 **Boring** CSA/SD12

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
				CB-17						@66.22' VW PIEZO S/N 79631
66										
68				CB-18						
		GC	69.0'-70.0': DAMP TO DRY							
70									RUN 6	
72				CB-19						
74										
76				CB-20						
78		SP	78.0'-81.0': SAND; MOD TO DARK YEL BRN (10 YR 5/4 - 4/2), MOIST, VERY LOOSE, POORLY GRADED, NO FINES, ANG-SUB ANG, NO CEMENTATION, GRADATIONAL INTO CLAYEY SANDY GRAVEL, WELL SORTED							10:25 AM 20' CORING RUN 11:15 AM RIG PROBLEMS 11:25AM WASHING DOWN CASING 12:13PM ATTACHED ANOTHER 10' SECTION OF CASING
80				CB-21				SC		12:20PM LUNCH BREAK 1:00PM LUNCH BREAK OVER
82			81.0'-109.0': CLAYEY SANDY GRAVEL; MOD YEL BRN (10 YR 5/4) TO MOD RD BRN (10 R 4/6), MOIST, MED DENSE TO DENSE, SUB ANG TO SUB ROUND GRAVELS 1"-3" (60%), COARSE ANG SAND (25%), MOD-HIGHLY PLASTIC CLAY BINDER (15%).							2:00PM PULLING UP CORE RIG KEEPS QUITTING 9:05AM 7/21/04 DRILLERS DAY 3 PUT ON NEW CASING SHOE AND WASH DOWN TO 110'
84				CB-22						
86										
88		GC		CB-23					RUN 7	
90										
92				CB-24						
94			94.0'-98.0': LOOSE TO MED. DENSE							4:00PM - PULLING 6" CASING OUT TO PUT A DIFFERENT SHOE ON. RIG HAVING PROBLEMS END DAY 2
96				CB-25						11:00AM FIXING RIG CORED AND WASHING 3:05PM CASING DOWN

Braided ~~LOWER GRAVELS~~ Stream Deposits

Project RMC Quarry/E0134G **Date** 7/21/04 **Boring** CSA/SD12

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										12:55PM CORING DRILLER SAYS ON LAST RUN HE PUSHED PAST 98' TO 108'
100										
102		GC								
104										@106.22' VW PIEZO S/N 79632
106										
108										
110		CL/ML	109.0'–115.0': SILTY CLAY; MOTTLED OR STRIPED LT OL GRY (5Y 5/2) AND MOD YEL BRN (10 YR 5/4), MOIST, STIFF TO VERY STIFF, MED TO HIGH PLASTICITY, UNIFORM TEXTURE, TRACE PEBBLES UP TO 1/2". UNIT GRADES INTO UNIFORMLY COLORED CLAY BELOW.	CB-26						
112										
114			@114.0': LAMINATED OXIDIZED/UNOXIDIZED CLAY	CB-27						
GRADATIONAL CONTACT			115.0'–122.0': CLAY W/CALICHE NODULES; LT OL GRY (5Y 5/2) TO LT BRN GRY, MOIST, VERY STIFF TO HARD, HIGH PLASTICITY, ABUNDANT CARBONATE NODULES UP TO 2" (15%) BELOW 118.0', MANY SHINY, WAXY, WAVY SURFACES WHEN SAMPLE IS BROKEN APART, SOME SURROUND CARBONATE NODULES. NONE APPEAR TO BE THROUGH GOING. UNIT GRADES INTO SLIGHTLY MOTTLED/LAMINATED SILTY CLAY BELOW.							1:32PM WHILE WASHING DOWN CASING, DRILL RATE SPEEDS UP MARKEDLY AROUND 117'.
116								SC		
118		CH		CB-28					RUN 8	
120										
GRADATIONAL CONTACT 122		CL	122.0'–128.0': SILTY CLAY; SLIGHTLY MOTTLED MOD YEL BRN (10 YR 5/4) W/DK YEL ORN (10 YR 6/6) SPECKS, MOIST, VERY STIFF, MED TO HIGH PLASTICITY, TRACE PEBBLES UP TO 1/2", TRACE MED TO FINE SAND, FEATHERING OF CARBONATES.	CB-29						
124										
126				CB-30						
128			128.0'–133.0': CLAYEY SANDY GRAVEL; DK YEL BRN (10 YR 4/2), MOIST, MED DENSE, SUB ANG TO SUB ROUND GRAVEL UP TO 2" (50%), COARSE ANG SAND (30%), PLASTIC CLAY BINDER (20%).							1:11PM CORED TO 128' 1:30PM RIG PROBLEMS AGAIN 1:00PM 7/22/04 DAY 4 RIG FIXED? WASHING CASING 2:00PM–2:45PM AIR COMPRESSOR PROBLEMS. 2:50PM CORE OUT OF HOLE@129'
130		GC		CB-31					RUN 9	

Braided Stream Deposits

~~LOWER GRAVELS~~

Oxidized Lacustrine Clay

Unoxidized Lacustrine clay (locally sheared)

~~LOWER CLAY~~

Lacustrine Clay and Silt

Braided Stream Deposits (?)

Project RMC Quarry/E0134G **Date** 7/22/04 **Boring** CSA/SD12

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		GC								
			133.0'-150.0': CLAYEY SILT; STRIATED MOD AND DK YEL BRN (10 YR 5/4 AND 4/2), MOIST, VERY STIFF, FINELY LAMINATED (<1 mm), WAVY, SMOOTH UNIFORM TEXTURE.							
134				CB-32						
										@136.22' VW PIEZO S/N 79638
136										
									RUN 9	
138				CB-33						
140		ML/CL						SC		4:00 PM - CORED TO 140' 6:00 PM - 128'-140' CORE OUT OF HOLE
142										
144										
146										
148										
150			TD @ 150', SAMPLED W/ 4"ϕ CORE BARREL TO 140' AND CASED W/ 6"ϕ CASING TO 150'.							DATE 7/23/04 7:30-9:00 - INSTALLED SI w/ 3 VW PIEZOS 9:00-9:30 A.M. MIXED AND PUMPED 1 DRUM OF GROUT 2.75"ϕ QC SLOPE INCLINOMETER SET TO 150' TOP OF CASING @ 432.0'
152										
154										PER 50-GAL DRUM MIX: 45 GALS H_2O 3, 47-lb BAGS CEMENT 1, 50-lb BAG BENTONITE
156										CEMENT/BENTONITE GROUT MIX: 1/2.5/0.3 CEMENT/H_2O/BENTONITE RATIO BY WEIGHT
158										PUMPED ~200 GALS PULLED 6"ϕ CASING AND PUMPED ANOTHER 100 GALS OF GROUT
160										
162										VIBRATING WIRE PIEZOMETERS:
164										66.22' S/N 79631 106.22' S/N 79632 136.22' S/N 79638

LOWER ~~CLAY~~

Braided Stream Deposits (?)

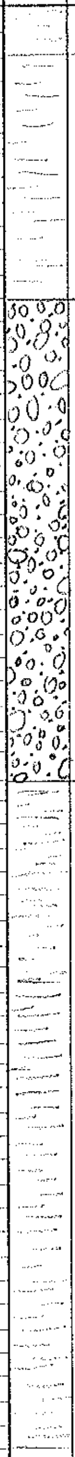
Lacustrine Clay

Sheet 5 of 5

Project RMC E0134 Date 7/22/04 Boring No. SD-12

Abundant Carbonate

Contact Not recovered



Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
125		CH	124 - 125.4 CLAY with SILT Olive Brown 2.5Y 4/4, dry,	T						
126			very stiff, high plasticity, abundant carbonate nodules to 1.5"							
127		CH	125.4 - 128' SILTY CLAY: Yellowish Brown (10YR 5/6), dry, very stiff, moderate							
128			to high plasticity, local carbonate filaments, local pebbles (<5%)							
129			128' - 133' SANDY GRAVEL with Clay: Light Olive Brown	Bx #						
130			(2.5Y 5/4), damp to dry, dense; approx. 50% subrounded							
131		GC	to subangular gravel to 2", 35% very coarse to medium sand, 15% clay+silt							
132			@ 133' sharp contact	Bx #						
133			133' - 140' CLAY with SILT Olive Brown (2.5Y 4/4), damp,							
134		CH	very stiff, high plasticity, laminated, laminations are locally contorted							
135			Dark Grayish Brown (2.5Y 4/2) locally, isolated subrounded to rounded pebbles to ¼"							Well Developed lamination
136										
137			@ 137.4' - 138.9' minor carbonate filaments	Box #						
138										
139										
140										TD=140'

Clay & Silt

Lacustrine

Braided Stream Deposits

Lacustrine Clay

Sheet of

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC E0134 H Date 7/22/04 Boring No. SD-12

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
~~108~~										
109 110 111 112 113		CL	109 - 114.0' SILTY CLAY mostly oxidized to Yellowish Brown (10YR 5/8) and strong Brown 2.5 YR 5/8 with local mottling of Pale Olive (5Y 6/3), slightly damp to dry, very stiff, low to moderate plasticity, massive, local lamination, overconsolidated @ 111.4 color change to Light Olive Brown (2.5Y 5/4)							
114 115 116 118 120		CH	@ 114' Grades to lower silt content 114 - 121.2' CLAY with SILT mostly oxidized to Yellowish Brown (10YR 5/6), laminated with lt. Olive Gray (5Y 6/2), damp, very stiff, moderate to high plasticity, color laminated, overconsolidated @ 115.7 - 116' Numerous weakly polished surfaces @ 116' color change to Light Olive Gray (5Y 6/2) with minor local oxidation to Yellowish Brown, high plasticity, local carbonate filaments, local weakly polished surfaces @ 117.6' color change to lt. Olive Brown (2.5Y 5/3) @ 118' carbonate nodules to 2"; local moderately polished surfaces around the carbonate nodules							
122		ML	@ 121.2' Grades to lower clay content 121.2 - 124 CLAYEY SILT with trace SAND Yellowish Brown (10YR 5/4) locally oxidized to Yellowish Red (5YR 4/6) slightly damp to dry, very stiff, low plasticity @ 123.1 to 124 small carbonate nodules & filaments							
124 125		CH								

Oxidized Lacustrine Clay

Unoxidized Lacustrine Clay (locally sheared)

Lacustrine Clay and Silt

carbonate Nodules

Abundant Carbonate

Sheet of

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD17
Location SW CORNER OF TRAVISO CIRCLE
Project No. E0134G
Drilling Contractor/Rig PITCHER DRILLING, CO., FAILING 1500 TRUCK MOUNT, ROTARY WASH RIG
Date of Drilling 8/16/04
Ground Surface Elev. 457.0' (456.1' TOC) **Logged By** JD
Hole Diameter 6"ø
Surface ASPHALTIC CONCRETE
Weather CLEAR, WARM, CALM

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
		AC	0.0'-0.35': ASPHALTIC CONCRETE SLAB.					CB		DRILLER: ROGER
			0.35'-70.0': CLAYEY SANDY GRAVEL; MOD YEL BRN (10 YR 5/4), DRY TO DAMP, MED DENSE, SUB ANG TO SUB ROUND GRAVEL UP TO 4" (60%), COARSE ANG SAND (25%), CLAY BINDER (15%).							HELPER: PAUL 8:12 AM - START DRILLING W/ 14"ø CORE BARREL 8:26 AM - SWITCH TO 6"ø CORE BARREL 8:40 AM - INSTALLED 6"ø CONDUCTOR CASING. 8:52 AM - DRILLING W/ 4 7/8" TRI CONE BIT
2										
4								TC		
6										
				[illegible]						
8										
10										
12										
14										
		GC								9:14 AM @ 15.5'
16										
18										9:24 AM @ 18.0'
20				[illegible]						9:25 AM @ 20.0'
22										9:27 AM @ 22.0'
24			@ 24.0': RIG CHATTER ON GRAVELS							9:30 AM @ 24.0'
										9:32 AM @ 25.5'
26										9:36 AM @ 26.0'
28				[illegible]						9:39 AM @ 28.0'
			@ 29.5': RIG CHATTER ON GRAVELS							9:42 AM @ 30.0'

~~UPPER GRAVEL~~ TWD 12/22/05

Braided Stream Deposits

Project RMC Quarry/E0134G **Date** 8/16/04 **Boring** CSA/SD17

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
32										9:45AM @ 32.0'
				R003				TC		
34										9:47 Am @ 34.0'
										9:48 Am @ 35.5'
36										9:51 Am @ 36.0'
38										9:54 Am @ 38.0'
			@39.0': RIG CHATTER ON GRAVELS	R004						
40										9:59 Am @ 40.0'
			@41.5': LITTLE CHATTER.							
42										10:02 Am @ 42.0'
44										10:05 Am @ 44.0'
			@45.0': LOTS OF CHATTER ON GRAVELS							10:07 Am @ 45.5'
46										10:11 Am @ 46.0'
48		GC								10:14 Am @ 48.0'
				R005						
50										10:16 Am @ 50.0'
52										10:19 Am @ 52.0'
54										10:21 Am @ 54.0'
										10:23 Am @ 55.5'
56										10:26 Am @ 56.0
58										10:29 Am @ 58.0'
				R006						
60										10:31 Am @ 60.0'
62			62.0'-63.0': LITTLE CHATTER ON GRAVELS							10:34 Am @ 62.0'
										10:36 Am @ 64.0'

~~UPPER GRAVEL~~
Braided Stream Deposits

Sheet 2 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0134G **Date** 8/16/04 **Boring** CSA/SD17

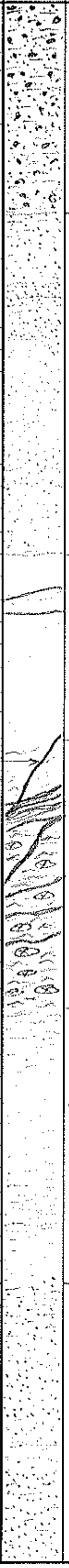
Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
66	GC		RUN6						VW PIEZO: S/N 79629 @ 66.35' 10:38AM @ 65.5' 10:50AM @ 66.0'
68		CONTACT UNCERTAIN	RUN 7				TC		10:53AM @ 68.0' 10:56AM @ 70.0'
70 72	ML/CL	70.0'-74.0': CLAYEY SILT; MOTTLED DK YEL ORN (10 YR 6/6) AND YEL GRY (5 Y 7/2) W/ DUSKY BRN ORGANIC SPECKS, MOIST, VERY STIFF, MOD TO HIGHLY PLASTIC.	PB-1A				PB	24"/30"	11:07AM START RUN, PLUGGED 11:20AM START RUN AGAIN 11:24AM END RUN
			PB-1B				PB	18"/18"	11:40AM END RUN
74	GC	74.0'-76.0': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, MED DENSE.	PB-1C				PB	9"/24"	11:59AM END RUN
76 78	ML/CL	76.0'-80.5': CLAYEY SILT; MOTTLED DK YEL ORN (10 YR 6/6) AND YEL GRY (5Y7/2) W/ DUSKY BRN ORGANIC SPECKS, MOIST, VERY STIFF TO STIFF, HIGHLY PLASTIC.	PB-1D				PB	30"/30"	12:12AM END RUN
80		BELOW 79.0': FINE SANDY SILT, SAME MOTTLED COLOR AS ABOVE, FIRM.	PB-1E				PB	30"/30"	
	GC	SHARP CONTACT, WAVY 80.5'-102.5': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, MED DENSE TO DENSE, SUB ANG TO SUB ROUND GRAVELS GENERALLY <0.5", UP TO 3" (50%), VERY COARSE ANG SAND (40%), CREAMY CLAY BINDER (10%).	PB-2A						12:28PM END RUN
82			PB-2B				PB	24"/30"	12:40PM END RUN
84			PB-2C				PB	18"/18"	12:52PM END RUN
86			PB-2D				PB	24"/30"	1:05PM END RUN
88			PB-2E				PB	6"/30"	1:18PM END RUN
90 92		89.5'-90.5': VF SANDY SILT; MOD YEL BRN, MOIST, FIRM TO STIFF (SLIGHTLY SPONGY), SLIGHTLY MOTTLED LT OL GRY 90.5' AND BELOW: GRAVELLY SAND W/CLAY, LOOSE TO MED DENSE.	PB-3A				PB	24"/30"	1:28PM END RUN
94			PB-3B				PB	18"/30"	1:40PM END RUN
96			PB-3C				PB	18"/30"	VW PIEZO: S/N 79634 @ 96.35' 1:52PM END RUN
			PB-3D				PB		

Braided Stream Deposits
~~UPPER GRAVEL~~

"UPPER CLAY"

~~LOWER GRAVEL~~
Braided Stream Deposits

Project RMC Quarry/E0134G **Date** 8/16/04 **Boring** CSA/SD17

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
100				PB-3D				PB	6"/30"	2:08PM END RUN
102				PB-4A				PB	6"/30"	2:30PM END RUN, 2:40PM END DAY 1
104		ML/SM	102.5'-110.0': INTERBEDDED CLAYEY SILT AND FINE SAND; MOTTLED MOD YEL BRN, YEL GRY AND DARK YEL ORN W/ LOCAL DUSKY BRN SPECKS, MOIST, VERY STIFF TO DENSE, FINELY LAMINATED CLAYEY SILTS, WAVY. SAND LAYERS VARY FROM <1" TO 6" THICK.	PB-4B				PB	30"/30"	7:27AM DAY 2 CIRCULATE ON BOTTOM W/ [illegible] CORE 7:5?AM START RUN 7:57AM END RUN
106				PB-4C				PB	30"/30"	8:02AM START RUN [illegible] 8:13AM END RUN
108				PB-4D				PB	24"/30"	8:26AM END RUN
110 112		CL	110.0'-114.0': SILTY CLAY; DARK GRN GRY (5 GY 4/1), MOIST TO DAMP, VERY STIFF TO HARD, OCCASSIONAL CALICHE NODULES AND CARBONATE FEATHERING, SPARSE GASTROPOD AND MOLLUSK SHELL FRAGMENTS, SPARSE BLACK ORGANIC FRAGMENTS. @ 111': 2 THROUGH GOING PLANAR, SMOOTH, STRIATED PARTING SURFACES.	PB-5A				PB	29"/30"	8:48AM END RUN
114			114.0'-120.0': SHEARED CLAY; DK GRN GRY (5 GY 4/1 TO 5G 4/1), MOIST, VERY STIFF, HIGHLY PLASTIC/ABUNDANT 20° TO 30° DIPPING, THROUGH GOING, STRIATED SHEARS, PLANAR, PAPER THIN; WAVY TEXTURE. BELOW 116': MORE CALICHE NODULES, ABUNDANT CORNFLAKE SHEARS AND SHINY SHEARS SURROUNDING CALICHE NODULES. @ 114'-115': 80° HIGH ANGLE SHEAR, STRIATIONS RAKE 20°, PLANAR. ANOTHER @ 116'-117'.	PB-5B				PB	29"/30"	9:00AM END RUN
116		CH		PB-5C				PB	30"/30"	9:17AM END RUN ~115.6' RIG CHANGE
118				PB-5D				PB	24"/30"	9:30AM END RUN
120 122		CL/CH	120.0'-126.0': SILTY CLAY; LT OL GRY (5 Y 5/2) TO YEL GRY (5 Y 7/2), MOIST TO WET, FIRM TO SOFT, HIGHLY PLASTIC, ABUNDANT CARBONATE MOTTLING. 120.0-121.5': SOFT AND PLIABLE, 122-124 AS WELL.	PB-6A				PB	30"/30"	9:54AM END RUN CUT 2.5" OFF END OF TUBE.
124				PB-6B				PB	30"/30"	10:16AM END RUN
126		ML/SM	126.0'-140.0': CLAYEY SILT W/ FINE SAND; MOTTLED LT OL GRY AND DARK YEL ORN W/ SPARSE DUSKY BRN SPECKS, MOIST, VERY STIFF TO DENSE, GRADES FROM SILT TO SAND DOWNWARD, NO CARBONATE NODULES BELOW 127.0'.	PB-6C				PB	20"/30"	10:30AM END RUN
128 130				PB-6D				PB	27.5"/30"	10:48AM END RUN START REAMING W/ 5 7/8" TRI CONE BIT
								TC		

Braided Stream Deposits

~~LOW~~ LOWER GRAVEL

Oxidized Lacustrine Silt and Sand

Unoxidized Lacustrine Clay (Sheared)

LOWER CLAY

Marl (?)

Shallow Lacustrine Sand and Silt

Project RMC Quarry/E0134G **Date** 8/17/04 **Boring** CSA/SD17

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
134										VW PIEZO: S/N 79643 @ 136.35'
136			CUTTINGS: CLAYEY SILT W/ VF SAND; MOTTLED LT OL GRAY AND MOD YEL BRN TO DK YELLOW, MOD TO HIGHLY PLASTIC, VERY STIFF TO STIFF					TC		
138										
140			TD @ 140.0'							1:11PM @ 140.0' 2:15PM 2.75" φ SLOPE INCLINOMETER CASING SET TO 140' W/ ABS GLUED JOINTS. 2:45PM - 1st DRUM OF GROUT PUMPED, W/ NO FLUID RETURN 2:59PM - 2nd DRUM OF GROUT PUMPED W/ NO FLUID RETURN 3:10PM - 3rd DRUM OF GROUT PUMPED, W/ NO FLUID RETURN 3:23PM - 4th 2/3 FULL DRUM OF GROUT, NO FLUID RETURN. 3:33PM - 5th 2/3 DRUM, GROUT UP TO TOP OF CASING, THEN DROPPED DOWN 8' PUMPED ~216 GALS GROUT
148										CEMENT/BENTONITE GROUT MIX: 3, 47-lb BAGS CEMENT 1, 50-lb BAG BENTONITE 45-GALS H_2O 1/2.5/0.3 CEMENT/H_2O/BENTONITE
154										TOP OF CASING @ 456.1'
156										
158										
160										
162										VIBRATING WIRE PIEZOMETERS: 66.35' S/N 79629 96.35' S/N 79634 136.35' S/N 79643
164										

LOWER CLAY

Shallow Lacustrine Sand and Silt

Sheet 5 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD19
Location EAST LIMB OF LAKESIDE CIRCLE NEAR OLD OAK RD
Project No. E02845
Drilling Contractor/Rig GREGG DRILLING, B-80 MUD ROTARY RIG
Date of Drilling 1/6/05
Ground Surface Elev. ~448.5'
Logged By JD
Hole Diameter 6¾"ϕ TRI CONE BIT
Surface ASPHALTIC CONCRETE ROADWAY
Weather CLOUDY, COOL, RAIN THREATENING

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
		AC	0.0'-0.3': ASPHALTIC CONCRETE							DRILLER: CHRIS ST. PIERRE
		BS	0.3'-1.5': BASEROCK							HELPERS: JOE, JASON
2			1.5'-25.0': SANDY GRAVEL W/CLAY; MOD YEL BRN, DENSE, ANG-SUBANG COBBLES UP TO 3", GENERALLY 1" (60%), COARSE ANG SAND (30%), (10%) CLAY (PLASTIC) BINDER.							2:28PM: START DRILLING W/ 6¾"ϕ TRI CONE BIT USING 4½" O.D. DRILL STRING RATHER THAN 2½" O.D. ON SD18
4										@5.0': GRINDING ON BOULDER
6										VIGOROUS CHATTERING ON COBBLES THROUGHOUT ENTIRE RUN
8				RUN 1						
10										
12		GP								
14								TC		3:15PM @15' CIRCULATING 3:53PM DRILLING
16										
18										
20										4:00PM @20' END DAY 1 7:45AM DRILLING DAY 2
22				RUN 2						
24										
26		GC	25.0'-69.0': CLAYEY SANDY GRAVEL; MOD YEL BROWN, DENSE, SUBANG-SUB RND COBBLES UP TO 3" (50%), COARSE ANG SAND (30%), CLAY BINDER (CREAMY, 20%)							@25': SMOOTHS OUT, THEN CHATTERING AGAIN CLAY BINDER IN CUTTINGS
28										
										8:05AM @30' CIRCULATING

~~UPPER GRAVEL~~
Braided Stream Deposits

Project RMC Quarry/E0284J **Date** 1/7/05 **Boring** CSA/SD19

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										8:15AM DRILLING
32										VIGOROUS CHATTER THROUGHOUT ENTIRE RUN
34										
36										
		GC		RUN3						
38										
40										
42										
44										
								TC		8:33AM @ 45' CIRCULATING 8:47AM DRILLING
46										FIRST FIVE FEET LOTS OF CHATTER LAST TEN FEET SMOOTHER LESS CHATTER
48										
50			@50.0' AND BELOW; LESS CHATTER, DRILLING SMOOTHER							
52				RUN4						
54										
56										
58			@60.0': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, DENSE, ¼-1" GRAVEL (50%), COARSE SAND (30%), PLASTIC CLAY BINDER (20%).	PA-1				PB	R=17"/24"	8:59AM @58' CIRCULATING 9:55AM START RUN LOST RETURN FLOW @ START OF RUN FAN WIEN AND GROUTING 9:59AM END RUN 10:26AM DRILLING
60										
62				RUN5				TC		CONSTANT RIG CHATTER

~~UPPER GRAVEL~~ Braided Stream Deposits

Sheet 2 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E02845 **Date** 1/7/05 **Boring** CSA/SA19

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										RIG CHATTER ON COBBLES
66		GC								
68										
			69.0'-78.0'; CLAYEY SILT; MOTTLED LT OL GRY AND MOD YEL BRN, STIFF TO VERY STIFF, MOD PLASTIC.							
70				RUN 5						@69.0' AND BELOW QUIET, SMOOTH, NO CHATTER, RATE SLOWS A LITTLE
		ML/CL								
72										
74										10:09AM CIRCULATING 11:00 AM DRILLING
76								TC		
78			78.0'-100.0'; CLAYEY SANDY GRAVEL; MOD YEL BRN, DENSE TO VERY DENSE, GRAVELS 1/4" TO 2", SUB ANG TO SUB RND (50%), COARSE TO VERY COARSE SAND (30%), PLASTIC CLAY BINDER (20%).							@78': RIG CHATTERING ON GRAVELS AGAIN
80										
				RUN 6						
82		GC								
84										
86										
			RATE PICKS UP AND SLOWS AGAIN							SWITCHING FROM 4 1/4" STEM TO 2.5" STEM FOR SAMPLING
88			@90.0': CLAYEY SANDY GRAVEL							11:09AM @88' CIRCULATING 12:05PM START RUN
				PB-2				PB	R=13"/24"	RIG CHATTERING THRU RUN SPED UP THRU MIDDLE AND SLOWED AGAIN
90			@92.5': CLAYEY SANDY GRAVEL							12:10PM END RUN 12:20PM
				PB-3				PB	R=14"/30"	RIG CHATTERING THRU MOST OF RUN, SPED UP END WORN EVENLY
92			@95.0': CLAYEY SANDY GRAVEL							12:29PM 12:35PM
94				PB-4				PB	R=22"/30"	CHATTERING THRU RUN ROCK STUCK IN END BADLY WORN
			@97.5': CLAYEY SANDY GRAVEL							12:40PM 12:50PM
96				PB-5				PB	R=16"/30"	CHATTERING THRU RUN ROCK IN MIDDLE END BADLY WORN
				PB-6				PB		12:58PM 1:09PM

← Braided Stream Deposits →

← "Upper Clay" →

← Braided Stream Deposits →

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E02845 **Date** 1/7/05 **Boring** CSA/SD19

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
100			@100.0': CLAYEY SANDY GRAVELS (SOME SILTY CLAY SUBSTRATA)	PB-6				PB	R=19"/30"	ROUGH, BUMPY RUN END BADLY WORN 1:22PM
102		ML/CL	@102.5': SILTY CLAY; LAMINATED LT OL GRY AND YEL BRN (LIGHT OXIDIZED), MOIST, MOD-HIGHLY PLASTIC, STIFF TO VERY STIFF	PB-7				PB	R=15"/30"	1:35PM SLOW, QUIET RUN SAMPLE END BARELY WORN GOOD CONDITION 1:52PM [illegible]
104			@105.0': SILTY CLAY; MOTTLED LT OL GRY, HIGHLY PLASTIC, MOIST, STIFF - VY STIFF, TINY SHELL FRAGS.	PB-8				PB	R=32"/30"	2:20PM SMOOTH, QUIET RUN END IN GOOD COND 2:26PM
106		CH	@107.5': HIGHLY PLASTIC CLAY; LT OL GRY, HIGHLY PLASTIC, MOIST, CRUMBLY [illegible] BREAKS, FEW [illegible] SHINY SHEARS, CRUMBLES EASILY WHEN REMOLDED, [illegible]	PB-9				PB	R=30"/30"	2:40PM SMOOTH, QUIET RUN END IN GRT COND 2:49PM
108–110		CH	@110.0': SHEARED CLAY; STRONGLY MOTTLED BY OL GRY AND BLUE GRY, HIGHLY PLASTIC, MOIST, STIFF - VY STIFF, ABUNDANT CORNFLAKE SHEARS, BANANA-WAXY LEAF SHEARS, VERY SHINY, CRUMBLES EASILY WHEN REMOLDED.	PB-10				PB	R=30"/30"	2:55PM SMOOTH RUN END GRT COND 3:03PM
112			@112.5': SAME AS ABOVE; [illegible] SMALL CARBONATE NODULES	PB-11				PB	R=30"/30"	3:12PM CHATTER HALFWAY IN SMOOTH ABOVE AND BELOW END BENT IN ON [illegible] 3:24PM END DAY
114		CL	@115.0': CLAY w/ CARBONATE NODULES; GRY YEL GRN (5 GY 7/2), VERY STIFF TO HARD, MOIST, CLAY VERY PLASTIC. HARD CALICHE NODULES.	PB-12				PB	R=23"/30"	9:25AM START RUN 1/10/05 RIG CHATTER ON CARBONATE NODULES THRU MOST OF RUN END HEAVILY WORN, GROUND 9:39AM
116		CL/CH	@117.5': SAME AS ABOVE; YEL GRY (5 Y 7/2)	PB-13				PB	R=23"/30"	9:48AM CHATTER AND SLOW & START FAST HALFWAY THRU END HEAVILY WORN, BELLED OUTWARD. 9:55AM PB BROKE
118		ML	@118.5': CLAYEY SILT W/ VF SAND; LT OL GRY W/ YEL ORN MOTTLES, STIFF TO VY STIFF, SLIGHTLY PLASTIC, MOIST	MC-1			31	MC	3/6	MOD CAL. W/ AUTOHAMMER
				MC-2			50	MC	6/6	140 lb AUTOHAMMER
				MC-3			50 (4")	MC	6/6	
			@120.5': SAME AS ABOVE; MORE YEL ORN MOTTLES THAN LT OL GRY, SLIGHTLY SPONGY.	MC-4			27	MC	/6	
120				MC-5			50	MC	/6	
				MC-6			50	MC	/6	1:02PM END RUN 1:25PM DRILLING
122										SMOOTH, QUIET, FAST
124								DB		
126		ML/SM		RUN 7						
128										
130										1:30PM CIRCULATING 1:36PM DRILLING
				RUN 8						

Braided Stream Deposits

Oxidized Lacustrine Clay

Unoxidized Lacustrine Clay (sheared)

Marl

Lacustrine Silt

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Sheet 4 of 5

Project RMC Quarry/ E0284J **Date** 1/10/05 **Boring** CSA/SD19

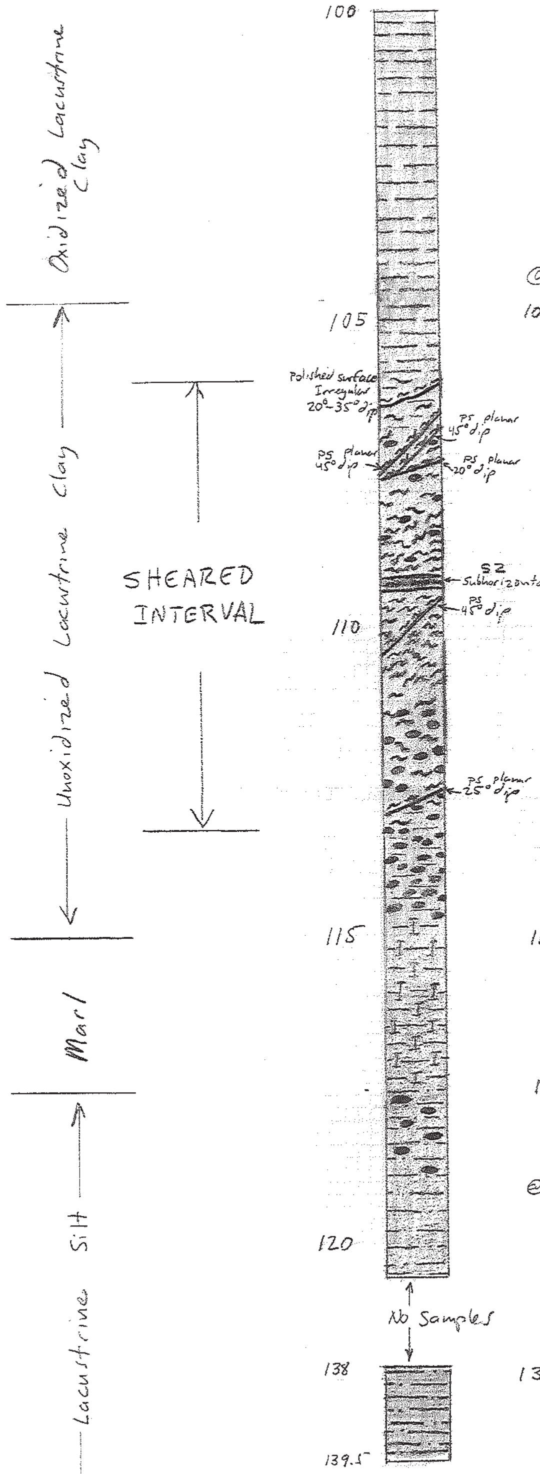
Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										SLOW, SMOOTH, QUIET
134				RUN 8						
								DB		
136										
138			@138.0: CLAYEY SILT; MOTTLED DK GRN GRY							1:40PM CIRCULATING
		ML/CL	(5G 4/1) AND LT OL GRY (5 Y 5/2), MOIST, STIFF,	MC-7			29	MC	/6"	
			MOD PLASTIC	MC-8			32	MC	/6"	
			@139.5': SAME AS ABOVE; UNIFORM DK GRN GRY	MC-9			49	MC	/6"	2:00 PM END RUN
140			TD @ 140.0'							3:56PM REAMING COMPLETED
142										10:00AM 1/11/05 INSTALLED 140' of 2.75"ø QC INCLINOMETER CASING W/ SEAMS GLUED W/ ABS CEMENT AND THREE VIBRATING WIRE PIEZOMETERS TAPED TO THE SIDE OF THE CASING. (CASING ANCHOR USED)
144										10:20AM PUMPED 50 GALS OF GROUT. 11:26AM PUMPED 100 GALS
146										10:40 AM PUMPED 150 GALS 10:50AM PUMPED 200 GALS 11:00 AM PUMPED 250 GALS 11:10 AM PUMPED 230 GALS 11:20 AM PUMPED 260GALS
148										CEMENT/BENTONITE GROUT MIX:
150										3, 47-lb BAGS CEMENT 1, 50-lb BAG BENTONITE 45 - GALS H_2O
152										1/2.5/0.3 CEMENT/H_2O/BENTONITE RATIO BY WEIGHT
154										
156										
158										
160										
162										
164										VIBRATING WIRE PIEZOMETERS: 55' S/N 81240 95' S/N 81247 135' S/N 81257

← Lacustrine Silt →

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

RMC/E0284K 1/28/05 PJ

SD-19



100' - 104.7' <u>CLAY with Silt</u> Yellowish Brown (10YR 5/4) dry to damp, very stiff, high plasticity; color laminated, brownish yellow to yellowish brown laminae 0.1" to 0.3" thick; highly oxidized (CH)

@ 104.7' Gradational color change

104.7' - 115' <u>CLAY with silt</u> Olive Gray (5Y 4/2), local white carbonate filaments and nodules, massive, dry to damp, very stiff, high plasticity (CH)

@ 106' - 112.8' <u>SHEAR ZONE</u> : pervasive discontinuous polished surfaces; some are throughgoing and striated;

- 106'-107.5' most polished surfaces are 0.1"-0.2" wide;
- 107.5' - 112.5' Abundant larger discontinuous polished surfaces and many throughgoing polished surfaces with striations; orientations and dip angles are highly varied
- 109.2' - 109.3' Subhorizontal SHEAR ZONE with moist, highly plastic, olive Gray clay gouge bounded by highly polished surfaces

@ 111.3' - 112.5' Abundant carbonate nodules, diminished shearing (only small discontinuous polished surfaces)

@ 112.5' - 115' Increased percentage of carbonate; very little shearing

115' - 117.5' <u>MARL</u> Light Olive Gray (5Y 6/2), dry, very stiff, highly reactive to HCL; local pods of residual olive Gray clay;

@ 115.8' color change to Light Yellowish Brown (2.5Y 6/3)

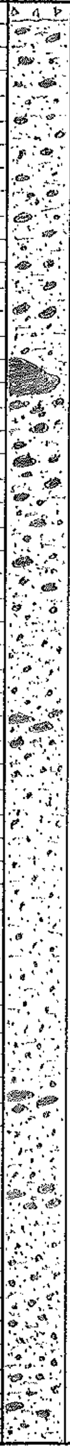
117.5' - 120.5' <u>CLAYEY SILT</u> Light Yellowish Brown (2.5Y 6/3), dry, very stiff, high plasticity; abundant carbonate nodules (MH)

@ 119 - 120.5' No carbonate nodules; locally oxidized to Yellowish Brown (10YR 5/6)

138 - 139.5 <u>CLAYEY SILT</u> Dark Gray (5Y 4/1), unoxidized, dry to damp, stiff, high plasticity; local carbonate nodules up to 0.2" wide

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD21
Location NORTHWEST END OF TRAVISO CIRCLE
Project No. E0284J
Drilling Contractor/Rig GREGG DRILLING, B-80 MUD ROTARY DRILL RIG
Date of Drilling 1/24/05
Ground Surface Elev. ~457'
Logged By JD
Hole Diameter 6 3/4" ∅ MUD ROTARY
Surface ASPHALTIC CONCRETE ROADWAY
Weather FOGGY, COOL, CALM



Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
		AC	0.0'-0.3': ASPHALTIC CONCRETE							DRILLER: CHRIS ST. PIERRE HELPER: FAUSTO 10:30AM: START DRILLING W/ 6 3/4" TRI CONE BIT.
			0.3'-69.0': SANDY GRAVEL W/ CLAY; MOD YEL BRN, MOIST, DENSE, COBBLES UP TO 6", IN GENERAL 2"-4" (60%), COARSE SAND (30%), CLAY BINDER (10%).							MODERATE CHATTER ON GRAVELS
2										
4										
6		GW		RUN 1				TC		
8			@8.0': GRINDING ON LARGE COBBLE. 8"-10" BOULDER IN SIDEWALL OF HOLE.							@8.0': GRINDING ON COBBLE
10										
12										10:59AM END RUN, CIRCULATING 11:12AM START RUN
14										RELATIVELY SMOOTH RUN, FEW COARSE GRAVELLY ZONES
			@15.0' CHATTERING ON GRAVELS							
16			- MORE CLAY BINDER IN CUTTINGS (~15%)							
18										
20		GC		RUN 2						
22			@23.0' CHATTERING ON GRAVELS							
24										
26			@26.0' VIGOROUS CHATTER ON GRAVELS							
28										11:34AM END RUN 11:46 AM START RUN
			@30.0' CHATTER ON GRAVELS	RUN 3						

MG 12/28/05
UPPER GRAVELS
Braided Stream Deposits

Project RMC Quarry/ E0284J **Date** 1/24/05 **Boring** CSA/SD21

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										SMOOTH RUN, MINOR CHATTERING LAST FIVE FEET OF RUN
32										
34										
36				RUN 3				TC		
		GC								
38			38.0' AND BELOW: MINOR CHATTER ON GRAVELS.							
40										
42										
										12:07 PM END RUN 12:12 PM START RUN
44			@44.0': VIGOROUS CHATTERING ON GRAVELS.							VIGOROUS CHATTER FIRST FOOT OF RUN THEN SMOOTH TO 51.0'
46										
48										
50										
			51.0' AND BELOW: INTERMITTENT CHATTER ON GRAVELS.	RUN 4						
52										@52.56' VW PIEZO S/N 81242
54										
56										
			@57.0': VIGOROUS CHATTER ON GRAVELS.							
58										12:35 PM END RUN 12:44 PM START RUN
60			@60.0': LITTLE CHATTER							
62				RUN 5						

~~UPPER GRAVELS?~~

Braided Stream Deposits

Sheet 2 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E0284J **Date** 1/24/05 **Boring** CSA/SD21

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
			CONTINUED LITTLE CHATTER							CONSTANT CHATTER
66		GC								
68										
			69.0'-81.0': CLAYEY SILT; MOTTLED DK YEL ORN AND YEL GRY, VERY STIFF, MOIST, MOD PLASTIC.	RUN 5						@69.0': SMOOTHS OUT, SLOW AND QUIET REST OF RUN
70		ML/CL								
72										1:11PM END RUN 1:39PM START RUN SMOOTH, SLOW, QUIET
74										
76			MORE SANDY							DRILL RATE PICKS UP A LITTLE STILL SMOOTH AND QUIET
78		ML/SM								
80								TC		
			81.0'-101.0': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, DENSE, GRAVEL UP TO 2"3", SUB ROUND TO SUB ANG (50%), COARSE SUB ANG SAND (30%), CLAYEY BINDER (20%).	RUN 6						@81.0': GRINDING ON COBBLES. REST OF RUN CHATTER ON GRAVELS
82										
84		GC								
86										
88										1:58PM END RUN 2:05PM START RUN SPORADIC CHATTER ON GRAVELS THROUGH RUN
			INTERMITTENT CHATTER ON GRAVEL							
90										
92				RUN7						@92.56' VW PIEZO S/N 81253
94										
96										CIRCULATING 2:17PM END RUN

UPPER ~~GRAVEL~~ Braided Stream Deposits

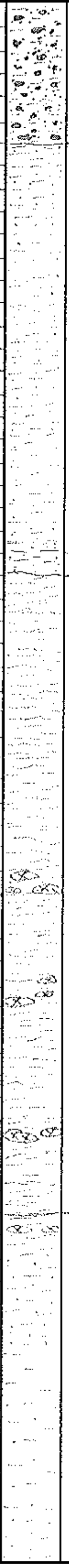
"UPPER CLAY"

LOWER ~~GRAVEL~~ Braided Stream Deposits

Sheet 3 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E0284 J **Date** 1/24/05 **Boring** CSA/SD21



Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
100	GC	@100.0': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, DENSE, 1/4"-1" SUB ANG TO SUB ROUND GRAVEL (50%), COARSE SUB ANG SAND (35%), CLAYEY BINDER (15%). @102.5': SAME AS ABOVE, BUT SILTY CLAY ON BOTTOM OF TUBE	PB-1				PB	R= 9"/24"	3:57PM START RUN ROUGH THROUGHOUT RUN END WORN EVENLY 4:01PM END RUN
102	ML/SM	<u>101.0'-110.5'</u>: <u>CLAYEY SILT</u>; MOD YEL BRN W/ LT OL GRY MOTTLES, MOIST, STIFF TO VERY STIFF, MOD TO HIGHLY PLASTIC, LOCAL FINE SANDS & DUSKY BROWN ORGANIC SPECKS.	PB-2				PB	R= 3"/30"	8:02 AM START RUN DAY 2 HARD AND ROUGH UNTIL 101', THEN SMOOTHS OUT & SPEEDS UP. END BADLY WORN, LOTS OF SLOUGH 8:08AM END RUN
104		@105.0': CLAYEY FINE SANDY SILT; MOTTLED/STRIATED MOD YEL BRN AND LT OL GRY, MOIST, STIFF TO VERY STIFF, MOD PLASTIC, VERY FINE SAND ([illegible]), SILT ([illegible]), CLAY ([illegible]), SUB ANG/SUB RND COBBLES UP TO 4" (SLOUGH?)	PB-3				PB	R= 8"/30"	8:23AM START RUN RELATIVELY SMOOTH RUN, END BADLY WORN, LOTS OF SLOUGH, GOING TO FLUSH OUT HOLE 8:27AM END RUN, FLUSHED HOLE
106		@107.5': CLAYEY SILT; MOTTLED LT OL GRY AND MOD YEL BRN, MOIST, VERY STIFF, MOD-HIGHLY PLASTIC, DUSKY BRN ORGANIC SPECKS. @110.0': SAME AS ABOVE. TRACE COARSE SAND. MINOR CARBONATE MOTTLES (REACTS W/ HCl)	PB-4				PB	R= 12"/30"	9:26 AM START SMOOTH, QUIET END IN GRT COND, STILL SLOUGH IN TUBE. 9:29AM END RUN
108		<u>110.5'-124.5'</u>: <u>CLAY W/CARBONATE NODULES</u>; LT OL GRY TO DK GRN GRY, MOIST, VERY STIFF TO LOCALLY HARD, HIGHLY PLASTIC, LOCALLY ABUNDANT SHEARING. (SEE CORE LOG FOR DETAILED DESCRIPTIONS).	PB-5				PB	R= 22"/30"	9:44AM START RUN SLOW, SMOOTH, QUIET RUN END IN GRT COND 9:57AM END RUN
110 112	CL/CH	@112.5': SILTY CLAY; LT OL GRY TO DK GRN GRY, MOIST, HIGHLY PLASTIC, VERY STIFF, UNIFORM COLOR, ABUNDANT CORNFLAKE SHEARS, CRUMBLES EASILY, ROLLS TO 1/8" THREAD. SMALL SHINY WAVY SHEARS	PB-6				PB	R= 30"/30"	10:12 AM START RUN SLOW, SMOOTH, QUIET RUN END IN GRT COND 10:23 AM END RUN
114		@115.0': SILTY CLAY; DK GRN GRY (5 G 4/1), MOIST, HIGHLY PLASTIC, VERY STIFF, UNIFORM COLOR, ABUNDANT CORNFLAKE SHEARS.	PB-7				PB	R= 30"/30"	10:43 AM START RUN SMOOTH, SLOW, QUIET RUN END IN GRT COND 10:57AM END RUN
116		@117.5': SILTY CLAY; DK GRN GRY (5 GY 4/1), MOIST, HIGHLY PLASTIC, VERY STIFF TO HARD, ABUNDANT CARBONATE NODULES.	PB-8				PB	R= 26"/30"	11:15 AM START RUN ROUGH, BUMPY, RUN (CALICHE) 1/3 OF END DENTED IN 11:26AM END RUN
118		@120.0': SAME AS ABOVE, LIGHTER COLOR, GRN GRY (5 GY 6/1) TO DK GRN GRY (5 GY 4/1)	PB-9				PB	R= 21"/30"	11:40AM START RUN SMOOTH, FAST, QUIET LITTLE CHATTER END OF RUN. 1" BENT 11:48AM END RUN
120 122		@122.5': SAME AS 120.0', BUT MORE HARD CARBONATE NODULES ON BOTTOM.	PB-10				PB	R= 22"/30"	12:08PM START RUN ROUGH, BUMPY THROUGHOUT ENTIRE RUN. END JAGGEDLY WORN 12:17PM END RUN
124	CL	@125.0': SILTY CLAY W/CARBONATE MOTTLING; MOTTLED MOD YEL BRN, LT OL GRY (5 Y 5/2) AND YEL GRY (5 Y 7/2), VERY STIFF TO HARD, MOIST, MOD-HIGHLY PLASTIC. SPARSE Fe OXIDE SPECKS.	PB-11				PB	R= 26"/30"	12:36PM START RUN SMOOTH RUN, FEW BUMPS 2, 1/2" DENTS 12:43 PM END RUN
126	ML	@127.5': CLAYEY SILT; MOTTLED LT OL GRY AND MOD YEL BRN (FE STAINS), MOIST, MOD PLASTIC, VERY STIFF, UNIFORM TEXTURE. <u>124.5'-140.5'</u>: <u>CLAYEY SILT TO SANDY SILT</u>; MOTTLED LT OL GRY AND MOD YEL BRN TO DK GRN GRY, MOIST, VERY STIFF, MOD PLASTIC,	PB-12				PB	R= 30"/30"	12:54 PM START RUN SMOOTH RUN. END IN GRT COND 1:07PM END RUN
128 130							DB		NEW DRAG BIT 5 3/4" SMOOTH, QUIET DRILLING @132.56' VW PIEZO S/N 81258

~~LOWER GRAVELS~~ Braided Stream Deposits

OXIDIZED LACUSTRINE CLAY

UNOXIDIZED LACUSTRINE CLAY

Marl

~~ELUVIAL~~ ~~SILTS~~/SANDS Shallow Lacustrine Silt and Sand

Sheet 4 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E0284J **Date** 1/25/05 **Boring** CSA/SD21

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										SMOOTH, SLOW, QUIT
134										
136								DB		
138		ML/SM	@140.5'; CLAYEY FINE SANDY SILT; MOTTLED LT OL GRY AND DK GRN GRY (5 G 4/1), MOIST, STIFF TO VERY STIFF, MOD PLASTIC. FINE SAND (35%), SILT (40%), CLAY (25%).	PB-13				PB	R=30"/30"	2:09PM START RUN SMOOTH, SLOW, QUIET RUN END IN GRY COND
140			TD @ 140.5'							2:14 PM END RUN 4:00PM INSTALLED 140' OF 2.75"Ø O.D. QC INCLINOMETER CASING W/ SEAMS GLUED W/ABS CEMENT AND TAPED. CASING ANCHOR ON BOTTOM. THREE VIBRATING WIRE PIEZOMETERS TAPED TO THE SIDE OF CASING 9:00AM 1/26/05 PUMPED 220 GALS OF BENTONITE/CEMENT GROUT.
142										
144										
146										CEMENT/BENTONITE GROUT MIX: 3, 47 lb BAGS CEMENT 1, 50 lb BAG BENTONITE 45 GALS H_2O 1/2.5/0.3 CEMENT/H_2O/BENTONITE RATIO BY WEIGHT
148										
150										
152										
154										
156										
158										
160										
162										VIBRATING WIRE PIEZOMETERS: 52.56' S/N 81242 92.56' S/N 81253 132.56' S/N 81258
164										

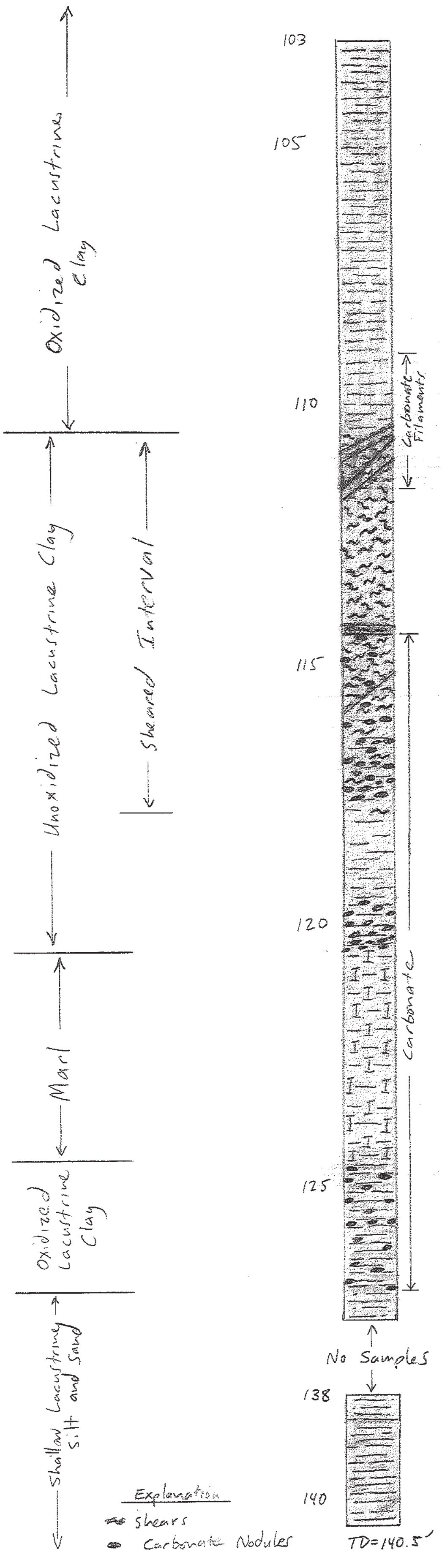
~~FLUVIAL SILTS/SANDS~~
Shallow Lacustrine Silt and Sand

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

E0284/RMC

PJ
2/28/05

SD-21



103' - 120.5' <u>CLAY with Silt</u> Light Olive Brown (2.5Y 5/3) oxidized to 110.5; damp, very stiff, high to moderate plasticity, mottled with Olive Gray (5Y 5/2), local black MnO2 staining; isolated roots and minor plant fragments (CH)

@ 109' - 110' color lamination (light olive brown and olive gray laminae)

@ 109.5' - 111.5' carbonate filaments

@ 110.5' - 112' Gradational color change: mottled olive gray with light olive brown oxidation grades downward to olive gray

@ 110.6' - 117.9' <u>SHEAR ZONE</u>

- 110.6' - 111.7' Numerous small discontinuous polished surfaces with widely varied orientations, little gouge on the polished surfaces; several throughgoing surfaces with down dip oriented striae.
- 111.7' - 114.3' Pervasive small polished surfaces, crushed, intense brittle shearing; the orientations of surfaces are highly varied, and they intersect in a complex manner.
- 114.3' - 114.4' SUBHORIZONTAL SHEAR ZONE: highly plastic, moist, medium stiff, olive gray clay gouge bounded by highly polished, planar to slightly irregular subhorizontal surfaces.
- 114.4' - 117.9' pervasive small polished surfaces; intense brittle shearing that diminishes below 116' to small, diffuse polished surfaces.

@ 114.4' color change to Dark Greenish Gray (5G 4/1)

@ 114.4' - 117.5' carbonate nodules; carbonate percentage increases downsection to 117.5'

@ 117.5' - 119.5' scattered carbonate filaments

@ 119.5' - 120.5' Abundant carbonate nodules; carbonate percentage increases downsection; color change to Olive Gray (5Y 5/2) with White (5Y 8/1) carbonate nodules.

@ 120.5' Gradational contact

120.5' - 124.5' <u>MARL</u>: Greenish Gray (5GY 6/1) to White (5Y 8/1), dry to damp, very stiff, White carbonate laminae interbedded with clay laminae.

@ 124.5' Gradational contact

124.5' - 127.0' <u>SILTY CLAY</u>: variably oxidized, Olive Gray (5Y 5/2) with color laminae of Yellowish Brown (10YR 5/4) to Light Olive Brown (2.5Y 5/4); abundant white carbonate nodules, very stiff, high plasticity (CH)

@ 127.0' Gradational contact

127.0' - 127.5' <u>CLAYEY SILT</u>: Olive Gray (5Y 5/2) mottled with Yellowish Brown (10YR 5/8), damp, very stiff, high plasticity (MH)

138.0 - 138.6 <u>SILT with clay</u>: Olive (5Y 4/3) to Dark Greenish Gray (5G 4/1), damp, stiff, low plasticity (ML)

@ 138.6 Gradational contact

138.6 - 140.5 <u>SILTY CLAY with Sand</u>: Bluish Gray (5B 5/1) mottled with Olive (5Y 5/4), damp, very stiff, locally laminated, much disseminated black carbonaceous material

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD24
Location NORTH SIDE OF LAKE "A", 35 FT EAST OF KANE I-2
Project No. E0284J
Drilling Contractor/Rig GREGG DRILLING, B-80 MUD ROTARY RIG
Date of Drilling 2/2/05
Ground Surface Elev. ~410
Logged By JD
Hole Diameter 6 3/4" ϕ TRI CONE
Surface BARE GRAVEL AND SOIL
Weather CLEAR, SUNNY, WARM

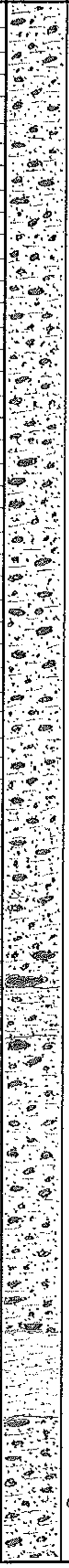
Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
			0.0'-75.2': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, MED DENSE, SUB ANG TO SUB RND GRAVELS UP TO 4" (55%), COARSE ANG SAND (30%), MOD PLASTIC CLAY BINDER (15%)							DRILLER: CHRIS ST. PIERRE HELPER: ANGEL, JUNIOR 10:08AM START DRILLING W/ 4 7/8" ϕ DRAG BIT CONSTANT CHATTER ON GRAVEL THRU RUN
2										
4										
		GC		RUN 1						
6										
8										
								DB		10:15AM CIRCULATING 10:22AM DRILLING CONSTANT CHATTER
10										
12										
14										
				RUN 2						
16										
18										
										10:24AM CIRCULATING 10:54AM DRILLING SWITCH TO 4 3/4" TRICONE CONSTANT CHATTER ON GRAVELS
20										
22				RUN 3				TC		
24										11:00AM CIRCULATING 11:20AM START RUN 1.0' ROUGH, CHATTER
26			@27.5': CLAYEY SILT W/ FN-MED SAND; MOD YEL BRN W/ SLIGHT MOTTLES OF LT OL GRY, MOIST, STIFF, SLIGHTLY PLASTIC, TRACE 1"-2" SUB RND PEBBLES. SAND (10%),	PB-1				PB	R=22"/30"	END BADLY WORN, JAGGED
		ML/SM								LAST 1.5' SMOOTH, FAST 11:28AM END RUN 11:32AM DRILLING
28										
		GC		RUN 3				TC		11:36AM END RUN CIRCULATING

~~UPPER GRAVEL~~

Braided Stream Deposits

12/29/05

Project RMC Quarry/ E0284J **Date** 2/2/05 **Boring** CSA/SD24



Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										11:47AM DRILLING CHATTER ON GRAVELS THRU RUN
32										
34										
				RUN 4						
36										
38										
40		GC						TC		12:00 PM END RUN
42										
										@ 43.30' VW PIEZO S/N 81243
44										
				RUN5						
46										
48										
50										12:14PM END RUN 12:29PM START RUN 1' IN HARD COBBLE, SMOOT, FAST LAST 1.5' END BADLY WORN
				PB-2				PB	R= 26"/30"	
52		ML	@ 52.5': CLAYEY SILT W/GRAVEL; MOD YEL BRN W/ DUSKY BRN ORGANIC SPECKS, MOIST, MOD PLASTIC, MED DENSE TO STIFF; SUB ANG GRAVEL UP TO 1" (10%).							12:36PM END RUN 12:42PM DRILLING CHATTER ON GRAVELS
54										
56		GC						TC		
				RUN6						
58										[illegible] END 12:47PM END RUN SMOOTH TO 61'
60		ML								AFTER 61': LOTS OF CHATTER ON GRAVEL
62				RUN7						
		GC								

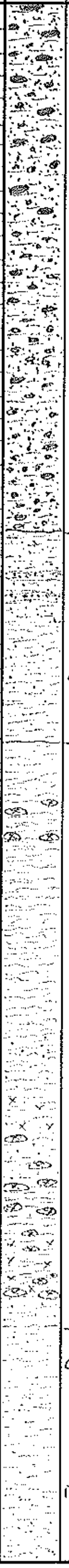
~~UPPER GRAVEL~~

Braided Stream Deposits

Sheet 2 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E02845 **Date** 2/2/05 **Boring** CSA/SD24



Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
66 68		GC		RUN7				TC		CONSTANT CHATTER ON GRAVELS.
70 72			@72.5': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, MED DENSE, SUB ANG TO SUBRND GRAVEL UP TO 1" (50%), COARSE SAND (30%), CLAY (20%).	PB-3				PB	R=14"/30"	1:00PM END RUN 1:19PM START RUN BUMPY, ROUGH RUN THRU OUT. END BADLY WORN @73.30' VW PIEZO S/N 81252
74			@75.0': SAME AS ABOVE; DENSE **75.2'-80.1': SILTY CLAY**; MOTTLED TO LAMINATED DK YEL ORN, MOD YEL BRN AND LT OL GRY, STIFF TO VERY STIFF, MOIST, MOD TO HIGHLY PLASTIC, SOME DK BRN ORGANIC FRAGS, TRACE FINE TO MED SAND	PB-4				PB	R=9"/30"	1:21PM END RUN 1:34PM START ROUGH, BUMPY RUN END BADLY WORN LOTS OF SLOUGH
76		ML/SM	@77.5': INTERLAMINATED SILTY CLAY AND CLAYEY FINE SAND; LAMINATED LT OL GRY AND MOD YEL BRN, MOIST, MED DENSE TO STIFF, MOD PLASTIC. FINE TO MED SAND.	PB-5				PB	R=21"/30"	1:37PM END, FLUSHING HOLE w/ 2:09PM START TC BIT. ROUGH, BUMPY, FEW SMOOTH ZONES. 2" BENT IN END
78		CL/ML	@80.0': SILTY CLAY; MOD YEL BRN w/ LT OL GRY MOTTLES, MOIST, VERY STIFF, MOD-HIGHLY PLASTIC, UNIFORM TEXTURE.	PB-6				PB	R=17"/30"	2:14PM END 2:24PM START SMOOTH, QUIET RUN END GOOD SHP SAMPLE SLID IN TUBE "DISTURBED"
80 82		CH	**80.1'-93.0': CLAY w/ CARBONATE NODULES**; LT OLIVE GREY w/ SPARSE BROWN MOTTLES, MOIST, VERY STIFF TO LOCALLY HARD, LOCALLY ABUNDANT SHEARING (SEE DETAILED CORE LOG FOR DESCRIPTIONS).	PB-7				PB	R=30"/30"	2:30PM END 2:40PM START SMOOTH, QUIET RUN END IN GRT SHP
84		CH	@85.0': SHEARED CLAY; LT OL GRY w/ TINGE OF BROWN AND FAINT MOTTLING, MOIST, VERY STIFF, HIGHLY PLASTIC, ABUNDANT SHINY CORNFLAKE SHEARS.	PB-8				PB	R=30"/30"	2:48PM END 2:59PM START ROUGH, BUMPY RUN END IN GRT SHP
86		CH	@87.5': SHEARED CLAY; LT OL GRY w/ TINGE OF BRN, MOIST, VERY STIFF TO HARD, HIGHLY PLASTIC, ABUNDANT CORNFLAKE SHEARS, MANY RANDOMLY ORIENTED WAVY STRIATED SHEARS (SOME VERTICAL) TRACE COARSE SAND GRAINS (FEW). END OF SAMPLE BROKE OFF ALONG A 30° THROUGHGOING PLANAR SHEAR.	PB-9				PB	R=28"/30"	3:04PM END 3:17PM START ROUGH, BUMPY RUN END IN GRT COND
88		CL	@90.0': SILTY CLAY w/ CARBONATE NODULES; LT OL GRY w/ TINGE OF BRN MOTTLES, MOIST, VERY STIFF TO HARD, MOD TO HIGHLY PLASTIC, ABUNDANT CARBONATE NODULES,	PB-10				PB	R=30"/30"	3:24PM END 3:34PM START ROUGH, BUMPY RUN END SLIGHTLY WORN
90 92		CL	@92.5': SILT CLAY w/ CARBONATE MOTTLING; MOTTLED LT OL GRY, MOD YEL BRN AND CHALKY WHITE, MOIST, VERY STIFF TO HARD (LOCALLY), MOD PLASTIC.	PB-11				PB	R=29"/30"	3:43PM END 3:52PM START ROUGH, BUMPY RUN HALF OF END WORN
94		CL/ML	@95.0': SILTY CLAY; LT OL GRY w/ MOD YEL BRN MOTTLES AND DUSKY BROWN ORGANIC SPECKS AND BLEBS, MOIST, VERY STIFF, SLIGHTLY TO MOD PLASTIC, **93.0'-140.5': SILTY CLAY TO SILTY SAND**; MOD YEL BRN w/ LT OL GRY MOTTLES TO DK GRN GRY, MOIST, VERY STIFF TO DENSE, SLIGHTLY PLASTIC, LOCAL DUSKY BROWN ORGANIC SPECKS AND CARBONATE MOTTLING.	PB-12				PB	R=29"/30"	4:01PM END 4:10PM START ROUGH, BUMPY RUN END IN GOOD SHP
96		ML/CL		PB-13				PB	R=26"/30"	4:15PM END 4:24PM START ROUGH, BUMPY RUN END IN GRT SHP
				PB-14				PB		4:29PM END RUN 4:39PM START

~~UPPER GRAVEL~~ Braided Stream Deposits

~~OXIDIZED LACUSTRINE CLAY~~ oxidized Lacustrine clay

Lacustrine Clay

~~UNOXIDIZED LACUSTRINE CLAY~~ Unoxidized

Marl

~~FLUVIAL SILTS/SANDS~~ shallow Lacustrine Sand & silt

oxidized Lacustrine clay

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E0284J **Date** 2/2/05 **Boring** C5A/SD24

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		ML	@100.0': CLAYEY SILT W/ VF SAND; MOD YEL BRN W/ LT OL GRY MOTTLES, MOIST, VERY STIFF TO DENSE, SLIGHTLY PLASTIC, UNIFORM TEXTURE.	PB-14				PB	R=30"/30"	SMOOTH RUN END IN GRT SHP 4:41PM END RUN
100										8:12AM 2/3/05 DRILLING SMOOTH, QUIET RUN
102										
104				RUN 8				DB		
106										
108		SM	@110.5': CLAYEY SILTY SAND; MOD YEL BRN W/ SLIGHT MOTTLES OF LT OL GRY, MOIST, DENSE, UNIFORM TEXTURE.	PB-15				PB	R=30"/30"	8:18AM CIRCULATING 8:31AM START RUN QUIET, SMOOTH RUN, FAST END IN GRT COND
110										8:34AM END RUN 8:52AM DRILLING SMOOTH, FAST
112										
114				RUN 9				DB		
116										
118		ML/CL	@120.5': CLAYEY SILT; DUSKY YEL GRN (5 GY 5/2), DAMP, VERY STIFF, SLIGHT PLASTICITY; FAINT CARBONATE MOTTLES.							8:55AM CIRCULATING 9:07AM START RUN SMOOTH, SLOW RUN END IN GOOD COND
120				PB-16				PB	R=30"/30"	9:16AM END RUN 9:25AM DRILLING SMOOTH, FAST
122										
124				RUN 10				DB		
126										
128										
		CL/ML	@131.5': SILTY CLAY; DK GRN GRY (5 GY 4/1), MOIST, VERY STIFF, MED PLASTICITY, LITTLE Fe STAINS, UNIFORM TEXTURE							9:27AM CIRCULATING 9:38AM START RUN SLOW, QUIET RUN END IN GOOD COND
130				PB-17				PB	R=27"/30"	
				RUN 11				DB		9:46AM END RUN 9:57AM DRILLING

Oxidized Lacustrine Clay

Shallow Lacustrine Sand and Sandy Silt

FLUVIAL ~~SILTS~~/SANDS

Unoxidized Lacustrine Clay

Marl

Oxidized Lacustrine Clay

Project RMC Quarry/ E0284J **Date** 2/3/05 **Boring** CSA/SD24

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
134				RUN 11				DB		SMOOTH, FAST @133.30' VW PIEZO S/N 81261
136		ML/CL								
138			@140.5': SILTY CLAY; DK GRN GRY (5 GY 4/1) w/ Fe STAINS AND MOTTLES, MOIST, VERY STIFF, MID PLASTICITY, MINOR CARBONATE MOTTLES AND BLEBS.	PB-18				PB	R: 25"/30"	10:00AM CIRCULATING 10:15AM START RUN SLOW, QUIET RUN END SLIGHTLY WORN
140										10:20AM END RUN 10:44AM REAMING w/ 6 3/4" ø TRICONE BIT
142			TD @140.5'							1:15PM FLUSHING HOLE w/ CLEAN WATER.
144										2:55PM: INSTALLED 140' OF 3" ø I.D. PVC CASING (SCH 40) W/ 3 VIBRATING WIRE PIEZOMETERS TAPED TO SIDE OF CASING. ALL SEAMS GLUED w/ PVC CEMENT AND TAPED.
146										3:09PM PUMPED 55 GALS OF GROUT 3:15PM PUMPED 110 GALS 3:22PM PUMPED 165 GALS 3:28PM PUMPED 220 GALS 3:35PM PUMPED 250-275 GALS
148										
150										CEMENT/BENTONITE GROUT MIX:
152										3, 47lb BAGS CEMENT 1, 50lb BAG BENTONITE 45 GALS WATER
154										1/2.5/0.3 CEMENT/H_2O/BENTONITE RATIO BY WEIGHT
156										
158										
160										
162										VIBRATING WIRE PIEZOMETERS:
164										43.30' S/N 81243 73.30' S/N 81252 133.30' S/N 81261

FLUVIAL & SILTS/SANDS

Oxidized Lacustrine Clay

Sheet 5 of 5

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

12/29/95
Extruded and logged by PJ

Project RMC Quarry **Date** ________ **Boring No.** LSA-SD-24

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
		CH	– 97.7 SILTY CLAY Light Gray (5Y 7/2), very stiff, high to moderate plasticity, locally oxidized to Yellowish Brown							PB-14
98		SM	97.7 - 104' SILTY SAND Olive Gray (5Y 5/2) locally oxidized to Yellowish Brown (10YR5/) well sorted very fine sand with silt	Box 6					2.5 2.5	
		ML	@ 98.8 - 99.5' Sandy Silt lens							
100										
		SM								
102										
104										
106										
108			104'-114' SAND Olive Gray (5Y 4/2), locally oxidized to Yellowish Brown (10YR 5/6), well sorted fine sand, medium dense to dense, <5% fines							PB-15
		SP		Box 7					2.5 2.5	
110										
112										
114										

Oxidized Lacustrine clay

Shallow Lacustrine Sand and Sandy Silt

Sheet 1 of 3

Project RMC Quarry Date ________ Boring No. CSA-SD-24

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
114										
116		CL	114'-119' SILTY CLAY Dark Gray (5Y 4/1), very stiff, moderate to low plasticity							
118									1.9/2.5	PB-16
120		MARL	119'-124' MARL Olive Gray to Light Olive Gray (5Y 5/2 - 5Y 4/2), very stiff, reactive to HCL							
122										
124			124'-140.5' CLAY with Silt Olive Gray (5Y 5/2) very stiff, high plasticity, locally laminated, locally oxidized to yellowish brown	Box 8						
126										
128		CH							1.4/2.5	PB-17
130										

Unoxidized Lacustrine Clay

Marl

Oxidized Lacustrine Clay

Sheet 2 of 3

Project RMC Quarry Date ______ Boring No. CSA-SD-24

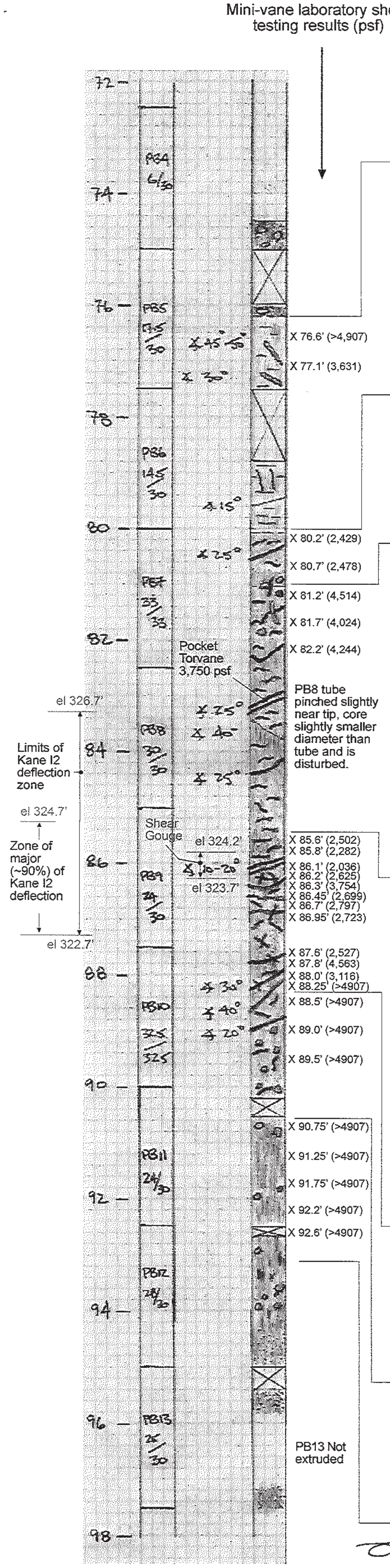
Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
132										
134										
136		CH								
138			@ 138 - 139.3 : laminated clay with silt as above @ 138.7 - 139.3 local carbonate nodules	Box 9					1.3/2.5	PB-18
140										
			TD=140.5'							

Oxidized Lacustrine Clay

Sheet 3 of 3

SD24 Core Log

RMC Eliot
(logged 3/2, 3/4/05 DRM) REV 3/16/05



61.0′ - 76.2′	~~Lower Gravels~~ Braided stream Deposits
74.5′ - 75.0′	Sandy Gravel w/Clay, mod. yllw brown to light olive brown, saturated & disturbed, ~ 50% to 60% gravels up to tube ID.
76.0′ - 76.2′	Gravelly Clay, mod yllw brown, mottled w/pale olive, ~60% clay, v. stiff, mod-highly plastic, moist, ~30% gravel, up to 2″ in size, subrounded.
76.2′ - 80.1	**Oxidized Lacustrine Clay**
76.2′ - 78.8′	Silty Clay, color btw dark yllwish orange and mod yllish brown, few small irr. blebs of pale olive, flecked w/mang. oxide stains (<1/16″ wide by 1/4″ tall vertical streaks), v. stiff, moist, core is cohesive.
76.5′	Pale olive color 'seam' follows planar trend (45°-50°)
77.3′	Pale olive seam follows fracture that formed after sample was extruded. Mechanically broken by hand. No shearing along fracture.
78.8′ - 79.3′	Clayey Silt, mod. yllw brown w/dark mang. oxide stains (thin and near vertical), moist, stiff. Core is brittle and falls apart easily.
79.3′ - 80.1′	Silty Clay, as desc. at 76.2′.
79.6′	Mechanically broken by hand (MBH) along 15° fracture, not sheared but very planar.
80.1′ - ~~93.0~~ 90.5′	**Unoxidized Lacustrine Clay**
80.1′ - 81.0′	Transition from unit above. Sheared Clay, unoxidized to oxidized, predom. pale to greyish olive mottled w/dk yllw brown, moist, v. stiff, highly plastic, random and occasional small (dime size) shears, semi polished, core has significant cohesion (not many connecting shears), mang. oxide stains as desc. at 76.2′.
80.5′	Through-going (TG) shear, MBH, 25°, striated down dip, sub-planar, very irregular, stepped, 3/8″ amplitudes, highly polished.
81.0′ - 85.6′	Sheared Clay, unoxidized pale olive to greyish olive, moist, v. stiff, highly plastic, carbonate nodules (hard) at top, small (dime size) shears increasing in frequency w/depth, generally not many connecting shears (extruded core is cohesive), mang. oxide stains as desc. at 76.2′.
81.1′	Shear, near vertical polished, broke along small portion of shear.
81.7′	Connecting shears, MBH sample along v. 'rough' surface composed of multiple shears forming surface of ~30°, faint downdip striae with mang. oxide stains along striae.
82.2′	Connecting shears, MBH along two interconnecting high angle shears.
82.7′	Sparse and random small blebs of dark yellow brown, sample very cohesive and difficult to break by hand, multiple wavy small and TG polished shears w/no striae, mostly curved (cupped), clay now has waxy feel and taffy-like texture, very faint, lighter discolorations along 25° dip.
83.2′	Shear, MBH, TG, 25°, smooth and planar, shiny polish, no striae.
83.4′	Core becoming more brittle, less cohesive
83.5′	Disseminated carbonate deposits along planar trend dipping at 40°, will not break by hand along fracture, not sheared.
84.5′	Shear, TG, 25°, fracture formed along shear after extrusion, portion of shear coated with thin (<1/8″ thick) layer of hard carbonate, not striated.
85.6′ - 88.2′	Highly Sheared Silty Clay, slightly darker than above, greyish olive to mod. olive brown, moist, v. stiff, highly plastic, numerous highly polished TG shears, subhorizontal to 20°, no striae near top, core is brittle due to degree of shearing.
85.6′	Highly sheared as desc. above
85.8′ - 86.3′	Shear Gouge, material is predominately waxy and taffy like, peels off along multiple highly polished surfaces with few striae, highly plastic, this material is mixed with lessor amounts of stiffer and more brittle clay as described at 85.6.
86.1′	Shear gouge
86.2′	Vane test, approx. 1/2 of vane within shear gouge, the remaining in highly sheared and 'brittle' clay.
86.3′	Very brittle, cracks emanating from vane upon insertion, material slightly siltier.
86.45′ - 86.7′	Top surface of vane at 86.45′ is a TG shear composed of several intersecting, highly polished shears forming a 'rough' surface, no striae, extruded material is intensely sheared and brittle, w/multiple TG shears, some highly polished and subhoriz. to near vert. At 86.7′, a highly polished and subhorz. shear.
86.95′	Cracks developed as vane inserted, brittle.
87.3′	Sample crumbled as vane inserted due to shearing.
87.6′	As described above at 87.3′.
87.8′	Highly sheared, but core more cohesive.
88.0′	As desc. above at 87.8′
88.2′ - 90.5′	Sheared Clay, color change back to grayish olive, v. stiff to hard, highly plastic, moist, core very difficult to break with hands, broken core still sheared, but not as frequent, and the shears are not as polished.
88.25′	Vane just through TG shear, planar to slightly wavy, striated, 30°.
88.5′	As described at 88.25′, minor carbonate nodules
88.6′	Shear, MBH along 1/2 of shear, portion exposed as desc. at 88.25′, 40°.
89.0′	Shears less frequent and less polished. Shear at 89′ as desc. at 88.25′, 20°.
89.5′	Core very difficult to manually break by hand, few small dime-size poorly polished shears. 90.5′ - 93.8′ MARL
90.5′ - 93.0′	Marl, carbonate-rich silty clay to clayey silt, pale olive to grayish olive, no shearing, moist to dry, v. stiff to hard, ~20% to 40% of sample is carbonate (hard nodules and pale olive disseminated carbonate).
90.75′	Sample almost entirely pale olive color due to disseminated carbonate, v. stiff, hard, dry, silt feel due to high amount of carbonate, difficult to break by hand.
92.5′	Beginning to see some light olive brown mottling, slightly less carbonate, core brittle and easy to break by hand, becoming siltier
93.0′	Brown mottling increases.
~~93.0′ -~~	~~**Fluvial Silts/Sands**~~
93.0′ - 93.8′	Marl, Carbonate rich Clayey Silt to Silty Fine Sand, occasional gravel <1/2″, predominately pale olive (carbonate) to grayish olive, dense to v. dense, moist, very brittle, carbonate is disseminated in streaks and swirls
93.8′ -	Clayey Silt to Silty Fine Sand, predominately pale olive (carbonate) to grayish olive w/signif. light olive brown mottling, dense to v. dense, moist, very brittle.

93.8′ - 140.5′
shallow Lacustrine
Sand and Silt with
interbedded Lacustrine Clay & Marl

Rev 3/16/05

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/SD 25
Location LOWER ACCESS ROAD ON SOUTH SIDE LAKE "A", 230' E OF LD-1
Project No. E0284J
Drilling Contractor/Rig GREGG DRILLING, B-80 MUD ROTARY RIG w/ SHAKER TUB
Date of Drilling 2/4/05
Ground Surface Elev. ~404.5'
Logged By JD
Hole Diameter 6 3/4" Ø TRI CONE BIT
Surface BARE SANDY GRAVEL
Weather FOGGY, COOL, BREEZY

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
			0.0'-13.0': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST TO WET, MED DENSE, SUB RND TO SUB ANG GRAVEL UP TO 3"-4" (50%), FINE TO COARSE SAND (35%), CLAYEY BINDER (15%). OCCASIONAL COBBLES TO BOULDERS 6"-12".							DRILLER: CHRIS ST. PIERRE HELPERS: ANGEL, JOE 11:55AM START DRILLING w/ 4 3/4" Ø TRI CONE BIT CHATTERING AND BOUNCING ON GRAVEL THRU OUT RUN
2										
4										
6		GC		RUN 1				TC	6.15ft/m	
8										
10										12:12PM CIRCULATING 12:24PM DRILLING CHATTER
12										
14		CL/ML	13.0'-17.0': SILTY CLAY; MOD RED BRN (10 YR 4/6), MOIST, STIFF, MOD PLASTIC							@13': SMOOTHS OUT
16				RUN 2					1.43ft/m	
18			17.0'-81.0': CLAYEY SANDY GRAVEL; MOD YEL BROWN, MOIST, MED DENSE, GRAVEL UP TO 2"-3", COARSE SAND, CLAY BINDER, SPORADIC CLAYEY ZONES.							@17': CHATTER ON GRAVEL
20										
22										12:31PM CIRCULATING 12:36PM DRILLING MODERATE CHATTER (LESS THAN 0-13')
24		GC								
26				RUN 3					1.81ft/m	
28										

~~UPPER GRAVEL~~ Braided Stream Deposits

"UPPER CLAY"

~~LOWER GRAVEL~~ Braided Stream Deposits

Project RMC Quarry/ E0284J **Date** 2/4/05 **Boring** CSA/SD25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
				RUN 3						12:45PM CIRCULATING 12:51PM DRILLING SLOW, TIGHT, CHATTER ON GRAVELS.
32										
34		GC								
									3.62fpm	
36				RUN 4						
38										
		CL/ML	@39.0': THIN 0.5'-1.0' THICK SILTY CLAY ZONE							
40		GC								
										1:07PM CIRCULATING 1:10PM DRILLING INTERMITTENT CHATTER THRU OUT RUN, HARD, SLOW,
42										
44								TC		
46				RUN 5					1.83fpm	
48										
50										
										1:22PM CIRCULATING 1:25PM DRILLING MIXED CHATTER, FAST TO MED FAST RUN.
52										
54										
56				RUN 6					1.25fpm	
58										
60										
										1:33PM CIRCULATING 1:35PM DRILLING
62										
				RUN 7						

~~LOWER GRAVEL~~ Braided stream Deposits

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E0284J **Date** 2/4/05 **Boring** CSA/SD25

Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
66 68 70	GC		RUN 7				TC	1:07pm	FAST, CHATTER THRU OUT RUN 1:41PM CIRCULATING @70.0' VW PIEZO S/N 81245
72 74			RUN8					1:25pm	9:02AM 2/7/05 DRILLING ANGEL (DRILLER) CHRIS HAS HURT BACK
76 78	GC	@78.5': CLAYEY SANDY GRAVEL; MOD YEL BRN, MOIST, MED DENSE TO DENSE, SUB RND TO SUB ANG GRAVEL UP TO 3"(50%), COARSE ANG SAND(35%), CLAYEY BINDER (15%).	PB-1				PB	R=9"/30'	9:06AM CIRCULATING 9:41AM START BUMPY, ROUGH 1st 2', LAST 0.5' FAST, SMOOTH ROCK IN BOTTOM 9:56AM END RUN
80	GC	@81.0': SAME AS ABOVE. **81.0'–88.0': CLAYEY SILT; MOTTLED MOD YEL BRN, DK YEL ORN AND LT OL GRY, MOIST, STIFF, TRACE FINE TO COARSE SAND.**	PB-2				PB	R=22"/30"	10:07AM ROUGH, BUMPY THRU RUN END BADLY WORN
82	CL/ML	@82.5': SILTY CLAY; VERY MOTTLED DUSKY YEL(5Y6/4) LT OL GRY(5Y5/2) AND DK YEL BRN (10 YR 4/2), MOIST TO DAMP, MOD PLASTIC, MOTTLED TEXTURE, ORGANIC MOTTLES, TRACE COARSE SAND.	PB-3				PB	R=6"/18"	10:10AM 10:28AM FEW BUMPS, MOSTLY SMOOTH END DENTED AND WORN
84	ML/CL	@85.0': CLAYEY SILT; MOTTLED DK YEL ORN(10YR6/6) AND LT OL GRY, MOIST, STIFF, MOD PLASTIC, TRACE COARSE TO FINE SAND, TINY ORGANIC SPECKS.	PB-4				PB	R=24"/30"	10:30AM 10:47AM SMOOTH, QUIET RUN END SLIGHTLY WORN, 1 DENT
86	SM/ML	@87.5': CLAYEY SILTY FINE SAND; MOD YEL BRN W/ LT OL GRY MOTTLES, MOIST VERY STIFF TO DENSE, TRACE PEBBLES UP TO 1", FINE TO MED SAND (50%), CLAYEY SILT (50%).	PB-5				PB	R=9"/30"	10:51AM 11:06AM SMOOTH, QUIET RUN COUPLE DENTS IN END, WORN
88	CL	@90.0': SILTY CLAY W/ CARBONATE NODULES; LT OL GRY AND CHALKY WHITE, MOIST, VERY STIFF TO HARD, HIGHLY PLASTIC. CARBONATE NODULE BLOCKS THE END OF TUBE.	PB-6				PB	R=30"/30"	11:13AM 11:30AM SMOOTH, QUIET RUN END MOD WORN, FEW DINGS
90 92	CH SHRD	@92.5': SHEARED CLAY W/ CARBONATE NODULES; SLIGHTLY MOTTLED LT OL GRY W/ HINT OF MOD YEL BRN, AND CHALKY YEL GRY, MOIST, VERY STIFF TO HARD (LOCALLY), HIGHLY PLASTIC, MANY SMALL WAVY TO PLANAR SHINY SHEARS, WEAKLY STRIATED, SOME SURROUNDING NODULES.	PB-7				PB	R=23"/30"	11:36AM 11:57AM SMOOTH, QUIET RUN END MOD WORN, FEW NICKS
94	CH	@95.0': HARD CARBONATE NODULE BLOCKS THE END OF THE TUBE. **88.0'–96.0': CLAY W/ CARBONATE NODULES; LT OL GRY, MOIST, VERY STIFF, HIGHLY PLASTIC, LOCALLY ABUNDANT SHEARS.**	PB-8				PB	R=30"/30"	11:59AM 12:12PM SMOOTH, QUIET RUN LAST 1' LITTLE CHATTER SLIGHTLY WORN END, DINGED END SLIGHTLY OVAL
96	CL/SM	@97.5': SANDY SILTY CLAY; SLIGHTLY MOTTLED GRAY ORANGE (10 YR 7/4) AND MOD YEL BRN (10YR5/4), MOIST, VERY STIFF, MOD PLASTIC, FINE TO COARSE SAND (30%), CARBONATE MOTTLES (25%).	PB-9				PB	R=30"/30"	12:17PM 12:31PM LITTLE CHATTER IN FIRST FOOT; QUIET, SMOOTH AFTER END WORN & DINGED
			PB-10				PB		12:37PM 12:51PM

LOWER ~~GRAVEL~~ Braided Stream Deposits

~~OXIDIZED LACUSTRINE CLAY~~ Oxidized Lacustrine clay

~~UNOXIDIZED LACUSTRINE CLAY~~ ← Unoxidized Lacustrine Clay → Oxidized Lacustrine clay →

~~FLUVIAL SILTS/SANDS~~ ← Marl →

Project RMC Quarry/ E0284E Date 2/7/05 Boring CSA/5025

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		CL		PB-10				PB	R=0"/30"	SLOW, SMOOTH RUN, VERY STIFF SAMPLE TUBE IS DESTROYED, FLATTENED
100		SC	@102.5': CLAYEY MED SAND W/GRAVEL; MOTTLED MOD YEL BRN AND LT OL GRY, MOIST, DENSE TO VERY DENSE, FN TO COARSE SAND (50%), CLAY BINDER (40%), GRAVEL UP TO ½" (10%).	PB-11				PB	R=12"/30"	1:14PM FIX SAMPLER 2:20PM START RUN SLOW, SMOOTH RUN END IN GOOD SHP
102		SM	@105.0': SILTY MED SAND W/ CLAY; LT OL GRY W/ Fe STAINS AND BLACK ORGANIC FRAGS (CHARCOAL?), MOIST, DENSE. FN TO MED SAND (60%), SILT (30%), CLAY (10%).	PB-12				PB	R=30"/30"	2:30PM END RUN 2:45PM SMOOTH, QUIET RUN GRT COND
104 106 108 110 112 114		SM/SC	<u>96.0'-249.0': SILTY CLAY TO SANDY SILT;</u> LOCALLY MOTTLED MOD YEL BRN AND LT OL GRY TO DARK GRN GRY, MOIST, VERY STIFF TO DENSE, LOCALLY MOD PLASTIC W/ BLACK ORGANIC FRAGMENTS, CARBONATE MOTTLING AND TRACE GRAVELS	RUN9				TC	0.32fpm	2:50PM 3:06PM DRILLING SMOOTH, SLOW, TIGHT STEADY @ 110' VW PIEZO S/N 81251 3:14PM NO SPEED UP THRU ANTICIPATED SAND ZONE.
116		SP	@117.5': FINE TO MED SAND; LT OL GRY W/ A TINGE OF BROWN, MED DENSE, MOIST, LITTLE TO NO CLAYEY BINDER, FRIABLE, QUICK DILATENCY. (DRM EXTRUDED 6" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-13				PB	3.53fpm R=30"/30"	3:47PM CIRCULATING 3:51PM START RUN SMOOTH AND FAST GRT COND
118 120 122 124				RUN10 RUN11				DB	1.07fpm	3:54PM END RUN 7:30AM 2/8/05 WATER ISSUING FROM STANDPIPE AND MUD TUB OVERFLOWING W/ WATER 8:35AM DRILLING W/ 4¾" ⌀ DRAG BIT (DRILLER: CHRIS) SMOOTH, FAST DRILLING 8:37AM CIRCULATING 8:40AM DRILLING SMOOTH, FAST 8:42AM CIRCULATING
126		ML	@127.5': CLAYEY SILT W/ FN TO MED SAND; GRY OL GRN (5 GY 3/2), MOIST TO DAMP, VERY STIFF, MOD PLASTIC, SLIGHTLY MOTTLED TEXTURE, SAND (10%), 2" FROM TIP: THROUGH-GOING SHEAR, CURVED, IRREGULAR, LOW ANGLE, MOD. POLISHED, HEAVILY STRIATED IN CURVED PATTERN FOLLOWING UNDULATIONS IN SURFACE, FEW RANDOM SHEARS (CORNFLAKE) IN LOWER 3"; SHEARS APPEAR TO DECREASE TO NONE ~4" FROM TIP AS CLAY DECREASES. (DRM EXTRUDED 6" ON 3/11/05 FOR MOISTUR/DENSITY)	PB-14				PB	2.00fpm R=29"/30"	8:57AM START RUN SMOOTH, SLOW RUN LITTLE [illegible]
128 130				RUN12				DB	1.33fpm	9:03AM END RUN 9:11AM DRILLING SMOOTH, FAST 129.0'-130.0': RATE SPEEDS UP.

← Marl →

~~FLUVIAL SILTS/SANDS~~

Shallow Lacustrine Sand and Silt

Sheet 4 of 9

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E0284E **Date** 2/8/05 **Boring** CSA/SD25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
				RUN12				DB	1.39fpm	SMOOTH, FAST
134										9:18AM CIRCULATING
136		CL/SC	@137.5': INTERBEDDED SILTY CLAY AND SILTY SAND. SILTY CLAY; LT OL GRY w/ Fe STAINS AND MOTTLES, STIFF TO VERY STIFF, MOIST, MOD PLASTIC, SPARSE CARBONATE MOTTLES, TRACE FINE SAND. SILTY SAND; LT OL GRY w/ Fe STAINS/MOTTLES, MOIST, LOOSE TO MED DENSE, FRIABLE, FINE GRAINED. (JS EXTRUDED 6" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-15				PB	0.42fpm R=22"/30"	9:36AM START RUN SLOW, SMOOTH RUN GOOD END, ONE SMALL DENT
138										9:42AM END RUN 9:54AM DRILLING SMOOTH, SLOW
140				RUN13				DB	1.41fpm	@140.0' VW PIEZO S/N 81260
142										
144										10:01AM CIRCULATING
146		CL/ML	@147.5': LAMINATED SILTY CLAY; LIGHT OLIVE GREY (5Y 5/2) AND DARK GREENISH GREY (5G 4/1), AND CHALKY WHITE CARBONATE LAYERS, MOIST, MOD PLASTIC, STIFF. (JS EXTRUDED 6.5" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-16				PB	0.53fpm R=19"/30"	10:15AM START RUN MODERATELY SLOW AND STEADY THRU ENTIRE RUN END IN GRT COND
148										10:19AM END RUN 10:33AM DRILLING SMOOTH, SLOW
150										10:35AM
152				RUN14				DB	1.25fpm	
154										10:39AM CIRCULATING
156		CL/ML	@157.5': SILTY CLAY; DK GRN GRAY (5GY 4/1) w/ SMALL GRN BLK (5G 2/1) MOTTLES, MOIST TO DAMP, VERY STIFF, MOD TO HIGHLY PLASTIC, UNIFORM TEXTURE AND FAIRLY UNIFORM COLOR, NO LAMINATIONS, ROLLS TO 1/8" THREAD, BLACK ORGANIC FRAGS AND STRANDS. 2" FROM TIP: 1" WIDE SHEAR, POLISHED, 40° DIPPING, DOWNDIP STRIAE, IRREGULAR SURFACE. DISCONTINUOUS, HIGH ANGLE LENSE OF MED SAND. (JS EXTRUDED 6.5" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-17				PB	0.45fpm R=29"/30"	10:56AM START RUN SMOOTH, SLOW END IN GRT COND
158										11:02AM END RUN 11:16AM DRILLING FAST, SMOOTH
160										
162				RUN15				DB	2.51fpm	VERY HIGH PORE PRESSURE MUD PUSHING UP OUT OF HOLE WHILE DRILL STRING OUT OF HOLE DRILLER THICKENS MUD
164		ML/CL	@167.5': CLAYEY SILT; UNIFORM DK GRN GRY (5GY 4/1 TO 5G 4/1), MOIST, STIFF TO VERY STIFF, MOD PLASTIC, FINELY LAMINATED. TRACE VERY FINE SAND (10-15%). (JS EXTRUDED 7" ON 3/11/05 FOR MOISTURE/DENSITY)	PB-18				PB	0.25fpm R=30"/30"	11:19AM CIRCULATING 11:33AM START RUN VERY STIFF, SLOW

Shallow Lacustrine Sand and Silt

~~FLUVIAL SILTS/SANDS~~ ?

Unoxidized Lacustrine Clay

Shallow Lacustrine Sand

Sheet 5 of 9

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/ E0284E **Date** 2/8/05 **Boring** CSA/SD25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		ML/CL		PB-18				PB	R=30"/30"	END SLIGHTLY WORN 11:48AM END RUN 12:12 PM DRILLING
168										SMOOTH, FAST
170										
172				RUN16				DB	3.13pm	
174										
176										
178										
180									1.04pm	12:16PM CIRCULATING 1:12 PM START RUN
		CL	@182.5': SILTY CLAY; DK YEL BRN (10 YR 4/2) W/SMALL DK GRN GRY (5 G 4/1) MOTTLES, MOIST, VERY STIFF, MOD TO HIGHLY PLASTIC, CARBONATE MOTTLES (FEW). FAIRLY UNIFORM BRN COLOR. (JS EXTRUDED 6" ON 3/11/05 FOR MOISTURE/DENSITY)	PB-19				PB	R=30"/30"	SMOOTH, SLOW RUN END IN GRT COND
182										1:17 PM END RUN 1:54 PM DRILLING SMOOTH, SLOW
184										
186				RUN17				DB	1.53pm	
188										
190									2.27pm	1:59PM CIRCULATING 2:35PM START RUN SLOW, SMOOTH RUN
		ML/CL	@192.5': CLAYEY SILT W/TRACE FINE SAND; MOD YEL BRN (10 YR 5/4) TO DK YEL BRN (10 YR 6/6), MOIST TO DAMP, VERY STIFF, SLIGHTLY PLASTIC, FAIRLY UNIFORM COLOR, TRACE SMALL CARBONATE MOTTLES AND LT OL GRY MOTTLES, TRACE FINE TO COARSE SAND. (JS EXTRUDED 7" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-20				PB	R=30"/30"	END IN GRT SHP
192										2:44 PM END RUN 3:05 PM DRILLING SMOOTH, FAST
194										
196				RUN18				DB	2.50pm	
198										
										3:08PM CIRCULATING

Shallow Lacustrine Sand

Oxidized Lacustrine Clay

Oxidized Lacustrine Silt

~~FLUVIAL SILTS/SANDS~~

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0284E **Date** 2/8/05 **Boring** CSA/SD25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
		CL/ML	CUTTINGS @ 202.0': SILTY CLAY w/ FN TO MED SAND, MOD YEL BRN TO DK YEL BRN, MOIST, MODERATELY PLASTIC.					TC		2:44PM REAMED TO 200.0' w/ 6 3/4" Ø TRI CONE 3:08PM DRILLING
202										3:13PM SWITCHING TO 6 1/4" DRAG BIT 3:53PM DRILLING
204										7:30AM WHILE TRIPPING BACK IN TO SAMPLE PB-21, HOLE COLLAPSED 30' SHORT OF BOTTOM. HOLE VERY UNSTABLE @ 110', HIGH PORE PRESSURE IN CLEAN, LOOSE SAND ZONE.
206				RUN 19				DB	0.49pm	9:00AM 2/9/05 HOLE CAVED TO ~90', REAMING OUT w/ 4 3/4" Ø DRAG BIT TO 200' AND THICKEN MUD TO STABILIZE HOLE.
208										11:30AM ATTEMPT TO SAMPLE @ 200' FAILED AGAIN, REFUSAL @ 170'. ABANDONING SAMPLING
210			CUTTINGS @ 210': SAME AS ABOVE, LOTS OF 1/4"-1/2" BLACK GRAVELS, SUB ROUND.						4:03PM 4:17PM	SWITCH TO 6 3/4" Ø TRI CONE BIT AND START REAMING
212										12:30PM REAMED TO 70' 12:45PM @ 90' 12:53PM @ 110' 1:05PM @ 130' 1:15PM @ 150' [illegible] 1:33PM @ 170' 2:00PM @ 190'
214										SMOOTH, QUIET
216		ML/CL		RUN 20					0.44pm	
218										BELOW 219' HARDER SLOWER
220			CUTTINGS @ 220': SILTY CLAY, DK GRN GRY (5GY4/1), VERY STIFF TO HARD, MOIST, MOD PLASTIC, FEWER CUTTINGS OF YEL BRN SILTY CLAY.						4:20PM	HARD, SLOW RUN
222										
224		CL								
226				RUN 21					0.63pm	
228										LAST 2' EASIER, FASTER
230			NOT A LOT OF CUTTINGS COMING UP.						4:35PM 4:45PM	HARD, SLOW, LITTLE CHATTER 500lbs DOWN PRESSURE
232				RUN 22					0.85pm	EASES UP @ 232'
										HARD AGAIN 700lbs

FLUVIAL ~~SILTS/SANDS~~ (No Samples)

Sheet 7 of 9

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0284E **Date** 2/9/05 **Boring** CSA/SD25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
236 238			CUTTINGS: STIFF TO HARD GRN GRY CLAY AND SOFT TO STIFF, PLASTIC YEL BRN CLAY.	RUN22				DB	0.45'fpm	HARD, 250 PSI LAST 2', FASTER, FASTER.
240 242		CL	@242.5'; VERY FINE SANDY SILTY CLAY; MOD YEL BRN W/ MOTTLES OF YEL GRY (5 Y 7/2) CARBONATES AND A THIN 1/4" LAYER OF DK YEL BRN, MOIST TO DAMP, VERY STIFF TO DENSE, MOD PLASTIC, VERY FINE TO FINE SAND (15%-20%) AND TRACE COARSE SAND. SMALL BLACK ORGANIC FRAGMENTS. (JS EXTRUDED 7" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-21				PB	5:07PM 0.25'fpm R= 26'/30"	7:55AM 2/10/05 LITTLE WATER FLOWING OUT TOP OF STANDPIPE. NOT AS BAD AS DAY BEFORE. 8:46AM START RUN SMOOTH, SLOW RUN — GRT CONDITION 8:55AM END RUN 9:20AM DRILLING SMOOTH, MED FAST
244 246 248			249.0'-272.5'; SILTY CLAYSTONE; MOD YEL BROWN (10 YR 5/4) W/ LOCAL MOTTLES OF MOD BRN (5 YR 4/4), YEL GRY (5 Y 7/2) AND CARBONATE MOTTLES, DAMP TO MOIST, LOW HARDNESS, MOD STRENGTH, SLIGHT TO MOD PLASTICITY, HARD CONSISTENCY, TRACE COARSE SAND TO 1.5" GRAVEL. LOCALLY ABUNDANT BLACK ORGANIC SPECKS.	RUN23				DB	0.90'fpm	LAST 1' CHATTER, GRAVELS?
250 252		CLYST	@252.5'; SILTY CLAYSTONE W/ TRACE COARSE SAND; VERY MOTTLED MOD BRN (5 YR 4/4), MOD YEL BRN (10 YR 5/4) AND ABUNDANT TINY BLACK ORGANIC SPECKS, DAMP, LOW HARDNESS, MOD STRENGTH, VERY OXIDIZED, HARD CONSISTENCY. TRACE VERY FINE SAND (<10%). (JS EXTRUDED 8" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-22				PB	0.21'fpm R= 28"/30"	9:28AM CIRCULATING 10:07AM START RUN HARD, 500PSI DOWN PRESSURE LAST 1' COARSE W/ FIXED AND CHATTER END WORN, NICKED AND DINGED TUBE IS HOT. 10:19AM END RUN 10:46AM VERY STIFF TO HARD, SLOW 300 PSI DOWN PRESSURE
254 256 258				RUN24				DB	0.50'fpm	@260.0' VW PIEZO S/N 81255
260 262		SLTST	@262.0': CLAYEY SILT; MOD YEL BRN (10 YR 5/4), MOIST, STIFF, SLIGHT TO MOD PLASTIC, SPARSE CARBONATE MOTTLES AND BLACK ORGANIC FRAGMENTS. TRACE VERY FINE TO FINE SANDS. ~6.0"-9.0" FROM TIP: CLAY W/ GRAVEL, MOD YEL BRN, WET, CHERTY GRAVEL COMMON, CLASTS UP TO 1.5" LONG. (JS EXTRUDED 9" ON 3/11/05 FOR MOISTURE/DENSITY).	PB-23				PB	0.15'fpm R= 24"/30"	11:01AM CIRCULATING 11:54AM START RUN HARD, 1st 2' @ 500 PSI, BOUNCY LAST 0.5' @ 600 PSI, [illegible], SMOOTH W/ CHATTER @ END. END WORN AND ONE LEFT. LOST 6" OF SAMPLE OUT THE END 12:13PM END RUN 12:27PM DRILLING SMOOTH, FAST, FEW BUMPS
264 266				RUN25				DB	1.25'fpm	

FLUVIAL SILTS/SANDS

BEDROCK

Oxidized Lacustrine Clay

Shallow Lacustrine or Fluvial Gravel

Oxidized Lacustrine Clay

Shallow Lacustrine or Fluvial Sand

Oxidized Lacustrine Clay

Project RMC Quarry/E0284E **Date** 2/10/05 **Boring** CSA/SD25

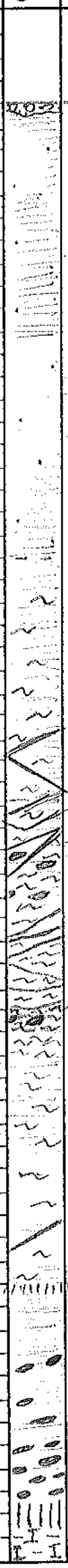
Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
270				RUN25				DB	1.25fpm	1:33PM CIRCULATING
272		CLYST	@272.5': SILTY CLAYSTONE; MOD YEL BRN (10YR5/4) W/ YEL GRY (5Y 7/2) CARBONATE MOTTLES, DAMP TO MOIST, LOW HARDNESS, WEAK TO MOD STRENGTH, HARD CONSISTENCY, MED PLASTICITY, TRACE FINE SAND AND PEBBLES UP TO ½". 4" FROM TIP: 1"X1" SHEAR, CURVIPLANAR, LOW ANGLE (≤45°), MOD. POLISHED, WEAKLY STRIATED. 5.5" FROM TIP: DISCONTINUOUS, MOD. POLISHED SHEAR. (IS EXTRUDED 6" ON 3/11/05 FOR MOISTURE/DENSITY)	PB-24				PB	0.21fpm R=27"/30"	2:17PM START RUN - SMOOTH, SLOW END IN GOOD COND 2:29PM END RUN, CIRCULATING
274			TD@272.5'							5:15PM INSTALLED 270' OF 3" ϕ I.D. PVC CASING W/ THREADS GLUED W/ PVC CEMENT AND TAPED. FOUR VIBRATING WIRE PIEZOMETER WERE TAPED TO THE SIDE OF THE CASING.
276										5:50PM PUMPED 150 GALS OF BENTONITE/CEMENT GROUT 8:25AM 2/11/05 PUMPED 200 GALS 8:37AM PUMPED 250 GALS 8:42AM PUMPED 300 GALS 9:02AM PUMPED 350 GALS 9:12AM PUMPED 400 GALS (~390)
278										
280										CEMENT/BENTONITE GROUT MIX: 3, 47 lb BAGS CEMENT 1, 50 lb BAG BENTONITE 45 GALS H_2O
282										1/2.5/0.3
284										CEMENT/H_2O/BENTONITE RATIO BY WEIGHT
286										
288										
290										
292										
294										
296										
298										VIBRATING WIRE PIEZOMETERS:
300										70.00' S/N 81245 110.00' S/N 81251 140.00' S/N 81260 260.00' S/N 81255

BEDROCK?

Oxidized Lacustrine Clay

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry Date ____________ Boring No. CSA-SD-25



Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
			8/2/05 PJ							
81			81.0 – 81.1 CLAYEY SANDY GRAVEL Yellowish Brown, Poorly sorted very coarse to fine sand, rounded to subrounded gravel to 2", moist @ 81.1 Irregular contact						0.4/1.5	PB-3
82 84		CL	81.1 – 86' SILTY CLAY with Sand, Light Olive Brown (2.5Y 5/3) mottled with Yellowish Brown (10YR 5/6) oxidation, moist, very stiff, moderate to low plasticity, approx. 10% very fine sand	Box 1					1.7/2.5	PB-4
86			@86' Contact not recovered						0/2.5	PB-5 "sample" is all sluff
88 90 92		CH	86' – 94.1' CLAY with silt Light Olive Gray (5Y 6/2), damp, very stiff, high plasticity, waxy feel, trace very fine sand numerous discontinuous and through-going polished surfaces, local carbonate nodules @ 88.6 – 91.5 Intensely sheared, polished surfaces throughout @ 91.0 – 91.2 Moist, highly plastic clay gouge with abundant polished surfaces; upper bounding surface is subhorizontal and highly polished @ 92.5' Fewer polished surfaces, mostly discontinuous, color change to Light Olive Brown (2.5Y 5/3)	Box 2					2.1/2.5 1.2/2.5 2.5/2.5	PB-6 PB-7 PB-8
94 96		CH	94.1 – 96.6 SANDY SILTY CLAY Light Olive Brown (2.5Y 5/3), damp to dry, very stiff, moderate to high plasticity, 15% – 20% very fine to fine sand, local carbonate nodules increasing downward	Box 3					2.3/2.5	PB-9
97		Marl	@96.6 Gradational contact							

Braided Stream Deposits

Oxidized Lacustrine Clay

Unoxidized Lacustrine Clay

Marl

Sheared Interval

Intensely Sheared

Sheet 1 of 1

Project RMC Quarry Date ________ Boring No. CSA-SD-25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
98		Marl	96.6 – 99' <u>MARL</u> Light Yellowish Brown (2.5Y 6/3) to Pale Yellow (2.5Y 7/3), moist, very stiff, highly reactive to HCL, high plasticity @99' contact not recovered	Box3					2.3/2.5	PB-10 missing
100		SP-SM	99' – 102' SAND with Silt, Olive Brown (2.5Y 4/3), damp, dense, well sorted fine to very fine sand with approx. 10% silt	Box 4					0.8/2.5	PB-11 cobble in sluff on top of sample
102 104		SW-SM ML	@102' contact not recovered 102' – 105' SAND with interbedded Clayey Silt, Olive Brown (2.5Y 4/3) sand with Olive Gray (5Y 5/2) silt, damp, poorly sorted very fine to very coarse sand with approx. 10% silt @103.7' - 105' well sorted very fine sand. @104.7 - 105' laminated						2.5/2.5	PB-12
106 108 110 112										105 - 115 No Samples
114 116 118 120 122		SP	@110' - 122' SAND, Olive Brown (2.5Y 4/3), damp, dense, well sorted very fine sand with approx. 5% silt and approx. 5% medium to coarse sand	Box 5					2.5/2.5	PB-13 0.6' removed from tip for lab testing

2 Scale

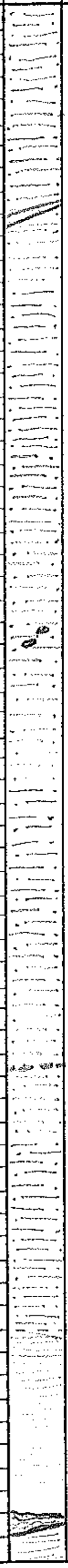
4 Scale

Marl

Shallow Lacustrine Sand and Sandy Silt

Sheet 2 of 7

Project RMC Quarry Date ______ Boring No. CSA-SD-25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
122			@ 122' contact not recovered	Box 5						
124										
126			122'-151' <u>SANDY SILT with Clay</u>, Dark Greenish Gray (5GY4/1) to Dark Gray (5Y4/1), damp to dry, very stiff, low plasticity, approx. 30%-40% very fine sand						1.8/2.5	PB-14 0.5' removed from tip for testing
128										
130			@126.1 - 126.3 Through-going polished surfaces with down dip striations							(127.5 - 135 No samples)
132		ML	@132' contact not recovered							
134										
136			@ 135'-136' Olive Gray (5Y5/2) clayey silt with sand, local carbonate nodules						1.5/2.5	PB-15 0.6' removed from tip
138										
140										
142										
144			@145'-146' Gray (5Y6/1) Clayey silt with sand	Box 6						
146			@145.7' irregular nodular carbonate bed, approx. 1" thick						1.3/2.5	PB-16 0.5' removed from tip for lab testing
148										
150			151'-161' <u>CLAY with Silt</u> Dark Greenish Gray (5BG4/1), damp to dry, very stiff, high plasticity, local polished surfaces							
152										
154		CH	@155.2 - 155.4 Very Dark Gray, moist clay gouge bounded by highly polished surfaces with 5°-10° dip numerous internal subhorizontal polished surfaces						2.3/2.5	PB-17
156										

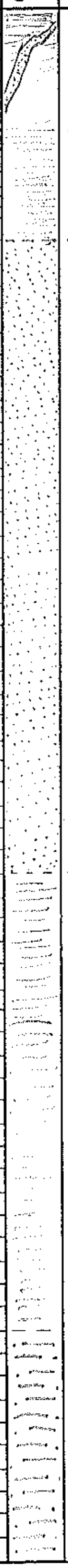
Shear Zone

Shallow Lacustrine Sandy Silt

Unoxidized Lacustrine Clay

Sheet 3 of 7

Project RMC Quarry **Date** ______ **Boring No.** CSA-SD-25



Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
156		@156.5 Clastic dikes, irregular, very fine sand	Box 6					2.3 2.5	PB-17 0.5' removed from tip for lab testing (originally 2.3/2.5)
158	CH								
160									
162		161' – 175' <u>SILTY SAND</u> Dark Greenish Gray (5G4/1), damp, dense, well sorted very fine sand with 40%-50% silt, <5% clay,							
164									
166		@165.5 – 165.8 Laminated, laminae dip approx. 5°–10°						1.8 2.5	PB-18 0.5' removed from tip for lab testing
168	SM	@166' Dark, organic enriched laminae dip approx. 5°							
170									
172									
174									
176		175' – 185' <u>SILTY CLAY with trace sand</u> Dark Olive Brown (2.5Y 3/3) to Dark Brown (10YR 3/3), damp, very stiff, high plasticity, 5% fine to medium sand, local carbonate filaments	Box 7						
178									
180								2.3 2.5	PB-19 0.5' removed from tip for lab testing
182	CH								
184									
186									
188	ML								
190									

Unoxidized Lacustrine Clay

Shallow Lacustrine Sand

Oxidized Lacustrine Clay

Oxidized Lacustrine Silt

Sheet 4 of 7

Project RMC Quarry Date ______ Boring No. CSA-SD-25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
190		ML	185'-193', CLAYEY SILT with Sand, Dark Brown (7.5 YR 4/4), damp to dry, hard to very stiff, low plasticity, oxidized, 5%-10% fine to medium sand						2.2/2.5	PB-20: 0.6' removed for lab testing (originally 2.2/2.5)
192										
194										
196			192.5 - 240 No Samples							
198										
200										
202										
204										
206										
208				Box 8						
210										
212										
214										
216										
218										
220										
222										
224										

← Oxidized Lacustrine silt

Sheet 5 of 7

Project RMC Quarry Date ________ Boring No. CSA-SD-25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
224										
226										
228										
230				Box 8						
232										
234										
236										
238			240' - 240.8' SANDY SILT with Clay Light Olive Brown (2.5Y 5/4), dry to damp, very stiff, low plasticity, fine to coarse sand, 5% - 10% clay							
240		ML							1.9 2.5	PB-21 0.6' removed for lab testing
242		CH	240.8' - 246' SILTY CLAY with Sand Yellowish Brown (10YR 5/6) with Dark Brown (10YR 4/3) laminae, damp, very stiff moderate plasticity, well developed horizontal lamination							
244										
246										
248		GW								
250			246' - 251.4' SANDY GRAVEL Olive Yellow (2.5Y 6/6), dry to damp, rounded gravel to 1½" with fine to very coarse sand (poorly sorted) @250.8 - 251.0 clay lens	Box 9					2.5 2.5	PB-22 0.6' removed from tip for lab testing
252										
254		CH	251.4 - 257' CLAY with Silt Dark Brown (10YR 4/3) with Light Yellowish Brown (10YR 6/4) laminae, damp, very stiff, high plasticity subhorizontal laminae with 2° - 5° dip							
256										
258										

Sheet 6 of 7

Oxidized Lacustrine Clay

Shallow Lacustrine or Fluvial Sandy Gravel

Oxidized lacustrine clay

Shallow Lacustrine or Fluvial Sand

Project RMC Quarry Date ______ Boring No. CSA-SD-25

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
258 260 262 264		SW	257' - 265' <u>GRAVELLY SAND with trace Silt</u>, Yellowish Brown (10YR 5/6), dry to damp, dense, poorly sorted fine to very coarse sand with rounded to subangular gravel to 1", approx. 5% silt	Box					1.0/2.5	PB-23: sample is mostly sluff 0.8' was removed from tip for lab testing
266 268 270 272		CL	265' - 272.5 <u>SILTY CLAY</u> Light Olive Brown (2.5Y 5/3) to Light Yellowish Brown (2.5Y 6/3), damp to dry, very stiff to hard, low plasticity						1.7/2.5	PB-24 0.6' removed from tip for lab testing

TD = 272.5'

Shallow Lacustrine or Fluvial Sand

Oxidized Lacustrine Clay

LOG OF EXPLORATORY DRILLING

Project RMC **Boring No.** CSA-SD-26

Location Approx. 300' east of Isabelle/Vineyard Ave **Project No.** E0284M

Drilling Contractor/Rig Pitcher/Fraste Rig (rotary) **Date of Drilling** 4/11-14/05

Ground Surface Elev. 412.5' **Logged By** PJ **Hole Diameter** 4½"

Surface Conditions Level surface w/coarse gravel **Weather** Fair

Depth (feet)	Graphic Log	USCS Class.	0-77' cuttings log: Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT** Bl./ft.	Drill Mode	Recov. ~~(in)~~	Remarks
			0 - 40' GRAVEL							Driller: Roland Medina
4			locally >4", mostly fine gravel with very coarse							
8			to med. sand							9:45am Start drilling with tricone bit (mud rotary drilling)
12										Rig chatter to approx. 40'
16		GW-GC								
20								RD		
24										
28										
32										
36										
40			40 – 77' CLAYEY SAND with local gravel, coarse to medium sand							
44										11:45 am @ 45'
48		SC								
52										minor rig chatter local gravelly intervals
56										
60										

Braided Stream Deposits

Sheet 1 of 8

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC E0284M **Date** 4/11-14/05 **Boring No.** CSA-SD-26

8 scale log

2 scale log

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. ~~(in.)~~	Remarks
60			Cuttings log (cont.)							
64								RD		
68		SC								
72										
76			77' to TD core log 77'-96' <u>GRAVELLY CLAYEY SAND</u> Reddish Yellow (7.5YR6/6), moist, dense, rounded to subangular clasts to 2", poorly sorted coarse to fine sand; local pebble imbrication; sandstone, chert, and claystone clasts					C	3.0/3.0	12:20 pm @ 77' pull rods; caving; drilling out sluff 3:05pm start coring @ 77'
80				Box 1					1.0/3.0	
81								C		
82										
83										
84								C	3.0/3.0	
85		SC		Box 2						
86										
87								C	1.3/3.0	
88										
89									2.8/3.0	
90				Box 3				C		stop drilling for the day at 92'; drillers need to switch coring systems. 4/11/05 4:45pm @ 92'
91										
92										

Braided Stream Deposits

Sheet 2 of 6

Project RMC **Date** 4/11-14/05 **Boring No.** CSA-SD-26

Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov.	Remarks 4/12/05
92									Drillers arrive: 9:15 switch to 5 1/8" ∅ bit
93							C	2.2/2.5	Start; 12:25 JS on rig
94	SC								
95							C	0/1.5	barrel has trouble penetrating below 94.5', switch to tri-cone bit for 94.5 - 96'
96		@96' contact not recoved 96' - 106' SAND with Gravel Light Olive Brown (2.5Y 5/4), well sorted/poorly graded medium to fine sand with minor coarse sand and fine gravel, angular to subangular clasts, ≤5% fines, loose, wet					c	0/.5	12:53 switch back to core barrel
97								0.7/2.5	PJ on rig
98							C		
99									
100	SP		Box 4				C	0/4.0	
101									
102									clean sluff from hole
103									
104								0/4.0	
105							C		
106		@106' contact not recovered 106' - 111.7 CLAYEY SANDY GRAVEL Yellowish Brown (10YR 5/4), damp to moist, dense, rounded to subangular gravel to >2", very coarse to medium sand, 20%-25% clay and silt							clean out sluff from hole
107									
108	GC		Box 5					3.0/4.0	
109									

Braided Stream Deposits

Sheet 3 of 8

Project RMC Date 4/11-14/05 Boring No. CSA-SD-26

Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. ~~(ft)~~	Remarks
109	GC								
110	- -	@ 110.5 contact not recovered 110.5 - 111.7 SILTY CLAY	Box 5				C	3.6/4.0	
111	CH	Yellowish Brown (10YR 5/6), damp, very stiff, moderate to high							
112		plasticity @ 111.7 sharp contact						2.0/3.0	
113		111.7 — CLAYEY SANDY GRAVEL, Light Yellowish					C		
114		Brown (10YR 6/4), rounded to subangular gravel to 2",							
115		poorly sorted coarse to medium sand, 20% clay and	Box 6						
116		silt; sandstone, chert, siltstone, and vein quartz					C	2.7/4.0	
117		clasts; local pebble imbrication							
118	GC								
119								2.2/4.0	
120							C		
121			Box 7						
122									4/12/05 4:45pm stop @ 122 4/13/05 start drilling 8:20 am
123							C	1.9/2.0	
124									
125			Box 8				C	1.4/5.	
126									

Braided Stream Deposits

Sheet 4 of 8

Project RMC Date 4/11-14/05 Boring No. CSA-SD-26

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. ~~(in.)~~	Remarks
126										
127				Box 8				C	1.4/5.0	
128										
129										
130								C	0.6/3.0	
131		GC								
132										
133								C	1.6/1.8	
134										
135				Box 9				C	3.1/3.2	
136										
137										10:35 am
138				Box 10				C	2.9/3.0	
139										
140										10:57 am
141		ML	@141.0-141.4 Sandy Silt lens, Light Olive Brown (10YR 5/6)					C	2.3/3.0	
142		GC								
143										11:20 am

Braided Stream Deposits

Sheet 5 of 8

Project RMC **Date** 4/11-14/05 **Boring No.** CSA-SD-26

Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
143	GC	143.4'-175.0' <u>CLAY with Silt</u>						0.3/0.5	
144		Light Olive Brown (2.5Y 5/4), Oxidized to Light Yellowish Brown	Box 11					2.2/2.5	140'-169' JS on the rig
145		(10YR 6/4) in the upper 0.2'-0.3', damp, very stiff, high dry							lower ½ ft. may be stuff 1:00pm
146		strength, high plasticity, abundant carbonate filaments, local discontinuous and through-							
147		going polished surfaces below 145.8'	Box 12					3.3/3.0	
148		@146.4 & 146.7'-TG wavy polished surfaces w/60° dip & down-dip striae							
149		@147.2' curviplanar polished surface w/45° dip							1:30pm
150		@147.7' Wavy polished surface (35° dip)						0.4/4.0	scraped sample out of shoe
151									
152	CH								
153		@153' color change to Olive (5Y 5/3)	Box 13						2:00pm
154		@157' Color Change to Olive Gray (5Y 4/2)						0.5/4.0	
155		@156.1' - wavy polished surface, 30° dip @156.7' - curviplanar polished surface, 35° dip							
156		@157.6' polished surface, wavy to planar, 40° dip							2:38pm
157		@157.8' polished surface, planar 20° dip, down-dip striae @158.0' polished surface, irregular to planar, 30° dip						3.3/3.0	0.3' of sample probably came from previous run
158		@158.3' polished surface, planar, 40° dip @158.7' planar polished surface, 30° dip	Box 14						
159		@159.1' planar polished surface 30° dip	Box					4.8/4.5	3:12pm
160									

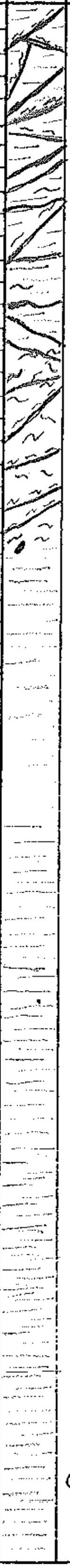
SHEARED CLAY

Braided Stream Deposits

Oxidized Lacustrine Clay

Unoxidized Lacustrine Clay

Project RMC Date 4/11-14/05 Boring No. CSA-SD-26



Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. ~~(in.)~~	Remarks
160		@ 160' Color Change to	Box14						
161		Greenish Gray (5GY 6/1) to Dark Greenish Gray (5GY4/1),						4.8/4.5	
162		numerous through-going polished surfaces with down	Box 15						
163		dip or oblique striae; numerous discontinuous polished							3:39pm
164		surfaces, dry, very stiff, high plasticity, high dry strength,							
165		isolated sand or fine gravel clasts; Highly sheared						2.9/3.0	High dry strength
166		to 165.9'							
167		@164.7' Through-going wavy polished surface w/ 50° dip @165' TG polished surface, 20° dip							4:15pm
168	CH	@165.2' TG polished surface 20° dip @165.4' TG planar polished surface 25° dip & down-dip striae @165.7' Irregular polished surface, 35° dip						0/1.9	4/13/05 4:50pm stop @ 169'
169		@165.9 Carbonate nodule, 1" long	Box 16						4/14/05 10:30am start drilling @ 169'
170		@165.9' to >167' Not Sheared						0/3.0	No recovery, a large clast was stuck in the bit
171									
172								0/2.0	No recovery
173									
174									11am 11:10am
175	—	@175' contact not recovered						0/3.0	Driller: "drills smooth" (likely still in clay)
176	CL								No recovery
177									11:20am

SHEARED CLAY

Unoxidized Lacustrine Clay

Oxidized Lacustrine Clay

Sheet 7 of 8

Project RMC **Date** 4/11-14/05 **Boring No.** CSA-SD-26

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. ~~(in.)~~	Remarks
177			175' - 184.3' SILTY CLAY with							11:30 am
			sand, Olive Brown (2.5Y 4/4)						0.9/5.0	
178			to Light Greenish Gray (5G 7/1),							
179			20% medium to very coarse sand							
		CL	size carbonate nodules, damp,	Box 16						
180			very stiff, moderate plasticity							
181			@ 182' Olive Gray (5Y 5/2) mottled							
			with strong Brown (7.5YR 4/6)							
182			oxidation, siltier							11:45 am (fix pump) 12:00 pm
			@183.7' fine sand bed 0.5" thick							
183			w/vertical orientation (clastic dike)	Box 17					5.5/5.5	
			@ 184.3 Gradational contact							
184			184.3 - CLAYEY SILT							
185		ML	Greenish Gray (5G 6/1) mottled							
			with Olive Brown (2.5Y 4/4)							
186			oxidation, damp, very stiff,	Box 18						
			moderate to low plasticity							
187		SM	@185.7' Gradational contact							
			185.7' - 187.5' SILTY SAND							12:15 pm
			w/trace clay, Gray (N5) mottled							Pull rods and install vibrating wire piezometers at 140' and 100' depth. Tremmie gra borehole with Portland Cement and Bentonite mix.
			with Light Olive Brown (2.5Y 5/3)							
			oxidation, moist, dense,							
			well sorted very fine sand							
			with 30% silt and 5% clay							
			@ 187.1 - 187.4 Faint							
			lamination with 20° dip							
			(cross stratification)							@100' SN81878 @140' SN81633
			TD = 187.5'							

← Oxidized Lacustrine Clay →

← Shallow Lacustrine Sand and S.H

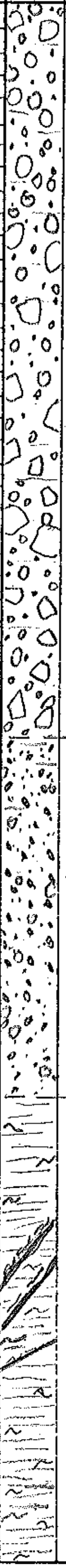
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring No. CSA-SD-29
Location East of Isabelle Ave and north of Arroyo Valle
Project No. E0284M
Drilling Contractor/Rig Pitcher/ Fraste Rig (mud rotary)
Date of Drilling 4/21-22/05
Ground Surface Elev. 412'
Logged By PJ
Hole Diameter 4½"
Surface Conditions Shoulder of unpaved quarry road
Weather Sunny, warm

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description Cuttings Log	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT** Bl./ft.	Drill Mode	Recov. (in.)	Remarks
			0-20' Gravel with Sand and Clay							10:50am start rotary drilling with tricone bit
4										
8'		GW-GC								Driller: Roland Medina Helper: Ramiro
12										Log cuttings to 100'
16										
20			20'-92' Clayey Gravel with Sand							
24				NA				RD	0	11:40am @26'
28										
32		GC								
36										
40										
44										
48										
52										
56										
60										

Braided Stream Deposits

Project RMC Quarry **Date** 4/21-22/05 **Boring No.** CSA-SD-29

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description Cuttings Log	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
60										
64										
68										
72		GC								
76										
80				NA				RD	0	2:10 pm @ 80' @83' Cobbles, rig chatter
84										
88										
92			92 – 99' CLAYEY SAND with Gravel, very coarse to medium sand							
96		SC								2:40pm @ 96'
97										
98			@99' Contact not recovered							
99			99' – 105' SILTY CLAY Light Yellowish Brown (2.5Y 6/3) oxidized to strong Brown							
100			(7.5YR 5/8), damp, very stiff, Moderate to high plasticity;							2:55pm @100' circulate mud to clean out hole, pull rods; install
101		CH	numerous discontinuous polished surfaces and several					C	3.0/3.0	101 coring system 3:44 pm start coring @100', bit plugged w/ cobble
102			through-going polished surface with down-dip oriented	BOX 1						
103			striae; TG shears: 100.7' (50°), 101.1' (50°), 101.7' (35° dip)						0/4.0	
104										

@102.2' carbonate nodules

← 8 Scale log →

← 2 scale log →

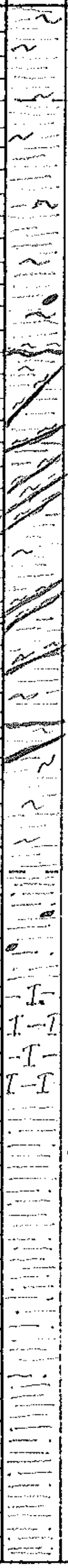
← Sheared Interval →

← Braided Stream Deposits →

← Oxidized Lacustrine Clay →

Sheet 2 of 6

Project RMC Quarry **Date** 4/21-22/05 **Boring No.** CSA-SD-29



Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. ~~(ft)~~	Remarks
104	CH								
105		105'-113.5' CLAY with Silt Lt Olive Gray (5Y 6/2) to Lt. Olive Brown (2.5Y 6/3)	Box 1					0/4.0	
106		damp, very stiff, high plasticity, SHEARED, numerous discontinuous							
107		polished surfaces and several through-going polished surfaces							4:32 pm 4:40 pm
108		with down-dip oriented striae @ 107.2' carbonate nodule						3.0/3.0	
109	CH	@107.8' TG polished surface, wavy, horizontal							4/21/05
110		@108.3' TG polished surface, 45° dip @108.7' TG surface w/30° dip	Box 2						4:50 pm stop @ 110' 8:15am 4/22/05
111		@109.0', 109.3', and 109.4' TG polished surfaces w/30°-40° dip							
112		@110.5', 110.6' and 111.1' TG polished surfaces w/ 25°-35° dip						2.8/4.0	
113		@111.8 wavy horizontal polished surface @112.1 TG shear w/30° dip							@ 113.5' contact not recovered
114		113.5'-121' SANDY SILT with clay interbedded with SILTY CLAY							8:53am
115		Light Olive Brown (2.5Y 6/3) damp, very stiff, low plasticity,						1.0/4.0	Marl (poor recovery)
116		carbonate nodules and filaments	Box 3						
117	ML/GL	@114.7-116.0 MARL horizon (calcareous clay)							
118		very hard, dry							9:15am
119								0.8/4.0	
120									
121									

Sheared Interval

Oxidized Lacustrine Clay

Unoxidized Lacustrine Clay

Lacustrine Marl

Lacustrine Silt and Clay

Sheet 3 of 6

Project RMC Quarry **Date** 4/21-22/05 **Boring No.** CSA-SD-29

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. ~~(ft.)~~	Remarks	
121			121 - 127.1 SILTY CLAY	Box 3				C			← Oxidized Lacustrine Clay →
			Olive Gray (5Y5/2) mottled with								
122			Yellowish Brown (10YR5/8), damp							9:35 am	
			very stiff, moderate to								
123		CL	low plasticity; numerous					C	2.0/4.0		
			coarse to medium sand								
124			size carbonate nodules								
125											
126				Box 4						10:00 am	
127		SW-SC	127.1-127.9 GRAVELLY SAND with						2.0/4.0		← Shallow Lacustrine Sand and Silt →
			Clay; very fine to fine								
128			sand w/lesser very coarse					C			
			to medium sand and fine								
129		ML	gravel, Light Olive Brown (2.5 5/3)								
			127.9 - 130.8 CLAYEY SILT								
130			Olive Gray (5Y 5/2), damp,							10:15 am	
131			very stiff, low plasticity								
		SM	130.8-131.8 SILTY SAND								
			Gray (5Y6/1) to Olive Brown								
132		CL	(2.5Y4/3), damp, very dense,	Box 5				C	4.3/4.0		← Oxidized Lacustrine Clay →
133		ML	very fine sand with silt								
			131.8 - 138.3 SILTY CLAY								
134			Gray (5Y6/1) to Olive Brown (2.5Y4/3)							10:35 am	
			locally oxidized to Brownish								
135		CL	Yellow (10YR 6/8), v.stiff, moderate								
			to low plasticity; carbonate filaments						4.0/4.0		
136			@132.6 - 133.3 Clayey	Box 6				C			
			silt lens								
137		SM	@136.5 - 137.1 Silty Sand	Box							Shallow Lacustrine Sand
			lew								
		CL								10:55 am	Oxidized Lacustrine Clay
138											

Sheet 4 of 6

Project RMC Quarry Date 4/21-22/05 Boring No. CSA-SD-29

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
138		CL	138.3 - 144.5 CLAY with Silt							
139			Greenish Gray (5GY 5/1), very stiff,							
			damp, high plasticity; 5% v. fine							
140			to medium sand; numerous					C	1.8/4.0	
			discontinuous and through-going							
141			polished surfaces (SHEARED);							
		CH	carbonate nodules and filaments	Box 7						
142			@138.8' & 139.6' planar polished surfaces							11:05 am
			@142.4 & 142.7' planar polished surfaces							11:14 am
143			@143.2 Color change to Olive							
			(5Y 4/3)						4.0/4.0	
144			@143.4 & 143.6 Planar polished					C		
			surfaces (through-going)							
145			143.9 Planar polished surface							
		ML	(through-going)							
146			144.5 - 146.0 CLAYEY							11:28 am
			SILT Olive Gray (5Y 4/2)	Box 8						
147		SP	damp, very stiff, low							
			plasticity; some very fine sand						3.9/4.0	
148			146.0 - 147.7 SAND with Silt					C		
			Olive Gray (5Y 4/2), moist,							
149			dense, 5% to 10% silt, no clay binder,							
			well sorted fine to very fine sand							
150		ML	147.7 - 153' SANDY SILT	Box 9						
			with Clay Dark Greenish							12:00 pm
151			Gray (5GY 4/1), damp to						3.0/3.0	
			dry, very stiff; fine to					C		
152			medium sand; local							
			carbonate nodules; massive							
153			153.0 - 156.0 SILTY CLAY							12:13 pm
			Greenish Gray (5GY 5/1), moist,	Box 10						12:20 pm
154		CH	stiff, moderate to high					C	0.5/4.0	core is disturbed
			plasticity; core is							
155			disturbed and recovery is poor							

← sheared Interval →

oxidized Lacustrine clay

← Unoxidized Lacustrine Clay →

← Shallow Lacustrine Sand and Silt →

← Unoxidized Lacustrine clay ↓

Project RMC Quarry **Date** 4/21-22/05 **Boring No.** CSA - SD-29

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
155		CH								
			@156' Contact not recovered						0.5/4.0	
156		—	156 - 158 SILTY SAND	Box 10						
			Dark Greenish Gray (5GY 4/1)							12:38 pm
157		SM	moist, very dense, v. fine							12:46 pm
			sand; carbonate cemented @157.3'							
158			158 - 167.3 SAND, Dark							@158' Gradational Contact
			Greenish Gray (5GY 4/1),							
159			moist, very dense to dense,						3.4/4.0	@159.6' sample of wood debris (RMC - 05; 0.35g)
160			well sorted fine to medium							
			sand organized in fining upward							
161			couplets 1" to 3" thick, horizontal							12:58 pm
		SP	bedding and cross stratification,	Box 11						1:07 pm
162			coarsens downward; local wood debris							@161.9 sample of wood debris (RMC-06; 2.9g)
			@ 161' - 165' well sorted						1.1/4.0	
163			fine sand							
			@165 - 166.5' well							
164			sorted medium sand							
			166.5 - 167.3' Coarse							
165			to medium sand							1:13 pm
166										
									2.5/4.0	
167			@167.3' Sharp Contact							
			167.3 - 169 SILTY CLAY	Box 12						
168			Dark Greenish Gray to Olive,							
		CL	damp, very stiff, mod to low							
169			plasticity, local carbonate nodules							1:33 pm 4/22/05
			TD = 169'							
										Install VW piezo's 90' SN 81635 140' SN 81634 } pn 52611034 100 psi

Unoxidized Lacustrine Clay

Shallow Lacustrine Sand

Unoxidized Lacustrine Clay

LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring No. CSA-SD-32
Location Trinity Hills Lane, 134 ft. NE of Wood Hollow Dr. &
Project No. E0284V
Drilling Contractor/Rig Pitcher Drilling / Fraste Rig
Date of Drilling 7/8-12/05
Ground Surface Elev. Approx. 455'
Logged By PJ
Hole Diameter 6"
Surface Conditions Paved Roadway
Weather Sunny, warm

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT** Bl./ft.	Drill Mode	Recov. (in.)	Remarks
10 20 30 40 50 60		GC	0-68' CLAYEY SANDY GRAVEL (cuttings) 7'-18' Cobbles (rig chatter) @ 65' cobbles	NA				RD	0	10:30am Start Drilling with tricone bit (mud rotary) to 68' Driller: Roland Medina Helper: Ramiro
70 72			68'-74' CLAYEY SANDY GRAVEL Yellowish Brown (10YR 5/6), moist, dense, rounded to subangular gravel to >2" with poorly sorted very coarse to medium sand	BOX 1				C	1.1/4.0	start coring at 68' 1:50pm @ 68' 2:00pm @ 72'
74			@ 74.0-74.2 Dark Brown organic-rich sand @ 74.7' irregular (erosional) contact dips approx. 50°					C	3.0/3.0	2:05pm 2:15pm
76 78		CL	74.7 - 89.0 SILTY CLAY Light Yellowish Brown (10YR 6/4), damp, very stiff, low plasticity minor fine to medium sand	BOX 2				C	2.8/3.0	2:20pm Core appears narrow and elongated 2:35pm

10 scale log

2 scale log

Braided Stream Deposits

Oxidized Lacustrine Clay

Sheet 1 of 7

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry Date ______ Boring No. CSA-SD-32

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
78		ML	@ 78.0'-78.4' Lens of Clayey silt with Sand							2:40pm
									0.9/4.0	
80				Box 2				C		
82										2:55pm Thin out mud and circulate
84		CL		Box 3				C	3.5/4.0	
			@ 85.3'-86 Laminated							
86										3:35pm
			Becomes siltier							
88								C	5.0/5.0	
			@ 89' Gradational contact	Box 4						
			89'-91.5 CLAYEY SILT							
90			Light Olive Brown (2.5Y 5/3)							
		ML	mottled with Yellowish Brown							(Friday) 4:00pm 7/8/05
			(10YR 5/6) oxidation, damp,							8:30 am 7/11/05 (Monday)
			very stiff, low plasticity,							
92		SC	minor v. fine to fine sand							
			91.5-92.1 CLAYEY SAND Lt.						3.7/4.5	@ 91.5 Gradational contact
		CL	Olive Brown (2.5Y 5/3), moist,	Box 5				C		@ 92.1 sharp contact
			v. dense, fine sand							
			92.1-93.0 CLAY with silt and							
94		CH	Sand, Lt. Yellowish Brown (2.5Y 6/3),							
95			damp, very stiff, moderate to low plasticity							

Oxidized Lacustrine Clay

Oxidized Lacustrine Silt and Clay

Sheet 2 of 7

Project RMC Quarry **Date** **Boring No.** CSA-SD-32

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
95			93.0 - 96.9 CLAY with Silt	Box 5				C	3.7/4.5	8:45am
96		CH	Light Yellowish Brown (2.5Y 6/3)							8:55am
			to Brownish Yellow (10YR 6/6), damp,							
			very stiff, high to moderate						4.6	
		ML	plasticity, local carbonate	Box 6				C		
98			filaments and nodules							
			96.9 - 98.3 SANDY SILT with							
			Clay, Pale Olive (5Y 6/3) mottled							
			with Yellowish Brown (10YR 5/6)							
100			oxidation, damp, very stiff,							9:05am
		SP-SM	low plasticity							9:15am
			98.3 - 107.4 SAND with Silt					C	1.3/2.0	
			Light Yellowish Brown (2.5 6/3)	Box 7						
102			mottled with Strong Brown							9:25am
			(7.5YR 5/6) oxidation, damp,							9:35am
			dense, well sorted fine to							
			very fine sand with 10% silt							
104			and clay; local beds of fine					C		
			to medium sand							
									3.4/5.0	
106				Box 8						
			107.4 - 110.0 CLAYEY SILT							9:50am
			with Sand, Yellowish Brown							10:00am
108			(10YR 5/6) with local light							
		ML	Yellowish Brown (2.5Y 6/3) mottling,							
			damp, very stiff, low plasticity							
			110.0 - 111.0 SAND with Silt					C	5.0/5.0	
110			Light Olive Brown (2.5Y 5/4), damp							
		SP-SM	to moist, dense, well sorted							
			fine Sand	Box 9						
		ML	111.0 - 112.0 CLAYEY SILT							
112			with Sand (as above)							10:10am

← Oxidized Lacustrine Clay →

← Shallow Lacustrine Sand and Silt →

Sheet 3 of 7

Project RMC Quarry **Date** **Boring No.** CSA-50-32

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
112			112.0 – 114.3 SILTY CLAY,							10:20 am@112'
		CL	Olive (5Y 5/3) mostly oxidized	Box 9						
			to Yellowish Brown (10YR 5/6) damp,						4.0/4.0	
114			very stiff, moderate to low					C		
			plasticity							
			114.3 – 125.3 CLAY with	Box 10						
			silt, Olive (5Y 5/3), damp,							
			very stiff, high plasticity,							10:30 am
116			local carbonate nodules,							10:40 am
			local through-going and							
			discontinuous polished							
118			surfaces with down-dip striae							
			@114.8 – 125.7 Sheared					C	4.8/5.0	
			@122.0 – 124.0 Intensely							
			sheared, numerous highly	Box 11						
		CH	polished surfaces with							
120			varied orientations							
			@114.9' Wavy polished surface w/10° dip							10:50 am
			@115.2' planar polished surface w/35° dip							11:00 am@121'
122			@116.2' Wavy polished surface w/20° dip							
			@116.4 planar polished surface w/30° dip	Box 12						
			@117.3' planar polished surface w/50° dip							
			@120.6' Irreg. polished surface w/40° dip					C	4.6/4.5	
124			@121.9' Irreg. polished surface w/40° dip							
			@122.2' planar polished surface w/40° dip							
			@123.4' Irreg. polished surfaces w/30° dip							
			@125.3 Gradational contact							11:15 am@125.5' 0.1/0.1
126			125.3' – 132' MARL Light					C	0.4/0.4	Difficult drilling
			Greenish Gray (5BG 7/1), dry							through strong Marl 11:55 am
			to damp, very stiff to hard,	Box 13					1.1/2.0	
		Marl	highly reactive to HCL					C		
128										12:05 pm 12:15 pm
								C	0.2/3.0	
129										

Sheared Interval

Intensely sheared

Oxidized Lacustrine Clay

(Unoxidized) Lacustrine Clay

Lacustrine Marl

Project RMC Quarry **Date** ____________ **Boring No.** CSA-SD-32

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (In.)	Remarks
129										
									0.2/3.0	
130								C		
		Marl		Box 13						12:30 pm
										12:35 pm
			@132' contact not recovered,						0.1/2.0	
132			depth is approximate					C		
			132' – 136.2 SANDY CLAYEY SILT							12:50pm
			interbedded with fine sand							1:00pm Insert wireline tricone bit to clear marl chunk blocking core bit
134		ML/SM	Light Yellowish Brown (2.5Y 6/3) to					RD	0	
			Yellowish Brown (10YR5/6), damp,							
			very stiff, low plasticity,							1:10pm
			interbedded fine sand is well						4.0/4.0	
136			sorted but somewhat silty							
			136.2 – 138.7 SILTY CLAY	Box 14						
			Light Olive Brown (2.5Y 5/4)							
		CL	mottled with Gray (5Y 5/1), damp,							
138			very stiff, moderate to low plasticity							1:20pm
			local carbonate nodules							1:30pm
			138.7 – 142.0 CLAYEY SILT with							
		ML	Sand, Lt. Olive Brown (2.5Y 5/3),							
		SM								
140		ML	damp, very stiff, low plasticity						3.8/4.0	
			@139.4 – 139.6 silty sand lens							
		CL	@140.3 – 141.0' silty clay lens	Box 15						
		ML	@142' Gradational contact							1:40pm
142										
		SM	142.0 – 143.0 SILTY SAND							1:55pm
			Olive (5Y 5/3), damp to moist,							
			dense, well sorted very							
144			fine sand with silt						5.0/5.0	
		ML	143.0 – 146.8 SANDY CLAYEY	Box 16						
			SILT Olive (5Y 5/3) to Gray (5Y 6/1)							
			damp, very stiff, low plasticity							
146			very fine sand							

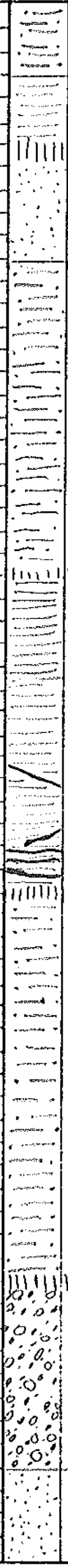
← Lacustrine Marl →

← Shallow Lacustrine Silt and Sand →

Oxidized Lacustrine Clay

← Shallow Lacustrine Sand and Silt →

Project RMC Quarry **Date** 7/8-12/05 **Boring No.** CSA-SD-32



Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (In.)	Remarks
146		ML	@146.8' Sharp contact w/subhorizontal	Box 16				C	5.0/5.0	
			polished surface							
		CH	146.8' - 147.8' SILTY CLAY							2:00pm 2:05pm
			Dark Bluish Gray (5B4/1), damp,							
148		SP	very stiff, high plasticity	Box 17						
			147.8 - 148.8 SAND with trace						4.0/4.0	
			silt Dark Greenish Gray					C		
150			(5GY4/1) damp, dense, well							
		ML	sorted fine to very fine							
			sand							2:20pm
			148.8 - 152.2 SANDY SILT with Clay							2:30pm
152			Dark Greenish Gray (5G 4/1)	Box 18						
			damp, very stiff, very fine sand							
			local carbonate filaments					C	4.5/4.0	
			152.2 - 155.7 CLAY with silt							
154		CH	Dark Greenish Gray (5BG 4/1)							
			damp, very stiff, moderate							
			to high plasticity, local							2:40 pm
			carbonate filaments, locally							
156			laminated	Box 19						
			@154.5' polished surface w/20° dip							
			@154.7 - 155 laminated							
		ML	@155.0 - 155.6 Black clay						4.8/5.0	
158			w/polished surfaces							
			155.7 - 160' CLAYEY SILT							
			Greenish Gray (5BG 5/1), damp,							
			very stiff, locally laminated,	Box 20						
160			local plant fragments (@157')							
			@ 158'-160' Cross-lamination (15°-25° dip)							
		SW-SM	160' - 162' GRAVELLY SAND w/silt							
			and clay Dark Greenish Gray (5BG 4/1)						3.6/5.0	
			moist, med. dense, very coarse to med. sand							
162			with rounded to subangular gravel to 1½"							
		SM	162' - 164 SILTY SAND Dk Greenish	Box 21						

Gray (5BG 4/1), moist, well sorted fine sand, locally laminated, dense

sheared

Shallow Lacustrine Sand and Silt

Unoxidized Lacustrine Clay

Unoxidized Lacustrine Silt

Shallow Lacustrine Sand

Sheet 6 of 7

Project RMC Quarry **Date** 7/8-12/05 **Boring No.** CSA-SD-32

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT Bl./ft.	Drill Mode	Recov. (in.)	Remarks
163		SM	@163' becomes coarser							
			@164' contact not recovered						3.6/5.0	
164		SW	164 - 169 GRAVELLY SAND	Bx 21						7/11/05 3:55pm@165'
			with trace silt and clay							8:15am 7/12/05
165			Light Olive Brown (2.5Y 5/4							
			to 2.5Y 5/6), moist, med.							
166			dense (?), poorly sorted						2.9/4.0	
167			very coarse to medium							
			sand with rounded to							
168			subangular gravel to 2"	B-1						
			@167.5' Detrital charcoal							8:30 am
169			TD=169'							7/12/05 Install inclinometer casing with VW piezometers: @102' Geokon VW piezo 4500S-350kpa SN 05-7815 @142' Geokon VW piezo 4500S-700kpa SN 05-6828 Note: during installation of inclinometer casing, the drillers had to push the casing hard (by hand) past squeezing hole below approx. 90 ft. depth

Shallow Lacustrine (?) Sand

Sheet 7 of 7

LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring No. CSA-SD-33
Location West end of Barleta Lane
Project No. E0284V
Drilling Contractor/Rig Pitcher Drilling/Frask mud rotary
Date of Drilling 7/13 - 14/05
Ground Surface Elev. ~456.0 **Logged By** PJ
Hole Diameter 6"
Surface Conditions Paved roadway
Weather Sunny, Hot

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Moisture (%)	Dry Den. (pcf)	SPT** Bl./ft.	Drill Mode	Recov. (in.)	Remarks
10 20 30 40 50		GC	0 - 52' CLAYEY SANDY GRAVEL	NA				RD	0	7/13/05 8:30am start drilling with tricone bit (no samples)
60		CL	52'-55' Silty Clay Yellowish Brown, low plasticity							Rig chatter 11:20 am circulate and then pull rods @ 65'
65 66 68		SC	55' - 68' CLAYEY GRAVELLY SAND Reddish Yellow (7.5YR 6/6), moist, dense, poorly sorted very coarse to fine sand with rounded to subangular gravel to 1", 15%-20% silt & clay @68' contact not recovered	Box 1				C	0.3/4.0	12:20pm start core drilling at 65' Rig chatter 12:30pm 12:35pm
70 72 74		CL	68' - 90.6' SILTY CLAY with trace sand Light Olive Brown (2.5Y 5/4), moist, stiff, moderate to low plasticity, minor fine to medium sand						0.2/4.0 0.9/4.0	core is disturbed 12:50pm 12:55pm

10 scale Log
4 scale
2 Scale Log

Braided Stream Deposits
Oxidized Lacustrine Clay

Sheet 1 of 6

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry Date 7/13-14/05 Boring No. CSA-SD-33

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
74										
								C	0.9/4.0	core is disturbed
76										1:05 pm
										1:15 pm
78				Box 1				C	0.2/3.0	core is disturbed
80										1:25 pm Driller believes that recovery problems and core disturbance result from a clast wedged at bottom of hole. He uses a wireline tricone bit to clear hole.
								RD	0	
82		CL						C	0/2.0	1:45 pm
										1:50 pm still pushing a clast through the clay. Driller tries to core it out w/o barrel.
84								C	0.1/2.0	2:00 pm
								C	0/1.0	2:10 pm Recovery remains poor. Driller tries a longer shoe to push clast aside.
86			@ 86.4 - 87.4 laminated moderate plasticity							Driller inserts a bit on 2½"Ø rod to try to push clast aside
			@ 87.6 - 90.4 carbonate nodules						2.0/3.0	
88										
90			90.6 - 91.3 SANDY CLAYEY SILT Light Yellowish Brown (2.5Y 6/4), damp, very stiff	Box 2					2.6/3.0	
91		ML	low plasticity, very fine sand							

Oxidized Lacustrine Clay

Shallow Lacustrine Sand @ 115 ft

Sheet 2 of 6

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry
Date 7/13-14/05
Boring No. CSA-SD-33

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
91		ML	91.3 – 100.8 SAND with silt Light Olive Brown (2.5Y 5/4), damp, dense, well sorted fine sand; interbedded with SANDY SILT with clay, Light Yellowish Brown (2.5Y 6/4) mottled with Yellowish Brown (10YR 5/6) oxidation, damp, very stiff, low plasticity (oxidized)	Box 2						
92										3:10pm 3:15pm
				Box 3						
94									5.0/5.0	
96										3:25pm
		SP/ML								
98				Box 4					5.0/5.0	
100			@100.8' Gradational contact							
		CL	100.8 – 104' SILTY CLAY Light Brownish Gray (2.5Y 6/2) mottled with Yellowish Brown (10YR 5/4) oxidation, damp, very stiff, low to moderate plasticity	Box 5						
102										3:45
			@104' Gradational contact							
104		ML	104 – 105.1' CLAYEY SILT Light Gray (5Y 6/1) oxidized to Light Yellowish Brown (10YR 6/4), damp, very stiff, low plasticity						5.0/5.0	
		SP-SM	105.1 – 105.5 SAND with silt Light Olive Brown (2.5Y 5/4) damp, dense, well sorted fine sand	Box 6						
106		CH	105.5 – 121.4 CLAY with silt Olive Gray (5Y 5/2), damp, very stiff, high plasticity @107 – 108.7' oxidized to Light Yellowish Brown (10YR 6/4)						4.8/5.0	4:05pm 7/13/05 8am 7/14/05 Circulate drilling mud 8:30 am
108										

Shallow Lacustrine Sand & Silt

Oxidized Lacustrine Clay

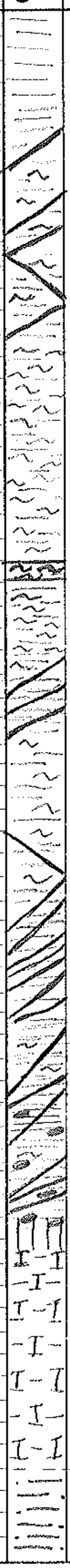
Shallow Lacustrine Sand & Silt

Unoxidized Lacustrine Clay

Sheet 3 of 6

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry Date 7/13-14/05 Boring No. CSA-SD-33

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
108			@107.6' Polished surface w/25° dip @109' Color change to Gray (5Y 5/1)	Box 6						
110			@109.5' – 121.3 SHEARED Discontinuous and local through-going highly polished surfaces with dips ranging from 25° to 50° @111.5 Color change to Greenish Gray (5GY 5/1)	Box 7					4.6/5.0	8:50 am
112			@112.0 – 115.0 Intensely sheared, numerous highly polished surfaces with widely varied orientations							
114		CH	@114.0 – 114.2' Moist, highly Plastic clay gauge (shear Zone) bounded by polished surfaces, horizontal to subhorizontal orientation	Box 8					5.0/5.0	
116										9:25 am
118									3.5/4.0	
120			@120.0 Increasing carbonate nodules	Box 9						9:50 am
			@121.4' Gradational contact							10:00 am
122			121.4' – 124' MARL Light Gray (5Y 7/1 to 5Y 6/1), damp to dry, very stiff to hard, highly reactive to HCL @123' laminated to very thin bedded	Box 10					2.2/3.5	Driller: "Hard drilling"
124		ML								10:20 am
125										

Sheared

Intensely Sheared

Unoxidized Lacustrine Clay

Marl

Shallow Lacustrine Sand & Silt

Sheet 4 of 6

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

$15,200 as of 7/8/

Project RMC Quarry Date 7/13 - 14/05 Boring No. CSA-SD-33

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
125		ML								
126		SM	124.0 - 125.1 <u>SANDY SILT</u> pale olive locally oxidized to Yellowish Brown, damp to moist, very stiff, low plasticity	Box 10					3.5/3.5	
		CL	125.1 - 126.3 <u>SILTY SAND</u> Pale Olive locally oxidized to Yellowish Brown, damp, dense, well sorted fine to v. fine sand	Box 11						
128			126.3 - 128.0 <u>SILTY CLAY</u> Lt. Olive Gray (5Y 6/2) locally oxidized to Yellowish Brown (10YR 5/8), damp, very stiff, moderate to low plasticity							
		ML	128.0 - 130.5 <u>CLAYEY SILT</u>, Lt. Olive Gray to Yell Brown, damp, v. stiff, low plasticity						3.5/4.0	
130										
132		SW-SM	130.5 - 133.3 <u>SAND with Silt</u> Light Olive Brown (2.5Y 5/3), moist, medium dense to dense (?), poorly sorted very coarse to fine sand with approx. 10% silt & clay	Box 12						11:10am 11:15 am
134		SP	133.3 - 137.0 <u>SAND</u> Olive Brown (2.5Y 4/3), moist, dense (?), <5% fines, well sorted medium to fine sand to 134.3' @ 134.3 - 136' Well sorted fine to very fine sand with subhorizontal stratification						3.6/4.0	
136			@ 136 - 137 medium to coarse sand @ 137' Gradational contact	Box 13					2.9/4.0	11:25 am 11:30 am
138		SW-SC	137.0' - 139.5' <u>GRAVELLY SAND with Clay</u> Light Olive Brown (2.5Y 5/4), wet, medium dense (?), approx. 10% - 15% clay and silt, poorly sorted medium to very coarse sand with rounded to subangular gravel to 1"							
140		CH		Box 14					48/5.0	11:50 am 12:00 pm
142										

Shallow Lacustrine Sand & Silt

Oxidized Lacustrine Clay

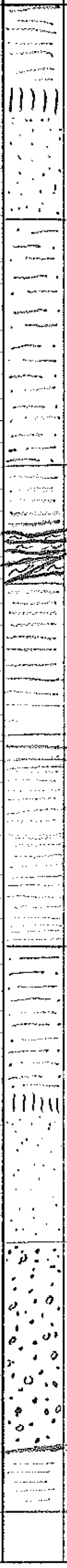
← Shallow Lacustrine or Fluvial (?) Sand and Silt →

← Lacustrine Clay →

Sheet 5 of 6

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry Date 7/13-14/05 Boring No. CSA-SB-33



Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Pen. (tsf)	Vane (tsf)	SPT Bl./ft.	Drill Mode	Recov. (%)	Remarks
142	CH	139.5 - 143.0 <u>SILTY CLAY</u> Lt. Olive Brown (2.5Y 5/3), moist, very stiff, moderate to high plasticity strongly laminated @141' Gray (5Y 5/1) @141.5 - 142.4 Abundant black laminae	Box 14					4.8/5.0	
144	SM	143.0 - 144.3 <u>SILTY SAND</u> Dark Greenish Gray (5BG 4/1), damp to moist, well sorted fine to very fine sand							12:15pm
146	ML	144.3 - 147.0 <u>CLAYEY SILT with Sand</u> Greenish Gray (5BG 5/1), damp, very stiff, low plasticity, local carbonate nodules	Box 15					3.5/3.5	
148 150	CH	147.0 - 152.3 <u>SILTY CLAY</u>, Greenish Gray (5BG 5/1), damp, very stiff, high to moderate plasticity @147.7' - 148.3 Black clay laminae with highly polished, striated surfaces (sheared) 148.3 - 149.3 Black to Light Gray, local carbonaceous fragments 149.3 - 152.3 Pale Green (5G 6/2) with Pale Yellow carbonate laminae and filaments that produces a brecciated appearance	Box 16					3.1/3.5	12:35pm 12:40pm
152	ML	152.3 - 154 <u>SANDY SILT with Clay</u> Greenish Gray (5G 6/1), damp, very stiff, low plasticity, very fine sand @154' Gradational contact	Box 17					4.0/4.0	1:10pm 1:15pm
154	SP	154 - 155.6 <u>SAND with trace silt</u> Grayish Green (5G 4/2), moist, dense, well sorted very fine to fine sand with minor silt							1:25pm
156	SW	155.6 - 157.8 <u>SAND with Gravel</u> Dark Greenish Gray (5G 4/1), moist, med. dense to dense (?), poorly sorted very coarse to medium sand with rounded to subrounded granules and pebbles to 1/2" @157.8 Sharp contact dips ~ 5°	Box 18					2.5/2.5	1:30pm Geokon VW piezos: @137' SN05-6829 @96' SN05-7813
158	CH	157.8 - 158.5 <u>SILTY CLAY</u> Dark Gray (N4), damp, very stiff, high plasticity							1:50pm 7/14/05 TD = 158.5' Install inclinometer casing w/ VW piezometers

Sheared

fining upward

Lacustrine Clay

Shallow Lacustrine Silt and Sand

Unoxidized Lacustrine Clay

Shallow Lacustrine or Fluvial (?) Sand & Silt

Unoxidized Lacustrine Clay

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES, AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project RMC Quarry **Boring No.** CSA-SD-35

Location 70' west of SD-14, upper bench north of Lake A **Project No.** E0284 FF

Drilling Contractor/Rig Pitcher Drilling / Fraste truck rig **Date of Drilling** 4/24-25/06

Ground Surface Elev 437.5 **Logged By** PJ **Hole Diameter** 5"

Surface Conditions Gravel road **Weather** overcast

Depth (feet)	Graphic Log	USCS Class.	Geological Description Cuttings Log (0-90')	Sample Desig.	Drill Mode	Recov. (%)	Remarks
8		GC	0-8' Large gravel with much rig chatter				10:00am start drilling with tricone bit
16		SC/GC	8'-90' Clayey sand with Gravel to Clayey Sandy Gravel; poorly sorted very coarse to medium sand				Driller: Roland Medina Geologist: Philip Johnson
24							Helper: Ramiro
32				NA	RD	0	
40							
48							
56							
64		SC/GC	@66'-66.5' clay lens				
72			@68'-68.5' clay lens				
80			@75' Rig chatter, larger gravel				
88		SC/GC					1:45pm @90' circulate mud and pull tricone bit.
90			90.0'-94' <u>CLAYEY GRAVELLY SAND</u> Brownish Yellow (10YR 6/6), moist, dense, poorly sorted very coarse to medium sand with gravel to 1½", approximately 15% fines, rounded to subangular clasts of sandstone & chert				2:15pm Start coring @90'
91		SC		Box 1	C	1.9/2.0	
92					C	0.2/3.0	
93							

8 Scale Log

4 Scale Log

2 Scale Log

Braided Stream Deposits

Project RMC Quarry **Date** 4/24-25/06 **Boring No.** CSA-SD-35

Depth (feet)	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
94	SC	@ 94' contact not recovered		C	0.2/3.0	Driller: "silty at 94 ft."
96	ML	94' - 97.2' CLAYEY SILT with Trace Sand, Light Olive Brown (2.5Y 5/4) to Strong Brown (7.5YR 5/8), moist, stiff to very stiff, low plasticity, 5-10% very fine sand, locally laminated	Box 1	C	0.9/2.0	2:35pm @ 95' Drillers stop to adjust drill head 2:55pm @ 97'
		@ 97.2' contact: gradational over 1"		C	0.5/0.5	
98	SC	97.2 - 98.7' CLAYEY GRAVELLY SAND Light Yellowish Brown (2.5Y 6/4), wet, poorly sorted very coarse to medium sand with gravel to 3/4"	Box 2	C	1.5/1.5	
100	CH	@ 98.7 Irregular, sharp contact 98.7 - 100.7' SILTY CLAY light Olive Brown (2.5Y 5/4), damp, very stiff, moderate to high plasticity, @ 98.7 - 99' laminated		C	3.2/3.0	
102	ML & SM	100.7 - 102.7' CLAYEY SILT with interbedded silty Sand mottled Light Olive Brown (2.5Y 5/4) to Olive Gray (5Y 5/2) to Yellowish Brown (10YR 5/8), damp, very stiff, low plasticity, very fine sand, @ 102.7' Gradational contact	Box 3	C	4.0/4.0	3:50pm @ 102'
104						
106	CH	102.7' - 112.7' CLAY with silt, Olive Gray (5Y 5/2), damp, very stiff, high plasticity, local polished surfaces, local mollusc shells, local carbonate nodules @ 104.5 - 112' Numerous discontinuous and through-going polished surfaces with varied orientations, many surfaces are moderately to highly polished; Intensely Sheared at 104.5 - 107.5'	Box 4	C	3.0/3.0	4:10pm @ 106' 106.2 - 106.5 Clay gouge zone
108		@ 106.2 - 106.6 Clay Gouge with many horizontal to subhorizontal through-going highly polished surfaces (very highly sheared)	Box 5	C.	3.0/3.0	4/24/06 4:30pm stop at 109' 8:15 am start 4/25/06 @ 109'
110						

Braided Stream Deposits

"Upper Clay"

Braided Stream Deposits

Unc.

Oxidized Lacustrine Clay and Silt

Unoxidized Lacustrine Clay

Sheared Interval

Intensely Sheared

Gouge

Cotton, Shires & Associates, Inc.
Consulting Engineers and Geologists

Project RMC Quarry **Date** 4/24-25/06 **Boring No.** CSA-SD-35

Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
110		CH	@110.2' through-going polished surface, 25° dip @110.4' through-going polished surface, 20° dip @111.0' TG polished surface w/ 25° dip @111.2' TG polished surface w/ 25° dip @111.4' TG polished surface w/ 20° dip	Box 5	C	3.0/3.0	
112			@ 112.7' Gradational Contact 112.7 - 114.6' MARL white (2.5Y 8/1) mottled with Light Olive Gray (5Y 6/2),	Box 6	C	2.3/2.3	8:40am @ 112'
114		CL	damp, hard, reactive to HCL @ 114.6 Gradational contact 114.6 - 115.0 SILTY CLAY Light Yellowish Brown (2.5Y 6/4) moist, v. stiff,		C	1.7/1.5	
116		SM CL SM	low to mod. plasticity @115.0 Gradational contact 115.0 - 117.5 SILTY SAND Light Yellowish Brown (2.5Y 6/3) locally	Box 7		3.0/3.0	9:25am @116'
118		SP-SM	oxidized to Reddish Yellow (7.5YR 6/8), very fine to fine sand with up to 40% silt & clay, local carbonate nodules and filaments from 115' - 117' @116.8' - 117.2' silty clay lens		C		@118.7 - 119 subhorizontal silt laminae 9:40am @119'
120			@117.5 Gradational contact 117.5 - 119.0' SAND with Silt Pale Olive (5Y 6/3) locally oxidized to Dark Yellowish Brown (10YR 4/6),	Box 8	C	3.0/3.0	
122		SP	moist to damp, well sorted very fine to fine sand with ≤ 10% silt & clay @ 119.0 Gradational contact				9:55am @122'
124			119.0 - 127.0 SAND Olive Gray (5Y 5/2) locally oxidized to Dark Yellowish Brown (10YR 4/3) moist to wet, well sorted fine to very fine sand with < 5% fine @120.5' minor medium sand	Box 9	C	0.7/4.0	
126			@ 121' poorly sorted medium to coarse sand with minor granules @ 122' - 127' well sorted fine to very fine sand		C	1.6/4.0	

← Sheared Interval →

Fining Upward →

Unoxidized Lacustrine Clay

Marl

Oxidized Lacustrine Clay

← Shallow Lacustrine Sand and Sandy Silt →

Project RMC Quarry **Date** 4/24-25/06 **Boring No.** CSA-SD-35

Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
128		CH	@127' contact: Sharp, planar to slightly irreg. 127.0' – 129.0' SILTY CLAY Yellowish Brown (10YR 5/8) to Light Olive Gray (5Y 6/2) damp, very stiff, moderate to high plasticity @127.0' - 127.6 laminated @ 127.3' - 127.4 Gray	Box 9	C	1.6/4.0	
130		ML	@ 129' contact not recovered 129' – 132.1' CLAYEY SILT with sand Light Olive Brown (2.5Y 5/4), damp, very stiff, low plasticity, very fine sand		C	2.0/2.0	10:35 am @130'
132							
134		SM	132.1' – 137.1 SILTY SAND Olive Brown (2.5Y 4/4), moist to wet, medium dense, very fine to fine sand with 20% to 30% silt & clay @133.5 - 133.8 silty laminae	Box 10	C	1.8/5.0	
136							
138		SP	@137.1 sharp contact 137.1 – 140.5 SAND Olive Brown (2.5Y 4/4), moist to wet, medium dense, moderately sorted medium to fine sand with approximately 5% silt & clay @137.8 - 138.4 medium to coarse sand	Box 11	C	3.5/3.5	
140			@ 138.4 - 139 fine to very fine sand @139 - 140.5 Very fine sand with horizontal lamination				11:30 am @ 140.5'
			TD = 140.5' Geokon 4500S vibrating wire Piezometers: 92' SN 06-3660 106.5' SN 06-4513 122' SN 06-4511				11:30 am - 12:15 pm pull rods 12:15 pm - 1:15 pm Install piezos 1:15 - 3 pm Grouting

fining upward

← Oxidized Lacustrine Clay →

← Shallow Lacustrine Sand →

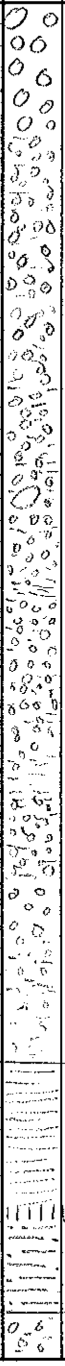
Cotton, Shires & Associates, Inc.
Consulting Engineers and Geologists

Sheet 4 of 4

COTTON, SHIRES, AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project CEMEX - RMC
Boring No. CSA-SD-37
Location N. side of gravel rd., adj. to Arroyo Del Valle
Project No. E0284FF
Drilling Contractor/Rig Pitcher Drilling / Fraste truck rig
Date of Drilling 4/27/06 to 5/1/06
Ground Surface Elev 432.1
Logged By PJ/RR
Hole Diameter 5"
Surface Conditions off gravel rd.
Weather clear

Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
		GC	0-90' CUTTINGS LOG: 0-11' Large Boulders				Driller - Roland Medina Helper - Ramiro 12.30, 7" core barrel to 11' 1.15, tri-cone drill
8							
16			11'-35.5' Clayey Gravel, moderate brown clay, gravel frag's to 1", local thin clay lenses + larger boulders				Geologist: Ron Rubin rig clatter
20				NA	RD	0	1.38, 21.5'
24							
28							1.58, 31.5'
32			33' - sandy clay in cuttings				
36		CL	35.5-41.0' SILTY CLAY Strong Brown (7.5YR 4/6) moist, very stiff, moderate plasticity, isolated sand and gravel grains @37.5-38.8 Mottled Pale Yellow (2.5Y 8/3) to Strong Brown @38' Increasing sand content	Box 1	C	4.0/4.0	2.20, coring 35.5
40		ML	@38.8' gradational contact 38.8-41.0 SANDY SILT Pale Yellow (5Y 8/3) mottled with Reddish Yellow (7.5YR 6/6) oxidation, damp, very stiff, low plasticity, very fine sand	Box 2	C	2.0/2.0	2.28, 39.5' 2.37, coring 2.40, 41.5
		GC					gravel

16-scale

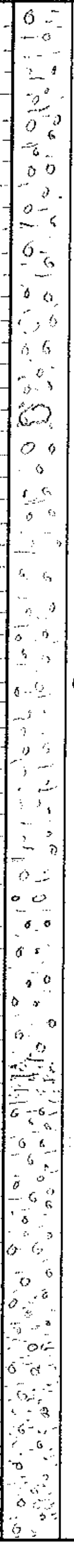
4-scale

Braided Stream Deposits

"Upper Clay"

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Date 4/27/06 Boring No. SD-37

Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
			@41.0 sharp contact 41.0 – 90 CLAYEY SANDY GRAVEL Yellow (10YR 8/6), damp, dense, very coarse to medium sand (poorly sorted) with subangular to rounded gravel				41.5' resome w/tricone
44							
48							
							rig chatter @51' 3,08, 51.5'
52							
56		GC		NA	RD	0	
60							
							3,30, 61.5' rig chatter
64							
			66' - fine gravel, coarse sand & clay in cuttings.				
68							
							3,51, 71.5'
72							

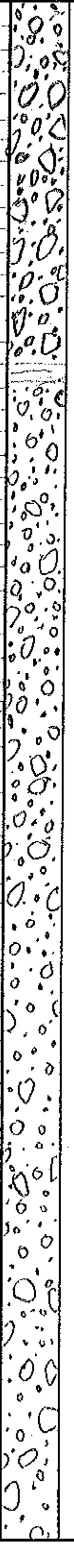
Braided Stream Deposits

Project RMC **Date** 4/27/06 **Boring No.** SD-37

4 Scale

2 scale

Braided Stream Deposits

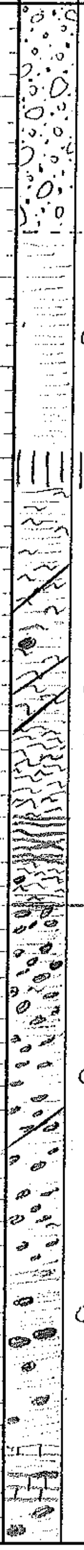
Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
							
80							
							14:14pm @ 81.5'
				NA	RD	0	
84			84' - Driller notes faster advancement, clay				
88							
		Sc	90-103.5 CLAYEY GRAVELLY SAND Yellow (10YR 7/6) to Brownish Yellow (10YR 6/8), moist, poorly sorted very coarse to medium sand with rounded to subangular gravel to >2.5", ~15% silt & clay, dense				4/27/06 4:32 pm @ 90' Stop for day 9:00 am 4/28/06 Start Coring @ 90' (after inserting the coring rods & bit/core barrel)
92				Box 1'	C	1.7/2.0	
94					C	2.5/2.5	Geologist: Phil Johnson
							9:35 am @ 95.5
96							Rig chatter
				Box 2	C	0/3.5	
98							
							Driller: "sand and gravel without much binder"
100					C	0/3.0	
101							

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Sheet 3 of 6

Project RMC Quarry **Date** 4/27-28/06 **Boring No.** CSA-SD-37

Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
102					C	0	Driller: "clean gravel & sand; no binder" 10:10 am
			Sand and gravel cuttings in return flow (drilling mud)		RD	0	• Apparently, there is a clast stuck in the bit. The driller inserts a tricone plug to drill it out (102 - 102.5)
			@ 103.5' contact not recovered; driller senses a change to clay		C	0	
104		CL		Box 4	RD	0	• No recovery from 102.5 to 104; insert tricone plug again and drill to 105'
			chips of Yellowish Brown Clay in cuttings				Core from 105'
106			103.5 - 106.1' SILTY CLAY, mottled Strong Brown (7.5YR 4/6) to Olive (5Y 5/3) damp, very stiff, low to moderate plasticity (oxidized lacustrine clay) @ 106.1' Gradational contact		C	1.5 1.5	11:10 am
108		CH	106.1 - 111.0' CLAY with silt Light Olive Brown (2.5Y 5/3) with local Yellowish Brown (10YR 5/8) oxidation, damp, very stiff, high plasticity; numerous discontinuos and through-going polished surfaces with highly varied orientations (sheared) @ 109 - 110.7 Intensely sheared, polished surfaces throughout		C	2.5 2.5	@ 107.4 TG polished surface w/ 40° dip, downdip oriented striae @ 108.4 TG polished surface w/ 35° dip, @ 108.8 TG polished surface 11:25 am
110			@ 110.0 - 110.5' Clay Gouge Zone, moist, very stiff olive gray clay with numerous horizontal to subhorizontal highly polished surfaces that are very closely spaced upper bounding surface is highly polished, planar, 6° dip @ 110.7 - 111.0' local discontinuous polished surfaces	Box 5	C	2.0 2.0	11:45 am
112		CH	111.0 - 122.6' MARLY CLAY with Carbonate Nodules Olive (5Y 5/3), damp, very stiff, high plasticity; carbonate nodules are white and very hard; abundant carbonate nodules; very few, local discontinuous polished surfaces; clay is reactive to HCL	Box 6	C	3.0 3.0	
114					C	1.0 1.0	12:05 pm 12:20 pm
116		CL	@ 113.5 Through-going planar polished surface with 35° dip @ 117.0 - 117.6 carbonate beds or very large nodules @ 115' Locally oxidized to yellowish brown decreased plasticity, increased carbonate %	Box 7	C	1.0 2.0	12:40 pm Hard drilling
118					C	0	
					C	1.5 1.7	



Braided Stream Deposits

Oxidized Lacustrine Clay

Unoxidized Lacustrine Clay

Marl

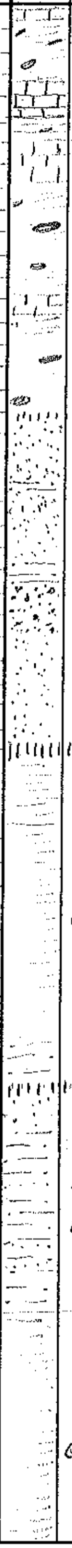
Sheared Interval

Intensely Sheared

Gouge

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry **Date** 4/27-28/06 **Boring No.** CSA-SD-37

Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
118				Box 7		1.5/1.7	
			@118.8' - 120.0' carbonate beds or very large nodules			0.4/0.4	1:10pm 1:30pm Driller: "drills like rock" (tough to core)
120		CL				1.2/1.6	
			@121.2 - 121.4' Carbonate bed or large nodule	Box 8		1.5/1.5	1:45pm Drilling remains difficult
122			122.6 - 126.3' SILTY SAND Olive (5Y5/4) locally oxidized to Yellowish Brown (10YR 5/8), damp, dense, well sorted very fine sand with 30-40% silt and clay, local beds of sandy silt				2:05pm
124		SM	@124.1 - 125.0' poorly sorted fine to very coarse sand	Box 9		2.4/2.5	2:20pm
			@125.0 - 126.3 well sorted fine sand, local rounded pebbles			2.0/2.0	
126			@ 126.3 Gradational contact				
		CL	126.8 - 130.1' SILTY CLAY light olive Gray (5Y6/2) mottled with Brownish Yellow (10YR 6/8) oxidation, damp, very stiff, moderate to low plasticity	Box 10		2.0/2.0	2:35pm
128							
		ML	Becomes more silty (clayey silt)			1.5/1.5	2:50pm
130		SM-ML	@130.1 - 132.5' SANDY SILT with interbedded SILTY SAND Olive (5Y5/3) damp, stiff, low plasticity, very fine sand	Box 11		2.0/2.0	3:05pm
132							3:25pm
		CL	132.5 - 135.5' SILTY CLAY Olive (5Y5/3) to Greenish Gray (5GY5/1) damp, very stiff, low plasticity			2.5/2.5	
134				Box 12			3:45pm

Marl

Shallow Lacustrine Sand and Sandy Silt with interbedded clay

Sheet 5 of 6

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry **Date** 4/27-28/06 **Boring No.** CSA-SD-37

Depth (feet)	Graphic Log	USCS Class.	Geological Description	Sample Desig.	Drill Mode	Recov. (%)	Remarks
136		CL ML	@ 135.5' Gradational Contact 135.5 - 139.0' <u>CLAYEY SILT with SAND</u> Light Yellowish Brown (2.5Y6/3) to Greenish Gray (5GY5/1), Mottled, damp, very stiff, low plasticity, very fine sand	Box 12		2.0/2.0	4:05 pm
138			@ 136.7' increased sand content (Loam) @ 139.0 Sharp contact (?)	Box 13		1.8/2.0	4:25 pm 4/28/06 Stop @ 139'
140		SP-SM	139.0 - 142.7' <u>SAND with Silt</u> Olive Gray (5Y4/2) moist, dense, well sorted very fine to fine sand, 5%-10% fines, locally very thin bedded with 0.5" thick sand beds separated by 1-2mm thick laminae, bedding is close to horizontal @ 140.0 - 140.7' Medium to fine sand			3.0/3.0	850 am 5/1/06 Start @ 139'
142			@ 140.7 - 141.2' Clayey silt bed @ 141.8' Increased fines content @ 142.7 sharp contact	Box 14		2.4/2.0	9:10 am
144		ML	142.7 - 144' <u>CLAYEY SILT w/ Sand</u> Olive Gray (5Y5/2) damp, very stiff, low plasticity, very fine sand @ 143.6 Irregular, subhorizontal stratification				9:30 am Finish coring @ 144' Pull rods and set up to install inclinometer casing and Piezometers
146			TD = 144'				
148							Note: there was 2½ ft. of sluff at the bottom of the borehole, so the originally planned piezo depths (100, 110, 124) could not be achieved.
150			Geokon Vibrating Wire Piezometers: model # 4500S 98' SN 06-3661 (350 kpa) 108' SN 06-4514 (700 kpa) 122' SN 06-4509 (700 kpa)				

← Shallow Lacustrine Sand and Sandy Silt →

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES, AND ASSOCIATES, INC.
LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/LD1
Location SOUTH SIDE OF LAKE, 1ST BENCH, RMC QUARRY PROPERTY
Project No. E0303C
Drilling Contractor/Rig Tri Valley Drilling Co., EARTHDRILL 42LHD, 42" RING GEAR, 116' QUAD KELLY, DRILL WT 40,000#, 96"ϕ MAX
Date of Drilling 1/22/04
Ground Surface Elev. 403.2' **Logged By** JD/DRM
Hole Diameter 30"ϕ BUCKET AUGER
Surface BARE GRAVEL
Weather CLEAR, SUNNY, WARM

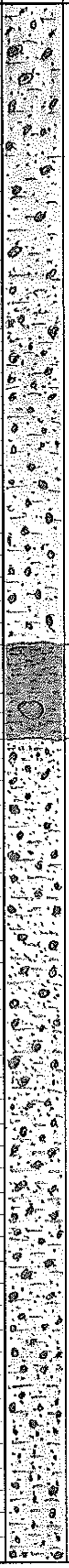
7:15AM 1/26/04 24.1'
7:40AM 1/23/04 ▽
7:20AM 1/27/04 @ 6.4'
3:15PM 1/22/04 ▽
END DAY 1

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
			0.0'-17.0': CLAYEY SANDY GRAVEL; MOD YEL BRN (10 YR 5/4), MOIST, DENSE, COBBLES UP TO 6", SUB ROUND TO SUB ANG. CLAY ~20%, SAND 30%, GRAVEL 50%. COARSE SAND. HIGH PLASTICITY CLAY.							12:27 PM START DRILLING W/ 30"ϕ BUCKET AUGER DRILLER: MARIO HELPER: GREG
2										
				B-1 BS-1				BAG BULK		
4			4.0'-6.0': MOIST TO WET.							
6										1:16 PM
			@7.0': WATER IN BOTTOM OF BOREHOLE.							1:25 PM
				B-2				BAG		7.6'-10.0': HOLE CAVING @ LEAST 1.0' INTO SIDE WALL, S40E WALL
8		GC								
										1:35 PM
10										1:40 PM 2:15 PM 5' SECTION OF 30"ϕ CASING SET TO 10'. 7:40AM 1/23/04 START DRILLING SECOND DAY. WATER LEVEL IS AT 4.4' BGS. 8:21AM - DRILLING W 26"ϕ BUCKET
12										
14										10:38 AM
16										
			17.0-19.0': CLAYEY SILT; MOD BRN (5YR 4/4) TO MOD YEL BRN (10YR 5/4), MOIST, VERY STIFF, TRACE SMALL GRAVEL AND COARSE SAND, SUB ROUND, TINY BLACK/BRN SPECKS. MED TO HIGH PLASTICITY. SLAKES QUICKLY IN STANDING WATER.							
18		ML								11:16 AM
			19.0'-44.0': CLAYEY SANDY GRAVEL; SAME AS 0.0'-17.0'.							
20										11:25AM WATER @ 16', CASING TOP @ 3', WATER POURING IN ON SOUTHEAST SIDE BEHIND CASING 11:35AM - ADD 10' OF CASING 12:30 PM
22										
24										12:55 PM
		GC								
26										
28										
										1:30PM SETTING ANOTHER 10' OF CASING

UPPER GRAVEL?
Braided Stream Deposits

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303C **Date** 1/23/04 **Boring** CSA/LD1



Depth (feet)	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
32									-SWITCH TO 18"ɸ BUCKET
34									
36	GC								3:30PM SWITCH BACK TO 24" BUCKET AND REAM
38									4:10PM DRILLED & CASED TO 40'
40 (END DAY 2)									7:30AM 1/26/04 START PUMPING WATER @ 41.0' TAGGED BOTTOM @ 33.0' ~45mins TO PUMP 25.0' 8:22AM-START DRILLING
42									
44	ML	44.0'-46.0': CLAYEY SILT; MOD YEL BRN (10 YR 5/4), MOIST, VERY STIFF, TRACE COARSE SAND AND GRAVEL. COBBLE UP TO 3", SUB ROUND, MED PLASTICITY, SLAKES QUICKLY IN STANDING H_2O.							.SOFT TO 42.5' 9:20AM-KELLY TO 45'
46		46.0'-81.0': CLAYEY SANDY GRAVEL; MOD YEL BRN CLAY w/ MULTI COLORED ROCK FRAGMENTS, MOIST-WET, DENSE-VY DENSE. 50% SMALL GRAVEL; SUB ROUND; 35% COARSE SAND, SUB ROUND; 20% CLAY BINDER, HIGH PLASTICITY. GRAVEL GENERALLY UP TO 1".							9:50AM
48									
50									10:25AM PUMPING WATER 11:00AM DRILLING AGAIN
52									
54									11:17AM
	GC								
56									11:37AM
58									
60									11:50AM 12:01PM-DRILLERS BREAK 12:09PM DRILLING AGAIN
62									

UPPER ~~GRAVEL~~ Braided Stream Deposits

"UPPER CLAY"

LOWER ~~GRAVEL~~ Braided Stream Deposits

Sheet 2 of 4

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303C **Date** 1/26/04 **Boring** CSA/LD1

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
66										12:30PM
68										12:45PM
70		GC								1:00PM
72										
74			@ 75': CLEANER GRAVELS							1:30PM 1:50PM 2:20PM - PUMPING WATER LOOSE GRAVEL . SLOUGHING @ 75.5
76										2:30PM 5:09PM CASED TO 60' AND TAGGED @ 64'.
78										7:20AM 1/27/04 WATER @ 6.4' AND SPOILS@63'
80			@ 81.0': MORE CLAY IN THE GRAVELS, STIFFER, TIGHT							8:20AM KELLY SAYS 80' AND THE TAPE SAYS 67.5' 8:52AM KELLY @ 81.5' AND MUCK @ 71'
82			<u>81.0'–93.5'</u>: <u>SILTY CLAY</u>; STRIATED FABRIC OF LT OL GRY (5Y 6/2), MOD YEL BRN (10 YR 5/4) AND DUSKY YEL BRN (10 YR 2/2) ORGANIC FLECKS, MOIST, STIFF TO VERY STIFF, TRACE GRAVELS. SUB ROUND PEBBLES UP TO 0.5". SLAKES A LITTLE IN STANDING WATER, CHAOTIC PAINTBRUSH STRIATIONS IN CROSS SECTION. SOME VITREOUS SURFACES WHEN PARTED, NO STRIAE.	BS-2 BS-3				BULK BULK		-MADE TWO UNSUCCESSFUL ATTEMPTS @ RECOVERING AN 18"ø CORE BARREL SAMPLE.
84			@ 84.0': MORE ANOXIC, MORE GREEN GRAY W/ CALICHE NODULE. LESS STRIATED/LAMINATED FABRIC. SOME WHITE SHELL FRAGMENTS (GASTROPOD)							11:00AM ATTEMPTING TO DRIVE AN 8"x 3" TUBE. 12:11PM KELLY DOWN ~83.5' W/24"ø BUCKET, TAPE DOWN TO 76'
86										12:50PM KELLY@ 84.0', TAPE@78' 1:30PM KELLY @~85.0', TAPE@79' 3:00PM KELLY@ 85.5', TAPE@ 83' 4:00PM KELLY@ 90-91', TAPE@ 87'
88		CH								
90			90'-91': MORE HOMOGENEOUS TEXTURE, GREEN GRAY, SOME VITREOUS, SHINY SHEAR SURFACES, UNEVEN TO WAVY, WAVY MICROSHEARS.							7:30AM 1/28/04 TAGGED @ 84. KELLY @ 88 9:55AM TAPE @ 88.5' KELLY@ ~91'
92			~92': ABUNDANT BANANA LEAF SHEARS							10:45AM TAPE@ 90.1' KELLY@ 93'
93			@ 93.5': MORE CALICHE, ABUNDANT, FEW PEBBLES SUB ROUND.							11:10AM TAPE@93.5'
94			@ 94.0': MORE GRAVELLY, UP TO ¼" SUB ROUND PEBBLES ABUNDANT CALICHE NODULES. SOME LIMONITE SPECKS. NO SHEARS							
96		CL	<u>93.5'–99.0'</u>; <u>SILTY CLAY W/ GRAVEL AND SAND</u>; MOD YEL BRN (10 YR 5/4); MOIST, VERY STIFF, SMALL SUBROUND GRAVEL ~10% - 15%, COARSE SAND ~10%. NO SHEARS IN CLAY. SOME CALICHE ZONES AND ORGANIC FLECKS. SLIGHT MOTTLING OF MOD YEL BRN; LT OL GRY							11:35AM TAPE @ 95.5' 11:40AM - 12:30PM DRILLER BREAK 12:30PM - DRILLING AGAIN 1:03PM @97'

END DAY3

END DAY4

Sheared

LOWER GRAVEL

Braided Stream Deposits

oxidized Lacustrine clay

LOWER CLAY

Unoxidized Lacustrine clay

Marl?

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303C **Date** 1/28/04 **Boring** CSA/LA1

END DAY 5

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
100		CL	@99.0': FINELY LAMINATED SILTY CLAY, ALTERNATING MOD YEL BRN AND LT OL GRY LAMINAE. CALICHE NODULES UP TO 6". LAMINATIONS ARE WAVY ERRATIC. @100': SAME AS ABOVE BUT ALTERNATING LIGHT BRN (5 YR 6/4), YEL GRY (5Y 7/2), LT OL GRY (5 Y 5/2) AND MOD YEL BRN (10 YR 5/4). CREAMY TEXTURE WHEN MOLDED BTW FINGERS w/ H2O. TRACE PEBBLES UP TO ½", WELL-SUB ROUND							1:25PM TAPE @ 98.5', KELLY@ 100' 1:45PM RIG PROBLEMS 12:40PM 1/29/04 WATER @95.5' SPOILS @ 94.5' 1:25PM TAPE@ 100', KELLY@103'
102			101'-103': SILTY CLAY; LAMINATED MOD YEL BRN AND LT OL GRY, MOIST, VERY STIFF, SMOOTH TEXTURE WHEN MOLDED							2:10PM TAPE@ 103' ON BOTTOM
104		ML	99.0'-109.0': CLAYEY SILT; ALTERNATING LAMINATIONS OF MOD YEL BRN (10 YR 5/4), DK YEL ORN (10 YR 6/6) AND LT OL GRY (5Y 5/2), MOIST, FIRM. SLIGHTLY SPONGY. TRACE GRAVEL. MED PLASTICITY. EASY TO CUT w/ KNIFE. ABUNDANT ORGANIC FLECKS							2:30PM TAPE @ 104.5' ON BOTTOM
106										3:15PM TAPE @ 106.5', KELLY@ 110-111'
108			MORE LIKE UNIFORM, HOMOGEOUS, LT OL GRY CLAYEY SILT w/ FEATHERINGS OF FE STAINS. NO CALICHE IN LOWER SECTION							3:25PM REAMING @~109-110' HIT LOOSE SAND w/ GRAVEL, UNDER HIGH H2O PRESSURE, WATER RISING FAST
110		SW	109.0'-110.5': GRAVELLY SAND; DSK YEL BRN (10 YR 2/2), LOOSE, WET. NO CLAY BINDER. MED TO COARSE SAND (75%), SUB-ROUND TO SUBANG COBBLES UP TO 3" (25%)							3:45PM TAPE @ 105' AFTER REAMING.
			TD = 110.5'							
112										
114										
116										
118										
120										
122										
124										
126										
128										
130										

100'

LOWER CLAY

Marl?

Shallow Lacustrine Silt

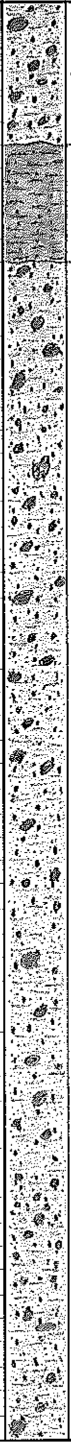
Sheet 4 of 4

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

COTTON, SHIRES, AND ASSOCIATES, INC.

LOG OF EXPLORATORY DRILLING

Project RMC Quarry
Boring CSA/LD2
Location NORTH SIDE OF LAKE NEXT TO KANE SI-2
Project No. E0303C
Drilling Contractor/Rig Tri Valley Drilling Co., EARTHDRILL 42LHD
Date of Drilling 2/3/04
Ground Surface Elev. 409.2'
Logged By JD
Hole Diameter 30"ø BUCKET AUGER
Surface LOOSE GRAVEL OVER NATIVE GRAVELS
Weather CLOUDY, WINDY, COOL (CHANCE OF T-STORMS)

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.	Sample Type	Recov. (%)	Remarks
		GC	0.0'-3.0': CLAYEY SANDY GRAVEL; MOD YEL BRN (10 YR 5/4), MOIST, MED DENSE. COBBLES UP TO 4", SUB ROUND (50%), COARSE SAND (30%), CLAY BINDER (20%), HIGH PLASTICITY. GRAVELS GENERALLY ~1".							DRILLER: MARIO HELPER: ABLE 6:50AM START DRILLING w/ 30"ø BUCKET AUGER.
2										
4		ML	3.0'-5.5': CLAYEY SILT; MOTTLED MOD YEL BRN (10 YR 5/4) AND LT OL GRY (5 Y 5/2), FIRM, MOIST, MED PLASTICITY, SOFT TEXTURE, TRACE GRAVEL.							
6			5.5'-50.5': CLAYEY SANDY GRAVEL; SAME AS 0.0'-3.0'.	BS-1				BULK		7:25AM WATER SEEP @ 6.5' SE SIDE OF HOLE. ADDING WATER TO HOLE W/ SUPER MUD DRY.
8										
										8:15 AM
10										8:29AM
										8:33AM
12										
										8:40AM
14										8:45AM
16										8:50AM
										8:56AM
18		GC								
										9:03AM
20										9:08AM
22										9:20AM
24										9:29AM
26										9:36AM
										9:42 AM
28										
										10:03AM

~~UPPER GRAVEL~~
Braided Stream Deposits

Project RMC Quarry/E0303C **Date** 2/3/04 **Boring** CSA/LD2

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
										10:10 AM
32										
34										
36										
38										
40		GC								
42										
44										
46										
48										
50										
		ML	50.5'-51.5': CLAYEY SILT; MOD YEL BRN TO DK YEL ORN (10 YR 6/6), MOIST, STIFF TO VERY STIFF, SOME DK BRN ORGANIC FLECKS, TRACE PEBBLES UP TO ½". SLIGHT MOTTLING OF COLORS.							
52			51.5'-58.5': CLAYEY SANDY GRAVEL; SAME AS ABOVE							
54										
		GC								
56										
58										
			58.5'-61.0': CLAYEY SILT; MOD YEL BRN MOTTLED/STRIATED W/ LT OL GRY, VY STIFF, MOIST, TRACE PEBBLES UP TO ½". @ 60.0': MORE LT OL GRY TIGER STRIPED W/BRN. GRAVEL LENSE.							
60		ML								
			61.0'-74.0': GRAVELLY SAND; MOD YEL BRN (10 YR 5/4) TO DARK YEL BRN (10 YR 4/2), LOOSE, WET. CLAY < 10% INCREASING W/ DEPTH TO 15%, MED TO COARSE SAND 60%, SMALL SUB-ROUND GRAVEL 30-35%							
62		SW/GW								

UPPER GRAVEL
Braided Stream Deposits

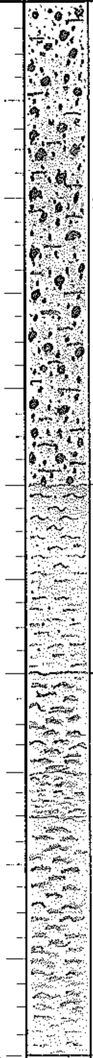
"UPPER CLAY"

LOWER GRAVEL
Braided Stream Deposits

Sheet 2 of 3

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

Project RMC Quarry/E0303C **Date** 2/3/04 **Boring** CSA/LA2

Depth (feet)	Graphic Log	USCS Class.	Geotechnical Description	Sample Desig.	Dry Density (pcf)	Moisture Content (%)	SPT Bl./ft.		Recov. (%)	Remarks
66 68 70 72		SW/GW	INCREASING CLAY CONTENT <10% ↓ ~15%							
74 76		CL	74.0–78.0': SILTY CLAY; MOD YEL BRN (10YR 5/4) W/ LT OL GRY STREAKS, MOIST, STIFF TO VERY STIFF, TRACE 1/2" PEBBLES, SUB ROUND (<10%), HIGHLY PLASTIC.							7:59AM DRILLING W/ 24"⌀ BUCKET AUGER SPOILS DEPTH @ 73', WATER @ GROUND SURFACE.
78 80 82 84		CH	78.0'–86.0': SILTY CLAY; GRY OL (10Y 4/2) TO DK GRN GRY (5GY 4/1), MOIST, VERY STIFF, ABUNDANT CONTINUOUS PLANAR TO WAVY, STRIATED SHEARS, WAXY, HIGHLY PLASTIC, MINOR CALICHE BLEBS. @ 80.0'-81.0': MORE MICROSHEARS, CORNFLAKE RATHER THAN PENETRATIVE SHEARS. GREENISH GRAY (5GY 6/1) @ 83': LT OL GRAY (5Y 5/2), NO MICRO SHEARS, MORE WAVY LEAF SHEARS W/ STRIATED, SHINY SURFACES, NOT AS WELL DEVELOPED AS 78'-80', LESS DEEPLY STRIATED @ 85.5: DK GRN GRY (5GY 4/1) TO GRAY OL (10Y 4/2)							8:20AM TAPE @ 76', KELLY @ ~78 8:55AM TAPE @ 78', KELLY @ ~79' 9:35AM @ 80'-81' 9:50AM @ 83' 10:05AM @ 84.5' 10:25AM @ 85'
86 88 90 92 94 96			TD @ 86'							11:00AM @ 86' DRILLER BREAK 11:20AM DRILLER AGAIN WATER @ 14.5' 11:53AM PUMPING WATER 12:07PM @ 26' 12:11PM @ 31.5' 12:24 @ 39.5' 12:58PM @ 53' 1:20PM @ 53' 1:40PM @ 61' 2:04PM - 63'

LOWER ~~GRAVEL~~ 2

Braided Stream Deposits

Oxidized Lacustrine Clay

LOWER ~~CLAY~~ 2

Unoxidized Lacustrine Clay

Sheet 3 of 3

COTTON, SHIRES & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LIST OF REFERENCES

Barlock, V.E., *Sedimentology of the Livermore Gravels (Miocene-Pleistocene), Southern Livermore Valley, California*, 1989.

Berlogar Stevens & Associates (2012), *Slope Stability Investigation, Lake B – Corrective Action Plan, SMP23 Quarry, Livermore, California*, October 30, 2012.

Bryant & Hart, E. W., *Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps, California Division of Mines and Geology Special Publication 42,* 1973, revised 2007.

California Geological Survey, *Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117A*, revised and re-adopted September 11, 2008.

Cotton, Shires and Associates, Inc. (CSA), *Technical Memorandum No. 10, Results of Recent Exploratory Borings CSA/SD-35, CSA/SD-36 and CSA/SD-37 at CEMEX Quarry,* June 15, 2006.

CSA, *Technical Memorandum No. 16, CEMEX – Elliot Quarry, Area 4, July 2007 Slope Stability Analysis of Section 40+20',* July 16, 2007.

CSA, *Slope Stability Analysis Results and Supporting Documentation, CEMEX Lakeside Circle Corrective Action Plan, Alameda County California,* CSA File No. E0284, July 21, 2006.

Engeo Incorporated, *Peer Review of Slope Stability Investigation, Eliot Mine – Lakes A and B, Reclamation Plan No. 23 (SMP-23), Alameda County, California,* Engeo Project No. 9269.000.000, October 23, 2013.

Engeo Incorporated, *Second Review of Slope Stability Investigation, Eliot Mine – Lakes A and B, Reclamation Plan No. 23 (SMP-23), Alameda County, California,* Engeo Project No. 9269.000.000, January 16, 2014.

Geocon Consultants, Inc. *Geotechnical Investigation / Slope Stability Analysis, CEMEX Eliot – Arroyo Del Valle Realignment at Lake B, Alameda County, California,* Geocon Project No. S1264-05-01, dated December 31, 2019.

Geo-Slope International, *SLOPE/W Version 7.23*, 2007.

Geo-Slope International, *SEEP/W Version 8.16.2.14053*, 2016.

KANE GeoTech, Inc., *CEMEX Eliot Quarry – Geotechnical Characterization Report*, *Alameda County, California,* (Project No. GT13-16), May 7, 2015 (46 pages).

KANE GeoTech, Inc., *CEMEX Eliot Quarry – Geotechnical Characterization Appendices, Alameda County, California,* (Project No. GT13-16), May 7, 2015 (3,795 pages).

Southern California Earthquake Center, *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California,* 2002.

Spinardi Associates, *Reclamation Plan, Eliot Facility, SMP-23, Alameda County, California,* Sheets C-1 through R-5, Spinardi Job No. 153.00, January 2019.

USGS, *Unified Hazard Tool:* http://earthquake.usgs.gov/hazards/interactive/