Appendix 3.0-2

Preliminary Geotechnical Report (Phase I Development)

YOUTUBE CAMPUS PHASE I
SAN BRUNO, CALIFORNIA

PRELIMINARY GEOTECHNICAL REPORT

SUBMITTED TO
Mr. Shawn Christman
Ellis Partners
111 Sutter Street, Suite 800
San Francisco, CA 94101

PREPARED BY
ENGEO Incorporated

August 5, 2019

PROJECT NO.
13667.000.002

ENGEO
Expect Excellence

Project No.
13667.000.002

August 5, 2019

Mr. Shawn Christman
Ellis Partners
111 Sutter Street, Suite 800
San Francisco, CA 94101

Subject: YouTube Campus Phase I
San Bruno, California

PRELIMINARY GEOTECHNICAL REPORT

Dear Mr. Christman:

With your authorization, we performed a geotechnical exploration for the proposed site of Phase 1 of the YouTube Campus located in San Bruno, California. This report presents our geotechnical observations, as well as our preliminary conclusions and recommendations for the project. We also provide site grading, drainage, and foundation recommendations for use during land planning.

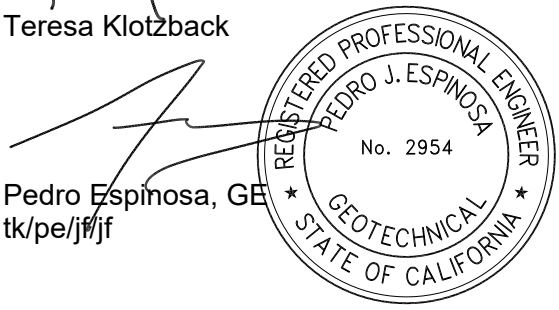
Based upon our initial assessment, it is our opinion that the proposed YouTube Phase I campus is feasible from a geotechnical standpoint. We will provide design-level conclusions and recommendations for the project during the building permit application process.

We are pleased to have been of service to you on this project and are prepared to consult further with you and your design team as the project progresses. If you have any questions regarding the contents of this report, please do not hesitate to contact us.

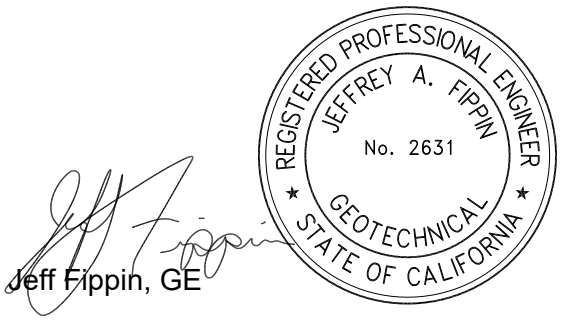
Sincerely,

ENGEO Incorporated

Teresa Klotzback



Pedro Espinosa, GE



Jeff Fippin, GE

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this preliminary geotechnical report is to provide an assessment of geotechnical concerns associated with the proposed construction of Phase 1 of the YouTube Campus. Our services included the following tasks:

- Review of published geologic maps and geotechnical data for the site.
- Review of historic aerial photos.
- Acquisition of appropriate San Mateo County Environmental Health Services Division permits.
- Notification of Underground Services Alert a minimum of 48 hours prior to our exploration.
- Retention of a private utility locator to clear the proposed exploration locations of existing utilities.
- Preparation of a work plan including proposed locations for our explorations, as well as excavation checklists showing their proximity to existing utilities.
- Performance of a subsurface field exploration and laboratory testing program.
- Interpretation of subsurface field exploration data.
- Evaluation of potential geotechnical concerns.

For our use, we received the following documents from Ellis Partners:

- SHoP Architects, Site Plan and Sections, Sheets SK-201 and SK-202, dated August 20, 2018.
- Ellis Partners, Basis of Design Pre-Schematic Design Report, 57 sheets, dated October 13, 2017.
- FYFE, Column Strengthening As-Built, Title Sheet and Sheets 1 and 2, YouTube, 900 Cherry Ave., San Bruno, CA, Revision 1 dated September 29, 2014, Project No. AAJA-J29Z60.
- Robinson and Mills Architecture and Planning, Bayhill Two Foundation Plans (1000 Cherry Avenue), Sheets S.1 through S.10, Bayhill Office Center, San Bruno, CA, Revision 1 dated October 9, 1978.

We previously prepared an overall master plan geotechnical report, dated August 15, 2018, and revised August 17, 2018. This report presents preliminary updates to the master plan report that are specific to the Phase I scope.

We prepared this report for the exclusive use of Google and its consultants. In the event that any changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate the need for modifications.

1.2 SITE LOCATION AND DESCRIPTION

The YouTube Campus project site is located in San Bruno, California. As shown on the Vicinity Map, Figure 1, the site is bounded on the north by Interstate 380, on the east by El Camino Real, on the west by Cherry Avenue, and on the south by San Bruno Avenue. Access is provided by

Bayhill Drive and Grundy Lane. The approximately 40.2-acre project site comprises eight parcels currently developed for commercial use. The YouTube Campus will consist of five phases of ground-up office campus development. The geotechnical recommendations outlined herein relate to the first phase of the YouTube Campus development, known as Phase 1, which is shown on the Site Plan, Figure 2A.

Phase 1 development includes the construction of two buildings and will be completed by 2022. Phase 1 North, is located at the north side of Grundy Lane and includes a three-story building above a three-level parking garage. Phase 1 South, is located at the south side of Grundy Lane and it includes a three-story building above a three-level parking garage. We provide a summary of the associated square footage, Assessor's Parcel Numbers (APN) per County of San Mateo, and street addresses in the table below.

TABLE 1.2-1: Project Parcels and Description

PHASE 1 BUILDINGS	PROPOSED SQUARE FEET	APN	ASSOCIATED ADDRESS
Phase 1 North	248,000	020-011-230	1000 Cherry Avenue
Phase 1 North Garage	404,000		
Phase 1 South	192,000	020-015-020	900 Cherry Avenue
Phase 1 South Garage	306,000		

Currently, the Phase 1 basement depths are anticipated to be at an elevation of 61 feet (NAVD88), approximately 45 to 55 feet from top of Sub-level 03 slab (the lowest basement level) to top of ground-level slab.

1.3 EXISTING GEOTECHNICAL DATA

As part of this preliminary geotechnical report for Phase 1, we reviewed available reports for previous projects within the site vicinity, including existing geotechnical reports as well as environmental and groundwater monitoring reports. This section provides a summary of the subsurface conditions encountered in each of the previous reports.

1971 – L.T. Evans, Inc. Foundation Investigation Report

This reference is a foundation investigation report prepared for the building at 850 Cherry Avenue, which was named Bayhill Office Building No. 1 at the time. The investigation was performed for a nine-story office building with a basement and a four-level garage located northeast of the intersection of Cherry Avenue and San Bruno Avenue.

The field exploration included nine 20-inch-diameter test borings to depths ranging from 35 to 70 feet. The soil encountered was predominantly silty and clayey sand with lenses of silt and clay. Up to 20 feet of fill was encountered along Cherry Avenue.

Groundwater was encountered between 42 and 65 feet below ground surface.

September 1974 - L.T. Evans, Inc. Foundation Investigation Report

This reference is a foundation investigation report prepared for the N.V. Yusra Office Buildings. The investigation was performed for the existing structures located at 1150, 1200, and 1250 Bayhill Drive.

The field exploration included drilling four 20-inch-diameter test borings to maximum depths of 35 feet. The soil encountered was predominantly sand with lenses of clay, silt, or mixtures of all three soil types. The borings encountered material with a low density and high moisture content at a depth of 6 feet in Boring 1 and a depth of 24 feet in Boring 4. The investigators suggest the subsurface conditions encountered indicate the site was previously traversed by gullies that flowed southeasterly. L.T. Evans concluded there was no evidence that fill that had been placed in the area prior to their study.

Groundwater was encountered at a depth of 10 feet in Borings 1 and 2, 21 feet in Boring 4, and not encountered in Boring 3. The investigators suggested the variation in groundwater elevation may indicate the infilling of an old channel.

L.T. Evans recommended overexcavating 6 feet below the building foundations, placing compacted fill, and embedding the shallow foundation 2 feet below finished grade.

December 20, 2012 – Cornerstone Earth Group Design-Level Geotechnical Investigation

This reference is a design-level Geotechnical Investigation report prepared for the San Francisco Police Credit Union Headquarters located at 1250 Grundy Lane. The proposed structure would include up to two levels of concrete-framed below-grade parking with a three-story steel-framed office building above. The project is currently under construction and the excavation for the below-grade parking structure appears to be nearly complete.

The field exploration included drilling nine auger borings using hollow-stem and solid-stem augers to depths ranging from 4 to 49½ feet below ground surface. The soil encountered included non-engineered fill ranging in thickness from 2 to 5 feet across the majority of the site, but as thick as 12 feet in the northeast corner of the site. The fill generally consisted of medium-stiff to hard lean clay over medium dense sand. Beneath the fill, alternating layers of stiff to hard lean clay and medium dense to very dense sand with varying amounts of silt and clay were encountered to the maximum depth explored of 49½ feet.

Groundwater was not encountered in any of the borings to the maximum depth of 49½ feet below ground surface.

Cornerstone concluded that the primary geotechnical concerns at the site were the presence of non-engineered fill and moderately corrosive soil. Cornerstone also concluded that there was a low potential for liquefaction at the site due to the stiff to hard cohesive soil and medium-dense to very dense granular materials encountered, in addition to the deep groundwater level.

February 10, 2017 – ENGEO Geotechnical Exploration

We conducted a geotechnical exploration at a site located to the southwest of the intersection of San Bruno Avenue and El Camino Real. The site is currently occupied by one- to two-story commercial buildings and the proposed project includes two four-story Type V residential units over a podium structure with one level of below-grade parking.

The field exploration included drilling five borings and advancing six cone penetration tests (CPT) to a maximum depth of 61½ feet below existing grade. The soil encountered included variable amounts of fill from 3 to 15 feet. The fill generally consisted of medium-stiff to stiff clay with some debris. Beneath the fill, we encountered stiff to hard sandy silt with traces of fine gravel, and

medium-dense to dense silty sand with silty clay lenses. We identified the soil below the fill as the Colma Formation.

We encountered groundwater at depths ranging from 15 to 20 feet during the field exploration.

August 15, 2017, Revised August 17, 2018 – ENGEO Geotechnical Exploration

We performed a geotechnical exploration for the overall YouTube campus. The field exploration included drilling five borings and advancing four cone penetration tests (CPT) to a maximum depth of 52½ feet below existing grade. The soil encountered within the Phase 1 boundary included varying amounts of fill up to 8 feet in thickness. The fill generally consisted of loose to dense silty sand and soft to hard sandy lean clay. At the surface or beneath the artificial fill, we encountered dense to very dense sand with varying amounts of silt and clay. We identified the soil below the fill as the Colma formation.

As part of this study, we measured groundwater depth using pore pressure dissipation testing and installed monitoring wells using vibrating-wire piezometers. Based on review of this data as well as existing geotechnical data, we determined groundwater to exist across the site a relatively stable elevation of approximately 25 to 30 feet (NAVD88).

2.0 FINDINGS

2.1 SITE BACKGROUND

As part of this study, we reviewed historic aerial photographs, historic maps, and other historic documents. Based on our review, we understand the site was utilized as a dairy prior to development. During World War II, the U.S. Navy established a base on the site that was used as a Classification Center and Personnel Depot. It appears the site was graded between 1943 and 1946. Modular, barracks-style structures are evident at and within the site vicinity in a photograph from 1946, including structures located to the east of Phase 1 North. The Naval Base remained operational following the conclusion of World War II. By the time of a 1968 photograph, several of the naval base structures were demolished, although the structures to the east of Phase 1 North remained. By the time of a 1980 photograph, the remainder of the naval base structures were demolished, Interstate 380 was constructed to the north of the site, and the existing office buildings located at 1000 Cherry Avenue and 900 Cherry Avenue were constructed.

From review of stereo-paired aerial photographs from 1943, shown in Figure 2B, it is evident that San Bruno Creek and one of its tributaries historically traversed an area to the east of the site, running approximately northwest to southeast between the location of the existing structures at 1100 Grundy Lane and 850 Elm Avenue. It appears that San Bruno Creek was dammed upstream of the site and infilled within the overall master plan limits between 1943 and 1946.

2.2 SURFACE CONDITIONS

Site topography generally slopes downward from the western corner of the site to the eastern corner of the site. The topography also slopes gradually downward from Grundy Lane towards Bayhill Drive. Site grades range from approximately Elevation 116 feet (Datum: NAVD88) along the western boundary to Elevation 105 feet at the northeastern corner of Phase 1 North and Elevation 99 at the southeastern corner of Phase 1 South.

2.3 GEOLOGY AND SEISMICITY

In our master plan report for the project (ENGEO, 2018), we described the regional and site-wide geology of the proposed YouTube campus. The discussion of relevant geologic units that pertain to Phase 1 is presented below and was enhanced with our site-specific exploration.

2.3.1 Regional Geology

The site is located on the eastern side of the San Francisco Peninsula, in the Coast Ranges physiographic province of California. The Coast Ranges comprise a system of northwest-trending, fault-bounded mountain ranges and intervening valleys that trend approximately parallel to the right-lateral transform boundary between the North American and Pacific Plates. The present physiography and geology of the Coast Ranges are the result of deformation and deposition along the tectonic boundary between the North American plate and the Pacific plate. Plate boundary fault movements are largely concentrated along the well-known fault zones, which in the Bay Area include the San Andreas, Hayward, and Calaveras faults, as well as other lesser-order faults. Bedrock in the Coast Ranges consists of igneous, metamorphic and sedimentary rocks that range in age from Jurassic to Pleistocene.

2.3.2 Site Geology

The area of Phase 1 is mapped as being underlain by dense sand from the Colma Formation. As part of this preliminary study, we also indicated that shallower artificial fill may be present at Phase 1 South and the eastern boundary of Phase 1 North.

2.3.2.1 Artificial Fill, Qaf

Portions of the overall site at the location of the former San Bruno Creek are underlain by artificial fill that was placed in the 1940s and 1950s. The mapped artificial fill (Qaf) follows the former Creek Channel. Fill material was likely derived from local sources and, based on our field exploration, generally comprises silty sand and sandy lean clay. Due to previous activities and site use, minor fill is likely present at various locations across the site.

2.3.2.2 Pleistocene Colma Formation, Qc

According to published geologic mapping covering the site by Bonilla (1998) and Brabb (1998), the site is underlain by Pleistocene Colma Formation (Qc). The Colma Formation is described as weakly consolidated, moderately well bedded, sandy clay and silty sand with well-rounded chert pebbles. Bedding structure within the vicinity is mapped as striking northwest and gently dipping 4 degrees towards the northeast (Figure 3). The Colma Formation is a late Pleistocene-age variable deposit of alluvium, sand dunes, and marine sediments that has been uplifted from sea level and tilted and folded to its present configuration. The age of the Colma Formation has been estimated at approximately 80,000 to 120,000 years before present (Caskey, et al. 2005).

2.3.3 Seismicity

Numerous small earthquakes occur every year in the San Francisco Bay Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of these faults and significant historic earthquakes recorded within the San Francisco Bay Region. Nearby active faults within 26 miles of the site and their estimated

maximum earthquake magnitudes based on the USGS fault database are provided in the following table. An active fault is defined by the State Mining and Geology Board as one that has had surface displacement within Holocene time (about the last 11,000 years) (Hart and Bryant, 1997).

TABLE 2.3.3-1: Active Faults Capable of Producing Significant Ground Shaking at the Site

FAULT NAME	DISTANCE FROM SITE (MILES)	DIRECTION FROM SITE	MAXIMUM MOMENT MAGNITUDE
Serra	0.25	West	Unknown
San Andreas	0.9	Southwest	8.0
San Gregorio Connected	6.6	Southwest	7.5
Monte Vista-Shannon	16	Southeast	6.5
Hayward-Rodgers Creek	17	Northeast	7.3
Calaveras	26	Northeast	7.0

As shown in Figure 5, the site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site. Fault rupture through the site, therefore, is not anticipated.

The Serra fault is located approximately ½ mile west of the project site. The Serra fault, although not currently included on the Alquist-Priolo Earthquake Fault Zone map for the area, is considered to be an active fault that has experienced displacement within Holocene time (Jennings, 2010). The Serra fault forms the contact between the Colma Formation and Merced Formation and is a reverse fault that dips towards the southwest likely merging with the San Andreas fault at depth (Kennedy, 2002).

According to the Health and Safety Element of the San Bruno General Plan, the San Bruno fault is mapped approximately ¼ mile east of the project site. According to the USGS Open-File Report 98-354, “A recent study of geophysical, geomorphic, and geological data found no evidence supporting the existence of the hypothetical San Bruno fault as a mappable structure (USGS Open-File Report 97-429, 1997), and the fault has been deleted.”

The Uniform California Earthquake Rupture Forecast (UCERF3, 2013) evaluated the 30-year probability of a Moment Magnitude 6.7 or greater earthquake occurring on the known active fault systems in the Bay Area. The UCERF3 generated an overall probability of 72 percent for the San Francisco Region as a whole.

2.4 FIELD EXPLORATION

As part of our master plan study, we drilled five exploratory borings and advanced four Cone Penetration Tests (CPTs) within the Phase 1 site boundary to depths ranging between 15 and 52½ feet. We performed this portion of our field exploration between January 23 and February 1, 2017.

The Phase 1 field exploration included drilling six exploratory borings within the Phase 1 site boundaries to greater depths. We performed this field exploration between September 12 and September 19, 2018.

The locations of our explorations within Phase 1 are shown in Figure 2A.

2.4.1 Exploratory Borings

We observed the drilling of six exploratory borings at the locations shown on the Site Plan, Figure 2A. An engineer observed the drilling and logged the subsurface conditions at each location. We retained a drilling crew operating a truck-mounted drill rig to advance the borings using 4-inch- and 5-inch-diameter mud rotary methods. We advanced the borings to depths ranging from 100 to 101½ feet below existing grade. We permitted and backfilled the borings in accordance with the requirements of the San Mateo County Environmental Health Services Division.

We obtained bulk soil samples from drill cuttings and retrieved disturbed samples at various intervals in the borings using standard penetration tests with a 2-inch outside diameter (O.D.) split-spoon sampler. In addition, we obtained 2.5-inch-inside-diameter (I.D.) samples using a Modified California Sampler.

We obtained the standard penetration resistance blow counts by dropping a 140-pound hammer through a 30-inch free fall. We drove the 2-inch O.D. split-spoon sampler 18 inches and recorded the number of blows for each 6 inches of penetration. In addition, we obtained 2.5-inch I.D. samples using a Modified California Sampler driven into the soil with the 140-pound hammer previously described. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows to drive the last 1 foot of penetration; we have not converted the blow counts using any correction factors. When sampler driving was difficult, we recorded the penetration only as inches penetrated for 50 hammer blows.

We used the field logs to develop the exploration logs in Appendix A. The logs depict subsurface conditions at the exploration locations for the date of exploration; however, subsurface conditions may vary with time.

2.5 SUBSURFACE CONDITIONS

We encountered asphalt concrete (AC) and aggregate base (AB) in each of our explorations. The thickness of AC was approximately 2½ inches. The thickness of AB encountered ranged from approximately 2½ to 4 inches.

We encountered varying amounts of artificial fill across the site. The artificial fill encountered primarily consisted of loose to dense silty sand and soft to hard sandy lean clay. The artificial fill was likely composed of locally derived material from either alluvial deposits or the Colma Formation. We encountered approximately 4 to 8 feet of fill within Phase 1 South, likely associated with the construction of the terraced slopes.

We encountered the Colma Formation underlying the entire site. Within the Phase I boundary, the Colma Formation generally comprises dense to very dense sand with varying amounts of silt and clay. We believe these lenses of fine-grained material to be relatively discontinuous, as is characteristic of the deposits of the Colma Formation.

At one boring location within Phase 1 North and all of the recent explorations within Phase 1 South, we encountered stiff to very stiff clay deposits of medium to high plasticity at depths of 75 feet below ground surface and deeper.

We include our current exploration logs in Appendix A and previous exploration logs and CPT logs in Appendices C and D. The exploration logs contain the soil type, color, consistency, and

visual classification in general accordance with the Unified Soil Classification System. The logs graphically depict the subsurface conditions encountered at the time of the exploration.

2.6 GROUNDWATER CONDITIONS

Due to the use of the mud rotary drilling method, we were unable to measure groundwater conditions in our most recent borings. As part of our master plan study, we measured groundwater depth using pore pressure dissipation testing and installed monitoring wells using vibrating-wire piezometers.

Based on a compilation of groundwater data from our exploration and a review of existing geotechnical data, we believe groundwater across the site exists at a relatively stable elevation of approximately Elevation 25 to 30 feet (NAVD88). Based on site topography and direction of the historic San Bruno creek, it is likely that groundwater is gradually flowing from the west corner to the east corner of the site. Therefore, groundwater elevation may be slightly higher on the west side of the site. However, ground elevation is significantly higher on the west side so groundwater depth will be significantly deeper. For the purpose of our analyses and recommendations, we assumed a long-term groundwater level at Elevation 30 feet.

Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practices, and other factors not evident at the time measurements were made.

2.7 LABORATORY TESTING

We performed laboratory tests on selected soil samples to evaluate their engineering properties. For this project, we performed laboratory testing as shown in the table below.

TABLE 2.7-1: Laboratory Testing

SOIL CHARACTERISTIC	TESTING METHOD	LOCATION OF RESULTS
Unconsolidated Undrained Triaxial	ASTM D2850	Appendix C
Consolidation – Incremental Loading	ASTM D2435	Appendix C
#200 Wash	ASTM D1140	Appendix C
Moisture Content and Unit Weight	ASTM D7263	Appendix A
Plasticity Index, Wet Method	ASTM D4318	Appendix C
Corrosivity	ASTM D1498, D4972, G57, D4327	Appendix C

The results of the laboratory testing performed as part of the master plan study are provided in Appendix E.

3.0 DISCUSSION AND CONCLUSIONS

The project site is feasible for the proposed development provided the recommendations contained in this report and future design-level recommendations are incorporated into the design plans.

Based upon our field exploration and review of readily available published maps and reports for the site, the main geotechnical concerns for the proposed site development include:

- Seismic hazards
- The need for shoring systems to protect the excavation walls, adjacent streets and improvements.
- Load-induced settlement.

These items and other geotechnical issues are discussed in the following sections of this report.

3.1 EXISTING FILL

As stated previously, based on our understanding of site history and development, the site is underlain by non-engineered fill up to 8 feet in thickness. The shallower fill appears to have been placed in order to grade the current site conditions.

Because no record exists regarding the placement of the fill, it should be considered non-engineered. Non-engineered fill can undergo excessive settlement, especially under new fill or building loads. Based on preliminary conversations with you and the design team, basements ranging from 45 to 55 feet in depth are planned below the proposed development. Therefore, the majority of the non-engineered fill will be removed during the excavation for the basements. If any buildings are constructed without basements, or the depth of basement does not extend below the bottom of the existing fill, the presence of the fill should be mitigated either by grading or through foundation design.

Fill extends laterally beyond the borders of the building sites. Considering the type of soil encountered in the fill layer as discussed in Section 2.5, without proper shoring techniques, the remaining portion of the fill outside of the building footprint could potentially collapse into the building excavation.

In the event the development plans change and the excavation depth is less than the thickness of the existing fill, we should be contacted to discuss alternatives for site preparation.

3.2 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking, soil liquefaction/cyclic softening and ground lurching. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, landslides, tsunamis, or seiches is considered low to negligible at the site.

3.2.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone (Figure 5), ground rupture is unlikely at the subject property.

3.2.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the current California Building Code (CBC) requirements, as a minimum. Seismic

design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code-prescribed lateral forces are generally considered to be substantially smaller than the actual forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.2.3 Liquefaction

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soil most susceptible to liquefaction is clean, loose, saturated, uniformly graded fine-grained sand. Empirical evidence indicates that loose to medium dense gravel, silty sand, low-plasticity silt, and some low-plasticity clay is also potentially liquefiable.

As discussed in Section 2.6, groundwater exists at a relatively stable level near Elevation 30 feet (NAVD88). Relative to planned building elevations, groundwater would be approximately 85 feet below ground surface. At this depth, the soil contains high amounts of fines and is sufficiently dense such that we do not consider liquefaction probable. In addition, soil at this depth within the Colma Formation is generally considered too old to be susceptible to liquefaction.

3.2.4 Dynamic Densification Settlement

Densification of loose granular soil above the groundwater surface can cause settlement of the ground surface due to earthquake-induced vibrations. Because the excavation for the below-grade parking will extend below the existing fill above the water table and because of the relatively high density of the sand within the Colma formation, the risk of dynamic densification is negligible at the site.

3.2.5 Ground Lurching

Ground lurching is a result of the rolling motion imparted to the ground surface during energy released by an earthquake. Such rolling motion can cause ground cracks to form in weaker soil. The potential for the formation of these cracks is considered greater at contacts between deep alluvium and bedrock. Such an occurrence is possible at the site as in other locations in the Bay Area region, but based on the site location, the offset, if any, would be minor. We provide recommendations for foundation and pavement design in this report that are intended to reduce the potential for adverse impacts from lurch cracking.

3.2.6 Flooding

Based on site elevation and distance from water sources, flooding is not expected at the subject site; however, the Civil Engineer should review pertinent information relating to possible flood levels for the subject site based on final pad elevations and provide appropriate design measures for development of the project.

3.3 2016 CBC SEISMIC DESIGN PARAMETERS

Based on the subsurface conditions encountered and CPT shear wave velocity testing, we classified Phase I as Site Class C in accordance with the 2016 CBC. We provide the 2016 CBC seismic design parameters in Table 3.3-1 below, which includes design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters.

TABLE 3.3-1: 2016 CBC Seismic Design Parameters, Latitude: 37.628972° **Longitude:** -122.424702°

PARAMETER	VALUE
Site Class	C
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	2.47
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	1.19
Site Coefficient, F_A	1.00
Site Coefficient, F_V	1.30
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	2.47
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	1.54
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.65
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	1.03
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.95
Site Coefficient, F_{PGA}	1.00
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.95
Long-period transition-period, T_L	12 sec

We performed a preliminary comparison of the site-specific analysis with the mapped values above, and this comparison shows that the above mapped values are more reliable than the current state-of-the-practice ergodic site-specific seismic hazard analysis. In addition, we evaluated the possibility of performing non-ergodic seismic analysis, but the lack of ground motion records near the site make this evaluation less feasible.

3.4 EXCAVATION

As discussed previously, an excavation up to approximately 45 to 55 feet deep may be necessary for the construction of the proposed basements. During excavation of the basements, the sides of the excavation will need to be shored. Support of adjacent settlement-sensitive structures should be addressed in the design of temporary construction support. The primary consideration related to the selection of the shoring systems is distance of the excavation from improvements sensitive to movement that will remain after building construction.

3.5 SOIL CORROSION POTENTIAL

As part of this study, we obtained a representative soil sample and submitted it to a California State certified analytical lab for determination of redox potential, pH, resistivity, sulfate, and chloride. These tests provide an indication of the corrosion potential of the soil environment on buried concrete structures and metal pipes. The results are included in Appendix B and Appendix E and summarized in the table below.

TABLE 3.5-1: Corrosivity Test Results

SAMPLE LOCATION	DEPTH (feet)	REDOX (mV)	PH	RESISTIVITY (OHMS-CM)	CHLORIDE* (mg/kg)	SULFATE* (mg/kg)
1-B02	3.5	420	5.41	1,000	52	85
3-B2	55	290	7.32	6,100	N.D.	N.D.

* ASTM D4327

The 2016 CBC references the 2014 American Concrete Institute Manual, ACI 318-14, Chapter 19, Sections 19.3.1.1 for structural concrete requirements. Based on the test results and ACI criteria, the tested soil would classify as 'Not Applicable' for sulfate exposure; there is no requirement for cement type or water-cement ratio for this category; however, a minimum concrete compressive strength of 2,500 psi is specified by the building code. For this sulfate range, we recommend Type II cement and a concrete mix design for foundations and building slabs-on-grade that incorporates a maximum water-cement ratio of 0.50. It should be noted, however, that the structural engineering design requirements for concrete may result in more stringent concrete specifications.

Soil with a pH less than 6.0 is considered to be corrosive to buried metal piping and reinforced concrete structures. The sample at 1-B02 had a pH of 5.41 and may be considered corrosive to metal of reinforced concrete placed in the acidic environment.

Based on the resistivity measurements, the shallow sample at 1-B02 is considered "highly corrosive" and the deeper sample at 3-B2 is considered "moderately corrosive."

If it is desired to investigate this further, we recommend a corrosion consultant be retained to evaluate whether specific corrosion recommendations are advised for the project.

Note that ASTM Test Method D4327 was used in lieu of the ACI-designated sulfate test methods as it generally provides more reliable test results.

3.6 LOAD-INDUCED SETTLEMENT

Soil may settle in response to new loads induced by new fill, structures, or equipment. This settlement, if it occurs, may occur as elastic or consolidation settlement. Elastic settlement is a function of soil stiffness while consolidation settlement is highly dependent on the amount of water-filled voids within the soil. The rate of settlement is highly dependent on the permeability of the soil and the presence of water. Consequently, sandy soil will settle almost immediately, whereas clayey soil below the water table will settle much more slowly.

Based on our settlement analysis, we estimate a total load-induced settlement of 1½ inches. Differential settlement would likely be half the total settlement over 50 feet. Additional discussion on the performance of the foundation is presented below.

4.0 PRELIMINARY EARTHWORK RECOMMENDATIONS

The following preliminary recommendations are for initial land planning and preliminary estimating purposes. Final recommendations regarding site grading and foundation construction will be provided after design-level exploration has been performed.

4.1 DEMOLITION AND STRIPPING

Site development will commence with the removal of buried structures, including abandoned utilities. All debris should be removed from any location to be graded and from areas to receive fill or structures. The depth of removal of such material should be determined by our representative in the field at the time of grading.

The existing pavement section (asphalt concrete/concrete and underlying aggregate base) and all existing landscaping should be removed from areas to receive fill or structures, or those areas to serve for borrow.

4.2 EXISTING FILL REMOVAL

Most of the existing fill will be removed by the proposed basement excavations. We recommend removing existing fill to competent soil, as determined by our representative, in areas to receive new fill, pavement, and other ancillary improvements. As noted in Section 2.5, we expect existing fill at Phase I to range in thickness from 0 to 8 feet.

4.3 ACCEPTABLE FILL

Onsite soil material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension. Imported fill material should meet the above requirements and have a plasticity index less than 25.

4.4 FILL PLACEMENT

For land planning and cost estimating purposes, the following compaction control requirements should be anticipated for general fill areas:

Test Procedures:	ASTM D-1557.
Required Moisture Content:	For material with a PI of less than 20, not less than 2 percentage points above optimum moisture content. For material with a PI of 20 or more, at least 4 percentage points above optimum moisture content.
Minimum Relative Compaction:	For material with a PI of less than 20, not less than 90 percent relative compaction. For material with a PI of 20 or more, between 87 and 92 percent relative compaction.

Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material.

5.0 PRELIMINARY FOUNDATION, BASEMENT, AND EXCAVATION RECOMMENDATIONS

The Phase I structures will be founded 45 to 55 feet below ground. The exploration logs within Phase I indicate that we encountered very dense silty or clayey sand in the borings at this depth.

We opine that the proposed structures can be supported on the following recommended foundation options:

1. Structural slab foundation
2. Spread footings with a slab-on-grade

5.1 SUBDRAINAGE RECOMMENDATIONS

The structures will have a finished basement floor at an approximate elevation of 61 feet NAVD 88 with design groundwater level at an elevation of 30 feet. Therefore, the basement floor does not need to be designed to resist hydrostatic uplift forces. In addition, the mat may be designed to be fully drained or, if deemed necessary, can be designed to be undrained and underlain by waterproofing. For spread footings with a slab-on-grade, we recommend that interior slabs-on-grade be underlain by a subdrain system to collect excess water from the basement and route it to the storm drainage system. The Civil Engineer should be consulted on the appropriate drainage connections.

The basement walls will act as retaining walls. Unless the full height of the garage basement walls are designed for hydrostatic pressures, these walls should be provided with drainage facilities. Wall drainage may be provided using a 4-inch-diameter perforated pipe embedded in Class-2 permeable material, or free-draining gravel surrounded by synthetic filter fabric. The width of the drain blanket should be at least 12 inches. The drain blanket should extend to about 1 foot below the finished grades. As an alternative, prefabricated synthetic wall drain panels can be used. The upper 1 foot of wall backfill should consist of clayey soils. Drainage should be collected by perforated pipes and directed to sump.

Temporary shoring will be required to facilitate construction of the three-level basements. The water level should be maintained at least 3 feet below the bottom of the deepest excavation during construction. The dewatering system implemented should be selected so as to have minimal impact on the groundwater level surrounding the proposed excavation. As the basement-level slabs will be founded approximately 30 feet above design groundwater level, dewatering may not be required.

6.0 FUTURE STUDIES

As previously discussed, a design-level geotechnical report should include specific recommendations regarding grading, foundation design, and drainage for the proposed development. The report should provide more detailed evaluations of the geotechnical issues discussed in this report and afford the opportunity to provide recommendations regarding techniques and procedures to be implemented during construction to mitigate potential geotechnical/geological hazards.

7.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.2 for the YouTube campus project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and

recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted geotechnical engineering principles and practices currently employed in the area; no warranty is expressed or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil, rock, stockpiled material, and groundwater, additional unexpected costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO should be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials should be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's recommendations. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include onsite construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transitions between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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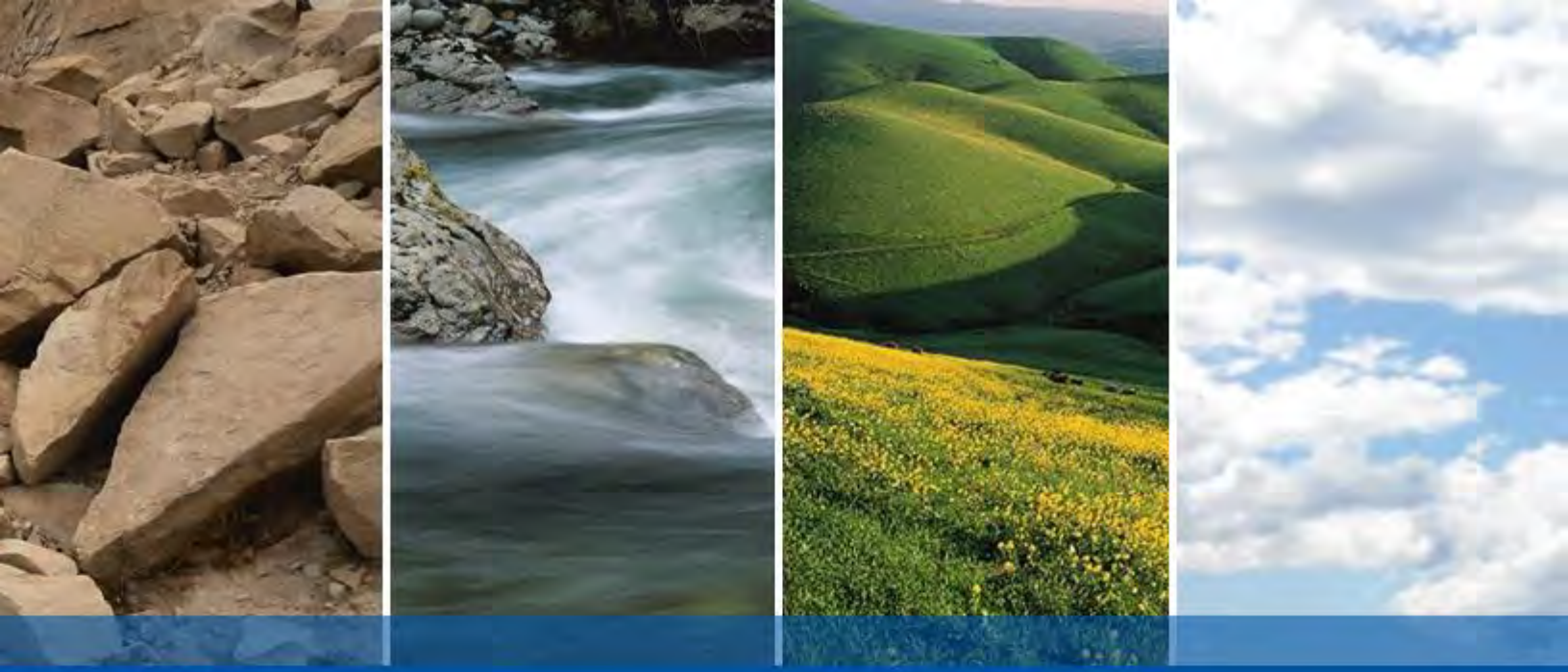

FIGURES

BASE MAP SOURCE: GOOGLE EARTH MAPPING SERVICE

IMAGE SOURCE: GOOGLE EARTH MAPPING SERVICE

ENGEO Expect Excellence

VICINITY MAP

YOUTUBE CAMPUS PHASE I

SAN BRUNO, CALIFORNIA

PROJECT NO.: 13667.000.002		FIGURE NO. 1
SCALE: AS SHOWN		
DRAWN BY: GLJ	CHECKED BY: PJE	

G:\Drafting\DRAFTING2_Dwg_13000 Plus\13667\000\002-GEX-1018\13667000002-GEX-1-VICMAP-1018.dwg Plot Date: 10-29-18 gjaffe

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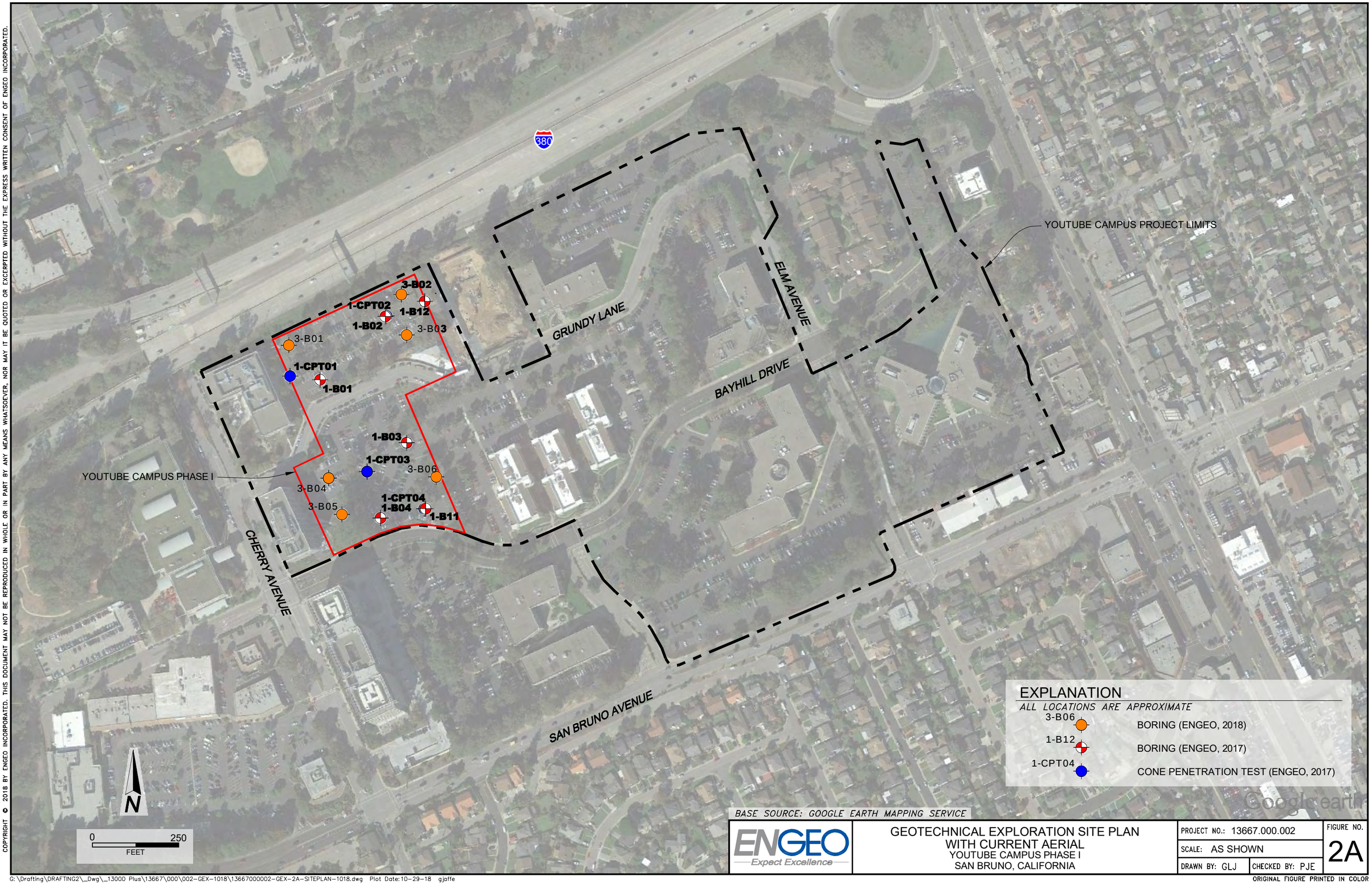

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 3-B06 — BORING (ENGEO, 2018)
- 1-B12 — BORING (ENGEO, 2017)
- 1-CPT04 — CONE PENETRATION TEST (ENGEO, 2017)

BASE SOURCE: GOOGLE EARTH MAPPING SERVICE

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GEOTECHNICAL EXPLORATION SITE PLAN WITH CURRENT AERIAL

YOUTUBE CAMPUS PHASE I
SAN BRUNO, CALIFORNIA

PROJECT NO.: 13667.000.002		FIGURE NO. 2A
SCALE: AS SHOWN		
DRAWN BY: GLJ	CHECKED BY: PJE	

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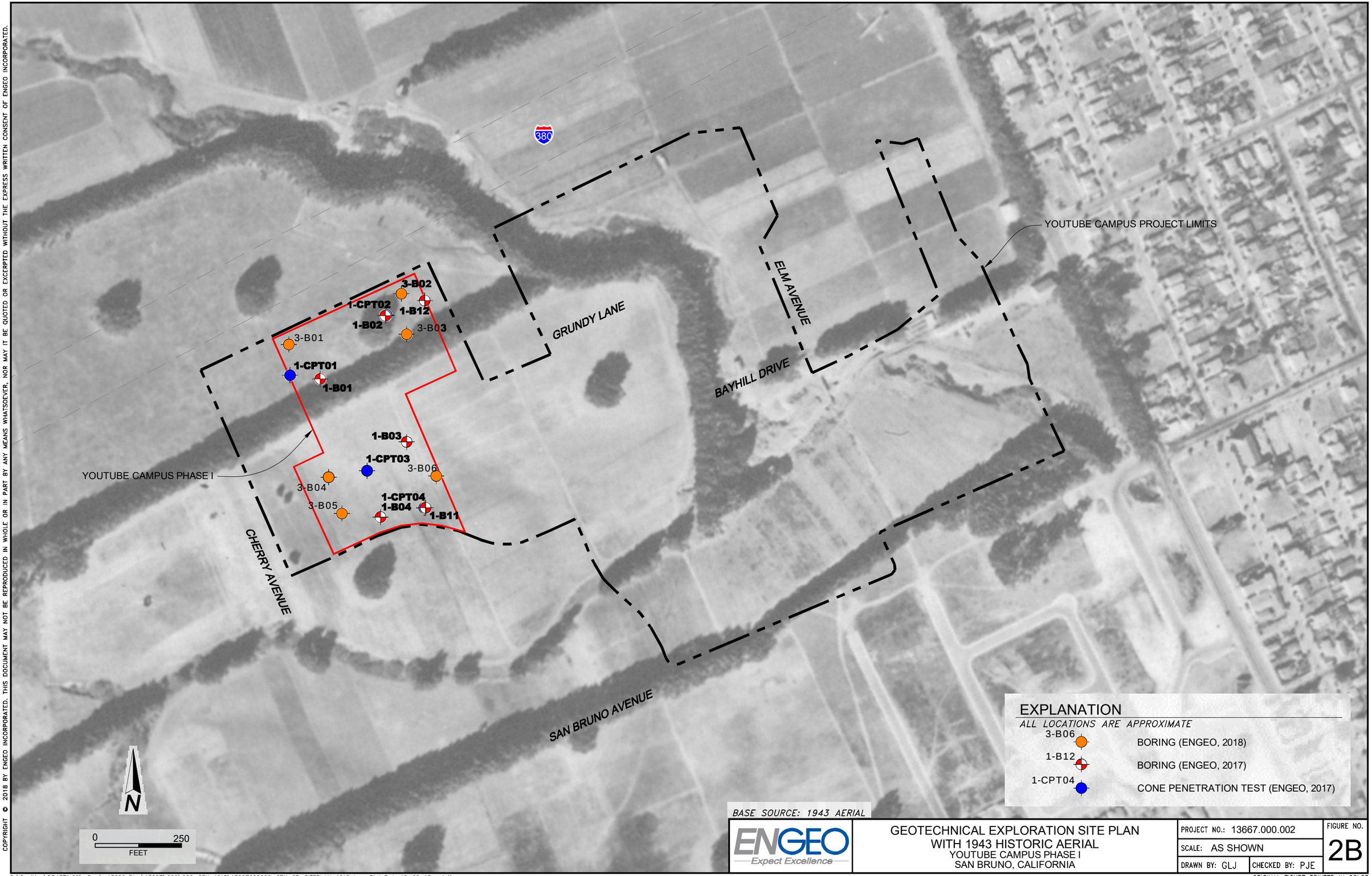

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- 3-B06 — BORING (ENGEO, 2018)
- 1-B12 — BORING (ENGEO, 2017)
- 1-CPT04 — CONE PENETRATION TEST (ENGEO, 2017)

BASE SOURCE: 1943 AERIAL

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GEOTECHNICAL EXPLORATION SITE PLAN WITH 1943 HISTORIC AERIAL

YOUTUBE CAMPUS PHASE I
SAN BRUNO, CALIFORNIA

PROJECT NO.: 13667.000.002		FIGURE NO. 2B
SCALE: AS SHOWN		
DRAWN BY: GLJ	CHECKED BY: PJE	

ORIGINAL FIGURE PRINTED IN COLOR

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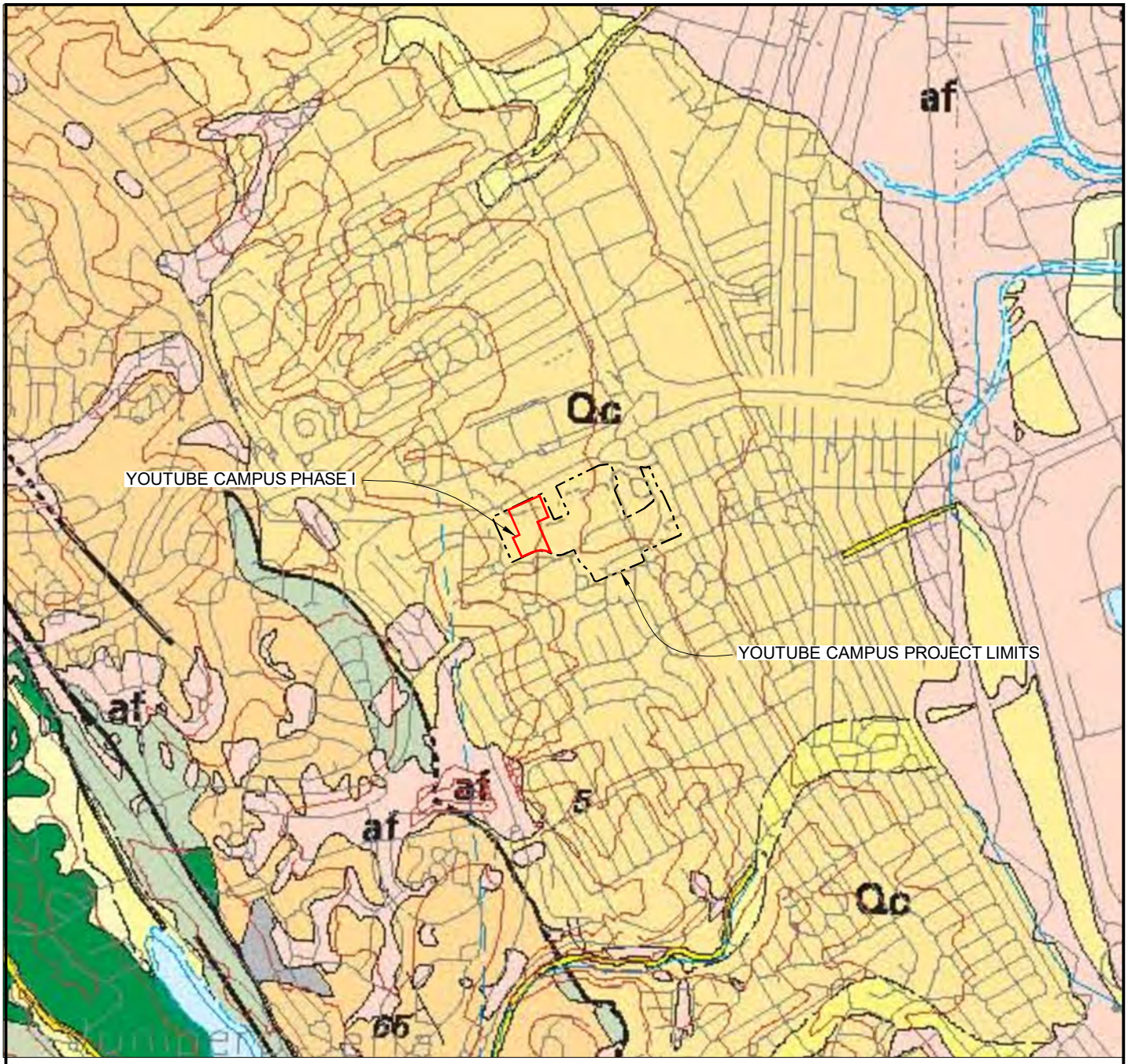

N

0 2000
FEET

EXPLANATION

af	ARTIFICIAL FILL
Qcl	COLLUVIUM (HOLOCENE)
Qc	COLMA FORMATION

BASE MAP SOURCE: BRABB, GRAYMER, AND JONES, 1998

ENGEO Expect Excellence

REGIONAL GEOLOGIC MAP

YOUTUBE CAMPUS PHASE I

SAN BRUNO, CALIFORNIA

PROJECT NO.: 13667.000.002		FIGURE NO. 3
SCALE: AS SHOWN		
DRAWN BY: GLJ	CHECKED BY: PJE	

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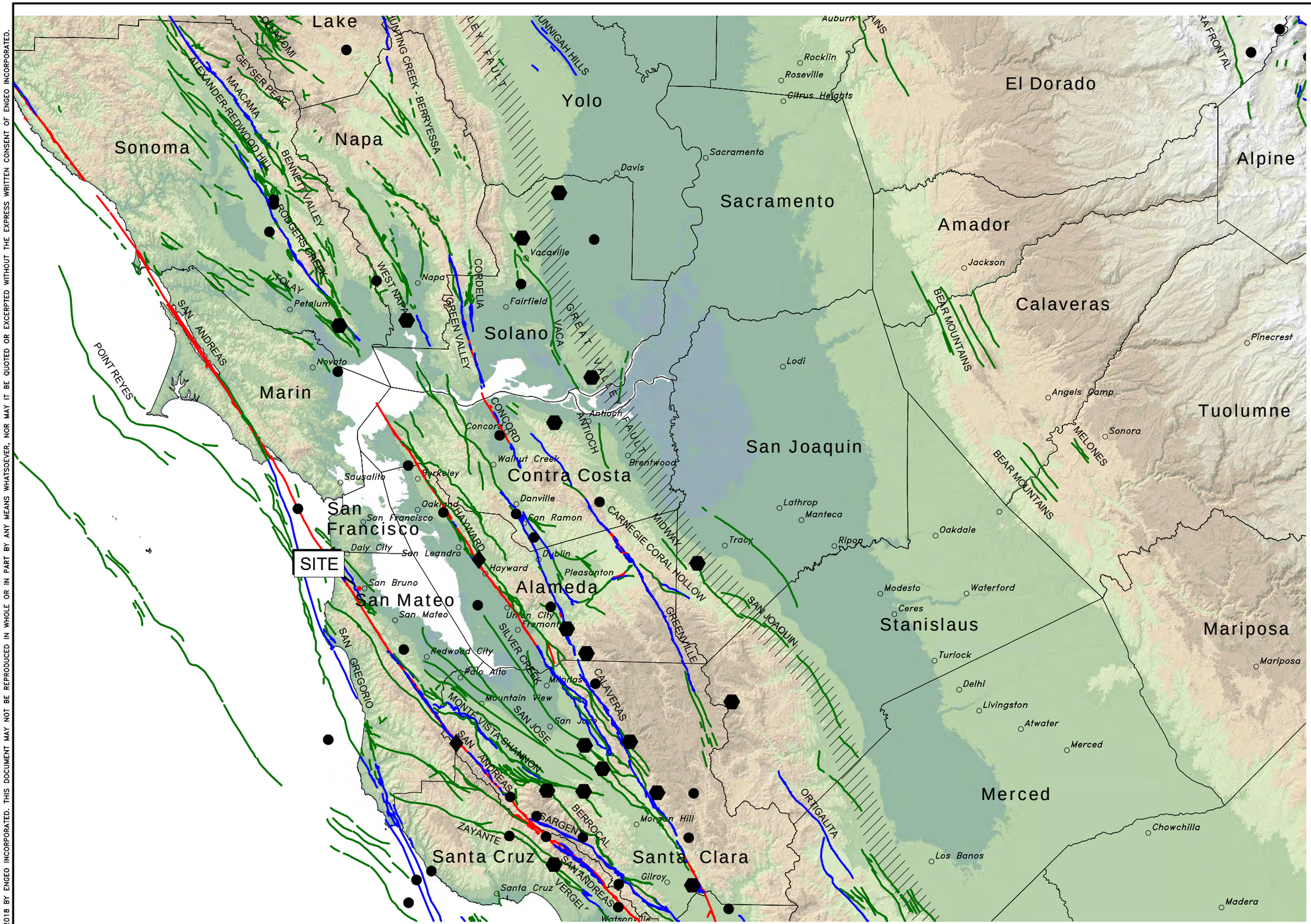

BASE MAP SOURCE:
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATASET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, NOVEMBER, 2010
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800–2000)

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REGIONAL FAULTING AND SEISMICITY

YOUTUBE CAMPUS PHASE I

SAN BRUNO, CALIFORNIA

PROJECT NO.: 13667.000.000
SCALE: AS SHOWN
DRAWN BY: GLJ CHECKED BY: PJE

FIGURE NO. 4

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ORIGINAL FIGURE PRINTED IN COLOR

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FEET

EXPLANATION

1906 C — FAULTS CONSIDERED TO HAVE BEEN ACTIVE DURING HOLOCENE TIME AND TO HAVE A RELATIVELY HIGH POTENTIAL FOR SURFACE RUPTURE; SOLID LINE WHERE ACCURATELY LOCATED, LONG DASH WHERE APPROXIMATELY LOCATED, SHORT DASH WHERE INFERRED, DOTTED WHERE CONCEALED; QUERY (?) INDICATES ADDITIONAL UNCERTAINTY. EVIDENCE OF HISTORIC OFFSET INDICATED BY YEAR OF EARTHQUAKE-ASSOCIATED EVENT OR C FOR DISPLACEMENT CAUSED BY CREEP OR POSSIBLE CREEP

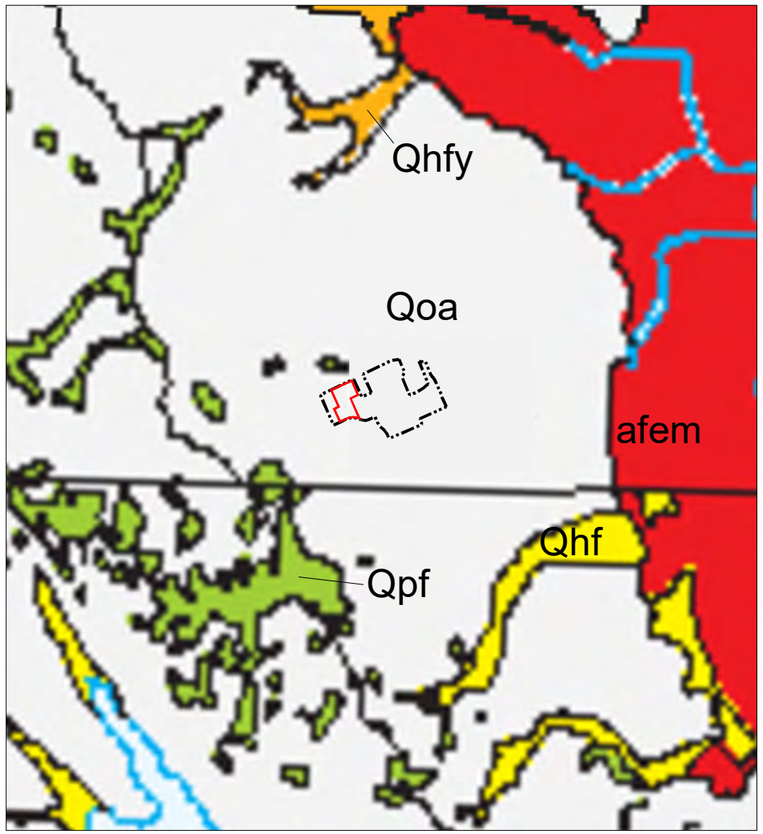
EARTHQUAKE FAULT ZONE BOUNDARIES; DELINEATED AS STRAIGHT-LINE SEGMENTS THAT CONNECT ENCIRCLED TURNING POINTS SO AS TO DEFINE EARTHQUAKE FAULT ZONE SEGMENTS

YOUTUBE CAMPUS PROJECT LIMITS

YOUTUBE CAMPUS PHASE I

EARTHQUAKE FAULT ZONE MAP

BASE MAP SOURCE: CDMG, 1993



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FEET

EXPLANATION

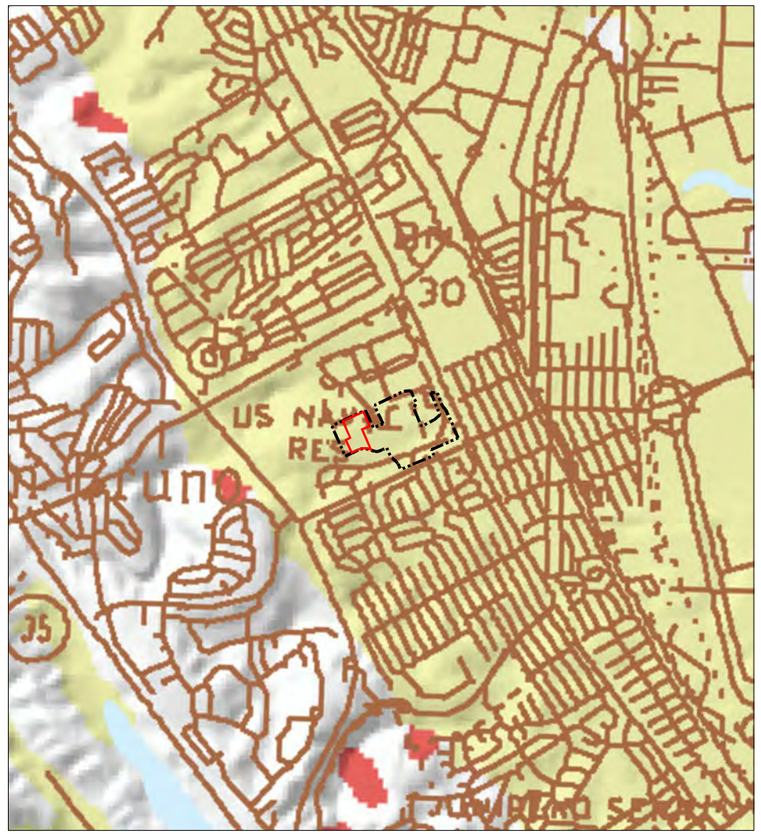
VERY HIGH	afem	ARTIFICIAL FILL
HIGH	Qhfy	ALLUVIAL FAN DEPOSITS (LATEST HOLOCENE)
MEDIUM	Qhf	ALLUVIAL FAN DEPOSITS (HOLOCENE)
LOW	Qpf	ALLUVIAL FAN DEPOSITS (PLIESTOCENE)
VERY LOW	Qoa	ALLUVIUM

YOUTUBE CAMPUS PROJECT LIMITS

YOUTUBE CAMPUS PHASE I

LIQUEFACTION SUSCEPTIBILITY MAP

BASE MAP SOURCE: WITTER, 2006



N

0 3000
FEET

EXPLANATION

MOSTLY LANDSLIDE

MANY LANDSLIDES

FEW LANDSLIDES

FLAT LAND

YOUTUBE CAMPUS PROJECT LIMITS

YOUTUBE CAMPUS PHASE I

LANDSLIDE SUSCEPTIBILITY MAP

BASE MAP SOURCE: WENTWORTH, 1997

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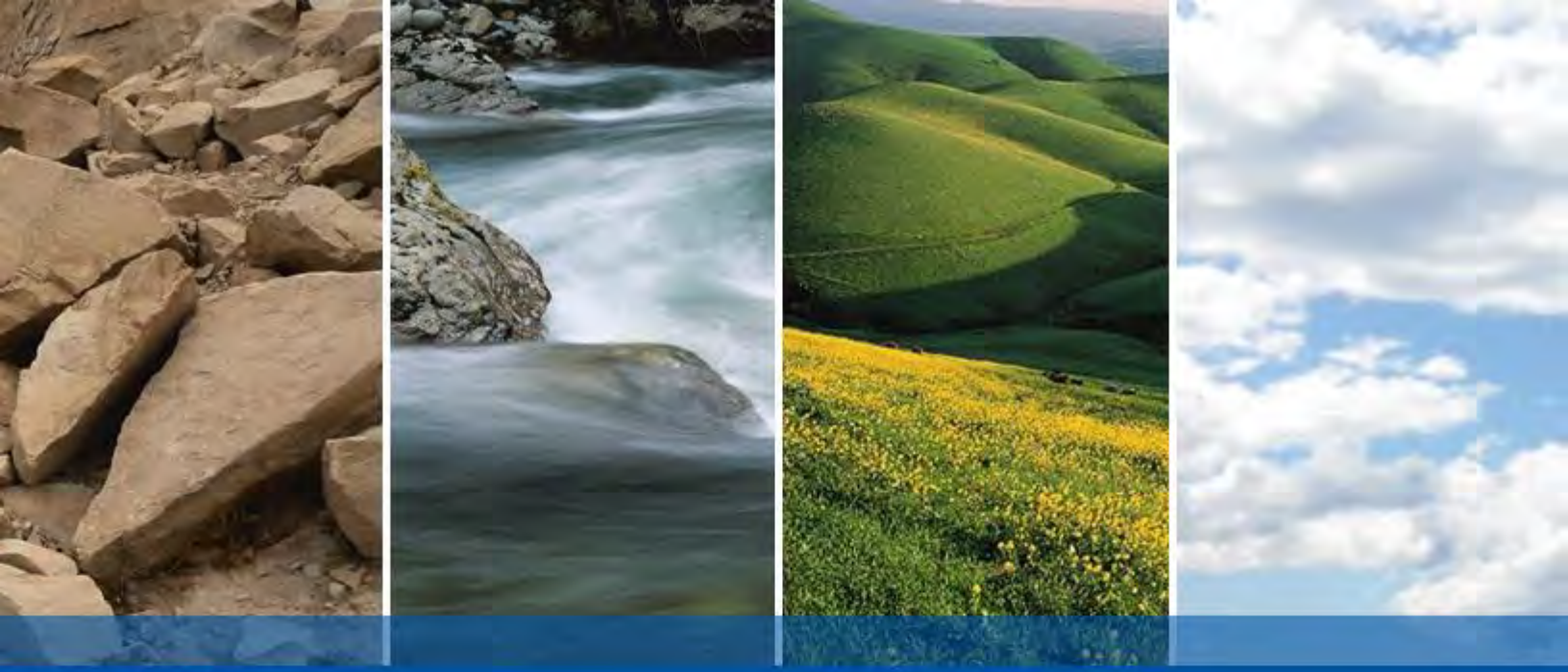
REGIONAL HAZARD MAPS
YOUTUBE CAMPUS PHASE I
SAN BRUNO, CALIFORNIA

PROJECT NO.: 13667.000.002
SCALE: AS SHOWN
DRAWN BY: GLJ
CHECKED BY: PJE

FIGURE NO. 5

G:\Drafting\DRAFTING2_Dwg_13000 Plus\13667\000\002-GEX-1018\13667000002-GEX-5-Hazards-1018.dwg Plot Date:10-29-18 gjaffe

ORIGINAL FIGURE PRINTED IN COLOR



APPENDIX A

BORING LOG KEY
EXPLORATION LOGS

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4 "	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Dames and Moore Piston
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

- ———— Solid - Layer Break
- – – – – – Dashed - Gradational or approximate layer break

GROUND-WATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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LOG OF BORING 3-B1

ENGEO Expect Excellence

LATITUDE: 37.629567 LONGITUDE: -122.42535

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/13/2018
HOLE DEPTH: 100 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 116 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			ASPHALT CONCRETE, 2-1/2 inches										
			AGGREGATE BASE, 3 inches										
	115		SILTY SAND (SM), pale brown, dense, moist, fine- to medium-grained sand, fine gravel										
			Layer of brownish yellow, fine- to coarse-grained sand with fine gravel										
5													
	110		Becomes light yellowish brown, non-plastic, fine- to medium-grained sand, no staining			35							
10													
	105		Becomes very dense, layers of silty fine sand, silty fine to medium sand, scattered coarse-grained sand			64					7	108	
15													
	100												
20													
	95					55							
			Becomes interlayered										
			SANDY CLAY (CL), light yellowish brown, stiff, moist, low plasticity, fine-grained sand, contains silt fines										
25													

LOG OF BORING 3-B1

ENGEO Expect Excellence

LATITUDE: 37.629567 LONGITUDE: -122.42535

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/13/2018
HOLE DEPTH: 100 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 116 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	90		SILTY SAND (SM), light yellowish brown, moist, coarse-grained sand										
			SANDY CLAY (CL), light yellowish brown mottled with reddish brown, moist, low plasticity, fine- to medium-grained sand										
			SILTY SAND (SM), light yellowish brown, very dense, moist, coarse-grained sand										
30	85		Grades to 1-inch interbedded layers of fine-grained sand, fine- to coarse-grained sand, scattered subangular gravel			60					16		
			SANDY LEAN CLAY (CL), light yellowish brown, stiff, moist, low plasticity, fine- to medium-grained sand										
35	80												
			CLAYEY SAND (SC), light yellowish brown, medium dense to dense, moist, gradational contact										
40			Reddish yellow Light yellowish brown, low plasticity, fine-grained sand, reddish oxidation staining, layers of clay and sand			50/4				32	14	112	
	75		SILTY SAND (SM), light yellowish brown, very dense, moist, non-plastic, fine- to medium-grained sand, layered										
			Reddish yellow silt in cuttings										
45			Reddish yellow clayey sand, fine-grained sand										
	70		Light yellowish brown sandy clay, fine-grained sand and silt										
50													

LOG OF BORING 3-B1

Expect Excellence

LATITUDE: 37.629567 LONGITUDE: -122.42535

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/13/2018
HOLE DEPTH: 100 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 116 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	65		SILTY SAND (SM), light yellowish brown, very dense, moist, interbedded 1-inch layers of clayey fine-grained sand and silt layers, reddish oxidation staining			71							
55	60		Grades to darker stronger yellowish brown, lack of interbedding			50/6				46	18		
60	55		Grades to less fines			50/5							
65	50		Lense of reddish yellow clayey sand			50/4							
70	45		6-inch layer of strong brown to reddish yellow, 2-inch layer of medium-grained sand			50/5							
75													

LOG - GEOTECHNICAL W/ELEV. 13667000002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B1

ENGEO Expect Excellence

LATITUDE: 37.629567 LONGITUDE: -122.42535

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/13/2018
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Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	40		SILTY SAND (SM), light yellowish brown, very dense, moist, lack of staining and layering			50/5					17		
80	35		Grades to less fines			50/4							
85	30												
90	25		1-foot layer of silty fine-grained sand Less fines, some oxidation staining			84							
95	20		FAT CLAY (CH), dark greenish gray, hard, moist, medium plasticity, some sandy clay seams, clay polish			53					38	81	4.5*
100			End of boring at approximately 100 feet. Groundwater not observed due to drilling method.										

LOG - GEOTECHNICAL W/ELEV. 13667000002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B2

Expect Excellence

LATITUDE: 37.630039 LONGITUDE: -122.424211

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/14/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 107 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
0	107		ASPHALT CONCRETE, 2-1/2 inches										
			AGGREGATE BASE, 4 inches										
			SANDY SILT (ML), pale brown, dense to very dense, moist, low plasticity, fine-grained sand, caliche stringers										
5	105		Caliche, pinholes, non plastic, some fine gravel			50							
10	100		SILTY SAND (SM), light yellowish brown, medium dense, moist, fine-grained sand, gradational contact, high fines content			13				47	17		
15	95												
20	90		SANDY SILT (ML), light yellowish brown, medium dense, moist, fine-grained sand, gradational contact Reddish yellow oxidation staining			24				53	14		
25	85		SILTY SAND (SM), light yellowish brown, dense, moist, fine-grained sand										

LOG - GEOTECHNICAL W/ELEV. 1366700002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B2

LATITUDE: 37.630039 LONGITUDE: -122.424211

Geotechnical Exploration
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San Bruno, California
13667.000.002

DATE DRILLED: 9/14/2018
HOLE DEPTH: 101.5 ft.
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SURF ELEV (NAVD88): 107 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light yellowish brown, dense, moist, fine-grained sand										
	80		Reddish yellow Fine gravel observed										
30			Light yellowish brown mottled with reddish yellow, fine-grained sand, non plastic			32							
	75												
35			Layer of coarse-grained sand and fine gravel										
	70												
40			Scattered 1-inch fine gravel layers and 1-inch layers of fine- to medium-grained sand with red oxidation staining, zones of black and red oxidation staining			41					18		
	65												
45			Layer of coarse-grained sand										
	60												
50													

LOG OF BORING 3-B2

Expect Excellence

LATITUDE: 37.630039 LONGITUDE: -122.424211

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13667.000.002

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LOGGED / REVIEWED BY: M. Parks / P. Espinosa
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DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			Light yellowish brown mottled with reddish yellow, very dense, less staining, no layers observed, less fines			58							
55	55		Fine- to medium-grained sand, reddish oxidation layer			55							
	50		CLAYEY SAND (SC), light yellowish brown, dense to very dense, moist, low plasticity, fine-grained sand										
60			Medium dense, red oxidation staining			19	30	14	16	44	20		
	45												
65			Dense to very dense, scattered fine subrounded gravel			50/3							
	40		SILTY SAND (SM), light yellowish brown, very dense, moist, fine- to medium-grained sand, non-plastic, scattered fine subrounded gravel, red oxidation staining										
70			Fine- to coarse-grained sand, red oxidation layer above clayey sand			56							
	35		CLAYEY SAND (SC), light yellowish brown, very dense, moist, low plasticity, fine- to medium-grained sand, high fines content, scattered fine gravel, black oxidation staining										
75													

LOG - GEOTECHNICAL W/ELEV. 13667000002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B2

LATITUDE: 37.630039 LONGITUDE: -122.424211

Geotechnical Exploration
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San Bruno, California
13667.000.002

DATE DRILLED: 9/14/2018
HOLE DEPTH: 101.5 ft.
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DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			CLAYEY SAND (SC), reddish yellow, very dense, moist, fine-grained sand										
	30												
			SILTY SAND (SM), light yellowish brown, very dense, moist, fine- to medium-grained sand, scattered 1/2- to 3-inch layers of clayey sand										
80						77							
	25												
85			Fine-grained sand										
	20												
90			Fine- to coarse-grained sand, black oxidation staining			50/6					15		
	15		Scattered layers of clayey fine- to medium-grained sand										
			Scattered fine subrounded gravel										
95													
			Reddish yellow, fine- to medium-grained sand, clayey sand layer										
	10												
100			Fine gravel layer										

LOG - GEOTECHNICAL W/ELEV. 13667000002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B2

LATITUDE: 37.630039 LONGITUDE: -122.424211

Geotechnical Exploration
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DATE DRILLED: 9/14/2018
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SURF ELEV (NAVD88): 107 ft.

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DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light yellowish brown, very dense, moist, fine- to medium-grained sand, thin silt laminations, black oxidation staining			50/4							
			End of boring at approximately 101½ feet. Groundwater not observed due to drilling method.										

LOG OF BORING 3-B3

Expect Excellence

LATITUDE: 37.629693 LONGITUDE: -122.424173

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/12/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 107 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			ASPHALT CONCRETE, 2-1/2 inches										
			AGGREGATE BASE, 3-inches										
	105		SANDY SILT (ML), yellowish brown, dense to hard, moist, fine-grained sand, non plastic, caliche, fine rounded gravel, red and black oxidation staining										
5			SANDY LEAN CLAY (CL), yellowish brown to grayish brown, stiff to very stiff, moist, low plasticity, fine-grained sand, scattered rounded fine gravel, red oxidation staining, grades to more clay			15							
	100												
10			More fine-grained sand, red oxidation staining			37							
	95		SILTY SAND (SM), light yellowish brown mottled with reddish yellow, dense, moist, fine- to coarse-grained sand, non plastic										
15													
	90		SANDY LEAN CLAY (CL), light brownish gray, stiff, moist, low plasticity, fine-grained sand										
20			SANDY SILT (ML), light brownish gray, hard to dense, moist, low plasticity, fine-grained sand, some clay, scattered coarse sand-size chert clasts, caliche			34							
	85												
25													

LOG OF BORING 3-B3

ENGEO Expect Excellence

LATITUDE: 37.629693 LONGITUDE: -122.424173

Geotechnical Exploration
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San Bruno, California
13667.000.002

DATE DRILLED: 9/12/2018
HOLE DEPTH: 101.5 ft.
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SURF ELEV (NAVD88): 107 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SANDY SILT (ML), light brownish gray, hard to dense, moist, low plasticity, fine-grained sand, some clay, scattered coarse sand-size chert clasts, caliche										
	80		SILTY SAND (SM), pale brown, dense, moist, fine-grained sand, 2-inch layer of poorly-graded medium-grained sand, high fines content										
30						42							
	75		Scattered clay and gravel layers, coarse gravel in cuttings										
35			Rounded to subrounded gravels and rock fragments of chert, jasper, quartz										
	70		Sandy silt with gravel										
40			Clayey sand pocket										
	65		Light yellowish brown, lense yellowish brown sandy lean clay										
			Layer of coarse sand and fine gravel, rounded to subrounded										
45													
	60		Clayey sand lense										
50													

LOG OF BORING 3-B3

LATITUDE: 37.629693 LONGITUDE: -122.424173

Geotechnical Exploration
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13667.000.002

DATE DRILLED: 9/12/2018
HOLE DEPTH: 101.5 ft.
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SURF ELEV (NAVD88): 107 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
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DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light yellowish brown, very dense, moist, fine-grained sand, high fines content, reddish oxidation staining, lenses of alternating clay and silt			89	20	19	1	39	16		
55	55		Fine- to medium-grained sand			74							
60	50		Dense, fine- to coarse-grained sand, scattered rounded to subrounded fine gravel			43							
65	45		Very dense, red oxidation staining throughout			50/4"							
	40		Fine rounded gravel, quartz clasts										
70			Fine- to medium-grained sand, less staining			80							
	35												
75													

LOG OF BORING 3-B3

Expect Excellence

LATITUDE: 37.629693 LONGITUDE: -122.424173

Geotechnical Exploration
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San Bruno, California
13667.000.002

DATE DRILLED: 9/12/2018
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SURF ELEV (NAVD88): 107 ft.

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HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light yellowish brown, very dense, fine- to medium-grained sand, little staining, occasional clay seam, scattered subrounded gravel			50/5"					15		
	30		Reddish yellow										
80			SANDY LEAN CLAY (CL), light yellowish brown, very stiff, moist, fine-grained sand, low to medium plasticity, some silt, red oxidation staining			26							
	25		CLAYEY SAND (SC), light yellowish brown, medium dense, low plasticity, fine- to medium-grained sand, red oxidation staining, zone of black manganese staining										
85			SILTY SAND (SM), light yellowish brown mottled with reddish yellow, very dense, fine- to coarse-grained sand, oxidation staining, layers of sorted sand			50/4"							
	20												
90			Scattered fine subrounded gravel, less staining			50/5"							
	15		Gravel in cuttings										
95			Gravel layers										
	10		Subrounded fine gravel										
100													

LOG OF BORING 3-B3

LATITUDE: 37.629693 LONGITUDE: -122.424173

Geotechnical Exploration
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13667.000.002

DATE DRILLED: 9/12/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 107 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light yellowish brown mottled with reddish yellow, very dense, moist, low plasticity, 1- to 2-inch layers of fine- to coarse-grained sand, scattered layers of clayey sand			44					22		
			End of boring at approximately 101½ feet. Groundwater not observed due to drilling method.										

LOG OF BORING 3-B4

Expect Excellence

LATITUDE: 37.62855 LONGITUDE: -122.424961

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/18/2018
HOLE DEPTH: 100.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 117 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
0	117		ASPHALT CONCRETE, 2-1/2 inches AGGREGATE BASE, 2-1/2 inches SANDY LEAN CLAY (CL), dark olive brown, moist, fine-grained sand, fine gravel, contains asphalt [FILL]										
5	110		SILTY SAND (SM), dark yellowish brown, loose, moist, fine- to medium-grained sand [NATIVE] Wood fragments in cuttings from 7 to 10 feet, possible tree roots			8							
10	105		CLAYEY SAND (SC), grayish brown, medium dense, moist			18							
15	100		Green coarse-grained sand Brown										
20	95		Dark yellowish brown, moist to wet, fine- to medium-grained sand SILTY SAND (SM), light yellowish brown, medium dense, moist			24							
25													

LOG OF BORING 3-B4

LATITUDE: 37.62855 LONGITUDE: -122.424961

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/18/2018
HOLE DEPTH: 100.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 117 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light yellowish brown, medium dense, moist Grades to more fines										
	90												
			Grades to more sand, fine- to coarse-grained sand										
30			Dark yellowish brown, dense, contains silt fines			49	23	20	3	22	18		
	85		Grades to more sand										
35													
	80												
40			Light olive brown, very dense, very fine-grained sand			73							
			Dark yellowish brown, strong brown oxidation, less fines										
	75												
45													
	70		Clayey sand in cuttings, more fines										
			Grades to less fines										
50													

LOG OF BORING 3-B4

LATITUDE: 37.62855 LONGITUDE: -122.424961

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/18/2018
HOLE DEPTH: 100.5 ft.
HOLE DIAMETER: 4.0 in.
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LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

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			SILTY SAND (SM), light olive brown, very dense, moist, contains strong brown oxidation, fine- to medium-grained sand			72				17			
	65												
55			Light yellowish brown, some clay fines			96							
	60												
			Fine- to coarse-grained sand										
60													
	55		Grades to coarse sand										
			SANDY SILT (ML), light olive brown, very dense, moist, low plasticity, very fine-grained sand, trace clay fines										
65													
			SANDY LEAN CLAY (CL), light olive brown, hard, moist, contains silt			65				17	20		
	50		SILTY SAND (SM), olive, very dense, wet, fine-grained sand										
70						50/5"							
	45		Grades to more fines										
75													

LOG OF BORING 3-B4

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DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), olive, very dense, wet, grades to less fines, fine- to coarse-grained sand										
			LEAN CLAY WITH SAND (CL), greenish black, hard, wet, medium plasticity, fine-grained sand										
	40												
80			Dark bluish gray, fine-grained sand			50/3"							
			SILTY SAND (SM), dark bluish gray, very dense, wet, fine-grained sand, some plastic fines										
	35												
85			LEAN CLAY (CL), dark bluish gray, hard, moist to wet, medium plasticity, fine-grained sand										
	30												
90						50/5"							
	25												
95			Grades to lean clay with sand, fine-grained sand										
	20												
			SILTY SAND (SM), dark yellowish brown, very dense, moist to wet										
100													

LOG OF BORING 3-B4

LATITUDE: 37.62855 LONGITUDE: -122.424961

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/18/2018
HOLE DEPTH: 100.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 117 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			POORLY GRADED SAND (SP), dark yellowish brown, very dense, moist to wet, few fines, fine- to medium-grained sand			50/5"							
			End of boring at approximately 100½ feet. Groundwater not observed due to drilling method.										

LOG OF BORING 3-B5

LATITUDE: 37.628237 LONGITUDE: -122.424805

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/19/2018
HOLE DEPTH: 101 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 113 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
0	113		ASPHALT CONCRETE, 2-1/2 inches AGGREGATE BASE, 2-1/2 inches										
			SILTY SAND (SM), olive brown, loose, moist, moderate fines, fine- to medium-grained sand [FILL]										
	110		Scattered fine gravel Very dark brown, high fines content										
5			Wood and gravel fragments from 4.5 feet to 8 feet			3							
	105		SANDY SILT (ML), dark yellowish brown, stiff to very stiff, dry to moist, moderate fine-grained sand, trace clay fines [NATIVE]										
10						18							
	100												
15			Yellowish brown, high fine-grained sand content			29							
	95												
20			SILTY SAND WITH GRAVEL (SM), yellowish brown, dense to very dense, moist, high fines content, fine- to medium-grained sand, fine to coarse gravel Strong brown, trace clay fines			60							
	90												
25													

LOG - GEOTECHNICAL W/ELEV. 13667000002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B5

ENGEO Expect Excellence

LATITUDE: 37.628237 LONGITUDE: -122.424805

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/19/2018
HOLE DEPTH: 101 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 113 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND WITH GRAVEL (SM), yellowish brown, dense to very dense, moist, high fines content, fine- to medium-grained sand, fine to coarse gravel										
	85												
30			SANDY LEAN CLAY (CL), yellowish brown, very stiff to hard, moist, moderate fine-grained sand			51							
			CLAYEY SAND (SC), dark yellowish brown, very dense, moist, moderate fines, fine- to medium-grained sand strong brown oxidation Grades to less clay fines										
	80												
35													
	75		SILTY SAND (SM), dark yellowish brown, very dense, grades to less fines, fine- to coarse-grained sand										
40			CLAYEY SAND (SC), light yellowish brown, very dense, moist, strong brown oxidation, low fines content, fine- to medium-grained sand			50/5"							
	70		SANDY LEAN CLAY (CL), light yellowish brown, stiff to very stiff, moist										
45													
			SILTY SAND (SM), light yellowish brown, very dense, moist to wet, low fines, fine-grained sand										
	65					50/4"							
50													

LOG OF BORING 3-B5

LATITUDE: 37.628237 LONGITUDE: -122.424805

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/19/2018
HOLE DEPTH: 101 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 113 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), light yellowish brown, very dense, moist to wet, low fines, fine-grained sand										
	60		LEAN CLAY (CL), light yellowish brown, stiff to very stiff, moist, medium plasticity, little fine-grained sand										
			POORLY GRADED SAND (SP), dark olive brown, very dense, wet, few fines, fine-grained sand, trace oxidation staining										
55						50/6"							
	55												
			SILTY SAND (SM), olive to light olive brown, very dense, moist to wet, moderate fines content, fine-grained sand										
60													
	50					50/6"							
65													
	45		Grades to more fines										
70			Very fine-grained sand, contains trace clay fines			74				31	24		
	40												
75													

LOG OF BORING 3-B5

LATITUDE: 37.628237 LONGITUDE: -122.424805

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/19/2018
HOLE DEPTH: 101 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 113 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			POORLY GRADED SAND (SP), olive to light olive, very dense, wet, few fines, fine-grained sand			50/5"							
	35		LEAN CLAY (CL), dark bluish gray, hard, moist, medium plasticity										
80			FAT CLAY (CH), dark bluish gray, hard, moist, high plasticity, trace fine-grained sand			54							
	30												
85													
	25												
90						50							
	20												
95			Fine- to coarse-grained sand lense										
	15		POORLY GRADED SAND (SP), very dark grayish green, very dense, moist, trace fines, fine-grained sand										
100													

LOG OF BORING 3-B5

LATITUDE: 37.628237 LONGITUDE: -122.424805

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/19/2018
HOLE DEPTH: 101 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 113 ft.

LOGGED / REVIEWED BY: T. Strack / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
							Liquid Limit	Plastic Limit	Plasticity Index				
			SILTY SAND (SM), dark olive brown, very dense, moist, low fines, fine- to medium-grained sand, mottled with black			50/3"							
			End of boring at approximately 101 feet. Groundwater not observed due to drilling method.										

LOG OF BORING 3-B6

Expect Excellence

LATITUDE: 37.628512 LONGITUDE: -122.423851

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/17/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 101 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			ASPHALT CONCRETE, 2-1/2 inches										
			AGGREGATE BASE, 3-inches										
	100		SILTY SAND (SM), dark yellowish brown, medium dense, moist, fine- to medium-grained sand, angular gravel, contains sand pockets										
			SANDY CLAY (CL), yellowish brown, stiff, moist, medium plasticity, moderate fine-grained sand										
5			SILTY SAND (SM), light brownish gray mottled with yellowish brown, very dense, moist, fine- to medium-grained sand, non-plastic			63							
	95		Yellowish brown, some clay										
10			Medium dense, fine-grained sand, moderate fines content, non-plastic, pockets of reddish yellow and black sand, wood fragments			18					14		
	90		Clayey sand layer										
15			Dark brown with reddish oxidation, low plasticity fines			29							
	85		Yellowish brown with red and black oxidation staining, fine-grained sand, non-plastic, red										
			Fine gravel										
20			Interbedded layers of silty fine-grained sand and silty fine- to coarse-grained sand with fine gravel, layers of oxidation staining, scattered subrounded fine gravel			22					14		
	80		Clayey sand layer										
25													

LOG OF BORING 3-B6

LATITUDE: 37.628512 LONGITUDE: -122.423851

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/17/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 101 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
			SILTY SAND (SM), yellowish brown, medium dense, moist										
	75		LEAN CLAY (CL), light yellowish brown, stiff, moist										
			SILTY SAND (SM), light yellowish brown, medium dense, moist, fine-grained sand										
			Fine gravel										
30			Layered, no staining										
	70					29				31	19		
35			Scattered layers of clayey fine-grained sand										
	65												
40			Dense, fine- to medium-grained sand, interbedded layers of non-plastic and low plasticity fines, some red oxidation staining			40							
	60												
45													
	55												
			POORLY GRADED SAND (SP), light yellowish brown, dense, moist, medium- to coarse-grained sand, scattered fine gravel, few clay fines										
50													

LOG OF BORING 3-B6

ENGEO Expect Excellence

LATITUDE: 37.628512 LONGITUDE: -122.423851

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/17/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 101 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	50		SANDY SILT (ML), light yellowish brown mottled with strong brown, very dense, moist, low plasticity, fine- to medium-grained sand, some clay fines			52							
55	45		SILTY SAND (SM), light yellowish brown mottled with strong brown, very dense, moist, low plasticity, fine- to medium-grained sand			58				15	15		
			Clay fines										
60	40		Grades to less fines			83							
65	35		Light yellowish brown mottled with strong brown, oxidation staining			65							
70			Grades to more fines										
	30		LEAN CLAY (CL), light gray mottled with strong brown, very stiff, moist, medium plasticity, few fine-grained sand, contains silt fines, oxidation staining			25	37	20	17		26		
			SILTY SAND (SM), olive brown, very dense, moist, fine- to medium-grained sand, scattered fine gravel			80							
75													

LOG - GEOTECHNICAL W/ELEV. 13667000002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B6

Expect Excellence

LATITUDE: 37.628512 LONGITUDE: -122.423851

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/17/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 101 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	25		CLAYEY SAND (SC), olive brown, very dense, moist, high fines content Grades to light gray, fine-grained sand, less fines										
			SILTY SAND (SM), light gray mottled with strong brown, very dense, moist, fine-grained sand							31			4.5*
80	20					87							
			SANDY LEAN CLAY (CL), bluish gray, stiff, moist, medium plasticity, moderate fine-grained sand										
85						25							
	15		LEAN CLAY (CL), bluish gray, hard, moist, medium plasticity, few fine-grained sand			68							4.5*
			SANDY LEAN CLAY (CL), bluish gray, very hard, moist, low plasticity, more fine-grained sand, contains silt fines										4.5*
90	10												
			FAT CLAY (CH), bluish gray, very stiff, moist, high plasticity, few fine-grained sand			44	59	23	36				4.5*
95	5												
			LEAN CLAY (CL), bluish gray, hard, moist, medium plasticity, few fine-grained sand, contains silt fines										
100													

LOG - GEOTECHNICAL W/ELEV. 13667000002 09-21-2018 BOREHOLE LOGS.GPJ ENGEO INC.GDT 10/29/18

LOG OF BORING 3-B6

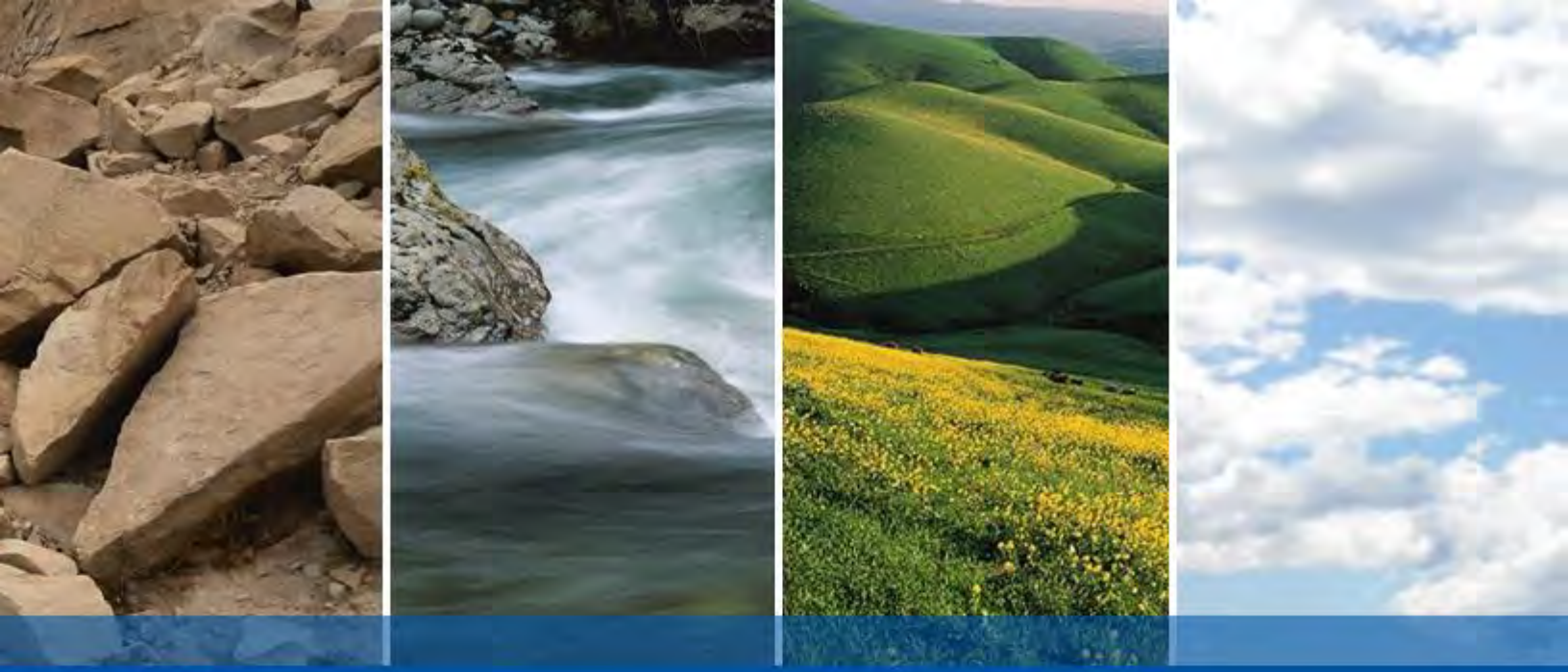
LATITUDE: 37.628512 LONGITUDE: -122.423851

Geotechnical Exploration
Youtube
San Bruno, California
13667.000.002

DATE DRILLED: 9/17/2018
HOLE DEPTH: 101.5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 101 ft.

LOGGED / REVIEWED BY: M. Parks / P. Espinosa
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Unconfined Strength (tsf) *field approx
	0		LEAN CLAY (CL), bluish gray, hard, moist, medium plasticity, few fine-grained sand, contains silt fines			46							4.5*
			End of boring at approximately 101½ feet. Groundwater not observed due to drilling method.										

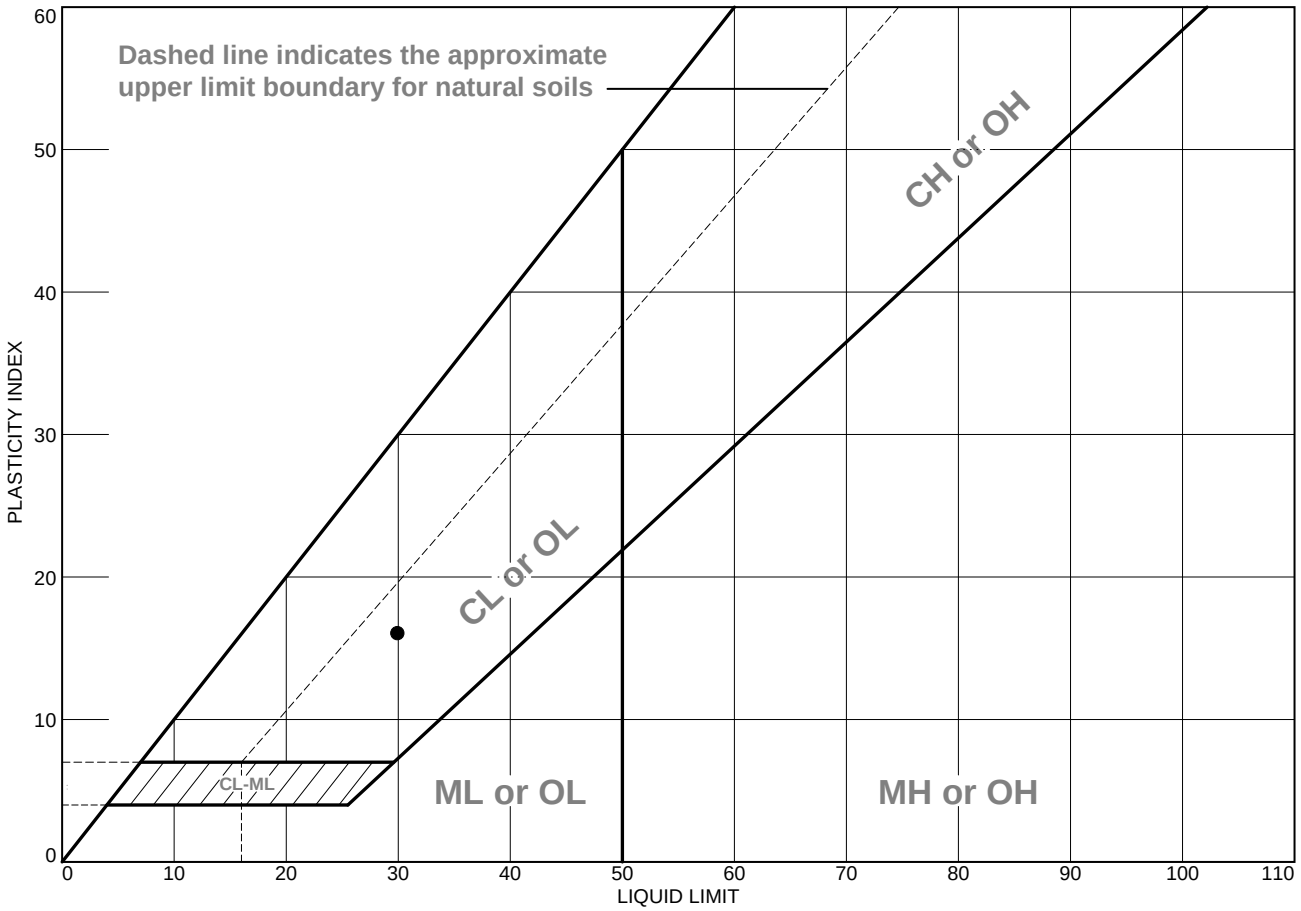


APPENDIX B

LABORATORY TEST DATA

Liquid and Plastic Limits Test Report
Particle Size Distribution Report
Unconsolidated Undrained Triaxial Test
Incremental Consolidation Report
Analytical Results of Soil Corrosion

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	30	14	16		43.9	

Project No. 13667.000.002 **Client:** Google Incorporated

Project: YouTube Campus Phase 1

●**Depth:** 60.0-61.5 feet **Sample Number:** 3-B2 @ 60-61.5

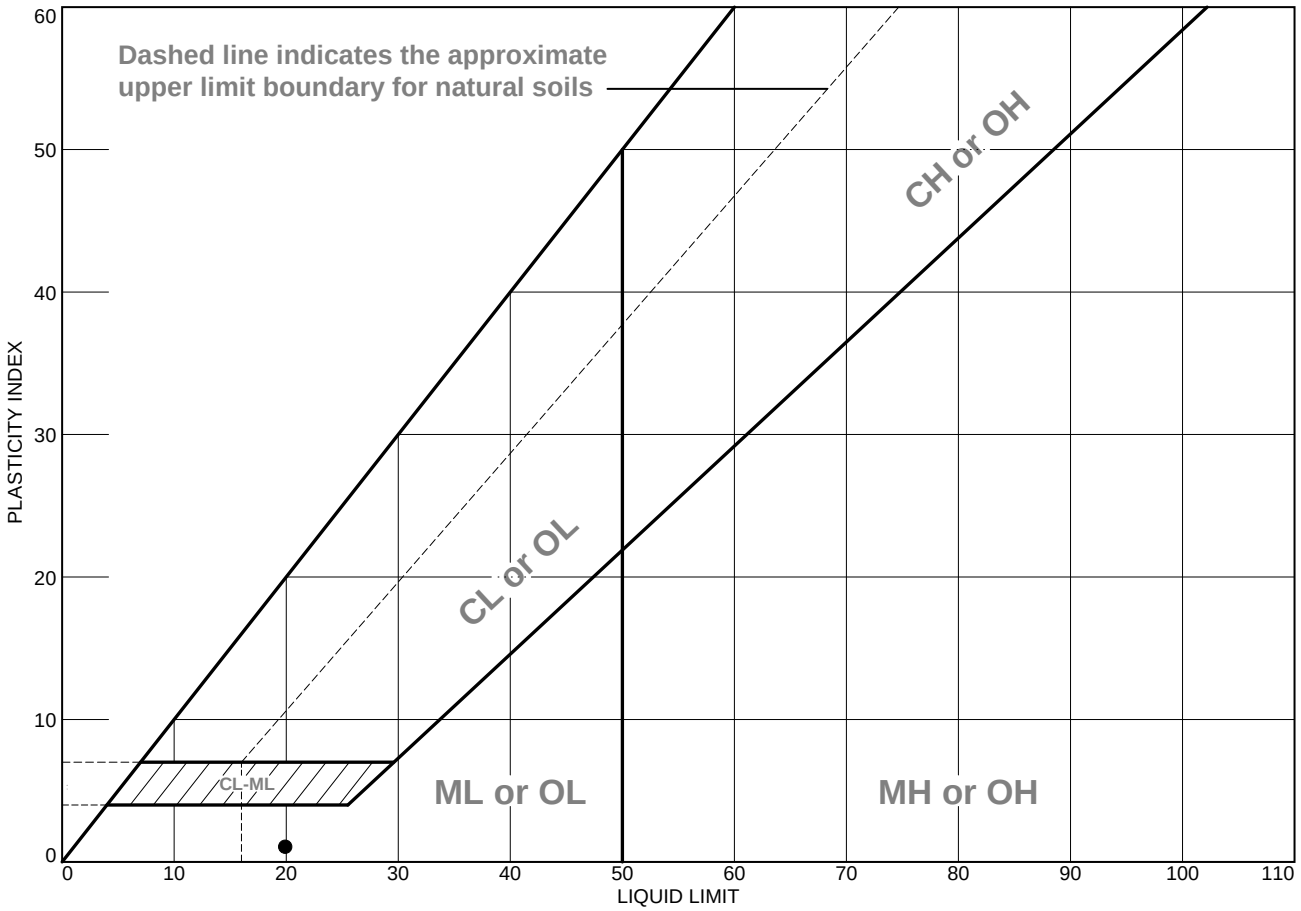
Remarks:

●PI: ASTM D4318, Wet method
GS: ASTM D1140, Method B

ENGEO INCORPORATED

Tested By: M. Bromfield **Checked By:** G. Criste

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	20	19	1		38.6	

Project No. 13667.000.002 **Client:** Google Incorporated

Project: YouTube Campus Phase 1

●**Depth:** 50.0-51.5 feet **Sample Number:** 3-B3 @ 50-51.5

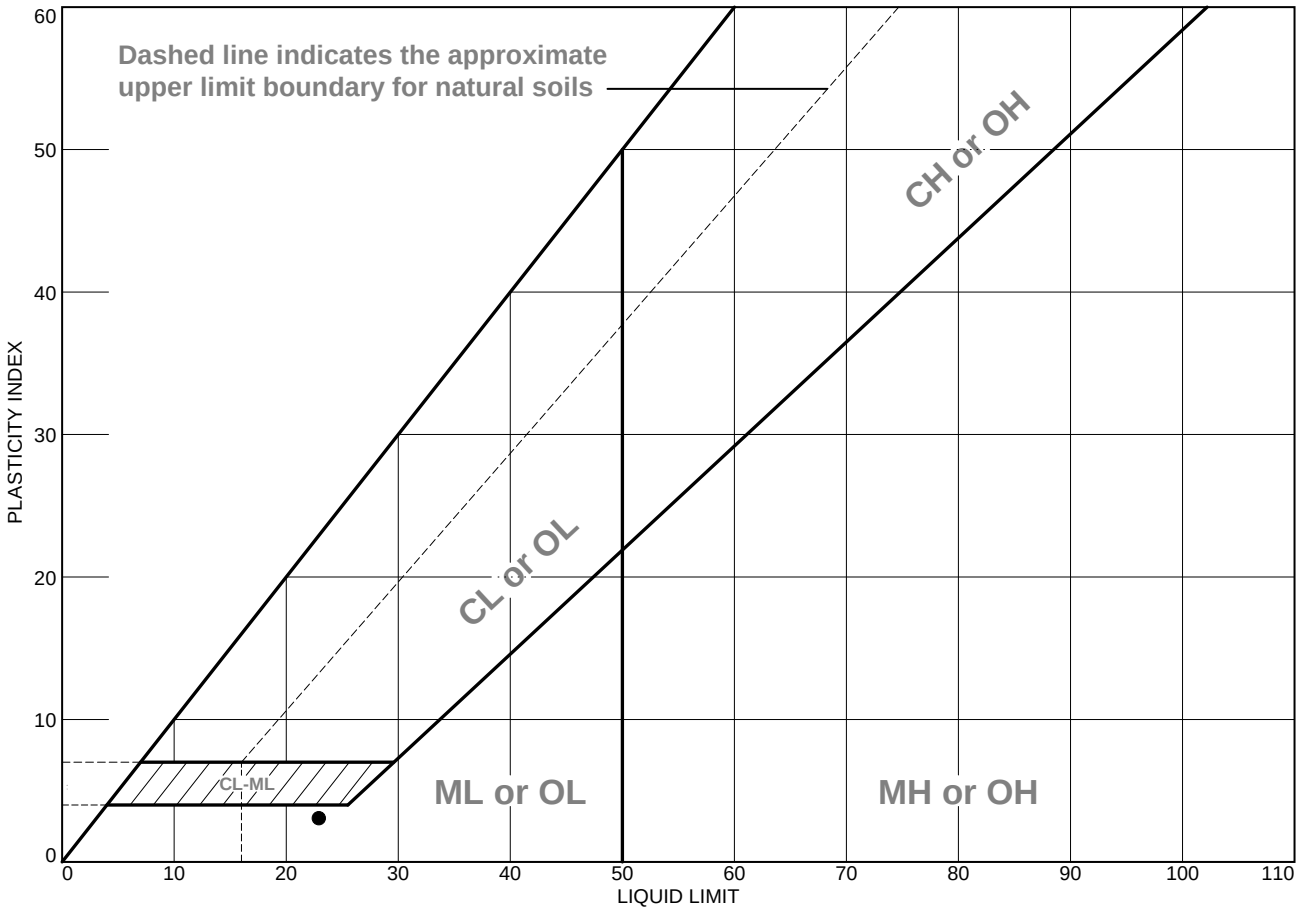
Remarks:

●PI: ASTM D4318, Wet method
GS: ASTM D1140, Method B

ENGEO INCORPORATED

Tested By: M. Bromfield **Checked By:** G. Criste

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	23	20	3		21.7	

Project No. 13667.000.002 **Client:** Google Incorporated

Project: YouTube Campus Phase 1

●**Depth:** 30.0-31.5 feet **Sample Number:** 3-B4 @ 30-31.5

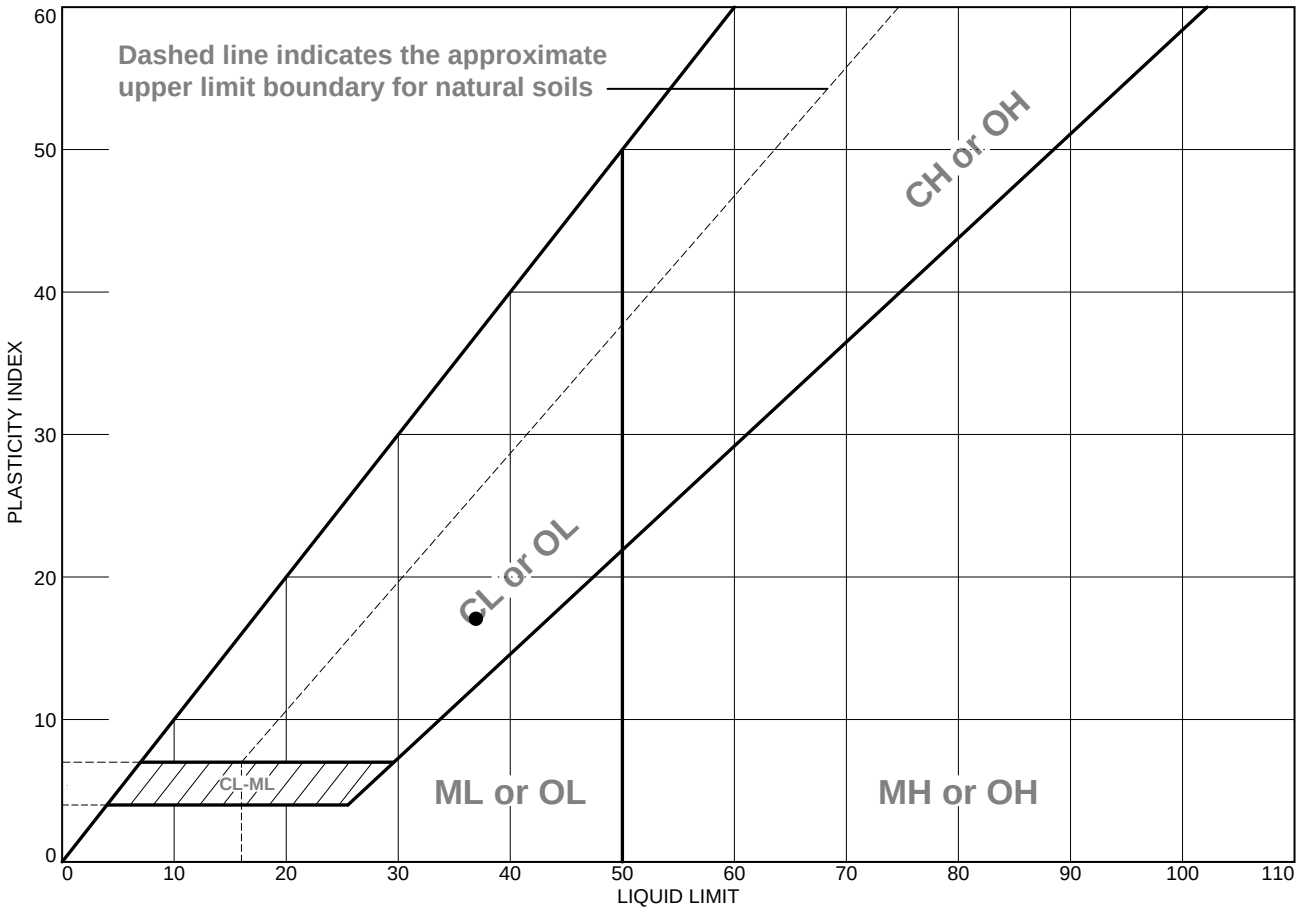
Remarks:

●PI: ASTM D4318, Wet method
GS: ASTM D1140, Method B

ENGEO INCORPORATED

Tested By: M. Quasem **Checked By:** G. Criste

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	37	20	17			

Project No. 13667.000.002 **Client:** Google Incorporated

Project: YouTube Campus Phase 1

●**Depth:** 70.5-71.5 feet **Sample Number:** 3-B6 @ 70.5-71.5

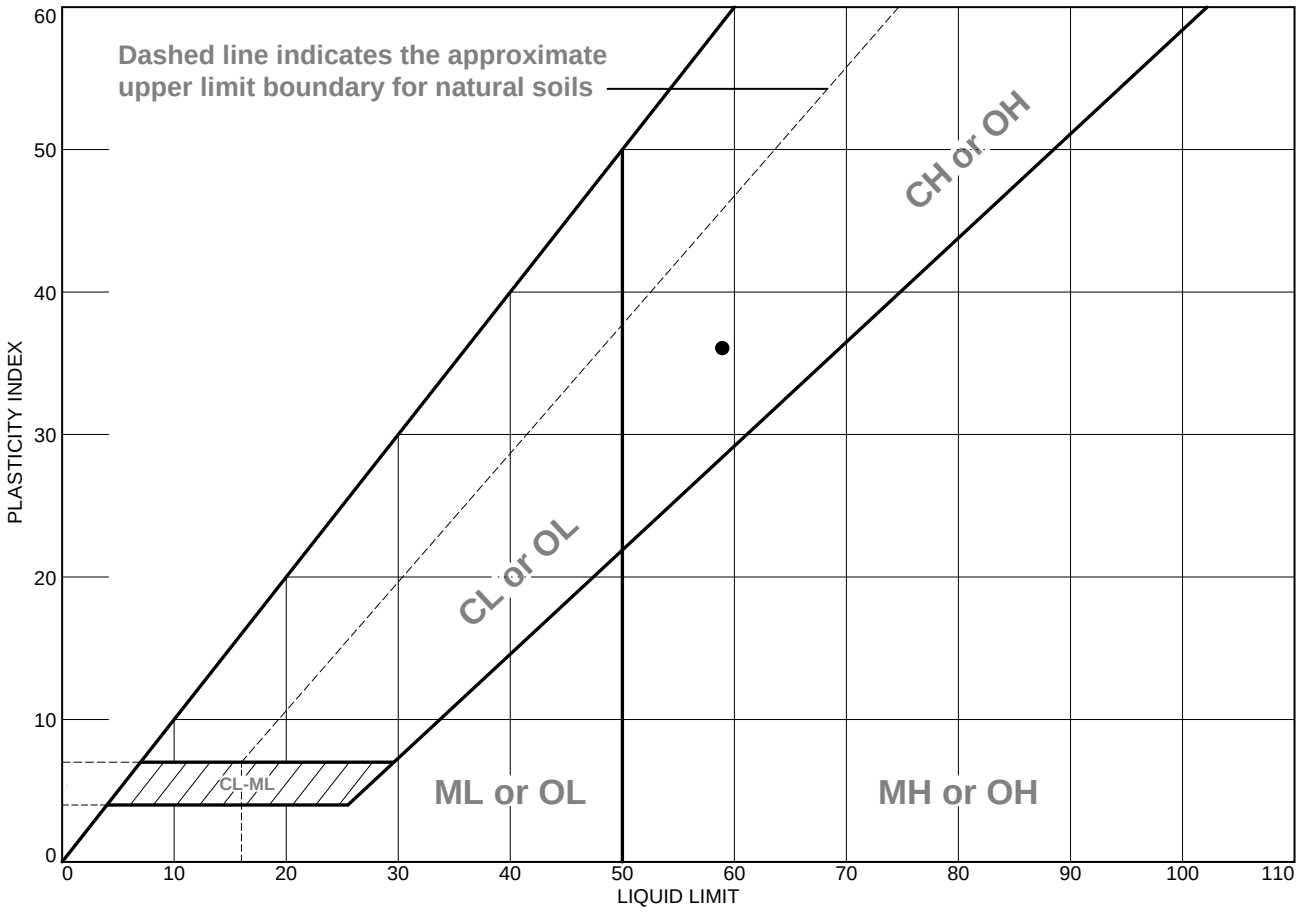
Remarks:

●ASTM D4318, Wet method

ENGEO INCORPORATED

Tested By: M. Quasem **Checked By:** G. Criste

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	59	23	36			

Project No. 13667.000.002 **Client:** Google Incorporated

Project: YouTube Campus Phase 1

●**Depth:** 94.0 feet **Sample Number:** 3-B6 @ 94

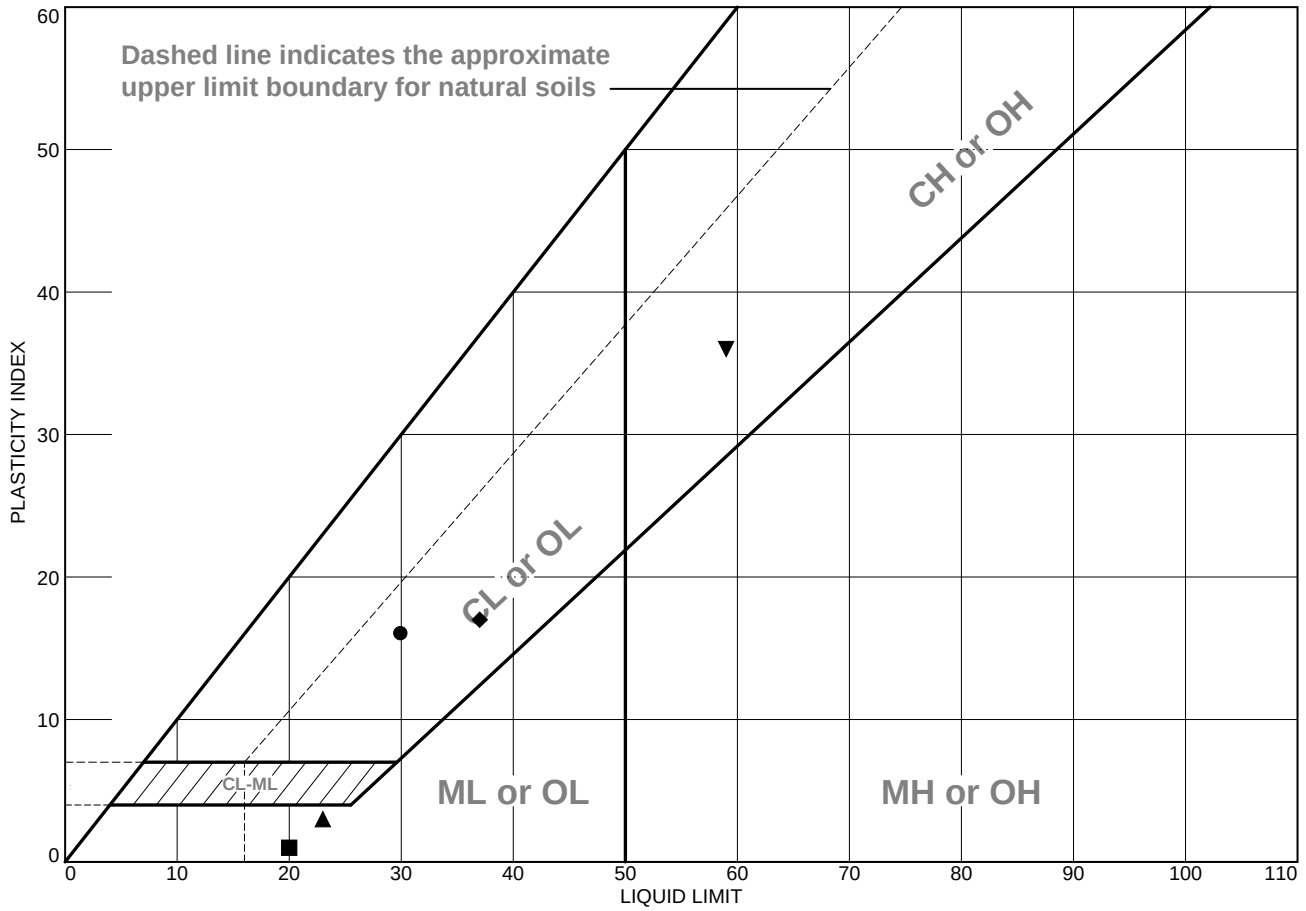
Remarks:

●ASTM D4318, Wet method

ENGEO INCORPORATED

Tested By: M. Quasem **Checked By:** G. Criste

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	30	14	16		43.9	
■	See exploration logs	20	19	1		38.6	
▲	See exploration logs	23	20	3		21.7	
◆	See exploration logs	37	20	17			
▼	See exploration logs	59	23	36			

Project No. 13667.000.002 **Client:** Google Incorporated

Project: YouTube Campus Phase 1

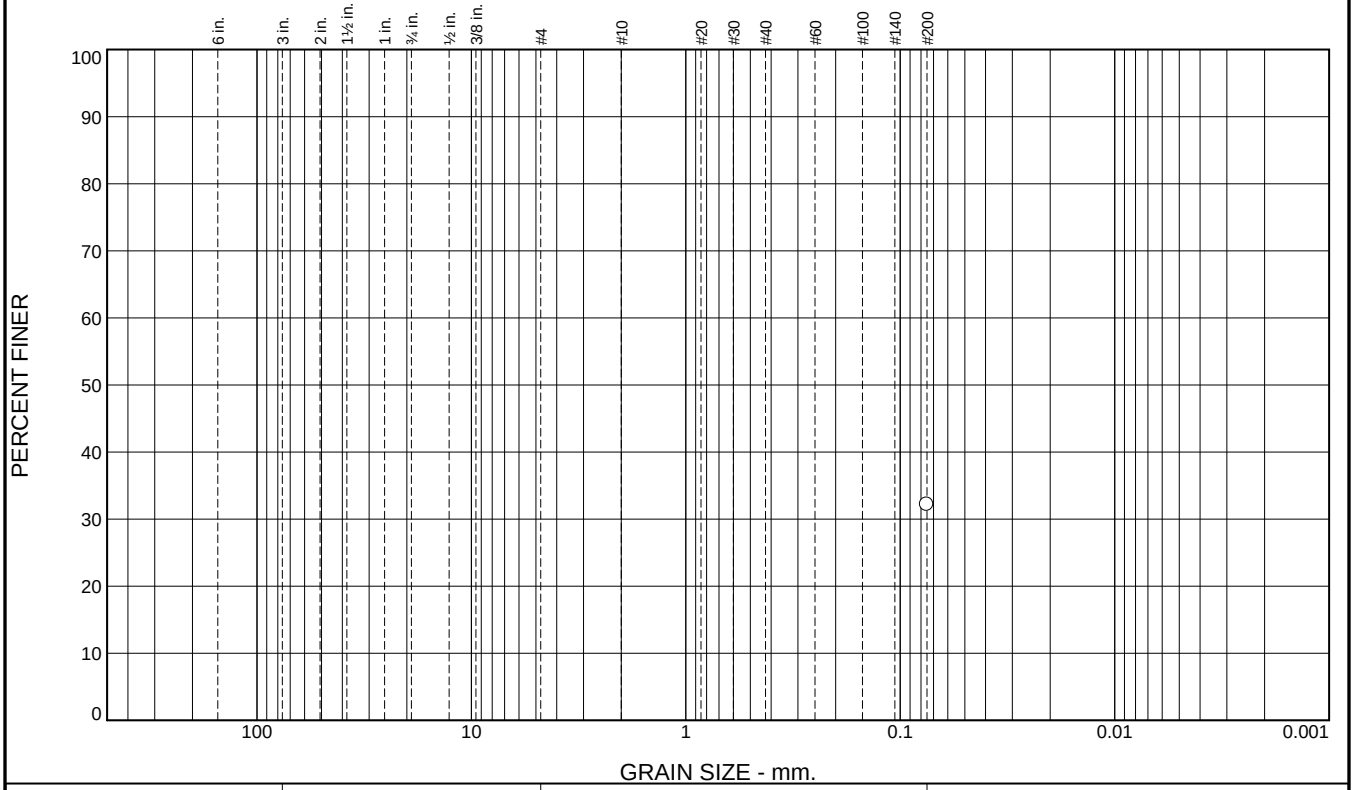
●**Depth:** 60.0-61.5 feet **Sample Number:** 3-B2 @ 60-61.5
■**Depth:** 50.0-51.5 feet **Sample Number:** 3-B3 @ 50-51.5
▲**Depth:** 30.0-31.5 feet **Sample Number:** 3-B4 @ 30-31.5
◆**Depth:** 70.5-71.5 feet **Sample Number:** 3-B6 @ 70.5-71.5
▼**Depth:** 94.0 feet **Sample Number:** 3-B6 @ 94

ENGEO INCORPORATED

Remarks:
●PI: ASTM D4318, Wet method
GS: ASTM D1140, Method B
■PI: ASTM D4318, Wet method
GS: ASTM D1140, Method B
▲PI: ASTM D4318, Wet method
GS: ASTM D1140, Method B
◆ASTM D4318, Wet method
▼ASTM D4318, Wet method

Tested By: ○ M. Bromfield □ M. Bromfield △ M. Quasem ◇ M. Quasem ▽ M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						32.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	32.2		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method B
Samples size: 514.0g; Soak time: 2hrs

Sample Number: 3-B1 @ 40.75 **Depth:** 40.75 feet

Date: 10/04/18

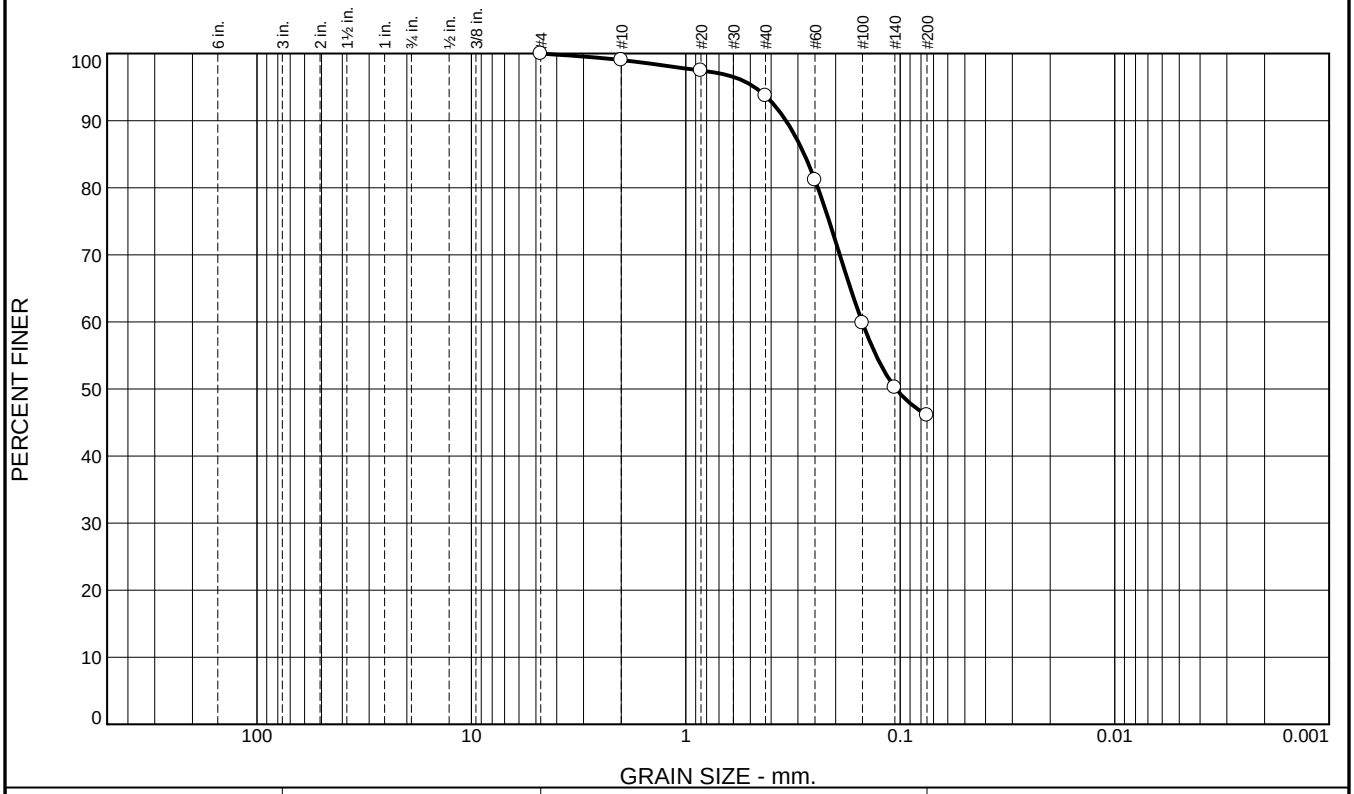
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	1.0	5.3	47.6	46.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.0		
#20	97.5		
#40	93.7		
#60	81.2		
#100	59.8		
#140	50.2		
#200	46.1		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3410 D_{85}= 0.2805 D_{60}= 0.1507
D_{50}= 0.1047 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ASTM D6913, Method B

Sample Number: 3-B1 @ 55-56 **Depth:** 55.0-56.0 feet

Date: 10/10/2018

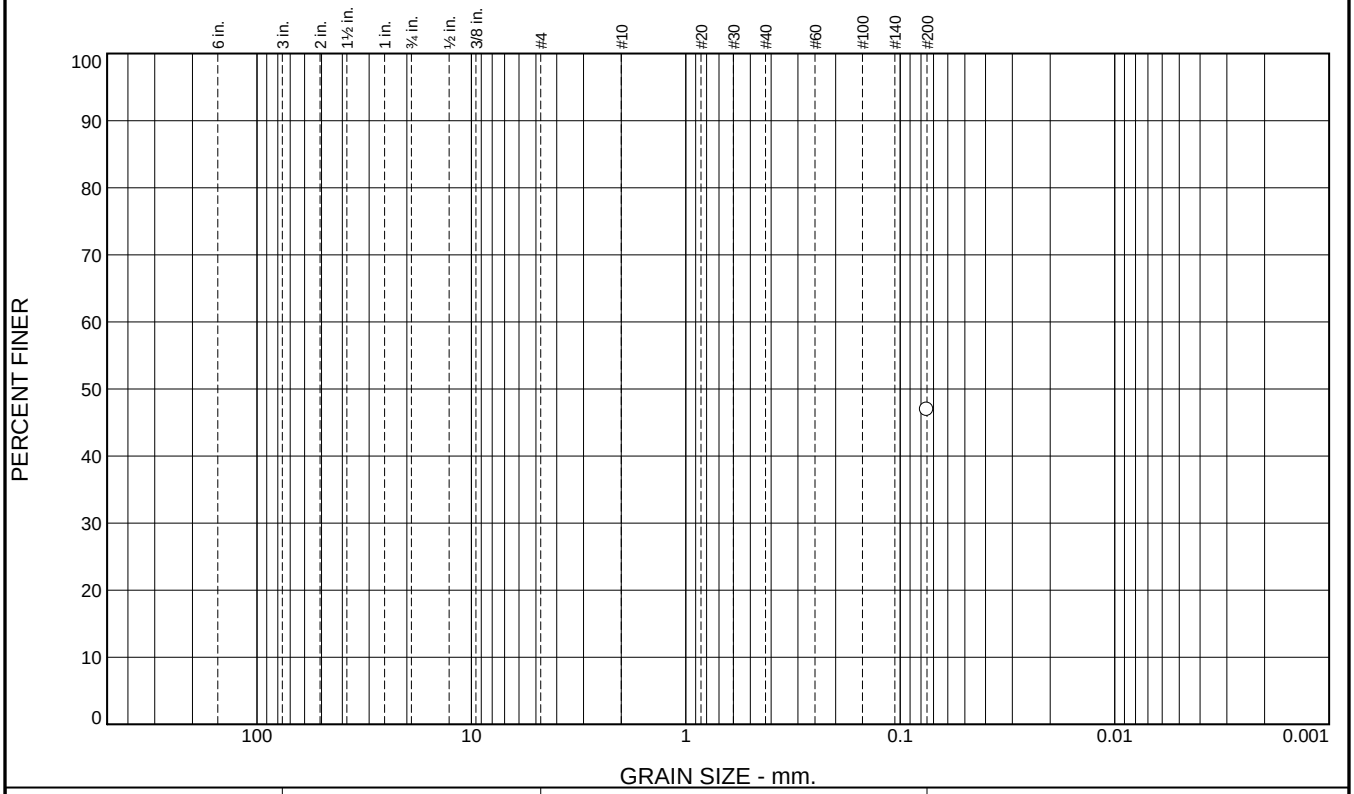
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Bromfield **Checked By:** M. Quasem

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						46.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	46.9		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method B
Samples size: 418.2g; Soak time: 2hrs

Sample Number: 3-B2 @ 10-11.5 **Depth:** 10.0-11.5 feet

Date: 10/04/18

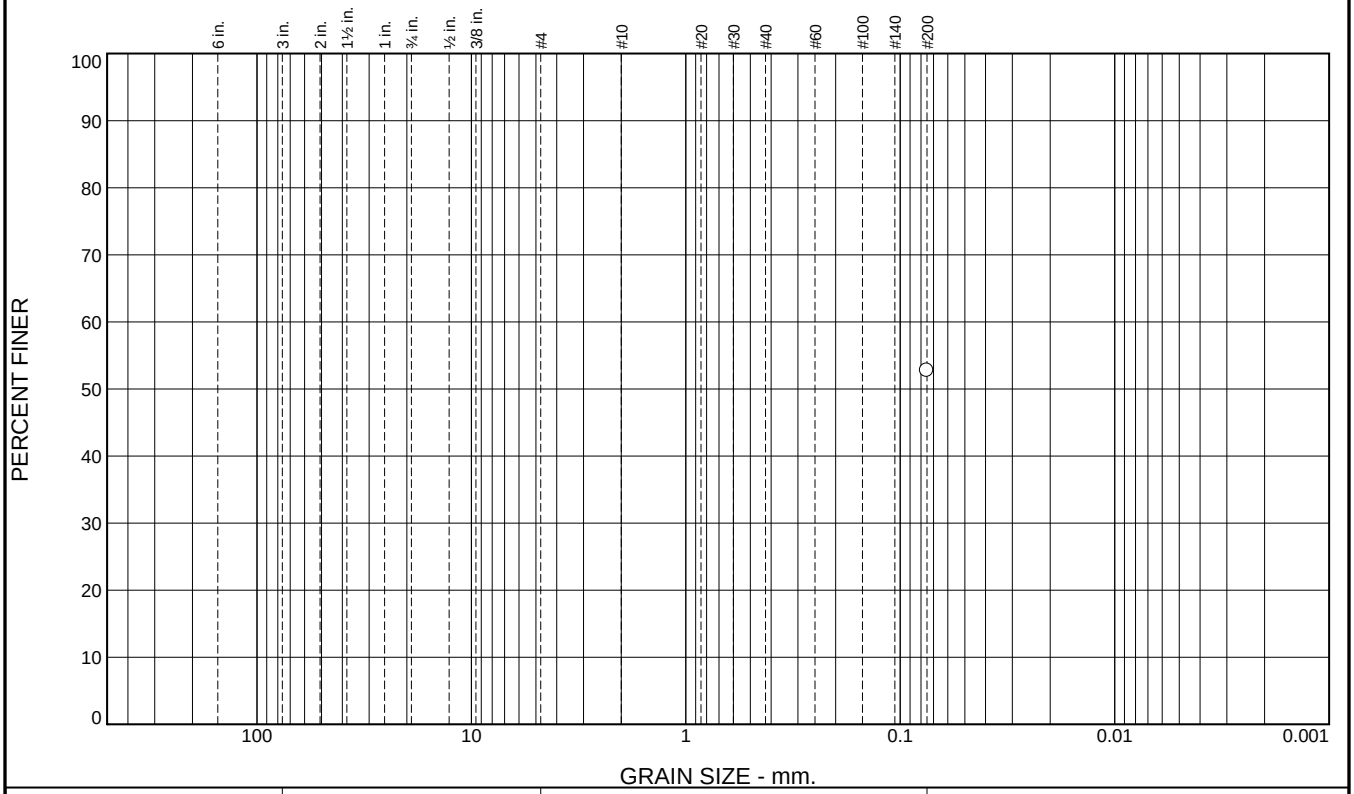
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						52.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	52.7		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method B
Sample size: 296.2g; Soak time: 2hrs

Sample Number: 3-B2 @ 20-21.5 **Depth:** 20.0-21.5 feet

Date: 10/04/18

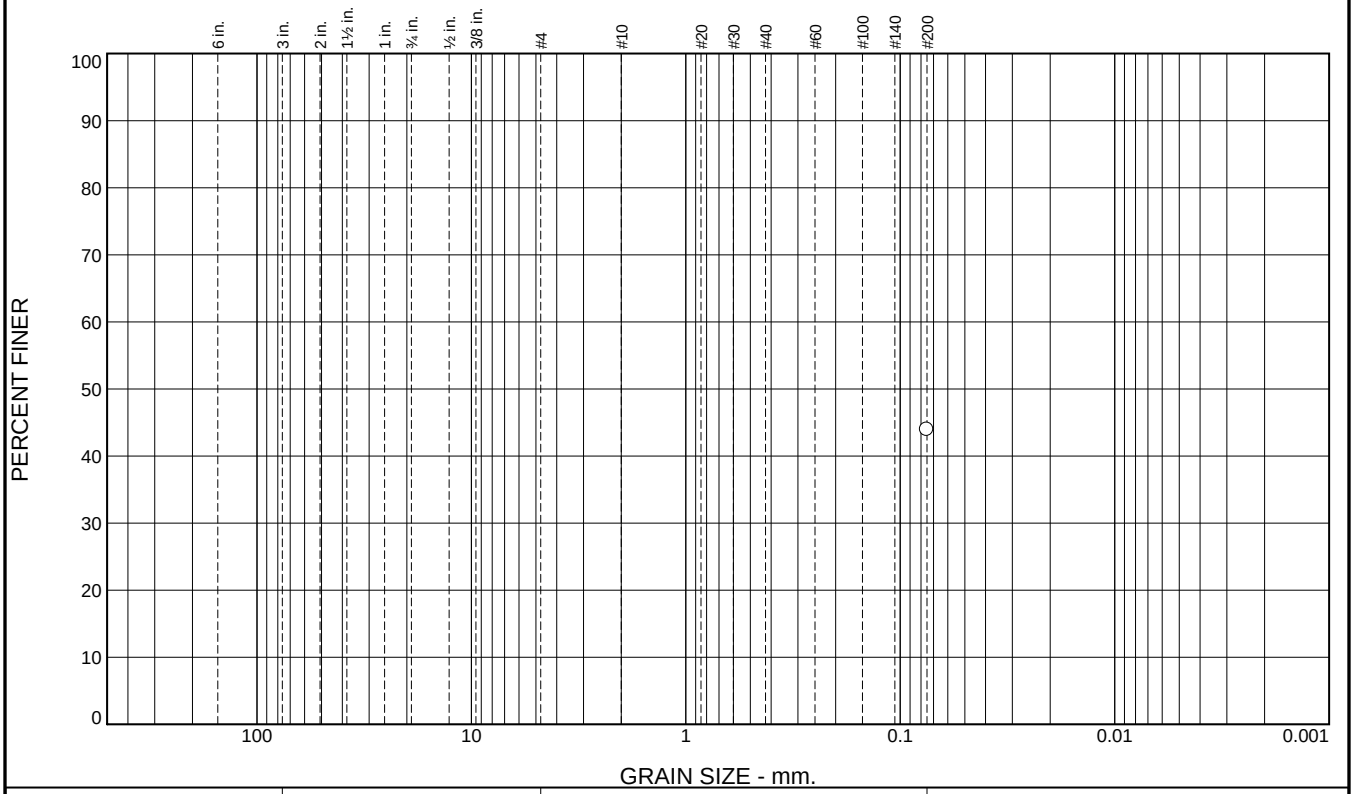
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						43.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	43.9		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= 14 LL= 30 PI= 16

Coefficients

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

Classification

USCS= AASHTO=

Remarks

GS: ASTM D1140, Method B
Sample size: 429.7g; Soak time: 2.5hrs
PI: ASTM D4318, Wet method

Sample Number: 3-B2 @ 60-61.5 **Depth:** 60.0-61.5 feet

Date: 10/04/18

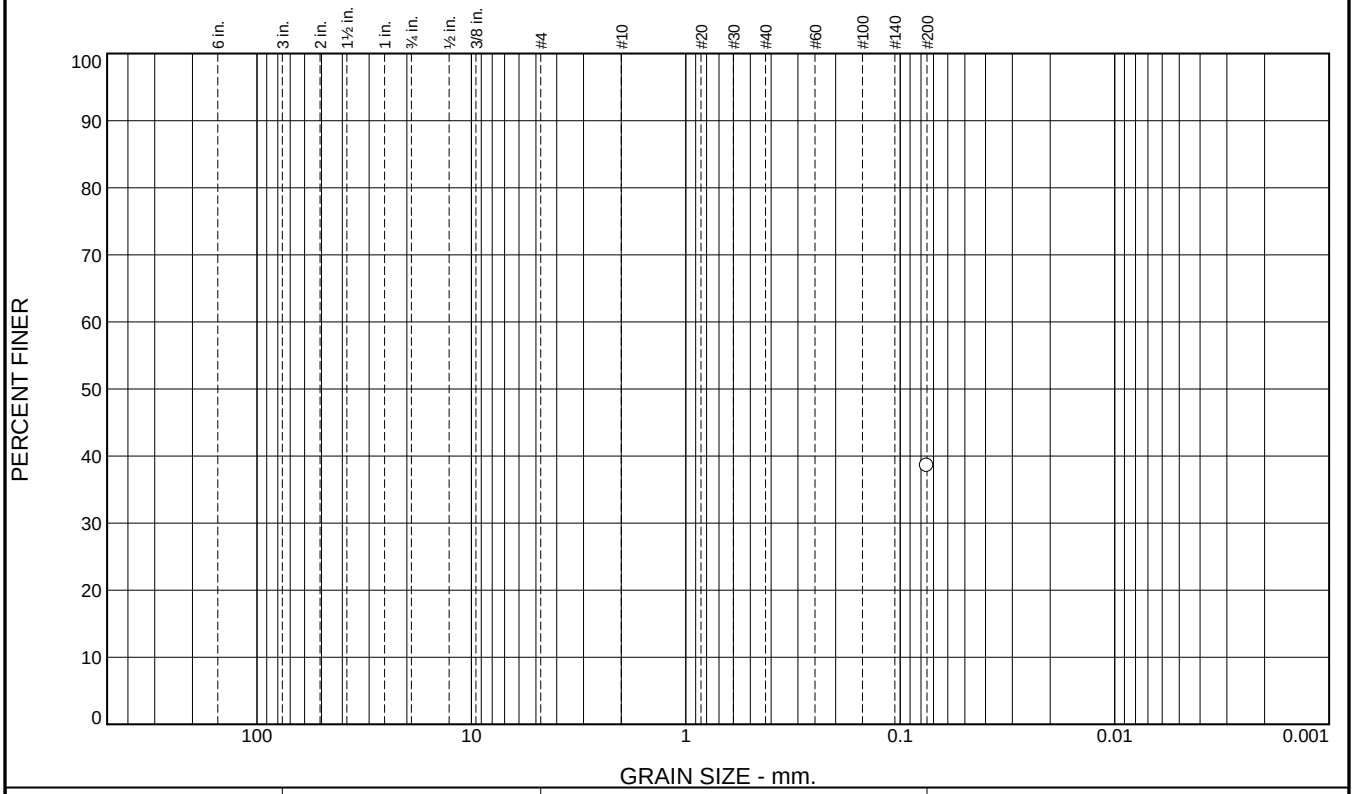
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						38.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	38.6		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= 19 LL= 20 PI= 1

Coefficients

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

Classification

USCS= AASHTO=

Remarks

GS: ASTM D1140, Method B
Sample size: 260.8g; Soak time 2.5hrs
PI: ASTM D4318, Wet method

Sample Number: 3-B3 @ 50-51.5 **Depth:** 50.0-51.5 feet

Date: 10/04/18

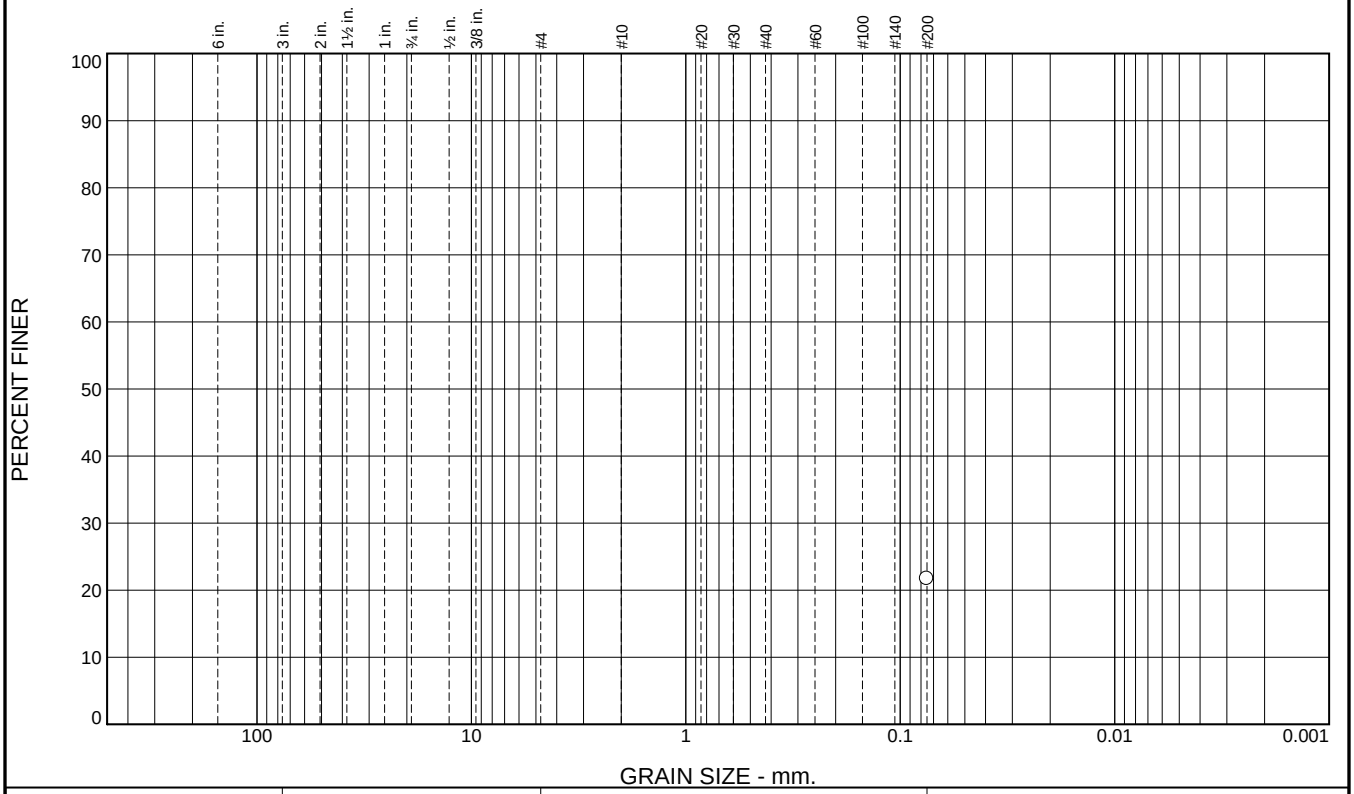
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						21.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	21.7		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= 20 LL= 23 PI= 3

Coefficients

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

Classification

USCS= AASHTO=

Remarks

GS: ASTM D1140, Method B
Sample size: 116.9g; Soak time: 2hrs
PI: ASTM D4318, Wet method

Sample Number: 3-B4 @ 30-31.5 **Depth:** 30.0-31.5 feet

Date: 10/04/18

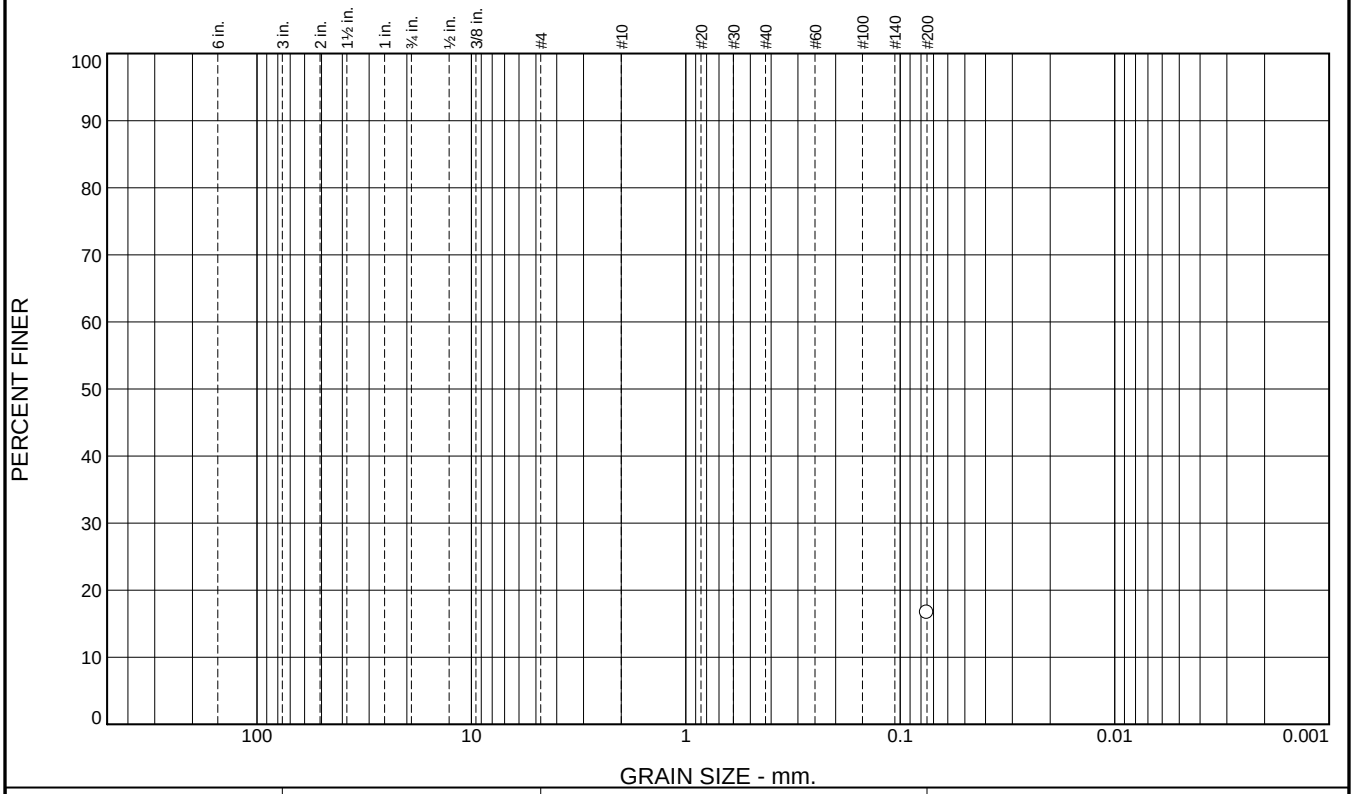
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						16.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	16.7		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method A
Sample size: 396.4g; Soak time: 1hr

Sample Number: 3-B4 @ 50-51.5 **Depth:** 50.0-51.5 feet

Date: 10/04/18

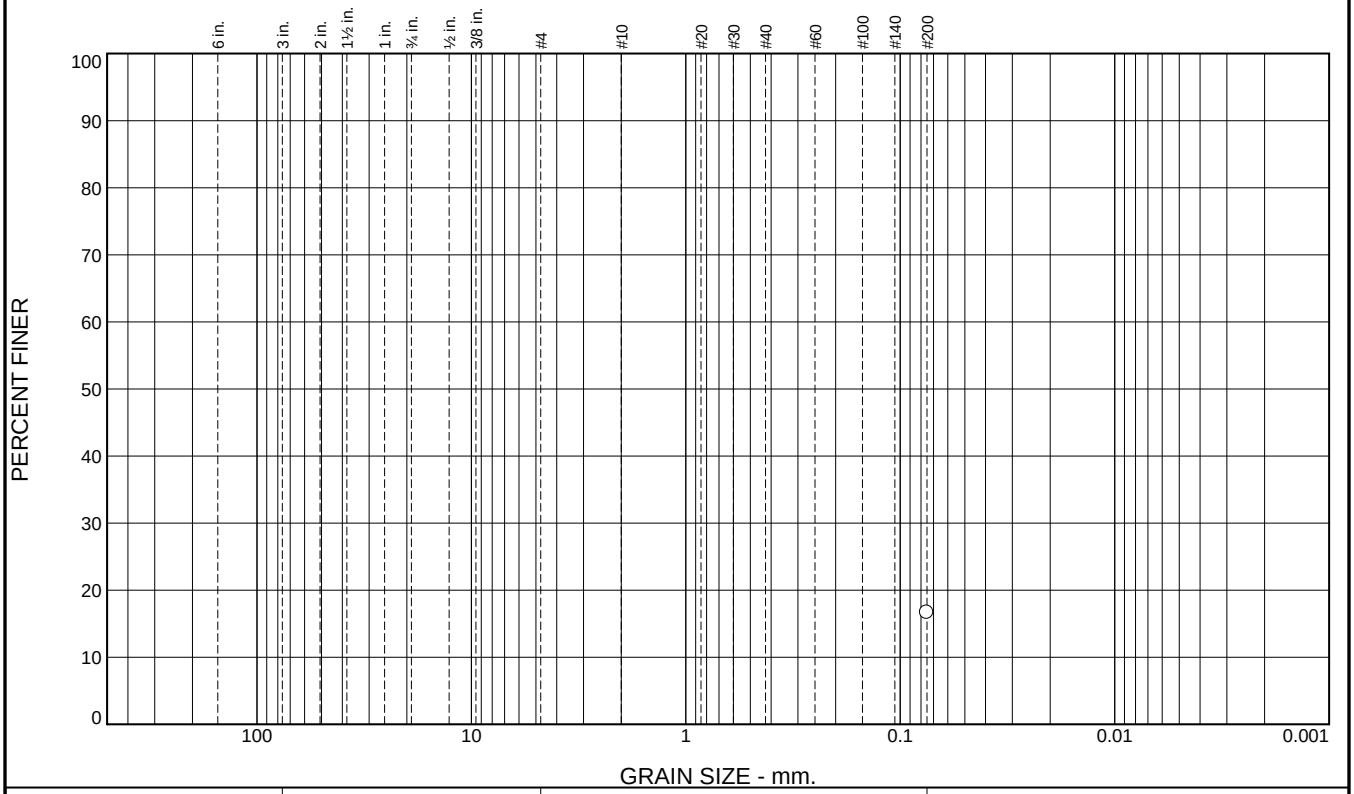
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						16.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	16.7		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method B
Sample size: 287.7g; Soak time: 2.5hrs

Sample Number: 3-B4 @ 65-66.5 **Depth:** 65-66.5 feet

Date: 10/04/18

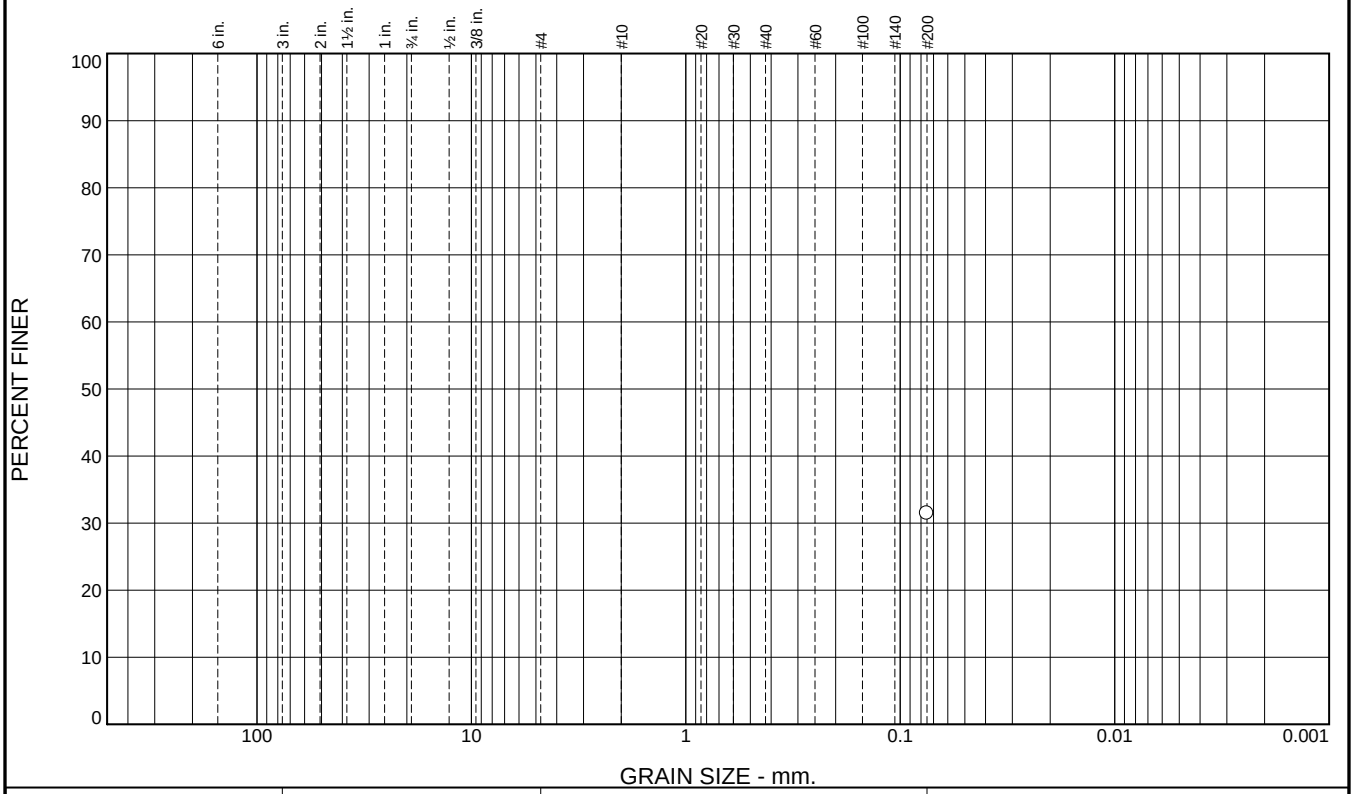
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						31.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	31.4		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method B
Sample size: 235.3g; Soak time: 3hrs

Sample Number: 3-B5 @ 70-71.5 **Depth:** 70.0-71.5 feet

Date: 10/04/18

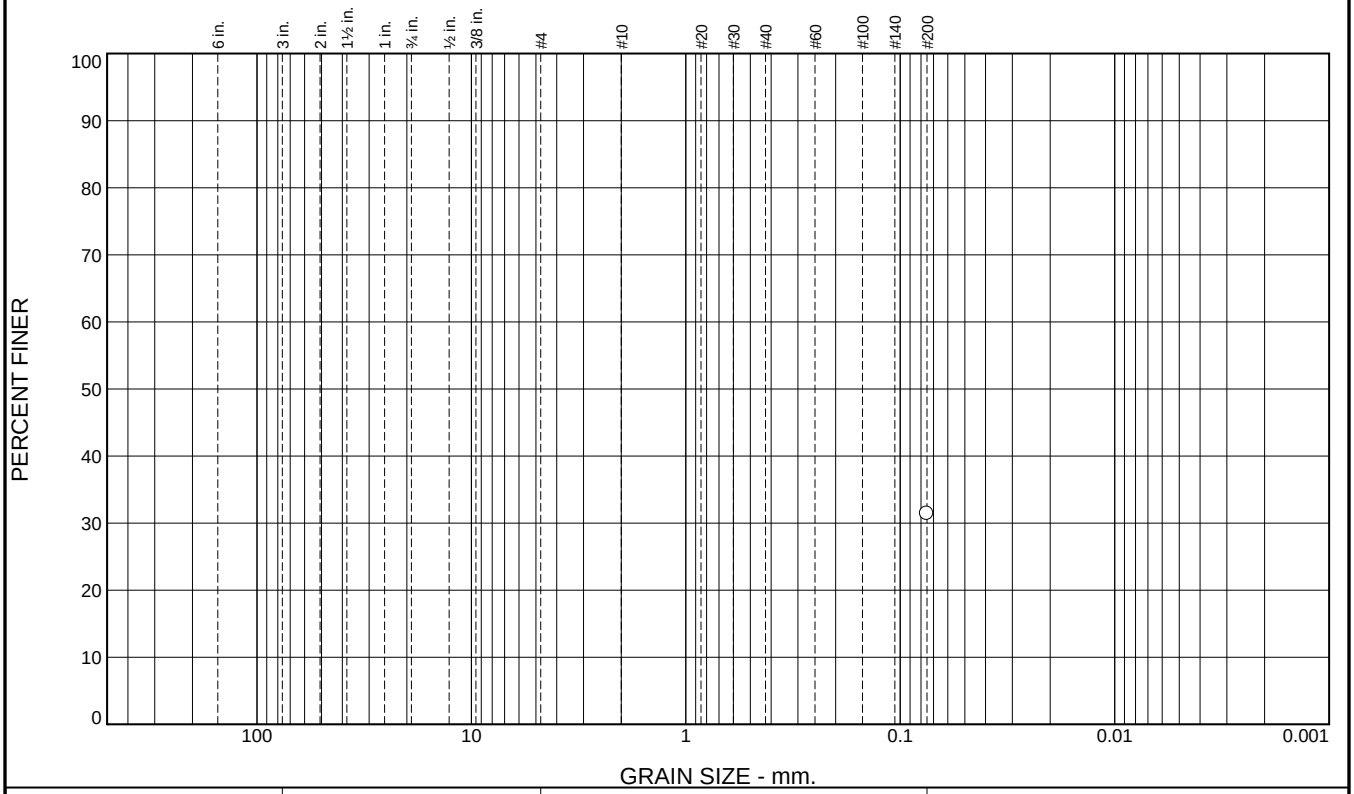
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						31.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	31.4		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method B
Sample size: 394.0g; Soak time: 3hrs

Sample Number: 3-B6 @ 30-31.5 **Depth:** 30.0-31.5 feet

Date: 10/04/18

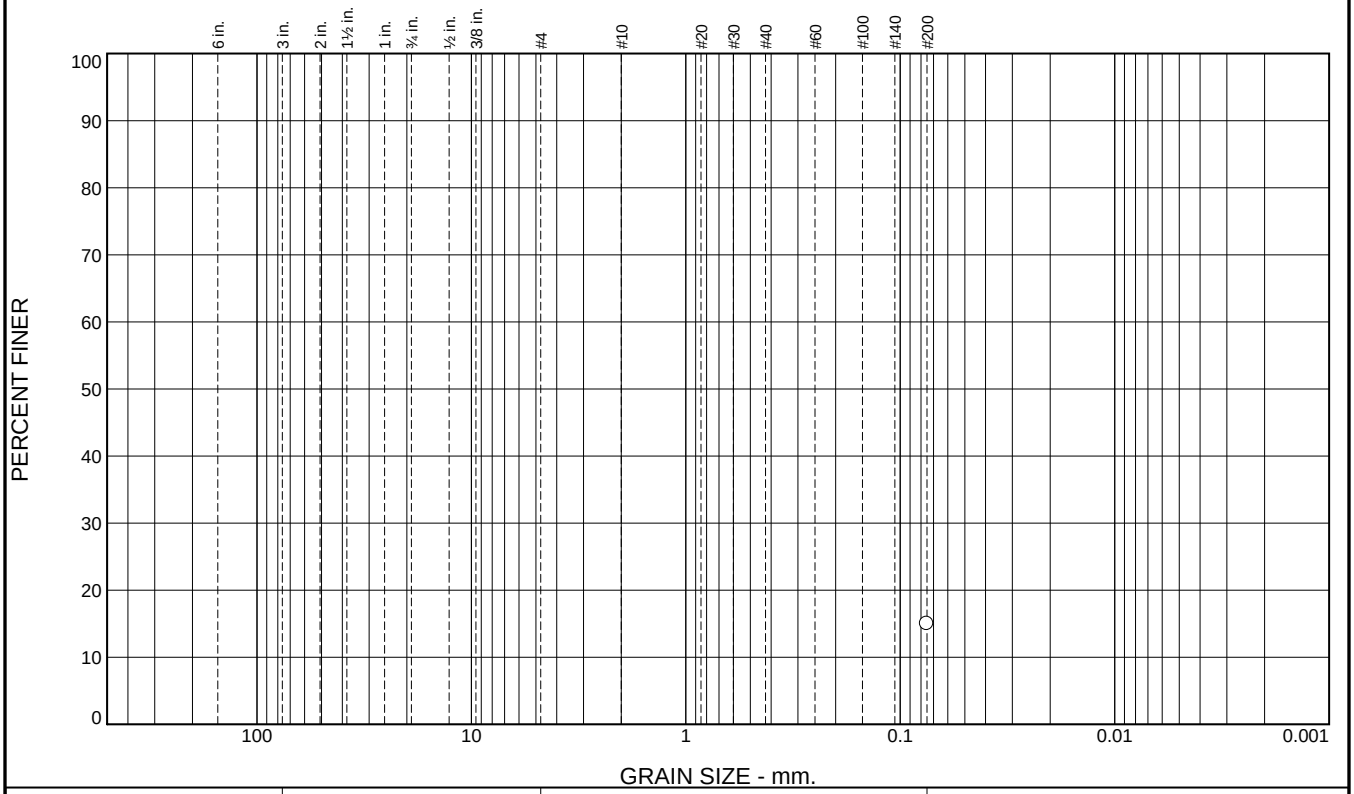
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						15.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	15.0		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method A
Sample size: 490.5g; Soak time: 2hrs

Sample Number: 3-B6 @ 55-56.5 **Depth:** 55.0-56.5 feet

Date: 10/04/18

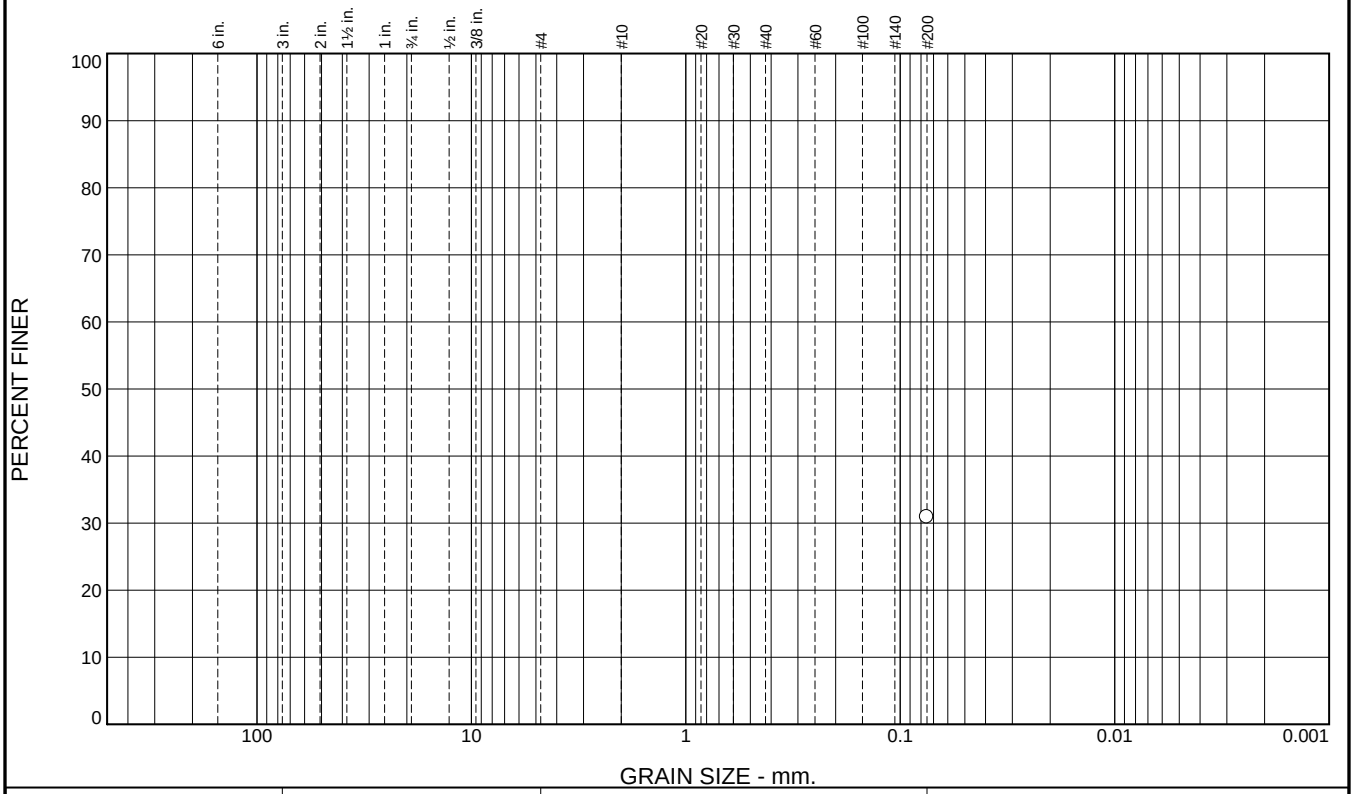
ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						30.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	30.9		

* (no specification provided)

Material Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140, Method B
Sample size: 411.7g; Soak time: 3hrs

Sample Number: 3-B6 @ 79 **Depth:** 79.0 feet

Date: 10/04/18

ENGEO INCORPORATED

Client: Google Incorporated
Project: YouTube Campus Phase 1

Project No: 13667.000.002

Tested By: M. Quasem **Checked By:** G. Criste

EN GEO

Unconsolidated Undrained Triaxial Test (ASTM D2850)

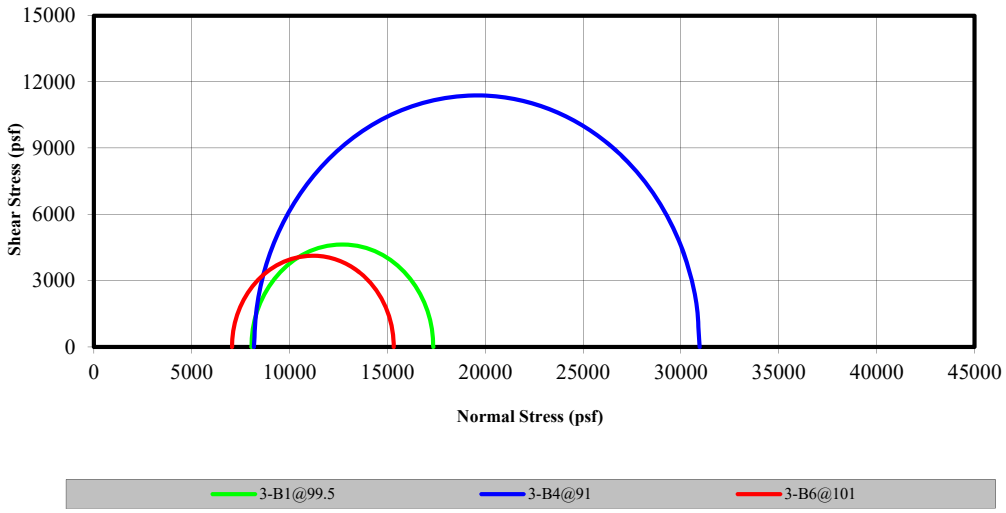
Date: 10/05/18

Checked by: G. Criste

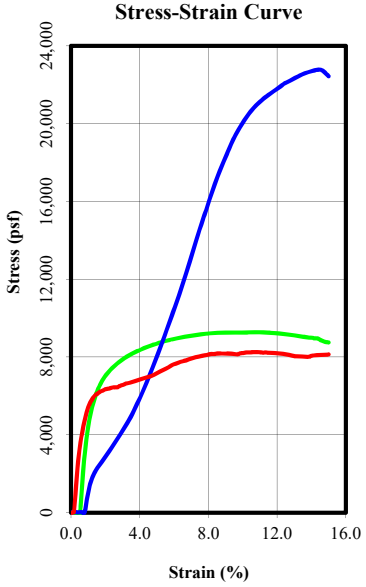
Date: 10/05/18

Tested by: M. Bromfield

Mohr Circles



Stress-Strain Curve

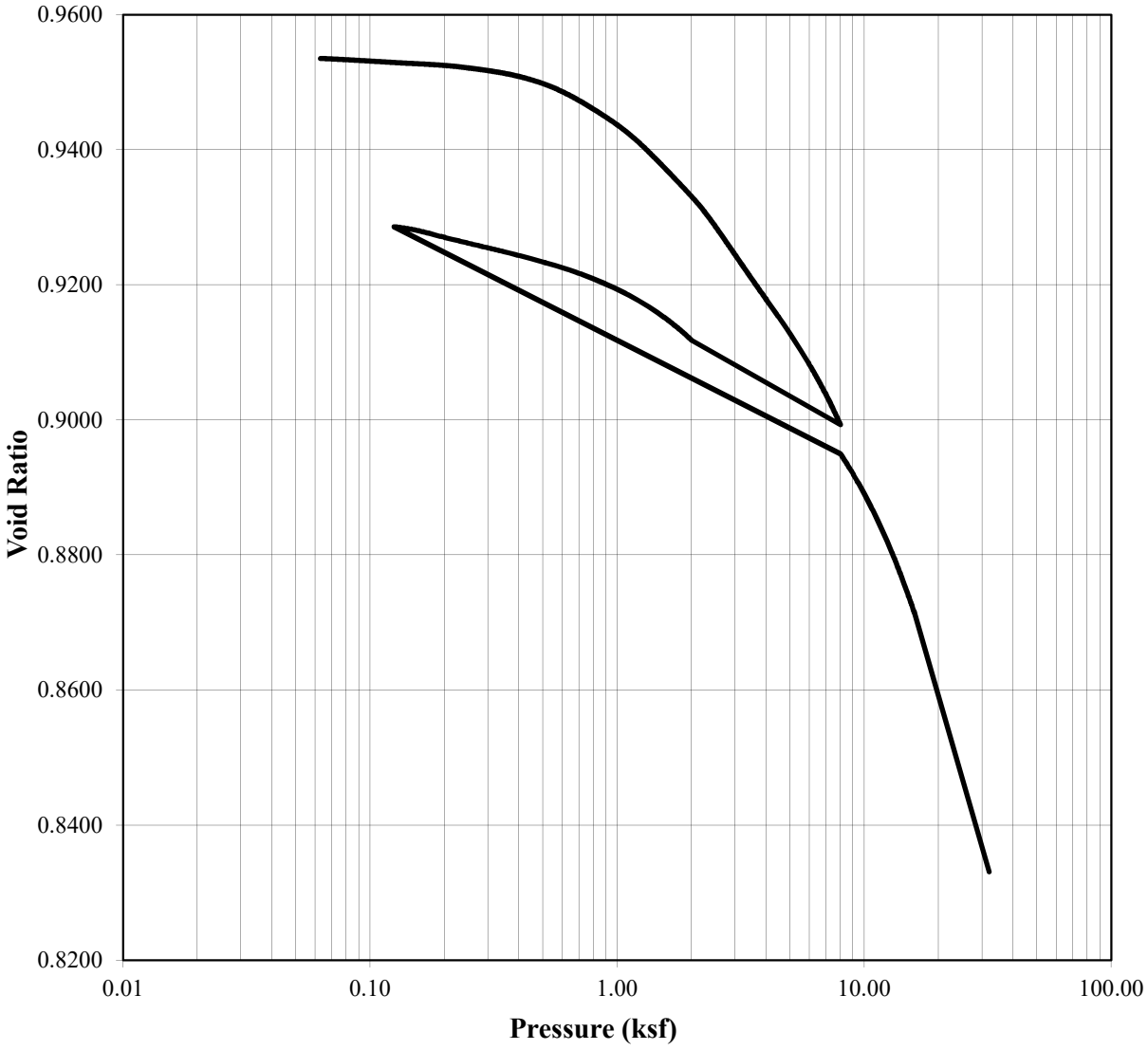


Before Test	Specimen 3-B1@99.5	3-B4@91	3-B6@101	
Water Content (%)	37.90	19.35	34.02	
Dry Density (pcf)	81.33	108.95	86.53	
Saturation (%)	97.13	98.91	98.87	
Void Ratio	1.03	0.52	0.91	
Diameter (in)	2.407	2.397	2.402	
Height (in)	5.888	5.253	6.027	
Liquid Limit	-	-	-	
Plastic Limit	-	-	-	
Specific Gravity	2.650	2.650	2.650	
Height-to-Diameter Ratio	2.446	2.191	2.509	
After Test	**3-B1@99.5**	**3-B4@91**	**3-B6@101**	
Water Content (%)	37.90	19.35	34.02	
Saturation (%)	97.13	98.91	98.87	
Strain Rate (in/min)	0.05	0.05	0.05	
Peak Deviator Stress (psf)	9287.7	22773.2	8265.1	
Axial Strain @ Failure (%)	10.768	14.563	10.868	
	Cell Pressure			
Cell (psf)	8049.6	8179.2	7056.0	
Back (psf)	n/a	n/a	n/a	
	Principle Stresses at Failure			
σ1 (psf)	17337.3	30952.4	15321.1	
σ3 (psf)	8049.6	8179.2	7056.0	

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)			Cohesion at Failure with a Zero Friction Angle (Ø=0)			
Cohesion, c (psf)	0.0		4643.8	11386.6	4132.5	
Friction Angle Ø	0.00		n/a	n/a	n/a	

Project Information			
Project Name:	YouTube Campus Phase 1		
Project Number:	13667.000.002	Job Number:	13667.000.002
Location:	San Bruno, CA	Boring Number:	Multiple
Client:	Google Incorporated	Sample Number:	Multiple
Description:	See exploration logs		

Incremental Consolidation
ASTM D2435 - Method B

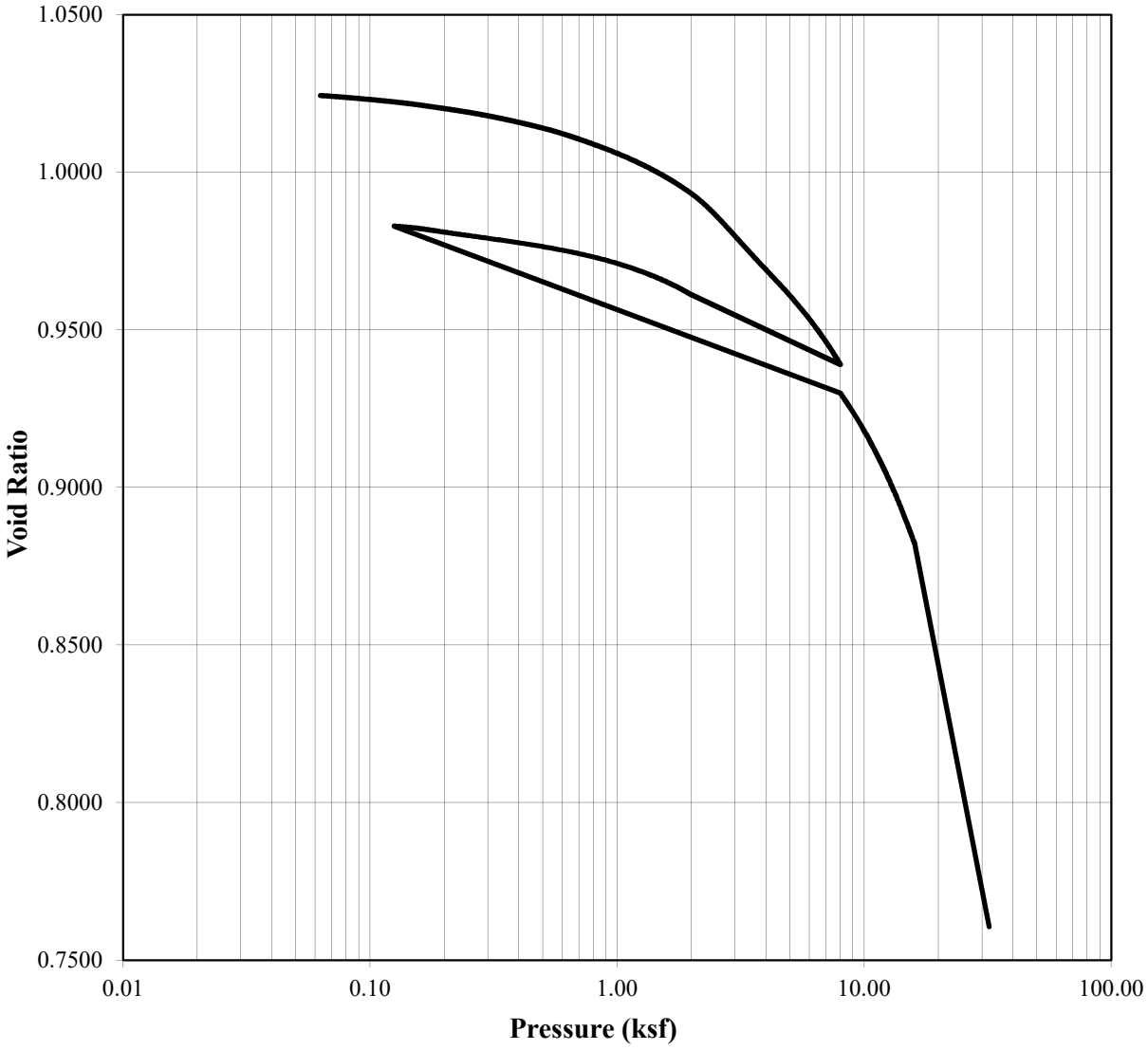


	Before	After	ASTM D4318 - Wet Method		Test Date: 10/12/2018
Moisture (%):	35.68	35.35	**Liquid Limit:**	n/a	
Dry Density (pcf):	82.09	84.13	**Plastic Limit:**	n/a	
Saturation (%):	95.93	99.99	**ASTM D854 - Measured**		
Void Ratio:	0.9503	0.8297	**Specific Gravity:**	2.574	
Soil Description:	See exploration logs		**Remarks:**		

Project Number:	13667.000.002	**Depth:**	80.5 feet
Sample Number:	3-B4@80.5	**Boring #:**	3-B4
Project Name:	YouTube Campus Phase 1		
Client:	Google Incorporated		
Location:	Sunnyvale, California		
Tested By: G. Criste	**Checked By:** K. Lecce		

ENGEO
Expect Excellence

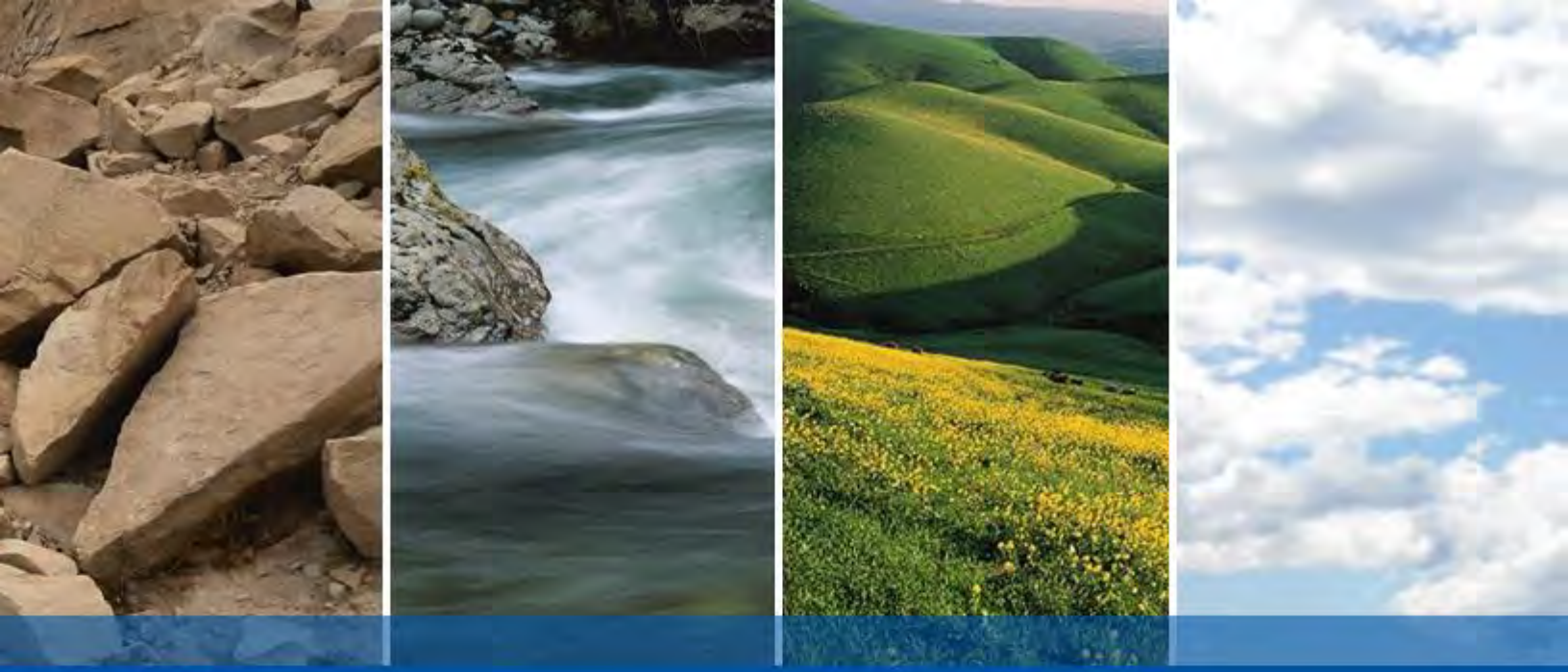
Incremental Consolidation
ASTM D2435 - Method B



	Before	After	ASTM D4318 - Wet Method		Test Date: 10/12/2018
Moisture (%):	29.48	26.80	**Liquid Limit:**	n/a	
Dry Density (pcf):	79.95	95.66	**Plastic Limit:**	n/a	
Saturation (%):	74.40	100.00	**ASTM D854 - Measured**		
Void Ratio:	1.0260	0.7602	**Specific Gravity:**	2.600	
Soil Description:	See exploration logs		**Remarks:** Interbedded fine sand layers		

Project Number:	13667.000.002	**Depth:**	94.0 feet
Sample Number:	3-B6@94	**Boring #:**	3-B6
Project Name:	YouTube Campus Phase 1		
Client:	Google Incorporated		
Location:	Sunnyvale, California		
Tested By: G. Criste	**Checked By:** K. Lecce		

ENGEO
Expect Excellence



APPENDIX C

PREVIOUS EXPLORATION LOGS

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4 "	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Dames and Moore Piston
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

- ———— Solid - Layer Break
- – – – – – Dashed - Gradational or approximate layer break

GROUND-WATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

ENGEO
Expect Excellence

LOG OF BORING 1-B01

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 1/25/2017
HOLE DEPTH: Approx. 50½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 114.17 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	114		CONCRETE Asphaltic concrete, 4.5"												
			AGGREGATE BASE (AB) 2"												
			SILTY SAND (SM), dark brown, organic odor, wood debris [FILL]												
			SILTY SAND (SM), yellowish brown, dense, moist, fine- to coarse-grained sand, contains trace angular fine gravel [FILL]			37									
5	110		SILTY SAND (SM), light grayish brown, dense, moist, fine- to medium-grained sand, iron oxide staining, contains clay, trace fine gravel [COLMA FORMATION]			39									
			Reddish brown, less fines												
10	105		Yellowish brown, very dense, fine-grained sand			68				17					
15	100		Light grayish brown, cemented			97/10"									
20	95		More silt			88									
25	90		SANDY LEAN CLAY (CL), light grayish brown, hard, moist												
			POORLY GRADED SAND (SP), reddish brown, very dense, moist, fine- to medium-grained sand			50/6"								>4.5*	PP
30	85														

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B01

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 1/25/2017
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HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 114.17 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SANDY LEAN CLAY (CL), light grayish brown, very stiff to hard, moist, fine-grained sand			52				63			2500*	>4.5*	PP+TV
35	80														
			Mottled with reddish brown			82/10"								>4.5*	PP
40	75		POORLY GRADED SAND WITH SILT (SP-SM), reddish brown, very dense, moist, fine-grained sand												
45	70														
			POORLY GRADED SAND (SP), reddish brown, very dense, moist, fine- to medium-grained sand												
50	65					50/6"									
			Boring terminated at a depth of 50 1/2 feet below ground surface. Depth to groundwater was not measured due to drilling method.												

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B02

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 1/26/2017
HOLE DEPTH: Approx. 52½ ft.
HOLE DIAMETER: 5.0 in.
SURF ELEV (NAVD88): 108.2 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			CONCRETE Asphaltic concrete, 4"												
			AGGREGATE BASE (AB) 5"												
			SANDY SILT (ML), light yellowish brown, hard, moist, fine-grained sand [COLMA FORMATION]												
	105					54									
5						50									
			More clay												
	100														
			SANDY LEAN CLAY (CL), brown mottled with light grayish brown, hard, moist, fine-grained sand, iron oxide staining												
10						34									
	95		SILTY SAND (SM), light grayish brown mottled with orange, dense to very dense, moist, manganese staining												
15						71									
	90														
20			Very dense, more fines, cemented, contains clay			75									
	85														
25			SANDY SILT (ML), light grayish brown mottled with orange, hard, moist, fine-grained sand			74					15	102		0.47	UC
	80														
			SILTY SAND (SM), light grayish brown, dense to very dense, moist, fine-grained sand, manganese staining, cemented												
30															

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B02

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
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HOLE DIAMETER: 5.0 in.
SURF ELEV (NAVD88): 108.2 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SILTY SAND (SM), light grayish brown, dense to very dense, moist, fine-grained sand, manganese staining, cemented			49									
	75														
35			WELL GRADED SAND WITH SILT AND GRAVEL (SW), reddish brown mottled with light grayish brown, very dense, moist, fine- to coarse-grained sand, fine to coarse gravel, subrounded to rounded gravel, pockets of silt			50/4"									
	70														
40			Less gravel, some weathered rock fragments			85									
	65														
45															
	60														
50			SILTY CLAYEY SAND (SC-SM), light yellowish brown mottled with orange, medium dense to dense, fine-grained sand			31	23	19	4	45	16				
			Boring terminated at a depth of 52 1/2 feet below ground surface. Depth to groundwater was not measured due to drilling method.												

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B03

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 1/25/2017
HOLE DEPTH: Approx. 51½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 108.86 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			CONCRETE Asphaltic concrete, 1.5"												
			AGGREGATE BASE (AB) 5"												
			SILTY SAND (SM), reddish brown, loose, moist, fine- to medium-grained sand [FILL]												
	105														
5			Light gray mottled with reddish brown SANDY SILT (ML), dark brown, medium stiff, moist, fine-grained sand, organic odor, roots [FILL]			5									
			More sand, trace fine gravel SANDY LEAN CLAY (CL), reddish brown, medium stiff to stiff, moist, iron oxide staining [HOLOCENE ALLUVIUM]			14									
	100														
10			SILTY SAND (SM), light grayish brown, very dense, fine-grained sand, contains trace coarse-grained sand and fine gravel, cemented [COLMA FORMATION]			56									
	95														
15			Dense			41				34					
	90														
20			Very dense			51									
	85														
25			Less fines			50/5"									
	80														
30															

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B03

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
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DATE DRILLED: 1/25/2017
HOLE DEPTH: Approx. 51½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 108.86 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			POORLY GRADED SAND (SP), yellowish brown, very dense, moist, fine- to medium-grained sand, some fine gravel and coarse-grained sand, cemented			94/11"									
35	75														
			SILTY SAND (SM), light grayish brown, very dense, moist, fine- to medium-grained sand, some fine gravel and coarse-grained sand			87/11.5"				25					
40	70														
45	65														
50	60		Less gravel and coarse-grained sand			58									
			Boring terminated at a depth of 51 1/2 feet below ground surface. Depth to groundwater was not measured due to drilling method.												

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B04

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 1/26/2017
HOLE DEPTH: Approx. 51 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 105.1 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			CONCRETE Asphaltic concrete, 2.5"												
			AGGREGATE BASE (AB) 4"												
			SILTY SAND (SM), light yellowish brown mottled with reddish brown, medium dense, moist, fine- to medium-grained sand, some coarse-grained sand, trace fine gravel [FILL]			20									
5	100		SANDY SILT (ML), dark brown, medium stiff to stiff, moist, fine-grained sand, organic odor, contains trace organics [HOLOCENE ALLUVIUM]			24									
10	95		SILTY SAND (SM), yellowish brown mottled with reddish brown, dense to very dense, moist, fine-grained sand, manganese staining [COLMA FORMATION]			40				45					
15	90		Light grayish brown, very dense, cemented			97/11"									
20	85		Light grayish brown mottled with reddish brown			98/11"									
25	80		More coarse-grained sand, rounded to subrounded fine gravel, more fines, iron oxide staining			50/5.5"									
30															

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B04

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 1/26/2017
HOLE DEPTH: Approx. 51 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 105.1 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SILTY SAND (SM), light grayish brown mottled with reddish brown, very dense, moist, fine-grained sand, some coarse-grained sand and fine gravel, cemented			50/6"				18					
35	70					50/4"									
40	65					50/6"									
45	60														
50	55		Reddish brown, fine- to medium-grained sand			50/6"									
			Boring terminated at a depth of 51 feet below ground surface. Depth to groundwater was not measured due to drilling method.												

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B11

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 2/1/2017
HOLE DEPTH: Approx. 50¾ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (NAVD88): 99.96 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Pitcher Drilling
DRILLING METHOD: Mud Rotary
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			CONCRETE Asphaltic concrete, 2"												
			AGGREGATE BASE (AB) 4"												
			SILTY SAND (SM), light yellowish brown mottled with reddish brown, dry, fine- to coarse-grained sand, contains trace fine gravel [FILL]												
5	95		SANDY SILT (ML), dark brown, dry, fine-grained sand [COLMA FORMATION]												
			Light brown, more fines												
10	90		SILTY SAND (SM), yellowish brown, very dense, moist, fine-grained sand, cemented, some pockets of cemented silt			50/6"									
15	85														
20	80		Light grayish brown, manganese staining			68									
			SANDY SILT (ML), light grayish brown mottled with reddish yellow, very stiff to hard, moist, fine-grained sand												
25	75					35				64	17				
			SILTY SAND (SM), light grayish brown mottled with reddish yellow, very dense, moist, fine-grained sand												
30	70														

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B11

ENGEO INCORPORATED

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HAMMER TYPE: 140 lb. Auto Trip

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			SILTY SAND (SM), light grayish brown mottled with reddish yellow, very dense, moist, fine-grained sand			69									
35	65		More medium-grained sand, less fines			92/11"									
40	60					50/5.5"									
45	55		More fines			90/10"									
50	50		Less fines			50/4"									
			Boring terminated at a depth of 50 3/4 feet below ground surface. Depth to groundwater was not measured due to drilling method.												

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B12

ENGEO INCORPORATED

Prelim. Geotechnical Exploration
YouTube Campus
San Bruno, California
13367.000.000

DATE DRILLED: 4/12/2017
HOLE DEPTH: Approx. 100½ ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): 105.54 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	105		Asphaltic concrete, 3"												
			AGGREGATE BASE (AB) 5"												
			SILTY SAND WITH GRAVEL (SM), brown, dry, fine- to coarse-grained sand, subrounded fine to coarse gravel, contains clay [FILL]												
5	100		SILTY SAND (SM), reddish yellow, moist, fine-grained sand, contains clay [COLMA FORMATION]												
10	95														
			SANDY LEAN CLAY (CL), yellowish brown, hard, moist, iron oxide and manganese staining												
15	90					40									
			SILTY SAND (SM), yellowish brown, dense, moist, fine-grained sand, iron oxide staining												
20	85														
25	80														
30															

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B12

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HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): 105.54 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	75		SILTY SAND (SM), light grayish brown, dense, moist, fine-grained sand, iron oxide staining			44									
35	70														
40	65		medium dense, more fines			20									
45	60														
50	55		dense, less fines			49									
55	50														
60															

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

LOG OF BORING 1-B12

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HOLE DIAMETER: 8.0 in.
SURF ELEV (NAVD88): 105.54 ft.

LOGGED / REVIEWED BY: N. Serra / PE
DRILLING CONTRACTOR: Britton Exploration
DRILLING METHOD: Hollow Stem Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	45		SILTY SAND (SM), light grayish brown, very dense, moist, fine-grained sand, iron oxide staining			62									
65	40														
70	35														
75	30														
80	25		less fines, trace coarse-grained sand			83									
85	20														
90															

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17

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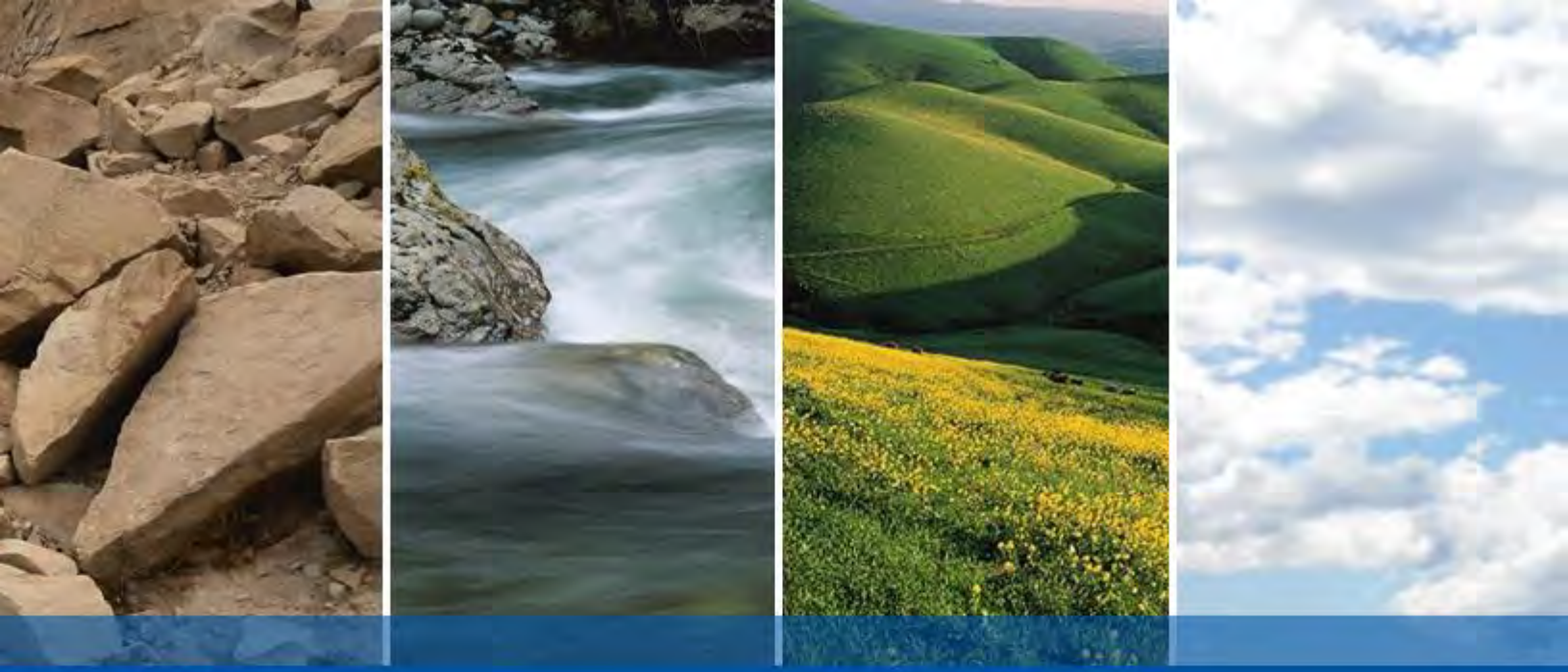
Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	15		SILTY SAND (SM), light grayish brown, very dense, moist, fine-grained sand, iron oxide staining												
95	10														
100						50/6"									
			Boring terminated at a depth of 100 1/2 feet below ground surface. Groundwater was not encountered at the time of drilling.												

SHEAR AND UNCONF STRENGTH W/ ELEV 1-B01 THRU 1-B11_UPDATE.GPJ ENGEO INC.GDT 6/5/17



APPENDIX D

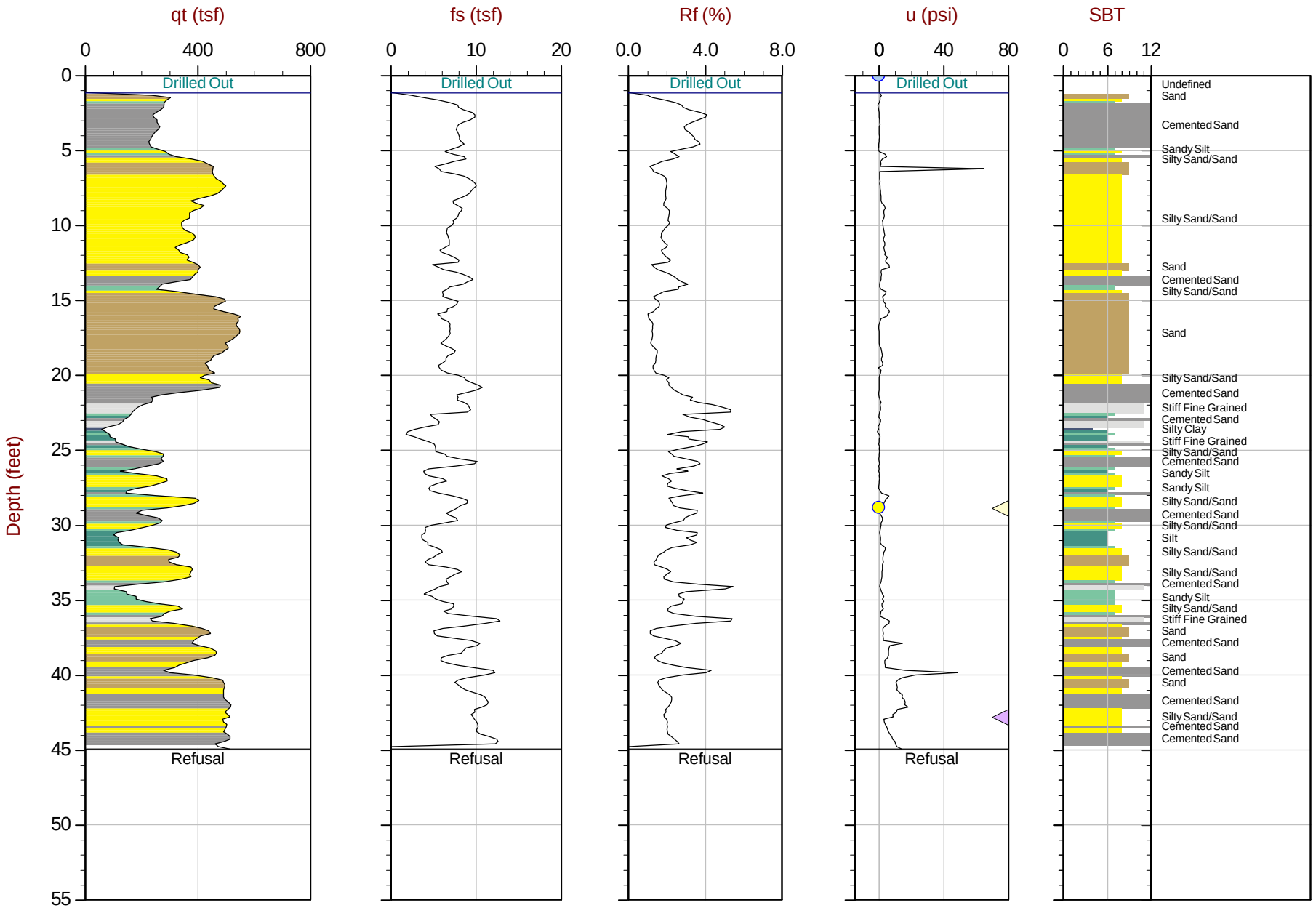
PREVIOUS CONE PENETRATION LOGS

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56008
Date: 01:23:17 12:01
Site: You Tube Campus, San Bruno, CA

Sounding: 1-CPT01
Cone: 448:T1500F15U500



Max Depth: 13.700 m / 44.95 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point
Overplot Item:

File: 17-56008_CP01.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 10N N: 4164855m E: 550710m
Page No: 1 of 1

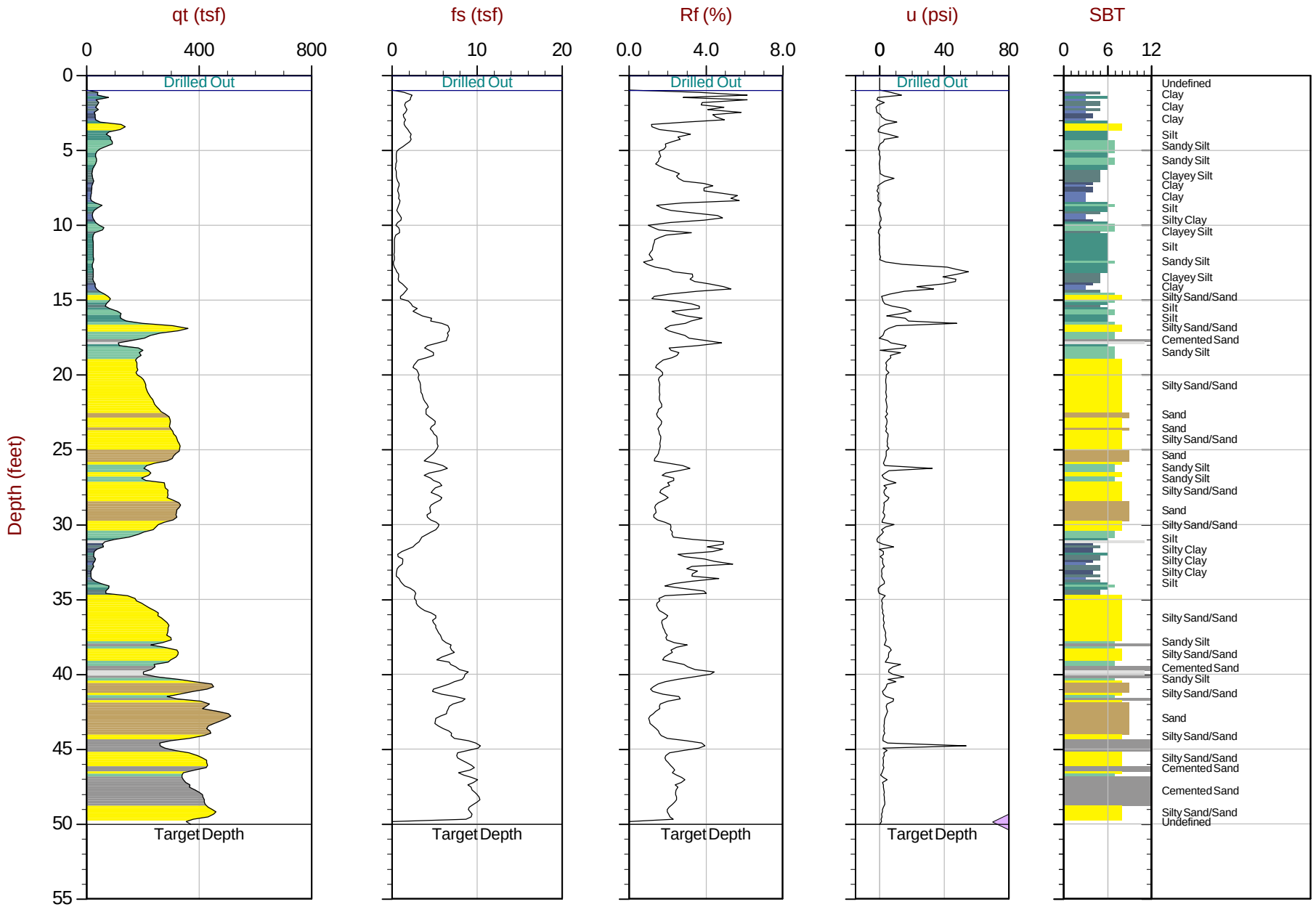
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56008
Date: 01:24:17 08:03
Site: You Tube Campus, San Bruno, CA

Sounding: 1-CPT03
Cone: 448:T1500F15U500



Max Depth: 15.250 m / 50.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point
Overplot Item:

File: 17-56008_CP03.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 10N N: 4164766m E: 550781m
Page No: 1 of 1

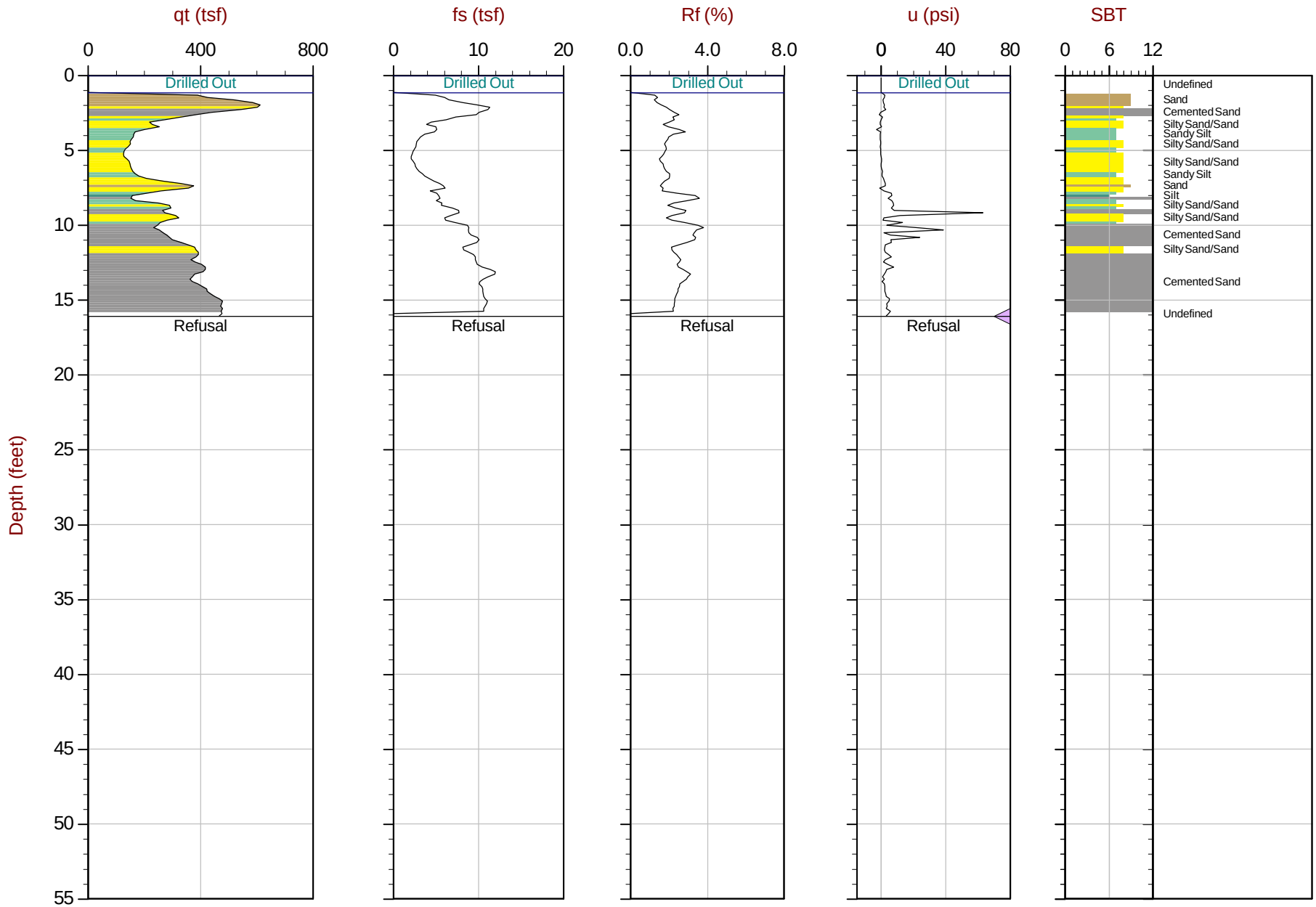
Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line

CALIFORNIA PUSH TECHNOLOGIES INCORPORATED

ENGEO Inc.

Job No: 17-56008
Date: 01:24:17 09:10
Site: You Tube Campus, San Bruno, CA

Sounding: 1-CPT04
Cone: 448:T1500F15U500

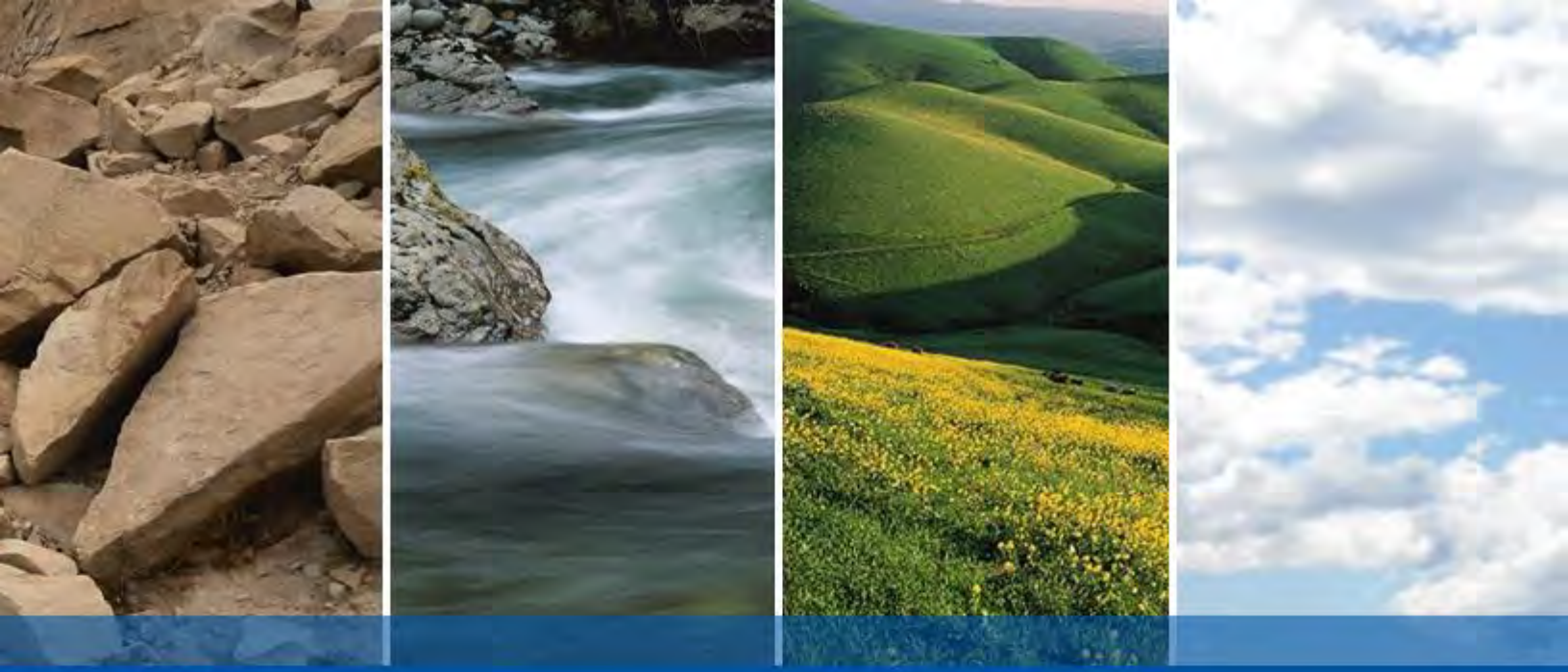


Max Depth: 4.900 m / 16.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point
Overplot Item:

File: 17-56008_CP04.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 10N N: 4164733m E: 550832m
Page No: 1 of 1

Assumed Ueq
Ueq
Dissipation, equilibrium achieved
Dissipation, equilibrium not achieved
Hydrostatic Line

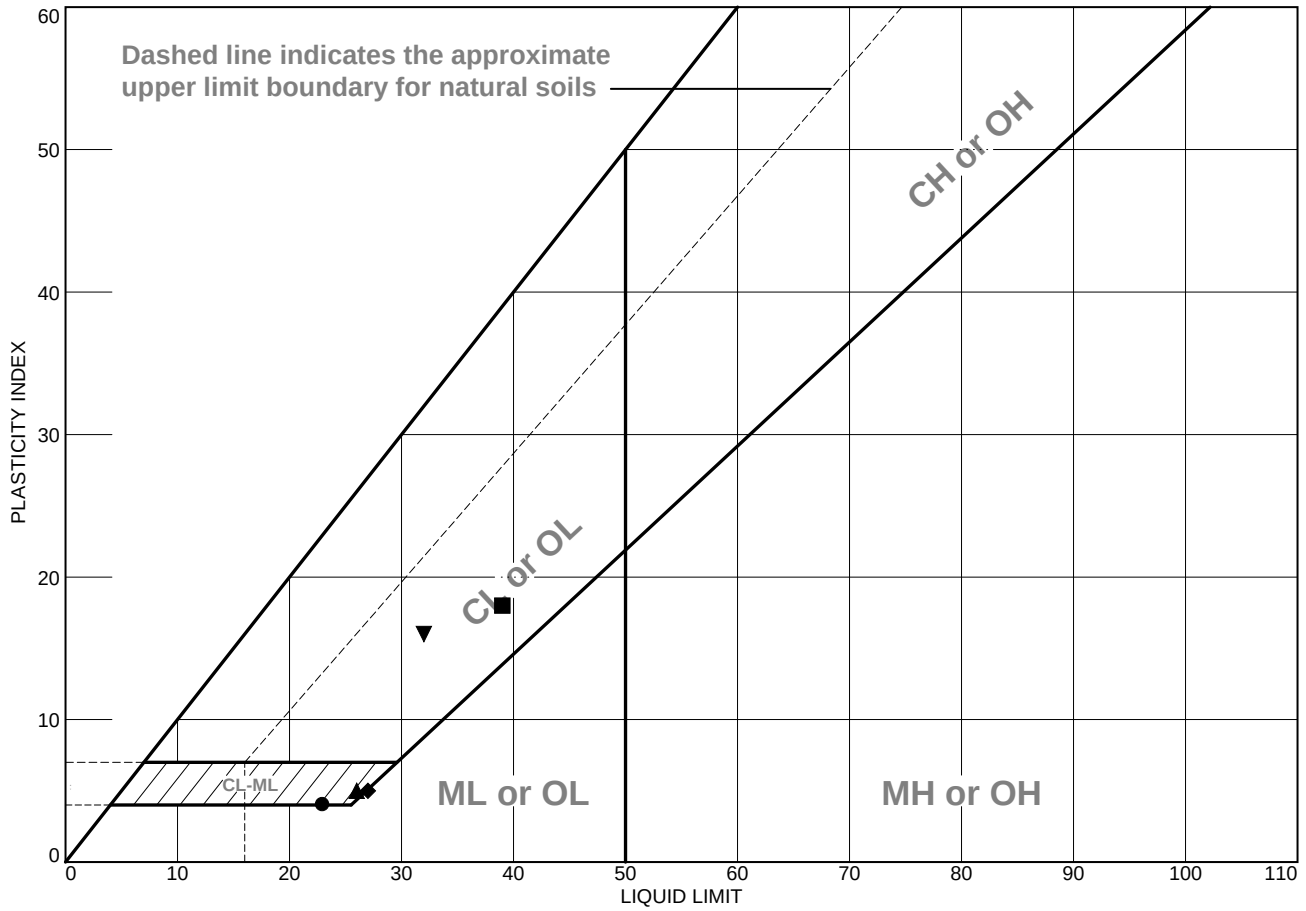


APPENDIX E

PREVIOUS LABORATORY TEST DATA

Liquid and Plastic Limits Test Report
Particle Size Distribution Report
Unconfined Compression Test
Incremental Consolidation Report
Analytical Results of Soil Corrosion

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	See exploration logs	23	19	4		44.5	
■	See exploration logs	39	21	18		68.6	
▲	See exploration logs	26	21	5		47.2	
◆	See exploration logs	27	22	5			
▼	See exploration logs	32	16	16			

Project No. 13667.000.000 **Client:** Google Incorporated

Project: Google Master Planning Services - Geotechnical Engineering

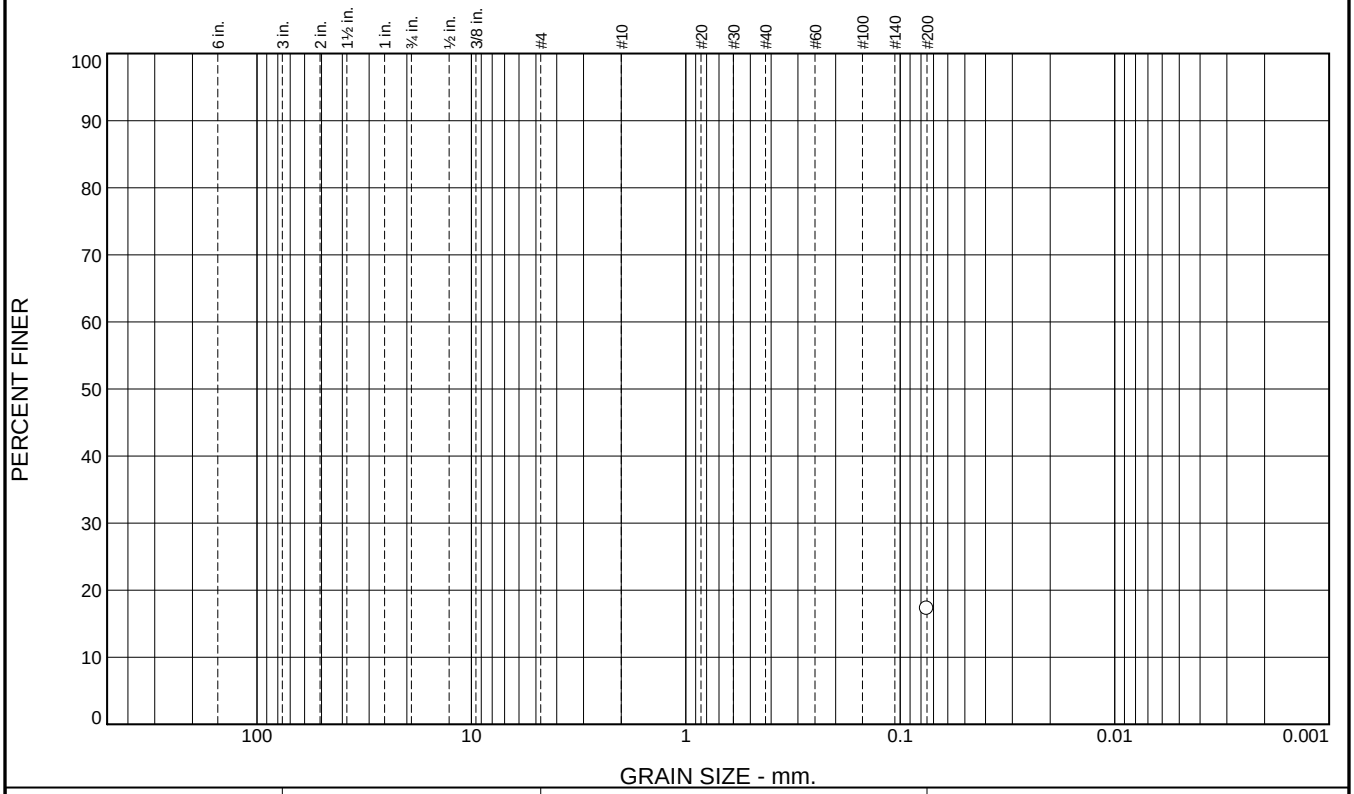
●**Depth:** 51.5 feet **Sample Number:** 1-B02 @ 51.5
■**Depth:** 25.5 feet **Sample Number:** 1-B05 @ 25.5
▲**Depth:** 30.5 feet **Sample Number:** 1-B05 @ 30.5
◆**Depth:** 40.8-41.2 feet **Sample Number:** 1-B06 @ 40.8
▼**Depth:** 15.5-16.0 feet **Sample Number:** 1-B07 @ 15.5

ENGEO INCORPORATED

Remarks:
●PI: ASTM D4318, Wet method
Grain Size: ASTM D1140
■PI: ASTM D4318, Wet method
Grain Size: ASTM D1140
▲PI: ASTM D4318, Wet method
Grain Size: ASTM D1140
◆ASTM D4318, Wet method
▼ASTM D4318, Wet method

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						17.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	17.3		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140

Sample Number: 1-B01 @ 10.5 **Depth:** 10.5 feet

Date: 2.15.17

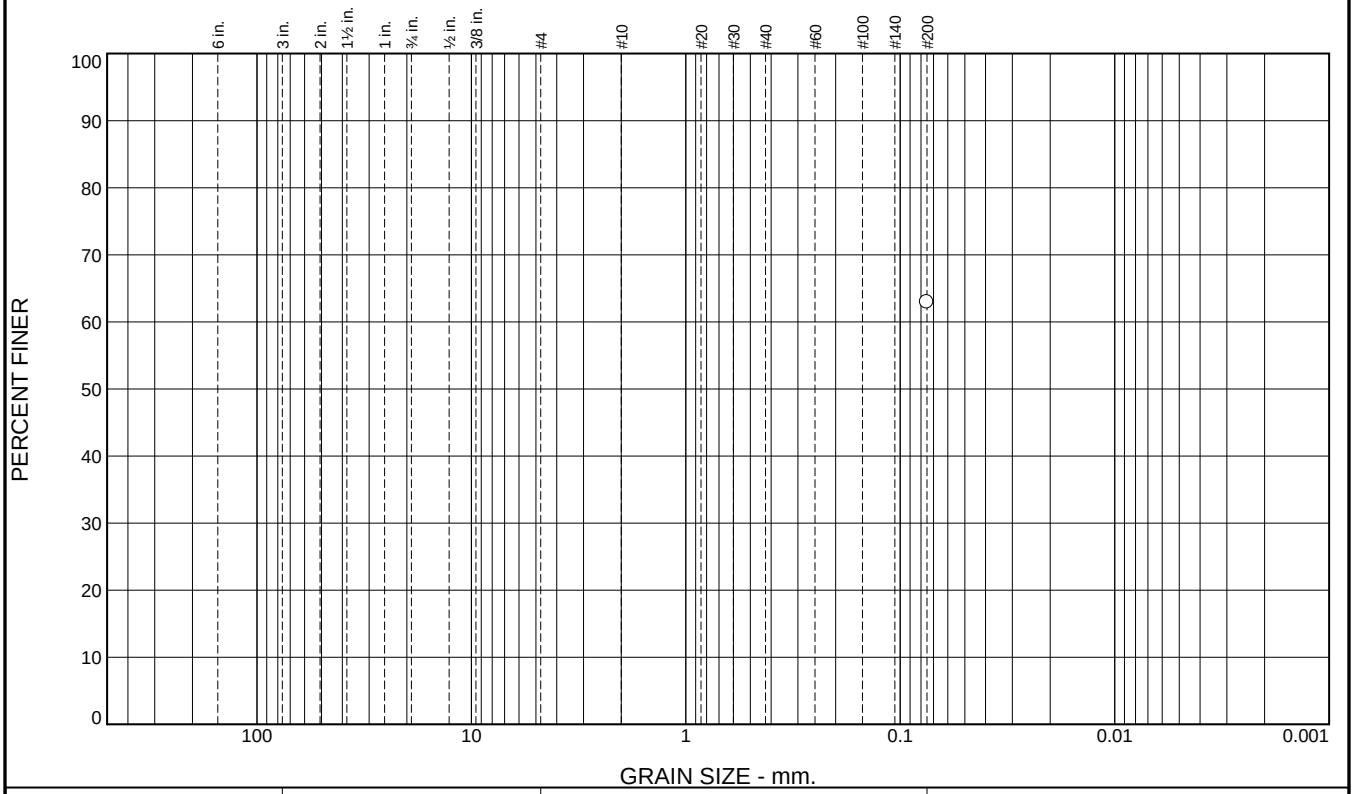
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						62.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	62.9		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

ASTM D1140

Sample Number: 1-B01 @ 33 **Depth:** 33.0-33.5 feet

Date: 2/16/17

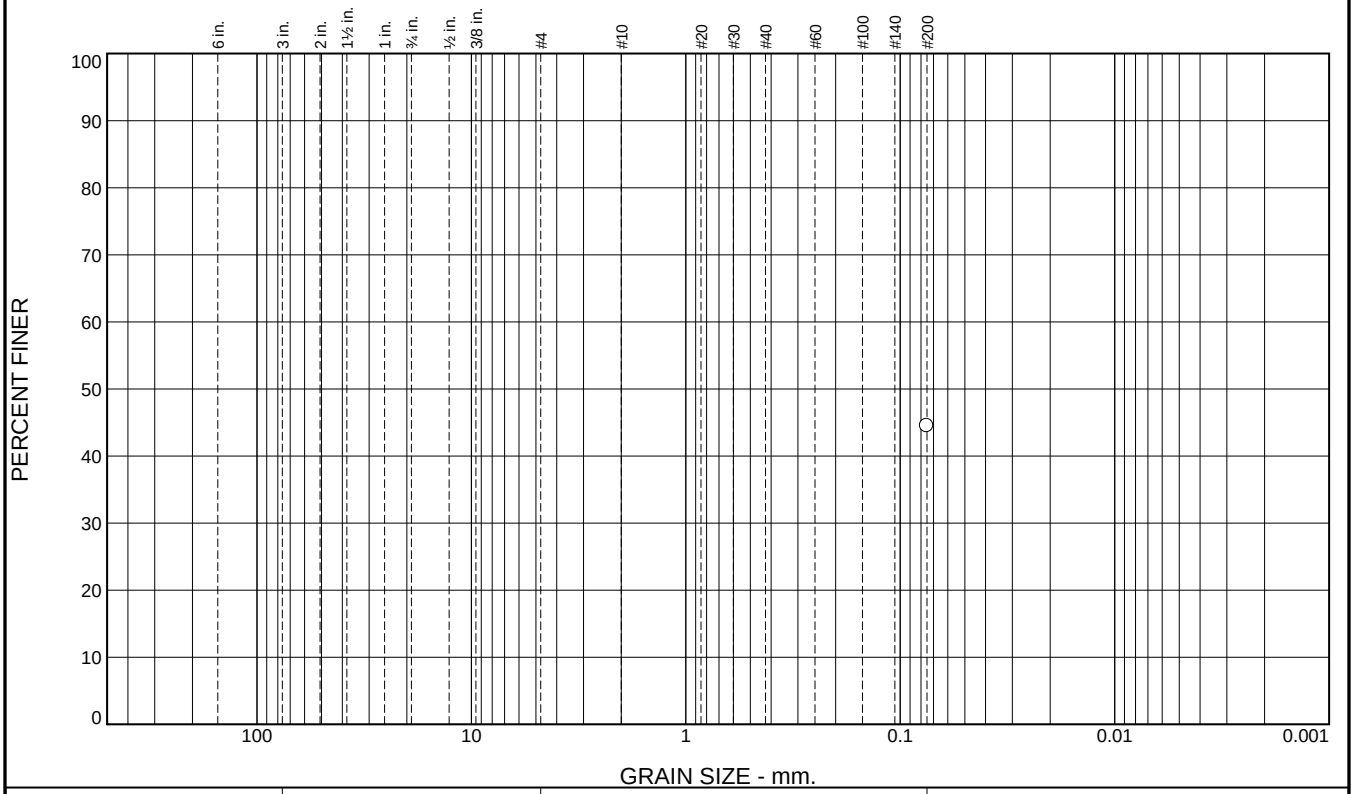
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: T. Borde **Checked By:** M. Quasem

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						44.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	44.5		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= 19 LL= 23 PI= 4

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140
PI: ASTM D4318, Wet Method

Sample Number: 1-B02 @ 51.5 **Depth:** 51.5 feet

Date: 2.15.17

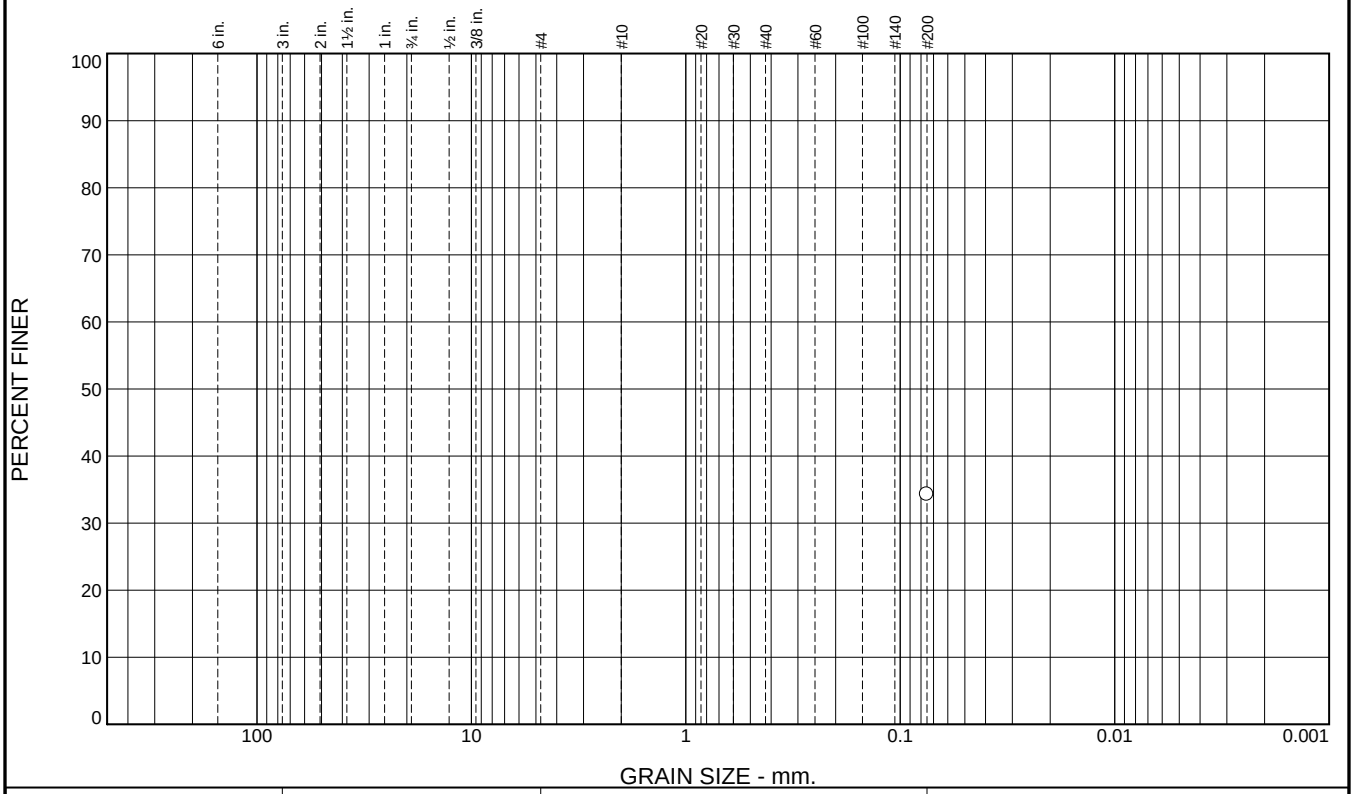
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						34.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	34.3		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140

Sample Number: 1-B03 @ 15.5 **Depth:** 15.5 feet

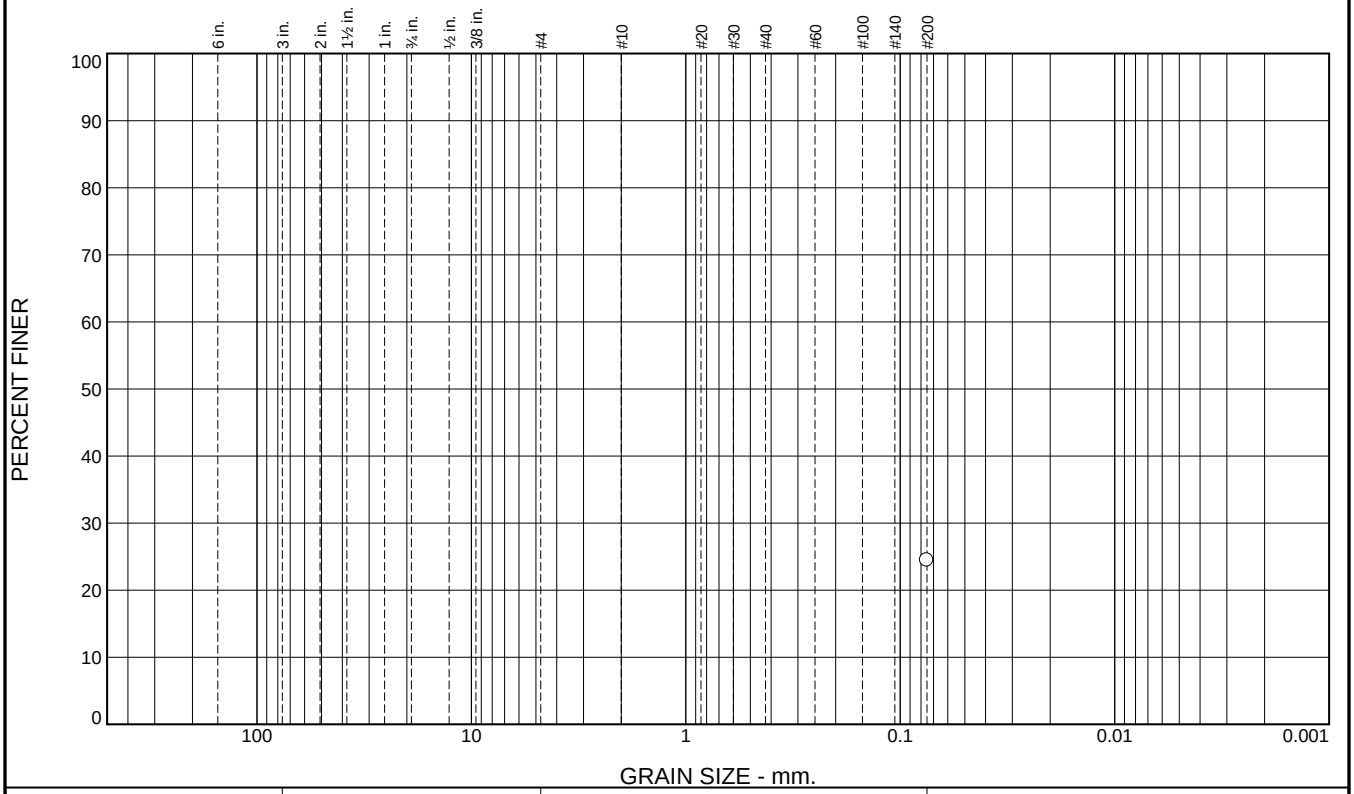
Date: 2.15.17

ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering
Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						24.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	24.5		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140

Sample Number: 1-B03 @ 40.5 **Depth:** 40.5 feet

Date: 2.15.17

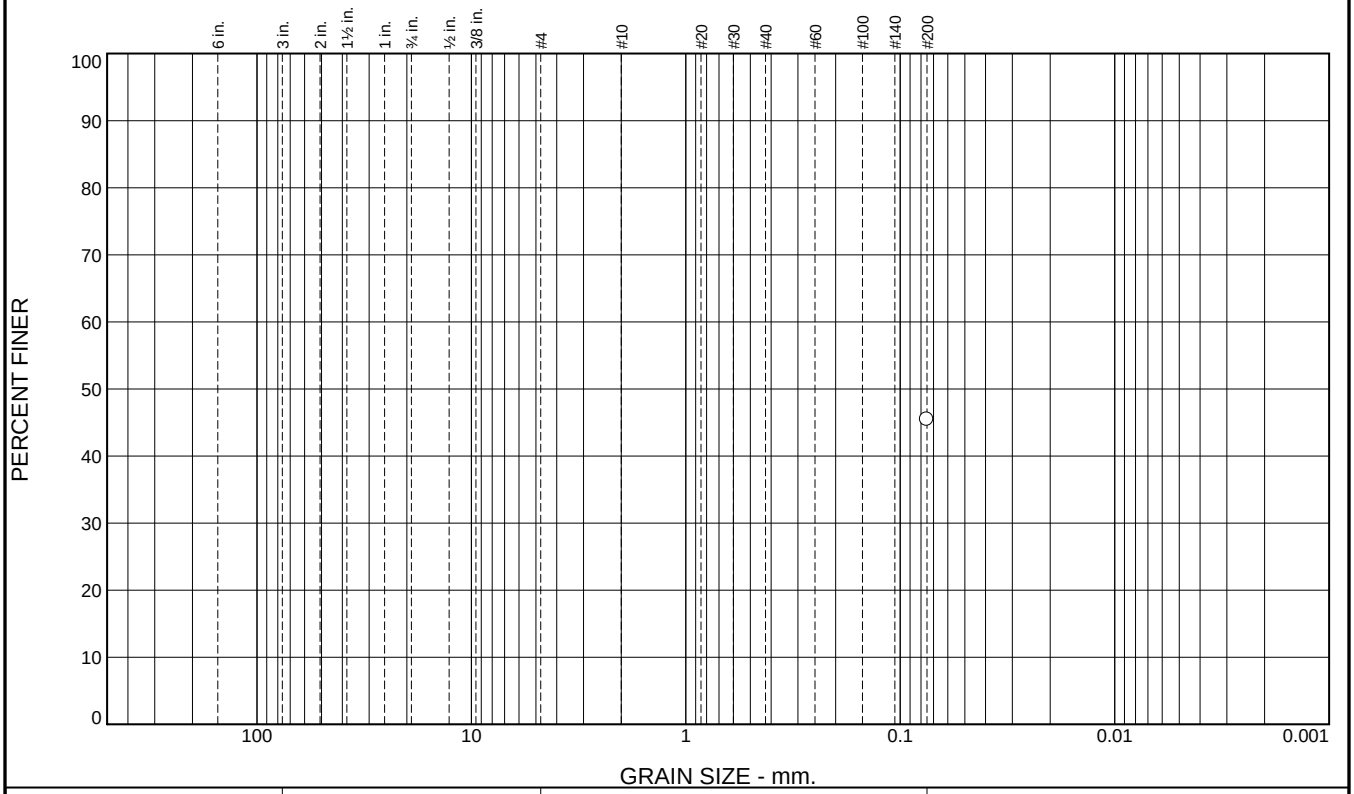
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						45.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	45.4		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140

Sample Number: 1-B04 @ 10.5 **Depth:** 10.5 feet

Date: 2.15.17

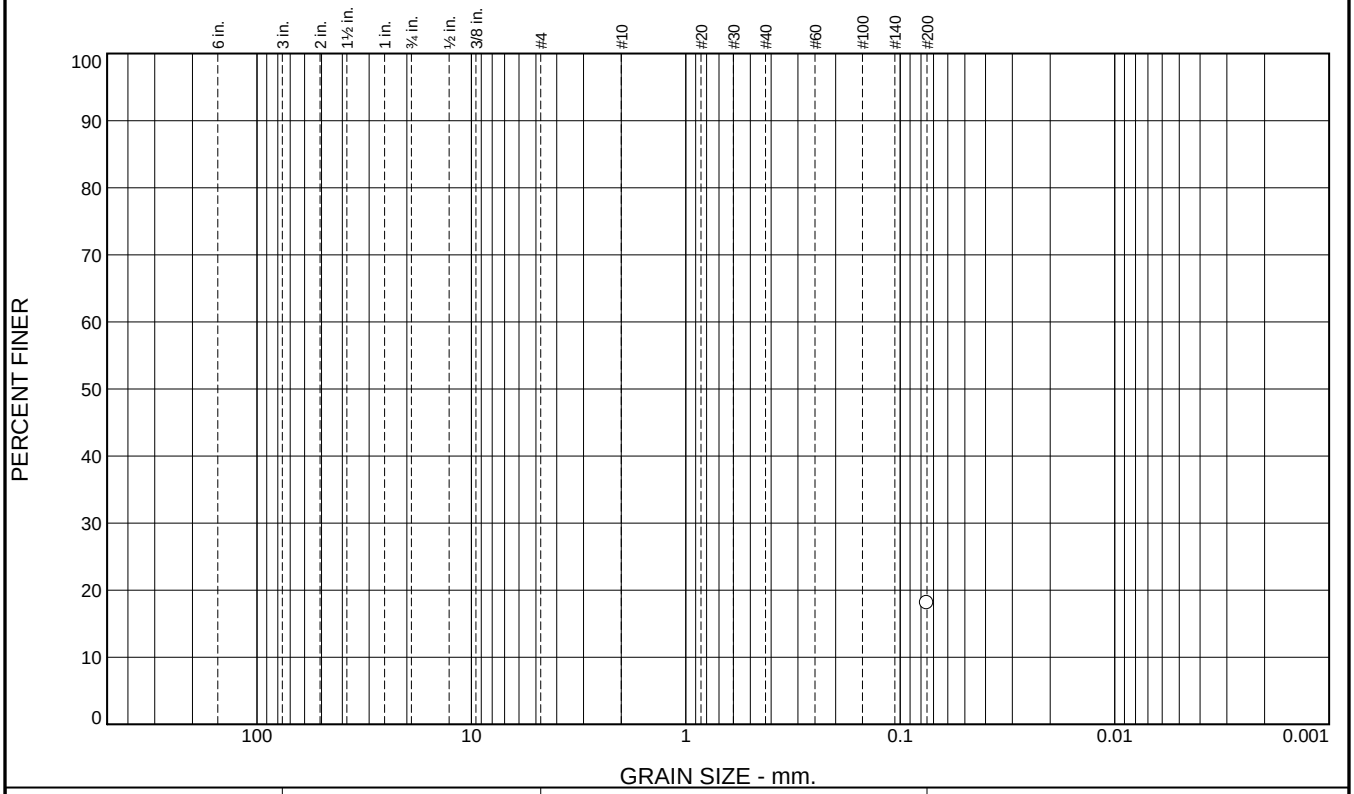
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						18.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	18.1		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140

Sample Number: 1-B04 @ 30.5 **Depth:** 30.5 feet

Date: 2.15.17

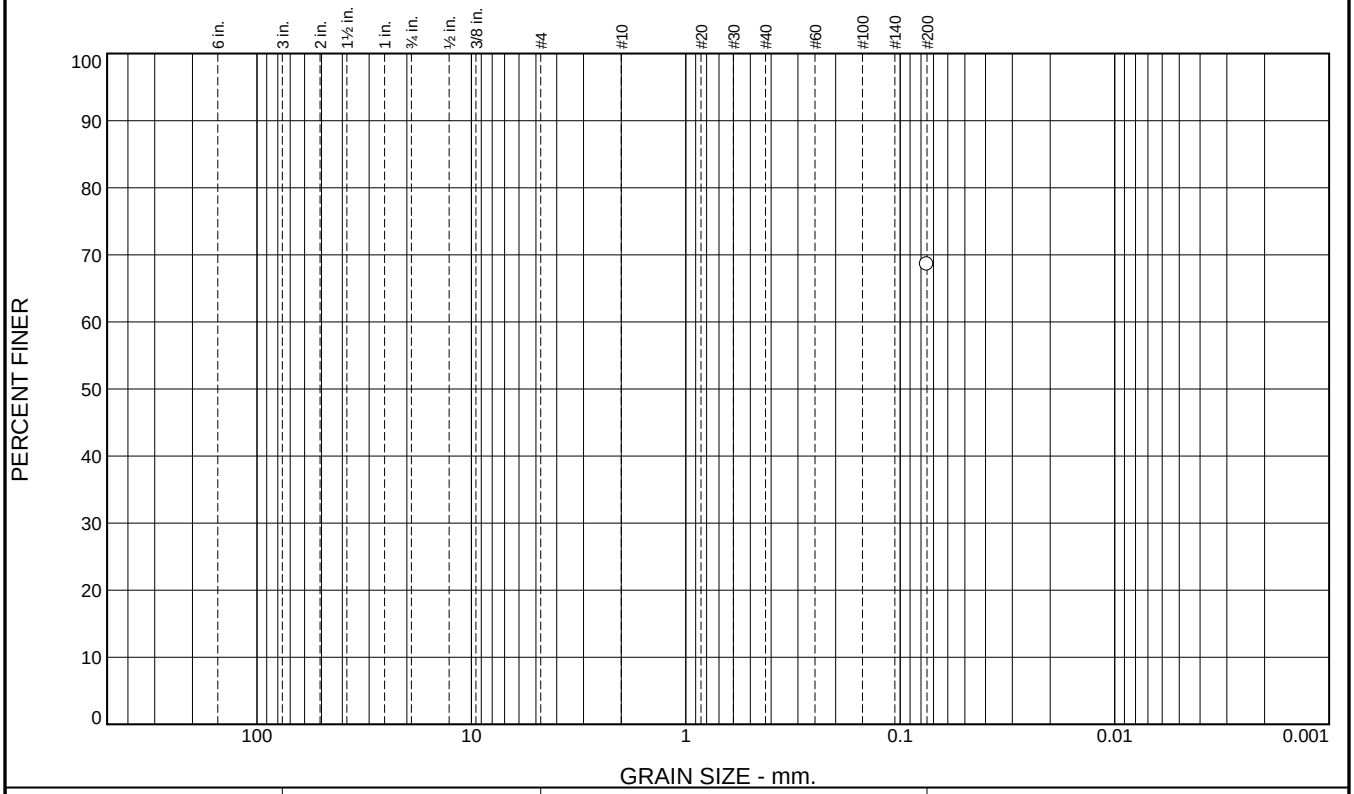
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						68.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	68.6		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= 21 LL= 39 PI= 18

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140
PI: ASTM D4318, Wet Method

Sample Number: 1-B05 @ 25.5 **Depth:** 25.5 feet

Date: 2.15.17

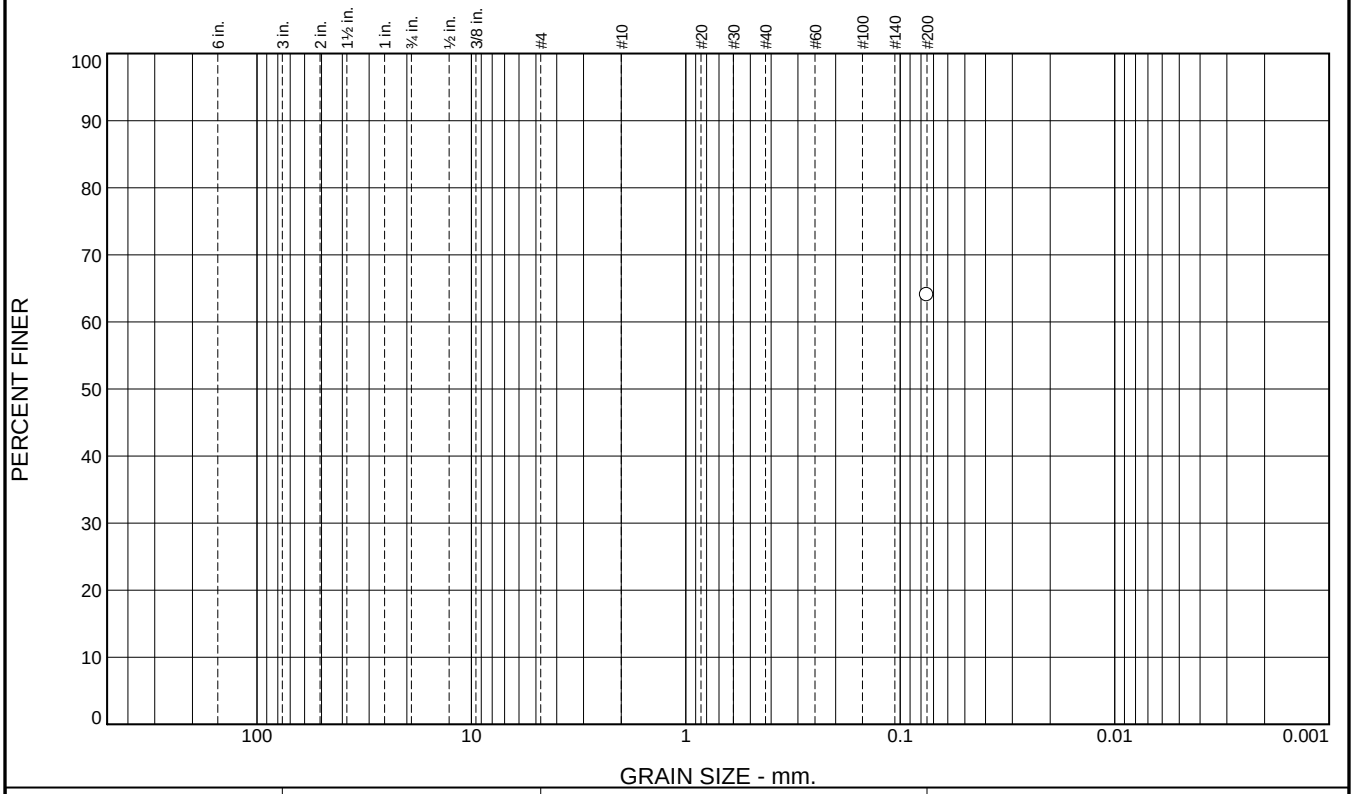
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

Particle Size Distribution Report



% +75mm	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
						64.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	64.0		

* (no specification provided)

Soil Description

See exploration logs

Atterberg Limits

PL= LL= PI=

Coefficients

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

Classification

USCS= AASHTO=

Remarks

Grain Size: ASTM D1140

Sample Number: 1-B11 @ 25.5 **Depth:** 25.5 feet

Date: 2.15.17

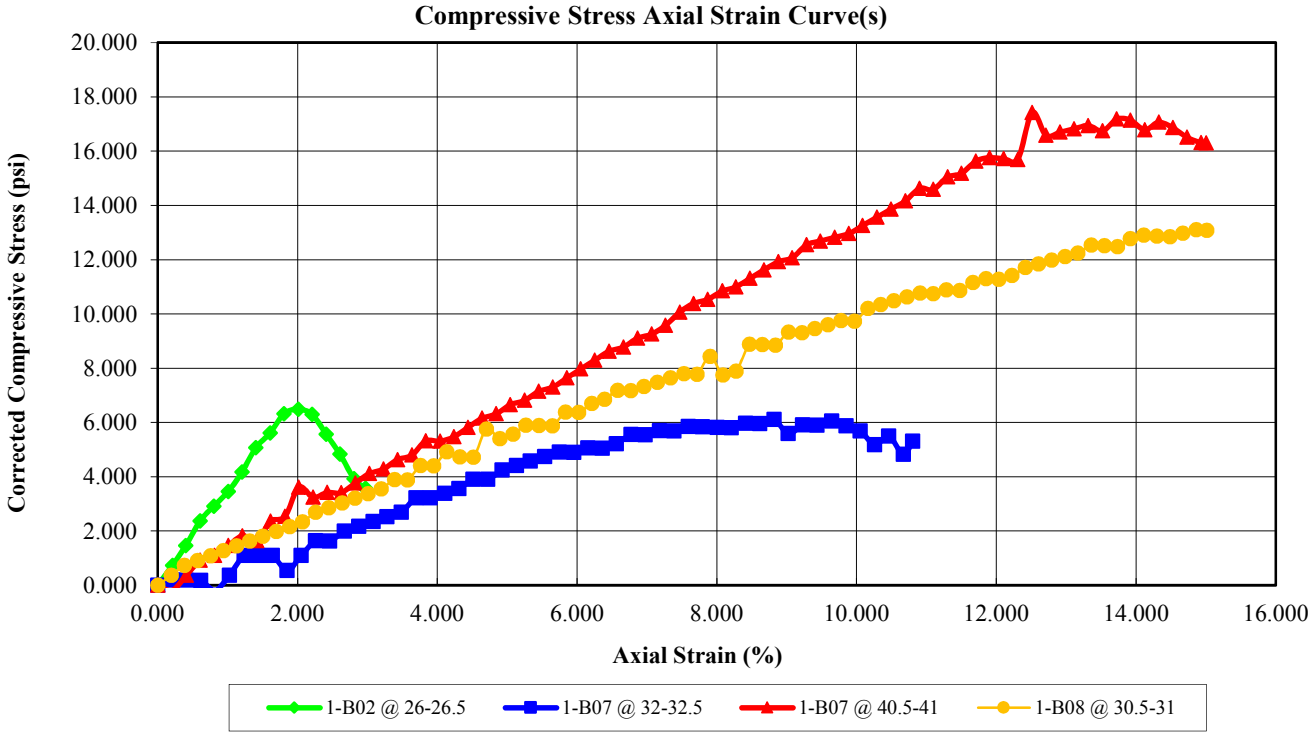
ENGEO INCORPORATED

Client: Google Incorporated
Project: Google Master Planning Services - Geotechnical Engineering

Project No: 13667.000.000

Tested By: M. Quasem **Checked By:** T. Borde

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



	SPECIMEN			
BEFORE TEST	**1-B02@26-26.5**	**1-B07@32-32.5**	**1-B07@40.5-41**	**1-B08@30.5-31**
Moisture Content (%)	14.9	25.1	20.3	25.4
Dry Density (pcf)	102.1	102.9	108.9	100.0
Saturation (%)	63.51	100.00	100.00	100.00
Void Ratio	0.62	0.61	0.52	0.65
Diameter (in)	2.389	2.375	2.386	2.394
Height (in)	5.030	4.916	4.998	5.361
Height-To-Diameter Ratio	2.105	2.070	2.095	2.239
TEST DATA				
Unconfined Compressive Strength (psf)	934.261	879.608	2508.660	1886.098
Undrained Shear Strength (psf)	467.131	439.804	1254.330	943.049
Strain Rate (in./min.)	0.05	0.05	0.05	0.05
Specific Gravity (Assumed)	2.650	2.650	2.650	2.650
Strain at Failure (%)	2.01	8.82	12.51	14.86

Test Remarks

SPECIMEN	DESCRIPTION
1-B02@26-26.5	See exploration logs
1-B07@32-32.5	See exploration logs
1-B07@40.5-41	See exploration logs
1-B08@30.5-31	See exploration logs

PROJECT NAME: Google Master Planning Services - Geotechnical Engineering
PROJECT NO: 13667.000.000
CLIENT: Google Incorporated
LOCATION: Mountain View, CA
PHASE NO: 001

Test Date: 02/14/17
Tested By: T. Borde
Reviewed By: M. Quasem

ENGEO — Expect Excellence

California State Certified Laboratory No. 2153

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: ENGEO Incorporated
Client's Project No.: 13667.000.000
Client's Project Name: You Tube Campus
Date Sampled: 17-Feb-17
Date Received: 17-Feb-17
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 23-Feb-2017

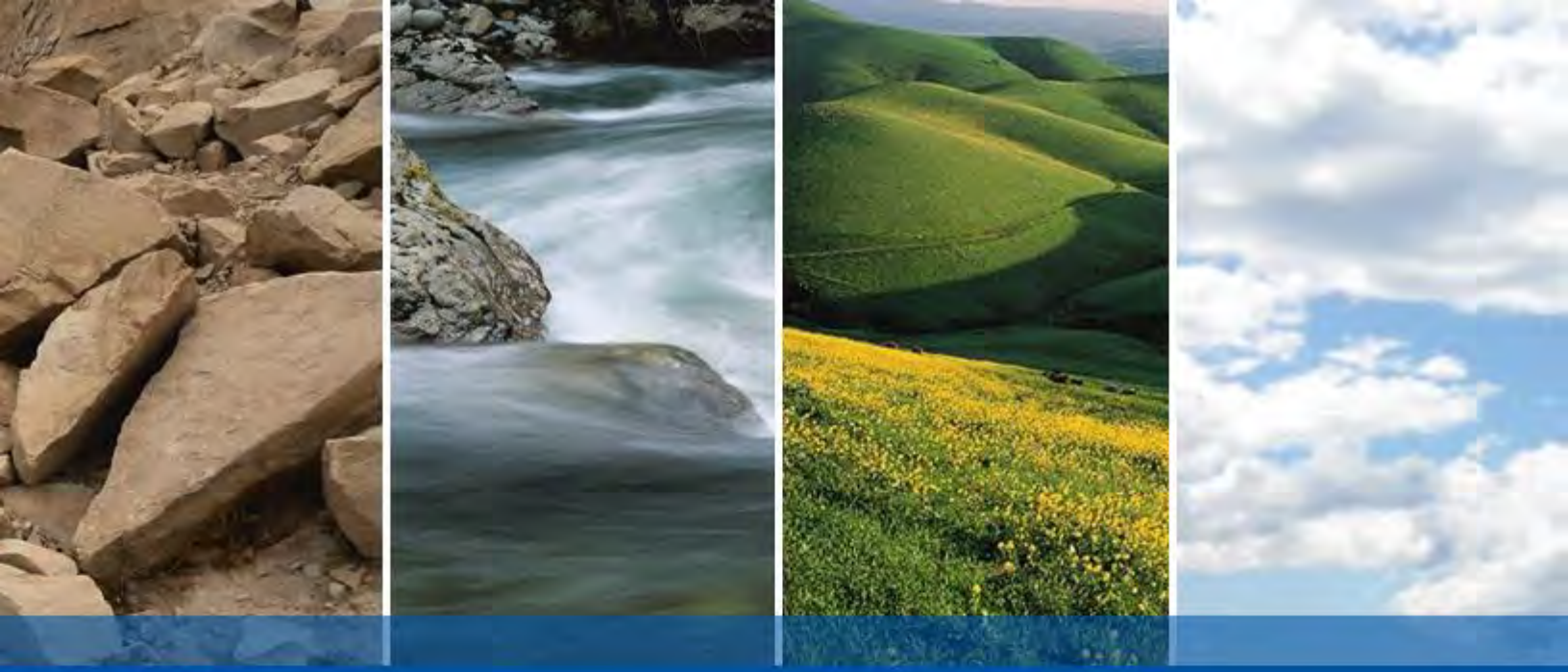
Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1702137-001	1-BO5 @ 15.5'	470	7.37	-	5,200	-	N.D.	28
1702137-002	1-BO7 @ 30.5'	460	8.46	-	1,900	-	N.D.	22
1702137-003	1-BO2 @ 2.5'	420	5.41	-	1,000	-	52	85

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	22-Feb-2017	22-Feb-2017	-	21-Feb-2017	-	22-Feb-2017	22-Feb-2017

Cheryl McMillen
Laboratory Director

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits



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Expect Excellence