Appendix E Geotechnical Study

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UPDATED
GEOLOGIC HAZARDS ASSESSMENT AND GEOTECHNICAL ENGINEERING STUDY
MARE ISLAND TECHNOLOGY ACADEMY
NEW CAMPUS
1 & 2 POSITIVE PLACE
VALLEJO, CALIFORNIA

November 11, 2020

Prepared for

Mare Island Technology Academy

Prepared by

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November 11, 2020 File No.: 302495-003

Mr. Matt Smith
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PROJECT: MARE ISLAND TECHNOLOGY ACADEMY – NEW CAMPUS,
1 & 2 POSITIVE PLACE
VALLEJO, CALIFORNIA

SUBJECT: Updated Geologic Hazards Assessment and Geotechnical Engineering Study

REF.: Proposal for Updated Geologic Hazards Evaluation and Geotechnical Engineering Study, Mare Island Technology Academy – New Campus, 2 Positive Place, Vallejo, California, by Earth Systems Pacific, April 14, 2020 *(Revised July 21, 2020).*

Geologic Hazards Assessment and Geotechnical Engineering Study, Mare Island Technology Academy – New Campus, 2 Positive Place, Vallejo, California, by Earth Systems Pacific, November 6, 2018.

Dear Mr. Smith:

As authorized by the Mare Island Technology Academy, Earth Systems Pacific (Earth Systems) is submitting herein the results of our Updated Geologic Hazards Assessment and Geotechnical Engineering Study for the subject project located at 1 & 2 Positive Place in Vallejo, California. This update was prepared to address an alternate campus layout. This report presents our assessment of local and regional geologic conditions and potential geologic hazards that could impact the site. The geotechnical engineering section of this report presents Earth Systems' preliminary geotechnical conclusions related to the updated design.

We appreciate the opportunity to have provided services for this project. Should you have any questions regarding the contents of the report, please contact our office.

Sincerely,
Earth Systems Pacific

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1.0 INTRODUCTION

This report presents the results of the geologic hazards assessment and geotechnical engineering study performed by Earth Systems Pacific (Earth System), for the proposed new Mare Island Technology campus to be constructed off Positive Place in Vallejo, California. The attached Site Location Map (Figure 1), shows the general location of the site and the attached Site Plan, Figure 2, shows the location of the borings and Cone Penetrometer Tests (CPTs) advanced at the site as part of this investigation.

Earth Systems issued a geologic hazards assessment and geotechnical engineering study report for the previously proposed development plan on November 6, 2018 which involved advancing nine cone penetrometer tests and drilling fifteen exploratory borings at the site. Subsurface exploration data from these borings and CPTs was used to augment the data collected as a part of this investigation.

Site Setting

The subject property is an irregularly shaped area consisting of land from APN 006-001-070. The approximate middle portion of the project site has a latitude of 38.1498°N and a longitude of 122.2444°W (See Figure 1). The site area is bordered by Rainer Avenue to the northeast, Corcoran Avenue to the northwest, Olympic Avenue to the southeast, and portions of both Positive Place and Mini Drive to the southwest. Positive Place divides the project area into two portions with differing addresses; the northern portion is at 1 Positive Place, and the southern portion is at 2 Positive Place.

Site Description

The northern portion of the project site is presently occupied by an existing school campus which includes existing buildings, landscape areas, paved areas and driveways. The southern portion of the project site is presently occupied by the existing Continentals of Omega Boys and Girls Club building, asphalt and concrete pavements, and a wood-framed gazebo and metal-framed playground. The site is shown to be approximately 110 feet above sea level on the 1:24,000 scale topographic map of the Cordelia Quadrangle (Figure 1). Based on the site plan provided by *aedis architects* (Figure 2) the site elevation ranges from 88 to 121 feet above sea level on the northern portion of the site and 90 to 108 feet above sea level on the southern portion of the site.

Project Description

It is our understanding that the proposed project will consist of the construction of a new campus for the Mare Island Technology Academy over the northern and southern portions of the site. Based on plans from *aedis architects*, dated August 21, 2020, the northern portion of the site will consist of nine new buildings. These include a 19,200 square-foot north classroom wing containing three buildings (Buildings A, B, & C), a 21,120 square-foot south classroom wing containing three buildings (Buildings F, G, & H), a 21,120 square-foot science building (Building E), a 9,014 square-foot multi-purpose room building (Building J), and a 4,006 square-foot administrative building (Building D). Additional construction in the northern portion of the site includes a quad area, an outdoor amphitheater, a synthetic turf sports field, a hard sports court, two solar canopies, and a parking lot (Parking Lot A) and associated driveways. The southern portion of the site will consist of a 11,316 square-foot gymnasium building (Building K), a paved parking lot (Parking Lot B) and associated driveways. See Figure 2 for the layout of proposed building and improvement locations.

Scope of Services

The scope of work for this report included a general site reconnaissance, subsurface exploration, field reconnaissance by a registered geotechnical engineer and geologist, laboratory testing of samples secured during the field investigation, geotechnical and geologic analyses of the data, and preparation of this report.

This report and preliminary geotechnical recommendations are intended to comply with the considerations of Sections 1803A.1 through 1803A.7 and J104.3 of the 2019 CBC; California Geological Survey Note 48 (CGS 2019); IR Document A-4 (DSA 2011); and common geotechnical engineering and engineering geology practice in this area under similar conditions at this time. The tests were performed in general conformance with the standards noted, as modified by common geotechnical engineering practice in this area under similar conditions at this time.

Preliminary geotechnical recommendations for site preparation and grading, foundations, utility trench backfill, exterior flatwork, pavements, drainage and maintenance, and geotechnical observation and testing are presented to guide the development of project plans and specifications. It is our intent that this report be used exclusively by the client in the preparation of plans and specifications.

Analyses of the soil for mold or other microbial content, asbestos, radioisotopes, hydrocarbons, or chemical properties other than corrosivity evaluation are beyond the scope of this report. This report does not address issues in the domain of contractors such as, but not limited to, site safety, loss of volume due to stripping of the site, shrinkage of soils during compaction, excavatability, shoring, temporary slope angles, and construction means and methods. Ancillary features such as temporary access roads, fences, light poles, signage, and nonstructural fills are not within our scope and are also not addressed.

As there may be unresolved geotechnical or geologic issues with respect to this project and to assist in verifying that pertinent geotechnical issues have been addressed and to aid in conformance with the intent of this report, the geotechnical engineer and engineering geologist should be retained to provide consultation as the design progresses and to review project plans as they near completion. In the event that there are any changes in the nature, design, or locations of improvements, or if any assumptions used in the preparation of this report prove to be incorrect, the conclusions and recommendations contained herein should not be considered valid unless the changes are reviewed, and the conclusions of this report are verified or are modified in writing. The criteria presented in this report are considered preliminary until such time as any peer review or review by any jurisdiction has been completed, conditions are observed by the geotechnical engineer and/or engineering geologist in the field during construction, and the recommendations have been verified as appropriate or modified in writing.

2.0 GEOLOGIC REVIEW

Regional Geologic Setting

The subject site is located in the southern Napa Valley, east of Napa River and west of the Mount Hamilton-Mount Diablo Range, in the Coast Ranges geomorphic province in central California. The Coast Ranges geomorphic province is characterized by northwest-trending mountain ranges resulting from tectonic uplift that has been interpreted to have been occurring since Pliocene-Pleistocene time (beginning approximately 3 to 5 million years before present). The regional basins now occupied by San Pablo and San Francisco Bays, and the Santa Clara Valley, were formed by related tectonic processes during Pleistocene time.

The predominant structural feature in the California Coast Ranges is the San Andreas fault zone, which is the structural boundary between two tectonic plates: the Pacific Plate west of the San Andreas fault zone and the North American Plate east of the fault zone. These two plates are moving past each other at approximately 5.1 cm/year at the mouth of the Gulf of California and 1 to 3 cm/year in the central and northern parts of California (Brown, 1990). The Hayward and Calaveras faults, located on the east side of the San Francisco Bay and the west side of the Mt. Hamilton-Mt. Diablo Range, respectively, are interpreted to be part of the San Andreas fault system.

For the San Francisco Bay area in general, the oldest rocks east of the San Andreas fault are the Jurassic-Cretaceous Franciscan Complex. The Franciscan Complex is composed of a chaotic assemblage of mainly shale, sandstone, chert, limestone, greenstone, and serpentinite. These rocks are interpreted to represent components of ancient Pacific Ocean crust that have been disrupted and accreted to western California during Cretaceous to early Tertiary time and prior to development of the San Andreas fault system. The Franciscan Complex is overlain by, or in fault contact with, sedimentary rocks of upper (?) Cretaceous age in some terrains in the southern and eastern Santa Clara Valley. West of the San Andreas fault, the oldest rocks are the predominantly Mesozoic granitic Salinian Block. Mesozoic and Paleozoic metamorphic rocks are a lesser component of the Salinian Block. On both sides of the San Andreas fault, the oldest rocks are overlain by Tertiary and Quaternary marine and terrestrial sedimentary rocks and local volcanic rocks. Each of the above rock units were faulted, folded, and uplifted due to plate motions and activity on the San Andreas, Hayward, Calaveras, and smaller related faults. This deformation began about 30 million years ago but is mainly Pliocene to Pleistocene in age (~5 million to 11,700 years ago). Holocene-age (11,700 years to present-day) plate motion is expressed mainly as fault creep and seismicity on the various faults of the San Andreas fault system.

Geologic Literature Review

Earth Systems reviewed available geologic and geotechnical literature for the subject site and vicinity to evaluate the possibility of fault traces and other geologic hazards on or near the subject site.

Soil Mapping

The USDA Soil Conservation Service web soil survey (2018) maps the soils at the site as the Dibble-Los Osos clay loam (DlC). The DlC is described as forming on 2 to 9 percent slopes. DlC is described as being located on mountain summits or central thirds of mountain flanks and is described as residuum weathered from sandstone. DlC is characterized as well-drained with a very high runoff classification. a saturated hydraulic conductivity of 0.06 to 0.20 in/hr. The DlC loam has a surface texture described as lean clay (CL) with a grain size distribution of 29% clay, 37% silt, and 34% sand. The published Plasticity index of the soil is 20 with a liquid limit of 40.

Geologic Mapping

Dibblee and Minch (2006) mapped the geology of the Cordelia and Fairfield South Quadrangles at a scale of 1:24,000. The mapping of Dibblee and Minch indicates that the site is underlain by undifferentiated Quaternary alluvial deposits. The immediate vicinity of the site is characterized by folded Panoche Formation bedrock and intervening alluvium filled structural valleys. The nearest fault to the site is unnamed and is mapped on the eastern margin of a band of serpentine approximately 1.4 miles northeast of the site and trending northwesterly. Landslides are mapped east of I-80 and north of Napa Route 37/Columbus Parkway; east of the site. No landslides are mapped on or near the site and no faults are mapped on, near, or trending towards the site.

Wagner and Gutierrez (2010) prepared a preliminary geologic map of the Napa 30x60 Minute Quadrangle at a scale of 1:100,000 (Figure 3). The subject site's location is indicated to be underlain by Pleistocene-age alluvial fan deposits. The vicinity of the site is similarly indicated to be a structurally-complex zone of folded and faulted Cretaceous-age Upper Great Valley Sequence sedimentary rocks. The nearest fault is an unnamed fault approximately 0.8 miles to the east of the site which trends northwesterly. The southern tip of the West Napa fault is mapped approximately 0.9 miles north of the site, also trending northwesterly. The projection of this trace to the southeast passes approximately 0.4 to 0.5 miles east of the subject site.

Landsliding

The State of California has not evaluated the Cordelia Quadrangle as part of the Seismic Hazards Zoning Program. Landslides are not mapped on or near the site by the California Landslide Inventory (CGS, 2018; Figure 4A). The site is essentially flat with a very gentle regional slope to the west. The relative landslide susceptibility map of the Cordelia quadrangle by Manson (1988) indicates that the site is located in an unclassified area where natural topography has been significantly altered by grading for development, road construction, or mining. Areas in similar geologic settings to the site are located within Zone 1 (least susceptible).

Liquefaction

The State of California has not evaluated the Vallejo Quadrangle as part of the Seismic Hazards Zoning Program. According to liquefaction potential mapping by the United States Geological Survey of the San Francisco Bay Area (2006; Figure 4B) the site is located in Pleistocene-age alluvial fan deposits with low liquefaction susceptibilities.

Faulting and Seismicity

The subject site is located outside of fault rupture hazard zones as defined by the State of California (1993; Figure 5). The nearest State-zoned fault is the West Napa fault approximately 0.9 miles north of the site.

Until recently, faults were historically described as “active” and “potentially active”. Active faults were defined by the California Geologic Survey (CGS) as faults that are well defined and have experienced movement within the last 11,700 years (Hart and Bryant, 2018). The definition of "potentially active" varied, however, a generally accepted definition of "potentially active" was a fault showing evidence of displacement older than 11,700 years and younger than 2,000,000 years (i.e., Pleistocene age).

As of 2018, the CGS no longer uses the terms “Active” and “Potentially active” to describe faults. Faults are now described as “Holocene-active” for faults having activity within the last 11,700 years; “Pre-Holocene” for faults which have not been active within the last 11,700 years (Pre-Holocene faults may still have potential for rupture but are not regulated by the Alquist-Priolo Act); and “Age-undetermined” is used for faults where timing of last rupture is unknown (within Alquist-Priolo Earthquake Fault Zones these are considered active unless data can be obtained to demonstrate otherwise).

The West Napa, Hayward-Rodgers Creek, Calaveras, and San Andreas faults are significant regional active faults which could produce earthquakes affecting the site. The West Napa fault is approximately 0.9 miles north of the site, the Hayward-Rodgers Creek fault is roughly 11.2 miles west of the site, the Calaveras fault is approximately 26.3 miles southeast of the site, and the San Andreas fault is approximately 29.1 miles to the west of the site (Jennings and Bryant, 2010). The nearest state-zoned fault is the West Nap fault. Refer to Figures 6 and 7 for locations of these and other faults of the San Andreas fault system, and for locations of notable earthquakes in the region (Keyed to Figure 7).

The site is in a region of generally high seismicity and has the potential to experience strong ground shaking from earthquakes on regional or local causative faults. The USGS has identified that there is a 72% chance of a strong earthquake (M>6.7) occurring in the San Francisco Bay area for the period 2014 to 2044 (see Figure 8).

The characteristics of significant regional faults are discussed below.

Maacaama-West Napa-Franklin-Calaveras Fault System

The West Napa fault zone is a zone of northwest to north northwest-striking, predominantly dextral, slip faults which extends from Yountville south southeast to the vicinity of the Napa River and Home Hill. The West Napa fault is delineated by well-defined geomorphic evidence of dextral strike-slip faulting in the vicinity of Napa County airport and includes linear vegetation contrasts in latest Pleistocene and Holocene alluvium, linear scarps on Holocene alluvium, dextrally deflected drainages, and closed depressions. Oat Hill may be a pressure ridge between a left compressional step-over south of the county airport. Recent research based on fault-zone guided waves (Catchings, et al., 2016), suggests that the West Napa Fault Zone (WNFZ) and Franklin fault (FF) are continuous in the subsurface for at least 75 km. Previously published potential-field data indicate that the WNFZ extends northward to the Maacama fault (MF), and previous geologic mapping indicates that the FF extends southward to the Calaveras fault (CF); this suggests a total length of at least 110 km for the WNFZ–FF. Because the WNFZ–FF appears contiguous with the MF and CF, these faults apparently form a continuous Calaveras–Franklin–

WNFZ–Maacama (CFWM) fault that is second only in length to the San Andreas fault in the San Francisco Bay area. Upper crustal splays of the WNFZ–FF, including a northward extension of the Southhampton fault, may cause strong shaking in the Napa Valley and the Vallejo area. A magnitude 6.0 earthquake (South Napa) occurred on the West Napa fault approximately 6 miles northwest of the site in 2014 and produced an estimated Modified Mercalli Intensity of VII at the site and Peak Ground Accelerations ranging from 0.296g to 0.329g in the vicinity of the site.

Hayward fault-Rodgers Creek fault

The Hayward fault is the dominant fault in the eastern San Francisco Bay Area and is located approximately 11.2 miles to the west (Figure 6). Recent research based on seismic surveys of San Pablo Bay have demonstrated that the Hayward and Rogers Creek faults are contiguous across San Pablo Bay. The Hayward-Rogers Creek fault system is dominantly strike-slip and has both locked and creeping segments. The system has produced two large earthquakes in the last 200 years (1858 and 1868). The Hayward-Rogers Creek fault is considered by the USGS Working Group on California Earthquake Probabilities (WGCEP UCERF3; 2013) to be the most likely fault in the San Francisco Bay Area to produce a large (magnitude 6.7 or larger) earthquake by the year 2044 (14.3% chance) and has a recurrence interval of approximately 155 years. UCERF3 also indicates that the Hayward fault is a "particularly ready" fault, in that the short-term (30-year) rupture probability (32.3%) exceeds the long-term (time independent) probability (21.3%). The Hayward-Rogers Creek fault is capable of generating large peak ground accelerations at the site.

Calaveras fault

The Calaveras fault lies approximately 26.3 miles southeast of the site. It is dominantly a strike-slip fault and trends northwest. UCERF3 also indicates that the Calaveras fault is a "particularly ready" fault, in that the short term rupture probability exceeds the long term probability (7.4% chance of a magnitude 6.7 or larger by 2044). There have been 4 large earthquakes (magnitude 5.9 or larger) in the last 200 years on the Calaveras fault, (e.g. 1861, 1897, 1979, and 1984).

San Andreas fault

The San Andreas fault is located approximately 29.1 miles west of the site. The San Andreas fault trends northwest and southeast throughout northern and southern California. The San Andreas fault is dominantly a strike-slip fault which is located at the boundary between the Pacific Plate to the west and the North American Plate to the east. Several large earthquakes (greater than 5.9 magnitude) have occurred along the northern segment of the San Andreas fault in the last 200 years (e.g. 1836, 1838, 1906, and 1989). A 6.9 (Mw) magnitude earthquake (Loma Prieta) occurred on this fault on October 17, 1989 and produced a Modified Mercalli Intensity of VI in the Vallejo area, and corresponding Peak ground accelerations from 0.104g to 0.117g (USGS, 2018). See Figure 9 for discussion of the Modified Mercalli Intensity scale.

Aerial Photo Interpretation

Earth Systems reviewed black and white and color satellite imagery taken over the subject property and vicinity from the years 1993 to 2018 available through Google Earth.

The images were studied for the presence of geomorphic features characteristic of active faulting, and recent and active landslide processes. Aerial photo lineaments or linear tonal differences identified on photos are sometimes associated with fault zones. Lineaments and tonal differences may also be due to changes in soil or rock type, vegetation, groundwater levels, other geologic structures, or sedimentary bedding characteristics. Other geomorphic features associated with fault zones include fault scarps, shutter ridges, sag ponds, spring zones, and offset drainages.

The site is located on relatively level terrain underlain by alluvial sediments and no evidence of landsliding was visible on or near the subject site on the images we reviewed. A possible extension of the West Napa fault between the Napa County airport segment and towards the Franklin fault (Southampton segment) is faintly visible approximately 0.2 miles to the east of the site, trending northwesterly. No indications of faulting were observed crossing or on trend with the subject site in the images we reviewed.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

Subsurface Exploration

As a part of the current phase of investigation, we explored subsurface conditions at the site using six Cone Penetrometer Tests (CPTs) advanced at the site on October 5, 2020 and nine exploratory borings drilled at the site on October 5 and 6, 2020 at the approximate locations shown on the Site Plan, Figure 2.

Exploratory Borings

The borings were drilled using a truck-mounted drilling rig equipped with 4.5-inch diameter continuous flight augers and sampled to depths ranging from 5 to 25 feet below the ground surface (bgs). The drilling process consisted of augering to the desired depth and upon reaching that depth, the augers were retrieved from the hole and a standard sampler connected to steel rods was lowered into the hole. The standard samplers were driven into undisturbed ground with a 140-pound, safety hammer falling about 30 inches per drop. The samplers were driven up to 18 inches and the hammer blows required to drive every six inches of the samplers were recorded and are presented on the boring logs. This information was used to interpret soil consistency/density.

Our project engineer supervised the drilling program, logged the soil conditions encountered in the borehole and collected representative samples for laboratory testing. Subsurface conditions revealed by our borings were described by our staff engineer. The borings were backfilled with lean cement grout. The boring logs show soil description including: color, major and minor components, USCS classification, changes in soil conditions with depth, moisture content, consistency/density, plasticity, sampler type, and sampling depths and laboratory test results. Copies of the boring logs advanced for this investigation are presented in Appendix A.

Cone Penetrometer Tests

The CPT soundings were performed with Middle Earth Geo Testing, Inc. (MEGT) using a 25-ton truck mounted CPT rig. The soundings were conducted in accordance with ASTM specifications and pushed to a maximum depth of 25 feet below the ground surface. A copy of the CPT soundings is included in Appendix A.

A CPT involves pushing a standardized size instrument of a conical shape into the ground at a specified constant rate. The cone used for this project had a tip area of 15 cm2 and a friction sleeve area of 225 cm2. The cone was pushed into ground at a constant rate of 20-mm per second using the 25-ton truck as reaction weight. The cone was fitted with load cells, which recorded the total force acting on the cone (Qc), sleeve friction (Fs), and pore pressure (u) readings at 5 cm depth intervals. The data collected from the CPT was used to interpret site stratigraphy, soil consistency, and strength using published relationships. Generally, cohesive soils (clays) have high friction ratios (sleeve friction divided by cone bearing – Rf), low cone bearing, and generate large excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing, and generate little in the way of excess pore water pressures.

Subsurface Profile

The results of our borings indicate the site is underlain by a combination of artificial fill soil (af), Pleistocene alluvial fan deposits (Qpf), and Great Valley Sequence interbedded shale and sandstone (Ku). The fill soil and alluvial fan deposits consist of predominantly fine-grained, stiff to very stiff moderately to highly expansive clays. The underlying shale was generally decomposed to lean clay and became less weathered with depth. The sandstone was friable and severely to moderately weathered.

Groundwater

Groundwater was encountered in five of the borings drilled (B-16, B-17, B-19, B-20, B-24) and three CPT soundings advanced (CPT-11, CPT-12, CPT-13) at the site. Depth to groundwater encountered on site ranged from 9.5 to 20 feet below the ground surface. Publicly available data from the State Water Resources Control Board's Geotracker database indicates that groundwater in the vicinity seasonally ranges from approximately 6 to 15 feet below the ground surface.

Laboratory Testing

As the borings were drilled, soil samples were obtained using a Modified California tube-lined barrel sampler and a Standard Penetration Test split-spoon sampler. Selected tube and bulk samples of the soil were tested to measure moisture content, dry density, liquid limit, and plasticity index. These test results reveal soil properties of engineering interest, such as shrink/swell potential of soils on site. Copies of the laboratory test results are included in Appendix B and the corrosion test results are presented in Appendix C.

4.0 DATA ANALYSIS

Subsurface Soil Classification

Based on the data in the boring logs drilled for this investigation, the site is assigned to Site Class C ("very dense soil and soft rock") as defined by Table 20.3-1 of ASCE 7 (per Section 1613A.3.2 of the 2019 CBC)

Seismic Design Parameters

General

The site is in a region of generally high seismicity and has the potential to experience strong ground shaking from earthquakes on regional or local causative faults. Because the site is assigned to Site Class C, per Section 1613A.1 of the 2019 CBC and Section 11.4.8 of ASCE7-16, a site-specific design response spectral analysis is not required for the site. Table 1, below, presents the California Building Code general procedure seismic design parameters.

TABLE 1

Summary of Seismic Parameters - CBC 2019

(Site Coordinates 38.1501° N, 122.2445°W)

Parameter	Design Value
Mapped Short Term Spectral Response Parameter (S_s)	2.213g
Mapped 1-second Spectral Response Parameter (S_1)	0.773g
Site Class	C
Site Coefficient (F_a)	1.2
Site Coefficient (F_v)	1.4
Site Modified Short Term Response Parameter (S_{MS})	2.655g
Site Modified 1-second Response Parameter (S_{M1})	1.082g
Design Short Term Response Parameter (S_{DS})	1.770g
Design 1-second Response Parameter (S_{D1})	0.721g
Design PGA	1.099g
S_{D1}/S_{DS} (T_s)	0.407 s

Seismic Design Category

Section 1613A.3.5 of the 2019 CBC indicates that structures classified as Risk Category I, II, or III where the mapped $S_1 \geq 0.75$ shall be assigned to Seismic Design Category E and that all others shall be assigned to Seismic Design Category D. The mapped S_1 for the site is 0.773g; therefore, the site would be a Seismic Design Category E (Occupancy Category III).

5.0 GEOLOGIC HAZARDS

This Geologic Hazards Evaluation was conducted to determine the geologic conditions at the subject site and to evaluate potential geologic hazards that may impact the site. Our Geologic Hazards Evaluation focused on addressing potential geologic hazards associated with the site's location near seismically active faults. In general, the potential geologic hazards encountered in the Vallejo area include landslides, debris flows, and the hazards concomitant with earthquakes. Earthquake-related hazards include ground rupture along the trace of a fault, ground shaking, ridge-top cracking, lateral spreading, lurching, liquefaction, and earthquake-induced landsliding.

The following conclusions are based on the data acquired and analyzed during the course of Earth Systems' Geologic Hazards Evaluation.

Primary Seismic Hazards

Ground Rupture

Surface ground rupture generally occurs at sites that are traversed by, or lie very near to, a causative fault. The site is outside of mapped fault hazard zones and no faults are mapped crossing the subject site. The hazard posed by fault rupture at this site is low.

Ground Shaking

The main geologic concern at the site is the potential for strong seismic shaking during a moderate to large earthquake on the Maacama-West Napa-Franklin-Calaveras fault system, the San Andreas fault, or the Hayward-Rodgers Creek fault system. Such events could produce large peak ground accelerations at the site and cause strong to violent shaking at the site. Structures built at the site should be designed for strong seismic shaking using the 2019 CBC and seismic design parameters shown in Table 3 as minimum design criteria.

Secondary Earthquake Effects

Landslides

The subject site is located on relatively level terrain and is not located within a potential landslide hazard zone as defined by state or local agencies. No features suggestive of landsliding were observed on or adjacent to the site during our geologic hazards evaluation. It is Earth Systems' opinion that the hazard posed by landsliding is nil.

Liquefaction and Lateral Spreading

The site is not located in a seismic hazards zone for liquefaction as defined by state or local agencies. Groundwater was first encountered in two of our test borings at 18 and 24 feet below the ground surface. The published historic groundwater level is about 6 to 15 feet bgs. The subsurface profile is predominantly fine-grained soils which overlie shale and sandstone bedrock which are not subject to liquefaction. The potential for surface effects related to liquefaction is low. The potential for lateral spreading is also considered low.

Ridge-top Cracking

The effects of topography on relative ground shaking intensity and resultant ground surface disturbance and structural damage were noted in the Santa Cruz Mountains after the 1906 San Francisco Earthquake (Lawson, 1908) and the 1989 Loma Prieta earthquake (Plafker and Galloway, 1989). Ridge-top cracking during the 1989 Loma Prieta earthquake damaged roadways and structures approximately 10 km from the epicenter in the Summit Road area of the Santa Cruz Mountains. The subject site is not located in terrain comparable to that affected by the 1989 Loma Prieta earthquake therefore, and the potential for this type of ground failure is considered nil at the site.

Debris Flows:

Debris flows are a type of landslide characterized by a rapidly flowing mass of rock fragments, soil, and mud with more than half of the particles being larger than sand size and typically containing cobbles and boulders as well. Debris flows generally are initiated in colluvium filled hollows. These flows result almost invariably from unusually heavy rain, and tend to find their way into drainages and travel for significant distances. Due to the site's location away from natural drainages and thick colluvium filled hollows, the potential for debris flows to affect the subject site is considered low.

Other Geologic Concerns

Flooding

According to Flood Insurance Rate Map, Panel Number 06095C 0440 F, dated June 9, 2014, published by the Federal Emergency Management Agency (FEMA), the site is located within Zone X (stippled). Zone X is defined as: *areas outside the 0.2% annual chance floodplain.* See Figure 10 for details.

6.0 CONCLUSIONS

General

Based on the results of the field investigation and the laboratory testing program, in our opinion, the site is both geotechnically and geologically suitable for the proposed new school campus provided that the recommendations contained herein are implemented in the design and construction.

The primary geotechnical concern is the presence of highly expansive surface soils at shallow depths within the site. To reduce the shrinkage and swelling potential, special provisions in the site preparation and under-slab measures will be necessary. A moderate to major earthquake on the Maacama-West Napa-Franklin-Calaveras fault system, the San Andreas fault, or the Hayward-Rogers Creek fault system could cause strong to violent ground shaking at this site. The potential for surface fault rupture to impact the site is deemed low. The potentials for landsliding, liquefaction, lateral spreading, debris flows, and flooding are also deemed low at the site.

Site Preparation and Grading

Based on preliminary grading plans by aedis architects, cuts and fills required to achieve the final pad grade are on the order of 6 feet or less. The near surface clayey soils encountered at the site could become unstable with the addition of excessive amounts of water should the grading occur during wet weather conditions. The ground surface needs to be stable prior to placement of structures, pavements, and additional fill. If excessive moisture content of the soil is found to be the cause of instability then the moisture content of the soil could be reduced by aeration, lime treatment, replacement of wet soil with dry soil, or addition of geotextiles. Recommendations for stabilization should be provided by the geotechnical engineer as needed during construction. Grading operations are discussed in detail in the *Recommendations* section of this report.

Soil Expansion Potential

Plasticity index tests performed on sample of the upper soils from the site resulted in liquid limits (LL) ranging from 44 to 54 and a plasticity indexes (PI) ranging from 24 to 35. These values indicate that the samples tested have a moderate to high expansion potential. This type of soils could undergo pronounced volume changes with moisture content fluctuations and when constrained they could exert significant uplift forces on the overlying structures.

In our experience, the commonly used engineering measures used to minimize post-construction distress to lightly loaded structures overlying expansive soils include one or a combination of the following:

- Increase the depth of footings to act as a moisture cutoff barrier and to support the loads on soils at depth which are less likely to undergo pronounced moisture content fluctuations;
- Pre-expand the near surface clays supporting slabs by compacting them at a high degree of saturation and relative compaction in the range of 88 to 92 percent;
- Add a layer of non-expansive soil layer on top of the expansive soils and support lightly loaded structures on non-expansive soil layer;

- Keep the soils moist until they are covered with concrete; and
- Manage surface water runoff to minimize post-construction moisture content fluctuations in soil.

Groundwater

Groundwater was encountered in five borings and three CPT soundings during our site explorations at depths ranging from 9.5 to 20 feet below the ground surface. Based on publicly available data from the State of California's GeoTracker database, groundwater near the site ranges from 6 to 15 feet below the ground surface, seasonally.

Groundwater is not anticipated to have an adverse effect on the construction or performance of the proposed improvements.

Static Settlement

The possibility of settlement is minimized by the light structural loads expected for the proposed development. Anticipated static settlements of the onsite native soils are on the order of 1 inch with a differential settlement between adjacent foundation elements of ½ inch.

Liquefaction

The site is not located in a seismic hazards zone for liquefaction as defined by state or local agencies. Additionally, due to the fine-grained nature of the subsurface soil, it is our opinion that the potential for liquefaction to occur at the site is low.

Foundations

Due to the stiff nature of the onsite soils, the proposed new campus buildings loads may be adequately supported on a conventional spread/strip type foundation system. However, due to the highly expansive nature of the on-site, near surface soils, it is recommended that the exterior foundations be deepened. Foundation recommendations are discussed in detail in the *Recommendations* section of this report.

Seismicity

The San Francisco Bay area is recognized by geologists and seismologists as one of the most seismically active regions in the United States. The significant earthquakes in this area are generally associated with crustal movement along well-defined, active fault zones which regionally trend in a northwesterly direction. Although research on earthquake prediction has greatly increased in recent years, seismologists cannot predict when and where an earthquake will occur. Nevertheless, based on current technology, it is reasonable to assume that the proposed development will be subjected to at least one moderate to severe earthquake during its lifetime. During such an earthquake, the danger from fault offset on the site is low, but strong shaking of the site is likely to occur and, therefore, the project should be designed in accordance with the seismic design provisions of the latest California Building Code. The California Building Code seismic design parameters are not intended to prevent structural damage during an earthquake, but to reduce damage and minimize loss of life.

7.0 RECOMMENDATIONS

Site Preparation and Grading

General Site Preparation

1. Site clearing, placement of fill, and grading operations at the site should be conducted in accordance with the recommendations provided in this report. Compaction recommendations for site grading can be found later in this section.

2. The site should be prepared for grading by removing structures and their associated foundations scheduled for demolition, existing flatwork, existing trees and their root systems, vegetation, debris, and other potentially deleterious materials from areas to receive improvements. Existing utility lines that will not be serving the proposed project should be either removed or abandoned. The appropriate method of utility abandonment will depend upon the type and depth of the utility. Recommendations for abandonment can be made as necessary.

3. Due to potential ground disturbance from potential demolition activities, a program of over-excavation and backfilling may be required. Loose, disturbed soil within the existing building areas should be cleaned out (excavated) to competent, undisturbed soil. Over-excavation of the upper 1 to 2 feet of existing ground may be needed. The lateral extent of the over-excavation should extend at least 5 feet beyond the perimeter of the proposed improvements, as determined in the field by the geotechnical engineering during grading operations. The exposed ground should be reviewed by the geotechnical engineer to determine the need for additional excavation work.

4. Ruts or depressions resulting from the removal of the previous building foundations, slabs, utilities, fill soils, tree root systems, and abandoned and/or buried structures, buried debris, and remnants of the former use of the site that are discovered during site grading should be removed and properly cleaned out down to undisturbed native soil. The bottoms of the resulting depressions should be scarified and cross-scarified at least 8 inches in depth, moisture conditioned and recompacted. The depressions should then be backfilled with approved, compacted, moisture conditioned structural fill, as recommended in other sections of this report.

5. Site clearing and backfilling operations should be conducted under the field observation of the geotechnical engineer.

6. The geotechnical engineer should be notified at least 48 hours prior to commencement of grading operations.

Compaction Recommendations

1. In general, the underlying native soil should be scarified at least 8 inches, moisture conditioned and recompacted to the recommended relative compaction presented below, unless noted otherwise. This scarification operation should be performed at locations designated for proposed structural fill, concrete slabs-on-grade, exterior flatwork, foundations, and pavement areas.

2. Recompacted native soils and fill soils should be compacted to a relative compaction ranging from 88 to 92 percent and at a moisture content at least 3 percentage points above optimum.

3. In areas to be paved, the upper 8 inches of subgrade soil should be compacted to a minimum 92 percent of maximum dry density at a moisture content at least 3 percentage points over optimum. The aggregate base courses should be compacted to a minimum 95 percent of maximum dry density at a moisture content that is slightly over optimum. The subgrade and base should be firm and unyielding when proof-rolled with heavy, rubber-tired equipment prior to paving. The pavement subgrade soils should be frequently moistened as necessary prior to placement of the aggregate base and concrete to maintain the soil moisture content above optimum.

Fill Recommendations

1. The on-site native and fill soils that are free of debris, excessive amounts of organics and other deleterious material, may be used as structural fill, but should not be placed within the upper 18 inches of the subgrade beneath building floor slab and exterior flatwork.

2. To reduce the effects of soil expansion and contraction on slabs-on-grade, the slabs should be constructed over a minimum of 18 inches of Class 2 aggregate base conforming with Section 26-1.02B of the Caltrans Standard Specifications. In-lieu of exporting the native expansive soil and importing non-expansive fill, the on-site top 18 inches of native soil could be mixed thoroughly with 5 percent quick lime (by dry unit weight of soil) and

compacted in place to a minimum of 90 percent relative compaction. The recommended percentage of lime is based on our experience with locally available lime and would need to be finalized prior to the mixing operation. Prior to placement of the non-expansive fill layer, the top 8 inches of subgrade soil should be scarified, moistened as necessary to maintain the soil moisture content at or above optimum, and compacted in-place to between 88 to 92 percent relative compaction at a minimum of 3 percent above optimum moisture content. Non-expansive imported material should also be used in areas to receive exterior concrete flatwork (refer to the Exterior Flatwork section of this report).

3. If fill is to be imported for general use or non-expansive fill at the site, it should meet the following criteria:
   a. Be coarse grained and have a plasticity index of less than 15 and/or an expansion index less than 20;
   b. Be free of organics, debris or other deleterious material;
   c. Have a maximum rock size of 3 inches; and
   d. Contain sufficient clay binder to allow for stable foundation and utility trench excavations.

4. A representative sample of the proposed imported soils should be submitted at least three days before being transported to the site for evaluation by the geotechnical engineer. During importation to the site the material should be further reviewed on an intermittent basis. Fill material conforming to Caltrans Class 2 aggregate baserock may be used at the site as general or non-expansive fill.

5. Should you choose to mix lime with in-place soils in-lieu of importing non-expansive fill, a sample of lime proposed to be used at the site should be provided a minimum of 2 weeks before importing to the site. This 2-week period will be required to complete the tests to finalize the percentage of lime required to achieve the optimum percentage of lime for use at the site.

Foundations

1. The proposed buildings may be supported by conventional strip/spread footings bearing on the stiff native or engineered fill material. The interior structural loads may be supported on spread and/or strip footing foundations extending a minimum of 30 inches below the finished floor elevations. However, the exterior perimeter foundations should consist of continuous strip footings extending a minimum 30 inches below the lowest adjacent soil pad grade. The footing excavations should be observed by the geotechnical engineer prior to placement of formwork or reinforcement.

2. The footings should be designed using a maximum allowable bearing capacity of 2,000 psf dead plus live load. This value may be increased by one-third when transient loads such as wind or seismicity are included.

3. The foundation excavations should be moisture conditioned over optimum to close any desiccation cracks prior to the placement of concrete, as recommended by the geotechnical engineer in the field. The geotechnical engineer should observe the foundation excavations prior to forming or placement of reinforcing steel to verify the adequacy of the conditioning or recommend additional moisture conditioning, if deemed necessary.

Retaining Walls

1. Retaining walls should be supported by conventional spread footings. The footings should have minimum depths of 30 inches below lowest adjacent grade and should bear in firm native soil or compacted engineered fill. The footing reinforcement should be specified by the design engineer. The footing excavations should be observed by the geotechnical engineer to verify penetration into firm native material prior to placement of formwork and should be moisture conditioned to close any desiccation cracks prior to concrete placement.

2. Footings should be designed using a maximum allowable bearing capacity of 2,000 psf dead plus live load. This value may be increased by one-third when transient loads such as wind or seismicity are included. Using these criteria, long term total and differential foundation settlements are expected to be on the order of ½ inch.

3. Resistance to lateral loads should be calculated based on a passive equivalent fluid pressure of 300 pcf and a friction factor of 0.3. Passive and frictional resistance can be combined in the calculations without reductions. These values are based on the assumption that backfill adjacent to foundations is compacted to the minimum recommended relative compaction values. The upper 12 inches of embedment should be disregarded in calculating passive resistance where concrete or asphalt pavement does not abut the foundation.

4. Lateral earth pressures for wall design should be based on the following parameters. For sloping backfill, the recommended active and at-rest pressures should be increased by 3 pcf for each 5 degree of slope:

Active equivalent fluid pressure (horizontal backfill)...........................	65 pcf
At-rest equivalent fluid pressure (horizontal backfill)..........................	80 pcf

5. If seismic forces are to be considered in the retaining wall design, the seismic increment of earth pressure should be 10H pounds per square foot, where H is the height of the retained soil. The seismic pressure should be applied uniformly on the back of the wall along the height of the retained material.

6. Retaining wall backfill should be fully drained utilizing either a free draining gravel blanket, permeable material, or a manufactured synthetic drainage system. Water from the drainage medium should be collected and discharged via either a rigid perforated pipe or weep holes. Collection pipes should be placed perforations downward near the bottom of the drainage medium and should discharge in a nonerosive manner away from foundations, slopes, and other improvements. Drainage medium consisting of a gravel blanket or permeable material should have a width of approximately 1 foot and should extend upward to within 1 foot of the top of the wall backfill. The upper foot of backfill over the drainage medium should consist of native soil to reduce the flow of surface drainage into the wall drain system. Gravel blankets should be separated from the backfill soil using a permeable synthetic fabric conforming to Caltrans Standard Specifications, Section 88-1.02B, Class A. Permeable material should conform to Section 68-2.02F(3), Class 2, of the Caltrans Standard Specifications. Manufactured synthetic drains such as Miradrain or Enkadrain should be installed in accordance with the recommendations of the manufacturer.

7. Water from the drainage medium can be drained using weep holes, provided that seepage at the base of the wall is acceptable. The weep holes should consist of minimum 1-½ inch diameter holes at 5-foot maximum spacings. The weep holes should be placed as low as possible on the wall. Corrosion-resistant screens or filter fabric should be placed behind the weep holes to reduce the chance of the drainage medium from washing out from behind the wall.

8. Retaining wall backfill should be placed in thin, moisture conditioned, lifts, compacted to a minimum 90 percent of maximum dry density, as tested by the geotechnical engineer.

9. The architect/engineer should bear in mind that retaining walls by their nature are flexible structures, and this flexibility can result in cracking of surface coatings. Where walls are to be plastered or will otherwise have a finish surface applied, this flexibility should be considered in determining the suitability of the surfacing material, spacing of horizontal and vertical joints, connections to structures, etc.

10. Long-term settlement of properly compacted sand or gravel retaining wall backfill should be assumed to be about ¼ percent of the depth of the backfill. Long-term settlement of properly compacted clayey retaining wall backfill should be assumed to be about ½ to 1 percent of the depth of the backfill. Improvements constructed near the tops of retaining walls should be designed to accommodate the estimated settlement.

Concrete Slab-on-Grade Construction

1. Interior slab-on-grade concrete should have a minimum thickness of 5 full inches and should be reinforced as directed by the architect/engineer.

2. Due to the high expansion potential of the soil, the top 18 inches of soil subgrade below the concrete floor at-grade slabs should consist of non-expansive fill as described under "Fill Recommendations" section of this report. In-lieu of excavating on-site soils and replacing it with non-expansive soils, the top 18 inches of soil subgrade below the design subgrade may be treated with 5 percent quick lime by dry unit weight of soil. For estimation purposes, the dry unit weight of native soil at the site may be assumed to be 120 pcf. Please contact our office if you choose to use the option of lime treatment, so we could perform necessary laboratory tests to determine the optimum percentage of lime that is needed.

3. Prior to placement of the non-expansive fill or aggregate base, the subgrade soil should be moistened as necessary to maintain the soil moisture content at or above optimum, and no desiccations cracks should be present.

4. For conventional interior slab-on-grade floor construction in areas which will receive carpet of other floor coverings or where moisture sensitive materials will be stored directly on the slab, a capillary break system that consists a vapor retarder and a 4-inch-thick, clean crushed rock layer should be placed above the pad subgrade to serve as a capillary break.

5. In order to minimize the migration of subgrade moisture a 15-mil thick vapor barrier that complies with ASTM Standard Specification E 1745-17 and the latest recommendations of ACI Committee 302 should be installed on top of the capillary break layer. The vapor retarder should be installed in accordance with ASTM Standard Practice E 1643-17. Care should be taken to properly lap and seal the vapor retarder, particularly around utilities, and to protect it from damage during construction.

6. A sand layer over the vapor retarder is optional. If sand, gravel or other permeable material is to be placed over the vapor retarder, the material over the vapor retarder should be only lightly moistened and not saturated prior to casting the slab. Excess water above the vapor retarder would increase the potential for moisture damage to floor coverings. Recent studies, including those by ACI Committee 302, have concluded that excess water above the vapor retarder would increase the potential for moisture damage to floor coverings and could increase the potential for mold growth or other microbial contamination. The concrete slab should be placed directly on top of the vapor retarded layer. However, placing the concrete directly on the vapor retarder would require special attention to concrete mix design, and finishing and curing techniques.

7. When concrete slabs are in direct contact with vapor retarders, the concrete water to cement (w/c) ratio must be correctly specified to control bleed water and plastic shrinkage and cracking. The concrete w/c ratio for this type of application is typically in the range of 0.45 to 0.50. The concrete should be properly cured to reduce slab curling and plastic shrinkage cracking. Concrete materials, placement, and curing methods should be specified by the architect/engineer.

Exterior Concrete Flatwork

1. Exterior flatwork that will not experience vehicular traffic should have a minimum thickness of 4 full inches and should be underlain by a minimum of 12-inch layer of compacted non-expansive material such as clean sand or aggregate base. In-lieu of using imported non-expansive material, the top 12 inches of soil subgrade may be lime-treated using 5 percent quick lime by dry unit weight of soil.

2. Assuming that movement (i.e., 1/4-inch or more) of exterior flatwork beyond the structure is acceptable, the flatwork should be designed to be independent of the building foundations. The flatwork should not be doweled to foundations, and a separator should be placed between the two.

3. To reduce shrinkage cracks in concrete, the concrete aggregates should be of appropriate size and proportion, the water/cement ratio should be low, the concrete should be properly placed and finished, contraction joints should be installed, and the concrete should be properly cured. Concrete materials, placement and curing specifications should be at the direction of the designer; ACI 302.1R-04 and ACI 302.2R-04 are suggested as resources for the designer in preparing such specifications.

Flexible Pavement Sections

1. The asphalt pavement design sections were developed using the State of California Highway Design Manual, Chapter 630-Flexible Pavement. Based on our experience with expansive soils, and based on the results of laboratory tests, an R-Value of 5 was used in the design of pavement sections. An R-Value of 50 was assigned to the lime-treated native soil (Option 2). Determination of the appropriate Traffic Index (TI) for each area to be paved should be established by the project Civil Engineer. The calculated Asphalt Concrete (AC) and aggregate base (AB) thicknesses are for compacted subgrade material. Normal Caltrans construction tolerances should apply. The aggregate base should conform to Caltrans Class 2.

Summary of Pavement Sections

Traffic Index	**Option 1 – w/o Lime Treated Subgrade R-Value = 5**		**Option 2 – With 12-inch Lime Treated Subgrade R-Value = 50**	
	Asphaltic Concrete (AC) inches	**Class II Aggregate Base (AB) inches**	**Asphaltic Concrete (AC) inches**	**Class II Aggregate Base (AB) inches**
4	3	6½	2½	4
4.5	3	8	2½	4
5.0	3½	8½	3	4
5.5	3½	10½	3	4
6.0	4	11½	3½	4
6.5	4	13½	3½	5
7.0	4½	14½	4	5

2. The upper 12 inches of native soil subgrade soil should be compacted to a minimum 92 percent of maximum dry density and the aggregate base courses should be compacted to a minimum 95 percent of maximum dry density. The subgrade and base should be firm and unyielding when proof-rolled with heavy, rubber-tired equipment prior to paving. The pavement subgrade soils should be frequently moistened as necessary prior to placement of the aggregate base to maintain the soil moisture content near optimum.

3. Pavement longevity will be enhanced if the surface grade drains away from the edges of the pavement. Finished AC surfaces should slope toward drainage facilities at 2 percent where practicable, but in no case, should water be allowed to pond.

4. Cutoff walls below curbs and around landscape islands may be used to extend the life of the pavement by reducing irrigation water and runoff that seeps into the aggregate base. Where utilized, cutoff walls should extend through the aggregate base to penetrate a minimum of 3 inches into the subgrade soils.

5. To reduce migration of surface drainage into the subgrade, maintenance of the paved areas is critical. Any cracks that develop in the AC should be promptly sealed.

Rigid Pavement Sections

1. Rigid Pavements should have a minimum thickness of 6 full inches with a minimum compressive strength of 3,000 psi and should be reinforced as directed by the architect/engineer. Rigid pavements should be cast on a minimum 6-inch layer of compacted Class 2 aggregate base (conforming with Section 26-1.02B of the Caltrans Standard Specifications) over a minimum of 18 inches of lime-treated on-site soil.

2. The lime-treated soil in the pavement areas should be compacted to a minimum 95 percent relative compaction and the aggregate baserock should also be compacted to a minimum of 95 percent relative compaction. The subgrade and base should be firm and unyielding when proof-rolled with heavy, rubber-tired equipment prior to paving. The pavement subgrade soils should be frequently moistened as necessary prior to placement of the aggregate base to maintain the soil moisture content slightly above optimum.

3. If the rigid pavements are to be subjected to traffic, such as where the rigid pavement is adjacent to flexible pavement, it is recommended that the thickness of the edges be increased by 20 percent and tapered back to normal slab thickness over a distance of 10 times the slab thickness.

Utility Trench Backfills

1. A select, noncorrosive, granular, easily compacted material should be used as bedding and shading immediately around utility pipes. The site soils may be used for trench backfill above the select material.

2. Trench backfill in the upper 12 inches of subgrade beneath pavement areas should be compacted to a minimum of 92 percent of maximum dry density at a moisture content at least 3 percentage points above optimum moisture content and the aggregate base courses should be compacted to a minimum 95 percent of maximum dry density at a moisture content slightly over optimum. Trench backfill in other areas should be

compacted to a minimum of 90 percent of maximum dry density at a moisture content at least 3 percentage points above optimum moisture content. Jetting of utility trench backfill should not be allowed.

3. Where utility trenches extend under perimeter foundations, the trenches should be backfilled entirely with approved fill soil compacted to a minimum of 90 percent of maximum dry density at a moisture content at least 3 percentage points above optimum moisture content. The zone of approved fill soil should extend a minimum distance of 2 feet on both sides of the foundation. If utility pipes pass through sleeves cast into the perimeter foundations, the annulus between the pipes and sleeves should be completely sealed.

4. Parallel trenches excavated in the area under foundations defined by a plane radiating at a 45-degree angle downward from the bottom edge of the footing should be avoided, if possible. Trench backfill within this zone, if necessary, should consist of Controlled Density Fill (Flowable Fill).

Surfacewater Drainage Management and Finish Improvements

1. Unpaved ground surfaces should be finish graded to direct surface runoff away from site improvements at a minimum 5 percent grade for a minimum distance of 10 feet. If this is not practical due to the terrain or other site features, swales with improved surfaces should be provided to divert drainage away from improvements. The landscaping should be planned and installed to maintain proper surface drainage conditions.

2. Runoff from driveways, roof gutters, downspouts, planter drains and other improvements should be collected in a closed pipe system which discharge in a non-erosive manner away from foundations, pavements, and other improvements.

3. Stabilization of surface soils, particularly those disturbed during construction, by vegetation or other means during and following construction is essential to protect the site from erosion damage. Care should be taken to establish and maintain vegetation.

4. Raised planter beds adjacent to foundations should be provided with sealed sides and bottoms so that irrigation water is not allowed to penetrate the subsurface beneath foundations. Outlets should be provided in the planters to direct accumulated irrigation water away from foundations.

5. Open areas adjacent to exterior flatwork should be irrigated or otherwise maintained so that constant moisture conditions are created throughout the year. Irrigation systems should be controlled to the minimum levels that will sustain the vegetation without saturating the soil.

6. Bio-retention swales constructed within 10 feet or less from the building foundation should be lined with a 20-mil pond liner.

Geotechnical Observation and Testing

1. It must be recognized that the recommendations contained in this report are based on a limited subsurface investigation and rely on continuity of the subsurface conditions encountered.

2. It is assumed that the geotechnical engineer will be retained to provide consultation during the design phase, to interpret this report during construction, and to provide construction monitoring in the form of testing and observation.

3. Unless otherwise stated, the terms "compacted" and "recompacted" refer to soils placed in level lifts not exceeding 8 inches in loose thickness and compacted to a minimum of 90 percent of maximum dry density. The standard tests used to define maximum dry density and field density should be ASTM D 1557-12 and ASTM D 6938-10, respectively, or other methods acceptable to the geotechnical engineer and jurisdiction.

4. Unless otherwise stated, “moisture conditioning” refers to adjusting the soil moisture to at least optimum moisture prior to application of compactive effort.

5. At a minimum, the following should be provided by the geotechnical engineer:
   - Review of grading and foundation plans as they near completion
   - Professional observation during site preparation, grading, and foundation excavation
   - Oversight of soil compaction testing during grading
   - Oversight of soils special inspection during grading

6. Special inspection of grading should be provided as per Section 1704A.9 and Table 1704A.9 of the CBC; the soils special inspector should be under the direction of the geotechnical engineer. The following operations should be subject to soils special inspection:

- Site preparation, scarification, moisture conditioning and compaction
- Over-excavation to the recommended depth
- Fill placement and compaction
- Proposed imported material
- Utility trench backfill compaction
- Pavement section construction

7. In our opinion, the following operations may be subject to *periodic* soils special inspection:
    - Site preparation,
    - Compaction of utility trench backfill,
    - Observation of foundation excavations,
    - Building pad moisture conditioning.

8. A preconstruction conference among a representative of the District, the geotechnical engineer, the soils special inspector, the architect/engineer, and contractors is recommended to discuss planned construction procedures and quality control requirements. The geotechnical engineer should be notified at least 48 hours prior to beginning grading operations.

9. If Earth Systems is not retained to provide construction observation and testing services, it will not be responsible for the interpretation of the information by others or any consequences arising there from.

8.0 CLOSURE

This report is valid for conditions as they exist at this time for the type of project described herein. Our intent was to perform the evaluation and study in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the locality of this project at this time under similar conditions. No representation, warranty, or guarantee is either expressed or implied. This report is intended for the exclusive use by the client as discussed in the Scope of Services section. Application beyond the stated intent is strictly at the user's risk.

If changes with respect to the project type or location become necessary, if items not addressed in this report are incorporated into the plans, or if any of the assumptions stated in this report are not correct, Earth Systems should be notified for modifications to this report. Any items not specifically addressed in this report should comply with the CBC and the requirements of the governing jurisdiction.

The preliminary recommendations of this report are based upon the geotechnical conditions encountered during the study and may be augmented by additional requirements of the architect/engineer, or by additional recommendations provided by Earth Systems based on conditions exposed at the time of construction.

This document, the data, conclusions, and recommendations contained herein are the property of Earth Systems. This report should be used in its entirety, with no individual sections reproduced or used out of context. Copies may be made only by Earth Systems, the client, and their authorized agents for use exclusively on the subject project. Any other use is subject to federal copyright laws and the written approval of Earth Systems.

Thank you for this opportunity to have been of service. Please feel free to contact this office at your convenience if you have any questions regarding this report.

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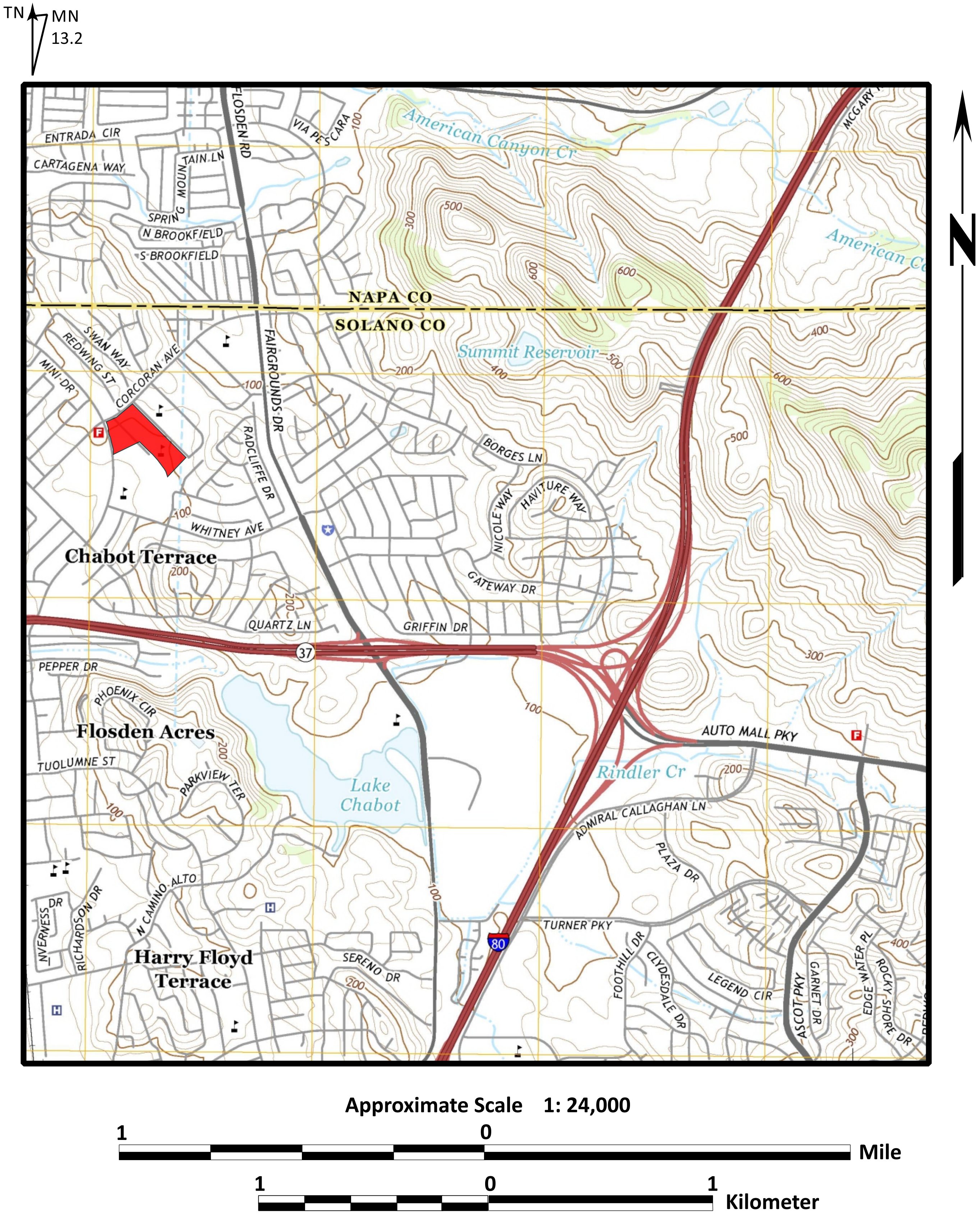
Aerial Photographs (Stereo Pairs)

Date	Scale	Type	Source	Ref. No.
1993-2018	variable	B&W/color	Google Earth®	v.7.1.5.1557

FIGURES

Figure 1

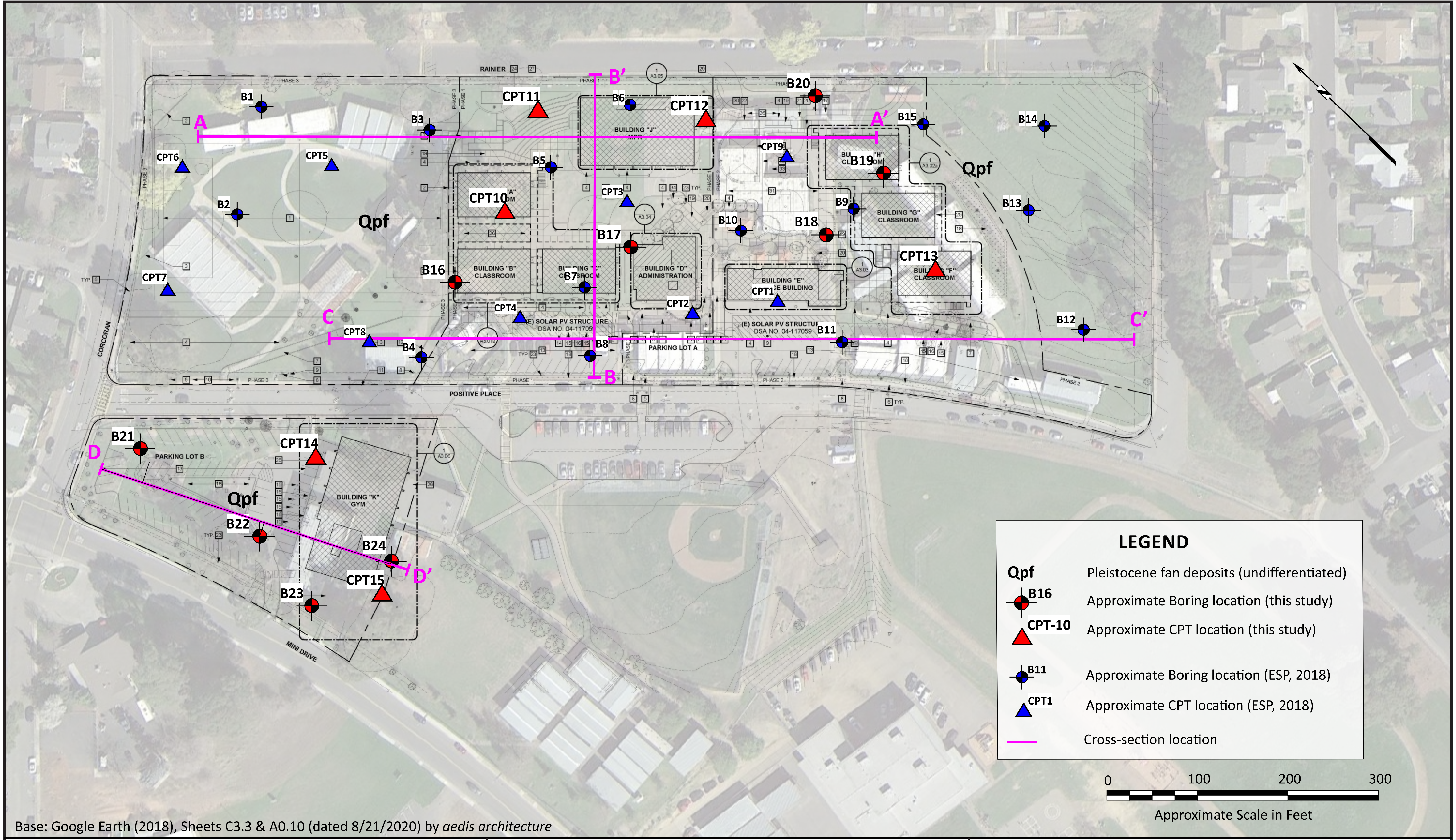


Approximate Scale 1: 24,000

Base: USGS 7.5 Minute Series, Cordelia Quadrangle (2015)

Earth Systems Pacific	Mare Island Technology Academy New Campus 1 & 2 Positive Place, Vallejo, California	**Vicinity Map** **302495-003**

Figure 2



LEGEND

Qpf	Pleistocene fan deposits (undifferentiated)
B16	Approximate Boring location (this study)
CPT-10	Approximate CPT location (this study)
B11	Approximate Boring location (ESP, 2018)
CPT1	Approximate CPT location (ESP, 2018)
	Cross-section location

Base: Google Earth (2018), Sheets C3.3 & A0.10 (dated 8/21/2020) by *aedis architecture*

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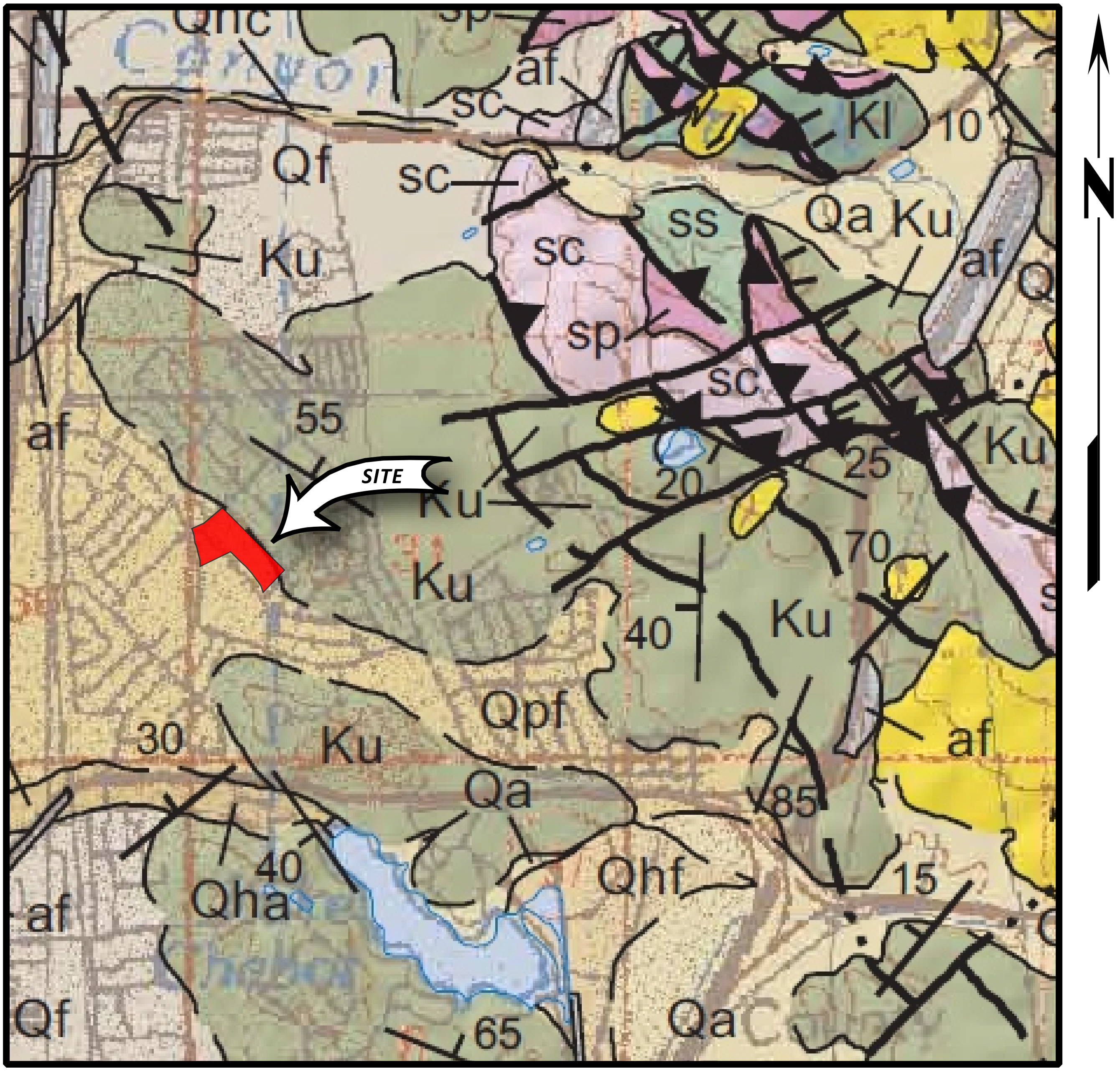
Site Plan and Geologic Map

File No. 302495-003

Figure 3



Base: Wagner & Gutierrez, 2010, Preliminary Geologic Map of the Napa 30'x60' Quadrangle, California; original scale 1:100,000

0 2000 4000 6000

Approximate Scale in Feet

af	Artificial fill
Qhc	Holocene channel deposits
Qha	Holocene alluvium
Qhf	Holocene fan deposits
Qf	Quaternary fan deposits
Qa	Quaternary alluvium
Qpf	Pleistocene fan deposits

Great Valley Sequence

Ku	Upper Great Valley Sequence
Kl	Lower Great Valley Sequence

Franciscan Complex

ss	Franciscan Sandstone
sp	Serpentinitized ultramafic rocks
sc	Silica carbonate Rocks

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Regional Geologic Map

File No: 302495-003

Figure 4

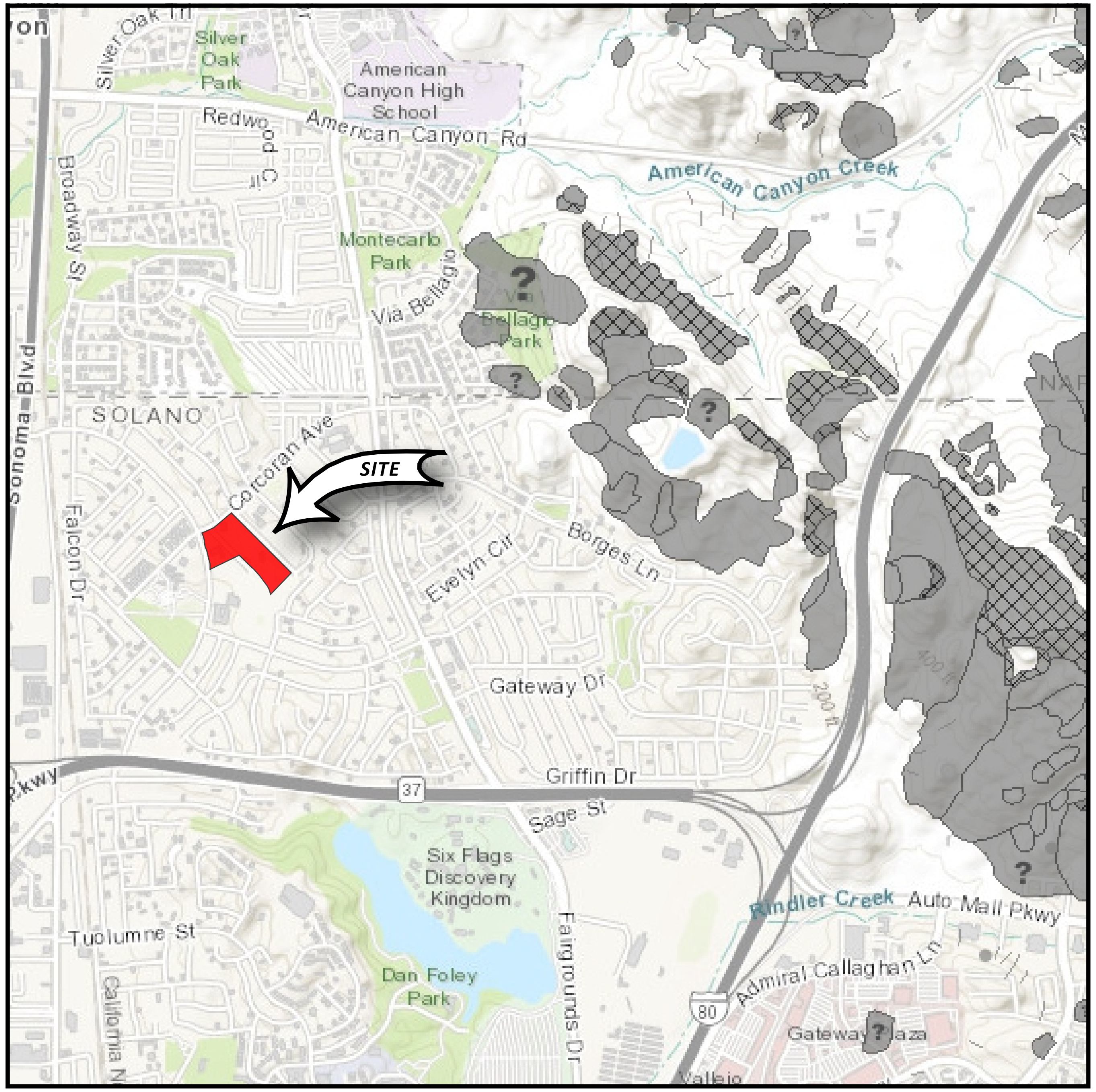

Figure 4A - CGS (2018) California Landslide Inventory, Scaled to approximately 1:24,000

▨ Landslide Source or Scarp

■ Landslide Deposit

— Linear Landslide

● Small Landslide

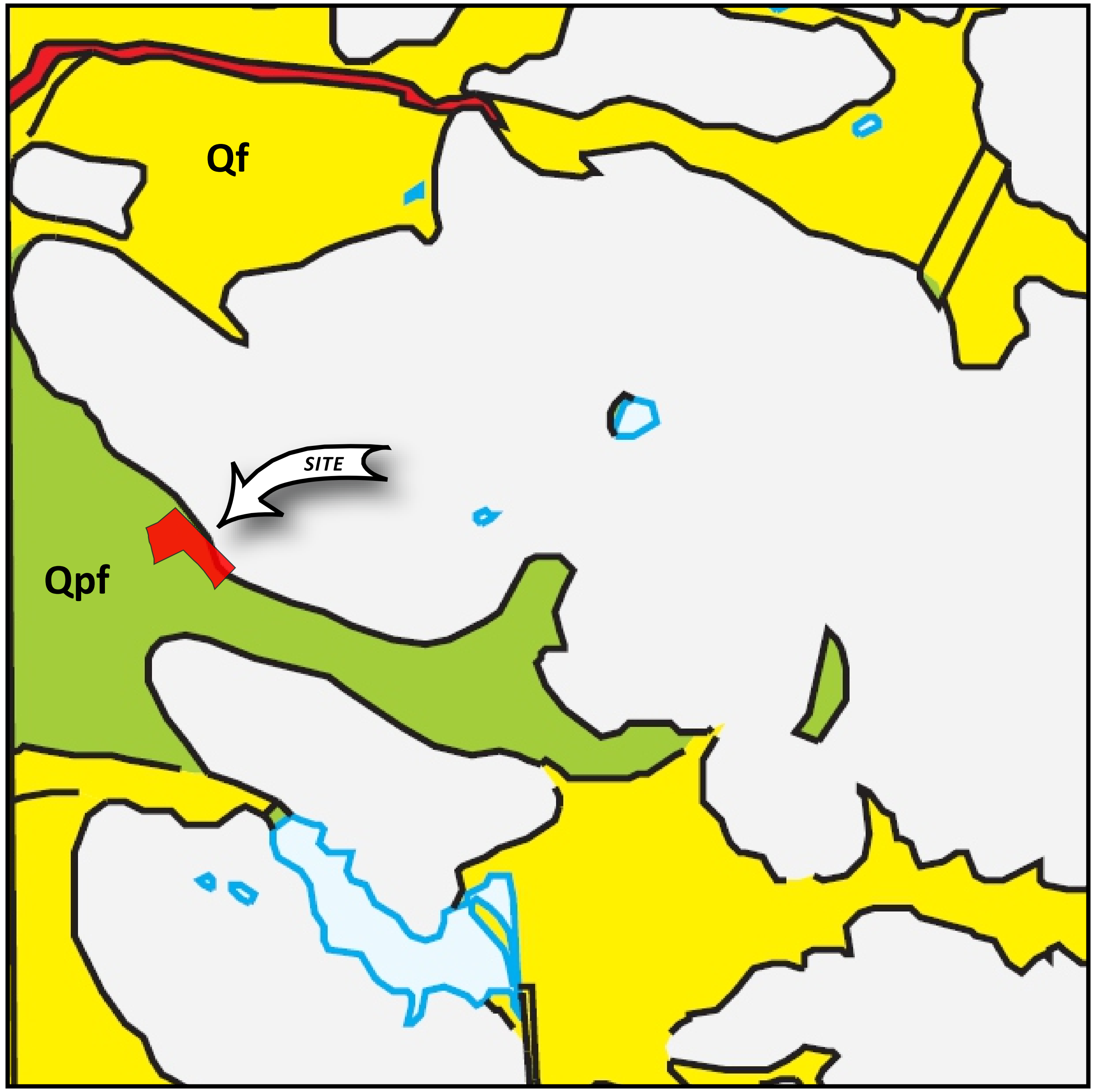

Figure 4B - USGS San Francisco Bay Region Liquefaction Susceptibility Map (2006); Scaled to approximately 1:24,000

Liquefaction Susceptibility

🟥	Very High
🟧	High
🟨	Moderate
🟩	Low
⬜	Very Low

Qf	Quaternary fan deposits (undifferentiated)
Qpf	Pleistocene fan deposits

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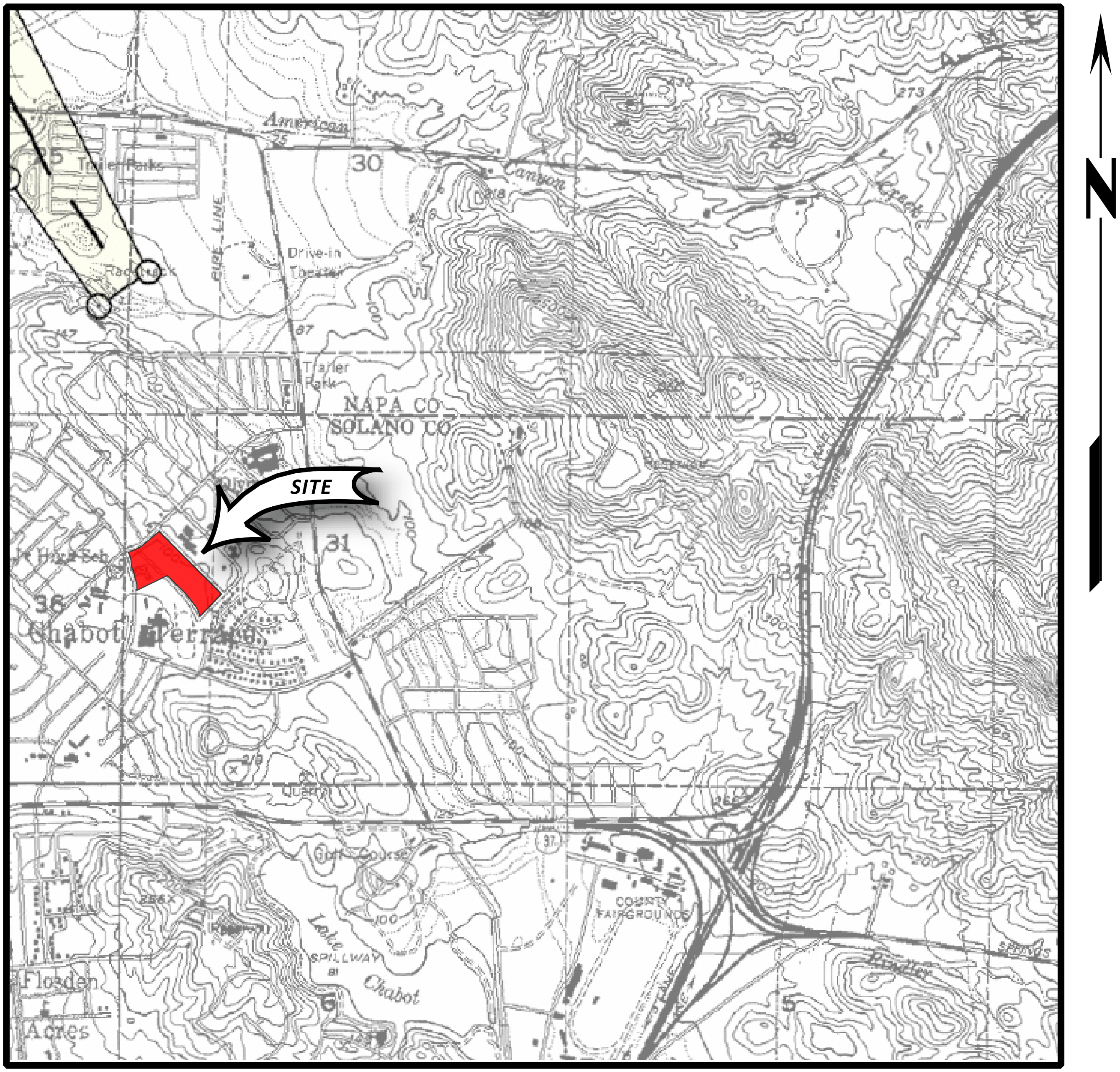
Vallejo, California

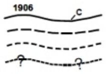
Seismic and Fault Hazard Maps

302495-003



Base: California Geological Survey (1993) - Revised Official Map; approx scale - 1:24,000

EARTHQUAKE FAULT ZONES



Active Fault Traces
Faults considered to have been active during Holocene time and to have 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 fault creep.

ZONES OF REQUIRED INVESTIGATION

🟨 **Earthquake Fault Zones**
Zones are areas delineated as straight-line segments that connect encircled turning points encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as defined in Public Resources Code Section 2621.5(a) would be required.

0 2000 4000 6000

Approximate Scale in Feet

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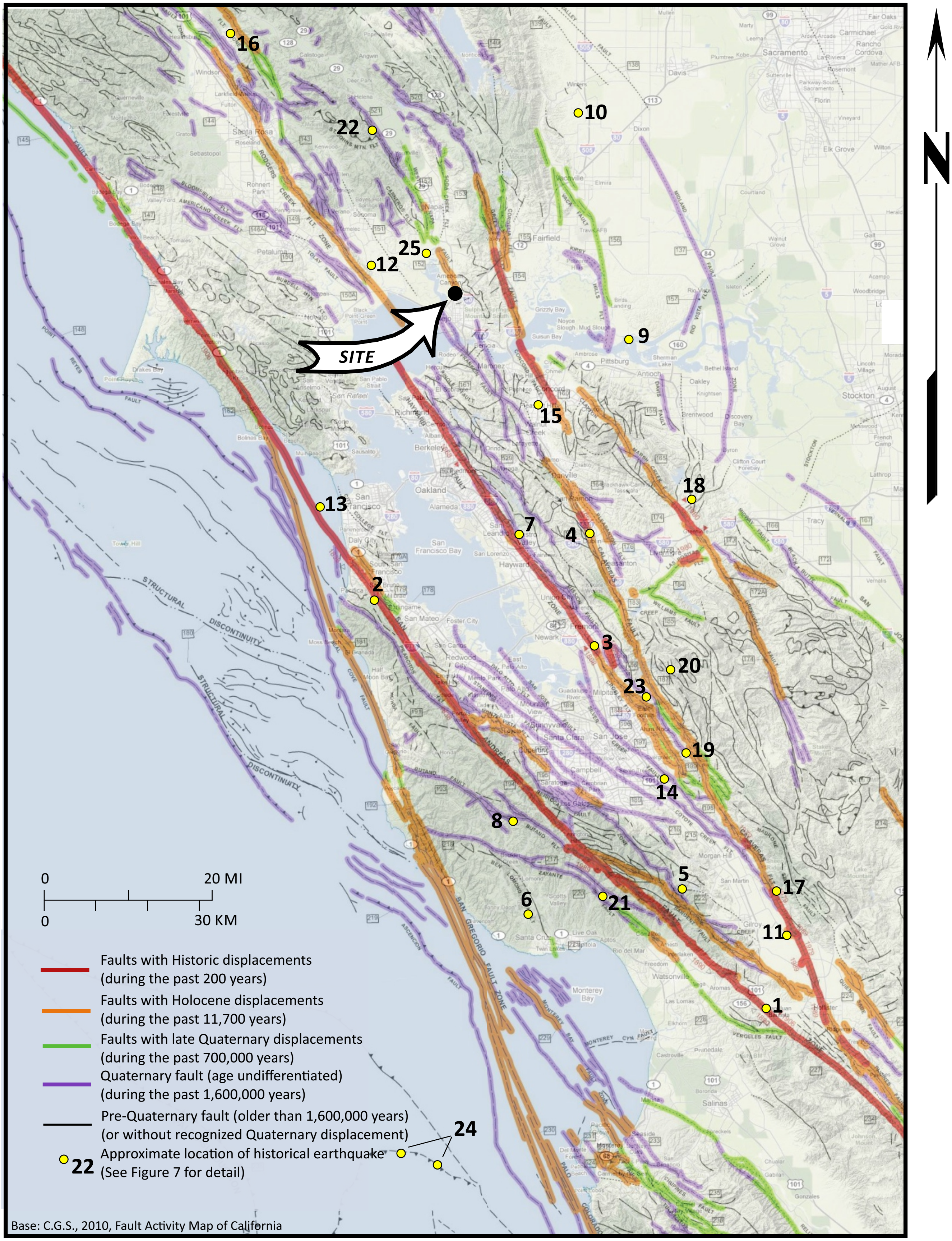
Earthquake Fault Zones Map

File No: 302495-003

Figure 6



Base: C.G.S., 2010, Fault Activity Map of California

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Regional Faults and Earthquakes

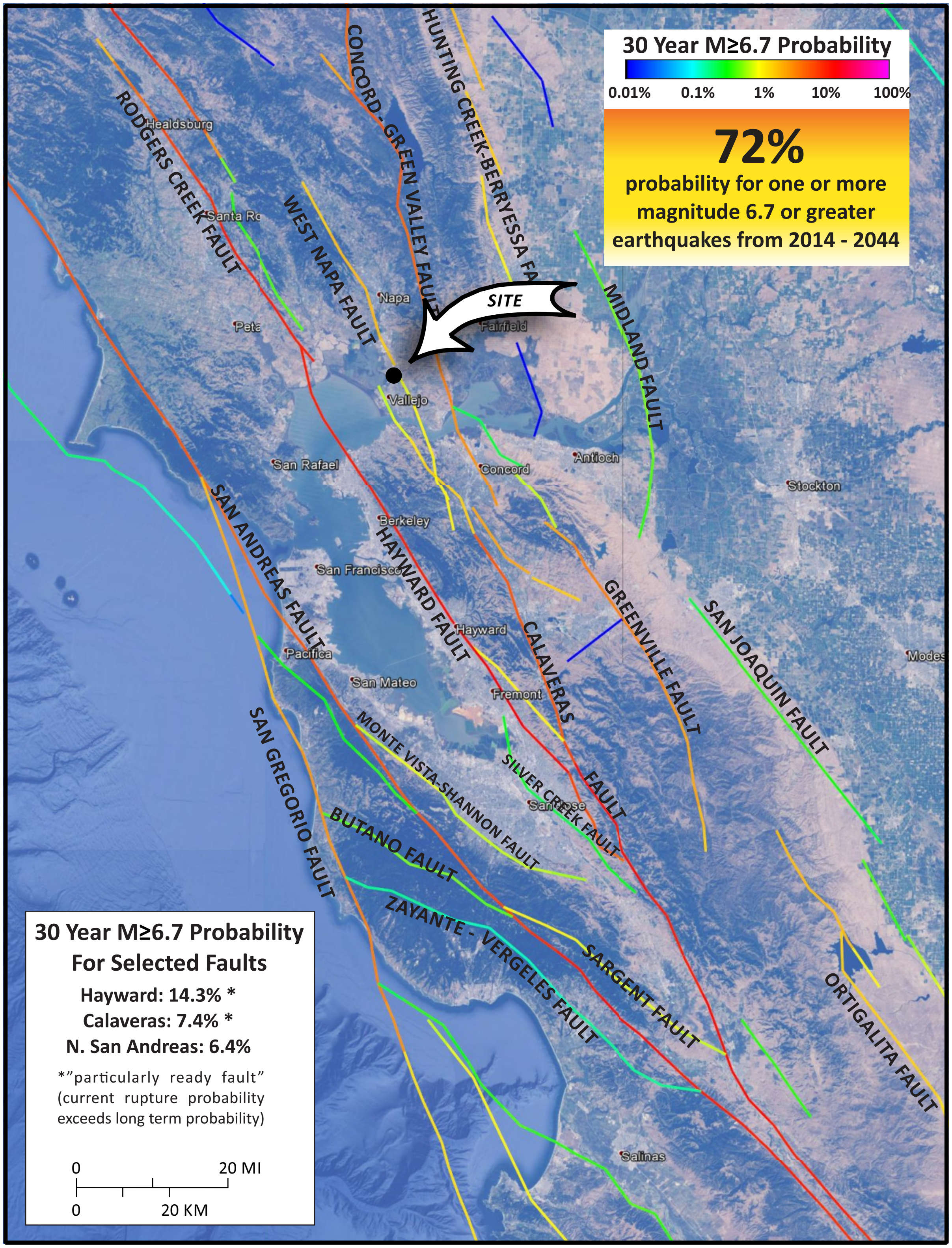
File No: 302495-003

Selected San Francisco Bay Area Earthquakes

Location Number (Refer to Figure 6)	Earthquake and Year	Magnitude Reported	Reference
1	Monterey Bay Area, 1836	M 6.8	Toppozada, 1998
2	San Francisco, 1838	M 7.0	Toppozada, 1981
3	Hayward, 1858	M 6.1	Toppozada, 1981
4	Calaveras-Dublin, 1861	M 5.9	Toppozada, 1981
5	Santa Clara Valley, 1864	M 5.9	Toppozada, 1981
6	Santa Cruz, 1865	M 6.3	Toppozada, 1981
7	Hayward, 1868	M 6.8	Toppozada, 1981
8	San Andreas, 1870	M 5.8	Toppozada, 1981
9	Antioch-Collinsville		
	1889	M 6.0	Toppozada, 1981
	1965	M 4.9	Toppozada, 1981
10	Vacaville-Winters, 1892	M 6.4	Toppozada, 1981
11	Calaveras, 1897	M 6.2	Toppozada, 1981
12	Mare Island, 1898	M 6.5	Goter, 1988
13	San Francisco, 1906	M 7.8	U.S. Geological Survey, 2010
14	San Jose, 1911	M 6.5	Toppozada and Parke, 1982
15	Concord, 1955	M 5.4	Tocher, 1959
16	Santa Rosa, 1969	M 5.6	Cloud, 1970
17	Coyote Lake, 1979	M 5.9	Hart, 1988
18	Greenville, 1980	M 5.8	Oppenheimer, 1990
19	Morgan Hill, 1984	M 6.2	Oppenheimer, 1990
20	Mount Lewis, 1986	M 5.7	U.S. Geological Survey, 1989
21	Loma Prieta, 1989	M 7.1	U.S. Geological Survey, 1989
22	Napa, 2000	M 5.2	U.S. Geological Survey, 2000
23	Calaveras Reservoir, 2007	M 5.4	U.S. Geological Survey, 2009
24	Monterey Bay		
	1926	M6.1	NCDEC, 2010
	1926	M6.1	NCDEC, 2010
25	South Napa, 2014	M6.0	U.S. Geological Survey, 2014

NOTE: Modified After Geomatrix, (1992); Update, USGS, 2014

Figure 8



Base: Working Group on California Earthquake Probabilities (2015)
Uniform California Earthquake Rupture Forecast 3 (UCERF3)
http://www.wgcep.org/UCERF3

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New Campus
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Earthquake Probability

File No: 302495-003

Figure 9

MODIFIED MERCALLI INTENSITY SCALE

MMI Value	Summary Damage Description Used on 1995 Maps	2003 Description of Shaking Severity	Full Description
I			Not felt. Marginal and long period effects of large earthquakes.
II			Felt by persons at rest, on upper floors, or favorably placed.
III			Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.
IV			Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV, wooden walls and frames creak.
V	Pictures Move	Light	Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.
VI	Objects Fall	Moderate	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Knicknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and Masonry D cracked. Small bells ring (church, school). Trees, bushes shaken (visibly or heard to rustle).
VII	Nonstructural Damage	Strong	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to Masonry D, including cracks. Weak chimneys broken off at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments). Some cracks in Masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.
VIII	Moderate Damage	Very Strong	Steering of motor cars affected. Damage to Masonry C; partial collapse. Some damage to Masonry B, none to Masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.
IX	Heavy Damage	Violent	General panic. Masonry D destroyed; Masonry C heavily damaged, sometimes with complete collapse; Masonry B seriously damaged. (General damage to foundations.) Frame structures, if not bolted, shifted off foundations. Frames cracked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluvial areas sand and mud ejected, earthquake fountains, sand craters.
X	Extreme Damage	Very Violent	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.
XI			
XII			Rails bent greatly. Underground pipelines completely out of service.

Masonry A:	Good workmanship, mortar, and design; reinforced, especially laterally, and bound together using steel, concrete, etc.; designed to resist lateral forces.
Masonry B:	Good workmanship and mortar; reinforced, but not designed to in detail to resist lateral forces.
Masonry C:	Ordinary workmanship and mortar; no extreme weaknesses like failing to tie in at corners, but neither reinforced nor designed against horizontal forces.
Masonry D:	Weak materials, such as adobe; poor mortar; low standards of workmanship; weak horizontally.

Source: Association of Bay Area Governments (2003)

Figure 10

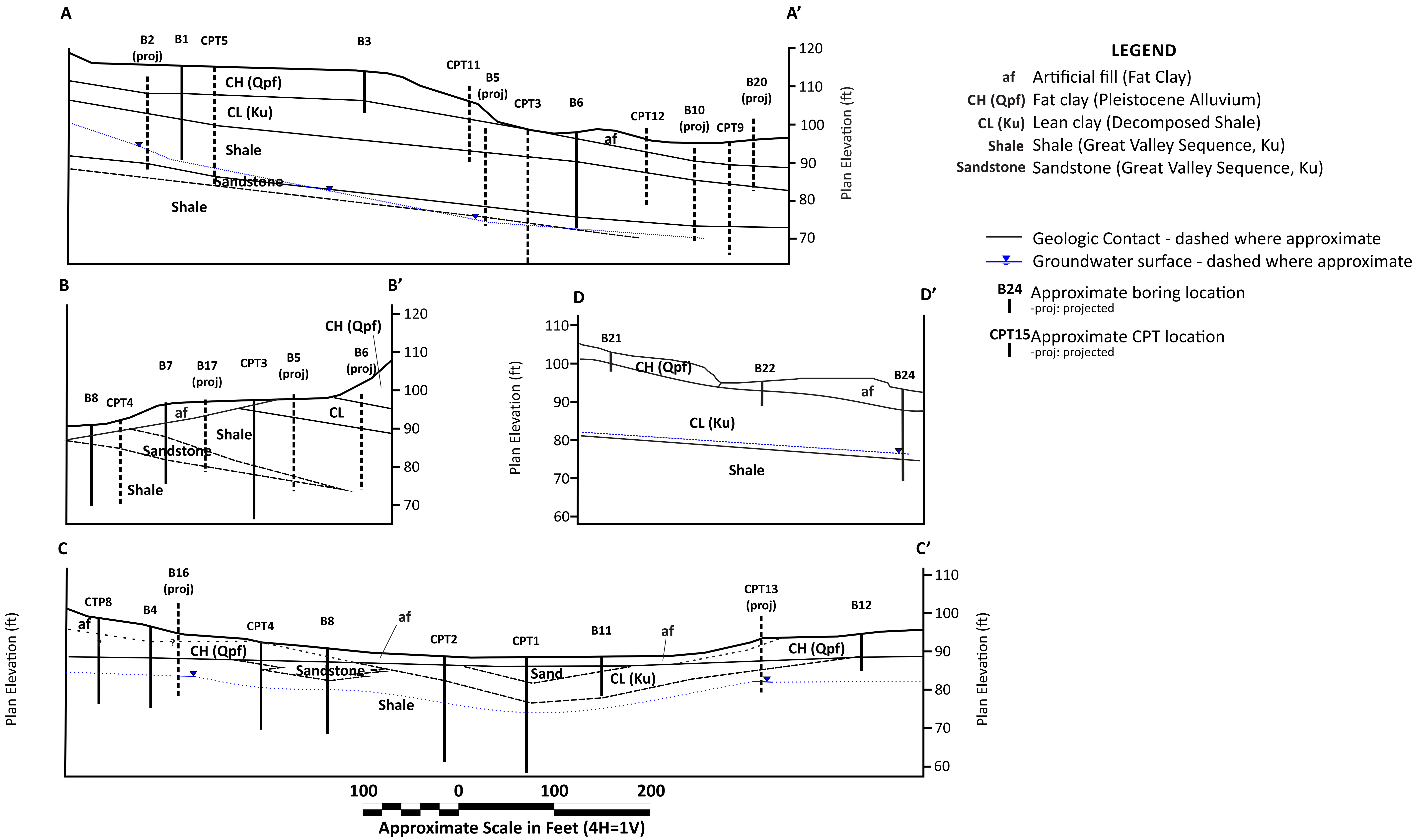
LEGEND

☐ **Zone X -** Areas outside the 0.2% annual chance floodplain

Base: FEMA Flood Insurance Rate Map, Santa Cruz County, California, Map No. 06095C0440F, June 9, 2014

Earth Systems Pacific	Mare Island Technology Academy New Campus 1 & 2 Positive Place, Vallejo, California	FEMA Flood Zone Map File No: 302495-003

Figure 11



Earth Systems Pacific

Mare Island Technology Academy - New Campus
1 & 2 Positive Place
Vallejo, California

Cross Sections A-A', B-B', C'C', and D-D'

302495-003

APPENDIX A

Boring and CPT Logs

Earth Systems Pacific

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

Boring No. 1

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/5/18

DEPTH (feet)	USCS CLASS	SYMBOL	Mare Island Technology Academy 1 & 2 Positive Place Vallejo, California SOIL DESCRIPTION	SAMPLE DATA INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	SANDY fat CLAY; very stiff, dark brown, moist, some gravel, rootlets, some orange and black mottling [Fill?]							
2	CH	▨	SANDY fat CLAY; very stiff, dark brown, moist, some gravel [Qpf] Normal Load=1500psf, Shear Stress=710psf -No gravel	1.0-2.5	1-1	■			8 10 9	>4.5
4		▨	Normal Load=3000psf, Shear Stress=2375psf	3.5-5.0	1-2	■			11 14 15	>4.5
7	CL	▨	SANDY lean CLAY; hard, light orange and brown, moist [decomposed SHALE]							
10		▨		8.5-10.0	1-3	■	110	17.0	11 16 25	>4.5
15	Bdrx	▨	SHALE; light orange brown, soft, plastic, highly weathered [Ku]	13.5-15.0	1-4	■			19 36 50/6"	
18		▨	-Gray to light orange brown, friable							
20		▨		18.5-20.0	1-5	■			23 38 50/5"	
24		▨		23.5-24.5	1-6	■			38 50/6"	
25			Bottom of boring at 24.5' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 2

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/5/18

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0 1 2	CH	▨	Fat CLAY with SAND; very stiff, brown, moist, gray and black mottling [Qpf] Normal Load=2000psf, Shear Stress=870psf	1.0-2.5	2-1	■			10 12 13	
3 4 5 6 7	CL	▨	SANDY lean CLAY; very stiff, orange brown, moist [decomposed SHALE] [LL = 48, PI = 27]	3.5-5.0	2-2	■	97	15.6	12 13 12	
8 9 10 11 12	Bdrx	⁙	SHALE; light orange to yellow brown, soft, friable, decomposed [Ku]	8.5-10.0	2-3	■	108	17.1	15 23 41	
13 14 15 16 17		⁙	-Severely weathered	13.5-14.5	2-4	■			43 50/3"	
18 19 20 21 22		⁙	-Wet ▼	18.5-20.0	2-5	●			14 14 20	
23 24	Bdrx	⁙	SANDSTONE; gray, firm, friable [Ku]	23.5-24.5	2-6	●			28 50/4"	
25 26			Bottom of boring at 24.5' Groundwater encountered at 18'							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 3

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/5/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	Fat CLAY with SAND; stiff, dark brown and brown mottled, moist [Fill]	0.0-6.0	Bag A	○				
2				1.0-2.5	3-1	■			8 6 8	>4.5
3	CH	▨	Fat CLAY with SAND; hard, dark brown, moist [NATIVE, Qpf]							
5				3.5-5.0	3-2	■			9 14 24	>4.5
7	CL	▨	Lean CLAY with SAND; very stiff, light orange brown, moist [decomposed SHALE]							
10				8.5-10.0	3-3	■			9 13 17	3.75
10			Bottom of boring at 10' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 4

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/5/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0		■	2" AC, 5" AB							
1 2 3 4	CH	▨	Fat CLAY with SAND; very stiff, dark brown, moist [FILL] -Brick in sampler Normal Load=2000psf, Shear Stress=870psf	1.0-2.5	4-1	■			7 8 12	4.0
5 6 7	CH	▨	Fat CLAY with SAND; very stiff, dark brown, moist [Qpf]	3.5-5.0	4-2	■	95	15.4	6 9 14	
8 9 10	Bdrx	▤	SHALE; gray, severely weathered, friable, moderately hard [Ku]	8.5-10.0	4-3	■			29 44 50/5"	
11 12 13 14 15		▤		13.5-15.0	4-4	●			23 32 50/5"	
16 17 18 19 20		▤	-Hard drilling	18.5-20.0	4-5	●			32 21 50/5"	
21 22 23 24 25 26			Bottom of boring at 21' due to auger refusal Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 5

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/6/18

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

				SAMPLE DATA						
DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	SM		SILTY SAND; medium dense, light yellow brown, moist, mostly fine sand [Fill]							
2	CL		SANDY lean CLAY; very stiff, light yellow brown, moist, mottled black and white, caliche [decomposed SHALE] Normal Load=1000psf, Shear Stress=620psf	1.0-2.5	5-1	■			11 12 14	
			-Claystone clasts Normal Load=2500psf, Shear Stress=2210psf	3.5-5.0	5-2	■			11 12 29	
6	Bdrx		SHALE; severely weathered, friable, light yellow brown, soft, mottled black and light orange brown [Ku]							
				8.5-10.0	5-3	■	112	17.3	18 24 33	
				13.5-15.0	5-4	●			19 28 41	
19	Bdrx		SANDSTONE; hard, orange brown, friable, moderately weathered [Ku]	18.5-19.5	5-5	●			15 50/6"	
23	Bdrx		SHALE; light yellow brown, severely weathered, friable [Ku] -Wet ▼	23.5-25.0	5-4	●			11 17 39	
25			Bottom of boring at 25' Groundwater at 24'							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 6

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/6/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	SANDY fat CLAY; stiff, dark brown, moist [FILL]							
2	CL	▨	Lean CLAY with SAND; very stiff, light yellow and orange brown, caliche [decomposed SHALE]	1.0-2.5	6-1	▬			6 8 10	3.75
5				3.5-5.0	6-2	▬	107	20.3	10 11 20	>4.5
8	Bdrx	⁝	SHALE; severely weathered, friable, light yellow brown [Ku]							
10			-Gray, highly weathered	8.5-10.0	6-3	▬	107	18.7	12 24 42	
14			-Moderately weathered	13.5-14.5	6-4	●			34 50/5.5"	
19			-Severely weathered	18.5-20.0	6-5	●			5 11 24	
24			-Moderately weathered	23.5-25.0	6-6	●			32 41 50/5"	
25			Bottom of boring at 25' Groundwater not encountered							

LEGEND: ▬ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 7

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/6/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	Fat CLAY with SAND; very stiff, dark brown, moist, rootlets [FILL]							
2		▨	Normal Load=5000psf, Shear Stress=560psf	1.0-2.5	7-1	▬			10 10 13	>4.5
3		▨	-More sand, some gravel, asphalt							
4		▨	Normal Load=2000psf, Shear Stress=2245psf	3.5-5.0	7-2	▬			12 9 5	
6	Bdrx	▨	SHALE; decomposed, friable, light yellowish gray [Ku]							
9		▨	-Severely weathered	8.5-10.0	7-3	▬	112	15.5	26 31 42	
10	Bdrx	▨	SANDSTONE; friable, dark orange brown to gray, moderately weathered [Ku]							
13		▨	-Severely weathered							
14		▨		13.5-15.0	7-4	●			24 24 35	
18	Bdrx	▨	SHALE; severely weathered, gray, friable [Ku]							
19		▨		18.5-19.5	7-5	●			42 50/4"	
21			Bottom of boring at 21' due to auger refusal Groundwater not encountered							

LEGEND: ▬ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 8

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/6/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0		■	3" AC, 10" AB							
1	CH	▨	Fat CLAY with SAND; very stiff, dark brown, moist [Fill?]	1.0-2.5	8-1	■			6 9 10	2.5
3	Bdrx	░	SANDSTONE; dark yellow brown, highly weathered, friable [Ku]	3.5-5.0	8-2	■			10 21 25	
8	Bdrx	▤	SHALE; yellow gray, moderately weathered, friable [Ku]							
9		▤	-Water in fractures	8.5-10.0	8-3	■	110	16.2	13 26 43	
14		▤	-Gray with orange brown in fractures	13.5-14.5	8-4	●			48 50/4"	
18		▤		18.5-19.0	8-5	●			50/6"	
22			Bottom of boring at 22' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 9

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/6/18

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

				SAMPLE DATA						
DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0		■	2" AC, 8" AB							
1	CH	▨	Fat CLAY with SAND; mostly stiff, dark gray brown, moist [Fill?] [LL = 61, PI = 40]	1.0-2.5	9-1	■	103	23.7	6 4 6	2.25
3	CL	▨	SANDY lean CLAY; stiff, yellow gray, moist [decomposed SHALE]	3.5-5.0	9-2	■	99	23.0	6 6 10	2.5
7	Bdrx	⁙	SHALE; severely weathered, friable, gray [Ku]	8.5-9.5	9-3	■			28 50/6"	
			Bottom of boring at 9.5' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 10

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/7/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	SANDY fat CLAY with GRAVEL; stiff, brown, moist [Fill?]							
1		▨								
2		▨	Normal Load=2500psf, Shear Stress=2300psf	1.0-2.5	10-1	■			6 6 8	
3	CL	▧	SANDY lean CLAY; very stiff, orangish to yellowish brown, moist [decomposed SHALE]							
4		▧	Normal Load=1000psf, Shear Stress=485psf	3.5-5.0	10-2	■			8 10 14	>4.5
5		▧								
6		▧								
7		▧								
8	Bdrx	▤	SHALE; highly fractured, severely weathered, gray to orange brown, friable to plastic, some caliche and oxidation in fractures [Ku]							
9		▤								
10		▤		8.5-10.0	10-3	■	106	18.7	13 22 27	
11		▤								
12		▤								
13		▤								
14		▤								
15		▤		13.5-15.0	10-4	●			30 27 39	
16		▤								
17		▤								
18		▤								
19		▤								
20		▤		18.5-20.0	10-5	●			17 31 50/6"	
21		▤								
22		▤								
23		▤								
24		▤	-Wet	23.5-24.0	10-6	●			50/6"	
25			Bottom of boring at 24' Groundwater encountered at 24'							
26										

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 11

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/7/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

				SAMPLE DATA						
DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0		■	2" AC, 8" AB							
1	CH	▨	SANDY fat CLAY with GRAVEL; stiff, brown, moist [Fill?]							
2	CL	▨	SANDY lean CLAY; very stiff, orangish to yellowish brown, moist [decomposed SHALE]	1.0-2.5	11-1	■	100	21.4	5 6 9	2.0
4			-Light yellow gray, caliche	3.5-5.0	11-2	■	100	24.3	7 9 14	2.75
7	Bdrx	⁝	SHALE; friable, severely weathered, yellowish gray, some sandstone present [Ku]							
10				8.5-10.0	11-3	■			13 42 50/5"	
10			Bottom of boring at 10' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▽ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 12

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/7/18

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	Fat CLAY with SAND; stiff, dark gray brown, moist [Qpf]	0.0-5.0	Bag B	○				
1										
2				1.0-2.5	12-1	■	94	14.8	7 8 9	>4.5
3			-Gray brown and very stiff							
4										
5				3.5-5.0	12-2	■	101	16..1	8 9 11	>4.5
6	Bdrx	▦	SHALE; light orangish brown to gray, friable, severely weathered [Ku]							
7										
8										
9										
10				8.5-10.0	12-3	■			14 22 26	
11			Bottom of boring at 10' Groundwater not encountered							
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 13

PAGE 1 OF 1

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

JOB NO.: 302495-001
DATE: 9/7/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	SC	▨	CLAYEY SAND with GRAVEL; yellow brown, mostly dense, moist [FILL]	0.0-5.0	Bag B	○				
2				1.0-2.5	13-1	■			5 7 9	
3	CH	▨	Fat CLAY with SAND; very stiff, gray brown, moist [Qpf]							
5				3.5-5.0	13-2	■			7 10 14	>4.5
8	Bdrx	▨	SHALE/SANDSTONE; friable, severely weathered [Ku]							
10				8.5-10.0	13-3	■			19 45 50/6"	
			Bottom of boring at 10' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 14

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/7/18

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CL	▨	CLAYEY SAND with GRAVEL; yellow brown, mostly dense, moist [Fill]	0.0-5.0	Bag C	○				
1									8 7	
2				1.0-2.5	14-1	■			10	4.5
3										
4			-More sand, abundant caliche and very stiff						11 15	
5				3.5-5.0	14-2	■			21	
			Bottom of boring at 5' Groundwater not encountered							
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 15

LOGGED BY: P. Penrose
DRILL RIG: CME-55
AUGER TYPE: 4" Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-001
DATE: 9/7/18

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	Fat CLAY with SAND; stiff, dark brown, moist, rootlets [Fill]							
1										
2				1.0-2.5	15-1	■			8 8 10	
3										
4										
5			Bottom of boring at 5' Groundwater not encountered	3.5-5.0	15-2	■			11 16 28	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 16

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-003
DATE: October 5, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	FAT CLAY; dark brown, slightly moist, very stiff; some fine to coarse sand, rounded sand							
2.5				1.5 - 3.0	16-1	■			8 13 16	> 4.5
5				3.5 - 5.0	16-2	■			12 15 20	> 4.5
6	CL	▨	SANDY LEAN CLAY; tan brown, slightly moist, hard, fine to coarse grained sand, sub angular to rounded [Decomposed SHALE]							
9.5				8.5 - 10.0	16-3	■	109.8	14.5	25 50/5"	
13			- light brown, increasing sand content							
14.5				13.5 - 15.0	16-4	■	118.9	12.8	25 64/6"	> 4.5
18			▼							
19	BDRX	▦	SHALE; yellowish brown, highly weathered, closely fractured [Ku]	18.5 - 20.0	16-5	■	104.4	20.8	20 50/2"	
24.5				23.5 - 25.0	16-6	●			25 30 30	
25			Bottom of boring at 25' Groundwater encountered at 18'							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 17

PAGE 1 OF 1

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

JOB NO.: 302495-003
DATE: October 5, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CL	▧	SANDY LEAN CLAY; dark brown, very stiff, slightly moist; trace gravel [Fill] [LL = 44, PI = 24]	0.0 - 3.0	B	○				
2	CL	▧	SANDY LEAN CLAY; brown, very stiff, slightly moist; trace gravel [Decomposed SHALE] - gravel lense, claystone gravel, caliche	1.5 - 3.0	17-1	▬	105.6	14.4	12 12 15	
4		▧	- brown	3.5 - 5.0	17-2	▬	116.0	9.6	20 50/6"	
8		▧	- increasing clay							
9		▧		8.5 - 10.0	17-3	▬	113.6	15.2	20 50/6"	
14		▧	- very moist						10 22 48	
15		▧		13.5 - 15.0	17-4	▬				
15	BDRX	⁝	SHALE; olive gray to yellowish brown, moderately weathered, closely fractured [Ku]							
18		⁝	▼							
19		⁝	- wet, decomposed claystone, brown	18.5 - 19.0	17-5	●			50/5.5"	
			Bottom of boring at 19' Groundwater encountered at 18'							
20–26										

LEGEND: ▬ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 18

PAGE 1 OF 1

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

JOB NO.: 302495-003
DATE: October 6, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	as	■	4" AC, 6" AB							
1	CH	▨	FAT CLAY; dark brown, moist, very stiff; trace sand, trace black mottling [Fill]	1.5 - 3.0	18-1	■	102.8	21.5	8 8 12	2.5
4	CL	▨	SANDY LEAN CLAY; orangeish brown, moist, very stiff, trace gravel, coarse rounded sand, trace gray mottling [Qpf] - decreasing sand	3.5 - 5.0	18-2	■	97.1	24.4	10 12 18	3.0
8	CL	▨	LEAN CLAY with GRAVEL; grayish orange, moist, hard, orange and gray mottling, claystone gravels, caliche [Decomposed SHALE]	8.5 - 10.0	18-3	■	106.1	20.0	15 20 35	
14	BDRX	▨	SHALE; yellowish brown, soft, highly weathered [Ku]	13.5 - 14.5	18-4	■			50/6"	
			Bottom of boring at 14.5' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 19

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-003
DATE: October 6, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
				SAMPLE DATA						
0	CH	▨	FAT CLAY; dark brown, slightly moist, very stiff; rootlets, trace sand, coarse sand, trace gray mottling [Fill]							
3		▨	- slight color change, lighter brown [LL = 53, PI = 35]	1.5 - 3.0	19-1	■			8 13 16	> 4.5
5		▨		3.5 - 5.0	19-2	■			12 15 20	
5	CL	▨	SANDY LEAN CLAY; orangeish brown, slightly moist, hard, white caliche [Qpf]							
9		▨	▼	8.5 - 10.0	19-3	■	106.5	20.7	12 20 20	
10	CL	▨	LEAN CLAY with GRAVEL; orange, moist, hard, tan gray mottling, moisture around gravels [Qpf]							
11	CL	▨	SANDY LEAN CLAY; orangeish brown, moist, trace gravels [decomposed SHALE]							
14	BDRX	░	SHALE; olive brown to yellowish brown, highly weathered, closely fractured [Ku]	13.5 - 15.0	19-4	■	110.9	15.7	30 50/4"	
19				18.5 - 19.0	19-5	●			50/4"	
19			Bottom of boring at 19' Groundwater encountered at 9.5'							

DEPTH scale (feet): 0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 14 - 15 - 16 - 17 - 18 - 19 - 20 - 21 - 22 - 23 - 24 - 25 - 26 -

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 20

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

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JOB NO.: 302495-003
DATE: October 6, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	as	■	4" AC, 5" AB							
1	CH	▨	FAT CLAY; dark brown, moist, very stiff; rootlets, trace sand [Fill?]							
2.5				1.5 - 3.0	20-1	■			7 9 11	
4	CL	▨	LEAN CLAY; orangeish brown, moist, very stiff, trace caliche [Decomposed SHALE, Qpf]	3.5 - 5.0	20-2	■			6 10 13	2.75
6			- increasing sand							
8	CL	▨	SANDY LEAN CLAY; grayish tan, hard, moist, trace caliche [decomposed SHALE]							
10				8.5 - 10.0	20-3	■	108.5	17.9	18 28 48	4.5
11			- decreasing sand							
14	BDRX	⁞	SHALE; olive brown to yellowish brown, moderatedly weathered, closely fractured, coarse siltstone gravel [Ku]	13.5 - 15.0	20-4	■	118.5	15.8	38 25 50/5"	
17			▼							
19			Bottom of boring at 19' Groundwater encountered at 17'	18.5 - 19.0	No recovery	■			50/4"	

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 21

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-003
DATE: October 5, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	FAT CLAY with SAND; dark brown, slightly moist, very stiff, fine to coarse sand [Qpf]							
1		▨								
2		▨		1.0 - 2.5	21-1	■	95.8	18.5	13 13 13	
3	CL	▨	LEAN CLAY; tan brown, slightly moist, hard, trace gravel, claystone clasts, white caliche [Decomposed SHALE]							
4		▨		3.0 - 4.5	21-2	■	108.0	16.5	14 24 50	
5			Bottom of boring at 4.5' Groundwater not encountered							
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Boring No. 22

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

PAGE 1 OF 1
JOB NO.: 302495-003
DATE: October 5, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	SAMPLE DATA						
				INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	as	■	4" AC, 4" AB							
1 2	CH	▨	FAT CLAY with SAND; dark brown, slightly moist, very stiff, fine to coarse sand [Fill]	1.0 - 2.5	22-1	■			10 12 12	> 4.5
3 4	CL	▨	LEAN CLAY; tan brown, slightly moist, hard, trace gravel, claystone clasts, white caliche [Decomposed SHALE]	3.0 - 4.5	22-2	■			10 15 28	> 4.5
5 6				5.0 - 6.5	22-3	■	104.6	16.2	15 25 30	
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26			Bottom of boring at 6.5' Groundwater not encountered							

LEGEND: ■ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 23

PAGE 1 OF 1

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

JOB NO.: 302495-003
DATE: October 5, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	FAT CLAY with SAND; dark brown, slightly moist, very stiff, fine to coarse sand [Fill] [LL = 54, PI = 32]							
1		▨		0.0 - 3.0	A	○				
2 - 3		▨		1.5 - 3.0	23-1	■	105.9	16.7	12 12 17	> 4.5
4 - 5		▨	- less dark in color	3.5 - 5.0	23-2	■	110.8	16.8	12 18 20	
5			Bottom of boring at 5' Groundwater not encountered							
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										

LEGEND: ■ 2.5" Mod Cal Sample ▭ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems Pacific

Boring No. 24

PAGE 1 OF 1

LOGGED BY: L. Becker
DRILL RIG: Soil Test Ranger/F-350 4x4
AUGER TYPE: 4.5-inch Solid Stem

JOB NO.: 302495-003
DATE: October 5, 2020

Mare Island Technology Academy
1 & 2 Positive Place
Vallejo, California

DEPTH (feet)	USCS CLASS	SYMBOL	SOIL DESCRIPTION	INTERVAL (feet)	SAMPLE NUMBER	SAMPLE TYPE	DRY DENSITY (pcf)	MOISTURE (%)	BLOWS PER 6 IN.	POCKET PEN (t.s.f)
0	CH	▨	FAT CLAY; dark brown, moist, hard; trace sand, rootlets [Fill]							
2 - 3		▨		1.5 - 3.0	24-1	▬	106.0	16.7	14 20 25	> 4.5
4 - 5		▨		3.5 - 5.0	24-2	▬	104.6	16.0	13 25 40	> 4.5
6	CL	▨	SANDY LEAN CLAY; tan brown, slightly moist, hard [Decomposed SHALE]							
8		▨	- more clay, white & yellow brown mottling							
9		▨		7.5 - 9.0	24-3	▬	106.6	16.5	10 21 25	
13		▨	- trace gravel, claystone gravel, caliche							
14 - 15		▨	▼	13.5 - 15.0	24-4	▬	112.0	16.3	22 64/6"	
19	BDRX	⁞	SHALE; yellowish brown, moderately to highly weathered, very closely fractured [Ku]	18.5 - 19.0	24-5	▬	110.3	16.4	80/4"	
24		⁞		23.5 - 24.0	24-6	●		16.3	50/4"	
25			Bottom of boring at 24' Groundwater encountered at 15'							

LEGEND: ▬ 2.5" Mod Cal Sample ☐ 2.0" Cal Sample ● SPT ○ Bulk Sample ▼ Groundwater

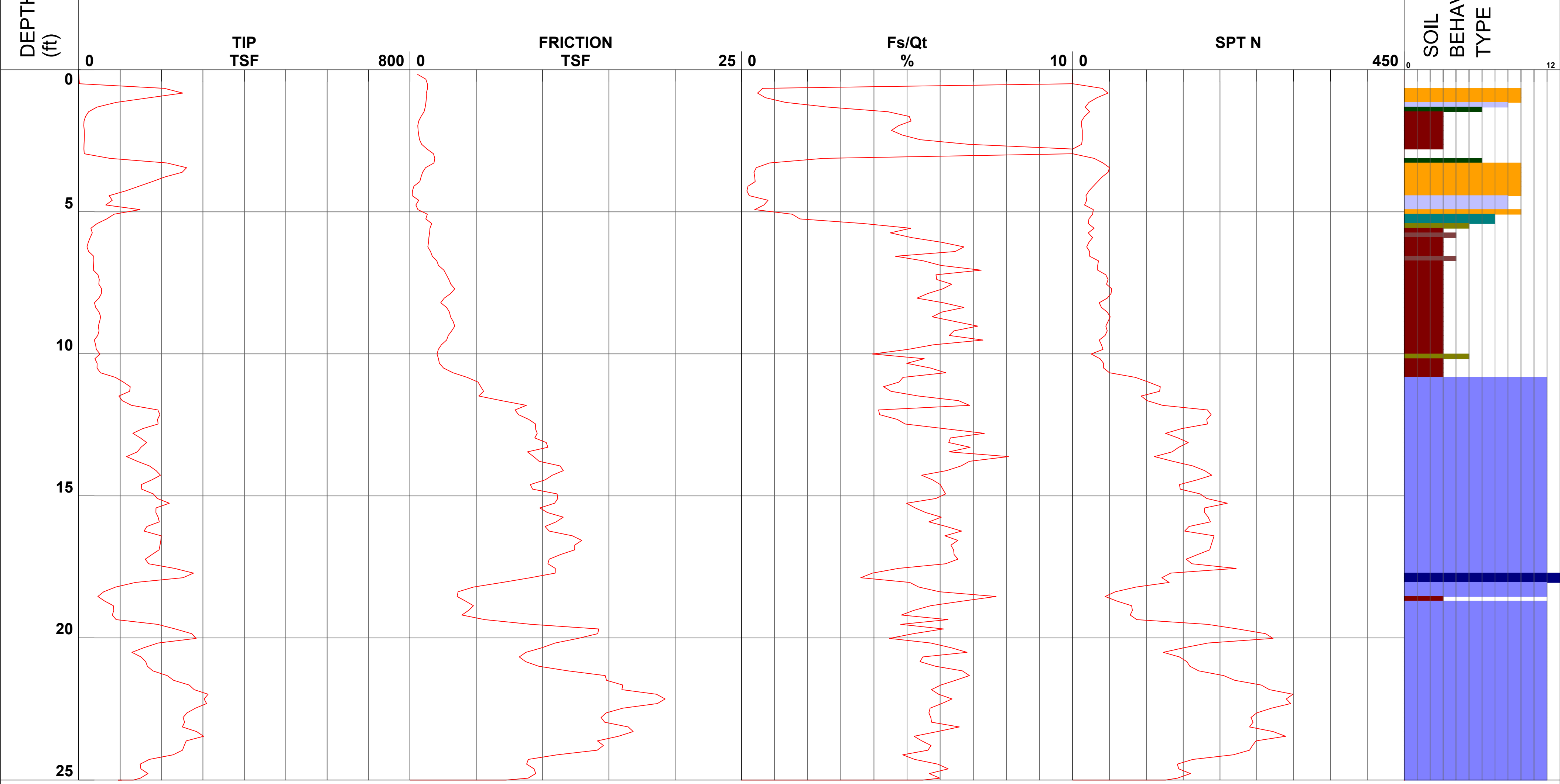
NOTE: This log of subsurface conditions is a simplification of actual conditions encountered. It applies at the location and time of drilling. Subsurface conditions may differ at other locations and times.

Earth Systems

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-01
EST GW Depth During Test 13.00 ft
Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 7:18:06 AM
Filename SDF(088).cpt
GPS
Maximum Depth 25.59 ft

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

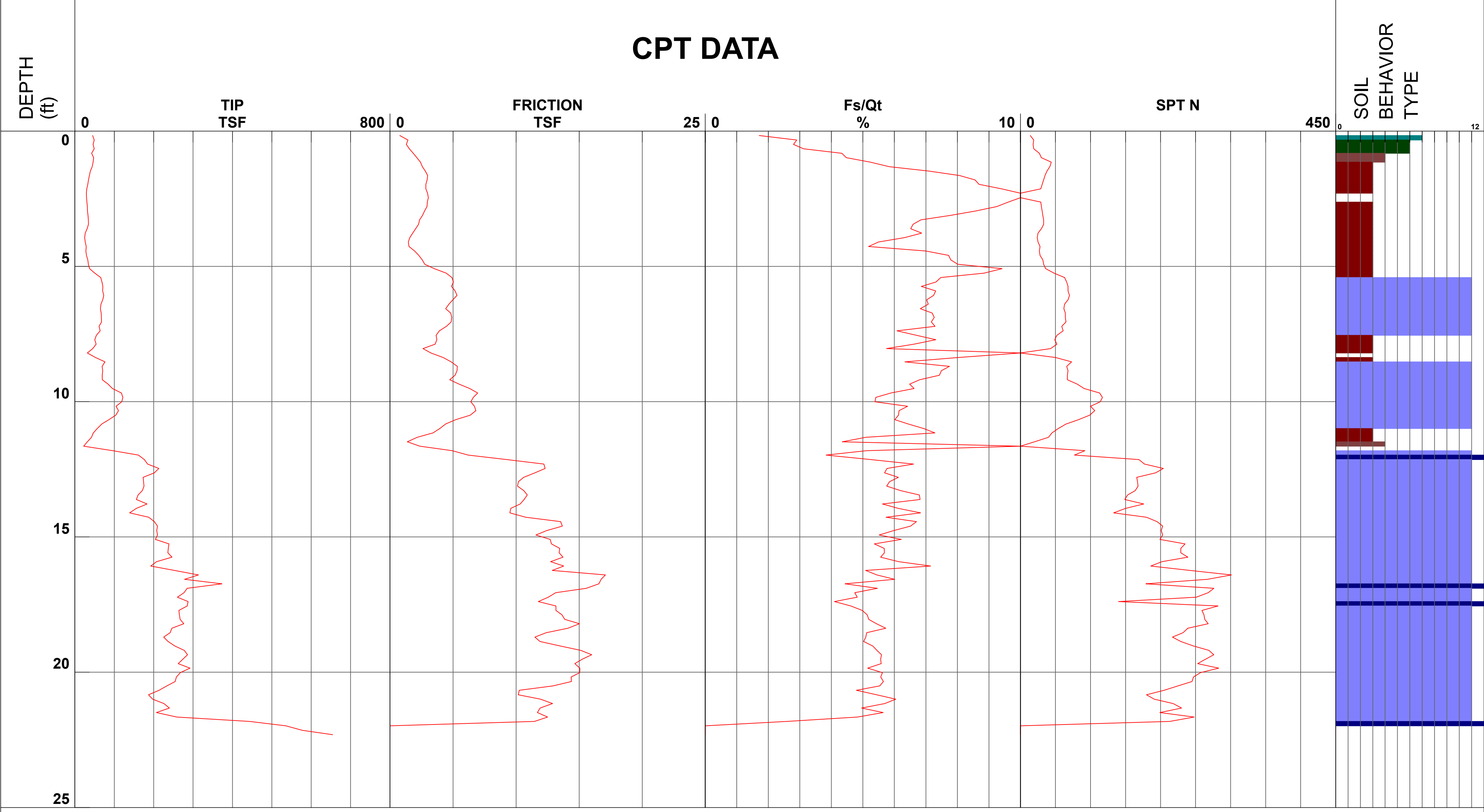
Earth Systems

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-02
EST GW Depth During Test 13.00 ft

Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 7:47:33 AM

Filename SDF(089).cpt
GPS
Maximum Depth 22.31 ft

Net Area Ratio .8



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Cone Size 15cm squared

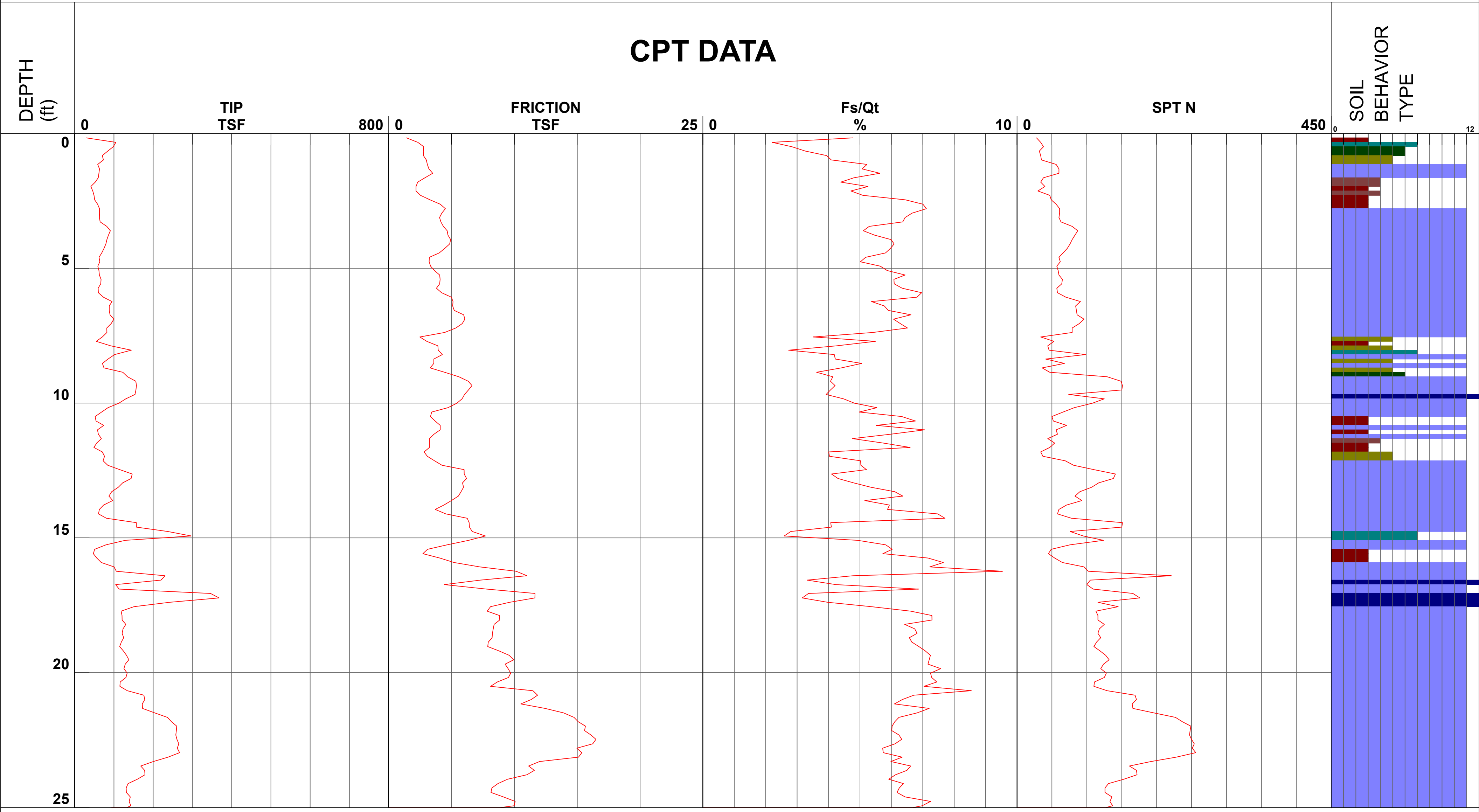
S*Soil behavior type and SPT based on data from UBC-1983

Middle Earth
Geo Testing Inc.

Earth Systems

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-03
EST GW Depth During Test 12.00 ft
Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 8:13:06 AM
Filename SDF(090).cpt
GPS
Maximum Depth 25.59 ft

Net Area Ratio .8



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

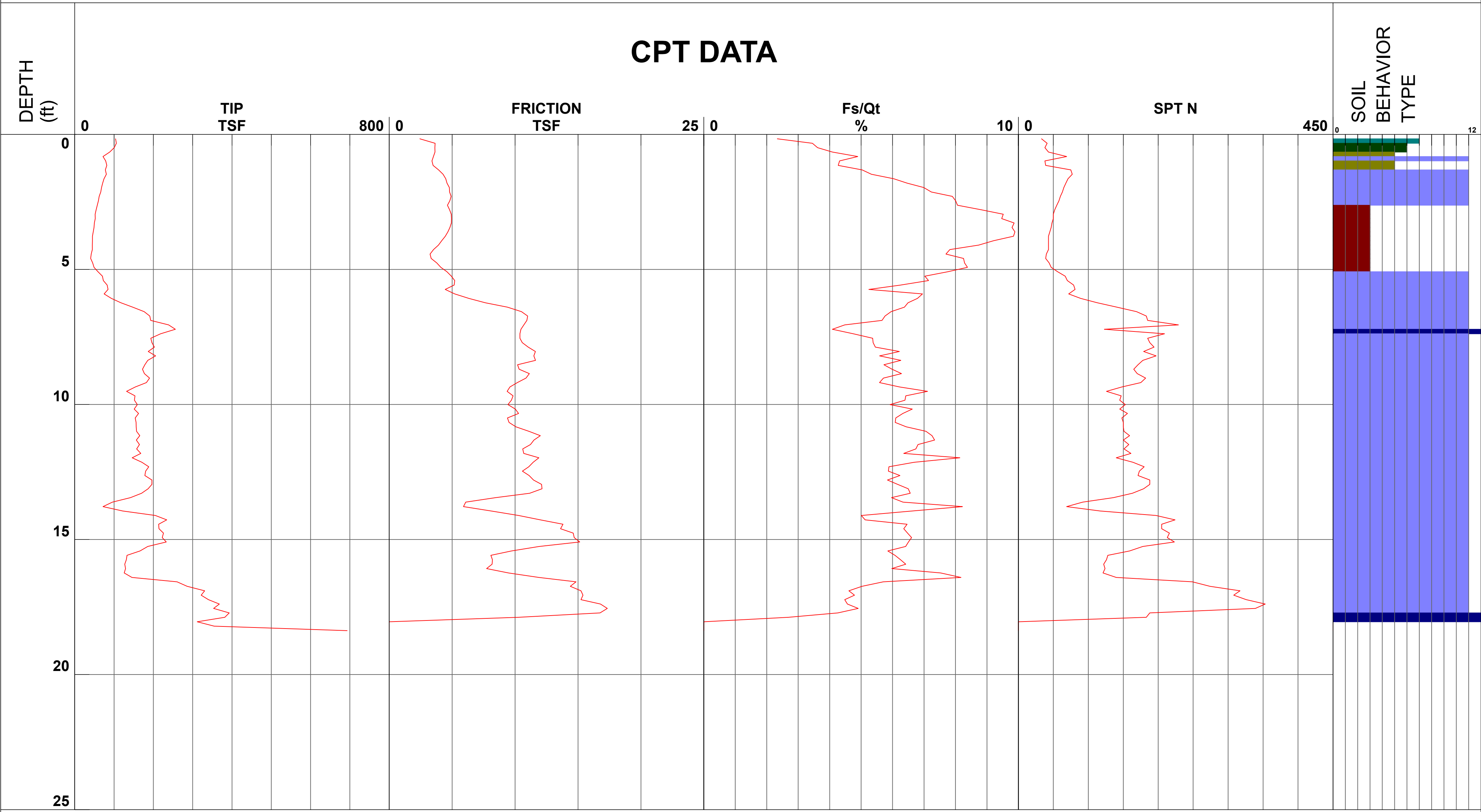
S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-04
EST GW Depth During Test 18.00 ft
Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 8:47:03 AM
Filename SDF(091).cpt
GPS
Maximum Depth 18.37 ft

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

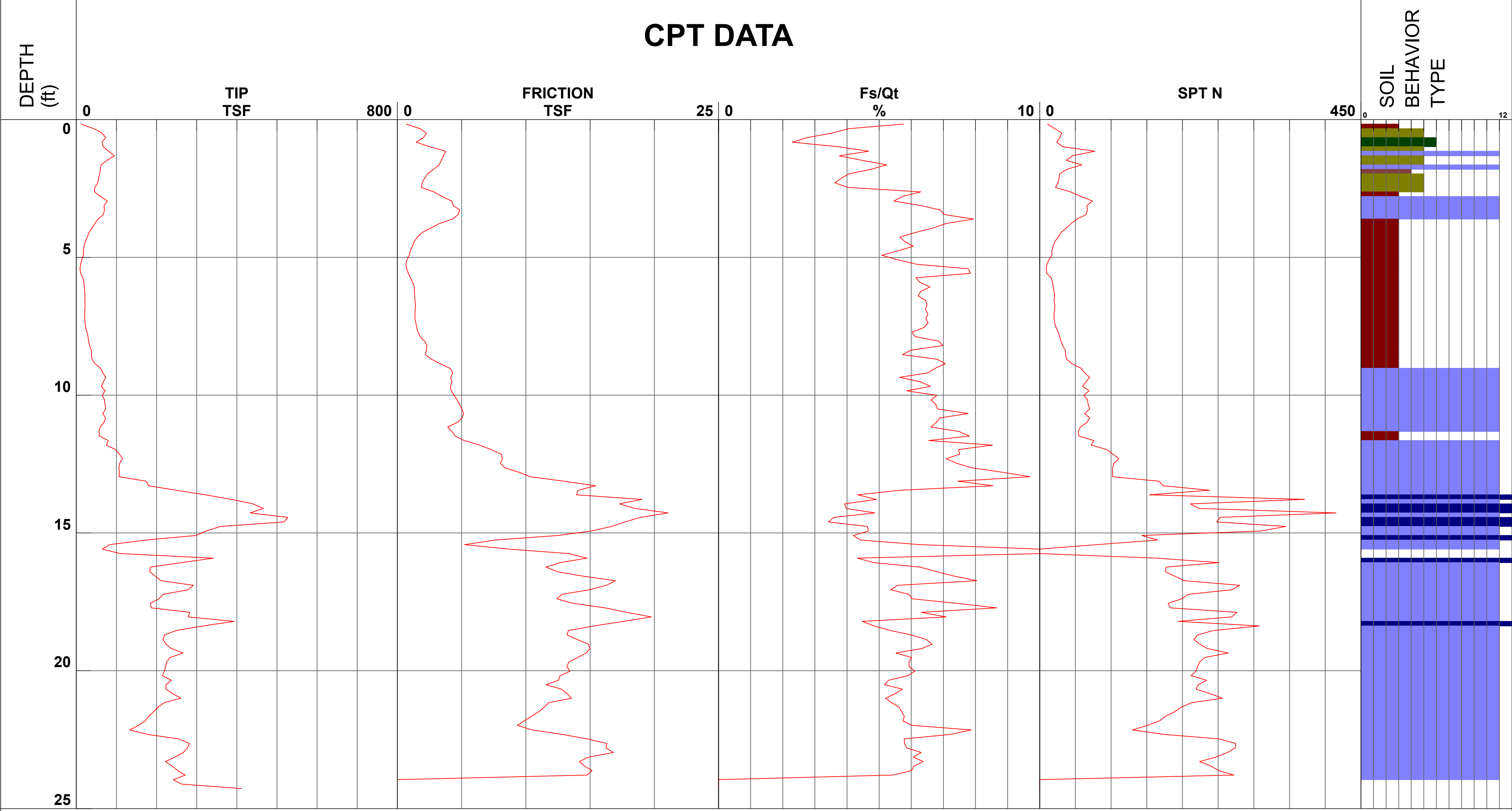
S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Project	Mare Island Technology New Campus	Operator	RB-JM	Filename	SDF(092).cpt
Job Number	302495-001	Cone Number	DDG1418	GPS	
Hole Number	CPT-05	Date and Time	9/24/2018 9:16:07 AM	Maximum Depth	24.28 ft
EST GW Depth During Test			20.00 ft		

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

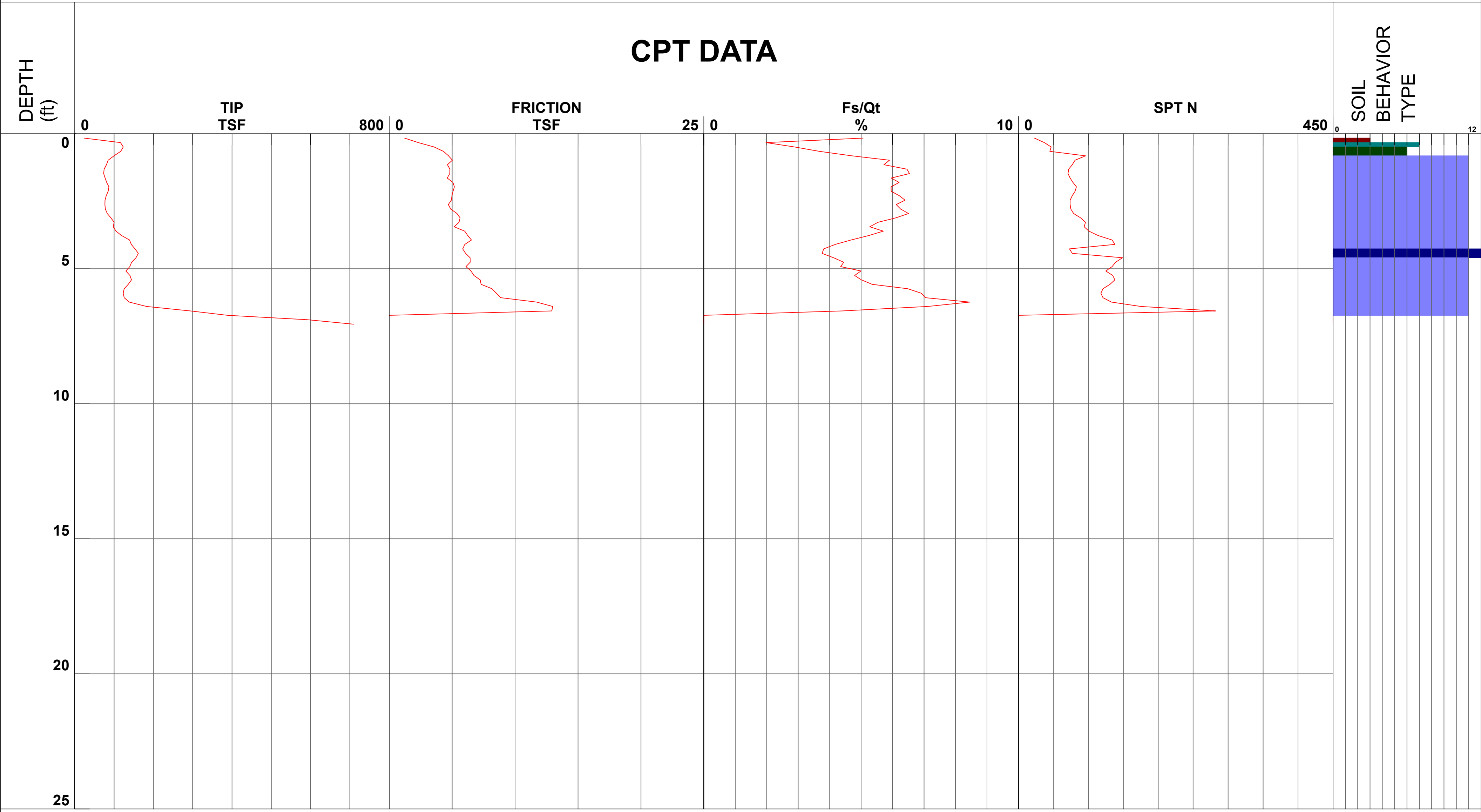
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-06
EST GW Depth During Test >7.05 ft
Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 9:49:13 AM
Filename SDF(093).cpt
GPS
Maximum Depth 7.05 ft

Net Area Ratio .8



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

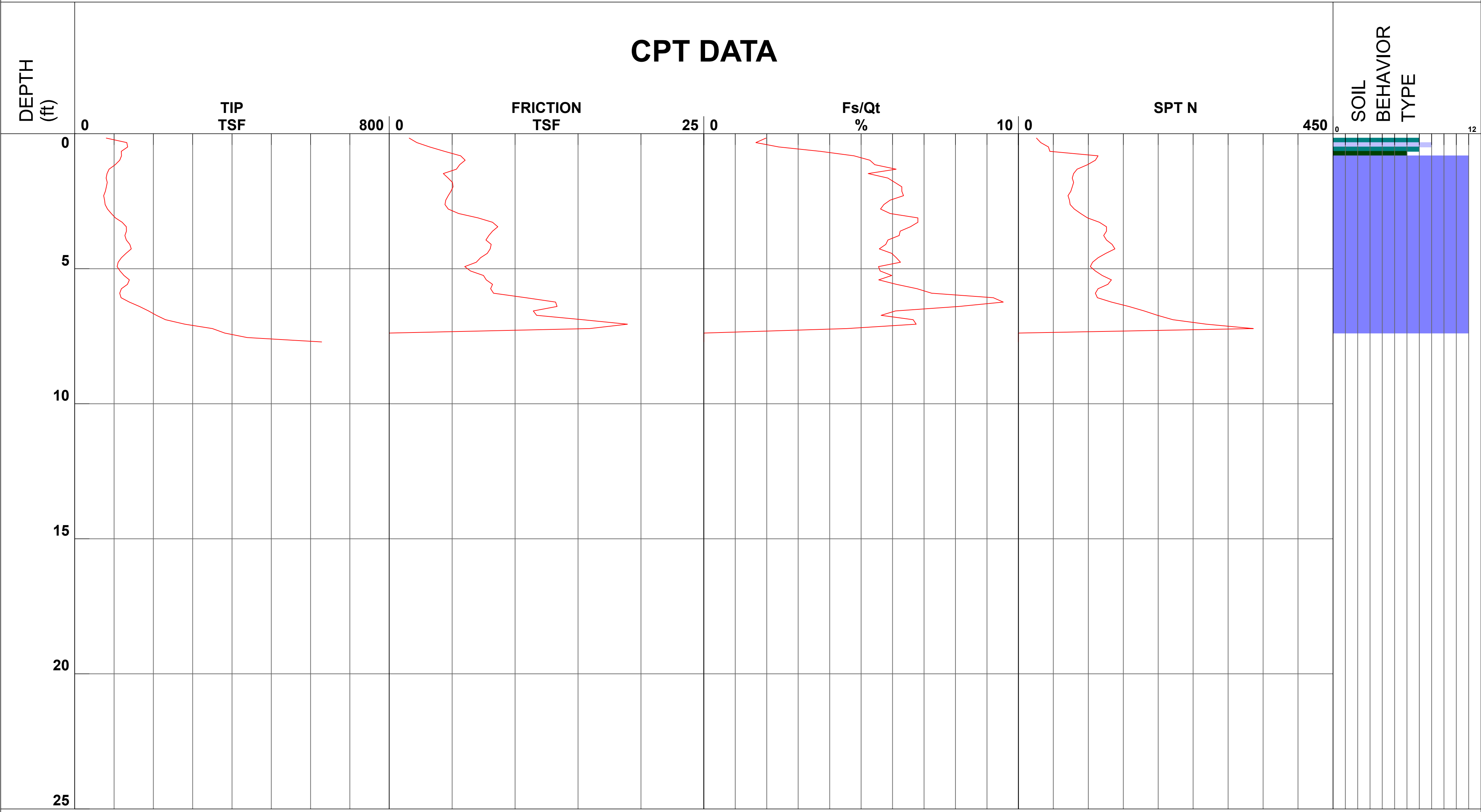
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-06A
EST GW Depth During Test >7.71 ft
Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 10:00:16 AM
Filename SDF(094).cpt
GPS
Maximum Depth 7.71 ft

Net Area Ratio .8



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

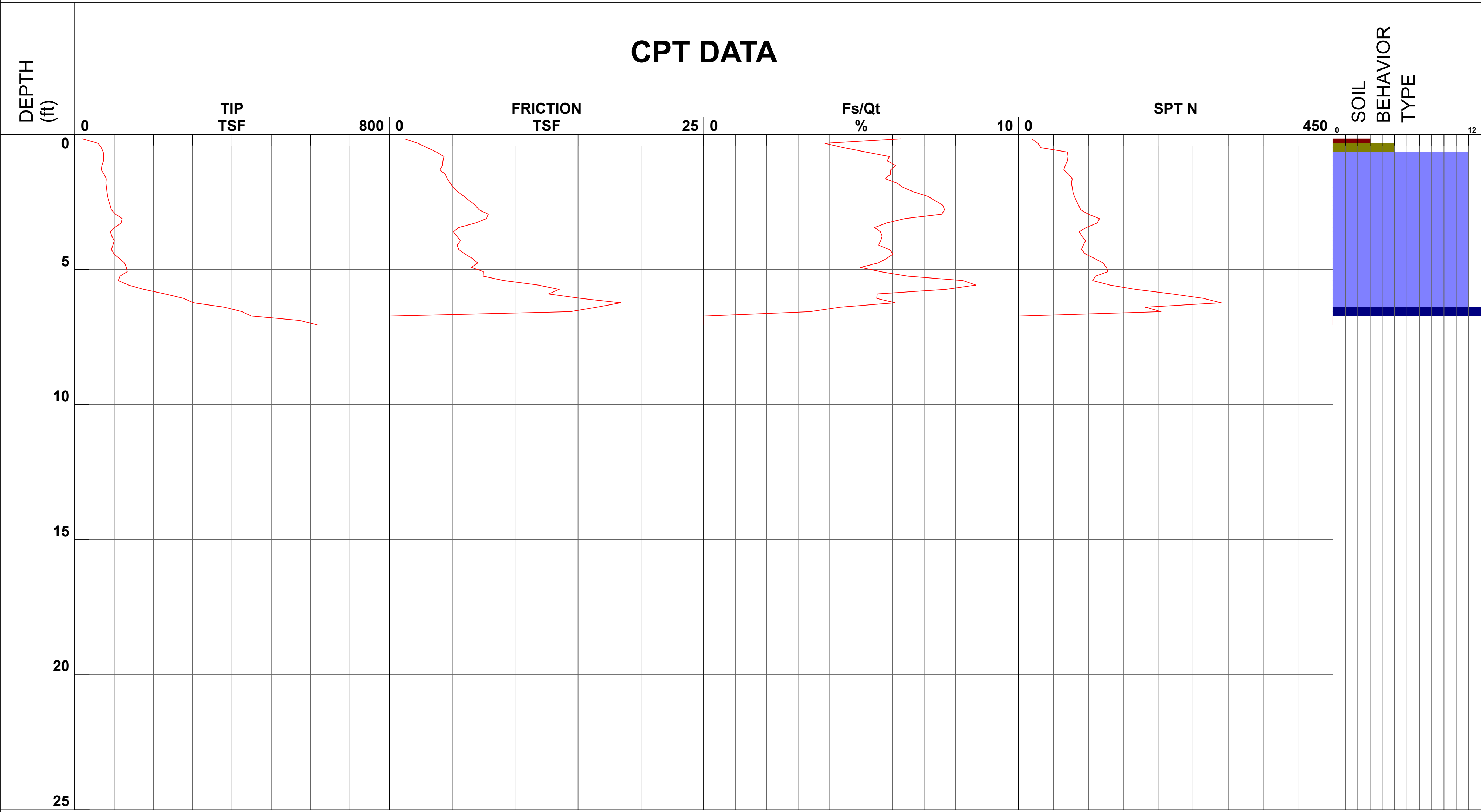
Earth Systems

Middle Earth
Geo Testing Inc.

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-06B
EST GW Depth During Test >7.05 ft
Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 10:09:19 AM
Filename SDF(095).cpt
GPS
Maximum Depth 7.05 ft

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Middle Earth Geo Testing Inc.

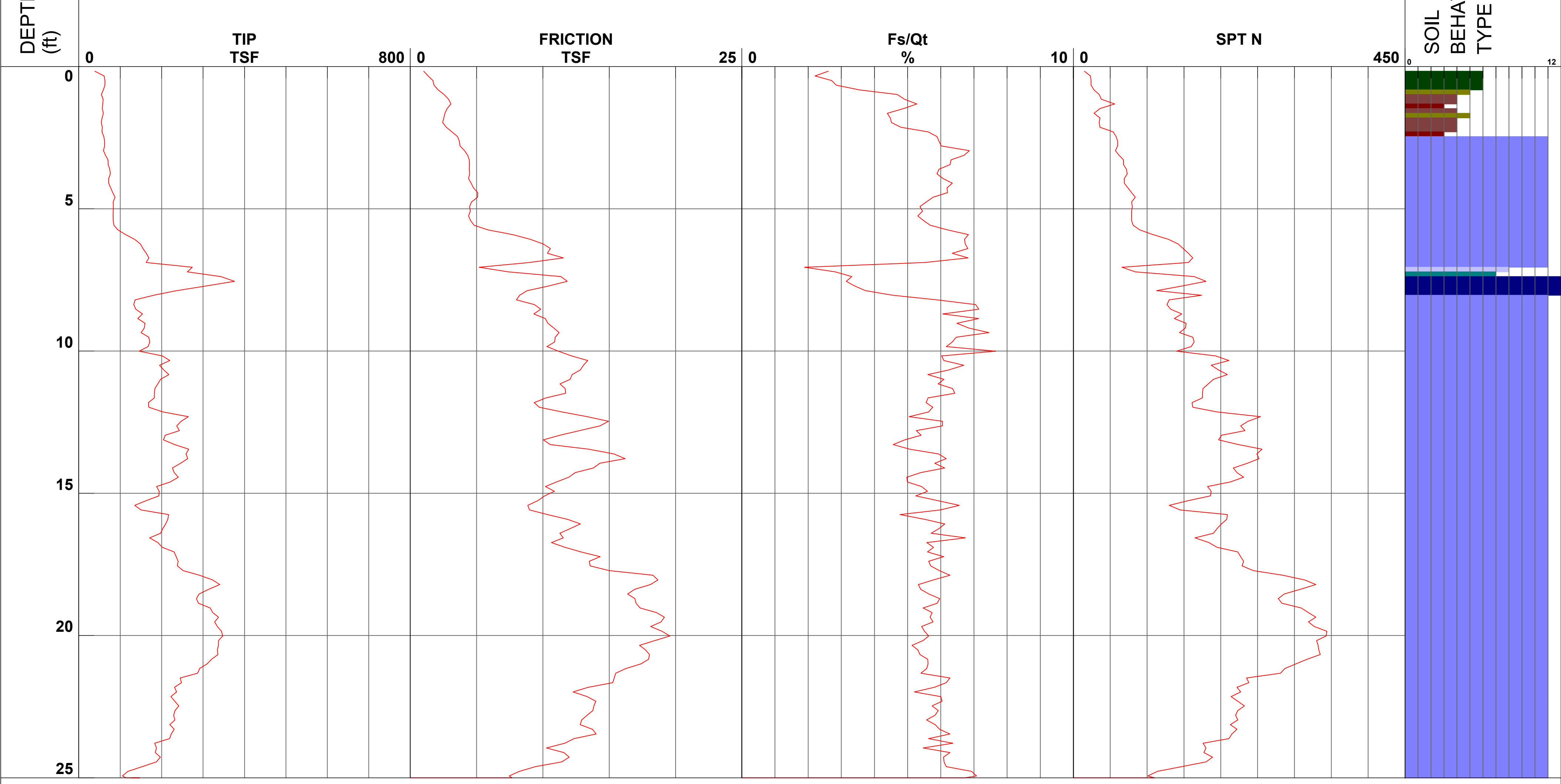
Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-07
EST GW Depth During Test >25.59 ft

Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 10:29:14 AM

Filename SDF(096).cpt
GPS
Maximum Depth 25.59 ft

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

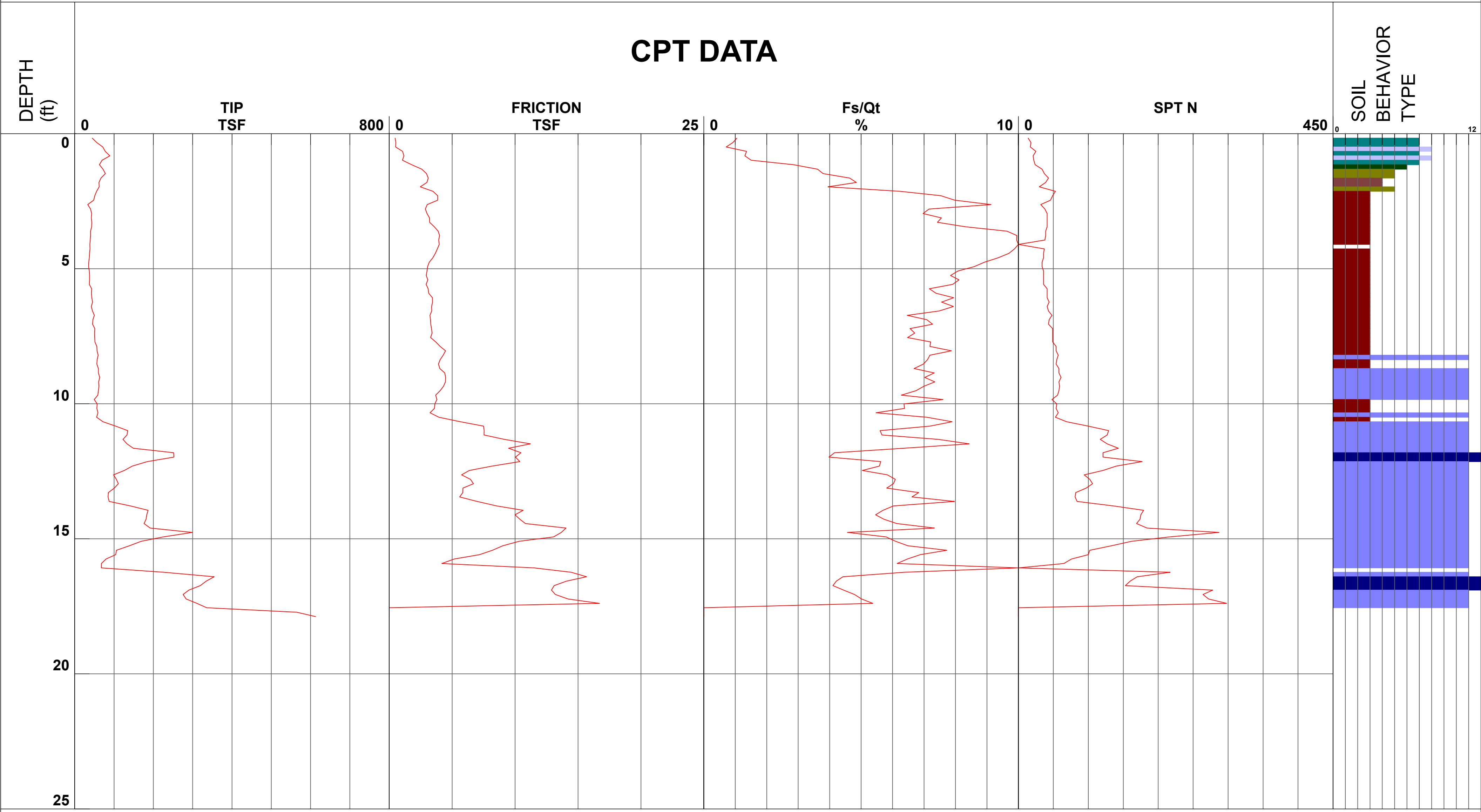
Earth Systems

Middle Earth GEO TESTING INC.

Project	Mare Island Technology New Campus	Operator	RB-JM	Filename	SDF(097).cpt
Job Number	302495-001	Cone Number	DDG1418	GPS	
Hole Number	CPT-08	Date and Time	9/24/2018 11:05:51 AM	Maximum Depth	17.88 ft
EST GW Depth During Test		>17.88 ft			

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

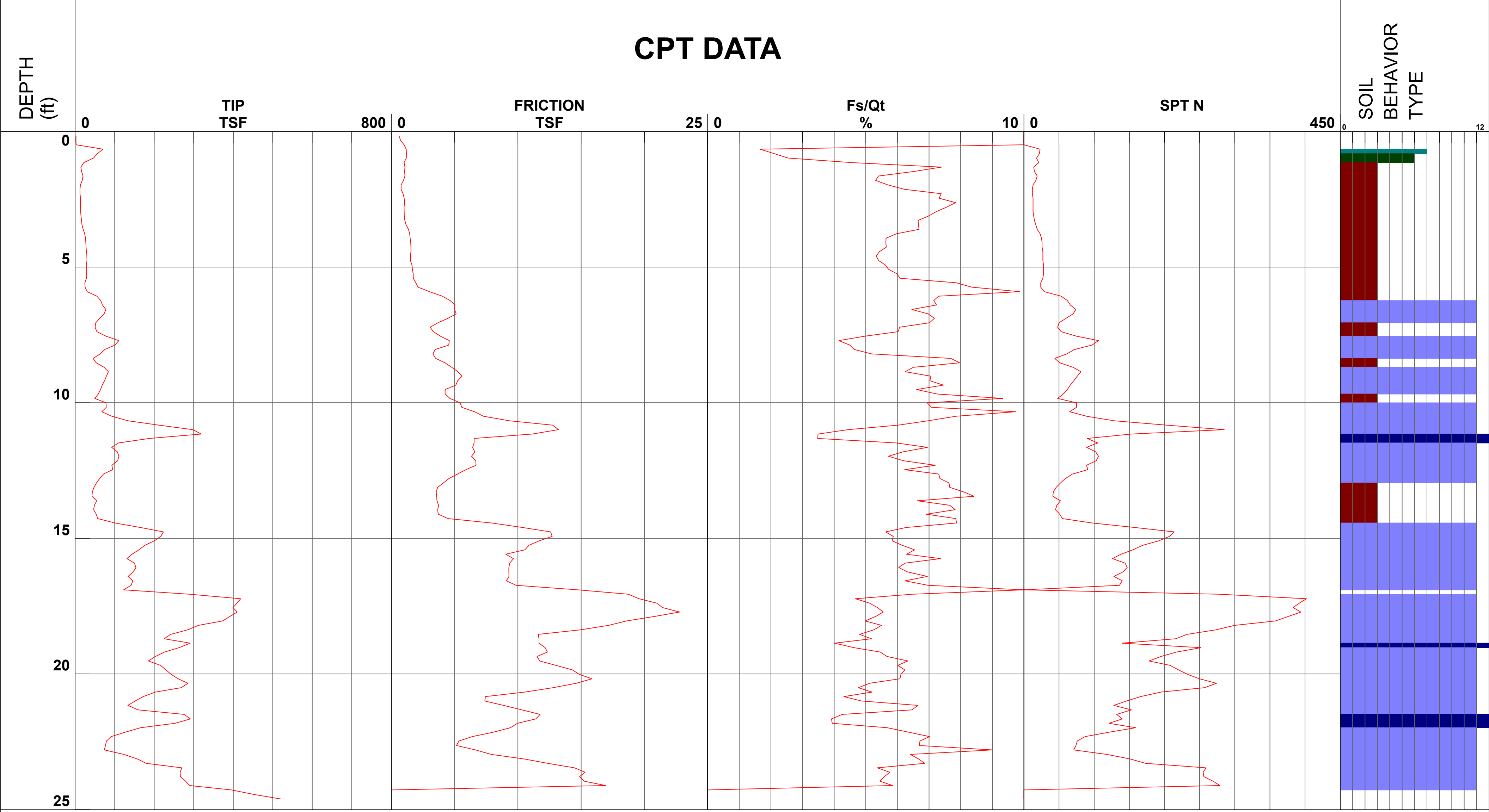
Earth Systems

Project Mare Island Technology New Campus
Job Number 302495-001
Hole Number CPT-09
EST GW Depth During Test 21.00 ft

Operator RB-JM
Cone Number DDG1418
Date and Time 9/24/2018 11:37:35 AM

Filename SDF(098).cpt
GPS
Maximum Depth 24.61 ft

Net Area Ratio .8



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay

■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt

■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand

■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

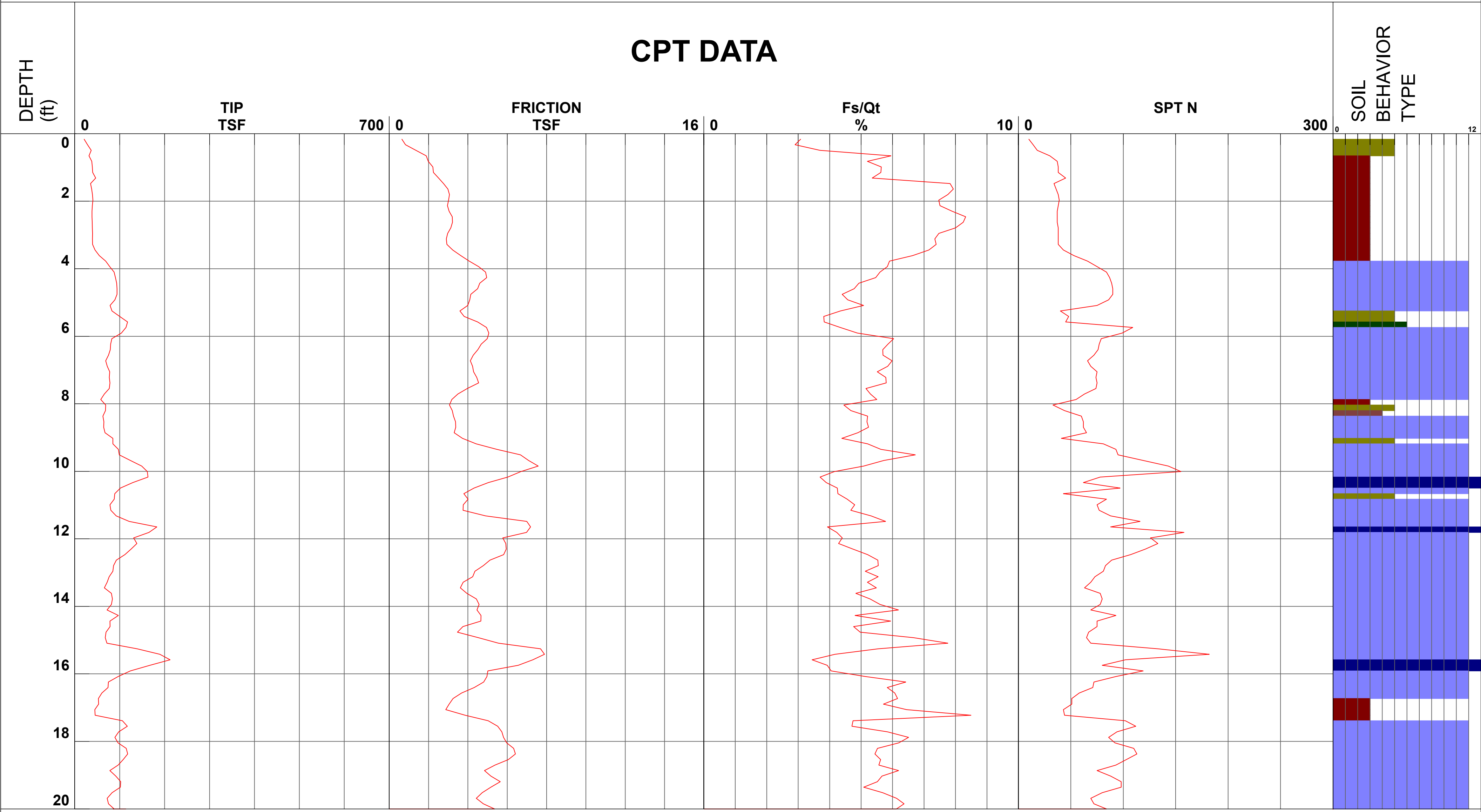
Earth Systems

Middle Earth
Geo Testing Inc.

Project	Mare Island Technology Academy	Operator	JM-ZG	Filename	SDF(146).cpt
Job Number	302495-003	Cone Number	DDG1530	GPS	
Hole Number	CPT-10	Date and Time	10/5/2020 9:39:06 AM	Maximum Depth	20.51 ft
EST GW Depth During Test			24.00 ft		

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

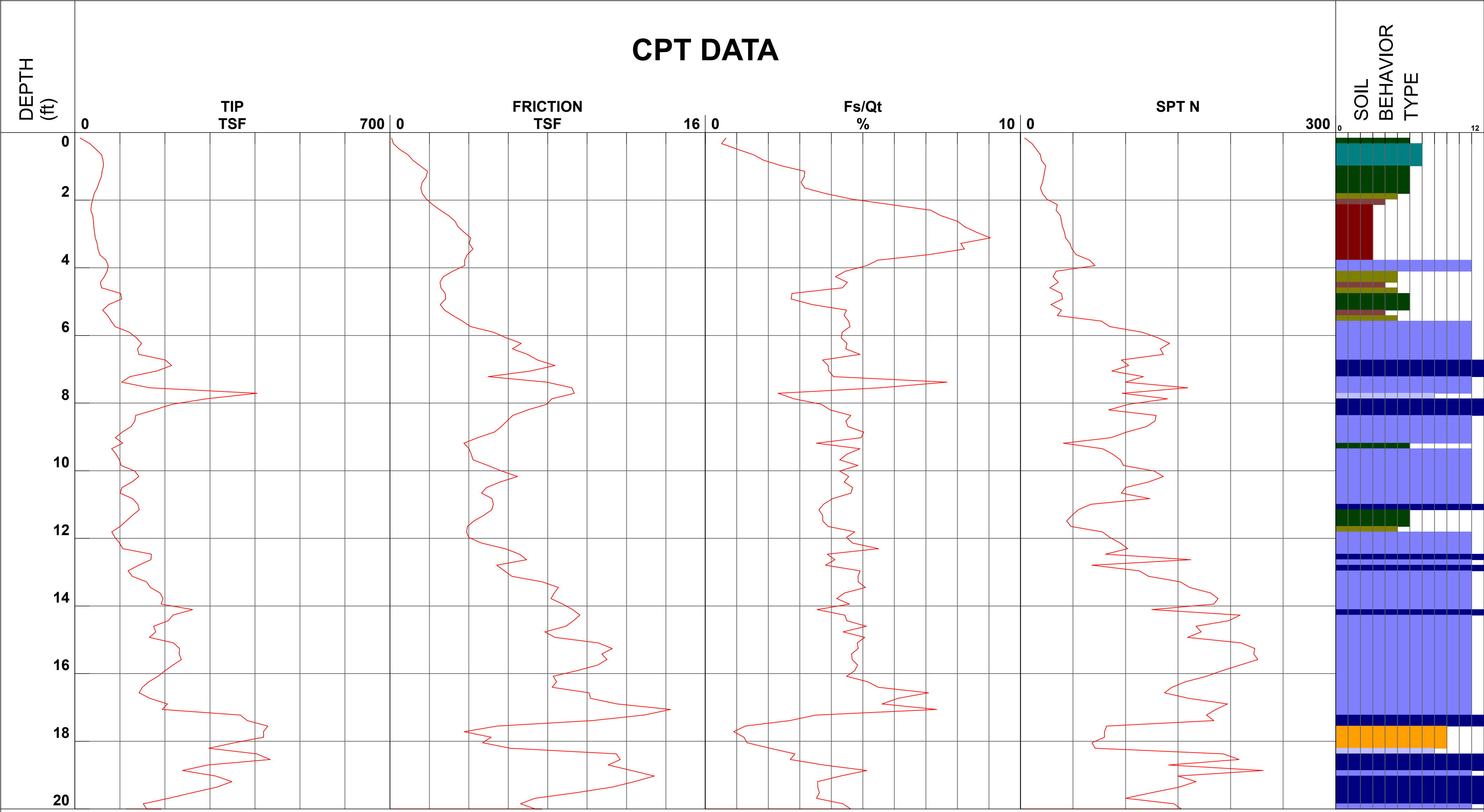
S*Soil behavior type and SPT based on data from UBC-1983

Middle Earth
Geo Testing Inc.

Earth Systems

Project Mare Island Technology Academy
Job Number 302495-003
Hole Number CPT-11
EST GW Depth During Test 16.00 ft
Operator JM-ZG
Cone Number DDG1530
Date and Time 10/5/2020 9:18:29 AM
Filename SDF(145).cpt
GPS
Maximum Depth 20.67 ft

Net Area Ratio .8



- ■ 1 - sensitive fine grained
- ■ 2 - organic material
- ■ 3 - clay
- ■ 4 - silty clay to clay
- ■ 5 - clayey silt to silty clay
- ■ 6 - sandy silt to clayey silt
- ■ 7 - silty sand to sandy silt
- ■ 8 - sand to silty sand
- ■ 9 - sand
- ■ 10 - gravelly sand to sand
- ■ 11 - very stiff fine grained (*)
- ■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

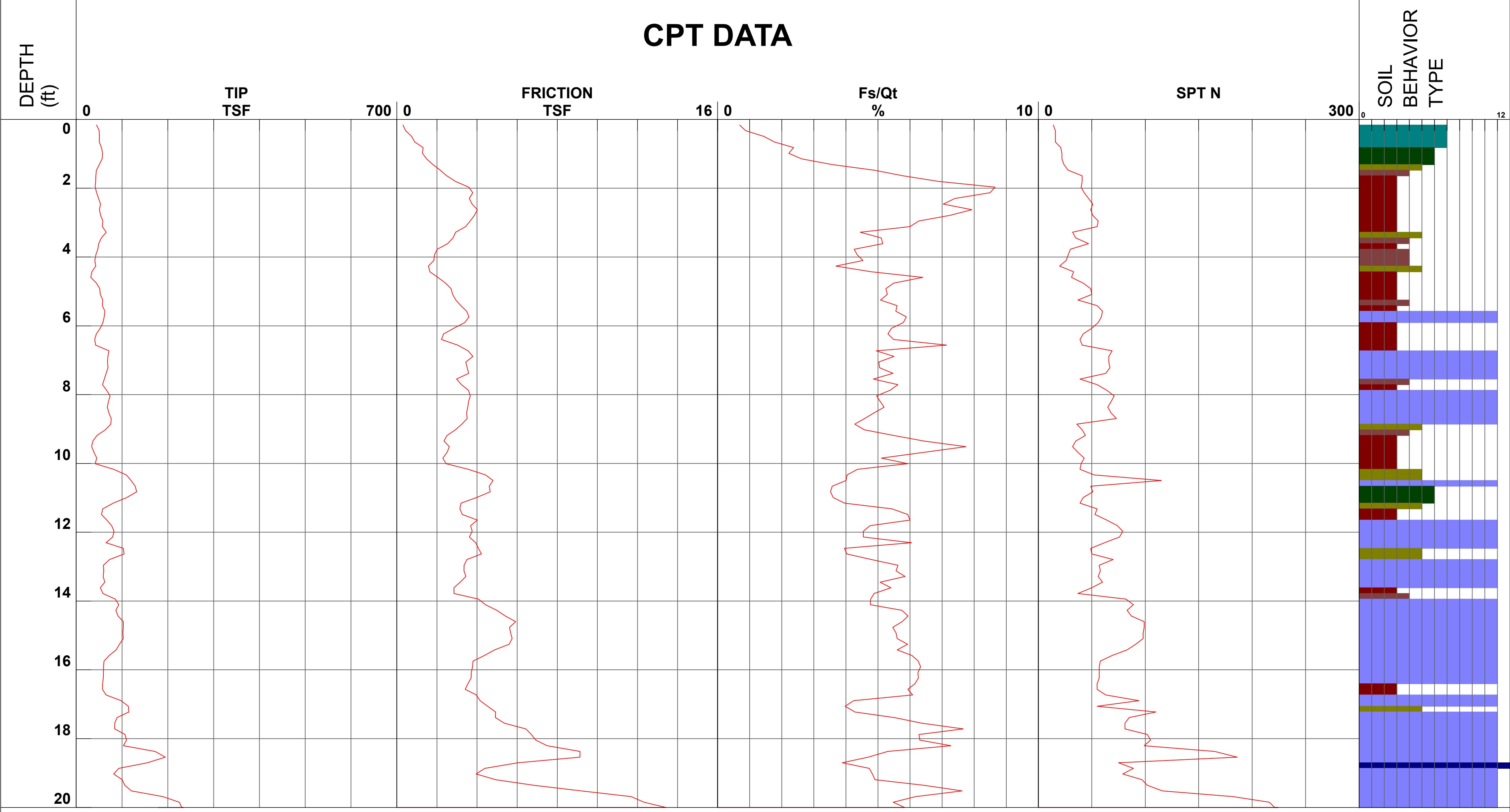
Middle Earth
GEO TESTING INC.

Earth Systems

Project Mare Island Technology Academy
Job Number 302495-003
Hole Number CPT-12
EST GW Depth During Test 20.00 ft
Operator JM-ZG
Cone Number DDG1530
Date and Time 10/5/2020 10:03:40 AM
Filename SDF(147).cpt
GPS
Maximum Depth 20.67 ft

Net Area Ratio .8

CPT DATA



- ⬜ 1 - sensitive fine grained
- ⬛ 2 - organic material
- 🟫 3 - clay
- 🟫 4 - silty clay to clay
- 🟨 5 - clayey silt to silty clay
- 🟩 6 - sandy silt to clayey silt
- 🟦 7 - silty sand to sandy silt
- 🟪 8 - sand to silty sand
- 🟧 9 - sand
- 🟥 10 - gravelly sand to sand
- 🟦 11 - very stiff fine grained (*)
- 🟦 12 - sand to clayey sand (*)

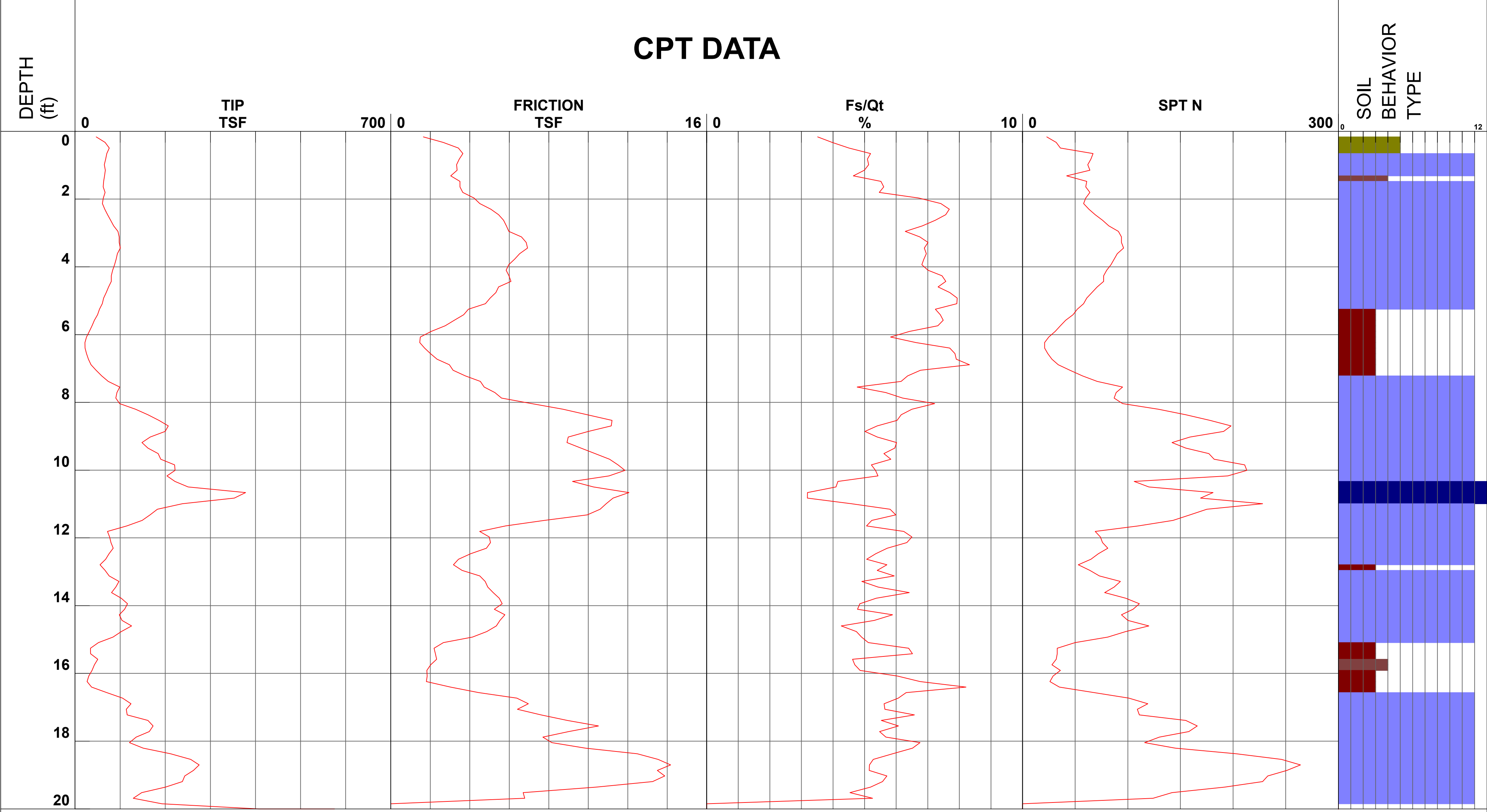
Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Project Mare Island Technology Academy
Job Number 302495-003
Hole Number CPT-13
EST GW Depth During Test 18.00 ft
Operator JM-ZG
Cone Number DDG1530
Date and Time 10/5/2020 10:24:01 AM
Filename SDF(148).cpt
GPS
Maximum Depth 20.18 ft

Net Area Ratio .8



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

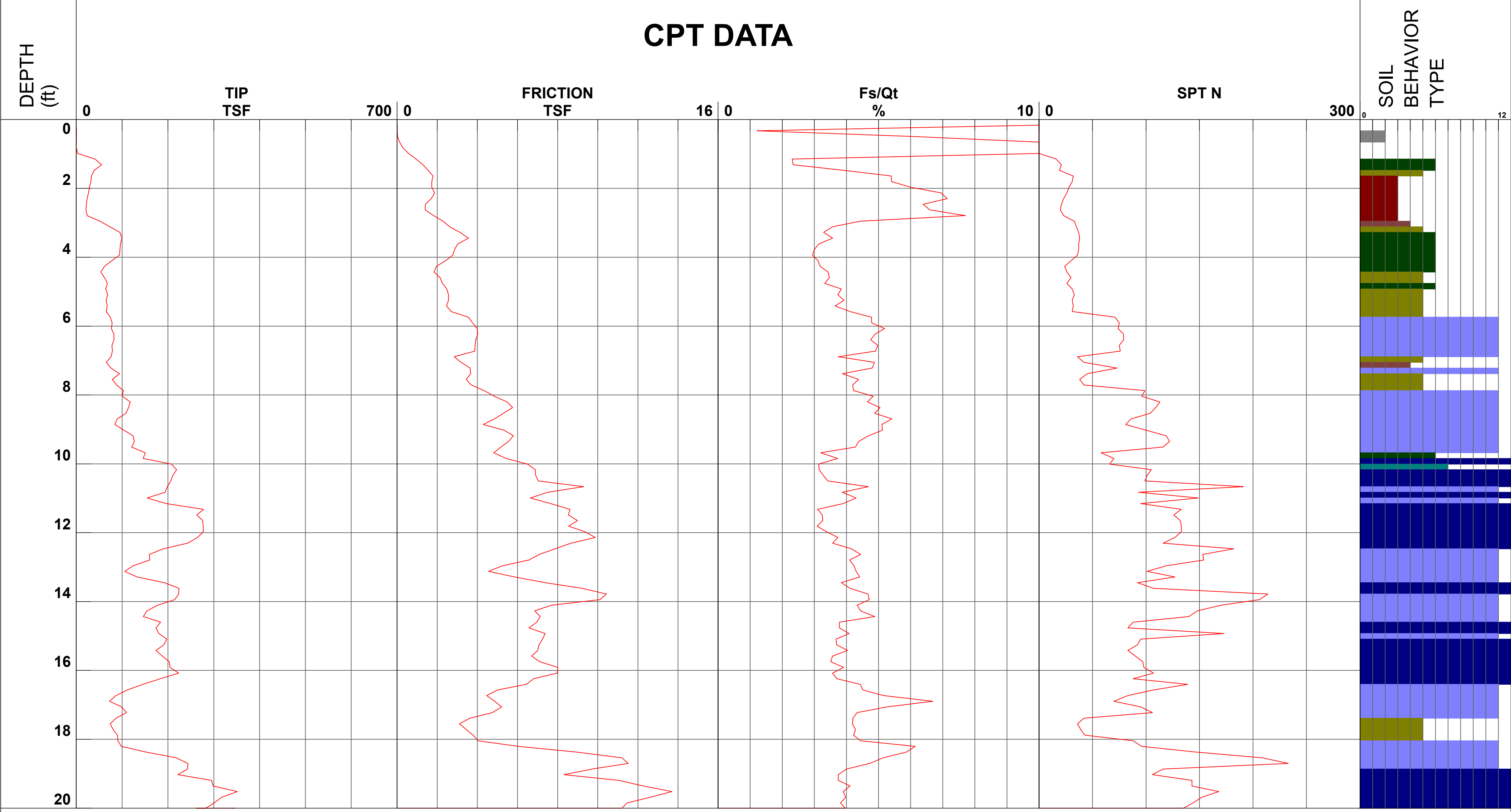
S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Project Mare Island Technology Academy
Job Number 302495-003
Hole Number CPT-14
EST GW Depth During Test 24.00 ft
Operator JM-ZG
Cone Number DDG1530
Date and Time 10/5/2020 8:30:28 AM
Filename SDF(144).cpt
GPS
Maximum Depth 20.51 ft

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay
■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt
■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand
■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Earth Systems

Middle Earth
Geo Testing Inc.

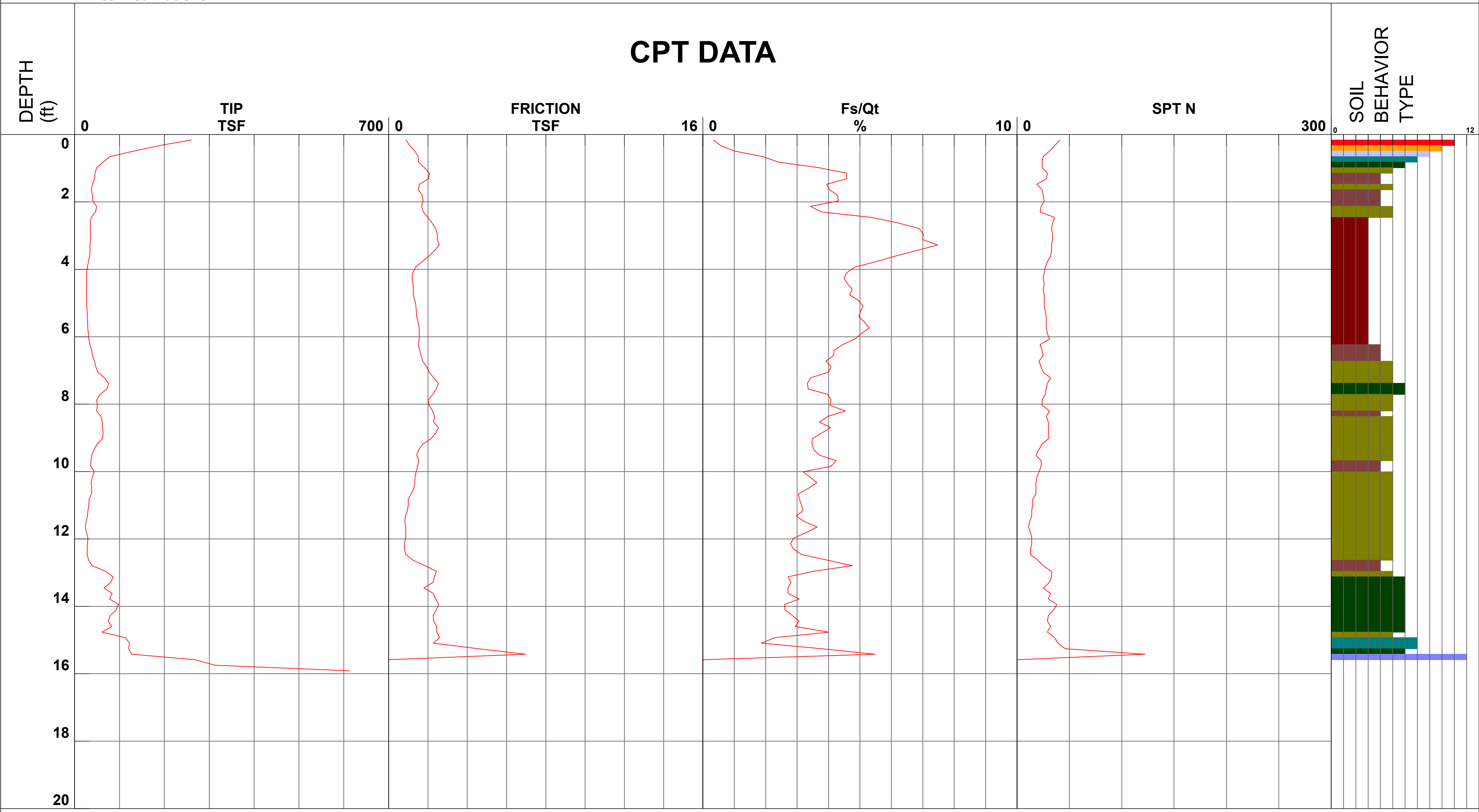
Project Mare Island Technology Academy
Job Number 302495-003
Hole Number CPT-15
EST GW Depth During Test 24.00 ft

Operator JM-ZG
Cone Number DDG1530
Date and Time 10/5/2020 7:49:02 AM

Filename SDF(142).cpt
GPS
Maximum Depth 15.91 ft

Net Area Ratio .8

CPT DATA



■ 1 - sensitive fine grained
■ 2 - organic material
■ 3 - clay

■ 4 - silty clay to clay
■ 5 - clayey silt to silty clay
■ 6 - sandy silt to clayey silt

■ 7 - silty sand to sandy silt
■ 8 - sand to silty sand
■ 9 - sand

■ 10 - gravelly sand to sand
■ 11 - very stiff fine grained (*)
■ 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

APPENDIX B

Laboratory Test Results

Mare Island Technology Academy
New Campus

302495-001

BULK DENSITY TEST RESULTS

ASTM D 2937-17 (modified for ring liners)

September 21, 2018

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
1-3	9.5 - 10.0	17.0	129.7	110.9
2-2	4.5 - 5.0	15.6	112.3	97.2
2-3	9.5 - 10.0	17.1	127.4	108.8
4-2	4.5 - 5.0	15.4	110.2	95.5
5-3	9.5 - 10.0	17.3	131.6	112.2
6-2	4.5 - 5.0	20.3	129.2	107.4
6-3	9.5 - 10.0	18.7	127.9	107.8
7-3	9.5 - 10.0	15.5	129.8	112.3
8-3	9.5 - 10.0	16.2	127.9	110.1
9-1	2.0 - 2.5	23.7	127.4	103.0
9-2	4.5 - 5.0	23.0	122.7	99.7
10-3	9.5 - 10.0	18.7	126.3	106.3
11-1	2.0 - 2.5	21.4	122.1	100.6
11-2	4.5 - 5.0	24.3	124.6	100.3
12-1	2.0 - 2.5	14.8	109.0	94.9
12-2	4.5 - 5.0	16.1	117.9	101.6

Mare Island Technology Academy
New Campus

302495-001

PLASTICITY INDEX

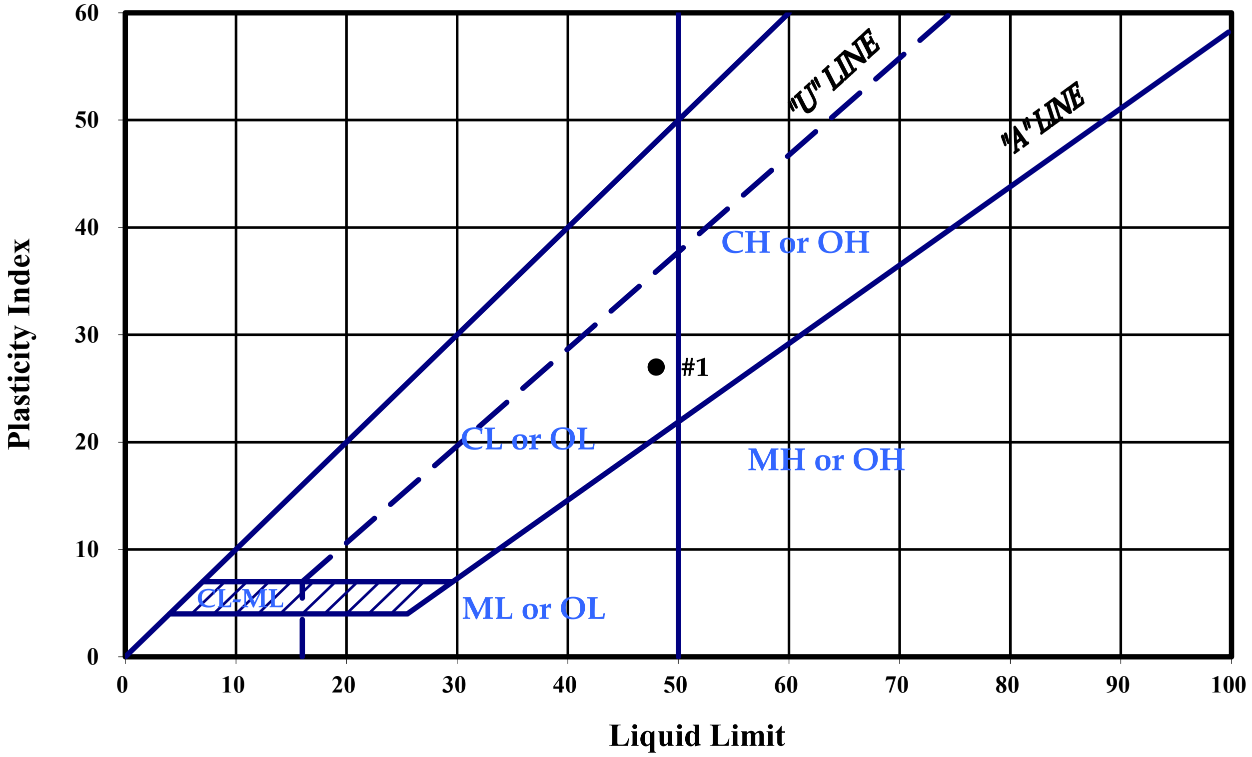
ASTM D 4318-17

Dark Yellowish Brown Lean Clay (CL)

September 21, 2018

Test No.:	1	2	3	4	5
Boring No.:	B2-2				
Sample Depth:	4.0 - 4.5'				
Liquid Limit:	48				
Plastic Limit:	21				
Plasticity Index:	27				

Plasticity Chart



Mare Island Technology Academy
New Campus

302495-001

PLASTICITY INDEX

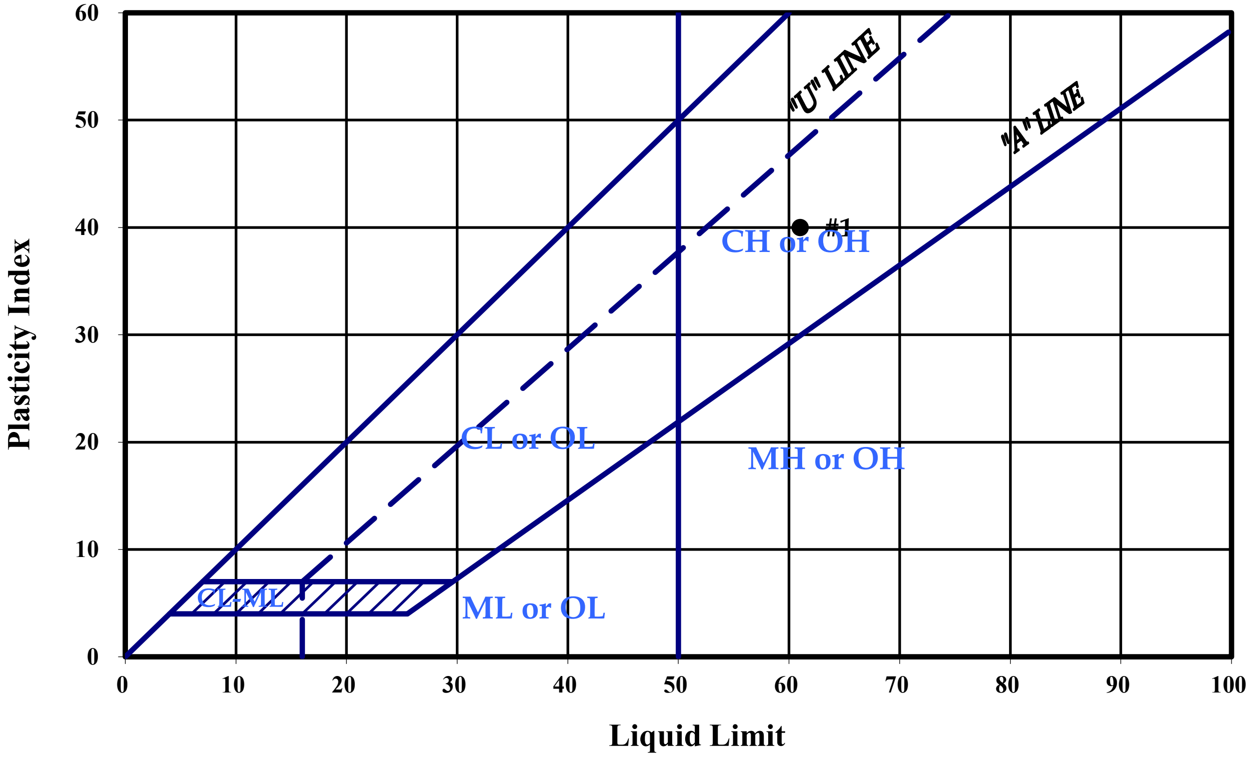
ASTM D 4318-17

Very Dark Grayish Brown Fat Clay (CH)

September 21, 2018

Test No.:	**1**	**2**	**3**	**4**	**5**
Boring No.:	B9-1				
Sample Depth:	2.0 - 2.5'				
Liquid Limit:	61				
Plastic Limit:	21				
Plasticity Index:	40				

Plasticity Chart



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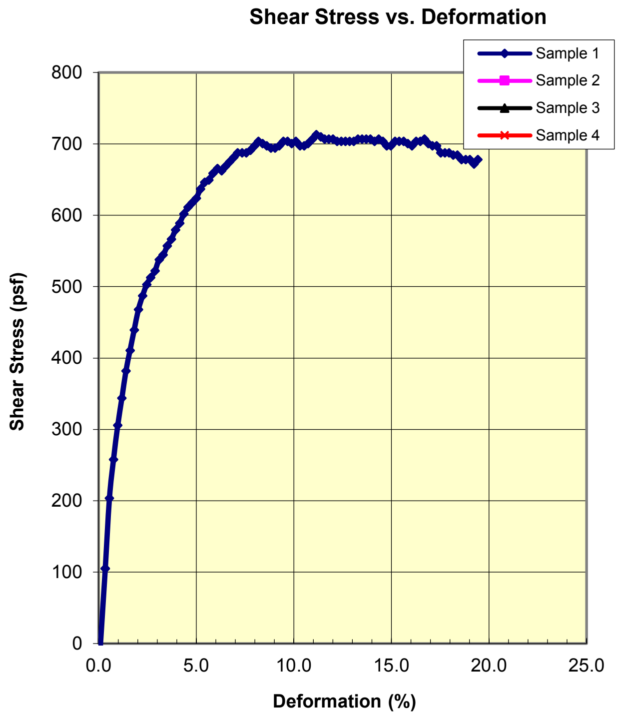
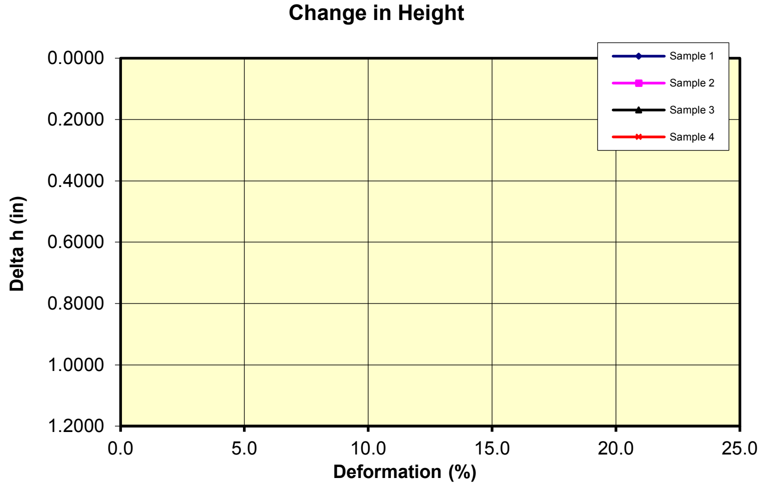
Consolidated Undrained Direct Shear (ASTM D3080M)

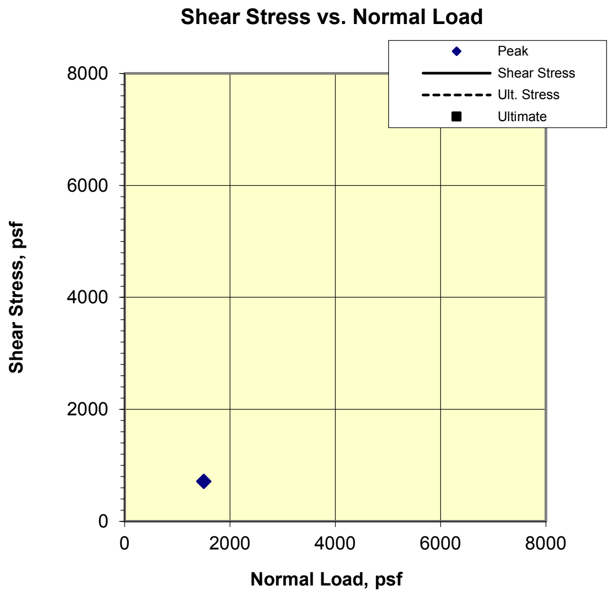
CTL Job #:	218-104	Project #:	302495-001	By:	MD
Client:	Earth Systems	Date:	9/28/2018	Checked:	PJ
Project Name:	MIT Academy	Remolding Info:			

Phi (deg)		**Ult. Phi (deg)**	
Cohesion (psf)		**Ult. Cohesion (psf)**	

Specimen Data	1	2	3	4
Boring:	B1			
Sample:	1			
Depth (ft):	2.0-2.5			
Visual Description:	Dark Yellowish Brown CLAY w/ Sand			
Normal Load (psf)	1500			
Dry Mass of Specimen (g)	103.0			
Initial Height (in)	0.98			
Initial Diameter (in)	2.40			
Initial Void Ratio	0.905			
Initial Moisture (%)	16.2			
Initial Wet Density (pcf)	102.8			
Initial Dry Density (pcf)	88.5			
Initial Saturation (%)	48.5			
ΔHeight Consol (in)	0.0540			
At Test Void Ratio	0.800			
At Test Moisture (%)	28.0			
At Test Wet Density (pcf)	119.9			
At Test Dry Density (pcf)	93.6			
At Test Saturation (%)	94.5			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	713			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				







Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

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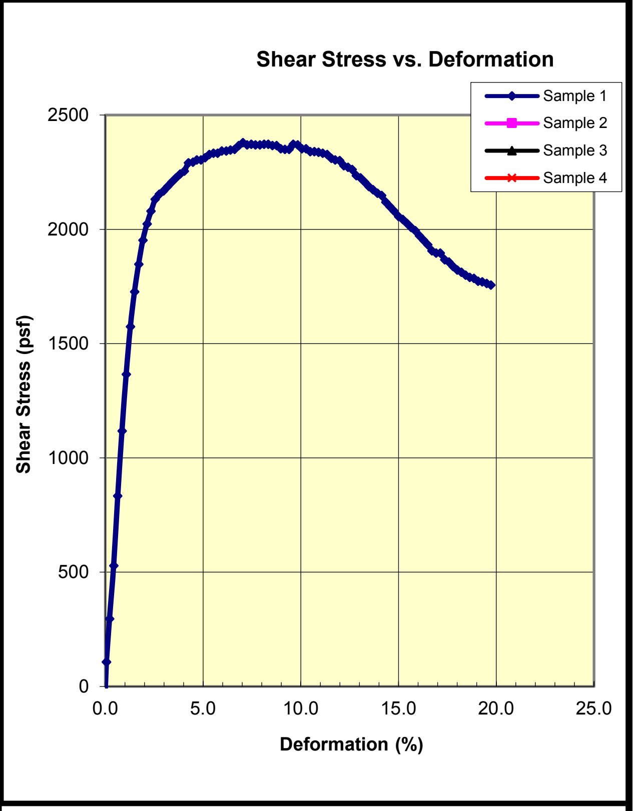
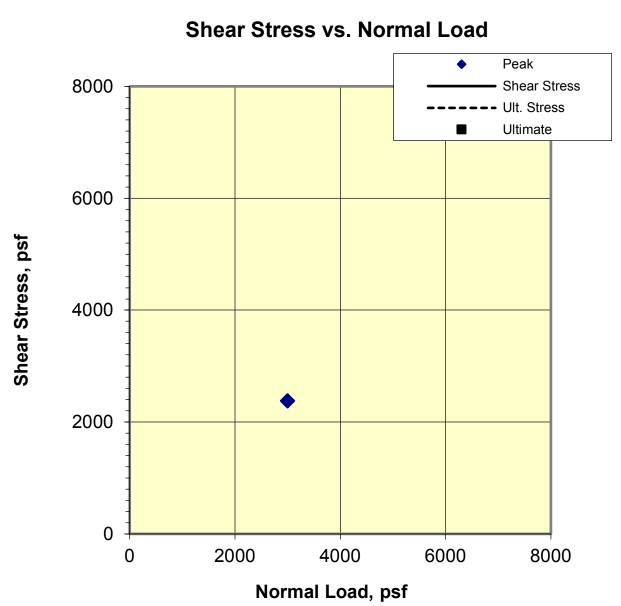
Consolidated Undrained Direct Shear
(ASTM D3080M)

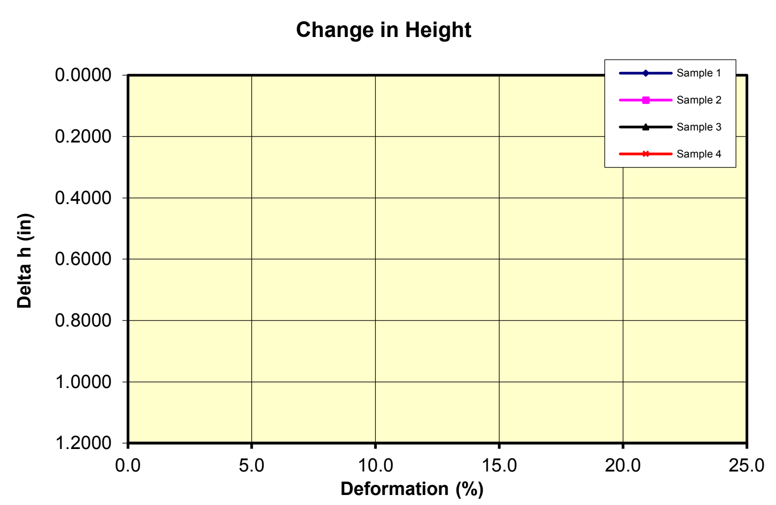
CTL Job #: 218-104
Client: Earth Systems
Project Name: MIT Academy
Project #: 302495-001
Date: 9/28/2018
Remolding Info:
By: MD
Checked: PJ

Specimen Data				
	1	2	3	4
Boring:	B1			
Sample:	2			
Depth (ft):	4.0-4.5			
Visual Description:	Dark Yellowish Brown CLAY w/ Sand			
Normal Load (psf)	3000			
Dry Mass of Specimen (g)	117.3			
Initial Height (in)	1.00			
Initial Diameter (in)	2.37			
Initial Void Ratio	0.667			
Initial Moisture (%)	17.7			
Initial Wet Density (pcf)	119.0			
Initial Dry Density (pcf)	101.1			
Initial Saturation (%)	71.6			
ΔHeight Consol (in)	0.0029			
At Test Void Ratio	0.662			
At Test Moisture (%)	23.5			
At Test Wet Density (pcf)	125.2			
At Test Dry Density (pcf)	101.4			
At Test Saturation (%)	95.8			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	2379			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		**Ult. Phi (deg)**	
Cohesion (psf)		**Ult. Cohesion (psf)**	







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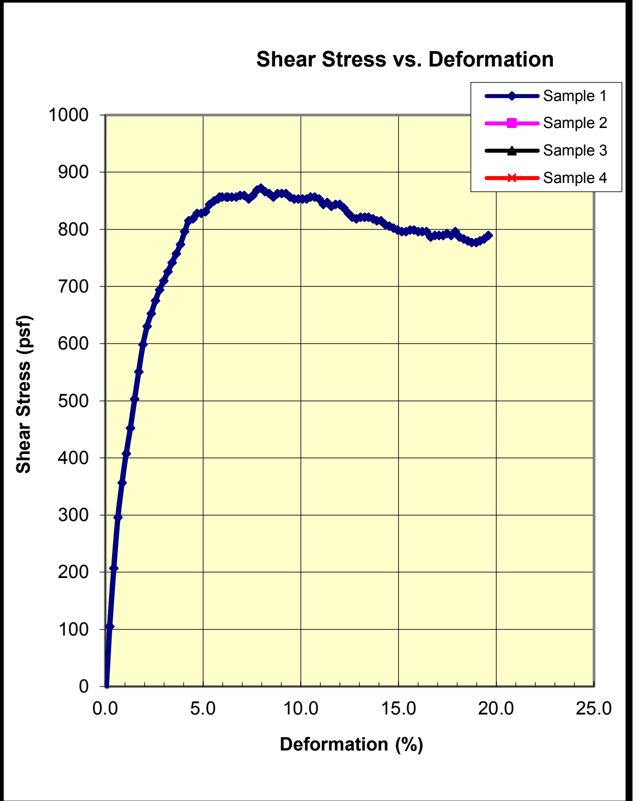
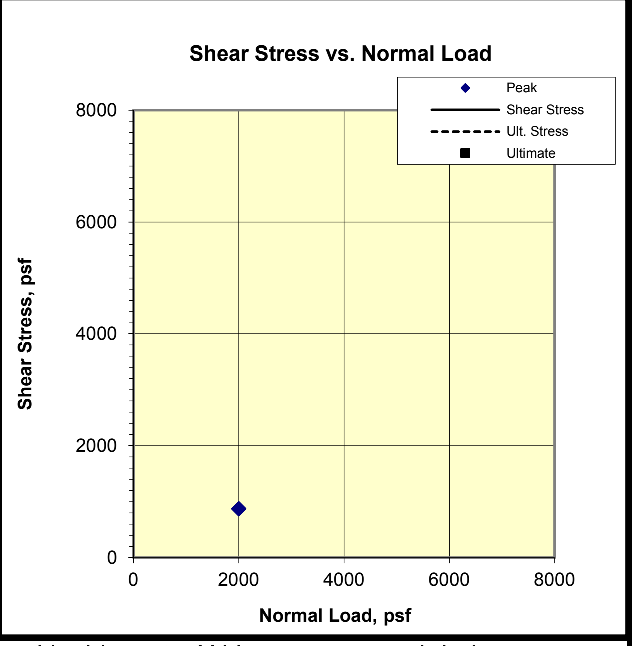
Consolidated Undrained Direct Shear
(ASTM D3080M)

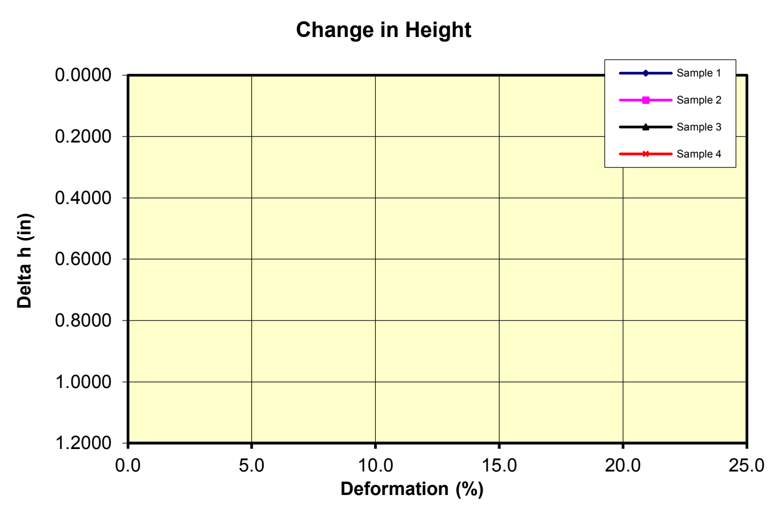
CTL Job #:	218-104	Project #:	302495-001	By:	MD
Client:	Earth Systems	Date:	9/28/2018	Checked:	PJ
Project Name:	MIT Academy	Remolding Info:			

Specimen Data				
	1	2	3	4
Boring:	B2			
Sample:	1			
Depth (ft):	2.0-2.5			
Visual Description:	Dark Yellowish Brown CLAY w/ Sand			
Normal Load (psf)	2000			
Dry Mass of Specimen (g)	102.1			
Initial Height (in)	1.00			
Initial Diameter (in)	2.40			
Initial Void Ratio	0.961			
Initial Moisture (%)	12.0			
Initial Wet Density (pcf)	96.3			
Initial Dry Density (pcf)	86.0			
Initial Saturation (%)	33.8			
ΔHeight Consol (in)	0.1325			
At Test Void Ratio	0.701			
At Test Moisture (%)	25.3			
At Test Wet Density (pcf)	124.2			
At Test Dry Density (pcf)	99.1			
At Test Saturation (%)	97.5			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	872			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		**Ult. Phi (deg)**	
Cohesion (psf)		**Ult. Cohesion (psf)**	







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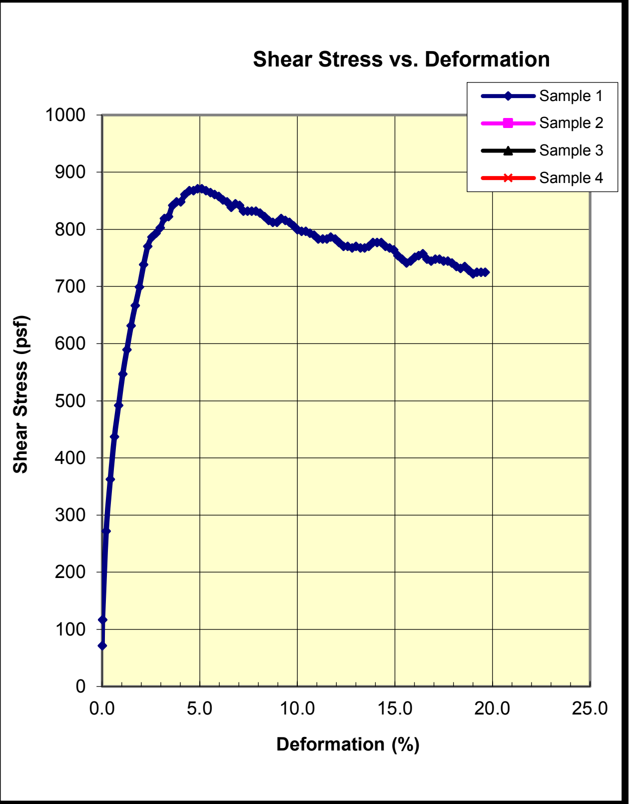
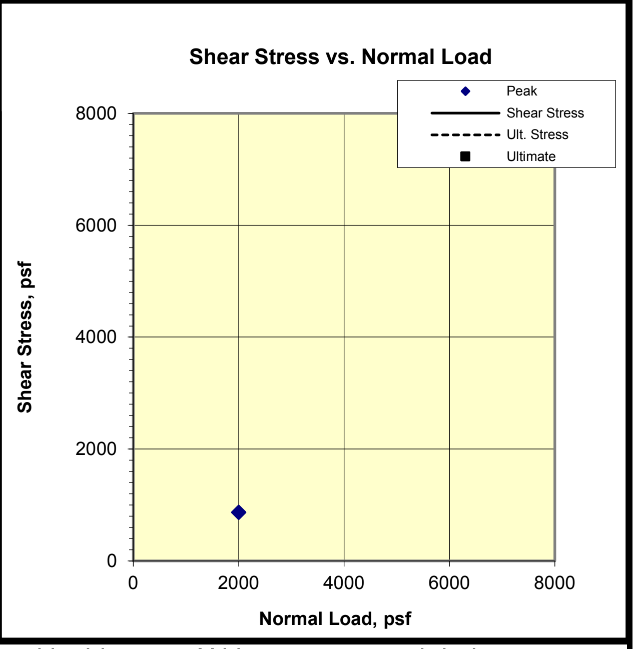
Consolidated Undrained Direct Shear
(ASTM D3080M)

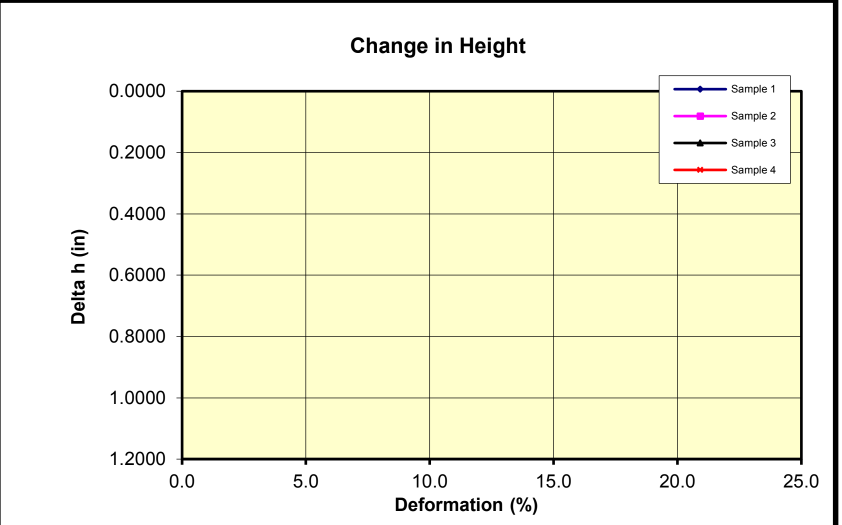
CTL Job #:	218-104	Project #:	302495-001	By:	MD
Client:	Earth Systems	Date:	9/28/2018	Checked:	PJ
Project Name:	MIT Academy	Remolding Info:			

Specimen Data				
	1	2	3	4
Boring:	B4			
Sample:	1			
Depth (ft):	2.0-2.5			
Visual Description:	Dark Grayish Brown CLAY w/ Sand			
Normal Load (psf)	2000			
Dry Mass of Specimen (g)	103.8			
Initial Height (in)	1.00			
Initial Diameter (in)	2.38			
Initial Void Ratio	0.896			
Initial Moisture (%)	18.4			
Initial Wet Density (pcf)	105.2			
Initial Dry Density (pcf)	88.9			
Initial Saturation (%)	55.3			
ΔHeight Consol (in)	0.0425			
At Test Void Ratio	0.816			
At Test Moisture (%)	28.0			
At Test Wet Density (pcf)	118.9			
At Test Dry Density (pcf)	92.8			
At Test Saturation (%)	92.8			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	871			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		**Ult. Phi (deg)**	
Cohesion (psf)		**Ult. Cohesion (psf)**	







Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

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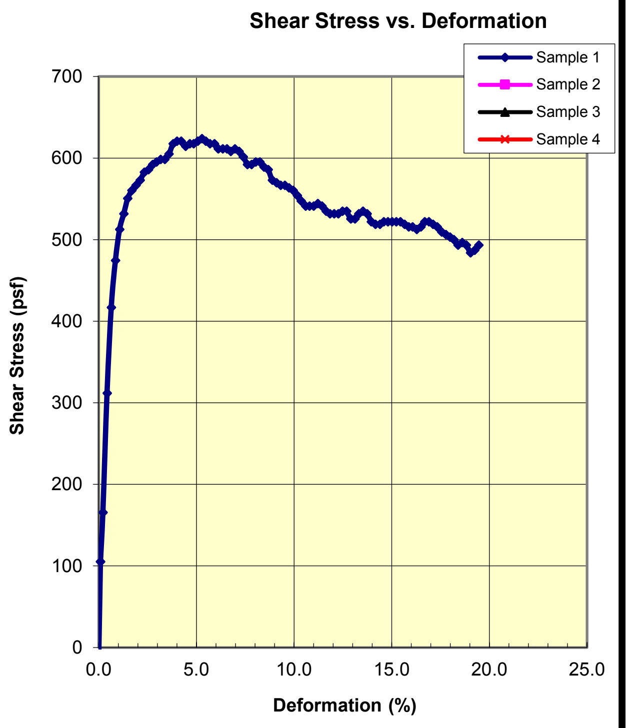
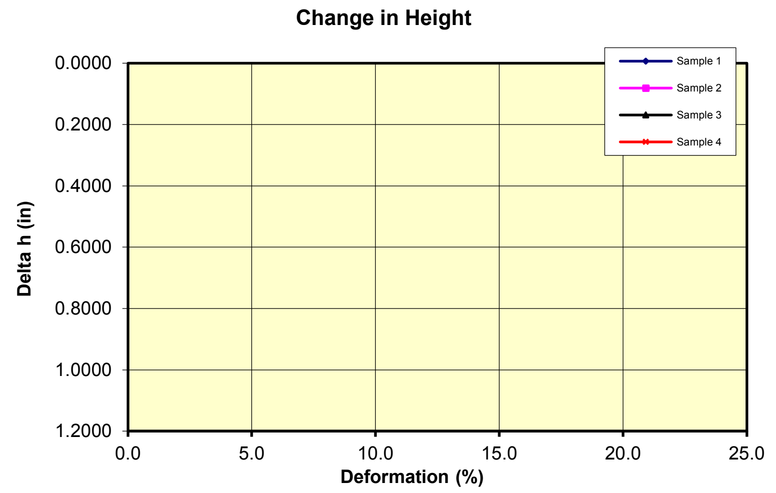
Consolidated Undrained Direct Shear
(ASTM D3080M)

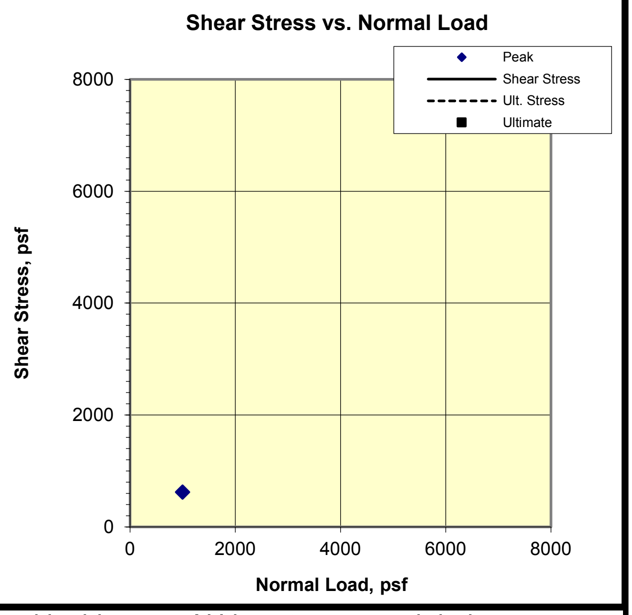
CTL Job #: 218-104 Project #: 302495-001 By: MD
Client: Earth Systems Date: 9/28/2018 Checked: PJ
Project Name: MIT Academy Remolding Info:

Specimen Data	1	2	3	4
Boring:	B5			
Sample:	1			
Depth (ft):	2.0-2.5			
Visual Description:	Yellowish Brown CLAY w/ Sand			
Normal Load (psf)	1000			
Dry Mass of Specimen (g)	95.8			
Initial Height (in)	1.00			
Initial Diameter (in)	2.40			
Initial Void Ratio	1.128			
Initial Moisture (%)	33.7			
Initial Wet Density (pcf)	107.9			
Initial Dry Density (pcf)	80.7			
Initial Saturation (%)	82.2			
ΔHeight Consol (in)	-0.0354			
At Test Void Ratio	1.204			
At Test Moisture (%)	43.5			
At Test Wet Density (pcf)	111.8			
At Test Dry Density (pcf)	77.9			
At Test Saturation (%)	99.4			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	624			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		Ult. Phi (deg)	
Cohesion (psf)		Ult. Cohesion (psf)	







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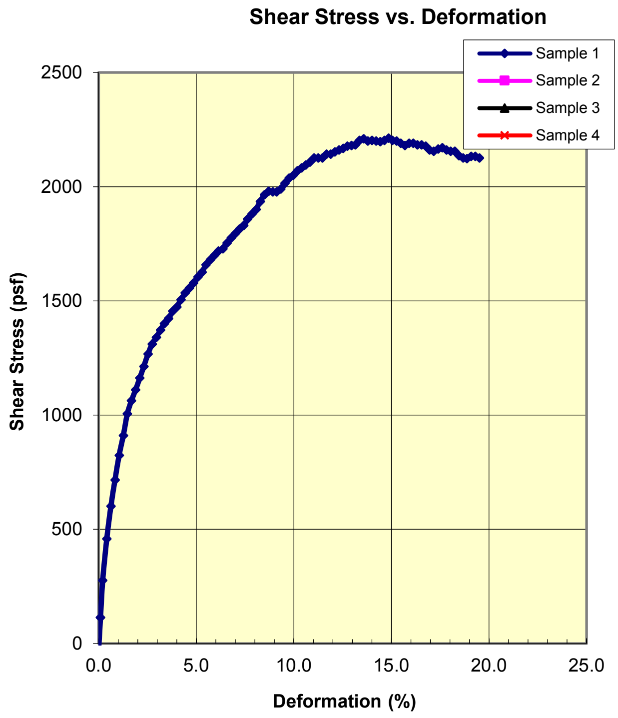
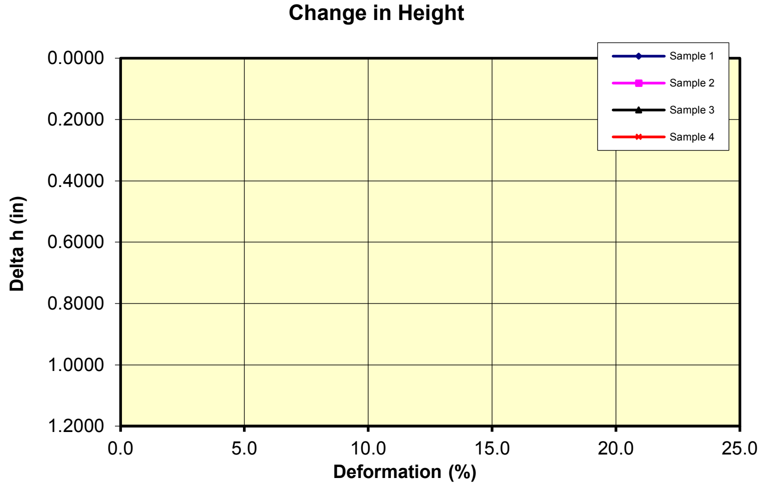
Consolidated Undrained Direct Shear (ASTM D3080M)

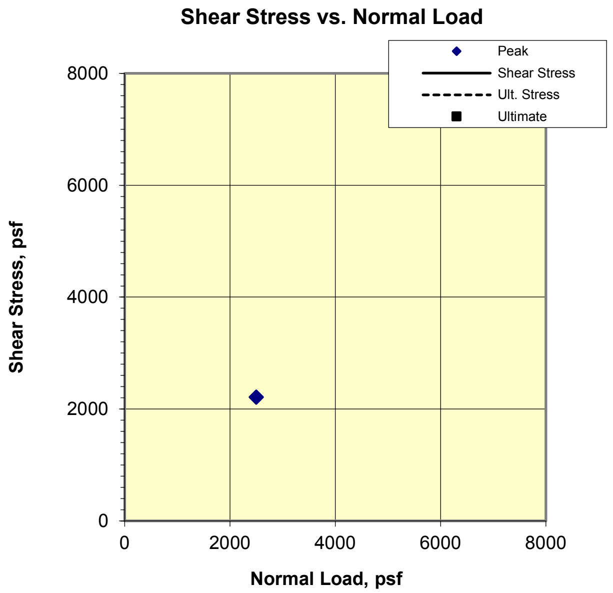
CTL Job #:	218-104	Project #:	302495-001	By:	MD
Client:	Earth Systems	Date:	10/2/2018	Checked:	PJ
Project Name:	MIT Academy	Remolding Info:			

Specimen Data	1	2	3	4
Boring:	B5			
Sample:	2			
Depth (ft):	4.0-4.5			
Visual Description:	Dark Greenish Gray Claystone w/ Gravel			
Normal Load (psf)	2500			
Dry Mass of Specimen (g)	112.7			
Initial Height (in)	1.00			
Initial Diameter (in)	2.40			
Initial Void Ratio	0.776			
Initial Moisture (%)	17.1			
Initial Wet Density (pcf)	111.2			
Initial Dry Density (pcf)	94.9			
Initial Saturation (%)	59.6			
ΔHeight Consol (in)	0.0408			
At Test Void Ratio	0.703			
At Test Moisture (%)	25.3			
At Test Wet Density (pcf)	124.0			
At Test Dry Density (pcf)	98.9			
At Test Saturation (%)	97.3			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	2212			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		**Ult. Phi (deg)**	
Cohesion (psf)		**Ult. Cohesion (psf)**	







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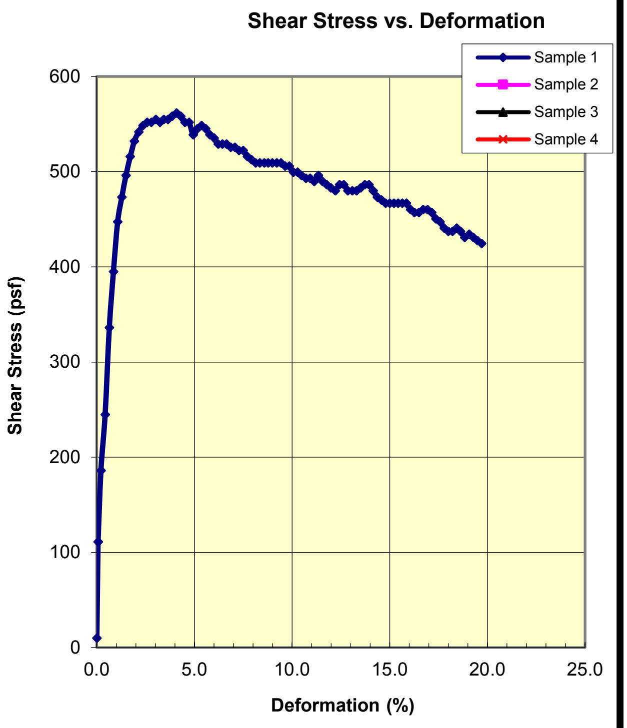
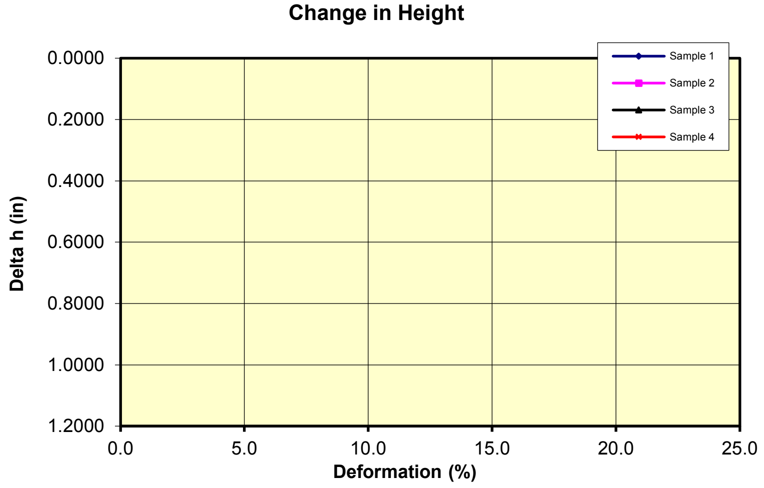
Consolidated Undrained Direct Shear (ASTM D3080M)

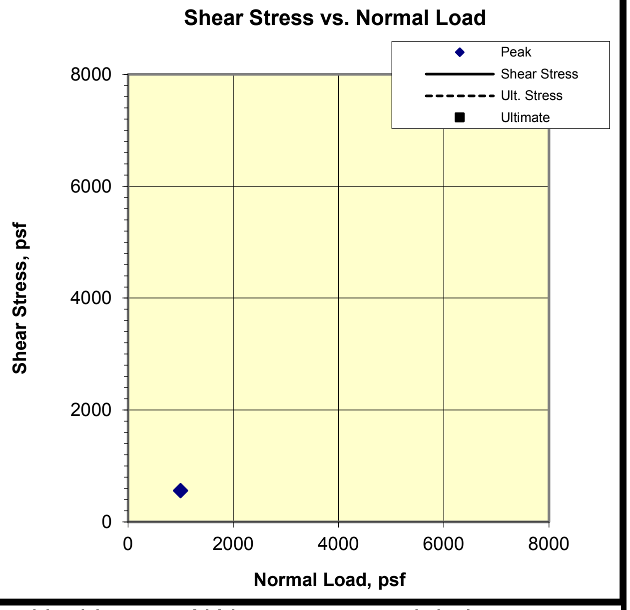
CTL Job #: 218-104
Project #: 302495-001
By: MD
Client: Earth Systems
Date:
Checked: PJ
Project Name: MIT Academy
Remolding Info:

Specimen Data				
	1	2	3	4
Boring:	B7			
Sample:	1			
Depth (ft):	2.0-2.5			
Visual Description:	Dark Grayish Brown CLAY w/ Sand			
Normal Load (psf)	1000			
Dry Mass of Specimen (g)	105.1			
Initial Height (in)	1.00			
Initial Diameter (in)	2.37			
Initial Void Ratio	0.857			
Initial Moisture (%)	14.9			
Initial Wet Density (pcf)	104.3			
Initial Dry Density (pcf)	90.8			
Initial Saturation (%)	47.0			
ΔHeight Consol (in)	0.0225			
At Test Void Ratio	0.815			
At Test Moisture (%)	28.4			
At Test Wet Density (pcf)	119.2			
At Test Dry Density (pcf)	92.9			
At Test Saturation (%)	93.9			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	561			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		**Ult. Phi (deg)**	
Cohesion (psf)		**Ult. Cohesion (psf)**	


Shear Stress vs. Deformation


Change in Height


Shear Stress vs. Normal Load

Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

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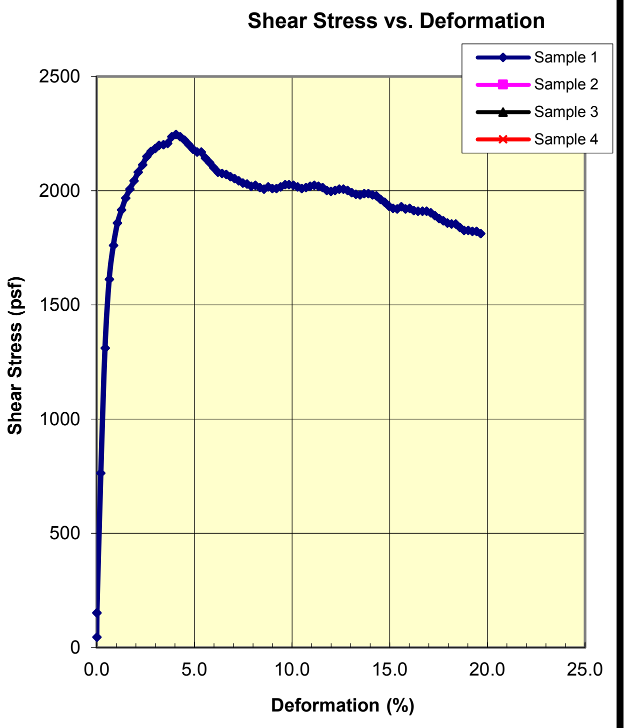
Consolidated Undrained Direct Shear (ASTM D3080M)

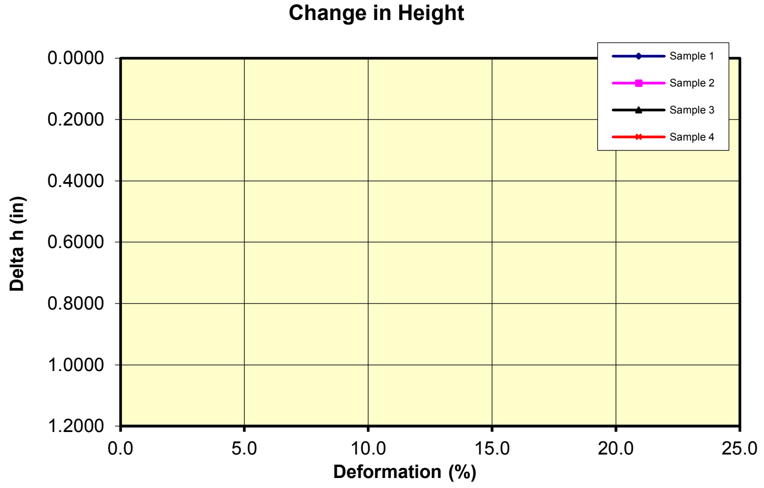
CTL Job #:	218-104	Project #:	302495-001	By:	MD
Client:	Earth Systems	Date:	10/2/2018	Checked:	PJ
Project Name:	MIT Academy	Remolding Info:			

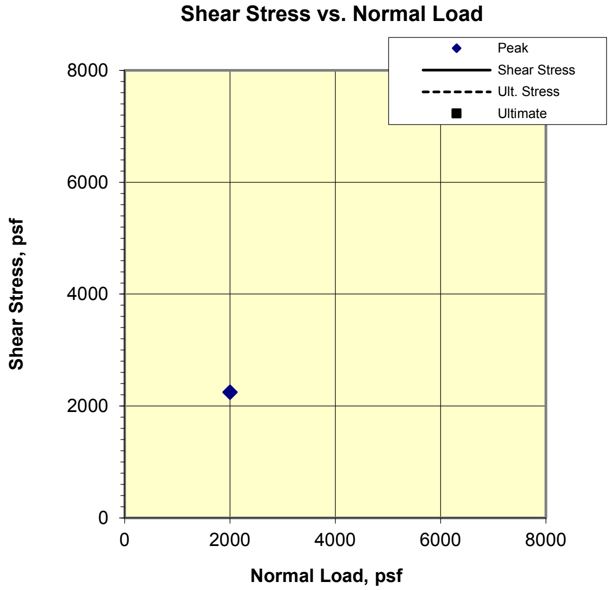
Specimen Data

	1	2	3	4
Boring:	B7			
Sample:	2			
Depth (ft):	4.5-5.0			
Visual Description:	Dark Grayish Brown CLAY w/ Sand			
Normal Load (psf)	2000			
Dry Mass of Specimen (g)	122.3			
Initial Height (in)	1.00			
Initial Diameter (in)	2.38			
Initial Void Ratio	0.642			
Initial Moisture (%)	18.4			
Initial Wet Density (pcf)	123.8			
Initial Dry Density (pcf)	104.5			
Initial Saturation (%)	78.9			
ΔHeight Consol (in)	0.0083			
At Test Void Ratio	0.629			
At Test Moisture (%)	22.7			
At Test Wet Density (pcf)	129.4			
At Test Dry Density (pcf)	105.4			
At Test Saturation (%)	99.5			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	2246			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		Ult. Phi (deg)	
Cohesion (psf)		Ult. Cohesion (psf)	







Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

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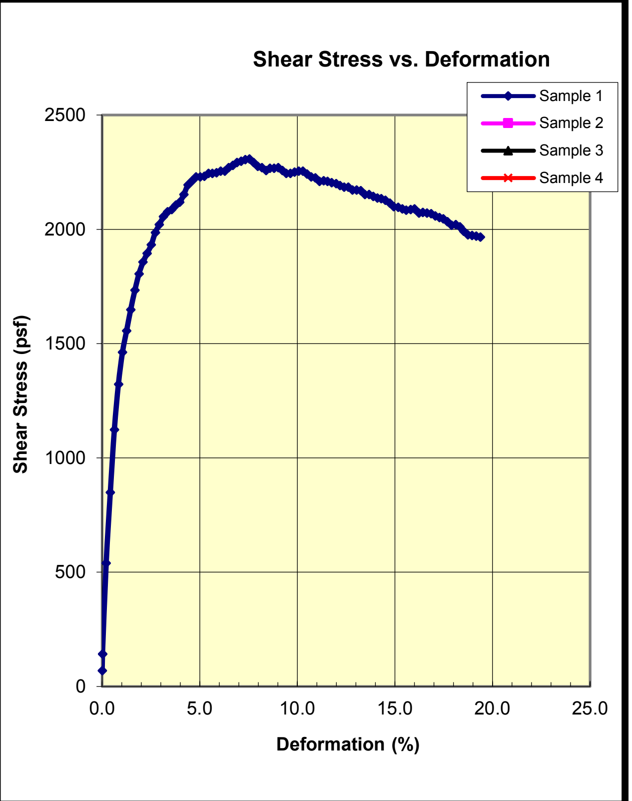
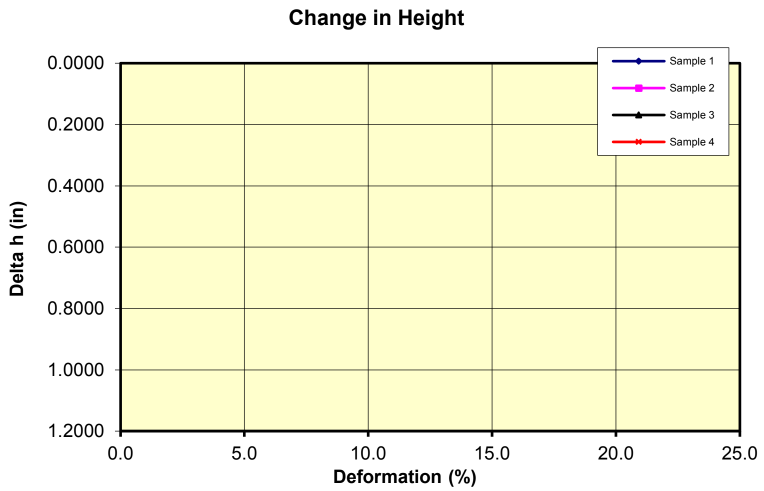
Consolidated Undrained Direct Shear (ASTM D3080M)

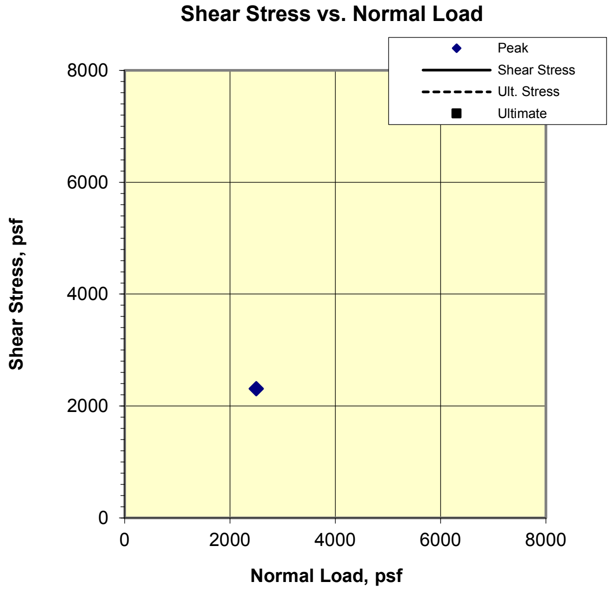
CTL Job #: 218-104
Client: Earth Systems
Project Name: MIT Academy
Project #: 302495-001
Date:
Remolding Info:
By: MD
Checked: PJ

Specimen Data	1	2	3	4
Boring:	B10			
Sample:	2			
Depth (ft):	2.0-2.5			
Visual Description:	Yellowish Brown CLAY w/ Sand			
Normal Load (psf)	2500			
Dry Mass of Specimen (g)	131.1			
Initial Height (in)	1.00			
Initial Diameter (in)	2.41			
Initial Void Ratio	0.568			
Initial Moisture (%)	18.3			
Initial Wet Density (pcf)	129.5			
Initial Dry Density (pcf)	109.5			
Initial Saturation (%)	88.6			
ΔHeight Consol (in)	0.0178			
At Test Void Ratio	0.540			
At Test Moisture (%)	19.6			
At Test Wet Density (pcf)	133.3			
At Test Dry Density (pcf)	111.4			
At Test Saturation (%)	99.6			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	2308			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		Ult. Phi (deg)	
Cohesion (psf)		Ult. Cohesion (psf)	







Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

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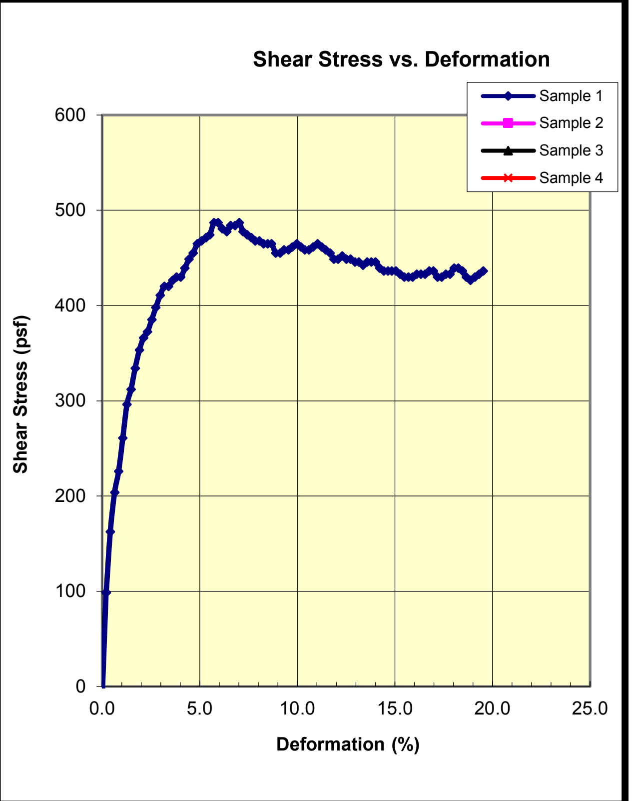
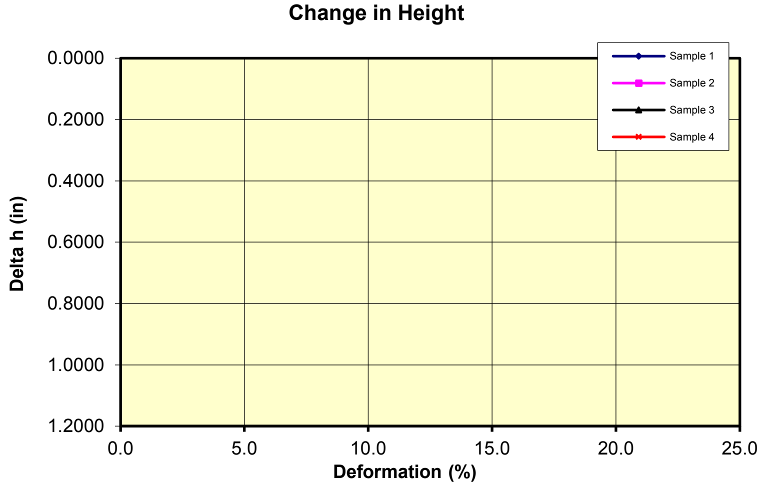
Consolidated Undrained Direct Shear
(ASTM D3080M)

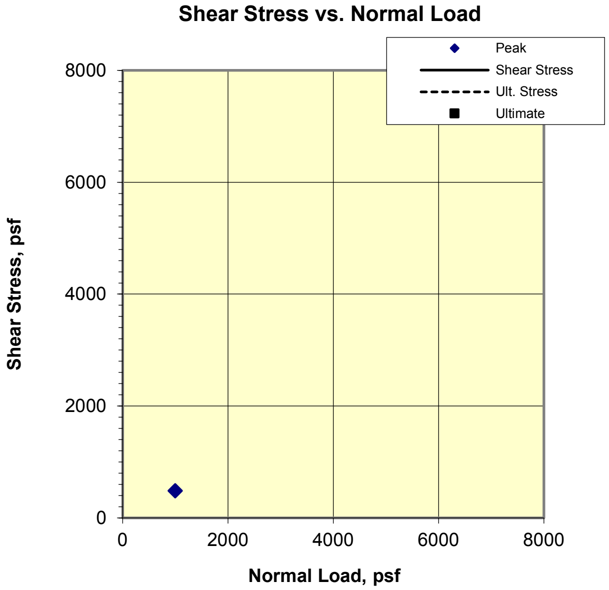
CTL Job #:	218-104	Project #:	302495-001	By:	MD
Client:	Earth Systems	Date:	10/2/2018	Checked:	PJ
Project Name:	MIT Academy	Remolding Info:			

Specimen Data				
	1	2	3	4
Boring:	B10			
Sample:	1			
Depth (ft):	4.5-5.0			
Visual Description:	Dark Yellowish Brown CLAY w/ Sand			
Normal Load (psf)	1000			
Dry Mass of Specimen (g)	103.1			
Initial Height (in)	1.00			
Initial Diameter (in)	2.40			
Initial Void Ratio	0.942			
Initial Moisture (%)	13.8			
Initial Wet Density (pcf)	98.7			
Initial Dry Density (pcf)	86.8			
Initial Saturation (%)	39.5			
ΔHeight Consol (in)	0.0759			
At Test Void Ratio	0.795			
At Test Moisture (%)	27.8			
At Test Wet Density (pcf)	120.0			
At Test Dry Density (pcf)	93.9			
At Test Saturation (%)	94.5			
Strain Rate (%/min)	0.9			
Strengths Picked at	Peak			
Shear Stress (psf)	487			
ΔHeight (in) at Peak				
Ultimate Stress (psf)				

Phi (deg)		**Ult. Phi (deg)**	
Cohesion (psf)		**Ult. Cohesion (psf)**	







Remarks: *DS-CU* A fully undrained condition may not be attained in this test. ΔH is not measured during undrained direct shear tests.

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RESISTANCE '*R*' VALUE AND EXPANSION PRESSURE

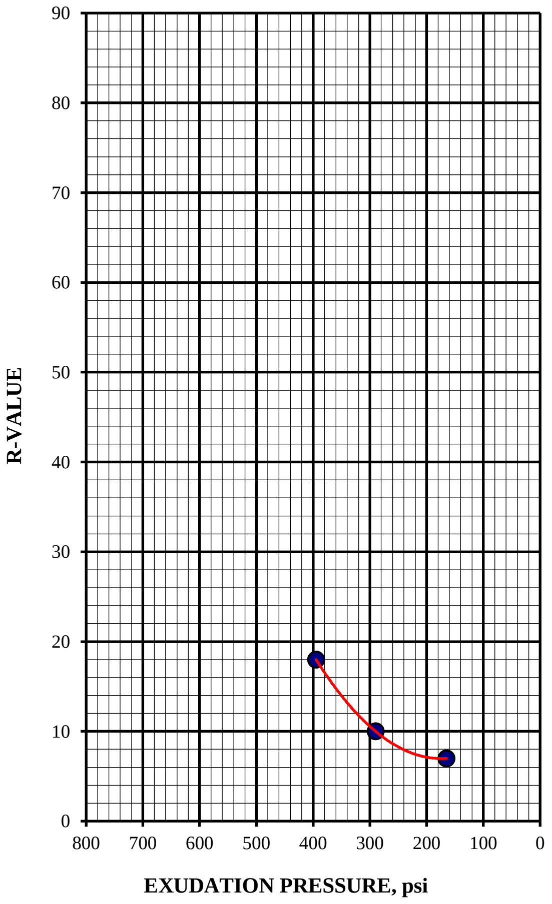
ASTM D 2844/D2844M-13

September 29, 2018

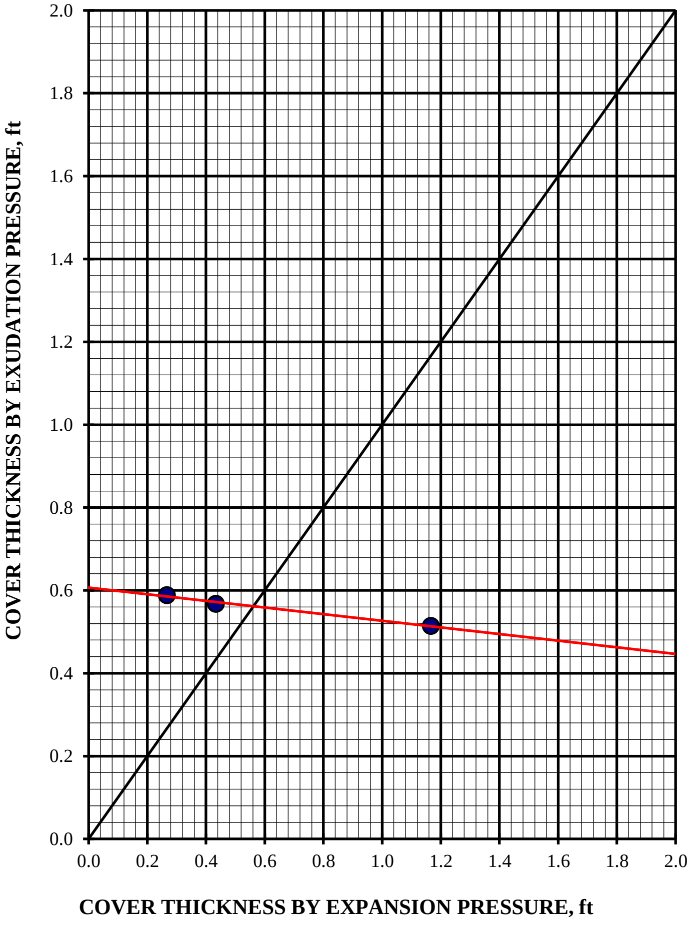
Bag A @ 0.0 -5.0'
Orange Brown Sandy Fat Clay (CH)
Specified Traffic Index: 5.0

Dry Density @ 300 psi Exudation Pressure: 116.3-pcf
%Moisture @ 300 psi Exudation Pressure: 19.7%
R-Value - Exudation Pressure: 11
R-Value - Expansion Pressure: 11
R-Value @ Equilibrium: 11

EXUDATION PRESSURE CHART



EXPANSION PRESSURE CHART



MIT Academy 301495-001

RESISTANCE '*R* ' VALUE AND EXPANSION PRESSURE

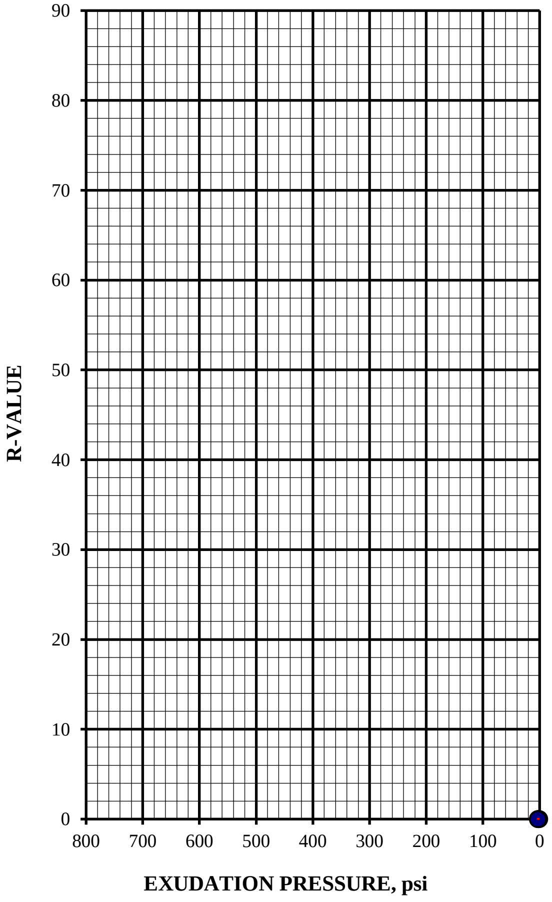
ASTM D 2844/D2844M-13

September 29, 2018

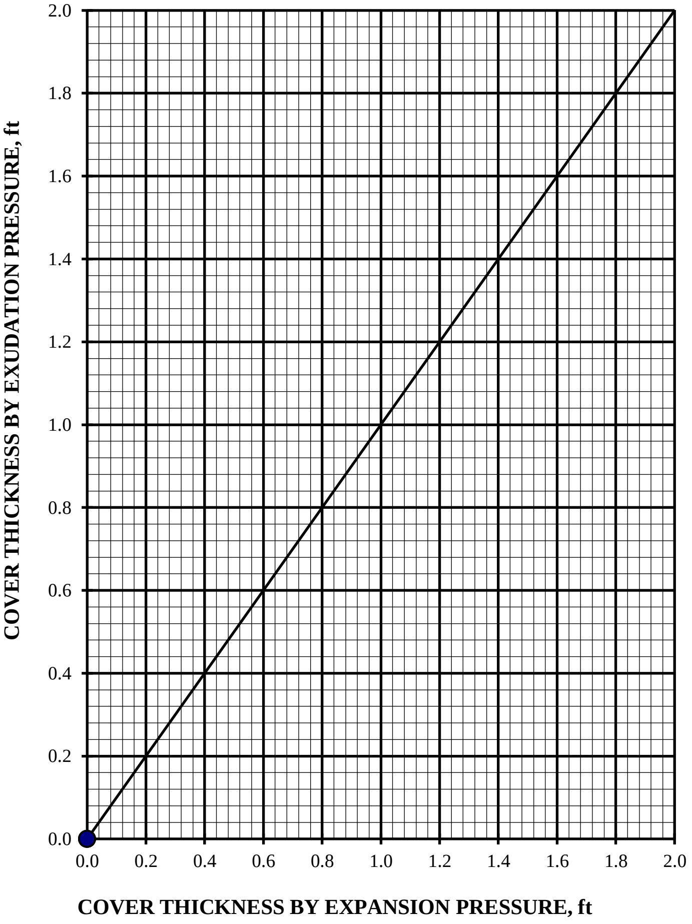
Bag B @ 0.0 -5.0'
Brown Sandy Fat Clay (CH)

Dry Density @ 300 psi Exudation Pressure: N/A
%Moisture @ 300 psi Exudation Pressure: N/A
R-Value - Exudation Pressure: N/A
R-Value - Expansion Pressure: N/A
R-Value @ Equilibrium: Less than 5
(sample extruded from mold during testing)

EXUDATION PRESSURE CHART



EXPANSION PRESSURE CHART



BULK DENSITY TEST RESULTS

ASTM D 2937-17 (modified for ring liners)

October 6, 2020

BORING NO.	DEPTH feet	MOISTURE CONTENT, %	WET DENSITY, pcf	DRY DENSITY, pcf
16-3	9.0 - 9.5	14.5	125.8	109.8
16-4	14.0 - 14.5	12.8	134.2	118.9
16-5	18.5 - 19.0	20.8	126.1	104.4
17-1	2.0 - 2.5	14.4	120.8	105.6
17-2	4.0 - 4.5	9.6	127.2	116.0
17-3	9.0 - 9.5	15.2	131.0	113.6
18-1	2.0 - 2.5	21.5	124.9	102.8
18-2	4.5 - 5.0	24.4	120.8	97.1
18-3	9.0 - 9.5	20.0	127.3	106.1
19-3	9.0 - 9.5	20.7	128.6	106.5
19-4	14.0 - 14.5	15.7	128.3	110.9
20-3	9.5 - 10.0	17.9	128.0	108.5
20-4	14.5 - 15.0	15.8	137.3	118.5
21-1	2.0 - 2.5	18.5	113.5	95.8
21-2	4.0 - 4.5	16.5	125.8	108.0
22-3	5.0 - 5.5	16.2	121.6	104.6
23-1	2.0 - 2.5	16.7	123.6	105.9
23-2	4.5 - 5.0	16.8	129.4	110.8
24-1	2.0 - 2.5	16.7	123.7	106.0
24-2	4.0 - 4.5	16.0	121.3	104.6
24-3	8.5 - 9.0	16.5	124.1	106.6
24-4	14.5 - 15.0	16.3	130.3	112.0
24-5	18.5 - 19.0	16.4	128.4	110.3
24-6	23.5 - 24.0	16.3	NA	NA

PLASTICITY INDEX

ASTM D 4318-17

October 6, 2020

Test No.:	1	2	3	4	5
Boring No.:	19-1	Bag B	Bag A		
Sample Depth:	2.5 - 3.0'	0.0 - 2.0'	0.0 - 2.0'		
Liquid Limit:	53	44	54		
Plastic Limit:	18	20	22		
Plasticity Index:	35	24	32		

Plasticity Chart