DESIGN LEVEL GEOTECHNICAL INVESTIGATION
PROPOSED COPPERLEAF PROJECT
SAN JUAN-HOLLISTER HIGHWAY
SAN JUAN BAUTISTA, CALIFORNIA

FOR
EDENBRIDGE HOMES
December 15, 2015

Job No. 3602.101

BERLOGAR STEVENS & ASSOCIATES

Via E-mail and Mail

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ASSOCIATES

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Subject: Design Level Geotechnical Investigation Report
Proposed Copperleaf Project
San Juan-Hollister Highway
San Juan Bautista, California

Ladies and Gentlemen:

Berlogar Stevens & Associates (BSA) is pleased to present this design level geotechnical investigation for the proposed Copperleaf residential development in San Juan Bautista, California. This report presents the results of our geotechnical investigation for the proposed Copperleaf project and provides conclusions and recommendations related to site grading, underground utilities, building foundations and pavements for the design and construction of the subject project.

In addition to our geotechnical investigation, we conducted a Fault Ground-Rupture Investigation The ground-rupture investigation was performed to evaluate ground-rupture potential from active fault displacement in the vicinity of planned site improvements and to present recommendations to mitigate the impacts of earthquake-induced ground deformation on the planned development. The results of that investigation are presented under separate cover and were considered in the development of the recommendations presented in this report.

PROJECT DESCRIPTION

The preliminary vesting tentative map shows a 45 lot residential subdivision on the approximately 13.3-acre site. The product type will be single family detached houses. The residential structures are expected to be two-story wood-frame buildings. The buildings are anticipated to be constructed at-grade and to be supported by structural concrete slab-on-grade foundations, all at one level for each structure (no step-down slabs). Structural loads are expected to be light, typical for this type of development. A preliminary grading plan prepared by Ruggeri-Jensen-Azar shows cuts and fills on the order of 4 feet or less required to established the building pads west of Street "B" as shown on the Site Plan, Plate 2. Fills of 5 to 11 feet are required to establish building pads east of Street "B". A storm water detention basin is shown at the northeast corner of the site. The proposed development will include construction of roadways and underground utilities.

PURPOSE AND SCOPE OF SERVICES

The purpose of this investigation was to evaluate the site soil and groundwater conditions including geologic hazards and to provide geotechnical conclusions and recommendations based on those conditions for use in the design and construction of the proposed project. The scope of our services included the following:

- Review of readily available published and unpublished geologic maps and documents relating to the site and vicinity.
- Examination of historical topographic maps and aerial photographs of the site and vicinity.
- Conducting a reconnaissance of the site to observe surface conditions.
- Exploration of subsurface conditions by drilling soil-test borings and the performance of cone penetrometer tests (CPTs).
- Geotechnical laboratory testing to assess the physical properties of selected soil samples.
- Analysis of data collected in the field and the laboratory to develop conclusions and recommendations regarding the soil and groundwater, as well as geologic conditions, as they related to the proposed development.
- Preparation of this report presenting our findings and recommendations.

As discussed below, BSA previously completed a Fault Ground-Rupture Investigation of the site. (February 19, 2015, Job No. 3602.100) The scope of the Fault Ground-Rupture investigation was limited to an evaluation of potential ground rupture at the project site and did not include evaluation of seismic shaking or other geologic hazards, which are addressed below.

SITE DESCRIPTION

The approximately 13.3-acre Copperleaf project site is located on the north side of San Juan-Hollister Highway, and is about 200 feet east of the intersection of The Alameda and San Juan-Hollister Highway, in the City of San Juan Bautista, California (Vicinity Map, Plate 1). The Site Plan, Plate 2, shows the general layout of the project site, west Alquist-Priolo boundary, and other features. The property is bordered on the north by State Highway 156. The west side of the site abuts a small undeveloped parcel, a portion of the parking lot for Hacienda de Leal (formerly known as San Juan Inn) and a parcel with several wood-frame structures. The site to the east is occupied by Mission Farm RV Park.

The property is accessed by an unpaved road leading from San Juan-Hollister Highway near the southeast property corner that extends north parallel to the property's east boundary. There is a barn close to the west property line at the location of a planned cul-de-sac. A municipal well with a pump house and a chain-link fence enclosed is located in the northeast portion of the site at the east end of Street "D". A concrete stand pipe is located south of the pump house adjacent to San Juan-Hollister Highway. No other surface structures were noted on the property. The site was covered with seasonal grasses, scattered brush and trees. Dense brush and trees were present along the northern property line in the vicinity of the pump house and the area to the east. The east margin of the property along the fence line is marked by a dense growth of mature trees. The United States Geologic Survey 7.5-Minute San Juan Bautista Quadrangle topographic map (USGS, revised 1997) shows the ground-surface elevation within the project site ranges from about 215 feet above mean sea level in its southwest corner to about 198 feet in its northeast corner.

FIELD EXPLORATION

The first phase of our field exploration was performed in April 2014 to provide information to Edenbridge Homes for due diligence consideration and in preparation for geologic investigation consisting of trenching on the site. Subsurface exploration at that time consisted of four borings to further explore the subsurface conditions. The borings were drilled using a truck-mounted drill rig equipped with hollow-stem augers. Borings were drilled to depths of between 15 and 20 feet below the ground surface (bgs). We drilled six additional borings on March 31, 2015 to further explore subsurface conditions. These borings were also drilled using a truck-mounted drill rig equipped with hollow-stem augers and were drilled to depths of between 15 and 21½ feet bgs.

A member of our staff visually classified the soils in the field as the drilling progressed and recorded a log of each boring. Visual classification of the soils was made in general accordance with the Unified Soil Classification System (ASTM D2487). Soil sampling was conducted using a 2.5-inch inside diameter Modified California sampler with brass liners and a 1⅜-inch inside diameter Standard Penetration Test (SPT) split-spoon sampler (smooth inside bore with no provisions for use of liners). The sampler were driven into the underlying soil to a depth of 18 inches with a 140-pound hammer falling 30 inches. The number of blows required to drive the samplers the last 12 inches of the 18-inch drive are shown as blows per foot on the boring logs.

In addition to drilling the exploratory borings, Cone Penetration tests (CPTs) were also performed to evaluate subsurface conditions. Fourteen Cone Penetration Tests (CPTs) were conducted by Brittsan CPT, Inc. on November 13, 2014, using truck mounted equipment. The CPTs were conducted in general accordance with ASTM Test Method D-5778. The CPTs were advanced to depths of between 20 and 45 feet bgs.

The approximate locations of the CPTs and borings are shown on Plate 2, Site Plan. The logs of the borings along with a key for the classification of the soil are presented in Appendix A. The soil classifications shown on the logs are based on field classifications as well as the results of laboratory tests. The CPT interpretation plots (logs) are presented in Appendix B.

Additional subsurface exploration was conducted on the site during our fault ground-rupture investigation. This included excavation of seven exploratory test pits and three trenches. The three trenches are identified as T-1, T-4, and T-10 and the seven test pits are identified as T-2, T-3, T-5, T-6, T-7, T-8, and T-9. The locations of these excavations are included on the attached Site Plan, Plate 2.

LABORATORY TESTING

Soil samples from the borings were transported to our laboratory for testing. Laboratory tests were performed on selected soil samples to evaluate their physical characteristics and engineering properties. Laboratory testing included moisture, density, Atterberg Limits, grain size distributions, single point consolidation test and R-Value tests were performed on selected samples. Atterberg Limits testing on near surface soil samples resulted in Plasticity Indices (PI) of 14 and 25. One sample of the surface clay soil was tested to determine the R-value. The R-value was determined to be 9. Laboratory test results for soil moisture and density are contained on the Boring Logs. Results of the remaining laboratory tests are presented in Appendix C.

A soil sample from boring B-10 at a depth of about 2 feet was transported to CERCO Analytical, a state certified analytical laboratory for sulfate and chloride testing. The results are contained in Appendix D. Chloride was found to be not detectable and water soluble sulfate concentrations were found to be negligible. However, based on resistivity testing, the soils were classified as "moderately corrosive."

SUBSURFACE SOIL CONDITIONS

The upper approximately 8 to 20 feet of the site west of Street "C" consists of varying layers of silty to sandy clays. The surficial clay layer extends to the east but is generally on the order of about 2 feet thick. The near surface clays are of low to high plasticity with Plasticity Indexes (PIs) ranging from 14 to 25. The fine grained soils range in consistency from medium stiff to very stiff. In the western portion of the site we encountered interbedded layers of clayey, silty and gravelly sands that extended to the depth explored of about 20 feet. These sand deposits are medium dense to dense. The logs of Trenches T-1, T-4 and T-10 are detailed depictions of the soils stratigraphy across the site. At Trench T-4, there is a change in the ground surface with the surface dipping down to the east about 4 feet. The change in ground elevation is attributed to erosion by an abandoned meander loop of San Juan Creek and correlates with the tonal change observed in aerial photographs. There is a distinct change in the soil stratigraphy associated with the stream channel meander and subsequent deposition of fluvial deposits. At Trench T-4 the deposits encountered northeast of Station 0+20 consist of loose to very loose interbedded sand and gravelly sand lenses and thin sandy clay lenses and mixed sandy clay and clay. When exposed in the open trench excavated for our fault ground rupture investigation the fluvial deposits east of about Station 0+25 collapsed. A similar buried erosional bank of a fluvial deposit was observed and logged at Trench T-10. Please refer to the boring logs, CPT logs and trench logs in Appendices A, B and E, respectively, for more detailed subsurface information.

GROUNDWATER

The borings were monitored for visible signs of free groundwater during and immediately after completion of drilling each boring. Groundwater was encountered in two of the 10 borings drilled for this investigation at depths below the ground surface of 15 to 20 feet. Groundwater was encountered at a depth of about 28 feet in the ground-rupture investigation Trench T-10.

The depth to groundwater can be expected to fluctuate both seasonally and from year to year, particularly when drought conditions exist as is the present case. Fluctuations in the groundwater level may occur due to variations in precipitation, irrigation practices at the site and surrounding areas, climatic conditions, pumping from wells and other factors not evident at the time of our investigation.

SEISMIC HAZARDS

FAULTING

The site is located within the Earthquake Fault Zone (formerly the Special Studies Zone) designated for the San Andreas fault. Based on the results of our Fault Ground-Rupture Investigation, a fault setback or building exclusion zone was established. This is depicted on Plate 2. The details of our fault investigation, the data collected, and our conclusions and recommendations regarding the location of the fault are presented in our Fault Ground-Rupture Investigation report, dated February 19, 2015.

SEISMIC SHAKING AND SEISMIC DESIGN PARAMETERS

The site will likely be subject to at least one moderate to severe earthquake and associated seismic shaking during the useful life of the planned development, as well as periodic slight to moderate earthquakes. Some degree of structural damage due to strong seismic shaking should be expected at the site, but the risk can be reduced through adherence to seismic design codes.

The U.S. Geological Survey Earthquake Hazards Program maintains a website with an application for U.S. Seismic Design Maps. The United States Geologic Survey 7.5-Minute San Juan Bautista Quadrangle topographic map (USGS, revised 1981) shows the coordinates of a point near the approximate center of the property are latitude: 36.8401 N and longitude: 121.5296 W. Based on this location, site soil classification D and risk category I/II/III, the design level peak ground acceleration (PGA) is 1.004 according to the USGS website. Additional seismic design parameters obtained from the USGS Earthquake Hazards Program, U.S. Seismic Design Maps program, determined with consideration of the 2010 ASCE 7 (w/March 2013 errata) publication, include the following:

Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters	
Mapped Spectral Acceleration for Short Periods, S_s	2.615 g
Mapped Spectral Acceleration for 1-Second Period, S_1	1.256 g
Site Class	D
Site Coefficient F_a (for Site Class D)	1.0
Site Coefficient F_v (for Site Class D)	1.5
Acceleration Parameter S_{MS} (adjusted for Site Class D)	2.615 g
Acceleration Parameter, S_{M1} (adjusted for Site Class D)	1.883 g
Acceleration Parameter, S_{DS}(adjusted for Site Class D)	1.744 g
Acceleration Parameter, S_{D1} (adjusted for Site Class D)	1.256 g
Long-Period Transition Period, T_L	12 seconds
Seismic Design Category	E

Additional Parameters for Sites with Site Design Categories D through F	
Risk Coefficient at 0.2 s Spectral Response Period, C_{RS}	1.008
Risk Coefficient at 1.0 s Spectral Response Period, C_{R1}	0.910
PGA_M	1.0

LIQUEFACTION EVALUATION

Liquefaction is a temporary transformation of saturated soil into a viscous liquid during strong to violent ground shaking from a major earthquake. Historically, the potential for liquefaction has been associated with cohesionless soil, such as sands and silty sands. Current practices in liquefaction evaluations now includes sands, silty sands and gravels, as well as silts and even some clay soils. While fine-grains soil (clays and silts) may not undergo complete liquefaction, these soils can be susceptible to cyclic softening. Liquefaction and cyclic softening both result in reduced soil shear strength. The loss of strength in both granular and fine-grained soils is a result of cyclically induced stresses which cause increased pore pressures within the soil matrix. Primary factors affecting the potential for a soil to undergo liquefaction include: depth to groundwater, soil type, relative density of granular soils, moisture content of fine grain soils, initial confining (overburden) pressure, and intensity and duration of ground shaking.

Seismic induced liquefaction or softening of fine grained soils can cause loss of or reduced support for foundations, significant ground deformation due to settlement within sandy liquefiable layers as pore pressures dissipate, and/or flow failures (lateral spreading) in sloping ground or where open faces (such as a canal, creek, or lake) are present (NCEER 1998).

The liquefaction potential of the site was investigated with cone penetration tests. The CPT data was analyzed using the software CLiq (version 1.7.4.34). CLiq was developed by GeoLogismiki specifically for use in analyzing CPT data in accordance with the recognized procedures based on the current state of practice for liquefaction analysis. The software was developed to address advanced issues such as cyclic softening in clay-like soils. Liquefaction analyses were performed using the CPT-based evaluation procedures as described by Idriss and Boulanger (2008) and Robertson (2009). We analyzed the liquefaction potential using an assumed high groundwater level at a depth of 15 feet. A design basis earthquake magnitude, M_W, of 8.0 and a peak ground acceleration of 1.004 g were used in the analysis.

The CPT data and subsequent analysis indicates that portions of the "sandy silt & silty sand" (CPT interpretation) layers encountered below the site are potentially liquefiable. Based on the CPT data alone, without adjustment for over-estimation of liquefaction-induced settlement of silts and clays, the expected amount of total seismic settlement associated with liquefaction is 1½ to 4 inches.

LATERAL SPREADING

Lateral spreading is a potential hazard commonly associated with liquefaction. This phenomenon typically occurs where the subject site is sloping, or is adjacent to a descending slope or an open channel. The site has a gentle slope with about 15 feet of fall to the northwest over approximately 1,200 feet. Our analysis, which was conducted in accordance with California Geologic Survey Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California, 2008, indicates that there is a potential for lateral spreading to occur in the eastern portion of the site. Lateral displacement could be on the order of 4 to 8 inches with consideration of the deposits with a liquefaction potential of high to very high risk. Mitigation of the effects of lateral spreading on foundations is recommended through foundation design as discussed in detail below.

LIQUEFACTION-INDUCED GROUND RUPTURE POTENTIAL

Liquefaction-induced ground rupture or sand boils occur when the sudden increase in pore water pressure in a layer of saturated, clean, loose sand or silty sand results in sufficient pressure to rupture up through the upper soil mantle to the ground surface. When this occurs, the liquefied sand blows out through the rupture, which is referred to as ejecta, resulting in the momentary loss or diminished support and increased differential settlement of structures on shallow foundations. Where structures are founded on concrete slabs-on-grade increased settlement typically occurs at the building perimeter where supporting soils are displaced from below the foundation. This could result in damage to the structure and the underground utilities.

Based on work by Youd and Garris (1995), a capping layer of non-liquefiable material over a liquefiable layer should have a ratio of capping layer thickness to liquefiable layer thickness of about 2:1 to prevent the occurrence of ground surface rupture. Based on an assumed high groundwater level of 15 feet (groundwater was logged at a depth of 28 feet in the 30 foot deep fault trench) the site is overlain by at least 15 feet of capping material. Filling of the site will increase the cap thickness. A liquefiable sand layer with a thickness of about 3 feet is present at a depth of 15 feet, with an additional liquefiable sand layers each about 1 to 2 feet thick at depths of 31 and 38 feet bgs in CPT-14. The potential for ground rupture based on this profile is very low. The liquefaction potential and lateral displacement potential for the soil profile at CPT-4 indicate soils with a high liquefaction potential between the depths of 19 and 36½ feet bgs. However, the soils logged between 19 and 21 feet, 23 to 26 feet, 27 to 35½ are all clay and silty clay. Based on these conditions, we judge the probability of liquefied sand layers venting to the surface during an earthquake to be low.

SEISMIC INDUCED SETTLEMENT OF UNSATURATED SANDS

Strong to violent ground shaking associated with seismic activity can cause settlement or densification of unsaturated sands. The potential impact of seismic-induced settlement of sands above the groundwater is settlement of the ground surface and structures supported on shallow foundations on the site. Seismic-induced settlement of sands above the groundwater is estimated to be up to approximately ½-inch.

EXPANSIVE SOILS

Moderately to highly expansive soils were encountered in the surficial soils that blanket the site. These soils extend below the depths of cut shown for the building pads at the western side of the site and will be present at the surface of this portion of the site unless removed and replaced with non-expansive import fill. Expansive soils can undergo significant volume change with changes in moisture content. Volume change, resulting from shrinkage upon drying and swelling upon wetting is not typically uniform across the area of a structure. With this condition it is important that foundations be capable of tolerating or resisting potentially damaging soil movements. The presence of expansive clay soils can also impact the performance of concrete flatwork as discussed below.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

Based on the information collected during this investigation and the results of our analyses, it is our opinion that development of the site is feasible from a Geotechnical Engineering prospective, provided that the conclusions and recommendations contained in this report are incorporated into the design and construction of the projects.

The predominant geotechnical considerations for this project are the presence of liquefaction induce settlement and expansive clays. Liquefaction-induced settlement, as well as lateral spreading of the surface soils underlain by liquefied soils, have the potential to impact buildings as well as site improvements including roads and underground utilities. The presence of liquefiable soils will need to be considered in design of foundations, infrastructure and site improvement.

The near-surface soils are primarily classified as sandy and silty clays. These clays have been determined to have expansion potentials ranging from low to high based on the Plasticity Indexes ranging from 14 to 25. With the presence of expansive soils it is important that foundations be capable of tolerating or resisting any potentially damaging soil movements. The use of post-tensioned (PT) concrete slab-on-grade foundations is a common approach to addressing the potential effects of expansive soils on residential structures. The recommendations presented for foundations and for concrete flatwork are based on the presence of soils with a moderate to high expansion potential.

The presence of existing undocumented or uncontrolled fills and disturbed surface soils will need to be considered in the development of the site. Uncontrolled fill is present at the locations of the exploratory trenches and test pits. This uncontrolled fill will need to be removed and then replaced as engineered fill as discussed in more detail below. It is our understanding that agricultural practices often include periodic tilling of sites to depths up to of about two feet. Evidence of soil disturbance was observed to depths of about 1½ to 2 feet in the exploratory test pits and trenches excavated during our fault ground-rupture investigation at the site. Over-excavation of the upper one foot of the surface soils in areas where excavation is not required as part of the planned grading operation to achieve design grades, and where uncontrolled fills are known to exist or are encountered during grading operations, is recommended.

Our opinions, conclusions and recommendations are based on our field and office studies, the properties of soils encountered in our borings and CPTs, the results of the laboratory testing program and our understanding of the proposed project. Our detailed design and construction recommendations pertaining to site clearing and preparation, site earthwork, foundations, retaining walls, concrete slabs-on-grade (flatwork) and pavements are presented below.

LIQUEFACTION MITIGATION

As discussed above, liquefiable soils have been identified at the site. Based on our liquefaction analysis, we estimate that liquefaction-induced free field settlement will range from about 1½ inches to 4 inches. Differential settlement is estimated to be up to 1 inch across a single residential structure. At this magnitude of total and differential settlement, mitigation of liquefaction-induced settlement on the structures could potentially be achieved by designing the foundations to resist the effects of liquefaction-induced differential settlement and possibly strengthening connections within the structure. The differential settlement associated with liquefaction is specifically noted in our foundation recommendations section, Post-Tension Concrete Slab Foundations, presented below.

Additional settlement, both for total and differential settlement, are possible should lateral spreading occur and with the occurrence of ground rupture (sand boils). Designing foundations with increased stiffness, particularly around the perimeter of the structure, to allow for increased cantilever capacity of the foundation to transfer building loads back into the central portion of the foundation will reduce the impacts of lateral spreading and ground rupture on the building.

LATERAL SPREADING MITIGATION

As noted above, there is a low potential that lateral spreading could occur at the site and impact the development. With the recommended foundation consisting of post-tensioned concrete slabs-on-grade and with the foundation design recommendations including a provision that seismic induced differential settlement of up to 1 inches be considered, the residential foundations should also be capable of withstanding minor lateral ground movement. Therefore it is our opinion that additional mitigation measures to address the low lateral spreading potential are not needed.

Lateral spreading and ground rupture can also effect underground utilities. This is of particular concern with gas and water lines. Flexible pipes should be used.

SITE PREPARATION AND GRADING

Our general site preparation and grading recommendations are as follows:

1. The site has limited improvements that will need to be cleared. These include the barn at the west side of the site, the municipal well and pump house located at the east end of Street "D" as shown on the Site Plan, along with the waterline that leads from the pump to San Juan Highway. BSA's field staff should be present during site clearing operations to enable us to locate areas where depressions or disturbed soils are present and to allow our staff to observe and test the backfill as it is placed.
2. Vegetation at the site includes trees, brush and seasonal grasses. Root balls at the trees and brush should be removed along with roots exceeding ½-inch in diameter. Holes resulting from tree removal should be cleared of loose soil and roots, and properly backfilled in accordance with our recommendations. Surface vegetation present at the time of grading should be stripped down to the soil surface and should not be incorporated into the fill. The upper 3 inches of the soil should be stripped from the site and stockpiled for use in future landscape areas. Organic laden soils should not be placed in compacted fills.
3. Exploratory excavations made for the fault ground-rupture study were backfilled with uncontrolled fill. The uncompacted fill should be re-excavated and then be replaced as engineered fill in accordance with the recommendations presented below. The locations of the test pits and trenches are shown on Plate 2. Test pits (T-2, T-3, T-5 through T-9) and Trenches T-1 and T-4 generally extended to depths of 12 to 15 feet bgs. Trench T-10 varied in depth from about 10 feet bgs at the southwest end to 29 feet bgs at the northeastern end. The depths of the trenches T-1, T-4, and T-10 are shown on the trench logs included in Appendix E. The test pits and shallower portions of the trenches (approximately 8-10 feet and less) were excavated with vertical side walls. Sidewalls at deeper excavations were sloped back at an inclination of about 1 horizontal to 1 vertical (1H:1V). Engineered fill is material that is properly moisture conditioned, placed and compacted in accordance with the recommendations presented below, as observed and documented by the Geotechnical Engineer. The contractor should be prepared to dewater the excavations extending below 10 feet.
4. Following the clearing and stripping operations, in areas other than those where excavation of one foot or more is planned as part of the designed grading operation, the top one foot of the site should be removed (over-excavated) to allow for processing and compaction of the newly exposed subgrade, followed by the placement of engineered fill to design grades.
5. Exposed subgrade soils in over-excavated areas and in cut areas that will support structures or pavement should be scarified to a depth of about 12 inches, properly moisture conditioned and compacted. If zones of soft or saturated soils or existing fills are encountered, deeper excavations may be required to expose firm soils. This should

be determined in the field by the Geotechnical Engineer. After the soil subgrades have been properly prepared, the areas may be raised to design grades by placement of engineered fill. In areas that are over-excavated, the excavated soils can be replaced as engineered fill.

6. With moderately to highly expansive clay soils present, compaction of clay soils where placed as fill within the upper three feet of the site in building pad and concrete flatwork areas and where present at the surface of cut lots should be between 88 and 92 percent relative compaction at a moisture content at least 5 percent over optimum moisture content. Compaction of clay soils deeper than three feet from finished grade and low plasticity fine grained soils and granular soils should be compacted to at least 90 percent at a moisture content of at least 3 percent above the optimum moisture content. Fill soils below a depth of 10 feet from the existing ground surface should be compacted to at least 93 percent relative compaction at a moisture content of at least 3 percent above the optimum moisture content. Where low plasticity clays, and more importantly silts and silt sands are present care should be exercise to avoid over wetting of these sensitive soils.

7. Fill and backfill should be placed in thin lifts (normally 6 to 8 inches in loose lift thickness depending on the compaction equipment), properly moisture conditioned, and compacted as specified above.

8. Relative compaction refers to the in-place dry density of the soil expressed as a percentage of the maximum dry density determined by ASTM D1557 laboratory compaction test procedure. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

9. The on-site soil is generally suitable for engineered fill, provided it is free of debris, significant vegetation, rocks greater than 4 inches in largest dimension and other deleterious matter. Use of on-site soils for fill or backfill within five feet of the back of retaining walls should be limited to those soil with a Plasticity Index of 15 or less.

10. Where import fill is required for mass grading of the site, the soil should have a Plasticity Index of 20 or less. Where gravelly soil is to be imported, the material should have sufficient sand and fine grained soils content to prevent nesting or pockets of open graded gravel. The import soil should not contain particles greater than 4 inches in largest dimension.

11. The Geotechnical Engineer should be notified at least 48 hours prior to site clearing, grading and backfill operations. The procedure and methods of grading may then be discussed between the contractor and the Geotechnical Engineer.

12. Observations and soil density tests should be carried out by a representative of the Geotechnical Engineer during grading and backfill operations to assist the contractor in obtaining the required degree of compaction and proper moisture content. Where the compaction and/or soil moisture content are outside the range required, additional compaction effort and/or adjustment of moisture content should be made until the specified compaction and moisture conditioning is achieved.

UTILITY TRENCH EXCAVATION AND BACKFILL

Excavations should conform to applicable State and Federal industrial safety requirements. The responsibility for the safety of open excavations should be borne by the contractor. Safety in and around utility trenches is the responsibility of the underground contractors. The walls of trenches extending into the clayey soils will likely stand in vertical cuts in the upper four to five feet with appropriate shoring, provided proper moisture content in the soils is maintained and that the trench walls are not subjected to vibration or surcharge loads above the excavation. However, in general, trench sidewalls should be sloped no steeper than 1 Horizontal to 1 Vertical (1H:1V) in stiff to hard cohesive soil and no steeper than 1.5H:1V in granular soils. Flatter trench slopes may be required where seepage is encountered during construction or if exposed soil conditions differ from those encountered in our borings, CPTs and trenches. If trench side slopes cannot be excavated due to site constraints, shoring should be provided to ensure trench stability and safety. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within five feet of the top (edge) of the excavation.

Materials type and quality, placement procedures and compaction operations for utility bedding and shading materials should meet local agency and/or other applicable utility providers' requirements. From a geotechnical perspective, utility trench backfill above the shading materials may consist of native soils that have been processed to remove rock fragments over 4 inches in largest dimension, rubbish, vegetation and other undesirable substances. Backfill materials should be placed in level lifts not to exceed 12 inches in loose thickness, moisture conditioned and mechanically compacted. Lift thickness will be a function of the type of compaction equipment in use. Thinner lifts will be required for manually operate equipment, such as wackers or vibratory plates, and thicker lifts possible where a sheepsfoot wheel is used on the stick of an excavator. No jetting is permissible on this project.

Trench backfill consisting of on-site or imported cohesive (clay) soil should be moisture conditioned to between 3 and 5 percent above optimum and compacted to at least 90 percent relative compaction; where sand is used as backfill the sands should be moisture conditioned to slightly above the optimum moisture content and compacted to at least 93 percent relative compaction. Trenches in pavement areas should be capped with at least 12 inches of compacted, on-site soil similar to that of the adjoining subgrade. The upper 12 inches of trench backfill in areas to be paved should be compacted to at least 95 percent relative compaction.

PAVEMENT AREA SUBGRADE AND AGGREGATE BASE

Prior to subgrade preparation, utility trench backfill in the pavement areas should be properly placed and compacted as previously recommended. The top 12 inches of soils for pavement subgrade should be scarified and compacted to at least 95 percent relative compaction to provide a smooth, <u>unyielding</u> surface. The compacted subgrade should be non-yielding when proof-rolled with a loaded ten-wheel truck, such as a water truck or dump truck, prior to pavement construction. Subgrade soils should be maintained in a moist and compacted condition until covered with the complete pavement section.

Class 2 aggregate base should conform to the requirements found in Caltrans Standard Specifications Section 26. The aggregate base should be placed in thin lifts in a manner to prevent segregation, uniformly moisture conditioned, and compacted to at least 95 percent relative compaction to provide a smooth, <u>unyielding</u> surface.

SURFACE DRAINAGE

Surface water should not be allowed to collect on or adjacent to structures or pavements. Final site grading should provide surface drainage away from structures, pavements and slabs-on-grade to reduce the percolation of water into the underlying soils. Surface drainage on residential lots should comply with Section 1804, Subsection 1804.3 of the California Building Code. If recommended surface gradients cannot be met or where there are landscape areas around the structures that cannot drain freely through sheet flow, area drains should be considered. Even with the recommended gradients there is a potential that ponding conditions may develop adjacent to the buildings over time. Where positive drainage around buildings cannot be established and maintained as part of the site grading and paving design, area drains should be provided around the structures in landscape areas and possibly within the areas of concrete flatwork where it abuts the structures.

HOUSE FOUNDATIONS

Moderately to highly expansive soils were encountered in the surficial soils that blanket the site. Expansive soils can undergo significant volume change with changes in moisture content. Volume change, resulting from shrinkage on drying and swelling on wetting is not typically uniform across the area of the structure. Unless these soils are over-excavated at the cut lots and lots with little to no fill, followed by replacement with non-expansive soils, and the expansive soils are not used as fill within the upper three feet of fill lots, the presence of the expansive soils will need to be considered in foundation selection and design. Liquefiable soils have also been identified at the site. These soils have the potential to undergo liquefaction-induced settlement. Lateral spreading of the site can also occur should the underlying soils undergo liquefaction. With these condition it is important that foundations be capable of tolerating or resisting potentially damaging soil movements. Foundations should be capable of withstanding differential settlement of 1 inch of the ground surface across the span of the structure. This is in addition to edge and center lift consideration that could occur as a result of soil volume (expansion or shrinkage) of expansive soils. As a method of mitigation of the effects of these soils on the building foundations, we recommend the use of post-tensioned (PT) slab-on-grade foundations for the proposed residential buildings for this project.

Post-tensioned foundations should be designed in accordance with the design provisions as presented in the document Design of Post-Tensioned Slabs-On-Ground, third edition, published by the Post-Tensioning Institute (PTI), with consideration of Addendums No. 1 and No. 2. With fill soils required at the majority of the lots, PT concrete foundation design parameters should be determined during the rough grading phase of the project. For preliminary planning, foundations on the order of 10 to 12 inches thick should be considered.

Where moisture vapor through the slabs would be objectionable, the use of a vapor retarder and capillary moisture break should be considered. The slab designer should determine the thickness of the slab and rock cushion layers.

RETAINING WALLS

The preliminary grading plan shows fills of as much as about 11 feet along a portion of the northern property line, which will require the construction of a retaining wall. Retaining wall and wall foundation design parameters are presented below.

Retaining Wall Design Parameters	
Active Equivalent Fluid Pressure Level backfill (drained conditions) Sloping backfill (drained conditions)	 60 pcf 75 pcf
At-Rest Equivalent Fluid Pressure (Level backfill and drained conditions)	90 pcf
Seismic Load for retained height (H) of 6 feet or greater Line Load applied at 0.6H above the wall base	$32H^2$
Surcharge Load, where applicable	Designated by Structural Engineer

Where retaining walls are free to rotate at least 0.1 percent of the wall height at the top of the backfill, as with a cantilever wall, the walls may be designed using an active lateral earth pressure. Walls that are incapable of this deflection or walls that are fully constrained against deflection, should be designed for an equivalent fluid at-rest pressure.

Retaining Wall Shallow Foundation Recommendations	
Allowable Bearing Capacity (may be increased by one-third for temporary seismic and wind loads at the discretion of the structural engineer)	1,500 psf
Allowable Passive Equivalent Fluid Pressure Level ground surface in front of the wall Sloping surface in front of the wall.	300 pcf Ignore the upper 1' of embedment Ignore the upper 3' of embedment
Allowable Base Friction Coefficient	0.30
Minimum Footing Depth	24 inches below lowest adjacent grade *

* Where footings are constructed in proximity to descending slopes, the base of the footing should be at a depth sufficient to provide a minimum of 10 feet of soil at the base of the footing as measured laterally out to the face of the slope.

Wall Surcharge

The above recommended lateral pressures do not include any surcharge loads due to live loads placed above the wall. Therefore, the designer should include appropriate surcharge loads, if any, in the retaining wall design. To prevent excess lateral forces from being applied to the retaining wall, heavy compaction equipment (such as loaders, dozers, or sheepsfoot rollers) should not be allowed within a horizontal distance of about 5 feet behind the top of the retaining wall. The backfill directly behind the retaining wall should be compacted using light-weight equipment such as self-propelled vibrating rollers or hand operated equipment (jumping jack compactors or vibratory plates). For backfill of the retaining wall using self-propelled vibrating rollers, an additional uniform lateral pressure of 200 psf should be added over the entire height of the retaining wall.

Retaining Wall Backdrains

The above recommended lateral pressures are based on drained conditions. The retaining walls should be provided with permanent backdrains to prevent hydrostatic pressure build-up. The backdrain should consist of a subdrain pipe placed at the base of the wall with a vertical drain constructed or installed behind the retaining wall. Subdrain pipes should be perforated SDR 35 pipe, typically at least 4 inches in diameter, installed with the perforations facing down. All subdrain pipes should be surrounded by and be underlain by at least 4 inches of Class 2 Permeable Material, as defined in Section 68-2.02F(3) of the State of Caltrans Standard Specification (2010). The vertical drain should extend from the Class 2 Permeable Material encapsulated subdrain pipe at the base of the wall to about 1 foot below the finished grade. The vertical drain should consist of Class 2 Permeable Material and should be at least 12 inches thick. Alternatively, a geo-composite drain, such as Miradrain 6200 or approved equivalent, may be used in lieu of the Class 2 Permeable Material vertical drainage blanket. The geo-composite should drain into the subdrain pipe. The subdrain pipe should tie into a solid pipe leading to a suitable gravity discharge or storm drain system. Even with the presence of a wall drain, dampness may occur at the face of the walls. If this is objectionable, waterproofing of the walls should be considered.

Where slopes are located above retaining walls, surface water draining toward the wall should be collected in a lined concrete ditch located at the back of the water. Surface water should not be allowed to percolate into the retaining wall backfill. The concrete ditch should direct the water into a closed pipe to be conveyed to a suitable discharge point.

Retaining Wall Backfill

Backfill soils should have a PI of 15 or less for soil placed within 5 feet of the wall. Backfill against walls should be compacted as discussed in the section "Site Preparation and Grading," above.

CONCRETE FLATWORK

With the exception of slabs subject to vehicular loads, it is our opinion that, from a Geotechnical Engineering standpoint, exterior concrete flatwork, such as sidewalks and patios, can be placed directly on the prepared subgrade. The use of aggregate base as support for concrete flatwork should be avoided except in traffic areas where required as part of a structural section, or where required for compliance with a City standard. The moisture content of the subgrade soils should be checked several days prior to the placement of concrete, or baserock where required. Where moderately to highly expansive soils are present and the soil moisture content is less than 5 percent above optimum, the subgrade should be presoaked to at least 5 percent over optimum moisture content prior to placing concrete. Even with proper site preparation there will be some effects of soil moisture change on concrete flatwork. Reinforcing steel should be considered to reduce potential tripping hazards caused by expansive soil swell and tree roots.

Where exterior concrete slabs-on-grade are planned, we generally recommended that exterior slabs-on-grade (i.e. sidewalks) be cast free from adjacent footings or other edge restraint. Using a strip of ½-inch thick asphalt impregnated felt or other commercially available expansion joint material between the slab edges and the adjacent structure may accomplish this. Where there is a concern that a trip hazard could develop due to differential movement between the exterior slab-on-grade and the adjoining foundation, such as at doorways or embedded curbs, consideration may be given to tying the slab to the foundation or with reinforcing steel (rebar) dowels. Construction and expansion joints should be considered by the designer to allow for concrete shrinkage and differential movement of soils.

CORROSIVITY CONSIDERATIONS

The corrosivity tests were performed by CERCO Analytical, Inc. of Concord, California on one sample of the surface soil. As reported by CERCO Analytical, the sample was determined to be "moderately corrosive" based on resistivity test results. CERCO Analytical's report (see Appendix D) included the following recommendation: "All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion." The chloride ion concentrations were determined by CERCO Analytical to be insufficient to attack steel embedded in a concrete mortar coating. Sulfate ion concentrations were determined by CERCO Analytical to be insufficient to damage reinforced concrete structures and cement mortar-coated steel. Please refer to the attached copy of the CERCO Analytical report for more information regarding their test results and brief evaluation.

Import soils should be tested to determine the corrosivity of those soils to check for impacts on concrete. In addition, PG&E requires soil corrosivity testing at the locations of underground vaults. Soil samples must be collected from the specific vault locations.

STRUCTURAL PAVEMENT SECTIONS

With import fill required to achieve design grades determination of the design R-value for subgrade soils should be made during the mass grading operations as the site approaches design grades. For preliminary planning purposes, we have developed pavement sections based on a subgrade R-value of 5, which is considered to be the worst case condition. The Caltrans flexible pavement design method was used to develop the recommended pavement sections presented below.

FLEXIBLE PAVEMENT SECTIONS Subgrade R-Value = 5 Caltrans Class 2 Aggregate Base, Minimum R-Value = 78			
Traffic Index	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	Total Section Thickness (inches)
4.0	3.0	6.5	9.5
	3.5	5.5	9.0
	4.0	4.5	8.5
5.0	3.0	10.0	13.0
	3.5	8.5	12.0
	4.0	7.5	11.5
6.0	3.5	12.5	16.0
	4.0	11.5	15.5
7.0	4.0	15.5	19.5

Soils within the upper three feet of rough subgrade should be sampled at the time of rough grading and tested to determine the R-value. Where street sections are left low to receive trench and foundation spoils sampling for R-value determination should be performed as the fills are being completed. Where R-value results are higher than 5, a decreased section of aggregate base may be considered.

Class 2 aggregate base should conform to the requirements found in Caltrans Standard Specifications Section 26. The aggregate base should be placed in thin lifts in a manner to prevent segregation, uniformly moisture conditioned, and compacted to at least 95 percent relative compaction to provide a smooth, unyielding surface.

Pavement areas should be sloped and drainage gradients maintained to carry surface water off the site. Ideally all pavements will be designed with a crown to allow for drainage toward the pavement perimeter. A cross slope of 2 percent is recommended in asphalt concrete pavement areas to provide surface drainage and to reduce the potential for water to penetrate into the pavement structure.

Maintaining a drained condition at the pavement section is important to reduce the possibility of premature pavement failure due to saturation of the aggregate base and softening of the subgrade soils. Where pavements are constructed with a centerline crown pavement edge drains should be constructed under the curb and gutter along both sides of the street. Where cross-sloped pavements are planned with a spill-type curb and gutter section at the upslope side of the pavement, a deepened curb section extending 2 inches below the aggregate base/subgrade contact should be considered to act as a seepage cut-off to reduce the amount of water that enters the pavement structure. A pavement edge drain should be constructed under the catch-type curb and gutter on the low side of pavements. These drains will drain water that may collect and saturate the aggregate base, which could cause premature pavement failure. The locations of pavement edge drains should be determined after a review of the final civil and landscape plans. A pavement edge drain detail is provided on Plate 3 of this report.

ADDITIONAL GEOTECHNICAL ENGINEERING SERVICES

With the need for significant import to raise the site, sampling and testing of the import will need to be performed to develop the post-tension slab-on-grade foundation design parameters and to evaluate the corrosivity of the import soils and the corresponding impacts on concrete foundations and below grade electrical vaults, if any. The aggregate base sections could also potentially be reduced should higher quality import be used to construct the fills in roadway areas. This would need to be determined by testing the import for its R-value.

Prior to construction, our firm should be provided the opportunity to review the grading and foundation plans and specifications to determine if the recommendations of this report have been implemented in those documents. We would appreciate the opportunity to meet with the contractors prior to the start of site grading, underground utility installation and pavement construction to discuss the procedures and methods of construction. This can facilitate the performance of the construction operation and minimize possible misunderstanding and construction delays.

To a degree, the performance of the proposed project is dependent on the procedures and quality of the construction. Therefore, we should provide observations of the contractor's procedures and the exposed soil conditions, and field and laboratory testing during site preparation and grading, placement and compaction of fill, underground utility installation, and foundation and pavement construction. These observations will allow us to check the contractor's work for conformance with the intent of our recommendations and to observe unanticipated soil conditions that could require modification of our recommendations.

LIMITATIONS

The conclusions and recommendations presented in this report are based upon the project information provided to us by Edenbridge Homes, information obtained from published geologic reports, subsurface conditions encountered at the boring and CPT locations, the results of geotechnical laboratory testing, the results of our fault ground-rupture investigation and professional judgment.

Site conditions described in this report are those existing at the times of our field explorations and are not necessarily representative of such conditions at other locations or times. The CPT logs and boring logs show subsurface conditions at the locations and on the dates indicated. It is not warranted that they are representative of such conditions elsewhere or at other times. The locations of the field explorations were estimated by pacing from existing surface features at the site, and should be considered approximate only. This geotechnical investigation has been conducted in accordance with professional Geotechnical Engineering standards current at the time of service and in the geographic area of the site; no other warranty, expressed or implied, is offered or made.

The information provided herein was developed for use by Edenbridge Homes for the project as described herein. In the event that changes in the nature, design or location of the proposed project are planned, or if it is found during construction that subsurface conditions differ from those described herein, then the conclusions and recommendations in this report shall be considered invalid, unless the changes are reviewed and the conclusions and recommendations are modified or approved in writing.

We trust that this report provides the information that you require at this time. If you have any questions, please contact the undersigned at (925) 484-0220. We appreciate the opportunity to provide professional services to Edenbridge Homes and look forward to continuing on with this project through design and construction.

Respectfully Submitted,

BERLOGAR STEVENS & ASSOCIATES

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Frank Berlogar
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Attachments:

- Plate 1 – Vicinity Map
- Plate 2 – Site Plan
- Plate 3 – Pavement Edge Drain Detail
- Appendix A – Boring Logs and Key to Boring Logs
- Appendix B – CPT Logs
- Appendix C – Laboratory Test Results
- Appendix D – CERCO Analytical Report
- Appendix E – Fault Trench Logs

Copies: Addressee (3)

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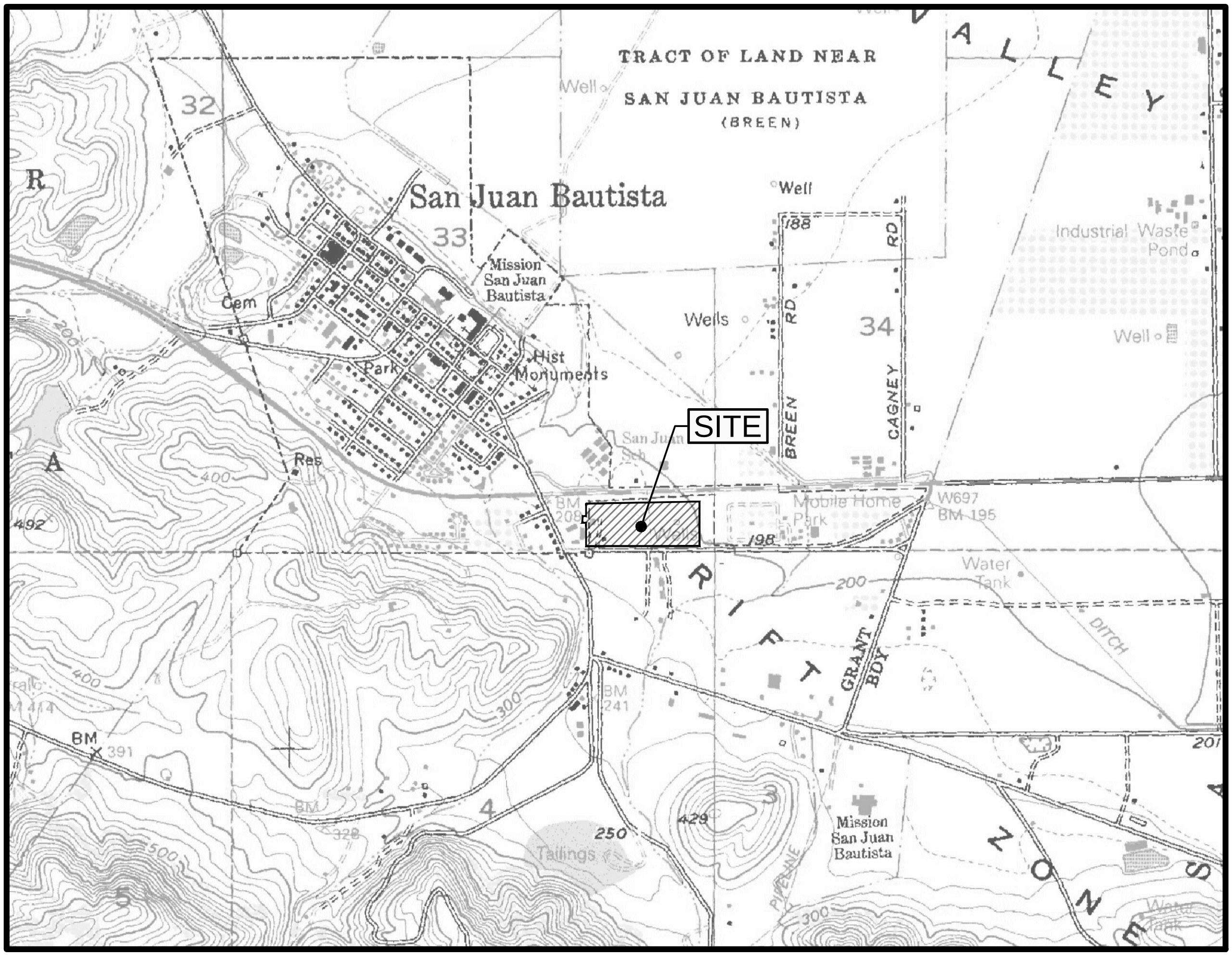
JOB NUMBER: 3602.100 DATE: 4-15-14 BY: CC



0 2000'

1"=2000'

VICINITY MAP

COPPERLEAF

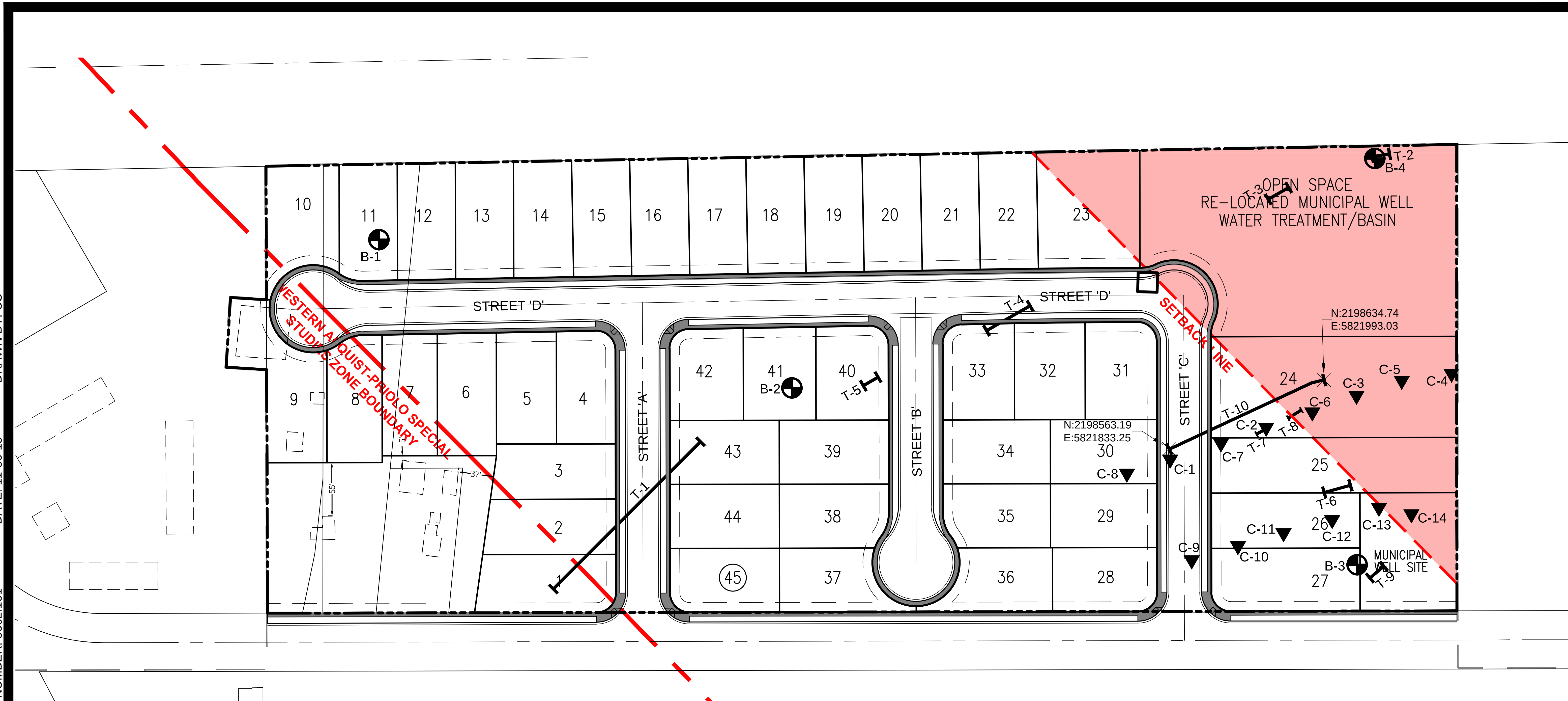
SAN JUAN BAUTISTA, CALIFORNIA

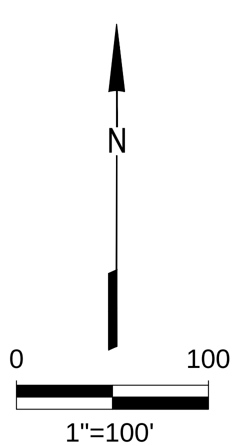
FOR

EDENBRIDGE

BASE: PORTION OF U.S.G.S. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, SAN JUAN BAUTISTA, CALIFORNIA, AT A SCALE OF 1:24,000.

PLATE 1





EXPLANATION

T-10 (trench symbol)	TRENCH LOCATION (THIS STUDY)
(pink area)	BUILDING EXCLUSION ZONE
B-4 (boring symbol)	BORING LOCATION (BSA 4-14)
C-14 (CPT symbol)	CPT LOCATION (BSA 11-14)

SITE PLAN

COPPERLEAF

SAN JUAN BAUTISTA, CALIFORNIA
FOR
EDENBRIDGE

Berlogar Stevens & Associates
SOIL ENGINEERS * ENGINEERING GEOLOGISTS

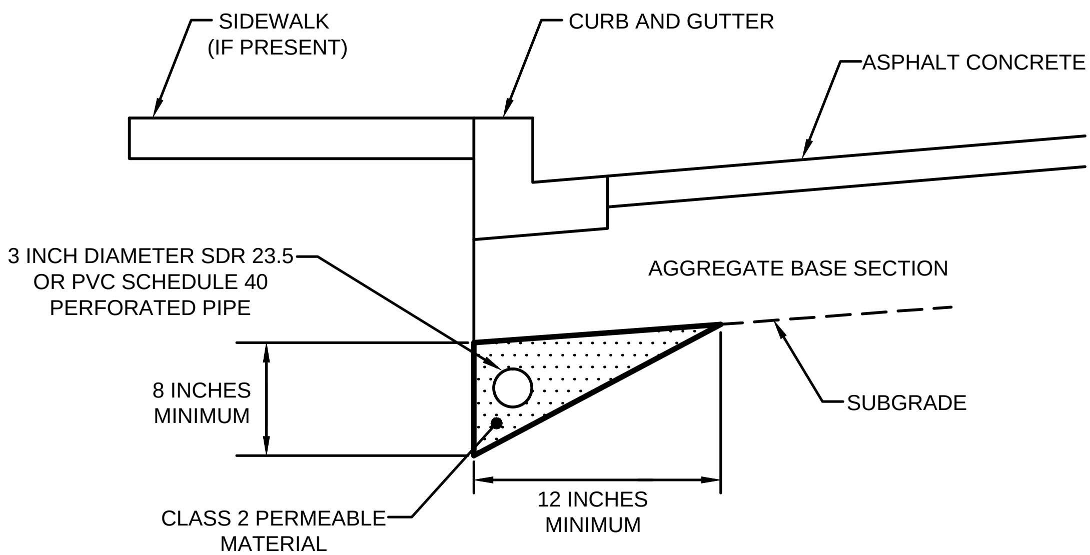
DRAWN BY: CC
DATE: 11-30-15
JOB NUMBER: 3602.101

PLATE 2

DRAWN BY: CC

DATE: 06-15-15

JOB NUMBER: 3602.101



NOTES:

1. PERFORATED PIPE TO BE SURROUNDED BY AT LEAST 2 INCHES OF CLASS 2 PERMEABLE MATERIAL.

2. PERFORATED PIPE TO DISCHARGE INTO CATCH BASIN/DRAIN INLET.

3. PERFORATED PIPE TO BE LOCATED BELOW EXISTING SHALLOW UNDERGROUND UTILITIES WHERE THEY CROSS.

4. FOR CROWNED STREETS, PAVEMENT EDGE DRAIN TO BE INSTALLED ON BOTH SIDES OF STREET. FOR FIXED CROSS SLOPE STREETS, PAVEMENT EDGE DRAIN TO BE INSTALLED ON LOW SIDE OF STREET.

SCALE N.T.S.

PAVEMENT EDGE DRAIN

APPENDIX A

Boring Logs and Key to Boring Logs

BORING LOG B-1

Job No.: 3602.100	Client: Edenbridge	Elevation: 210 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 4-14-14

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
■ 2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SANDY CLAY, dark gray-brown to black, dry to moist, medium stiff, fine-grained sand, trace organic matter, trace silt	210
		8		■			
					CL	SILTY CLAY, gray-brown, moist, stiff, trace to some fine-to medium-grained sand	
		22	5	■			205
					CL	SANDY CLAY, light to medium gray-brown, moist, stiff, fine-to medium-grained sand, trace fine gravel, trace silt	
		22	10	■			200
					SP	GRAVELLY SAND, gray-brown, moist, medium dense, fine-to coarse-grained sand, fine-to coarse gravel, trace silt, trace clay, limonite stains	
		35		■			
			15			Boring terminated at 15 feet No groundwater encountered	195
			20				190

BORING LOG B-2

Job No.: 3602.100	Client: Edenbridge	Elevation: 206 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 4-14-14

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SANDY CLAY, dark gray-brown to black, dry to moist, medium stiff, fine-grained sand, trace organic matter, trace silt	206
		22		■	CL	SANDY CLAY, gray-brown, moist, stiff, fine-to medium grained sand, trace fine-to coarse gravel, some silt	
		21	5	■	CL	SILTY CLAY, gray-brown, moist, stiff, trace fine-to medium-grained sand	201
						below 7-1/2 feet, fine-to coarse-grained sand, trace fine-to coarse gravel	
		41		■			
			10				196
					CL	SANDY CLAY, light gray-brown, moist, stiff, fine-to medium-grained sand	
		21		■			
			15			Boring terminated at 15 feet No groundwater encountered	191
			20				186

BORING LOG B-3

Job No.: 3602.100	Client: Edenbridge	Elevation: 202 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 4-14-14

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		SM	SILTY SAND, light gray-brown, dry to moist, very loose, fine-to medium-grained sand, trace fine gravel	202
		6		2.5-inch I.D. Split Barrel			
		3		Standard Penetration Test			
		3	5	Standard Penetration Test			197
		6		Standard Penetration Test	CL	SILTY CLAY, black, moist, medium stiff, trace fine-grained sand, trace silt, slightly peaty	
			10				192
					CL	SANDY CLAY, light brown-gray, wet, stiff, fine-to coarse-grained sand, trace fine gravel, trace silt	
		21		2.5-inch I.D. Split Barrel		at 15 feet, saturated	
			15			Boring terminated at 15 feet Groundwater encountered at 15 feet	187
			20				182

BORING LOG B-4

Job No.: 3602.100	Client: Edenbridge	Elevation: 196 feet
Job Name: Copperleaf	**Drill Method**: Hollow-stem Auger	**Date Drilled**: 4-14-14

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		SP	GRAVELLY SAND, light gray-brown, dry to moist, medium dense, fine-to coarse-grained sand, fine gravel	196
		17		2.5-inch I.D. Split Barrel			
					SM	SILTY CLAY, light gray-brown, moist, medium dense, fine-to coarse-grained sand, trace fine gravel	
		26	5	2.5-inch I.D. Split Barrel			191
					SP	GRAVELLY SAND, light gray-brown, moist, medium dense, fine-to coarse-grained sand, fine gravel	
		16		Standard Penetration Test			
			10				186
					PT	PEAT, rust-brown, wet, medium stiff, 100% organic	
		9		2.5-inch I.D. Split Barrel			
			15				181
		10		2.5-inch I.D. Split Barrel			
			20				176
						Boring terminated at 20 feet, groundwater encountered at 20 feet	

BORING LOG B-5

Job No.: 3602.100	Client: Edenbridge	Elevation: 198 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 3-31-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SANDY CLAY, dark gray-brown, moist, stiff to very stiff, fine-grained sand, some silt	198
-	-	23		Split Barrel	CL	SANDY CLAY, dark to medium gray-brown, moist, very stiff, fine-to medium-grained sand, trace to some silt	
-	-	34		Split Barrel	SC	CLAYEY SAND, light to medium gray-brown, moist, medium dense, fine-to coarse-grained sand, some silt, porous, limonite stains, carbon clasts	
			5				193
-	-	24		SPT			
-	-	54		Split Barrel			
					SM/SC	SILTY SAND/CLAYEY SAND, light gray-brown, moist, dense, fine-to coarse-grained sand, trace fine gravel 26% Passing #200 sieve	
-	-	29	10	SPT			188
-	-	26		SPT			
			15		SC	CLAYEY SAND, light gray-brown, moist, medium dense, fine-to medium-grained sand, trace silt	183
					SM	SILTY SAND, light gray-brown, moist, dense, fine-to coarse-grained sand, trace fine-to coarse gravel	
5.0	113	70		Split Barrel			
-	-	26	20	SPT		below 20 feet, medium dense	178

BORING LOG B-5

Job No.: 3602.100	**Client:** Edenbridge	**Elevation**: 198 feet
Job Name: Copperleaf	**Drill Method**: Hollow-stem Auger	**Date Drilled**: 3-31-15

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
5.0	113	70		Split Barrel	SM	SILTY SAND, light gray-brown, moist, medium dense, fine-to coarse-grained sand, trace fine-to coarse gravel	
-	-	26	20	Standard Penetration Test			178
			-				-
			-			Boring terminated at 21-1/2 feet No groundwater encountered	-
			-				-
			-				-
			25				173
			-				-
			-				-
			-				-
			-				-
			30				168
			-				-
			-				-
			-				-
			-				-
			35				163
			-				-
			-				-
			-				-
			-				-
			40				158

BORING LOG B-6

Job No.: 3602.100	Client: Edenbridge	Elevation: 209 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 3-31-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SANDY CLAY, dark gray-brown, dry to moist, medium stiff to stiff, fine-grained sand, some silt	209
-	-	12		2.5-inch I.D. Split Barrel			
13.2	111	21		2.5-inch I.D. Split Barrel	CL	SANDY CLAY, gray-brown, moist, stiff, fine-to medium-grained sand, some silt	
			5				204
					CL	SILTY CLAY, light gray-brown, moist, hard, some fine-grained sand	
-	-	55		2.5-inch I.D. Split Barrel			
			10				199
					CL	SANDY CLAY, light gray-brown, moist, very stiff, fine-to coarse-grained sand, trace silt	
14.5	113	30		2.5-inch I.D. Split Barrel			
			15				194
					SM	SILTY SAND, light gray-brown, moist, very dense, fine-to coarse-grained sand, trace fine-to coarse gravel	
-	-	70		2.5-inch I.D. Split Barrel			
-	-	30	20	Standard Penetration Test			189

BORING LOG B-6

Job No.: 3602.100	**Client:** Edenbridge	**Elevation**: 209 feet
Job Name: Copperleaf	**Drill Method**: Hollow-stem Auger	**Date Drilled**: 3-31-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
-	-	70		Split Barrel	SM	SILTY SAND, light gray-brown, moist, very dense, fine-to coarse-grained sand, trace fine-to coarse gravel	
-	-	30	20	Standard Penetration Test			189
			-				-
			-			Boring terminated at 21-1/2 feet No groundwater encountered	-
			-				-
			-				-
			25				184
			-				-
			-				-
			-				-
			-				-
			30				179
			-				-
			-				-
			-				-
			-				-
			35				174
			-				-
			-				-
			-				-
			-				-
			40				169

BORING LOG B-7

Job No.: 3602.100	Client: Edenbridge	Elevation: 212 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 3-31-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		SM	SILTY SAND, mottled dark and medium gray-brown, dry to moist, loose, fine-grained sand (fill)	212
-	-	17		Split Barrel	CL	SILTY CLAY, dark gray-brown, moist, stiff to very stiff, fine-to medium-grained sand, porous	
-	-	36	5	Split Barrel			207
					CL	SANDY CLAY, light to medium gray-brown, moist, very stiff to hard, fine-to medium-grained sand	
-	-	71		Split Barrel	SC	CLAYEY SAND, light to medium gray-brown, moist, very dense, fine-to coarse-grained sand, trace fine-to coarse gravel, trace silt, porous	
-	-	43	10	SPT			202
					SM	SILTY SAND, light gray-brown, moist, dense to very dense, fine-to coarse-grained sand, trace fine gravel, trace clay	
-	-	49		SPT			
			15			Boring terminated at 15 feet No groundwater encountered	197
			20				192

BORING LOG B-8

Job No.: 3602.100	Client: Edenbridge	Elevation: 209 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 3-31-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		CL	SILTY CLAY, dark gray-brown, moist, medium stiff, some fine-to medium-grained sand	209
-	-	12		2.5-inch I.D. Split Barrel			
					CL	SILTY CLAY, gray-brown, moist, stiff, some fine-to medium-grained sand	
-	-	22	5	2.5-inch I.D. Split Barrel			204
					CL	SANDY CLAY, light gray-brown, moist, very stiff, fine-to medium-grained sand, some silt, slightly porous	
16.1	110	38	10	2.5-inch I.D. Split Barrel			199
					SP	GRAVELLY SAND, light gray-brown, moist, very dense, fine-to coarse-grained sand, fine-to coarse gravel, trace silt	
-	-	72	15	Standard Penetration Test			194
						Boring terminated at 15 feet No groundwater encountered	
			20				189

BORING LOG B-9

Job No.: 3602.100	Client: Edenbridge	Elevation: 205 feet
Job Name: Copperleaf	Drill Method: Hollow-stem Auger	Date Drilled: 3-31-15

SAMPLER TYPE:	DRIVE WEIGHT (LBS.)	HEIGHT OF FALL (IN.)
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		SM	SILTY SAND, light gray-brown, dry to moist, loose, fine-to coarse-grained sand (fill)	205
-	-	17		Split Barrel	CL	SILTY CLAY, dark gray-brown, moist, stiff, trace fine-to medium-grained sand	
16.2	109	26	5	Split Barrel	CL	SILTY CLAY, gray-brown, moist, very stiff, some fine-to medium-grained sand	200
					CL	SANDY CLAY, light gray-brown, moist, very stiff, fine-to medium-grained sand, trace clay	
8.8	104	28		Split Barrel			
-	-	9	10	SPT	SM/SC	SILTY SAND/CLAYEY SAND, light gray-brown, moist, loose to medium dense, fine-grained sand, trace clay, caliche stains 41% Passing #200 sieve	195
-	-	13		SPT			
			15			Boring terminated at 15 feet No groundwater encountered	190
			20				185

BORING LOG B-10

Job No.: 3602.100	**Client:** Edenbridge	**Elevation**: 200 feet
Job Name: Copperleaf	**Drill Method**: Hollow-stem Auger	**Date Drilled**: 3-31-15

SAMPLER TYPE:	**DRIVE WEIGHT (LBS.)**	**HEIGHT OF FALL (IN.)**
2.5-inch I.D. Split Barrel	140	30
Standard Penetration Test	140	30

Moisture Content (%)	Dry Unit Weight (PCF)	Penetration Resistance (blows/foot)	Depth (feet)	Sample Symbol	USCS Classification	DESCRIPTION AND REMARKS	Elevation (in feet above MSL)
			0		SC	CLAYEY SAND, gray-brown, dry to moist, loose, fine-to medium-grained sand	200
					SM	SILTY SAND, light gray-brown, moist, loose, fine-to coarse-grained sand	
-	-	7		Split Barrel	CL	SILTY CLAY, dark gray-brown, moist, medium stiff, trace fine-grained sand	
-	-	11	5	Split Barrel			195
					SC	CLAYEY SAND, light yellow-brown, moist, medium dense, fine-grained sand, limonite stains, trace silt	
-	-	17	10	SPT			190
						below 13 feet, fine-to coarse-grained sand, some silt	
-	-	30	15	SPT			185
						Boring terminated at 15-1/2 feet No groundwater encountered	
			20				180

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			CLASSIFICATION SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE TO NO FINES	GW	WELL GRADED GRAVELS, GRAVEL/SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL/SAND MIXTURES
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL/SAND/SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL/SAND/CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE TO NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND/SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND/CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SILTS

KEY TO BORING LOG SYMBOLS

Depth in Feet	Moisture Content (%)	Dry Unit Weight (pcf)	Blows per foot	Unified Soil Classification System	
					Bulk Sample
					2.5-inch I.D. Split Barrel Sample
					2.8-inch I.D. Shelby Tube Sample
					No Sample recovered
					Standard Penetration Test interval
					Well-defined stratum change
					Gradual stratum change
					Interpreted stratum change
					Water level encountered while drilling boring
					Stabilized water level in boring after drilling

Note: Soils described as dry, moist, and wet are estimated to be dry of optimum, near optimum, and more wet than optimum moisture content, respectively. Saturated soils are estimated to be within areas of free groundwater.

BY: CC

DATE: 4-6-15

JOB NUMBER: 3602.101

APPENDIX B

Cone Penetration Test Logs

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 1
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 10:55:58 AM
Location: San Juan Bautista
Job Number: BSA-494

Maximum Depth = 19.69 feet

Depth Increment = 0.164 feet

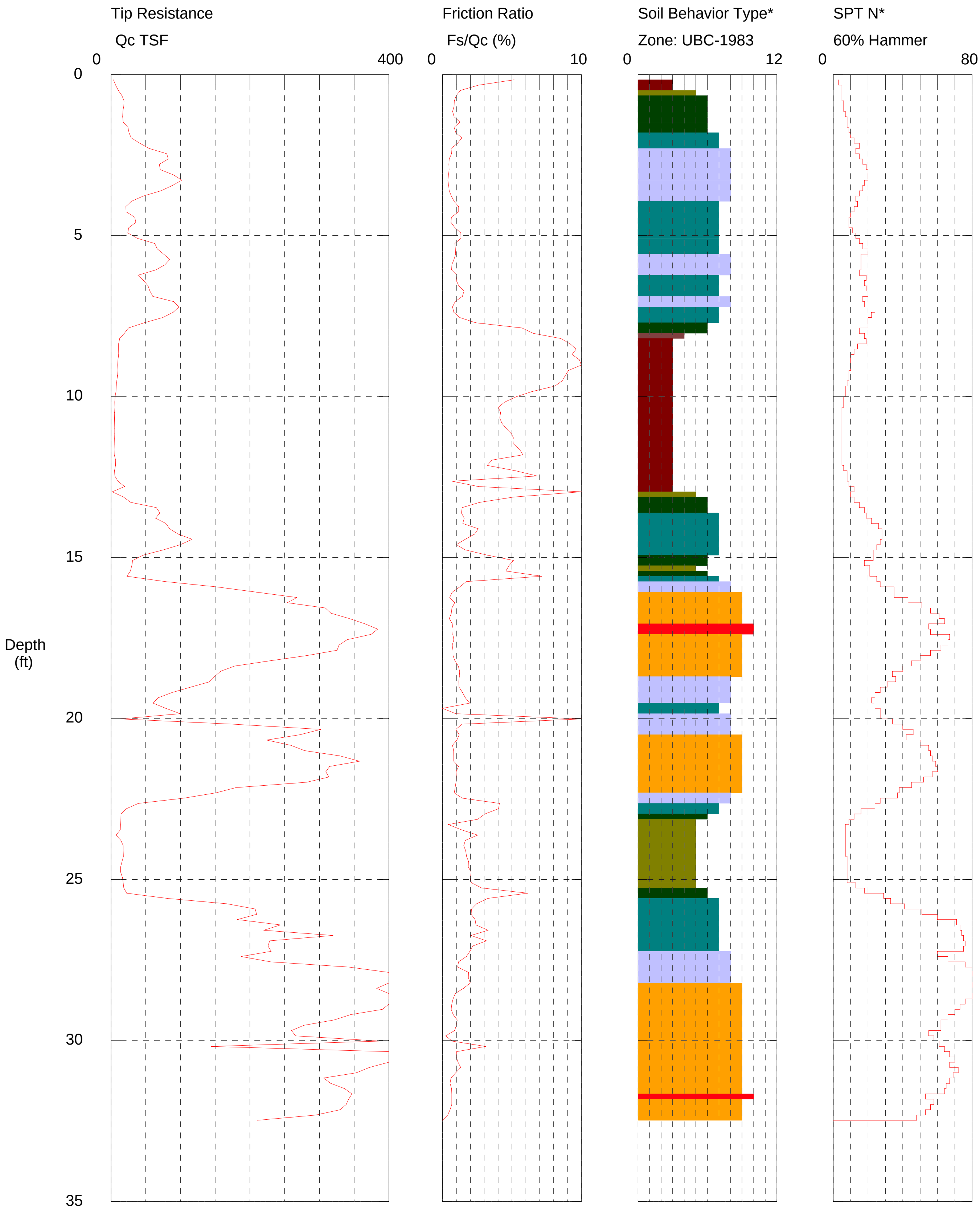
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 2
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 8:38:07 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 32.48 feet

Depth Increment = 0.164 feet

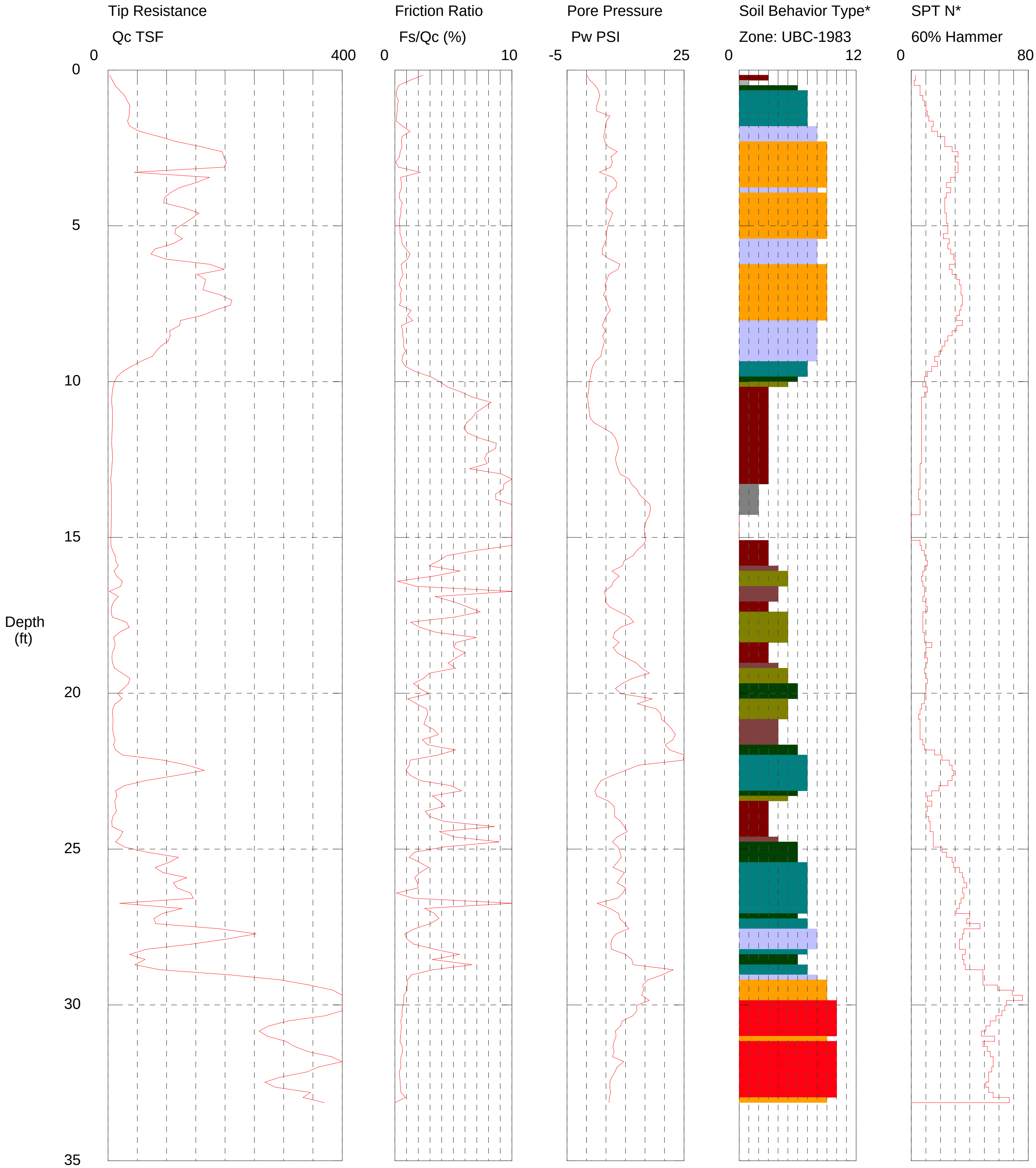
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 3
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 9:09:20 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 33.14 feet

Depth Increment = 0.164 feet

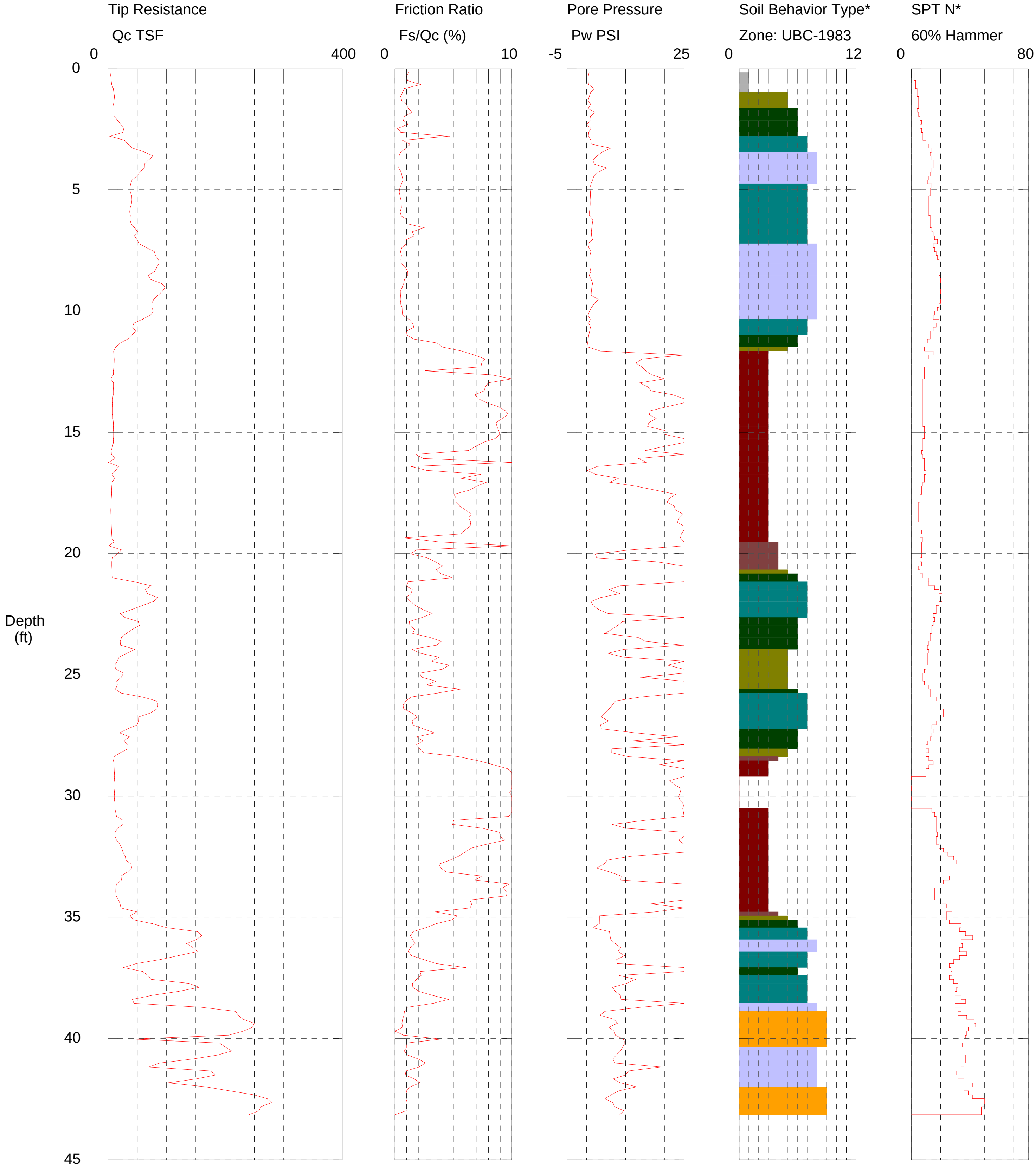
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 4
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 9:31:01 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 43.14 feet

Depth Increment = 0.164 feet

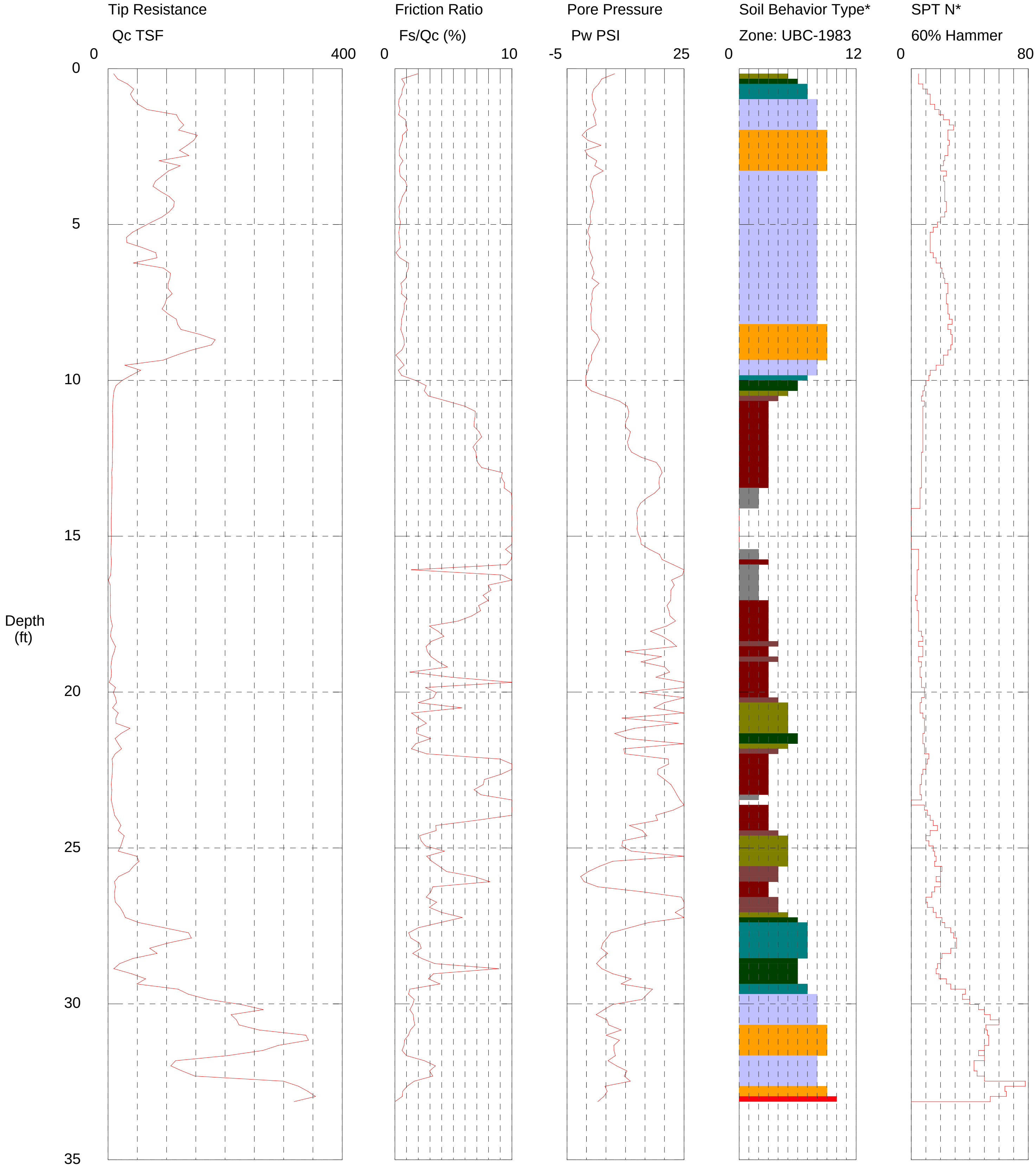
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 5
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 9:54:36 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 33.14 feet

Depth Increment = 0.164 feet

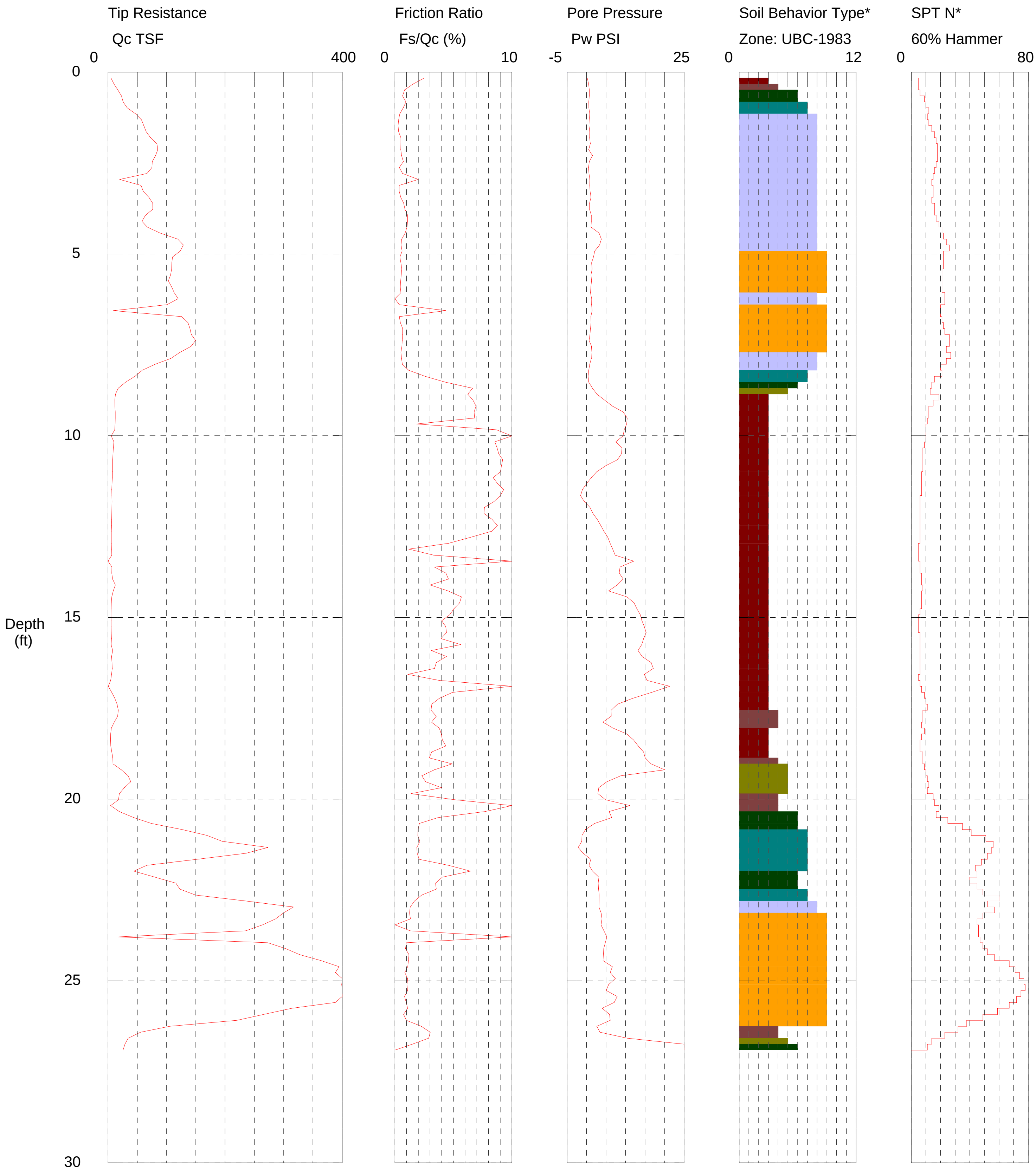
1	sensitive fine grained
2	organic material
3	clay
4	silty clay to clay
5	clayey silt to silty clay
6	sandy silt to clayey silt
7	silty sand to sandy silt
8	sand to silty sand
9	sand
10	gravelly sand to sand
11	very stiff fine grained (*)
12	sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 6
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 10:16:40 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 26.90 feet

Depth Increment = 0.164 feet

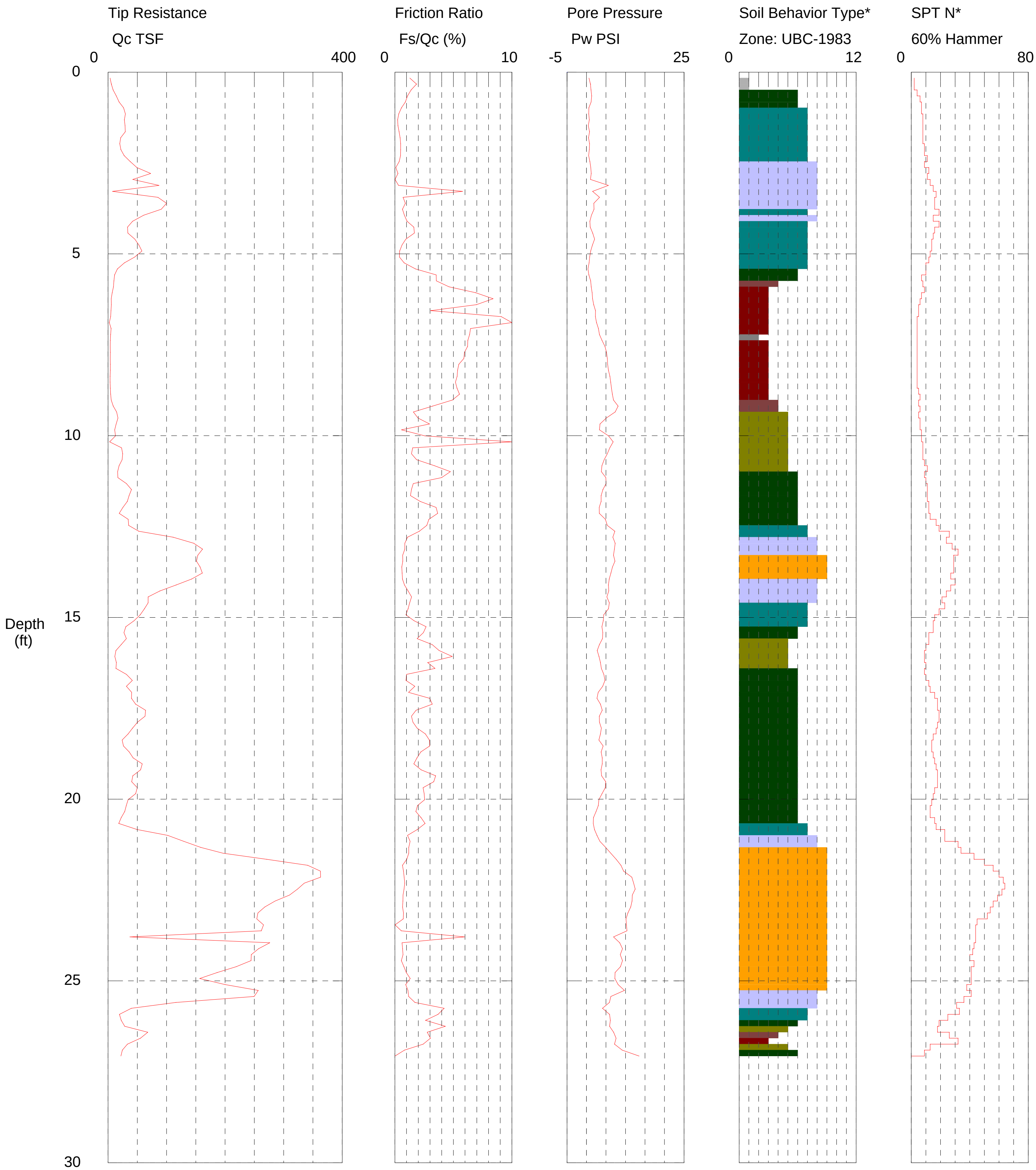
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 7
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 10:36:10 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 27.07 feet

Depth Increment = 0.164 feet

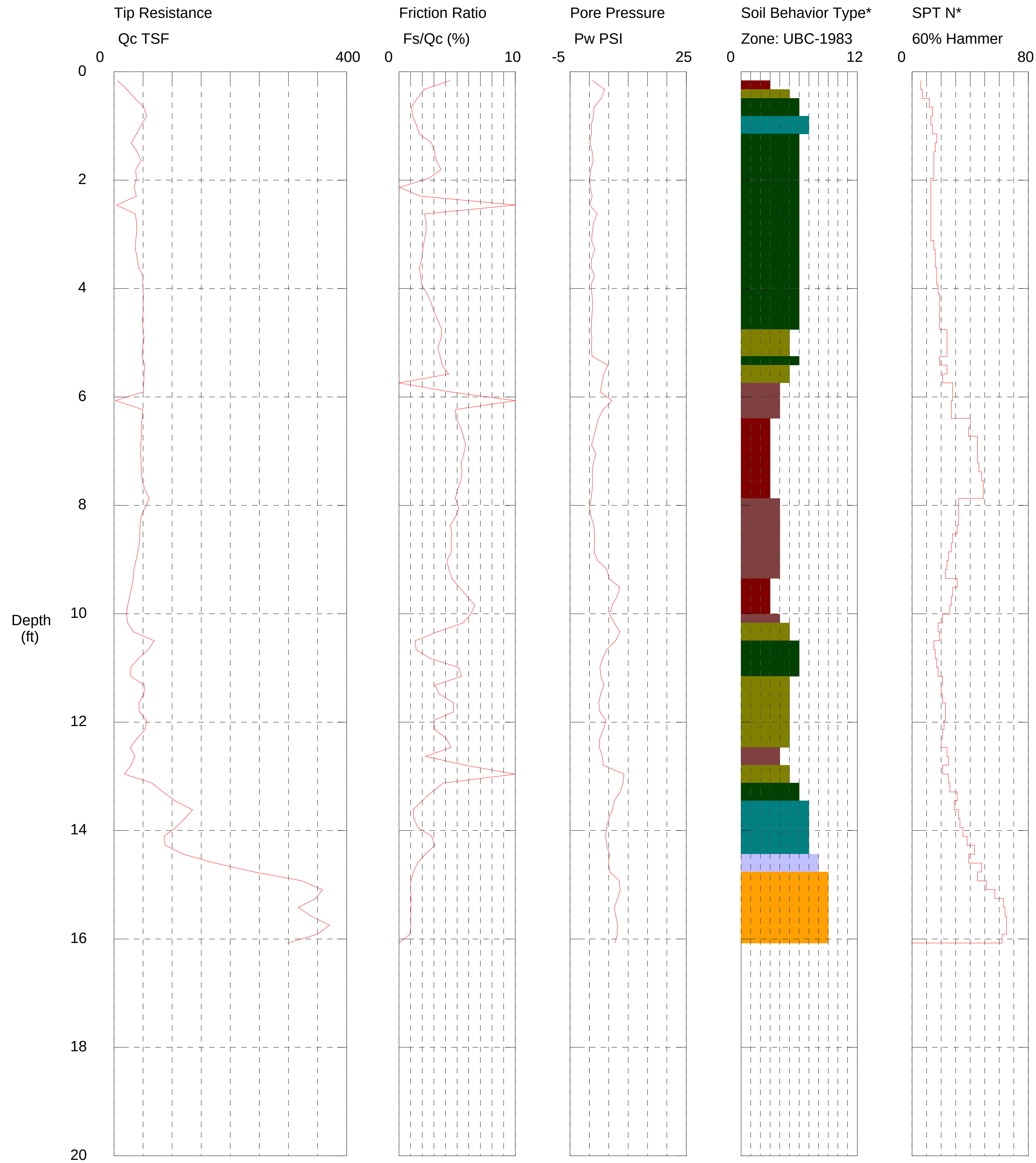
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 8
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 11:12:32 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 16.08 feet

Depth Increment = 0.164 feet

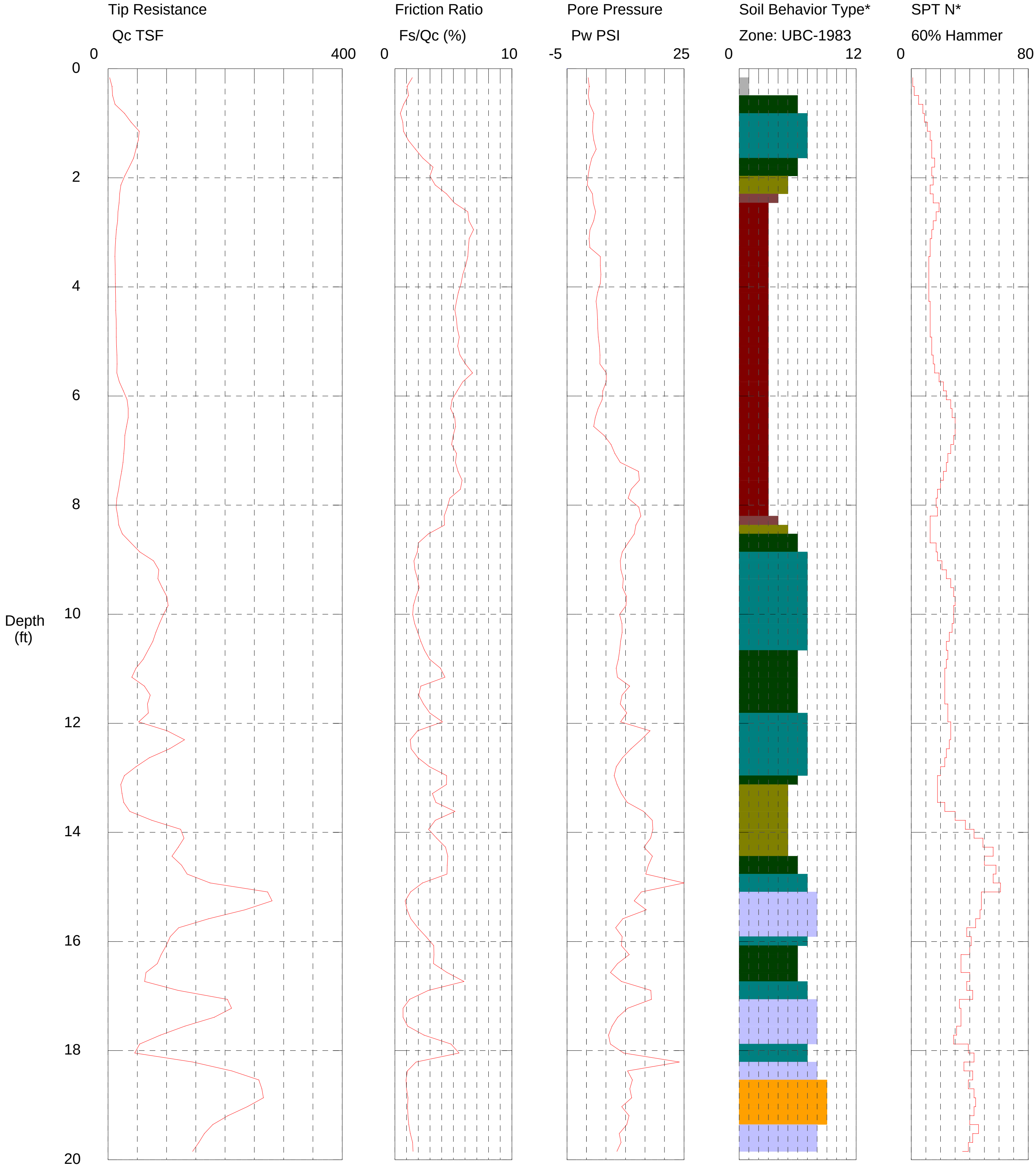
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 9
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 11:28:59 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 20.67 feet   Depth Increment = 0.164 feet

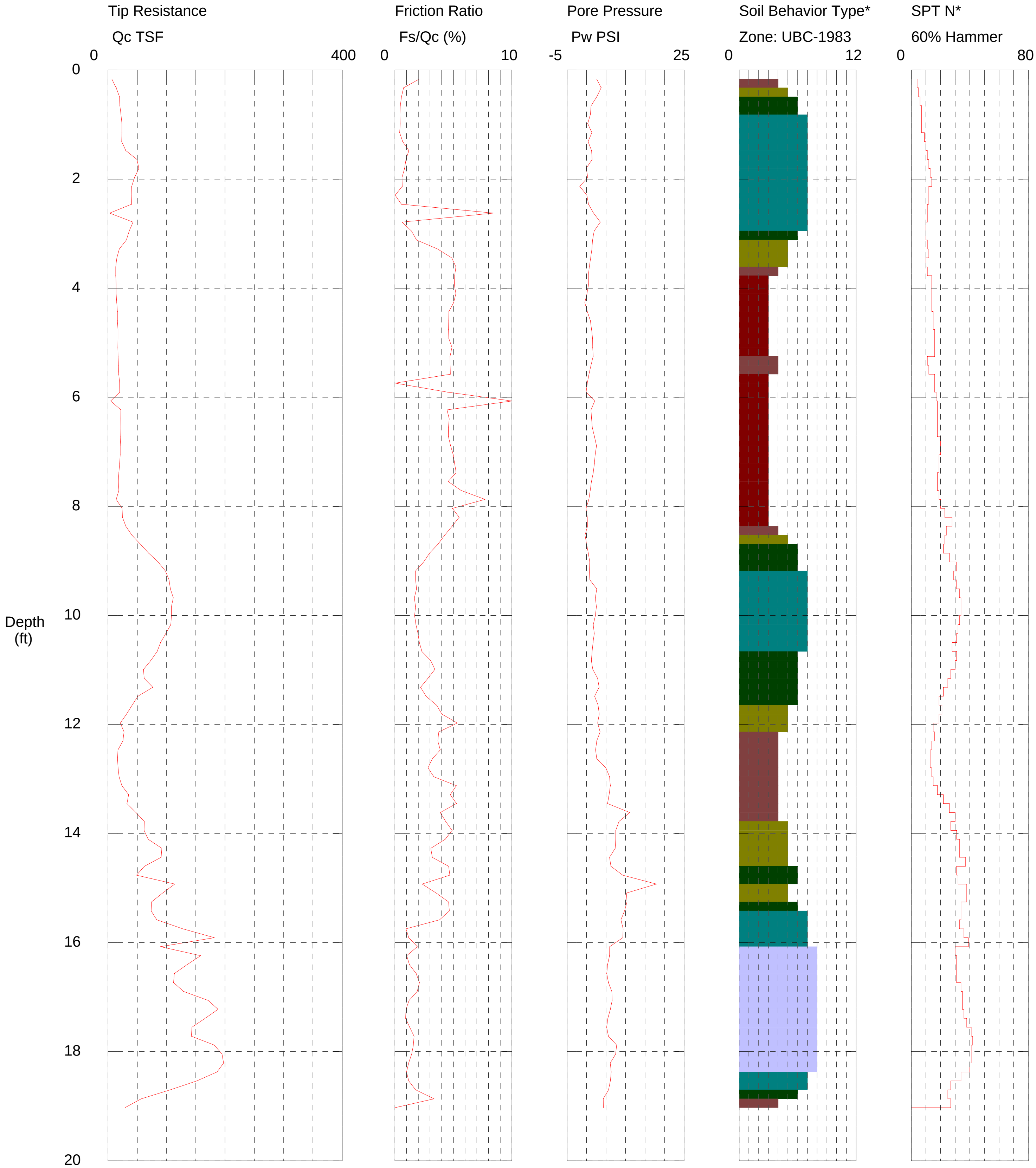
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 10
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 11:47:45 AM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 19.03 feet

Depth Increment = 0.164 feet

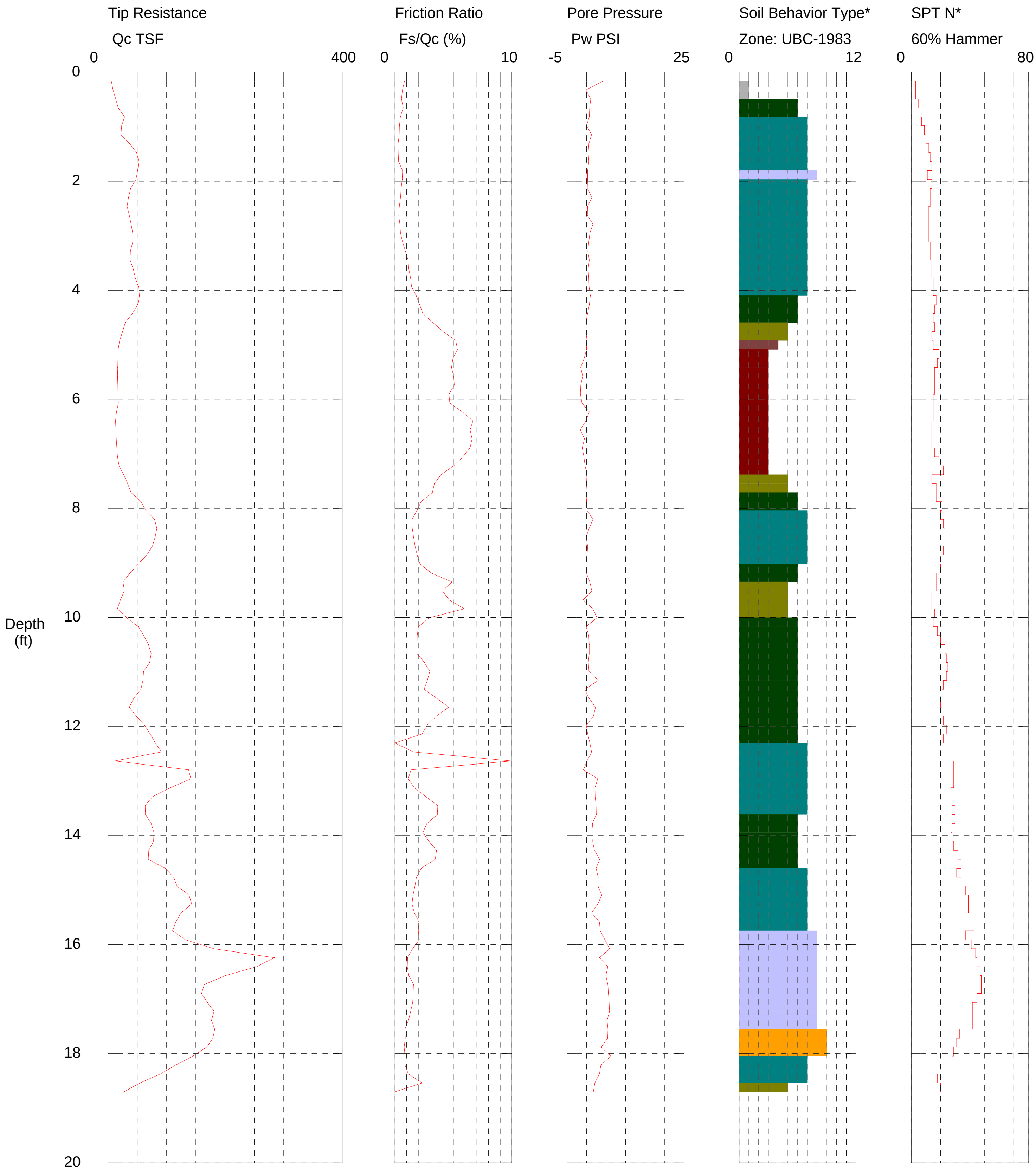
1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 11
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 12:04:03 PM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 18.70 feet

Depth Increment = 0.164 feet

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 (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 12
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 12:30:35 PM
Location: San Juan Bautista
Job Number: BSA-494

Maximum Depth = 23.79 feet

Depth Increment = 0.164 feet

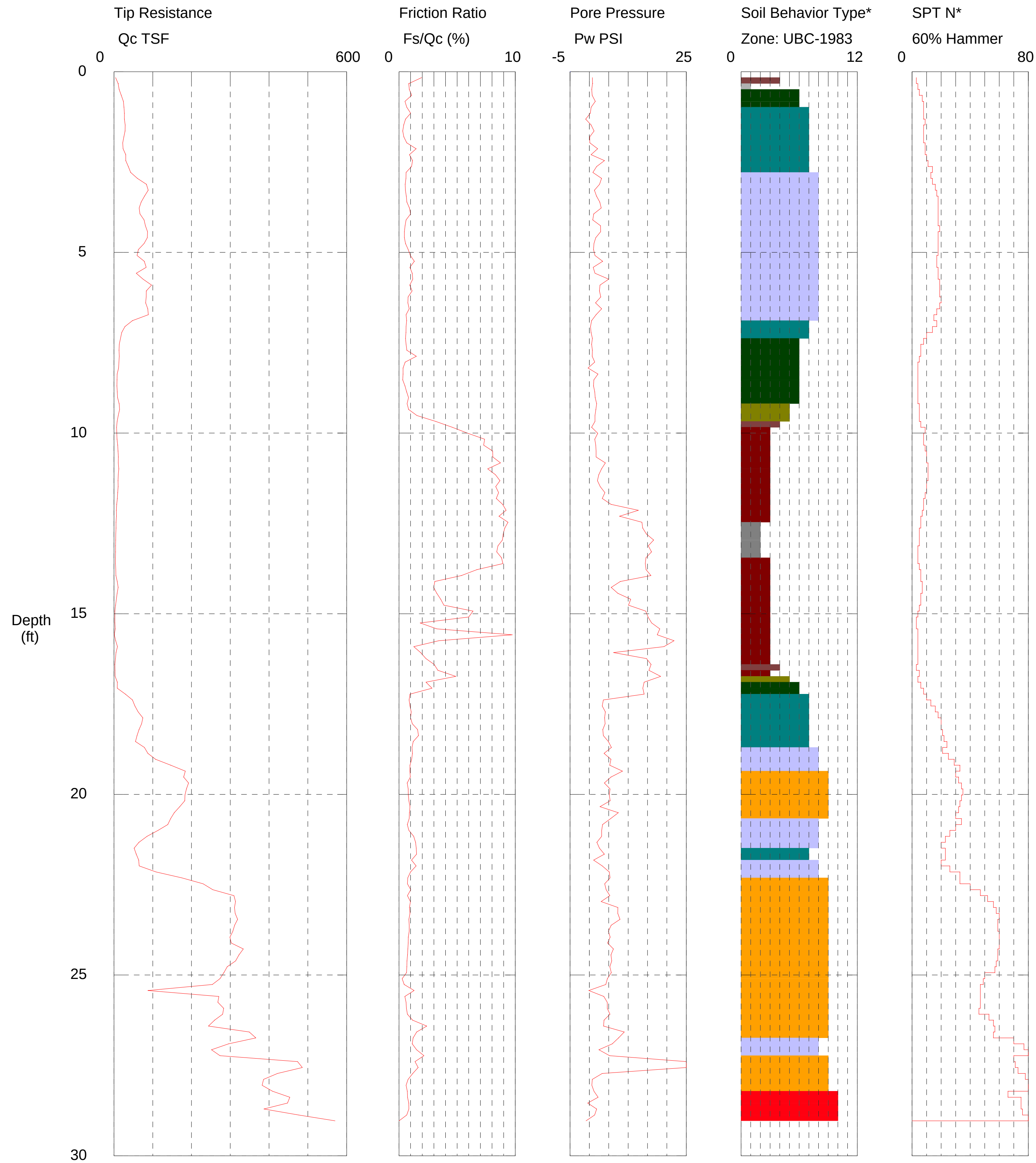
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 13
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 12:53:26 PM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 29.04 feet

Depth Increment = 0.164 feet

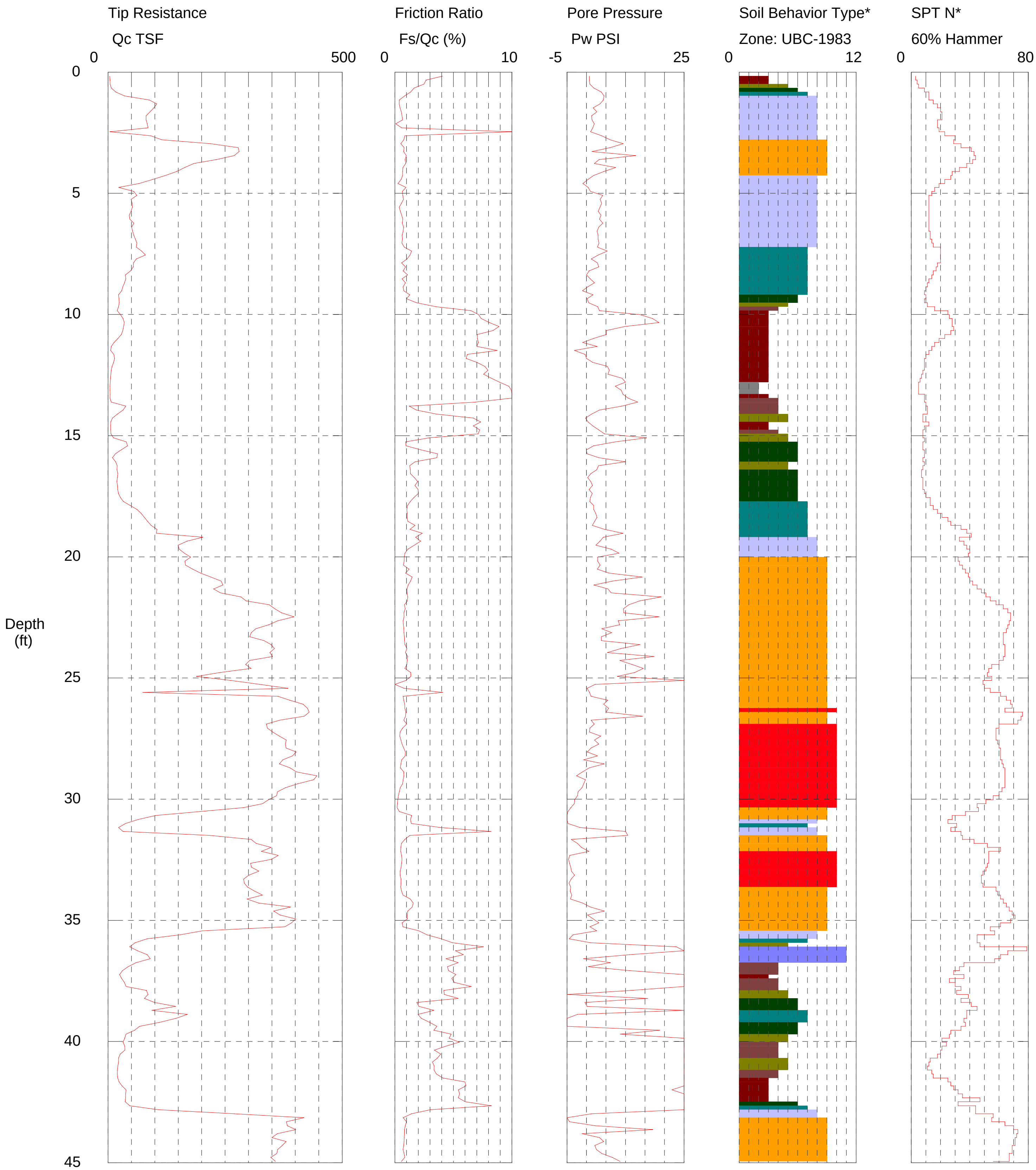
1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

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

Berlogar Stevens & Associates

Operator: Brittsan
Sounding: CPT 14
Cone Used: DSG1150

CPT Date/Time: 11/13/2014 1:17:45 PM
Location: San Juan Bautista
Job Number: BSA-494



Maximum Depth = 45.28 feet

Depth Increment = 0.164 feet

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

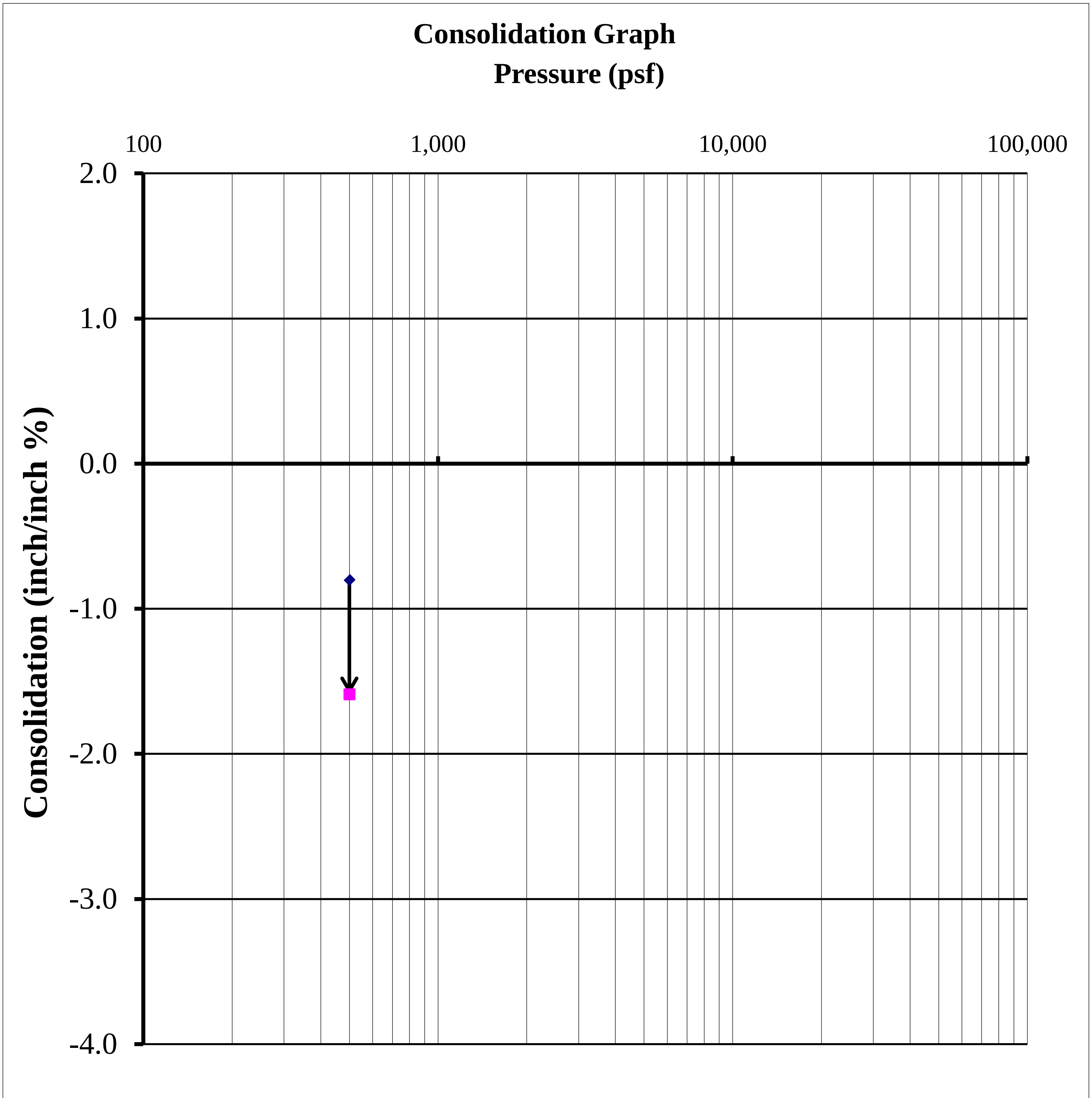
*Soil behavior type and SPT based on data from UBC-1983

APPENDIX C

Laboratory Test Results

Consolidation Test Data ASTM D 2435

Project Name: Copperleaf	Project No: 3602.101
Comments:	Date: 04/11/15



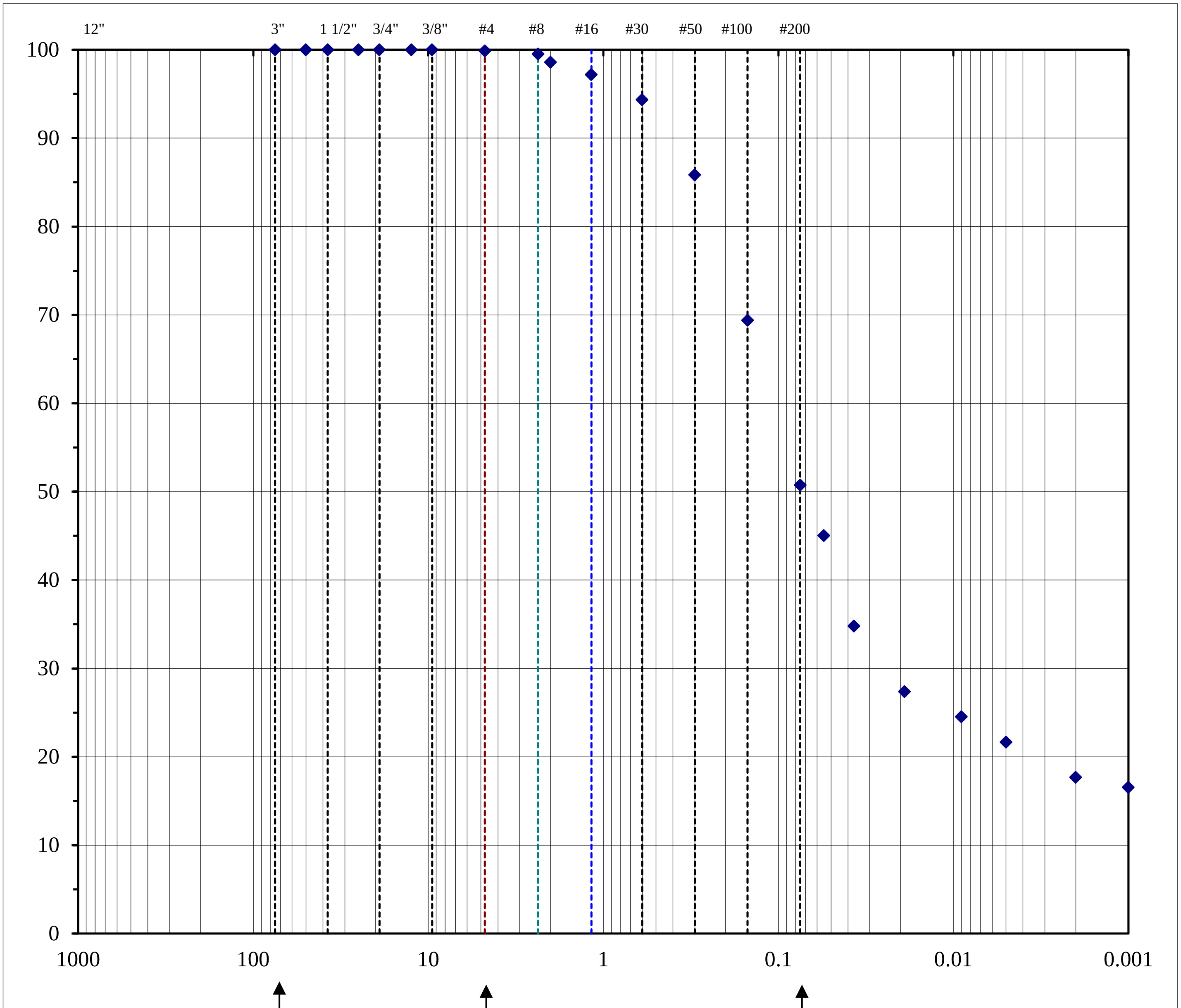
Symbol	Sample ID	Description	Initial Moisture Content (%)	Initial Dry Density (pcf)
	B5 at 2ft	SM-CL Dark Gray	9.1	94.6

Gradation Test Data ASTM D 422

Project Name: Copperleaf	**Project No: 3602.101**
Comments:	**Date:** 4/10/2015
	Invoice Number: 14202

Tested By: gs

Reported By: G. Suckow



COBBLES	GRAVEL		SAND			SILT/CLAY
	coarse	fine	coarse	medium	fine	

Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B7 at 2ft	CL Sandy Clay Dark Brown	14

Berlogar Stevens & Associates Pleasanton, CA

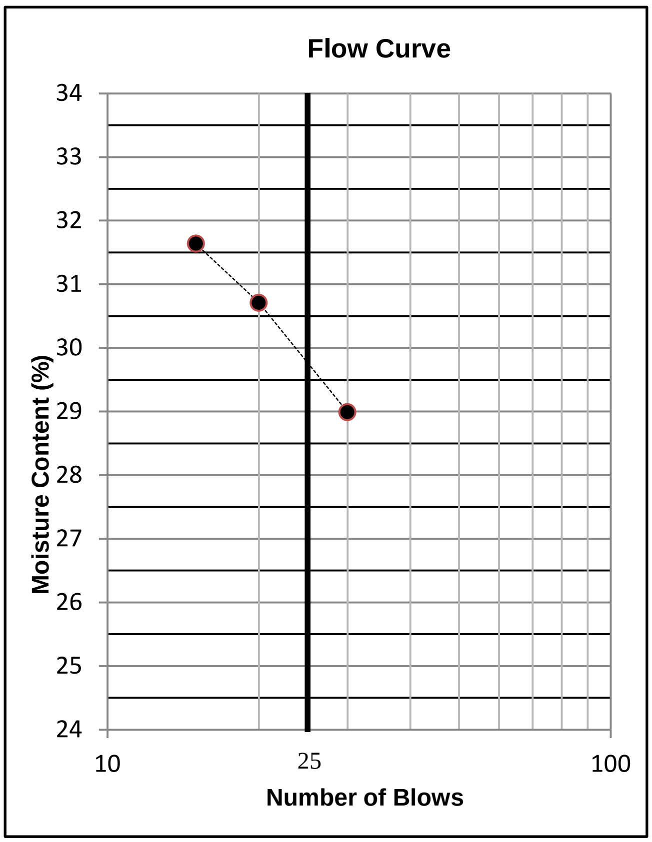
Atterberg Limits Test Data ASTM D 4318

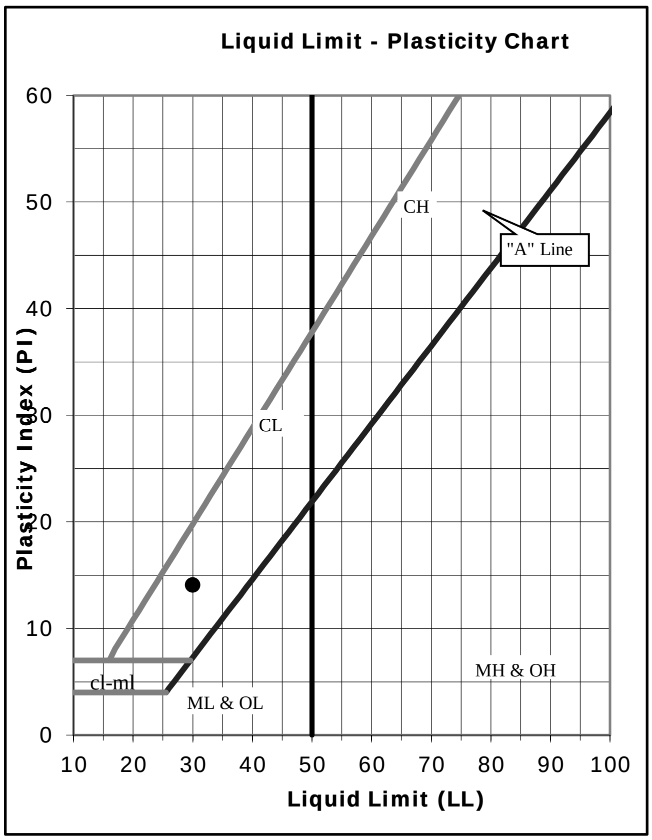
Project Name: Copperleaf	**Project Number: 3602.101**
Sample ID: B7 at 2ft	**Date Tested:** 04/10/15
Material Description: **CL Sandy Clay Dark Brown**	Invoice Number: 14202

Summary of Test Results

Liquid Limit:	**30**	**Plastic Limit:**	**16**	**Plasticity Index:**	**14**
Classification:	**CL Lean Clay**				

	Liquid Limit					Plastic Limit		
Tare ID:	03	z8	j1			x8	z1	
Number Of Blows:	**30**	**20**	**15**					
Tare Mass, (g):	14.16	14.25	14.40			14.66	15.06	
Wet Soil + Tare Mass, (g):	31.38	27.53	28.88			28.95	24.57	
Dry Soil + Tare Mass, (g):	27.51	24.41	25.40			27.01	23.25	
Moisture Content, %:	**29.0**	**30.7**	**31.6**			**15.7**	**16.1**	





Tested By: gs

Reported By: G Suckow

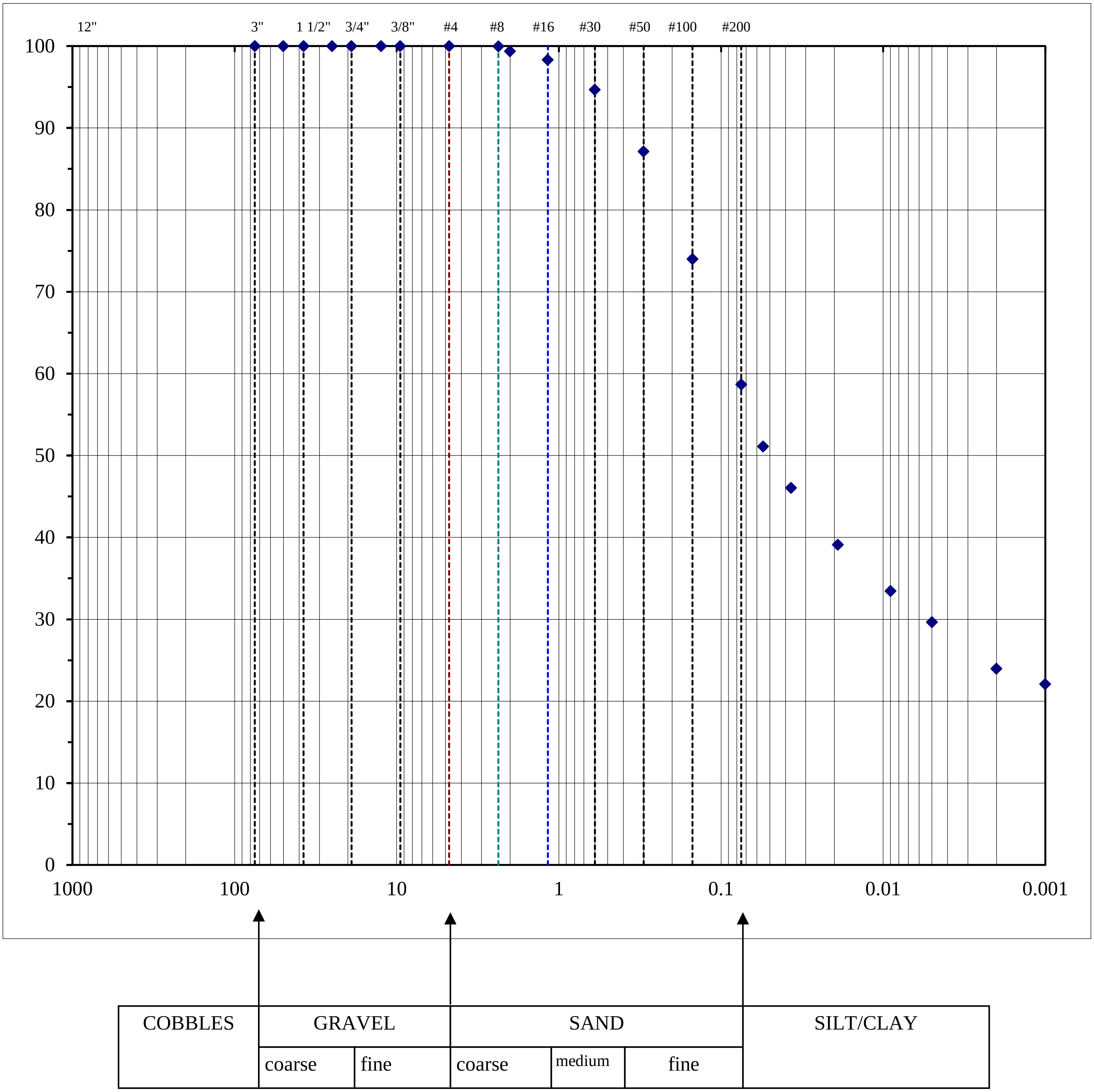
Berlogar Stevens & Associates Pleasanton, CA

Gradation Test Data ASTM D 422

Project Name: Copperleaf	Project No: 3602.101
Comments:	Date: 4/10/2015
	Invoice Number: 14202

Tested By: gs

Reported By: G. Suckow



Symbol	Sample ID	Description	ASTM D4318 Plasticity Index:
	B9 at 1ft	Sandy Clay Dark Gray	25

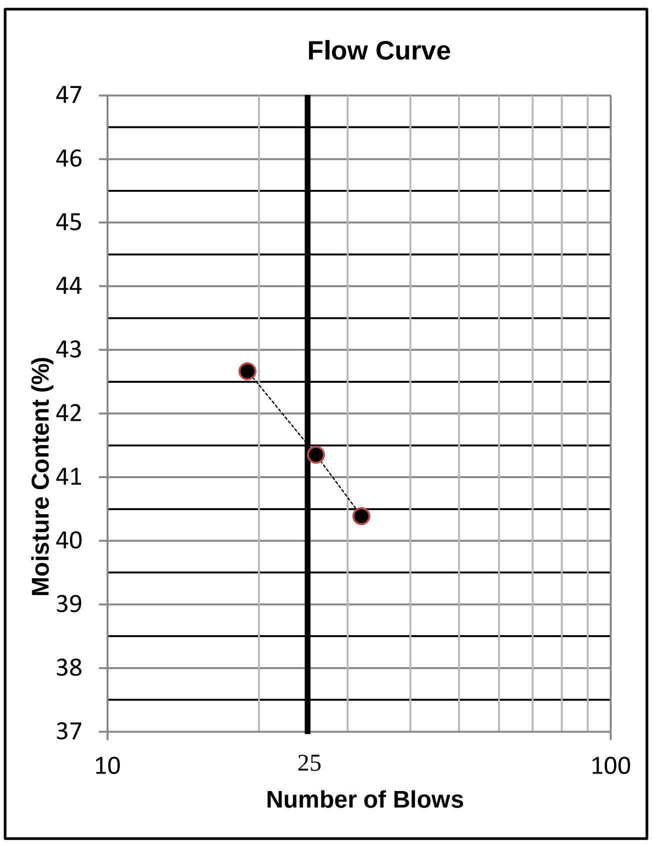
Atterberg Limits Test Data ASTM D 4318

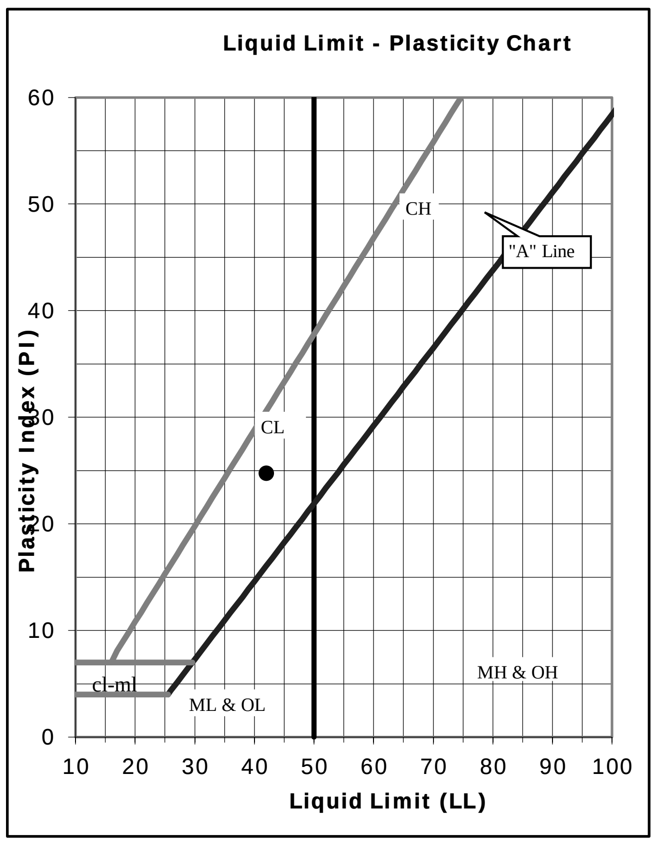
Project Name:	**Copperleaf**	**Project Number:**	**3602.101**
Sample ID:	**B9 at 1ft**	**Date Tested:**	04/10/15
Material Description:	**Sandy Clay Dark Gray**	Invoice Number:	14202

Summary of Test Results

Liquid Limit:	**42**	**Plastic Limit:**	**17**	**Plasticity Index:**	**25**
Classification:	**CL Lean Clay**				

	Liquid Limit					Plastic Limit		
Tare ID:	b7	c3	w4			z1	us	
Number Of Blows:	**32**	**26**	**19**					
Tare Mass, (g):	13.59	15.26	13.90			13.67	14.56	
Wet Soil + Tare Mass, (g):	28.99	32.66	30.82			20.34	25.74	
Dry Soil + Tare Mass, (g):	24.56	27.57	25.76			19.35	24.11	
Moisture Content, %:	**40.4**	**41.3**	**42.7**			**17.4**	**17.1**	





Tested By: gs

Reported By: G Suckow

Berlogar Stevens & Associates Pleasanton, CA

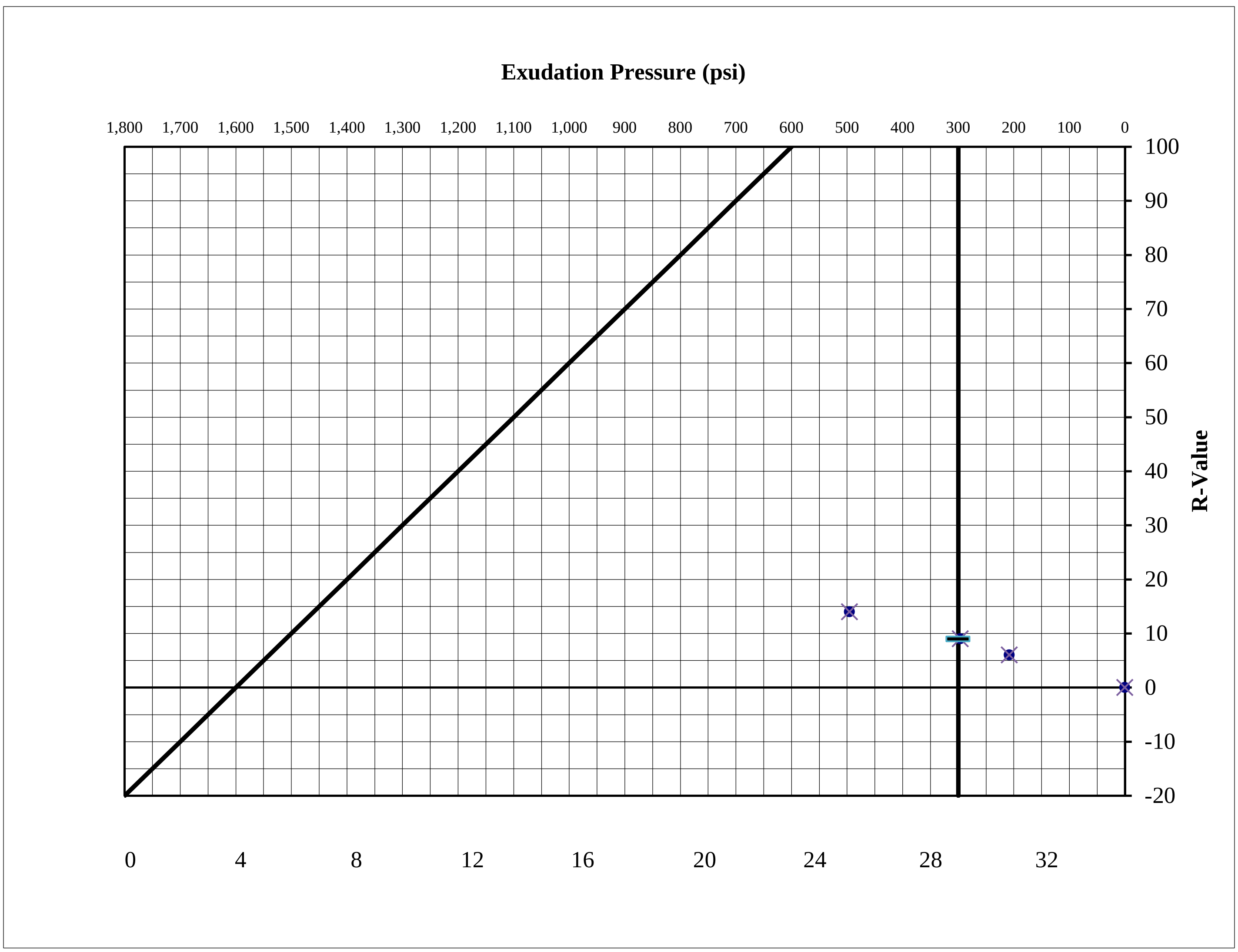
Resistance Value (R) Value Test

ASTM D2844 and CalTrans CTM 301

Project Name: Copperleaf	**Project Number: 3602.101**
Sample ID: B6 at 0-4ft	Date Tested: 04/15/15
Area Sample Represents:	Invoice Number: 14202
Material Description: Sandy Clay Dark Gray Organic?	Reported By: G Suckow
Comments:	

Specimen Data

Specimen	A	B	C	D
Exudation Pressure, psi	208	296	496	0
Resistance Value (R) :	6	9	14	0
% Moisture at Test:	15.4	14.5	13.6	
Dry Density at Test, pcf:	108.0	110.3	116.4	
Expansion Dial, (0.0001"):	0	2	6	0
Expansion Pressure, psf:	0.0	8.9	26.6	
Expansion Pressure at 300 psi:	9.3 psf			
R-Value at 300 psi Exudation Pressure:	**9**	**Specification:**		



APPENDIX D

CERCO Analytical Report

California State Certified Laboratory No. 2153

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

10 June 2015

Job No. 1506061
Cust. No.10598

Mr. Greg Ruf
Berlogar Stevens & Associates
5587 Sunol Blvd.
Pleasanton, CA 94566

Subject: Project No.: 3602.101
Project Name: Copperleaf
Corrosivity Analysis – ASTM Test Methods with Brief Evaluation

Dear Mr. Ruf:

Pursuant to your request, CERCO Analytical has analyzed the soil samples submitted on June 5, 2015. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, the sample is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration is none detected to 15 mg/kg.

The sulfate ion concentration is none detected to 15 mg/kg.

The sulfide ion concentration reflects none detected with a detection limit of 50 mg/kg.

The pH of the soil is 7.98, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 290-mV which is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

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

Client: Berlogar Stevens & Associates
Client's Project No.: 3602.101
Client's Project Name: Copperleaf
Date Sampled: 31-Mar-15
Date Received: 5-Jun-15
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 10-Jun-2015

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
1506061-001	B-10 @ 0'-3'	290	7.98	-	8,000	N.D.	N.D.	N.D.

	Redox	pH	Conductivity	Resistivity	Sulfide	Chloride	Sulfate
Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	9-Jun-2015	9-Jun-2015	-	8-Jun-2015	8-Jun-2015	9-Jun-2015	9-Jun-2015

* Results Reported on "As Received" Basis

N.D. - None Detected

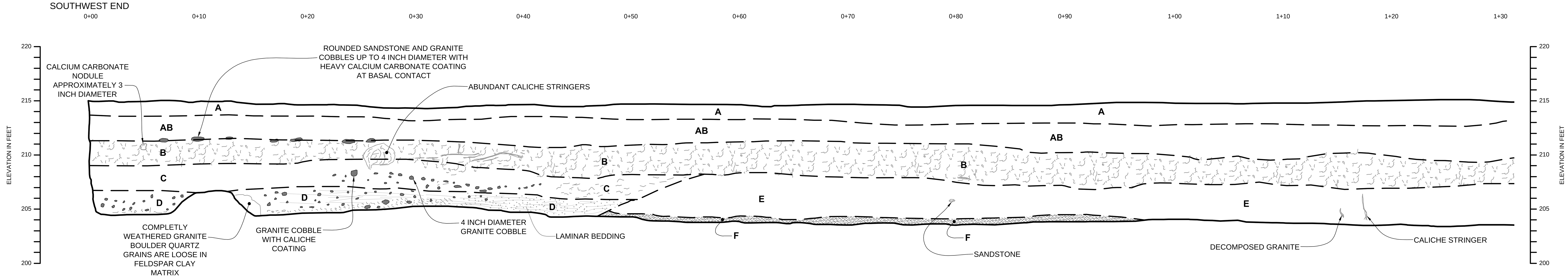
Cheryl McMillen
Laboratory Director

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

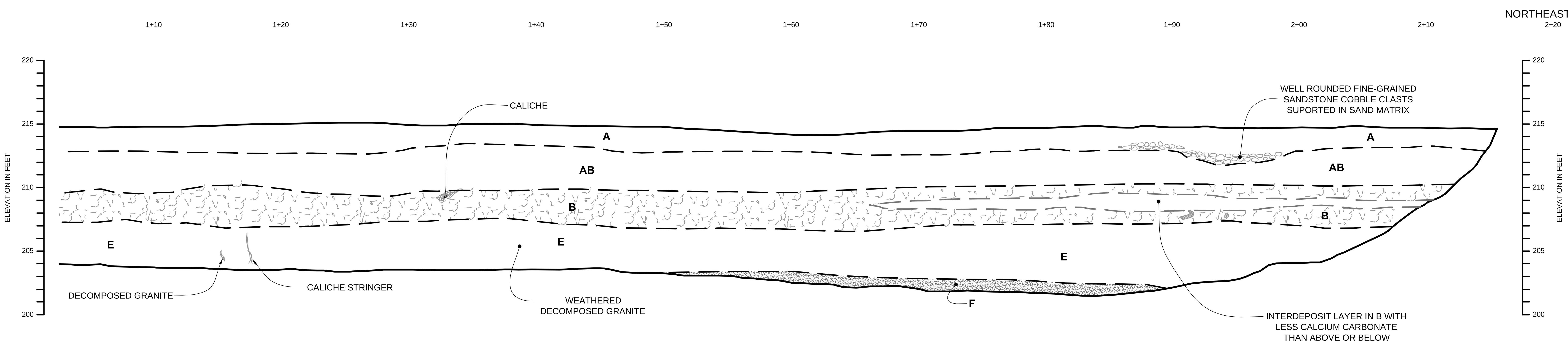
APPENDIX E

Fault Trench Logs

TRENCH T-1
LOG OF NORTH WALL
TREND N46E



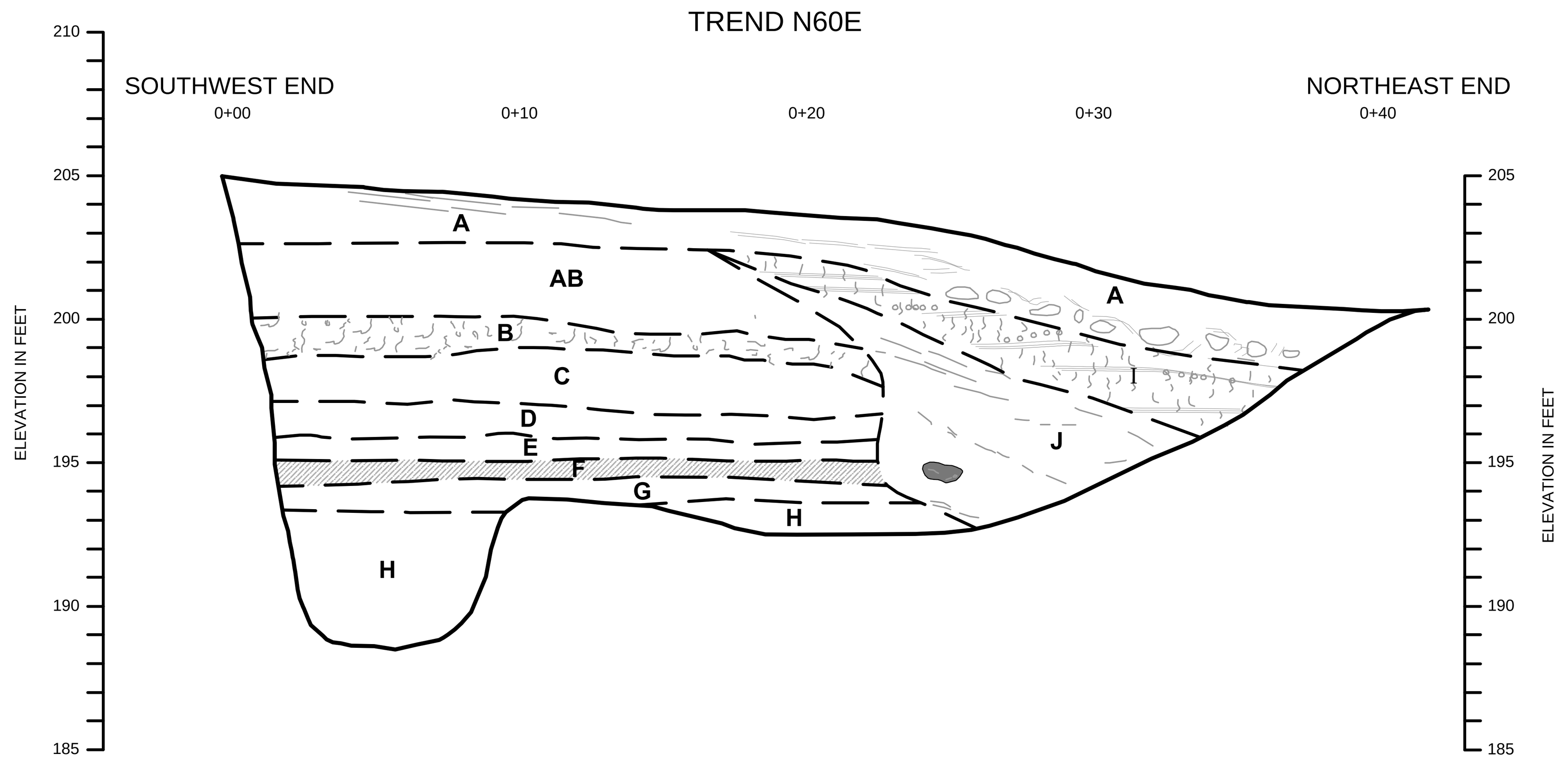
TRENCH T-1
LOG OF NORTH WALL CONTINUED
TREND N46E



TRENCH T-1 EXPLANATION

———	GROUND SURFACE AND BOTTOM OF TRENCH
— — —	GEOLOGIC CONTACT, SOLID WHERE SHARP, DASHED WHERE APPROXIMATE
A	SILTY CLAY, DARK GRAY TO BLACK, DRY, HARD, REWORKED BY DISKING
AB	SILTY CLAY WITH GRAVEL, DARK GRAY, DRY, VERY STIFF, GRAVEL IS ROUNDED TO WELL ROUNDED, QUARTZITE AND MODERATELY TO HIGHLY WEATHERED GRANITE, NO CALICHE
B	SANDY SILTY CLAY WITH GRAVEL, LIGHT TO DARK RED-BROWN, MOIST, VERY STIFF TO HARD (pp >4.5 T/ft) COBBLES ARE SANDSTONE AND GRANITIC WITH THICK CALICHE COATINGS, SCATTERED CALICHE NODULES <1/2 INCH DIAMETER, ABUNDANT CALICHE STRINGERS, GRADATIONAL CONTACT BELOW
C	SANDY SILTY CLAY WITH MINOR GRAVEL AND ABUNDANT CALICHE NODULES UP TO 1/2 INCH DIAMETER AND STRINGERS, DARK RED-BROWN, MOIST, VERY STIFF TO HARD, FEW GRAVEL CLASTS ARE SUBROUNDED TO ROUNDED MODERATELY TO HIGHLY WEATHERED GRANITE AND CALICHE NODULES GRADATIONAL CONTACT BELOW
D	CLAYEY GRAVELLY SAND, MEDIUM RED-BROWN, MOIST, DENSE TO POCKETS OF LOOSE, SOME GRAVEL AND COBBLES OF COMPLETELY DECOMPOSED GRANITE WITH FELDSPAR WEATHERED TO CLAY, COBBLES UP TO 4 INCH DIAMETER
E	SILTY CLAY, MEDIUM BROWN, SLIGHTLY MOIST TO MOIST, UPPER CONTACT WITH UNITS C AND D IS DEPOSITIONAL
F	CLAYEY SAND, LIGHT BROWN, MOIST, MEDIUM DENSE, FINE-GRAINED SAND

TRENCH T-4
LOG OF NORTH WALL
TREND N60E



TRENCH T-4 EXPLANATION

———	GROUND SURFACE AND BOTTOM OF TRENCH
— — —	GEOLOGIC CONTACT, SOLID WHERE SHARP, DASHED WHERE APPROXIMATE
A	SANDY CLAY, VERY DARK GRAY TO BLACK, STIFF TO HARD, DISTURBED BY DISKING
AB	SANDY CLAY, VERY DARK GRAY TO BLACK, DRY, HARD, WELL DEVELOPED PRISMATIC SOIL PEDS
B	SANDY GRAVELLY CLAY, BLACK MOTTLED WITH WHITE, SLIGHTLY MOIST, VERY STIFF TO HARD, GRAVEL IS ANGULAR GRANITIC ROCK, COARSE GRAINED SAND FINING UPWARD, ABUNDANT CALCIUM CARBONATE NODULES AND STRINGERS
C	SAND FINE-GRAINED, MOTTLED DARK GRAY AND BROWN, SLIGHTLY MOIST TO MOIST, HARD, SCATTERED GRANITIC GRAVEL UP TO 1/4 INCH DIAMETER
D	SAND, LIGHT TAN TO LIGHT ORANGE-BROWN, MOIST, FINE-GRAINED, LOOSE
E	CLAYEY SAND TO SAND, MEDIUM ORANGE-BROWN, MOIST, DENSE, COARSE-GRAINED SAND
F	SILTY SAND, LIGHT TAN TO GRAY/WHITE, DRY TO SLIGHTLY MOIST, LOOSE (MARKER BED) FINING UPWARD FROM SILTY CLAY(SAME COLOR), HEAVY CARBONATE CONCENTRATION
G	FINE-TO COARSE-GRAINED SAND, MEDIUM TO DARK ORANGE-BROWN, LOOSE TO MEDIUM DENSE
H	SANDY CLAY, MEDIUM TAN/GRAY, SLIGHTLY MOIST TO MOIST, STIFF TO VERY STIFF
I	INTERBEDDED SAND AND GRAVELLY SAND LENSES TO THIN SANDY CLAY LENSES, ORANGE, TAN, BROWN, MEDIUM GRAY, SLIGHTLY MOIST, LOOSE TO VERY LOOSE
J	SANDY CLAY AND CLAY MIXED, MEDIUM TAN-BROWN, MOIST, MEDIUM STIFF

0 5
1"=5'

DRAWN BY: CC
DATE: 12-1-14
JOB NUMBER: 3602.100

FAULT TRENCH LOG
TRENCH T-1 AND T-4
COPPERLEAF
SAN JUAN BAUTISTA, CALIFORNIA
FOR
EDENBRIDGE

Berlogar Stevens & Associates
SOIL ENGINEERS * ENGINEERING GEOLOGISTS

JOB NUMBER: 3602.100 DATE: 12-1-14 DRAWN BY: CC

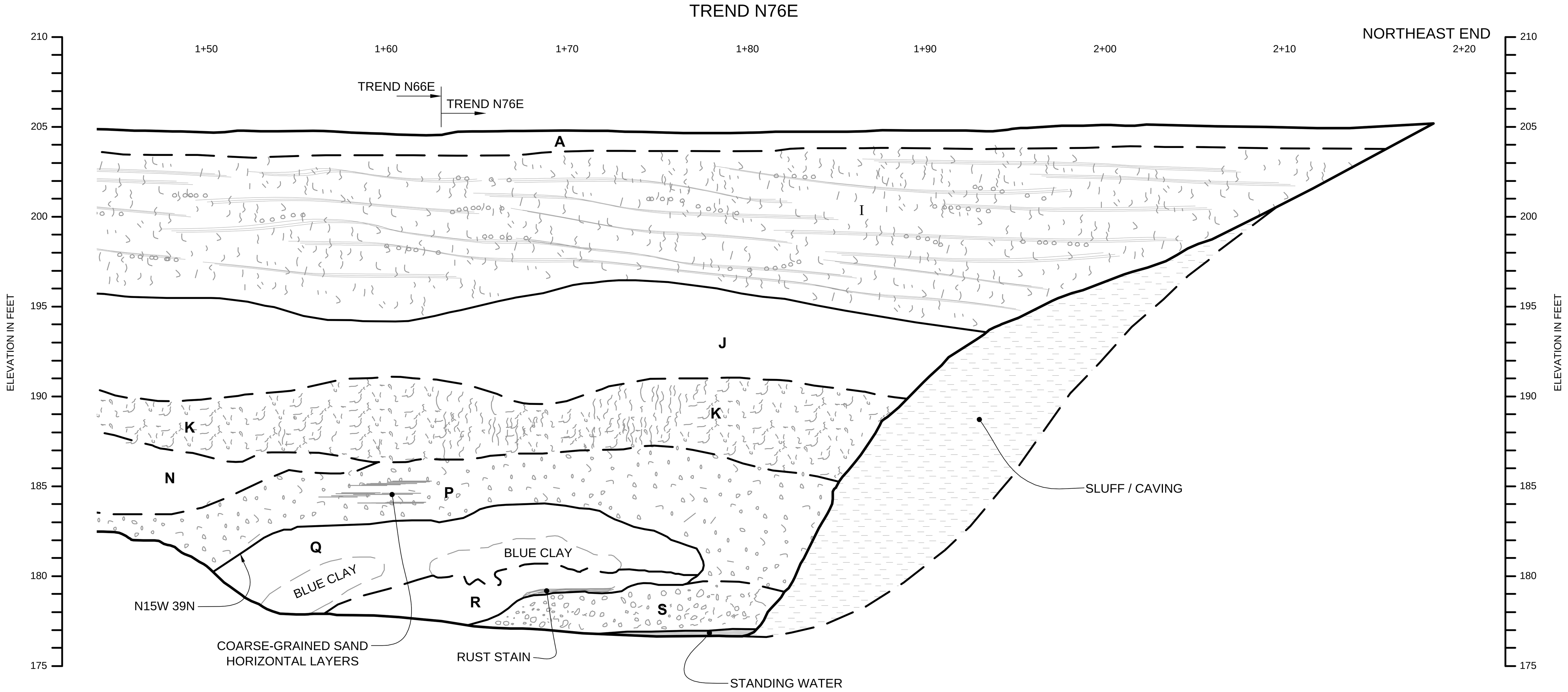
0 5
1"=5'

TRENCH T-10

LOG OF NORTH WALL
TREND N66E

TRENCH T-10

LOG OF NORTH WALL CONTINUED
TREND N76E



EXPLANATION

(solid line)	GROUND SURFACE AND BOTTOM OF TRENCH
(dashed line)	GEOLOGIC CONTACT, SOLID WHERE SHARP, DASHED WHERE APPROXIMATE
A	SANDY CLAY, DARK GRAY-BLACK, DRY, VERY STIFF TO HARD (CULTIVATED SOIL)
B	SANDY CLAY, MEDIUM GRAY, DRY, HARD, FINE-GRAINED SAND, WELL DEVELOPED SOIL PEDS, SCATTERED CALCIUM CARBONATE STRINGERS
C	SANDY CLAY, MEDIUM TO DARK GRAY WITH LIGHT GRAY MOTTLING, ABUNDANT CALCIUM CARBONATE STRINGERS, MEDIUM-TO COARSE-GRAINED SAND
D	SANDY CLAY, ORANGE-BROWN WITH WHITE LIGHT GRAY MOTTLING, SLIGHTLY MOIST, VERY STIFF TO HARD, FINE-GRAINED SAND
E	SILTY CLAY TO CLAY, VERY LIGHT GRAY/WHITE, MOIST, VERY STIFF, CARBONATE LAYER, HEAVY CALCIUM CARBONATE CONCENTRATION
F	SANDY CLAY, MEDIUM BROWN, SLIGHTLY MOIST TO MOIST, VERY STIFF (NONE TO MINOR CARBONATE)
G	SAND WITH TRACE CLAY, MEDIUM TAN/BROWN WITH ORANGE/BROWN LENSES, LOOSE TO DENSE, FINE-TO MEDIUM-GRAINED SAND
H	SILTY CLAY, MEDIUM GRAY/BROWN, SLIGHTLY MOIST, STIFF TO VERY STIFF
I	SAND WITH STRINGERS OF GRANITIC GRAVEL, INTERBEDS OF ORANGE, WHITE, TAN, SLIGHTLY MOIST, VERY LOOSE, FINE-GRAINED SAND
J	PEAT, BLACK WITH BROWN ORGANIC FILLIMENTS (GRASS), GRADES DOWNWARD TO PEATY CLAY, BLACK TO GRAY-BROWN, MOIST, VERY SOFT
K	SANDY CLAY, MIXED DARK ORANGE-BROWN AND DARK BLUE, MOIST, STIFF, SCATTERED ORGANIC FILLIMENTS
L	FINE-GRAINED SAND, LIGHT TAN/OLIVE, SLIGHTLY MOIST, MEDIUM DENSE
M	COARSE-GRAINED SAND, LIGHT GRAY/WHITE, LOOSE TO VERY LOOSE
N	FINE-GRAINED SAND, LENSES OF LIGHT TAN AND ORANGE BROWN, MOIST, LOOSE TO MEDIUM DENSE
O	COARSE-GRAINED SAND, QUARTZ AND GRANITE, MEDIUM TO DARK BROWN, MOIST, VERY LOOSE
P	GRAVELLY SAND (MEDIUM TO COARSE-GRAINED) MEDIUM ORANGE/BROWN, GRAVEL (4 INCH ROUNDED TO WELL-ROUNDED), SOME GRANITE ROCKS ARE COMPLETELY WEATHERED (FELDSPAR WEATHERED TO CLAY)
Q	CLAY, LIGHT TAN, MOIST, STIFF TO VERY STIFF WITH BLUE CLAY INCLUSIONS
R	SAND FINE-GRAINED, LIGHT TAN, MEDIUM DENSE, SCATTERED ROCK FRAGMENTS
S	FINE-GRAINED SAND, LIGHT TAN/OLIVE, SLIGHTLY MOIST, MEDIUM DENSE

FAULT TRENCH LOG
TRENCH T-10

COPPERLEAF

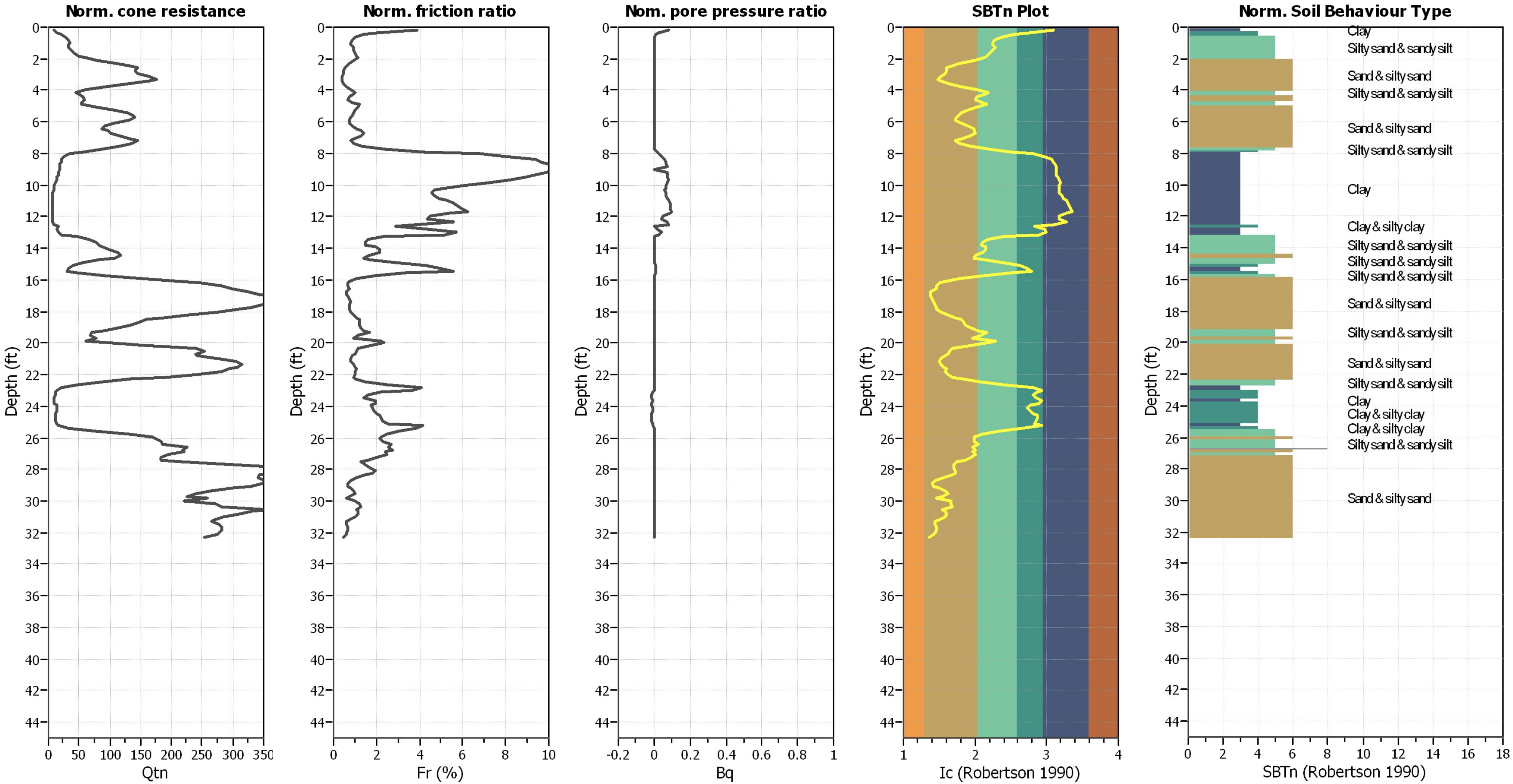
SAN JUAN BAUTISTA, CALIFORNIA
FOR
EDENBRIDGE

Berlogar Stevens & Associates
SOIL ENGINEERS * ENGINEERING GEOLOGISTS

APPENDIX F

Liquefaction Analysis

CPT basic interpretation plots (normalized)



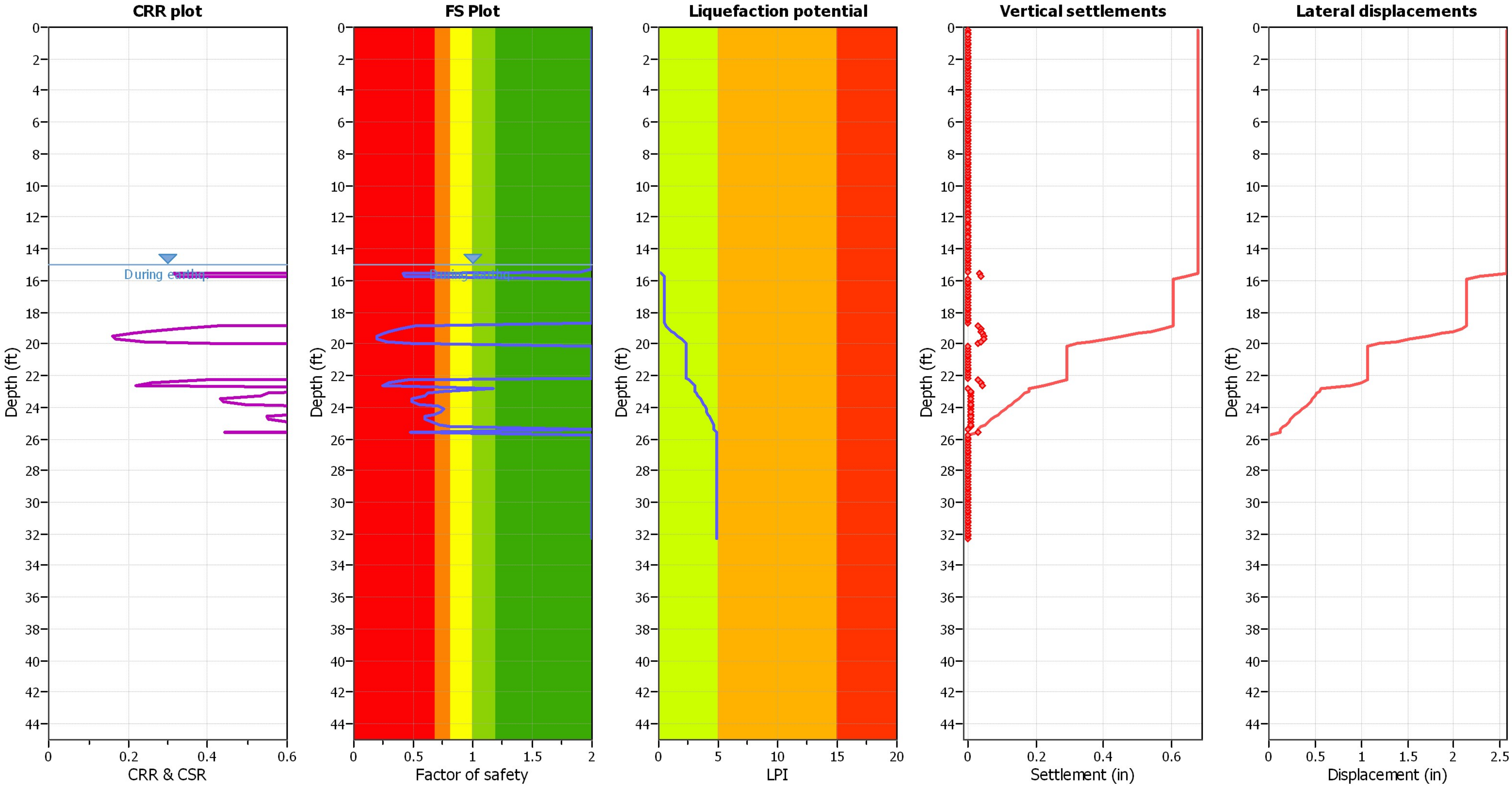
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	15.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	8.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	1.00	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	15.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

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Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
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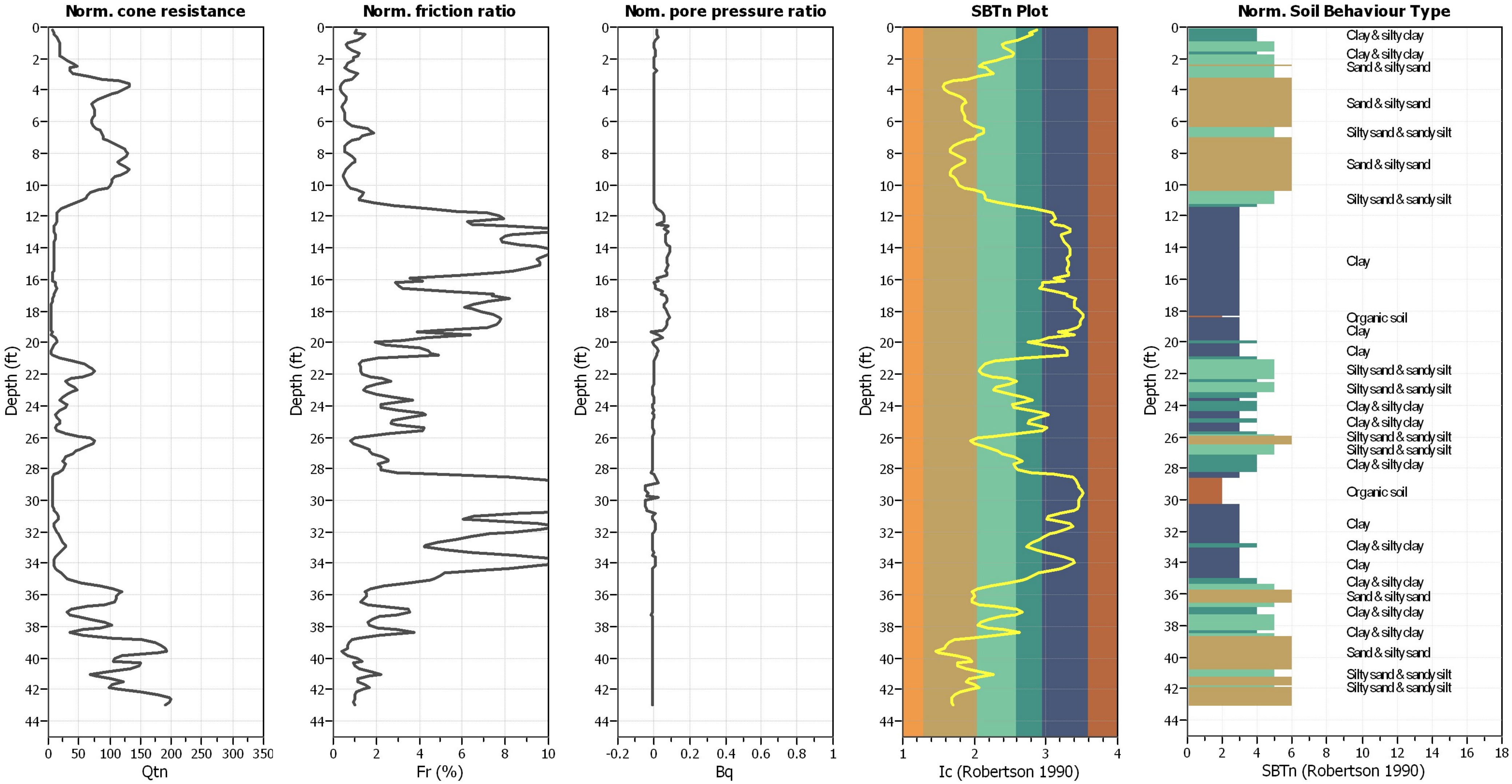
Peak ground acceleration:	1.00	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	15.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liquefaction are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

CPT basic interpretation plots (normalized)



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Earthquake magnitude M_w:	8.00	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	1.00	Use fill:	No	Limit depth applied:	No
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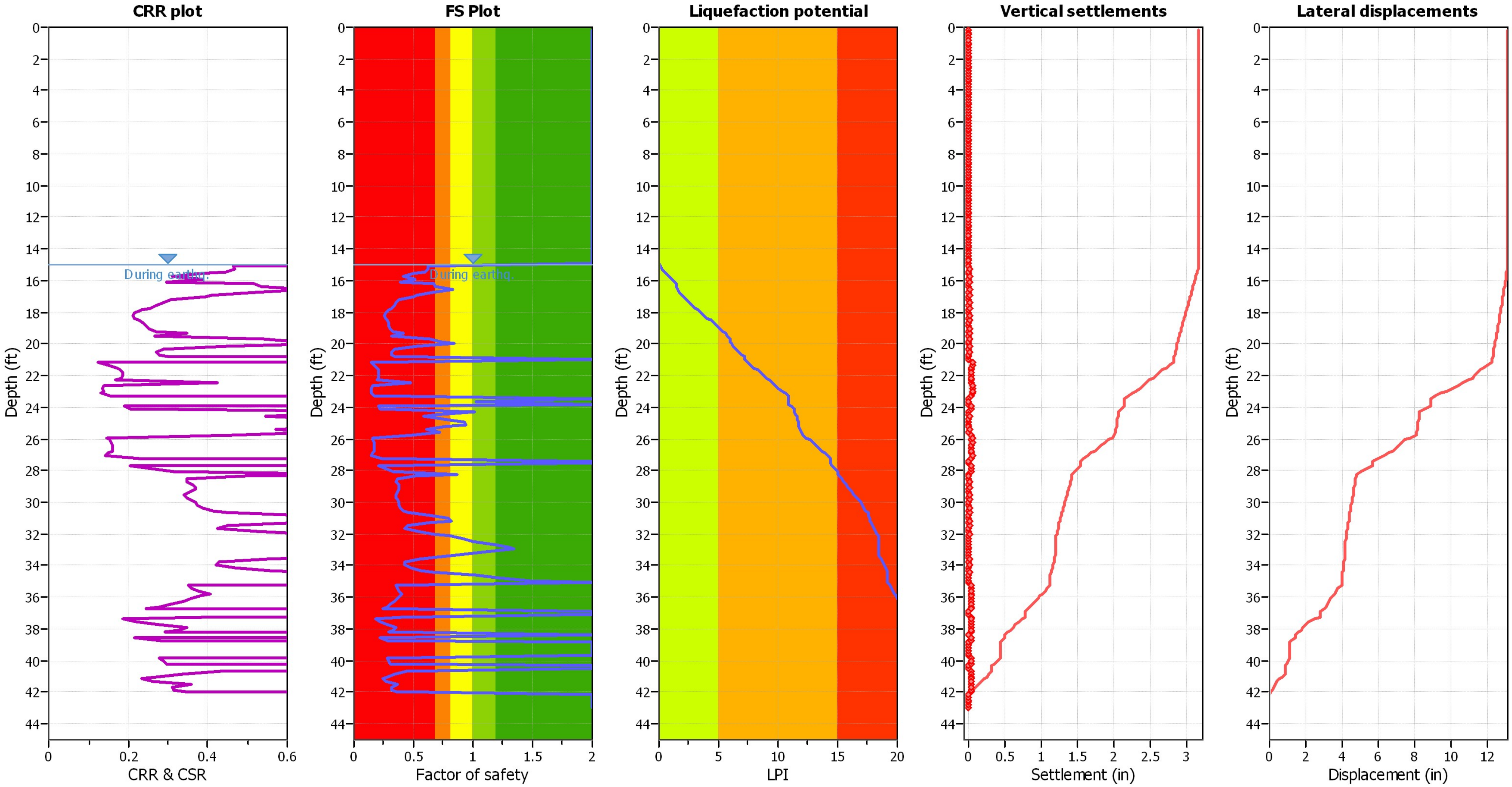
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	15.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	No
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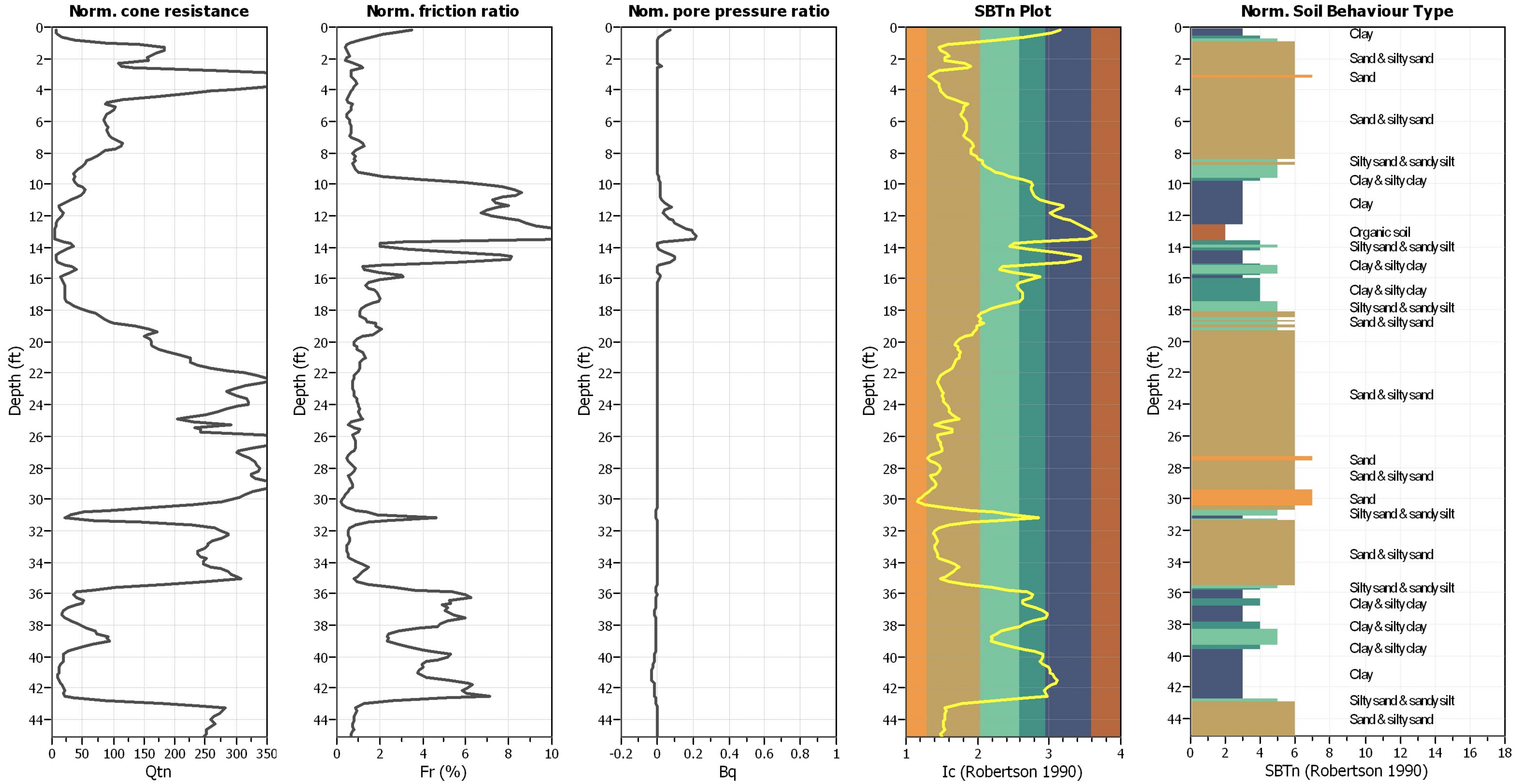

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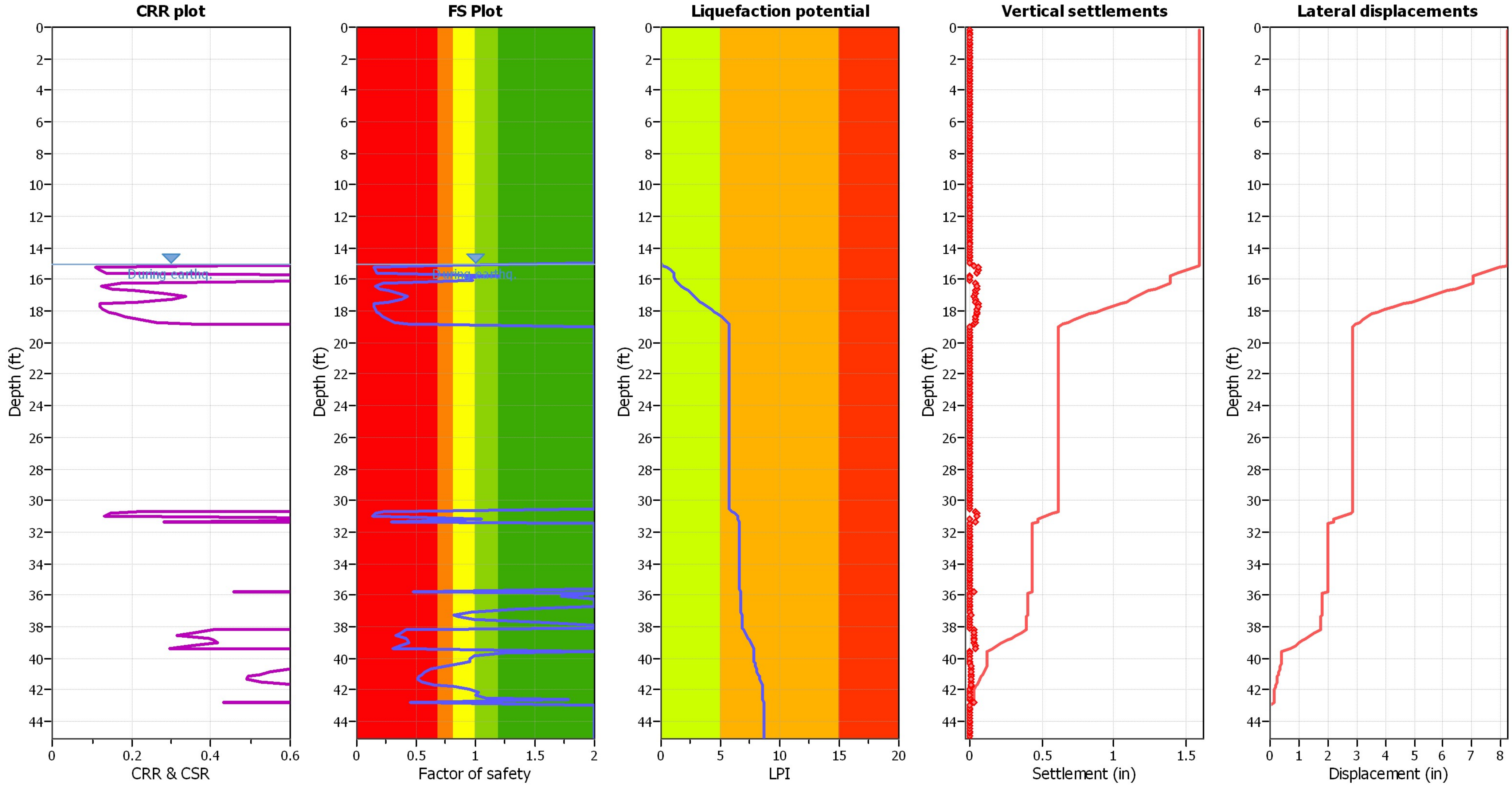
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	15.00 ft	Fill weight:	N/A
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Peak ground acceleration:	1.00	Use fill:	No	Limit depth applied:	No
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