APPENDIX L

Limited Geotechnical Investigation

LIMITED GEOTECHNICAL INVESTIGATION AND INPUT TO
BUENA VISTA LAGOON RESTORATION PROJECT
OCEANSIDE/CARLSBAD, CALIFORNIA

Prepared for
SCIENCE APPLICATIONS INTERNATIONAL CORP.
San Diego, California

Prepared by
TERRACOSTA CONSULTING GROUP, INC.
San Diego, California

Project No. 2615-02
November 7, 2008
Revised November 19, 2008

TerraCosta
Consulting Group

Geotechnical Engineering
Coastal Engineering
Maritime Engineering

Project No. 2615-02
November 7, 2008
Revised November 19, 2008

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LIMITED GEOTECHNICAL INVESTIGATION AND INPUT TO
BUENA VISTA LAGOON RESTORATION PROJECT
OCEANSIDE/CARLSBAD, CALIFORNIA

Dear Dr. Lissner:

TerraCosta Consulting Group, Inc. (TCG) is pleased to submit this report, which presents the results of the limited geotechnical investigation we performed in support of the planned restoration project at Buena Vista Lagoon in the Oceanside/Carlsbad area of San Diego County, California.

This report presents the results of our document research, field explorations, and our conclusions and recommendations pertaining to the project.

We appreciate the opportunity to be of service and trust this information meets your needs. If you have any questions or require additional information, please give us a call.

Very truly yours,

TERRACOSTA CONSULTING GROUP, INC.

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(1) Charles Phillips, SAIC
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LIMITED GEOTECHNICAL INVESTIGATION AND IN PUT TO
BUENA VISTA RESTORATION PROJECT
OCEANSIDE/CARLSBAD, CALIFORNIA

1 INTRODUCTION AND PROJECT DESCRIPTION

Buena Vista Lagoon is one of seventeen coastal wetlands recognized by the San Diego Region Coastal Commission, in San Diego County, and is currently classified as a "fresh water wild fowl sanctuary" by the California Department of Fish and Game. Figure 1, the Vicinity Map, shows the approximate location of this environmentally important wetland resource.

The Buena Vista Lagoon Restoration Project is evaluating alternatives for modifying the present configuration of the Lagoon basins, as well as the influences of fresh and ocean water inputs, to improve the habitat value of the Lagoon. The modifications could include changes to the existing lagoon crossings, as well as dredging to deepen certain basins and areas of other basins. These alternatives are being considered by a team of agencies and consultants led by the California State Coastal Conservancy, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game. As an aid to the planning of this effort, TerraCosta Consulting Group, Inc. (TCG) has been tasked by Science Applications International Corp. (SAIC) and Everest International Consultants, Inc. (EIC) to address the geotechnical factors affecting the design of grading and dredging for the project.

2 PURPOSE AND SCOPE OF INVESTIGATION

The purpose of our investigation is to address the geotechnical factors critical to the design of grading and dredging, including the issues summarized in an email from Mr. David Cannon of EIC, dated August 21, 2008, as follows:

1. *Range of stable slopes for the proposed cut areas within the lagoon.*

2. *Liquefaction and lateral spreading potential due to the proposed cut.*

3. *Range of bulking factors for proposed cut material.*

4. *Evaluation of sediment reuse options (e.g., building pad fill, road embankment fill) from a geotechnical standpoint.*

5. *Identification and discussion of mitigation measures to address problems identified from the geotechnical investigation.*

3 DOCUMENT RESEARCH AND FIELD INVESTIGATION

To aid our understanding of the project, we have discussed site-specific project issues with Mr. David Cannon of EIC, and Dr. Andrew Lissner and Mr. Charles Phillips of SAIC. Additionally, we have been provided with various plans and maps in electronic format showing alternative options under consideration for dredging and grading across the lagoon. We have reviewed various geologic and topographic/bathymetric maps, historic stereopair aerial photographs, and geotechnical reports from our TCG office files. Supplementary data for our study were obtained primarily from available published geologic, hydrologic , and environmental literature and maps. Pertinent references are listed at the end of this report.

The TCG field investigation included a geologic/geotechnical mapping reconnaissance around the perimeter of the lagoon, and advancing 19 continuous cone penetration tests (CPT), generally ranging in depth from 16 feet to 100 feet (three of the probes refused at less than less than 10 feet). Additionally, TCG was provided logs of vibracore test borings drilled for environmental purposes at various points around the lagoon from a shallow-draft barge as part of the SAIC investigation. The vibracore borings, advanced to depths ranging from 5.5 feet to 10.5 feet, provide an overall picture of the geotechnical characteristics of the shallow mantle of unconsolidated bay-floor sediments across the lagoon. The approximate locations of the above-described CPT and vibracore borings are shown on the Site Plan and Geologic Map (Figure 2), along with test boring and sampling points from investigations dating back to 1968. The logs of these borings are presented in Appendix A (Logs of Subsurface Explorations).

4 SITE CONDITIONS AND GEOLOGY

4.1 Geologic Setting – San Diego County Coastal Wetlands and Buena Vista Lagoon

Buena Vista Lagoon forms the lower reaches of Buena Vista Creek, which, like all of the major coastal drainages in the region, was incised rapidly during the mid to late Quaternary periods of glacial advance when the eustatic sea level reached a low of 400± feet below present day levels. During the past 18,000± years, the geologically-rapid eustatic rise in sea level caused large volumes of alluvial sediment to fill all of the regional coastal drainages (many of which had been incised more deeply than Buena Vista Lagoon), thus creating estuarine/lagoonal environments.

Of the 17 coastal wetlands in San Diego County, as classified by the San Diego Regional Coastal Commission, Buena Vista Lagoon ranks among the smallest (approximately 200 acres), primarily because it drains a comparatively small watershed (20± square miles) (State Coastal Conservancy, 1989).

4.2 Development History

Prior to 1940, Buena Vista Lagoon was a low-flow, tidal-brackish water estuary, fed principally by winter storms and, at much lower volumes, by artesian springs in summer (Caltrans, 1982; State Coastal Conservancy, 1989). It is likely that, at least within the last several thousand years, a dynamic tidal system has never existed at Buena Vista Lagoon, and in that more recent geologic time, the lagoon was probably closed off by the natural beach bar throughout most summer periods.

The development of transportation resulted in the construction of the railroad fill in 1881, the Pacific Coast Highway in 1912, and the Interstate 5 freeway in 1965 (State Coastal Conservancy, 1989). During 1940, a weir was constructed at the extreme westerly end of the lagoon and housing was built along the beach bar. Following construction of the weir, Buena Vista Lagoon has been predominantly a “fresh water” lagoon. During the 1970s, the easterly end of the lagoon was filled-in for the construction of a major shopping center (State Coastal Conservancy, 1989).

The cumulative result of all of these developments is the present day configuration of four major "basins" connected by relatively narrow channels, which traps virtually all of the sediment that comes into it. From west to east, the four basins have been named Weir Basin, Railroad Basin, Coast Highway Basin, and I-5 Basin.

Figure 6, the Generalized Dredging Plan, shows the relative locations of these four basins.

4.3 Geometry of the Alluvial-Filled Lagoonal Prism

The generalized geologic cross sections shown on Figures 3 and 4 present our best estimate, from a limited number of available deep boring and CPT logs, of the likely shape of the alluvial-filled lagoonal prism along CH/CB and the Interstate 5 freeway, respectively. It should be emphasized that these cross sections are exaggerated 1:10 (horizontal to vertical) in order to provide an overall picture of the relationships between the various soil and geologic units in the present day lagoonal system. Available logs of test borings made in recent years at, or near, the mouths of the principal San Diego County coastal drainages indicate that alluvial depths at the present day coastline range from approximately 80 to 130+ feet of depth. Although we do not have similar, specific test boring information in the beach bar area for Buena Vista Lagoon, extrapolations from the test borings of the Irvine Consulting Group (see Appendix A) and the Caltrans 1968 test borings (see Appendix A) indicate that the lagoonal alluvium is likely to be on the order of approximately 90± feet deep in the area of the beach bar.

4.4 Characterization of Lagoonal Soils

Fill Soils - Fill soils across the lagoon consist of both dredged material and land-derived graded soils. The dredged materials, for the most part, tend to be soft silts and clays and very fine sands, all rich in organic material, such as the soils which make up the "nesting islands" in the easterly basin (dredged in conjunction with the Interstate 5 grading and construction) and the remnants of duck blinds, which predominate in the "Coast Highway" basin. Land-derived materials have, of course, come from many sources, but appear predominantly to have been cut-graded from the nearby coastal terraces, which are composed predominantly of Quaternary and Tertiary silty to clayey sands.

Natural Alluvial Soils - Our review of the test boring logs of others and our own test borings and probes (see Appendix A) indicate that, from a geotechnical standpoint, the natural alluvial fill soils within the channel, incised into the very dense Santiago Formation sandstones, can generally be divided into three zones, as follows:

- A thin (0 to 5 feet thick) geologically recent mantle of unconsolidated, very loose sands and soft silts and clays;
- An upper zone (generally above -20 feet in elevation) of predominantly fluvial, medium dense sands; and
- A lower zone (generally below -20 feet in elevation) of predominantly marine and estuarine, medium dense to very dense sands with abundant shells and shell fragments.

Formational Soils – As indicated on the Site Plan and Geologic Map (Figure 1), and on Generalized Geologic Cross-Sections A, B, and C (Figures 3 and 4), the site is underlain by relatively horizontally-stratified sandstones and claystones of the upper-middle tertiary Santiago Formation (Tsb). Limited areas of the surface of this Eocene-age unit are exposed along the south shoreline of the lagoon. Also indicated on the Site Plan and Geologic Map are moderately-consolidated, poorly-indurated, tan to reddish-brown, sands and clays that include nearshore marine and beach sands and, in some areas, a cap of dune sands. These relatively thin (generally less than 20 feet thick) but extensive terrace deposits overlie a wave-cut platform, abraded during higher eustatic sea stands.

4.5 **Faulting and Seismicity**

4.5.1 *Seismicity*

The California Seismic Hazards Mapping Act of 1990 was developed to reduce the threat to public health and safety, and to minimize the loss in property by identifying and mitigating seismic hazards. The act requires that, prior to development, a site must be evaluated for the presence or absence of active or potentially active faults on or adjacent to the site that may cause ground rupture, or within the region of the site if they could affect the site through ground shaking. Secondary effects, such as liquefaction, shallow ground rupture, settlement

of soils, earthquake-induced landslides, and lurching should also be assessed. While no new development is anticipated for this project, the modifications due to dredging and grading were assessed to determine the impacts, if any, on adjacent existing improvements. Estimates of maximum credible earthquake may also be required by statute or regulation for a specific project type.

As part of our seismic assessment, TCG performed a geologic reconnaissance of the site, reviewed available geotechnical reports prepared by others, and reviewed published maps and reports applicable to the area. Our study included a search to identify active faults within a 62 mile (100 km) radius from the site using the computer program EQFault, Version 3.0 (Blake, 2000). This program identified 18 faults within the specified search radius. The closest identified fault to the site was the Newport-Inglewood (offshore segment) Fault at a distance of about 4.9 miles (7.9 km). The results of the EQFault search are presented in Appendix B. Figure 5 presents the location of the site in relation to the closest faults.

To further characterize the relative significance of ground shaking, we estimated the corresponding peak acceleration for the maximum credible earthquake for the site using the attenuation relationships for alluvium developed by Campbell and Bozorgnia (Blake, 2000). These accelerations are intended for comparative purposes to assess qualitatively which faults are more significant to the site as it pertains to the effects of ground shaking.

Using this program, the largest site accelerations were estimated to be 0.434g for a maximum credible earthquake of 7.1 (Richter Scale) on the Newport-Inglewood Fault located 4.9 miles westerly of the site, and 0.428g for a maximum credible earthquake of 7.2 on the Rose Canyon Fault located 5.6 miles southwest of the site. These estimates are consistent with those presented in the California Division of Mines and Geology, "Revised 2002 California Probabilistic Seismic Hazard Maps Report, Appendix A - 2002 California Fault Parameters," DMG Open-File Report 96-08 (June 2003).

4.5.2 *Local Faults*

Our review of geologic maps did not reveal the presence of active faulting underlying the site that could cause the potential for ground rupture. However, due to the proximity of active faults in the area and local geologic conditions, the site should be considered susceptible to

the secondary effects of seismic activity, including liquefaction and settlement of alluvial deposits.

4.5.3 *Liquefaction*

We reviewed the Multi-Jurisdictional Hazard Mitigation Plan, Section 4, Risk Assessment, prepared by the County of San Diego Office of Emergency Services. Under Section 4.3.6, Liquefaction, Figure 4.3.6, Buena Vista Lagoon is mapped within an area of high liquefaction risk. Additionally, our assessment of the site seismicity and review of the subsurface information collected and reviewed also indicates that the site may be considered moderately to highly susceptible for liquefaction of certain soils on the site in their natural condition.

Liquefaction occurs when saturated, loose, clean granular soil is subject to moderate to severe earthquake shaking. Liquefaction occurs when an increase in pore pressure of the saturated soil exceeds the in-situ stress of the soil, thus creating a loss in shear strength. Sandy soils with significant amounts of silt or clay are less likely to undergo liquefaction. Saturated soils (below the water table) encountered in CPT soundings and test borings were found to range from very loose to very dense. These materials are predominantly the younger alluvial lagoonal deposits, with the most susceptible deposits confined to the upper 15 to 20 feet. Due to their high density, the potential for liquefaction of the deeper alluvial soils (below -20 feet in elevation) is considered to be low. Mitigation for liquefaction of the alluvial soils is discussed later in this report.

4.6 **Surface Water and Groundwater**

Due to the existence of the weir that impounds runoff from the Buena Vista Creek, groundwater levels are expected to remain relatively consistent between 6 and 9 feet MSL around the margins of the lagoon. However, removal of the weir may result in a drop in groundwater levels of over 10 feet.

5 DISCUSSION AND RECOMMENDATIONS

5.1 Slope Stability of Proposed Dredging

We performed limited slope stability analyses with GSTABL7 slope stability computer software using the Modified Bishop Method for static and pseudo-static conditions assuming no liquefaction. These analyses included post-liquefaction effects. Cross-section locations were analyzed in critical areas near transportation routes and residential areas, and were evaluated for deep-seated, global stability, with general locations shown on Figure 7. Recognizing that several options and alternatives exist for the proposed project, the steepest and/or deepest dredging conditions were selected for each section. Slope stability analyses were also performed for additional slope inclinations under varying water conditions. Using simplified and empirical methods, we estimated the magnitude of seismic-induced slope movements.

Static and Pseudo-Static Slope Stability without Liquefaction

General

With regard to static slope stability, we believe the proposed embankment slopes to be generally stable with regard to static global stability. Based upon our analyses, we recommend that all newly created slopes be limited to a maximum slope steepness of 3:1 In addition, we would not recommend steepening any existing embankment slopes which currently support the roadways or railway beyond 3:1. The analyses also indicate that overdredging an additional 10 feet below proposed dredge levels should not decrease static slope stability for a majority of the site.

With regard to seismic slope stability, we have evaluated the anticipated yield acceleration and maximum ground acceleration at the site. We anticipate that the proposed slopes may be unstable during a significant seismic event. Furthermore, we expect that horizontal slope displacements on the order of 3 to 6 inches could occur during a seismic event. These slopes are also susceptible to the impacts of liquefaction and lateral spreading. These effects are discussed in Section 5.2.

Area-specific considerations have been described below.

I-5 Causeway Embankment

In the area of the Interstate 5 corridor, the existing embankment side slopes have an inclination of approximately 2:1. Given the limited geotechnical information concerning the strength of the embankment and its construction, we do not recommend steepening of the side slopes of this embankment. In addition, we expect that the dredging operations within the Coast Highway Basin would potentially expose a loose sand layer underlying the western I-5 embankment and proposed slope. As a result, we recommend that a minimum 30-foot wide bench be left in place to the west of the existing toe of slope to help confine these loose soils and provide a buffer between the embankment and adjacent grading activities. Caltrans subsurface information indicates the embankment is composed of silty sand. Based upon our analyses, these slopes are prone to minor surficial slope failures due to saturation.

Railroad and Coast Highway Embankments

Our slope stability analyses in these areas indicate that the proposed dredging should not destabilize the existing embankments, provided that embankment slopes are maintained at inclinations no greater than 3:1. Based upon CPT-soundings and previous exploratory borings, these two areas appear to be similar from the standpoint that both areas generally consist of silty sand fill underlain by layers of clay and silty sand, in turn underlain by the more dense alluvial deposits.

Western Residential Area

The residential area on the west side of the Weir basin is comprised of artificial fill overlying the lagoonal estuarine deposits. Because dredging may expose loose silty sands or soft clays below the fill, the stability of the slopes could be affected. Due to a lack of quality geotechnical data in the residential areas adjacent to the west shore of the Weir basin, we recommend that further analyses be carried out to verify that dredging activities have no impact on the adjacent houses. Depending upon the soil conditions, if slope stability is an issue, the slope can be buttressed by leaving an unexcavated bench adjacent to the residential area to provide additional stability or by placing an engineered riprap buttress on the slope. Additional analysis is needed to assess this issue.

Static Slope Stability with Liquefaction

Static stability analyses have also been performed taking into consideration the potential change in shear strength of sand layers located in the embankments at the site due to liquefaction. Our limited analyses indicate that the I-5 embankment may be at the greatest risk of post-liquefaction slope failure, due to the presence of an approximately 14-foot thick loose sand layer that underlies the embankment. The embankments supporting the railroad and Pacific Coast Highway have thinner underlying sand layers, on the order of 3 to 4 feet, that should have less impact on post-liquefaction slope stability. With regard to the westerly residential area, the impacts of liquefaction on static slope stability are unknown due to the lack of subsurface geotechnical data in the area.

5.1.1 *Groundwater Conditions*

As previously mentioned in our report, the groundwater elevation at the time of our field investigation was approximately 6.5 feet MSL, with an anticipated maximum height of 9 feet, MSL. We have examined a rapid draw-down condition to determine the effect of variable water height on the proposed embankment slopes. Based upon the results of our slope stability analyses, it is anticipated that rapid draw down could result in embankment slope failure. This preliminary analysis has not taken into consideration the effect of groundwater seepage forces within the embankment slopes.

5.2 **Liquefaction and Lateral Spreading**

As described in Section 4.5, the subject site is considered to have a moderate to high liquefaction risk. Based upon our review of CPT data and boring longs, and our preliminary analyses, we believe that liquefaction-induced settlements of the embankments supporting the railway and Coast Highway to be relatively low, due to the soil density, the presence of fine-grained cohesive soils, and the rather limited thickness of potentially liquefiable soils. However, we expect that settlements within the fill areas in the I-5 basin to be more significant, considering that those materials will likely be hydraulically placed in a loose, saturated condition. Based upon our review of limited geotechnical data within the I-5 corridor, it appears that a potentially loose layer of sand within the I-5 embankment is potentially liquefiable, with possible vertical settlement on the order of 6 inches.

We anticipate that lateral spreading poses a greater threat to the embankment fills. Lateral spreading displacements on the order of 2 to 6 feet can be expected at the subject site. The I-5 embankment, due to the 14 foot thick loose sand layer underlying the embankment, will likely experience the greatest amount of lateral spreading, with shear strains on the order of 20 to 50 percent. The embankments supporting the railway and Coast Highway are expected to experience less movement, but could still experience 2 or more feet of lateral spreading. Due to the lack of CPT data, the extent of potential lateral spreading in the residential area is unknown, but it could experience displacements similar to those of the I-5 embankment depending on soil conditions. We recommend that an in-depth study be performed to address the residential area.

Several options should be considered for mitigation of liquefaction/lateral spreading, , including maintaining lower water levels within the lagoon to prevent saturation of the upper embankment soils. Ground improvement methods, such as in-situ compaction grouting, or the installation of stone columns to densify the soils, could also be employed to mitigate seismic-induced hazards.

5.3 **Bulking/Shrinkage of Proposed Dredged Materials**

Bulking and shrinkage of excavated soils throughout the process of handling depends to a great extent on the in-situ dry density of the excavated materials, the method of excavation, how the materials are placed, and the desired dry density of the placed materials. For example, if the question of bulking and shrinkage only concerns the difference in volume between the point of excavation, and after final placement, one only needs to compare the in-situ dry density of the natural alluvial soils with the final as-placed dry density of the fill soils.

We estimate that overall, the soils proposed for dredging will increase somewhat in volume, both in transportation and after final placement. For planning purposes, we recommend an average bulking factor for the entire volume of soils to dredged of 1.10 in the context of transportation, and 1.05 in the context of final placement.

5.4 Evaluation of Sediment Reuse Options

It is our understanding that the primary fill areas will be on the eastern side of the I-5 basin and that those areas are intended to facilitate habitat only. As a result, we expect that most soils dredged from the lagoonal basins can be used in this area. In addition, we anticipate that soils dredged generally below elevation -10 to -12 feet may be suitable as beach sand.

5.5 Special Studies - Seismic-Induced Displacement of Bridges, Pipelines, Rail and Roadways

This study provides an overview of potential areas of concern. We recommend site-specific investigations and analyses for those structures that could be detrimentally affected by lateral spreading, including the gas pipeline that crosses the lagoon adjacent to the railroad, any bridge structures that support existing roads and railways, as well as the roads and railways themselves. These studies should not only examine the impacts of lateral spreading, but should also address seismic slope stability and anticipated displacements/movements resulting from seismic events.

6 LIMITATIONS

The conclusions and recommendations provided in this planning-level geotechnical report are based on the assumption that the soil conditions do not deviate appreciably from those disclosed by our subsurface investigations. Our conclusions and opinions on soil behavior are based on projects of a very limited number of subsurface explorations. A design-level geotechnical investigation must include additional, site-specific subsurface explorations, and, equally important, full-time monitoring and inspection during the dredging/grading and construction period.

The conclusions presented in this report were prepared in general accordance with accepted professional principles and practices in the field of geotechnical engineering and engineering geology. Analysis performed in the preparation of this report can be provided upon request.

This report is intended to be used in its entirety. Any party taking or using in any way excerpts from this report does so does so at its own risk.

In preparing this report, SAIC and TCG have relied on verbal and written information provided by secondary sources and personal communications, including information provided by the customer. Because the assessment consisted of evaluating a subset of the total information, the study may not have identified all potential items of concern and/or discrepancies and, therefore, SAIC warrants only that the project activities under this contract have been performed within the parameters and scope communicated by the California Coastal Conservancy and cooperating State and Federal agencies and reflected in the contract. SAIC has made no independent investigations concerning the accuracy or completeness of the information relied upon.

REFERENCES

Blake, T.F., 2000, *EQFAULT*, a computer program for deterministic prediction of peak horizontal acceleration, Computer Services and Software.

California Coastal Conservancy, 1989, *The Coastal Wetlands of San Diego County*.

California Department of Transportation, Engineering Geology Branch, 1982, *Geologic Investigation and Soil Analysis of Buena Vista Lagoon, Oceanside, San Diego County,* for the California Department of Fish and Game.

California Division of Mines and Geology, 2003, *Revised 2002 California Probabilistic Seismic Hazard Maps Report, Appendix A - 2002 California Fault Parameters*, DMG Open-File Report 96-08.

California Division of Mines and Geology, 1997, Special Publication 117, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*.

California Division of Mines and Geology, 1994, *Fault Activity Map of California and Adjacent Areas*.

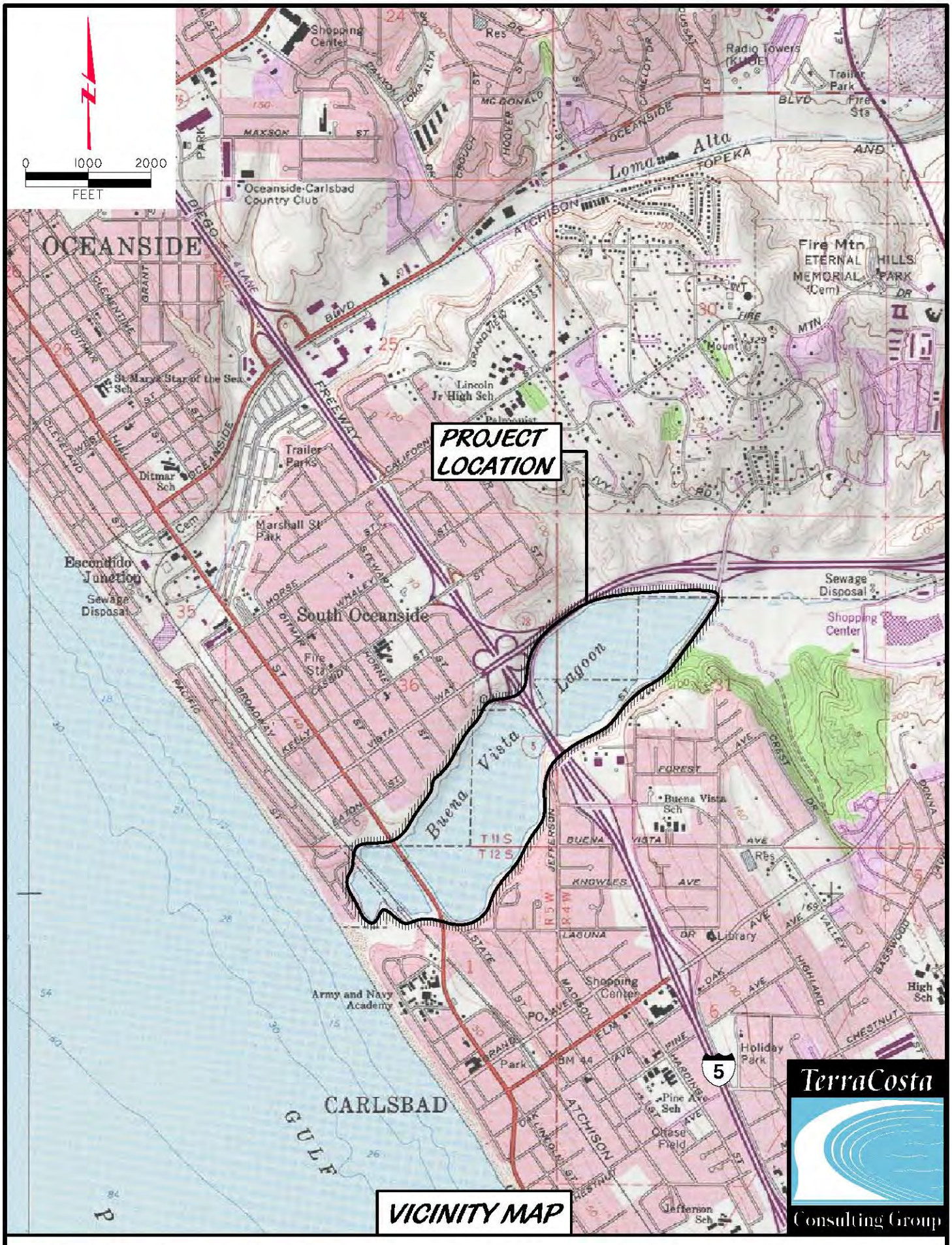
California Division of Mines and Geology, 1966, *Geologic Map of California, Santa Ana Sheet*, Map Scale 1:250,000.

California Geological Survey, Department of Conservation, 2007 (Interim Revision), *Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Map*, Special Publication 42.

County of San Diego, Office of Emergency Services, 2004, *Multi-Jurisdictional Hazard Mitigation Plan,* Section 4.

Group Delta Consultants, Inc., 1999, *Limited Geotechnical Investigation and Input to Buena Vista Lagoon land Management Plan Elements, Buena Vista Lagoon, Oceanside/Carlsbad, California*.

TerraCosta Consulting Group, Inc., 2008, *Buena Vista Lagoon Tide and Sea Level Study*.



Buena Vista Lagoon Restoration • Project No. 2615 • Figure No. 1

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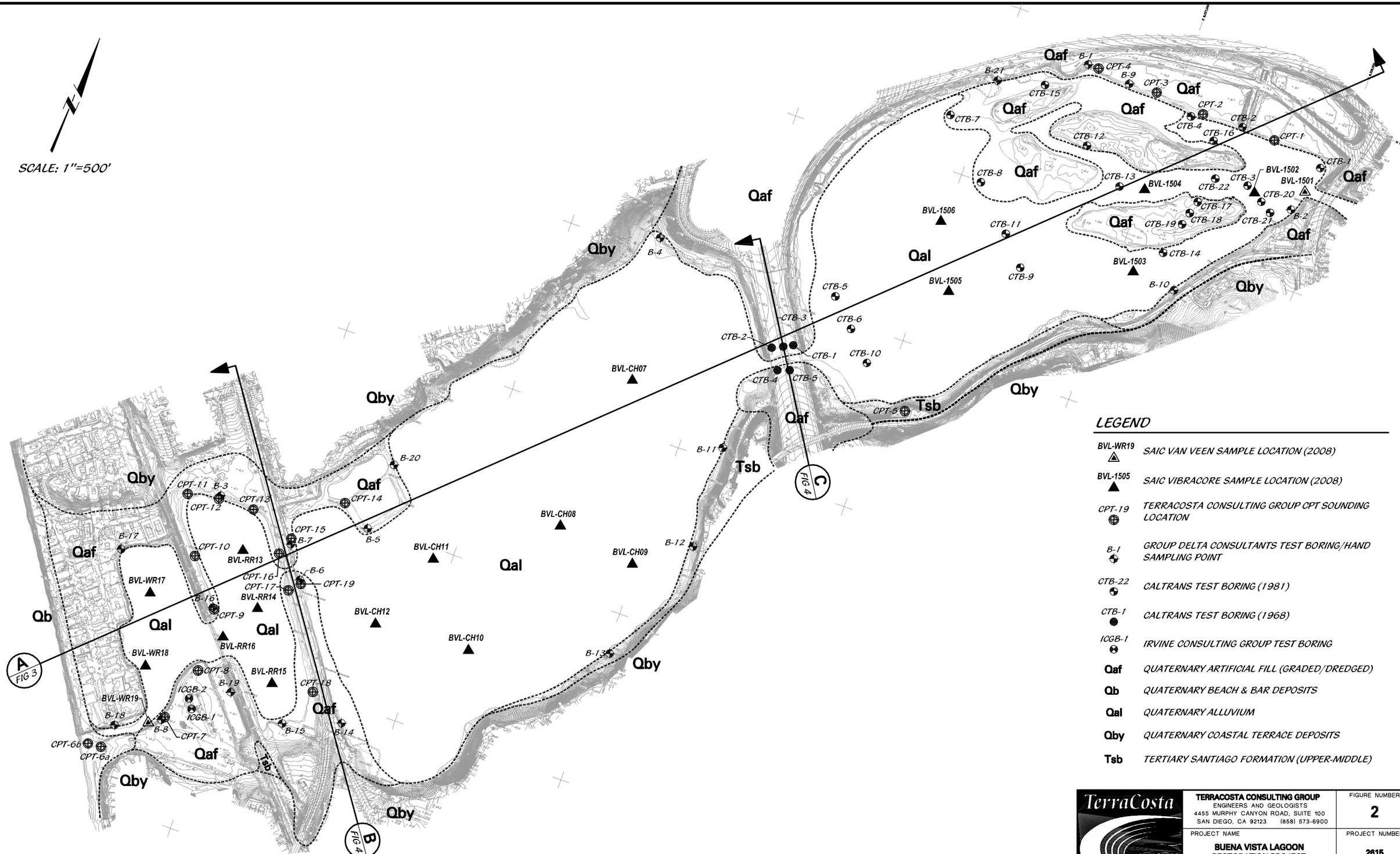

LEGEND

BVL-WR19 ▲	SAIC VAN VEEN SAMPLE LOCATION (2008)
BVL-1505 ▲	SAIC VIBRACORE SAMPLE LOCATION (2008)
CPT-19 ⊕	TERRACOSTA CONSULTING GROUP CPT SOUNDING LOCATION
B-1 ⊕	GROUP DELTA CONSULTANTS TEST BORING/HAND SAMPLING POINT
CTB-22 ⊕	CALTRANS TEST BORING (1981)
CTB-1 ●	CALTRANS TEST BORING (1968)
ICGB-1 ⊗	IRVINE CONSULTING GROUP TEST BORING
Qaf	QUATERNARY ARTIFICIAL FILL (GRADED/DREDGED)
Qb	QUATERNARY BEACH & BAR DEPOSITS
Qal	QUATERNARY ALLUVIUM
Qby	QUATERNARY COASTAL TERRACE DEPOSITS
Tsb	TERTIARY SANTIAGO FORMATION (UPPER-MIDDLE)

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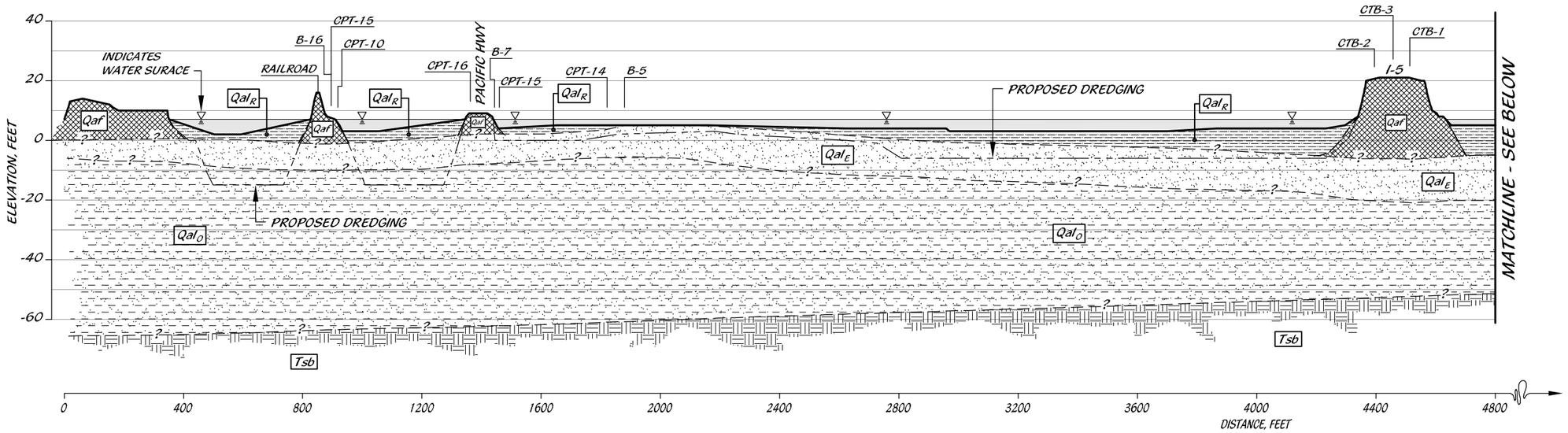
FIGURE NUMBER **2**

PROJECT NAME
BUENA VISTA LAGOON RESTORATION PROJECT

PROJECT NUMBER **2615**

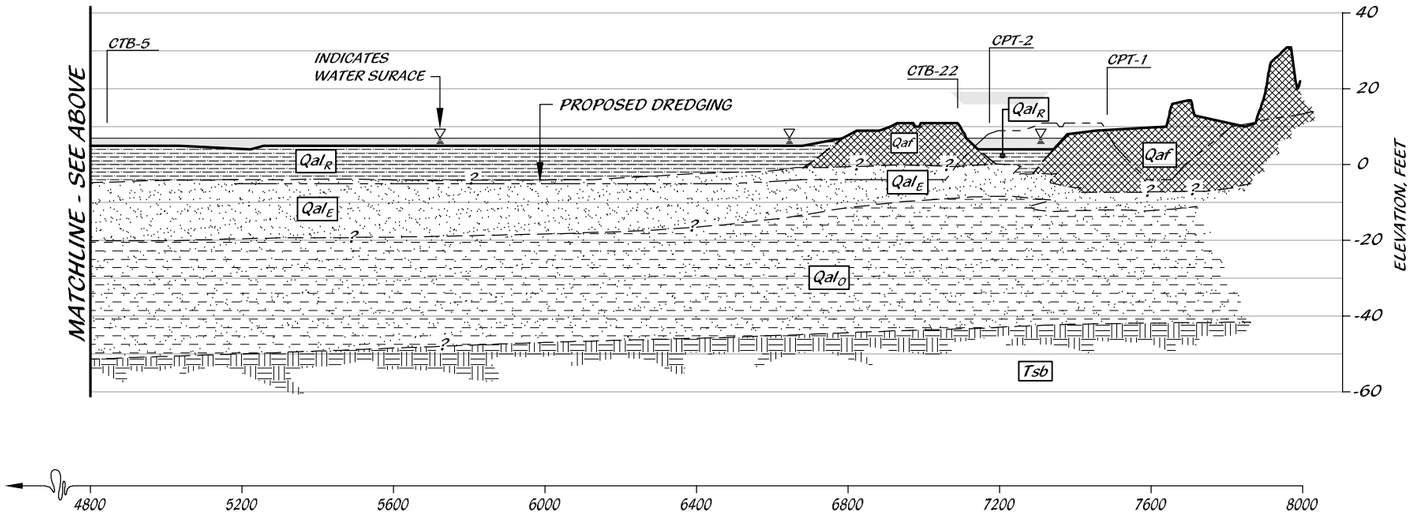
SITE PLAN AND GEOLOGIC MAP



CROSS SECTION A

SCALE: HORIZ. 1"=400'
VERT. 1"=40'

FIG 2



CROSS SECTION (CONT'D) A

SCALE: HORIZ. 1"=400'
VERT. 1"=40'

FIG 2

LEGEND

- Qaf — QUATERNARY ARTIFICIAL FILL (GRADED/DREDGED)
- Qal
  - Qal_R — RECENT LAGOONAL DEPOSITS
  - Qal_E — ESTUARINE DEPOSITS
  - Qal_O — OLDER ESTUARINE DEPOSITS
- Tsb — SANTIAGO FORMATION

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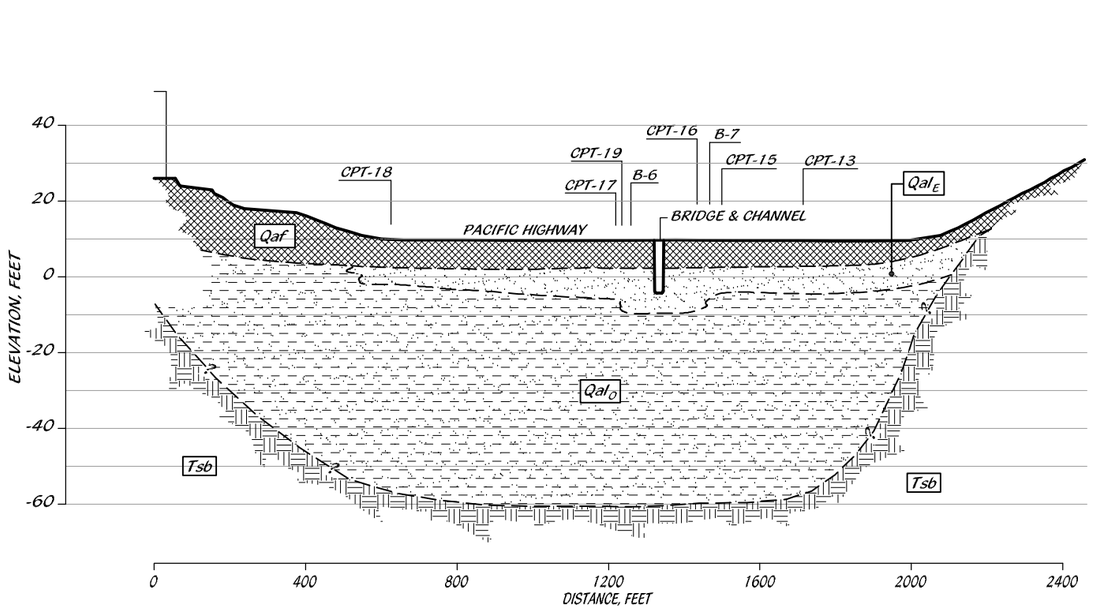
FIGURE NUMBER 3

PROJECT NAME
BUENA VISTA LAGOON RESTORATION

PROJECT NUMBER 2615

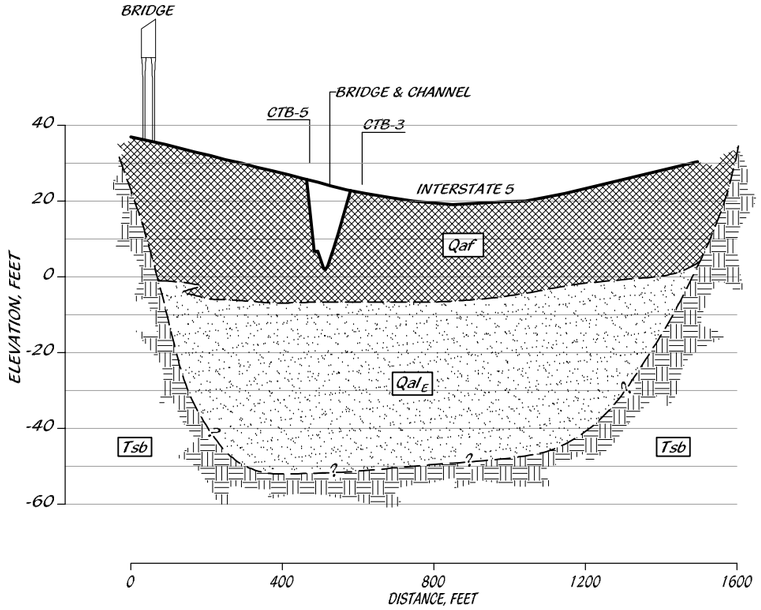
GENERALIZED GEOLOGIC CROSS SECTION 'A'



CROSS SECTION B

SCALE: HORIZ. 1"=400'
VERT. 1"=40'

FIG 2



CROSS SECTION C

SCALE: HORIZ. 1"=400'
VERT. 1"=40'

FIG 2

LEGEND

- Qaf — QUATERNARY ARTIFICIAL FILL (GRADED/DREDGED)
- Qal
  - Qal$_R$ — RECENT LAGOONAL DEPOSITS
  - Qal$_E$ — ESTUARINE DEPOSITS
  - Qal$_O$ — OLDER ESTUARINE DEPOSITS
- Tsb — SANTIAGO FORMATION

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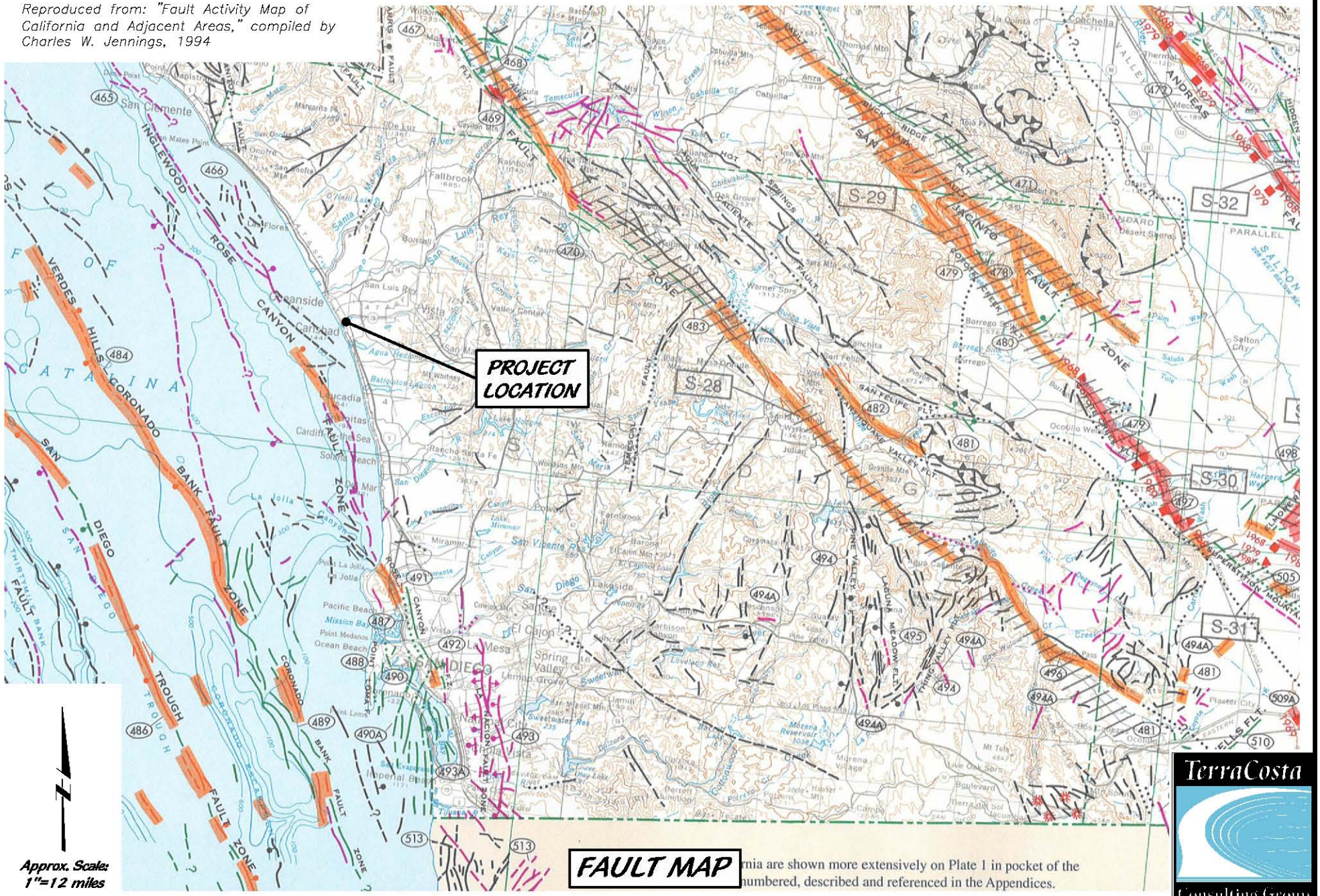
SAN DIEGO, CA 92123 (858) 573-6900

FIGURE NUMBER 4

PROJECT NAME
BUENA VISTA LAGOON RESTORATION

PROJECT NUMBER 2615

GENERALIZED GEOLOGIC CROSS SECTIONS 'B' & 'C'



Project Name: Buena Vista Lagoon Restoration • **Project. No. 2615** • **Figure No. 5**

SCALE: 1"=500'

A
FIG 3

LEGEND

-6 POST-DREDGING CONTOUR

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ENGINEERS AND GEOLOGISTS
4455 MURPHY CANYON ROAD, SUITE 100
SAN DIEGO, CA 92123 (858) 573-6900

FIGURE NUMBER
6

PROJECT NAME
BUENA VISTA LAGOON RESTORATION

PROJECT NUMBER
2615

GENERALIZED DREDGING PLAN

SCALE: 1"=500'

RAILROAD EMBANKMENT

I-5 EMBANKMENT

COAST HIGHWAY EMBANKMENT

RESIDENTIAL SLOPE

CPT-1 CPT-2 CPT-3 CPT-4 CPT-5 CPT-6a CPT-6b CPT-7 CPT-8 CPT-9 CPT-10 CPT-11 CPT-12 CPT-13 CPT-14 CPT-15 CPT-16 CPT-17 CPT-18 CPT-19

B-1 B-2 B-3 B-4 B-5 B-6 B-7 B-8 B-9 B-10 B-11 B-12 B-13 B-14 B-15 B-20

CTB-1 CTB-2 CTB-3 CTB-4 CTB-5 CTB-6 CTB-7 CTB-8 CTB-9 CTB-10 CTB-11 CTB-12 CTB-13 CTB-14 CTB-15 CTB-16 CTB-17 CTB-18 CTB-19 CTB-20 CTB-22

BVL-1501 BVL-1502 BVL-1503 BVL-1504 BVL-1505 BVL-1506

BVL-CH07 BVL-CH08 BVL-CH09 BVL-CH10 BVL-CH11 BVL-CH12

BVL-RR13 BVL-RR14 BVL-RR15 BVL-RR16

BVL-WR17 BVL-WR18 BVL-WR19

ICGB-1

LEGEND

BVL-WR19	SAIC VAN VEEN SAMPLE LOCATION (2008)
BVL-1505	SAIC VIBRACORE SAMPLE LOCATION (2008)
CPT-19	TERRACOSTA CONSULTING GROUP CPT SOUNDING LOCATION
B-1	GROUP DELTA CONSULTANTS TEST BORING/HAND SAMPLING POINT
CTB-22	CALTRANS TEST BORING (1981)
CTB-1	CALTRANS TEST BORING (1968)
ICGB-1	IRVINE CONSULTING GROUP TEST BORING

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ENGINEERS AND GEOLOGISTS
4455 MURPHY CANYON ROAD, SUITE 100
SAN DIEGO, CA 92123 (858) 573-6900

FIGURE NUMBER **7**

PROJECT NAME
BUENA VISTA LAGOON RESTORATION PROJECT

PROJECT NUMBER **2615**

ANALYSIS LOCATIONS

APPENDIX A

LOGS OF SUBSURFACE EXPLORATIONS

- TERRACOSTA CONSULTING GROUP CPT LOGS (CURRENT INVESTIGATION)
- TERRACOSTA CONSULTING GROUP VIBRACORE LOGS (CURRENT INVESTIGATION)
- GROUP DELTA CONSULTANTS BORING LOGS (1999)
- IRVINE CONSULTING GROUP BORING LOGS (1997)
- CALTRANS BORING LOGS (1968 & 1981 – ON CD)

TERRACOSTA CONSULTING GROUP CPT LOGS
(CURRENT INVESTIGATION)

TerraCosta
Consulting Group

GREGG DRILLING & TESTING, INC.
GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATION SERVICES

October 7, 2008

Terra Costa
Attn: Greg Spaulding
4455 Murphy Canyon Road, Suite 100
San Diego, CA 92123

Subject: CPT Site Investigation
Buena Vista Lagoon
Carlsbad, California
GREGG Project Number: 08-0433SH

Dear Mr. Spaulding:

The following report presents the results of GREGG Drilling & Testing's Cone Penetration Test investigation for the above referenced site. The following testing services were performed:

1	Cone Penetration Tests	(CPTU)	☒
2	Pore Pressure Dissipation Tests	(PPD)	☒
3	Seismic Cone Penetration Tests	(SCPTU)	☐
4	Resistivity Cone Penetration Tests	(RCPTU)	☐
5	UVOST Laser Induced Fluorescence	(UVOST)	☐
6	Groundwater Sampling	(GWS)	☐
7	Soil Sampling	(SS)	☐
8	Vapor Sampling	(VS)	☐
9	Vane Shear Testing	(VST)	☐
10	SPT Energy Calibration	(SPTE)	☐

A list of reference papers providing additional background on the specific tests conducted is provided in the bibliography following the text of the report. If you would like a copy of any of these publications or should you have any questions or comments regarding the contents of this report, please do not hesitate to contact our office at (562) 427-6899.

Sincerely,
GREGG Drilling & Testing, Inc.

Peter Robertson
Technical Operations

Cone Penetration Test Sounding Summary

-Table 1-

CPT Sounding Identification	Date	Termination Depth (Feet)	Depth of Groundwater Samples (Feet)	Depth of Soil Samples (Feet)	Depth of Pore Pressure Dissipation Tests (Feet)
CPT-01	10/1/08	50	-	-	-
CPT-02	10/1/08	56	-	-	24
CPT-03	10/1/08	56	-	-	-
CPT-04	10/1/08	56	-	-	-
CPT-05	10/1/08	16	-	-	-
CPT-06	10/2/08	3	-	-	-
CPT-06a	10/2/08	4	-	-	-
CPT-06b	10/2/08	9	-	-	-
CPT-07	10/2/08	26	-	-	-
CPT-08	10/2/08	50	-	-	-
CPT-09	10/2/08	50	-	-	-
CPT-10	10/2/08	47	-	-	-
CPT-11	10/3/08	26	-	-	-
CPT-12	10/3/08	63	-	-	-
CPT-13	10/3/08	47	-	-	-
CPT-14	10/3/08	47	-	-	-
CPT-15	10/6/08	50	-	-	-
CPT-16	10/6/08	50	-	-	-
CPT-17	10/6/08	100	-	-	-
CPT-18	10/6/08	50	-	-	-
CPT-19	10/6/08	50	-	-	21

Cone Penetration Testing Procedure (CPT)

Gregg Drilling carries out all Cone Penetration Tests (CPT) using an integrated electronic cone system, *Figure CPT*. The soundings were conducted using a 20 ton capacity cone with a tip area of 15 cm^2 and a friction sleeve area of 225 cm^2. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.80.

The cone takes measurements of cone bearing (q_c), sleeve friction (f_s) and penetration pore water pressure (u_2) at 5-cm intervals during penetration to provide a nearly continuous hydrogeologic log. CPT data reduction and interpretation is performed in real time facilitating on-site decision making. The above mentioned parameters are stored on disk for further analysis and reference. All CPT soundings are performed in accordance with revised (2002) ASTM standards (D 5778-95).

The cone also contains a porous filter element located directly behind the cone tip (u_2), *Figure CPT.* It consists of porous plastic and is 5.0mm thick. The filter element is used to obtain penetration pore pressure as the cone is advanced as well as Pore Pressure Dissipation Tests (PPDT's) during appropriate pauses in penetration. It should be noted that prior to penetration, the element is fully saturated with silicon oil under vacuum pressure to ensure accurate and fast dissipation.

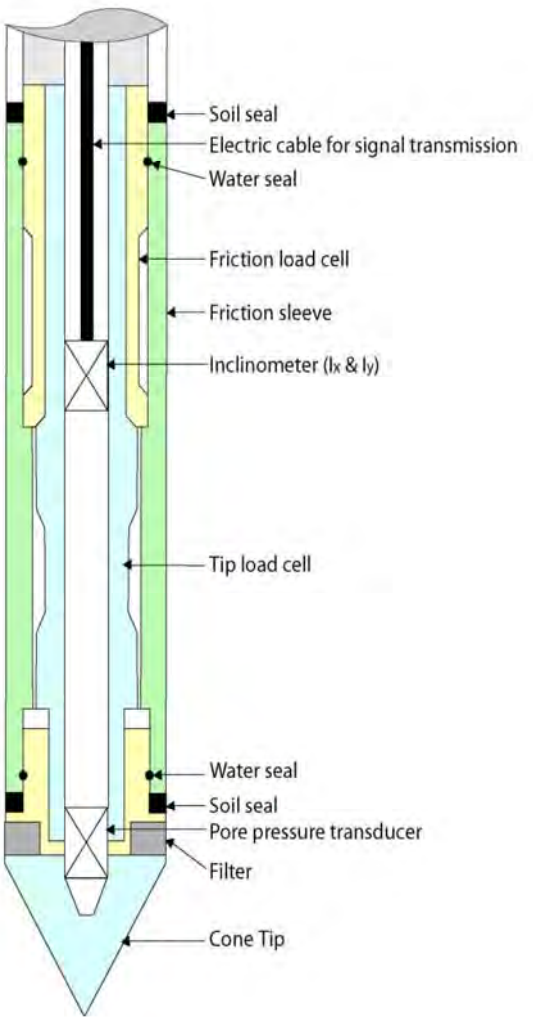


Figure CPT

When the soundings are complete, the test holes are grouted using a Gregg support rig. The grouting procedures generally consist of pushing a hollow CPT rod with a "knock out" plug to the termination depth of the test hole. Grout is then pumped under pressure as the tremie pipe is pulled from the hole. Disruption or further contamination to the site is therefore minimized.

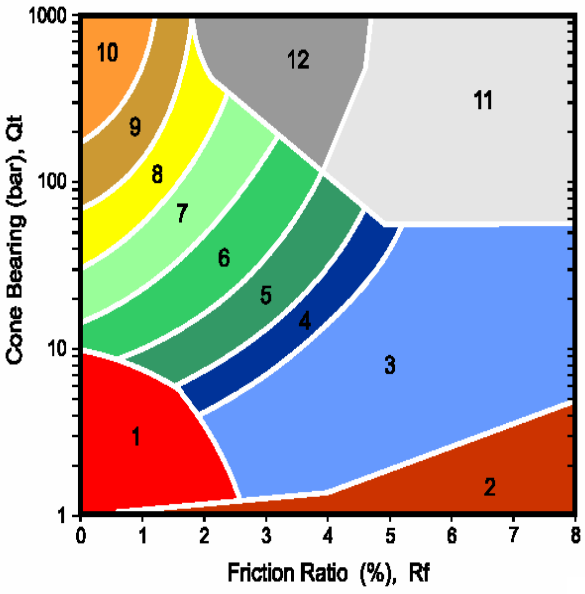
Cone Penetration Test Data & Interpretation

The Cone Penetration Test (CPT) data collected from your site are presented in graphical form in the attached report. The plots include interpreted Soil Behavior Type (SBT) based on the charts described by Robertson (1990). Typical plots display SBT based on the non-normalized charts of Robertson et al (1986). For CPT soundings extending greater than 50 feet, we recommend the use of the normalized charts of Robertson (1990) which can be displayed as SBTn, upon request. The report also includes spreadsheet output of computer calculations of basic interpretation in terms of SBT and SBTn and various geotechnical parameters using current published correlations based on the comprehensive review by Lunne, Robertson and Powell (1997), as well as recent updates by Professor Robertson. The interpretations are presented only as a guide for geotechnical use and should be carefully reviewed. Gregg Drilling & Testing Inc. do not warranty the correctness or the applicability of any of the geotechnical parameters interpreted by the software and do not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used in the software.

Some interpretation methods require input of the groundwater level to calculate vertical effective stress. An estimate of the in-situ groundwater level has been made based on field observations and/or CPT results, but should be verified by the user.

A summary of locations and depths is available in Table 1. Note that all penetration depths referenced in the data are with respect to the existing ground surface.

Note that it is not always possible to clearly identify a soil type based solely on q_t, f_s, and u_2. In these situations, experience, judgment, and an assessment of the pore pressure dissipation data should be used to infer the correct soil behavior type.



(After Robertson, et al., 1986)

ZONE		SBT
1		Sensitive, fine grained
2		Organic materials
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		Gravely sand to sand
11		Very stiff fine grained*
12		Sand to clayey sand*

*over consolidated or cemented

Figure SBT

Pore Pressure Dissipation Tests (PPDT)

Pore Pressure Dissipation Tests (PPDT's) conducted at various intervals measured hydrostatic water pressures and determined the approximate depth of the ground water table. A PPDT is conducted when the cone is halted at specific intervals determined by the field representative. The variation of the penetration pore pressure (u) with time is measured behind the tip of the cone and recorded by a computer system.
Pore pressure dissipation data can be interpreted to provide estimates of:

- Equilibrium piezometric pressure
- Phreatic Surface
- In situ horizontal coefficient of consolidation (c_h)
- In situ horizontal coefficient of permeability (k_h)

In order to correctly interpret the equilibrium piezometric pressure and/or the phreatic surface, the pore pressure must be monitored until such time as there is no variation in pore pressure with time, *Figure PPDT*. This time is commonly referred to as t_{100}, the point at which 100% of the excess pore pressure has dissipated.

A complete reference on pore pressure dissipation tests is presented by Robertson et al. 1992.

A summary of the pore pressure dissipation tests is summarized in Table 1.

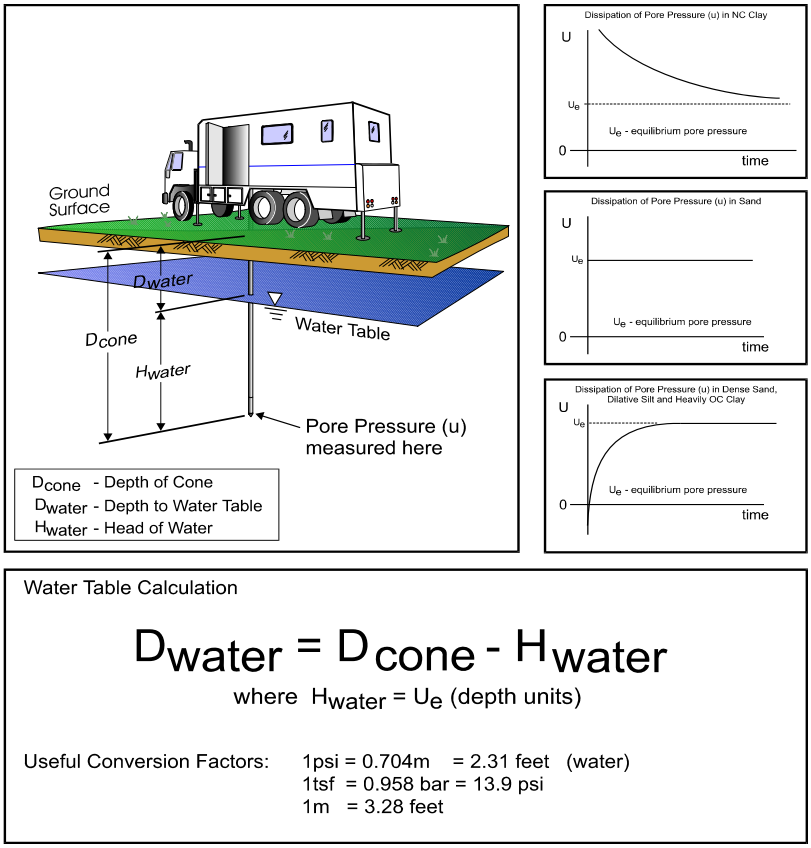


Figure PPDT

Bibliography

Lunne, T., Robertson, P.K. and Powell, J.J.M., "Cone Penetration Testing in Geotechnical Practice" E & FN Spon. ISBN 0 419 23750, 1997

Roberston, P.K., "Soil Classification using the Cone Penetration Test", Canadian Geotechnical Journal, Vol. 27, 1990 pp. 151-158.

Mayne, P.W., "NHI (2002) Manual on Subsurface Investigations: Geotechnical Site Characterization", available through www.ce.gatech.edu/~geosys/Faculty/Mayne/papers/index.html, Section 5.3, pp. 107-112.

Robertson, P.K., R.G. Campanella, D. Gillespie and A. Rice, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8, 1986 pp. 791-803.

Robertson, P.K., Sully, J., Woeller, D.J., Lunne, T., Powell, J.J.M., and Gillespie, D.J., "Guidelines for Estimating Consolidation Parameters in Soils from Piezocone Tests", Canadian Geotechnical Journal, Vol. 29, No. 4, August 1992, pp. 539-550.

Robertson, P.K., T. Lunne and J.J.M. Powell, "Geo-Environmental Application of Penetration Testing", Geotechnical Site Characterization, Robertson & Mayne (editors), 1998 Balkema, Rotterdam, ISBN 90 5410 939 4 pp 35-47.

Campanella, R.G. and I. Weemees, "Development and Use of An Electrical Resistivity Cone for Groundwater Contamination Studies", Canadian Geotechnical Journal, Vol. 27 No. 5, 1990 pp. 557-567.

DeGroot, D.J. and A.J. Lutenegger, "Reliability of Soil Gas Sampling and Characterization Techniques", International Site Characterization Conference - Atlanta, 1998.

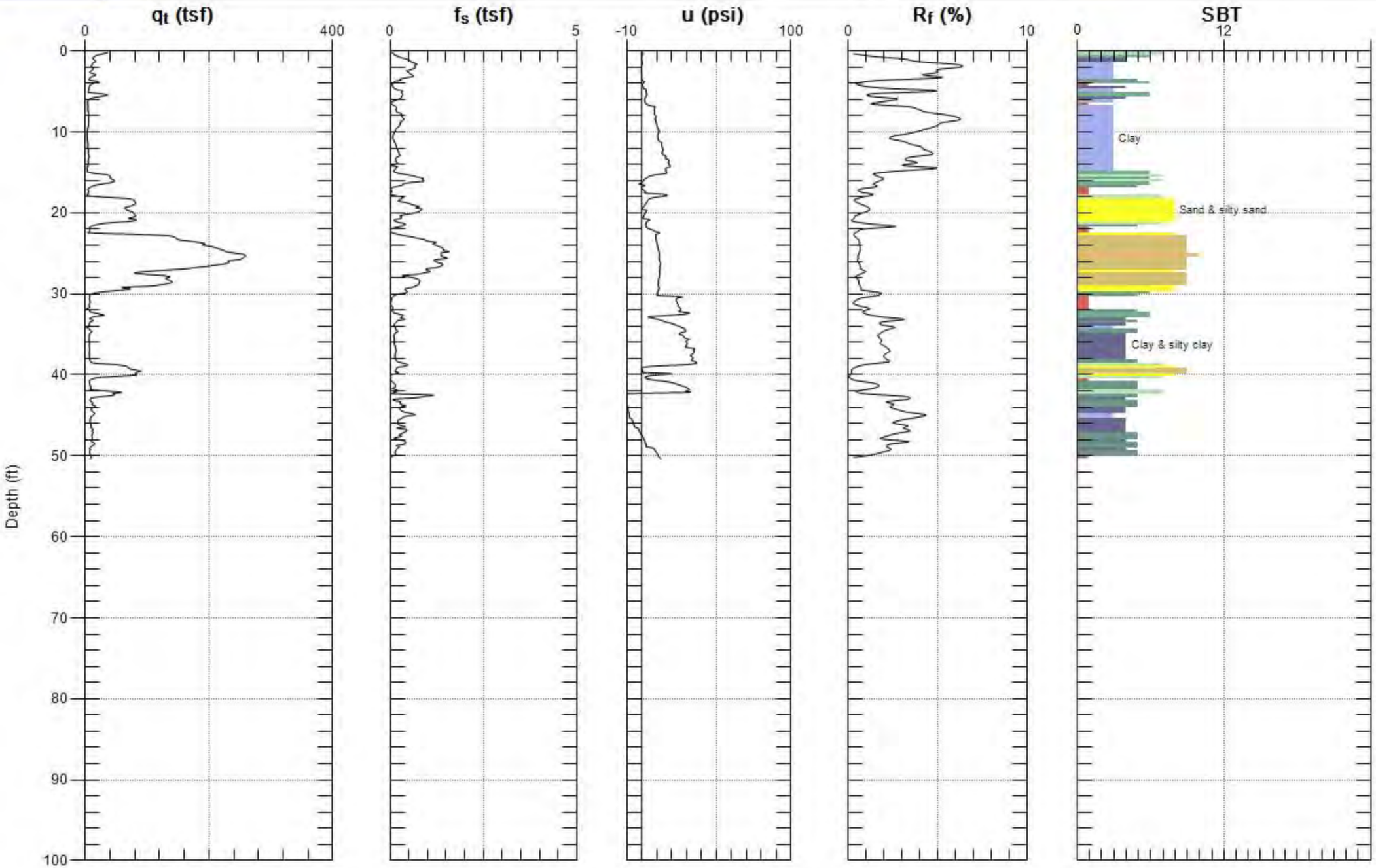
Woeller, D.J., P.K. Robertson, T.J. Boyd and Dave Thomas, "Detection of Polyaromatic Hydrocarbon Contaminants Using the UVIF-CPT", 53rd Canadian Geotechnical Conference Montreal, QC October pp. 733-739, 2000.

Zemo, D.A., T.A. Delfino, J.D. Gallinatti, V.A. Baker and L.R. Hilpert, "Field Comparison of Analytical Results from Discrete-Depth Groundwater Samplers" BAT EnviroProbe and QED HydroPunch, Sixth national Outdoor Action Conference, Las Vegas, Nevada Proceedings, 1992, pp 299-312.

Copies of ASTM Standards are available through www.astm.org

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-01
Engineer: G. SPAULDING
Date: 10/1/2008 09:05

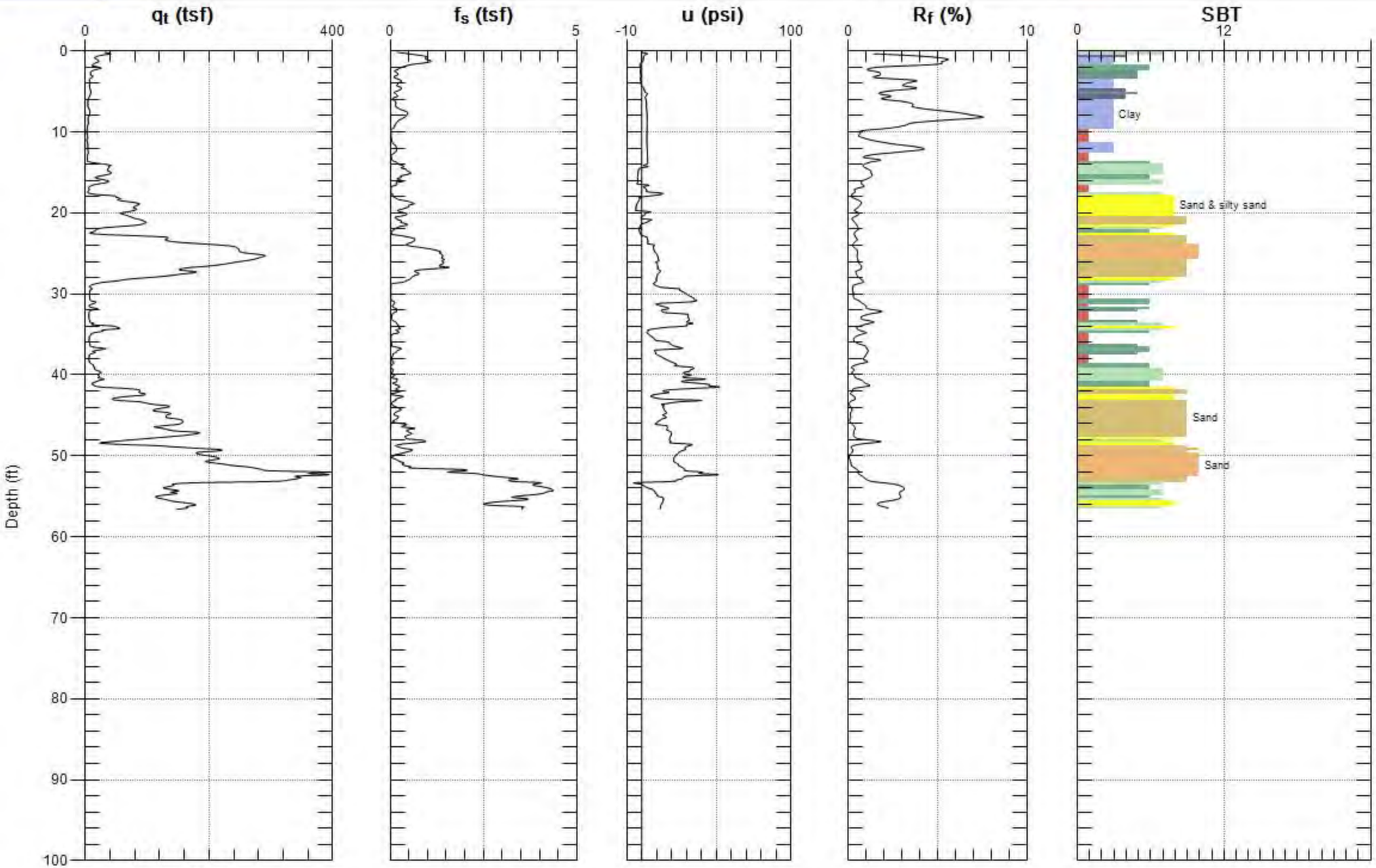


Max. Depth: 50.361 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-02
Engineer: G. SPAULDING
Date: 10/1/2008 10:14

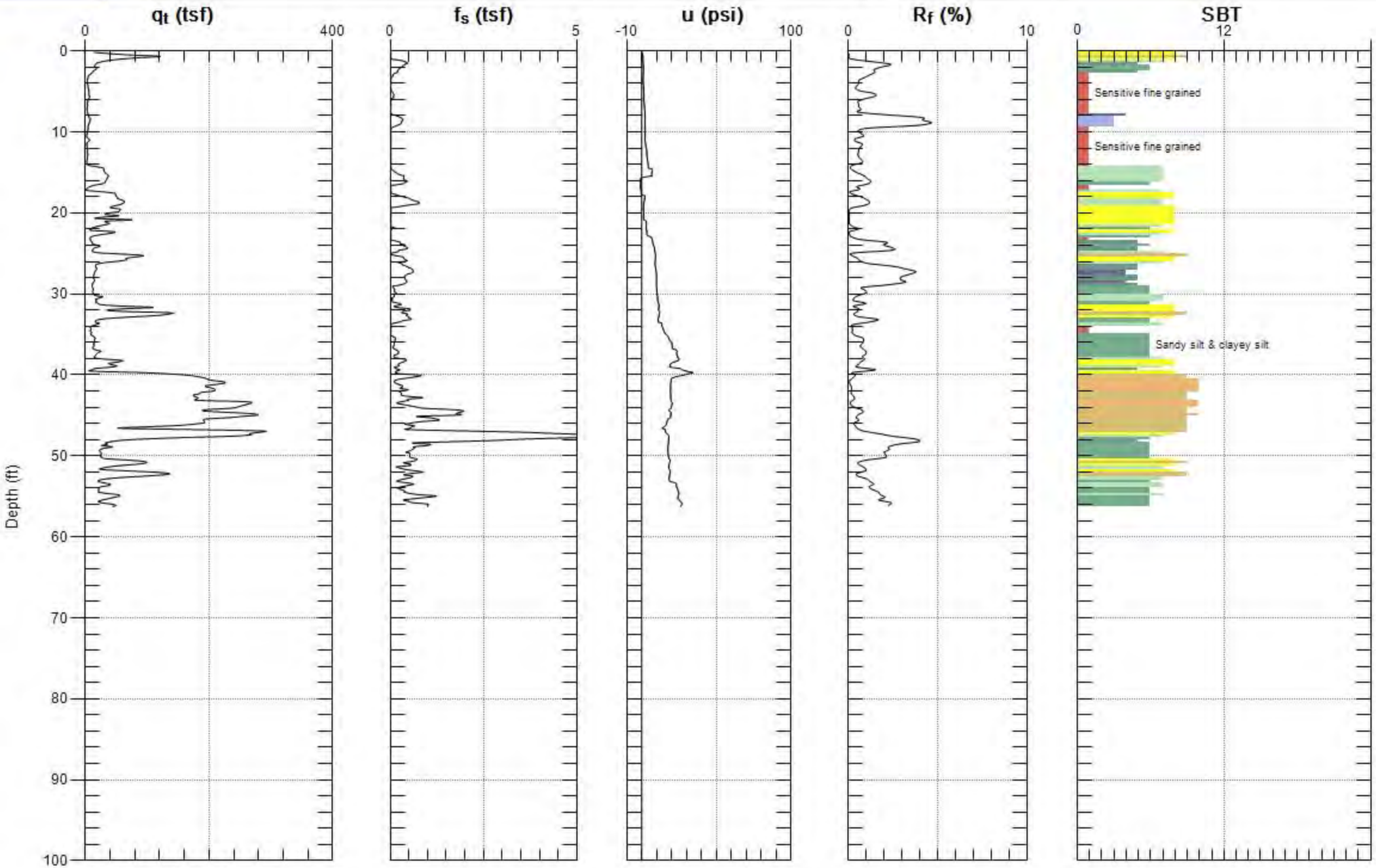


Max. Depth: 56.594 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-03
Engineer: G. SPAULDING
Date: 10/1/2008 11:20

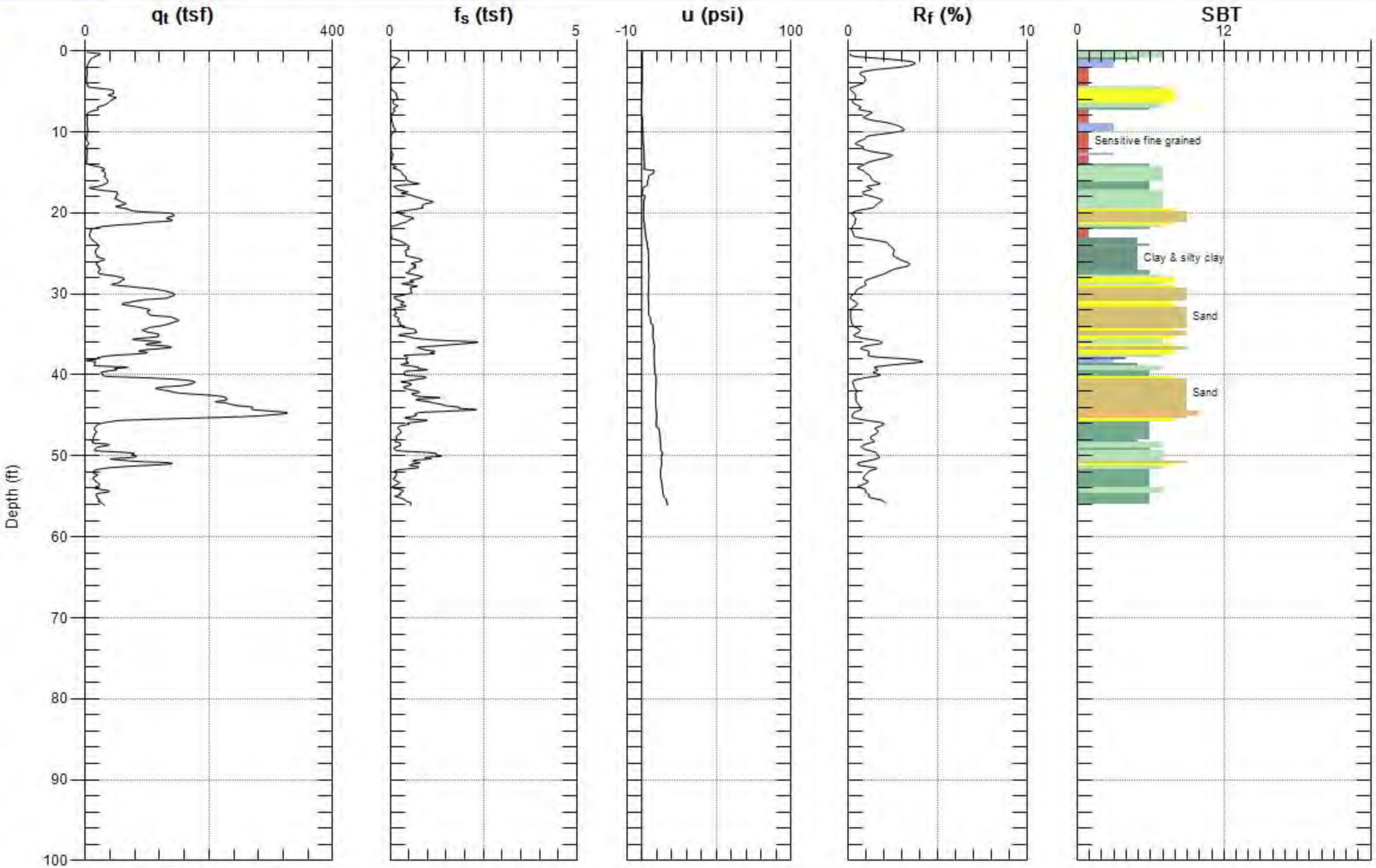


Max. Depth: 56.266 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-04
Engineer: G. SPAULDING
Date: 10/1/2008 12:16

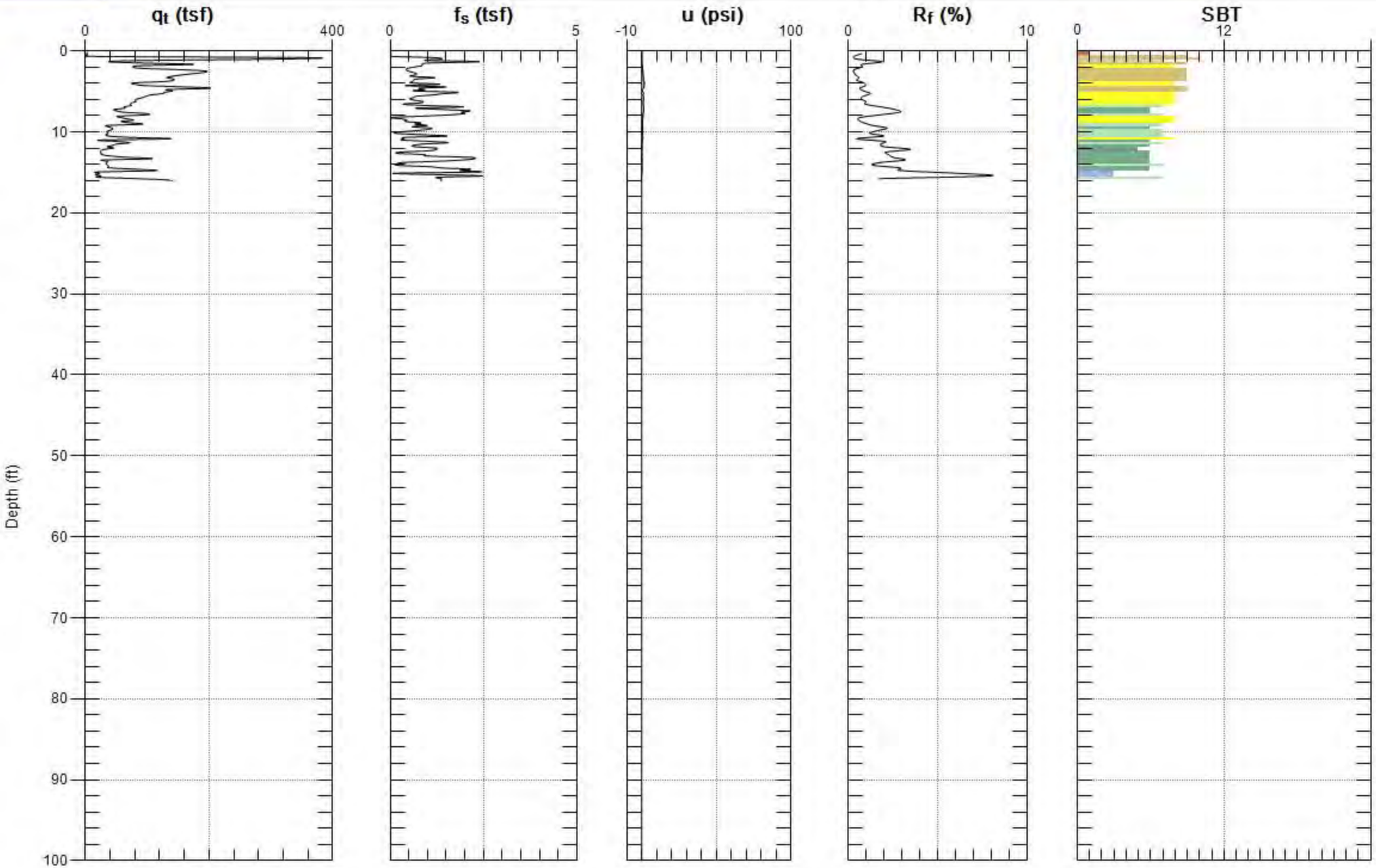


Max. Depth: 56.102 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-05
Engineer: G. SPAULDING
Date: 10/1/2008 02:44



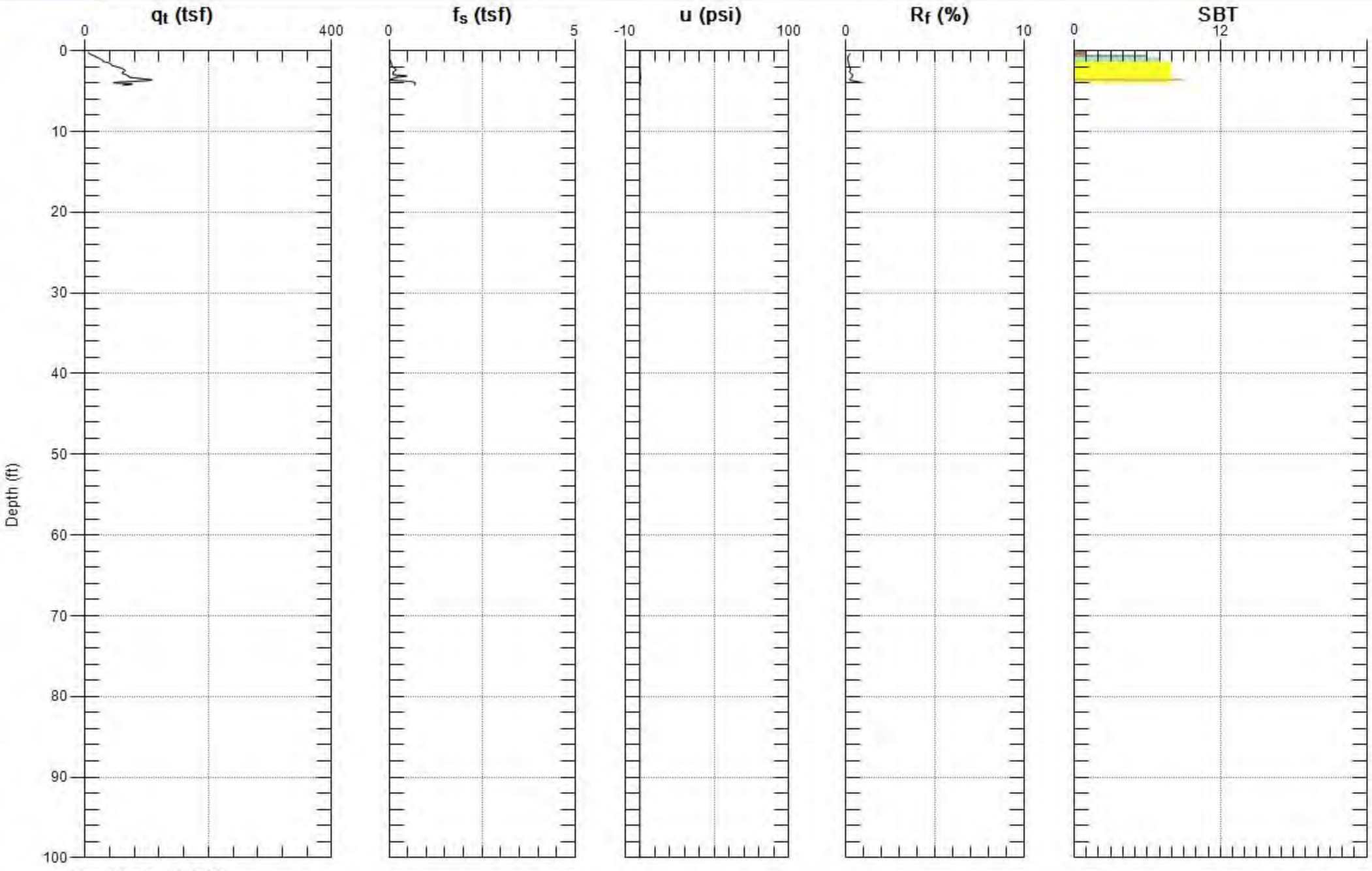
Max. Depth: 16.076 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-06a

Engineer: G. SPAULDING
Date: 10/2/2008 08:29



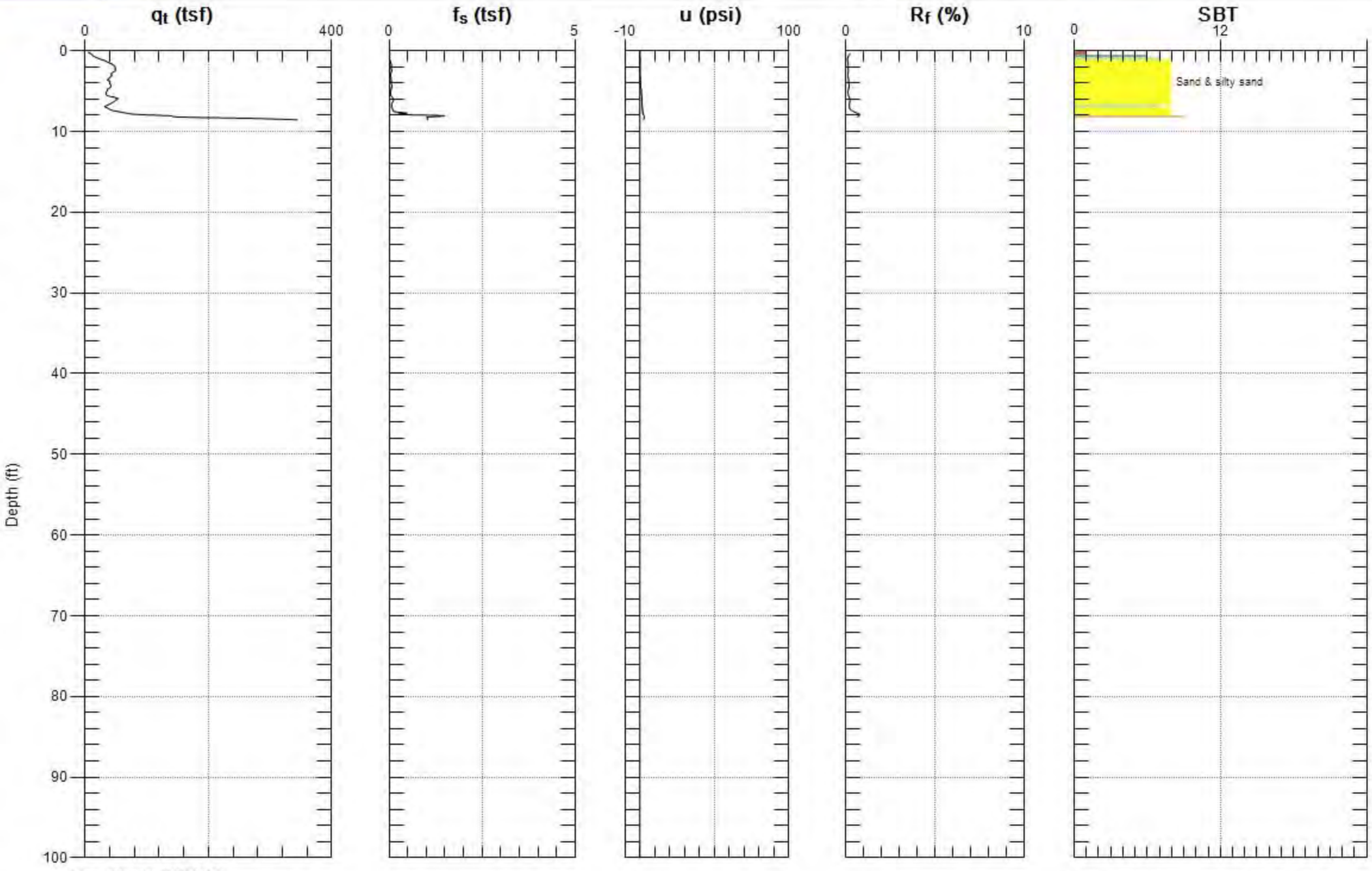
Max. Depth: 4.265 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-06b

Engineer: G. SPAULDING
Date: 10/2/2008 08:55



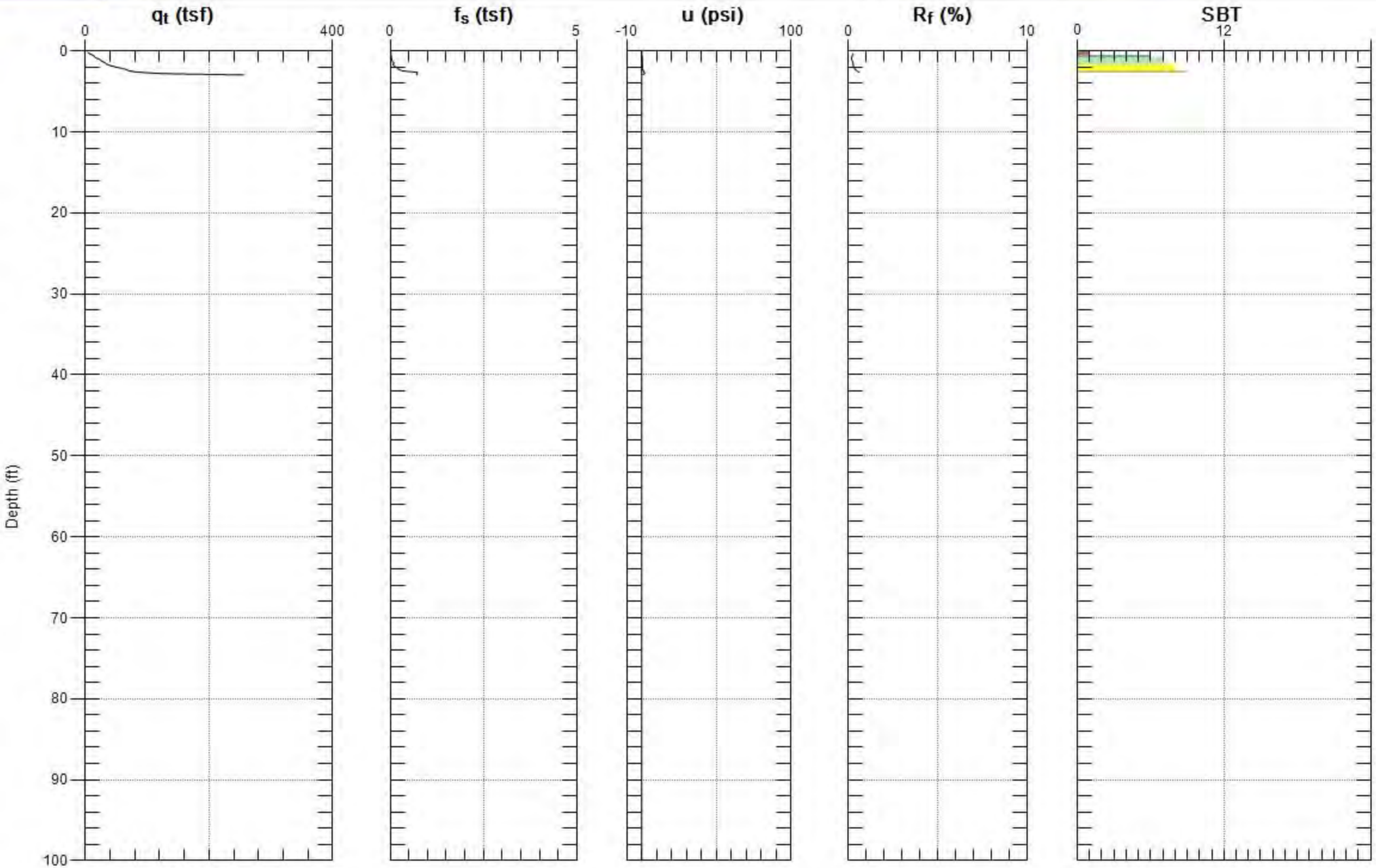
Max. Depth: 8.530 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON Engineer: G. SPAULDING

Sounding: CPT-06 Date: 10/2/2008 08:06

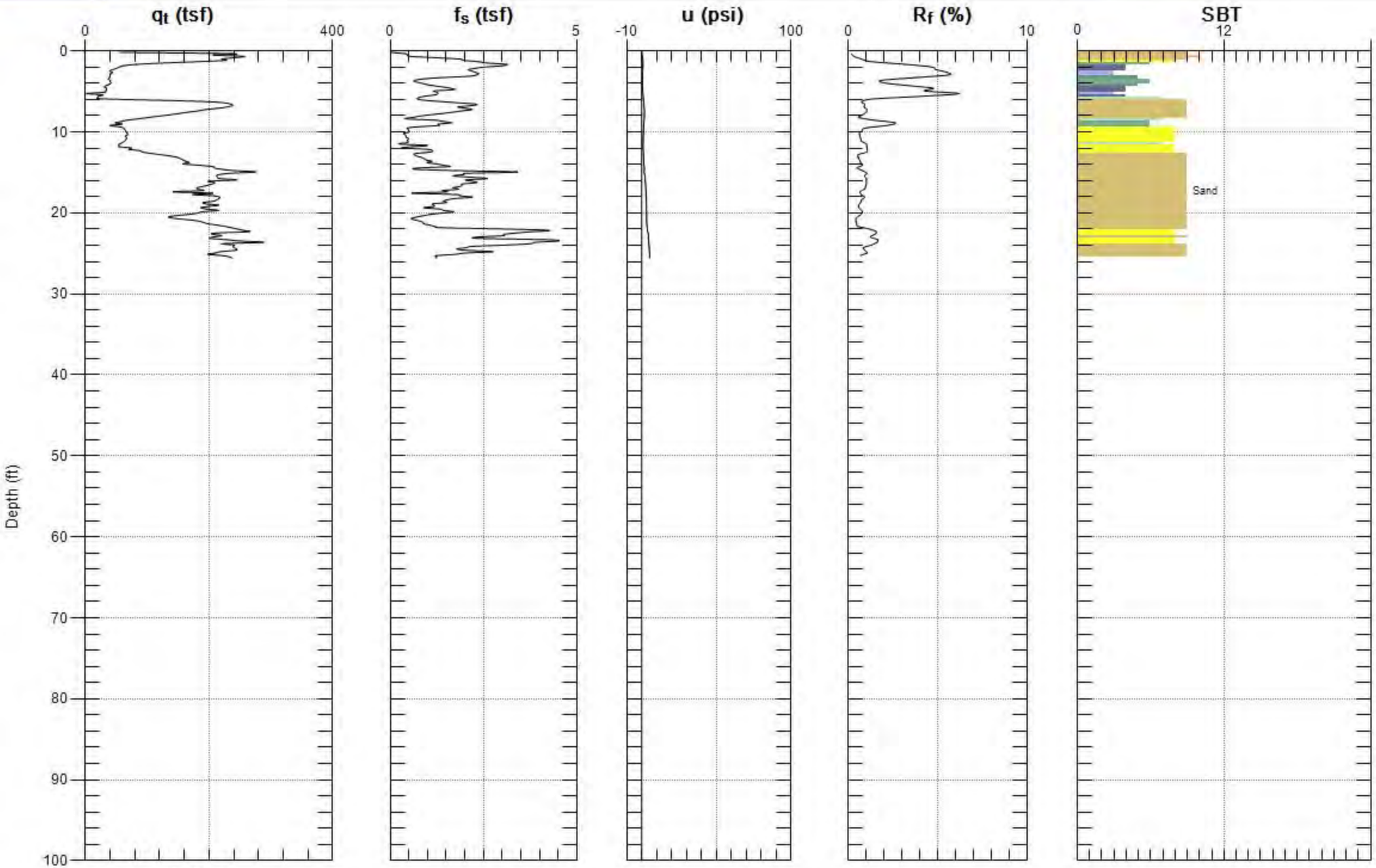


Max. Depth: 2.953 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-07
Engineer: G. SPAULDING
Date: 10/2/2008 09:25

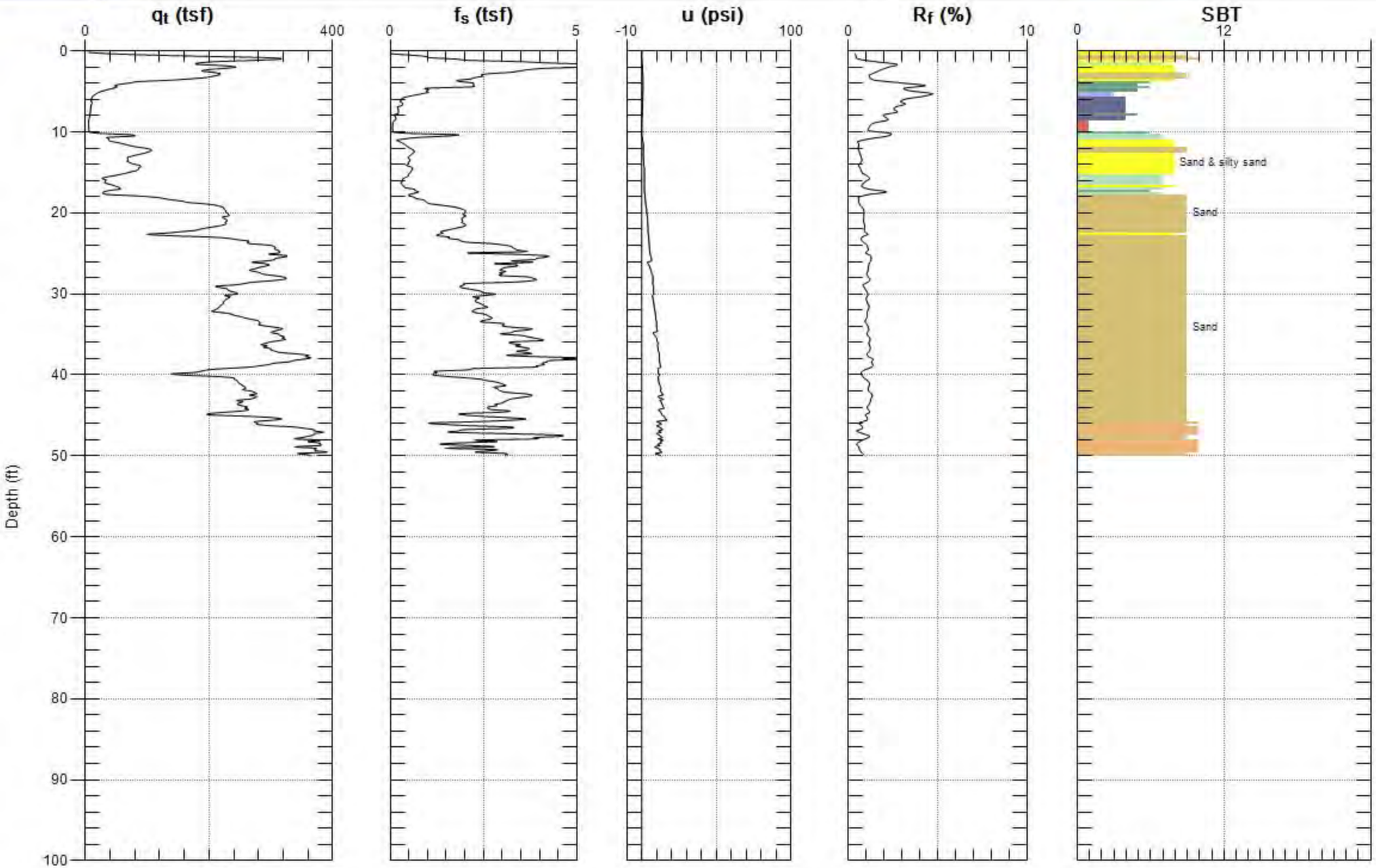


Max. Depth: 25.591 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-08
Engineer: G. SPAULDING
Date: 10/2/2008 11:23

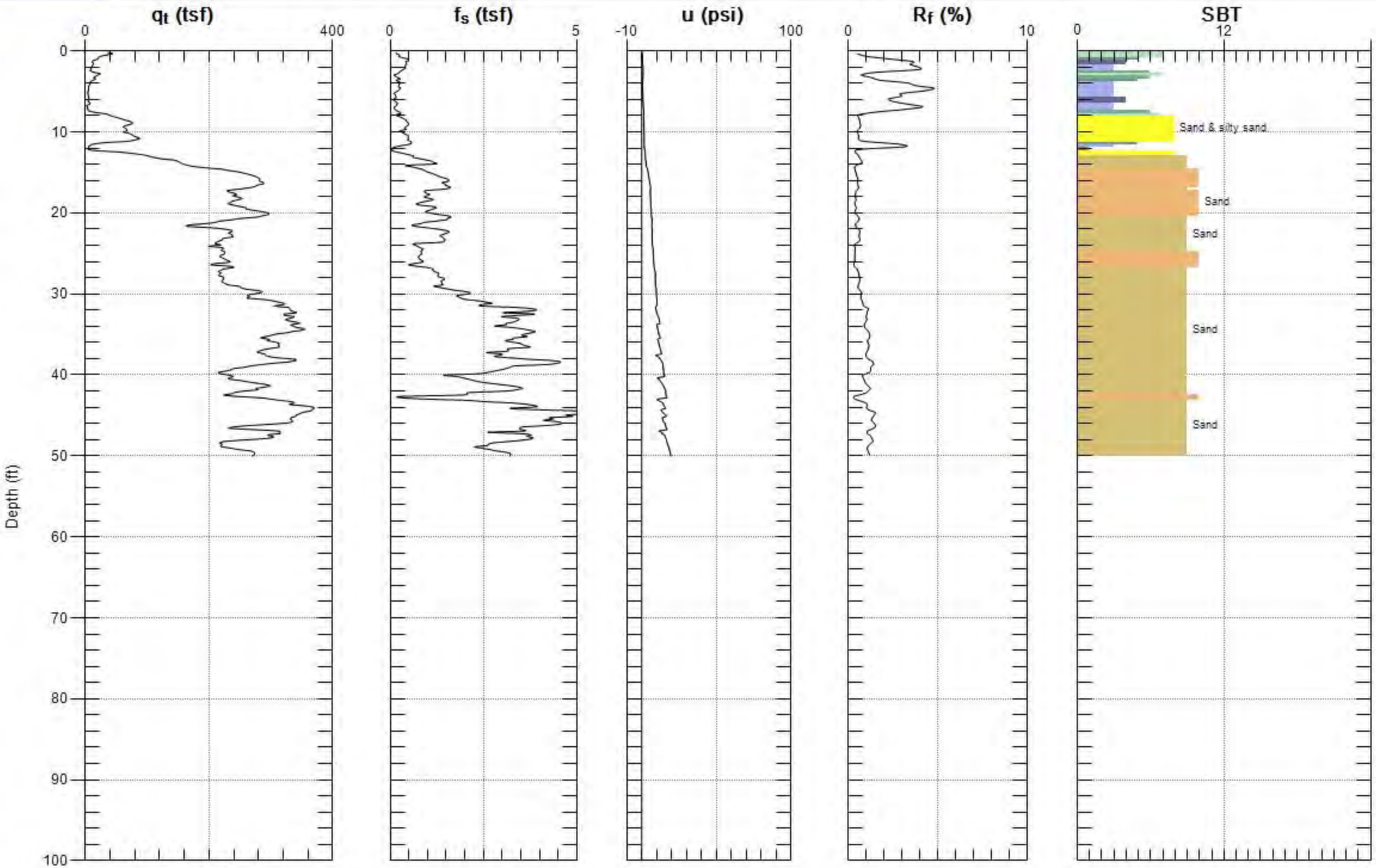


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-09
Engineer: G. SPAULDING
Date: 10/2/2008 02:20

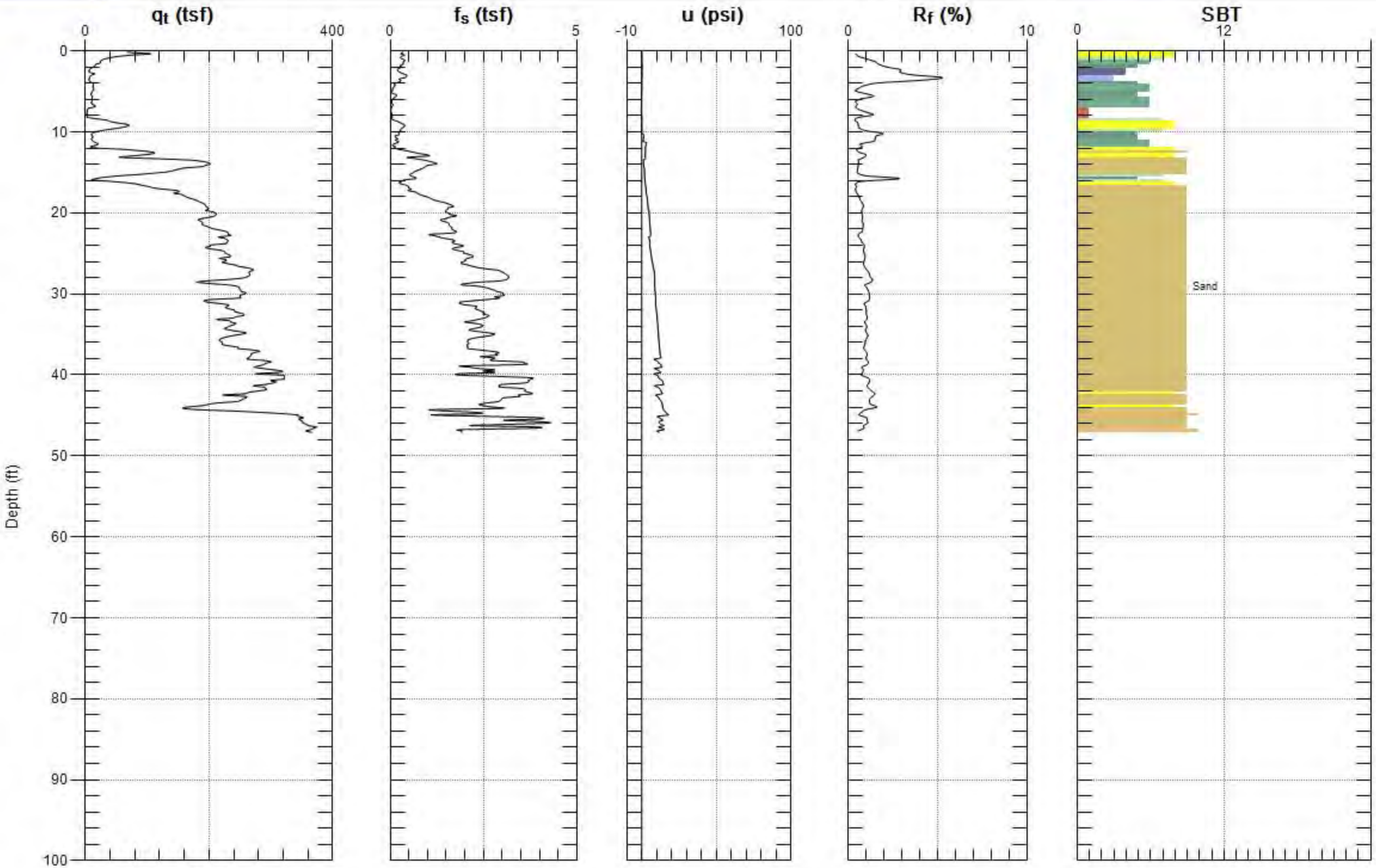


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Engineer: G. SPAULDING
Sounding: CPT-10
Date: 10/2/2008 03:31

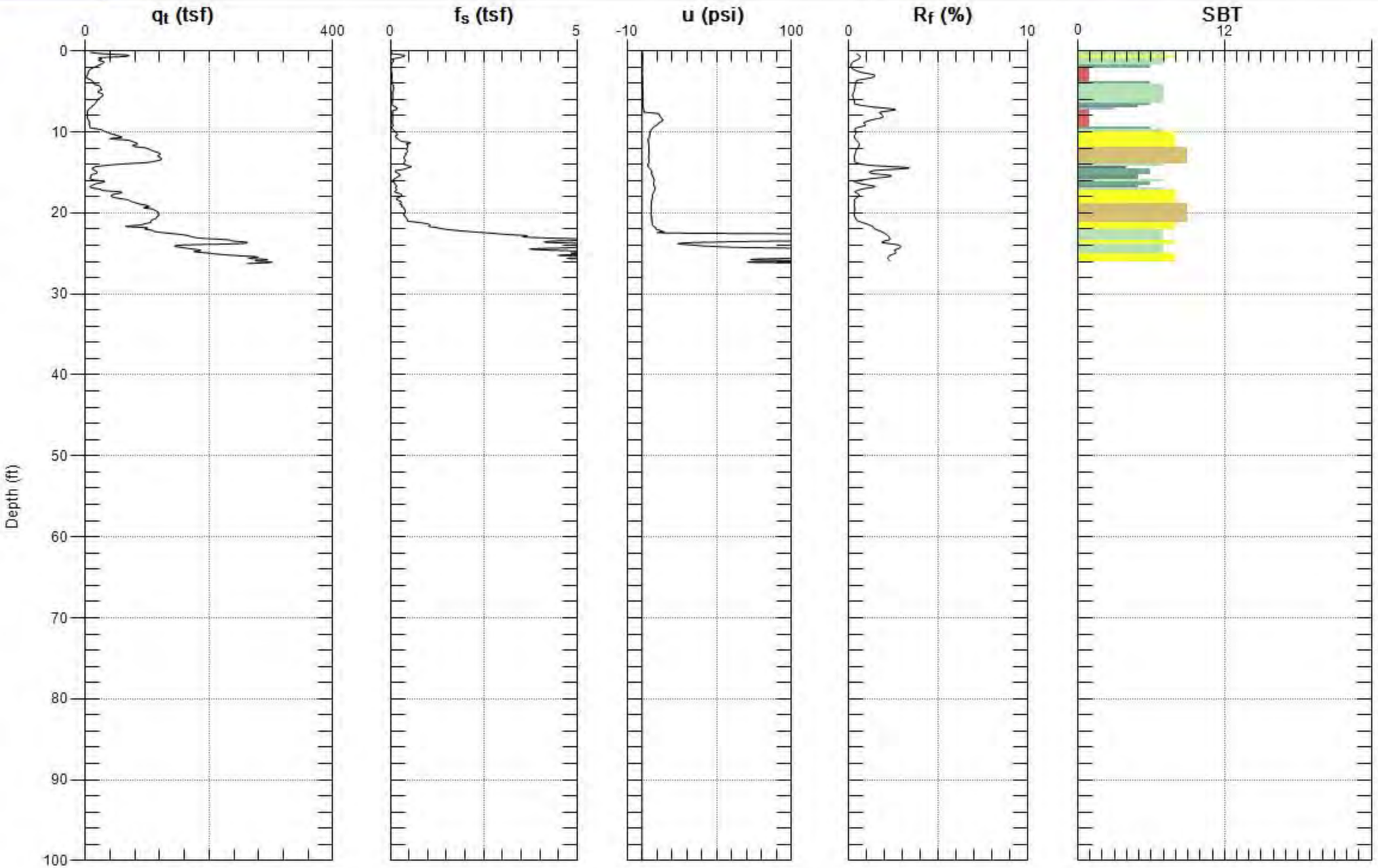


Max. Depth: 47.080 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-11
Engineer: G. SPAULDING
Date: 10/3/2008 08:07



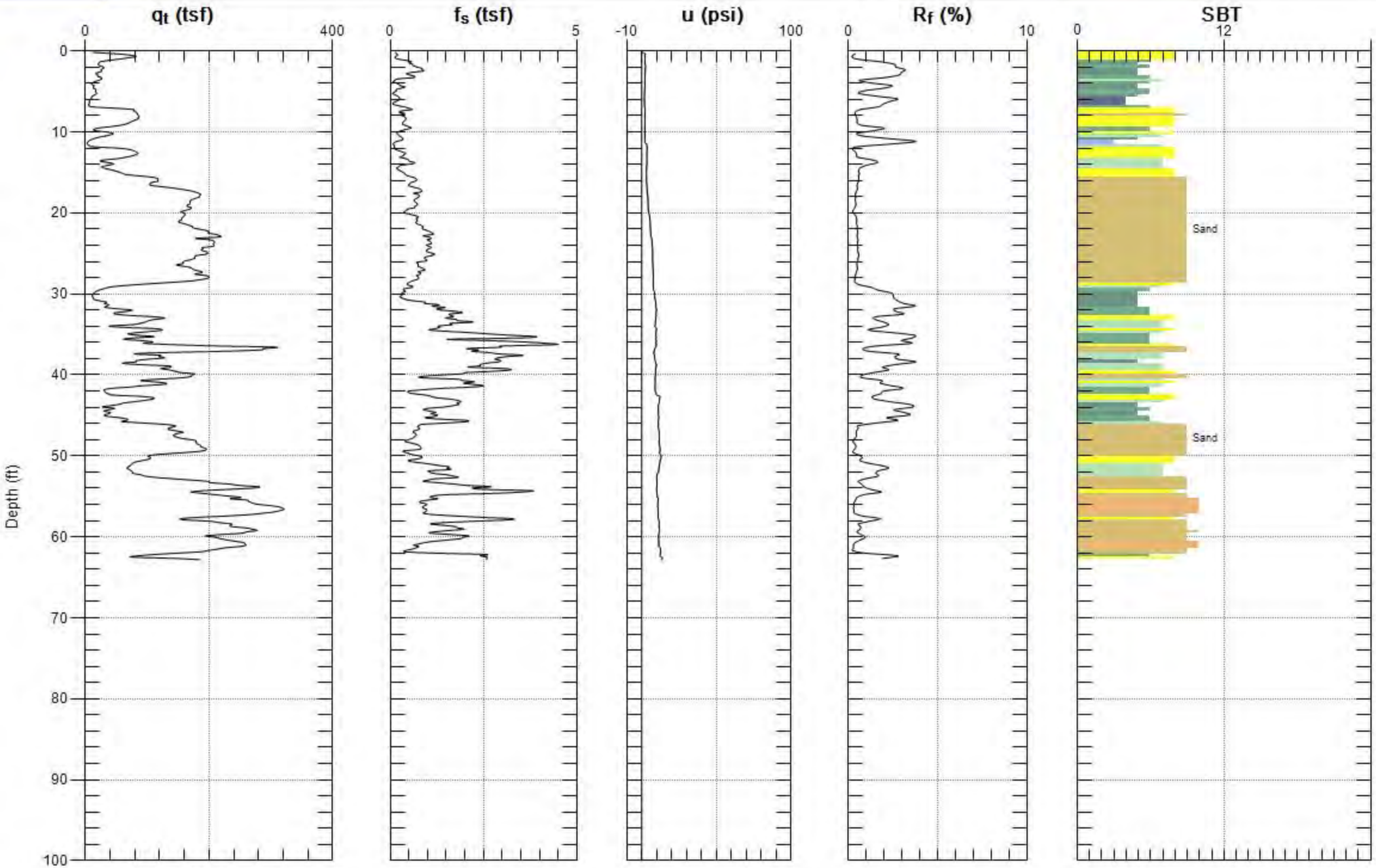
Max. Depth: 26.247 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON Engineer: G. SPAULDING

Sounding: CPT-12 Date: 10/3/2008 08:57

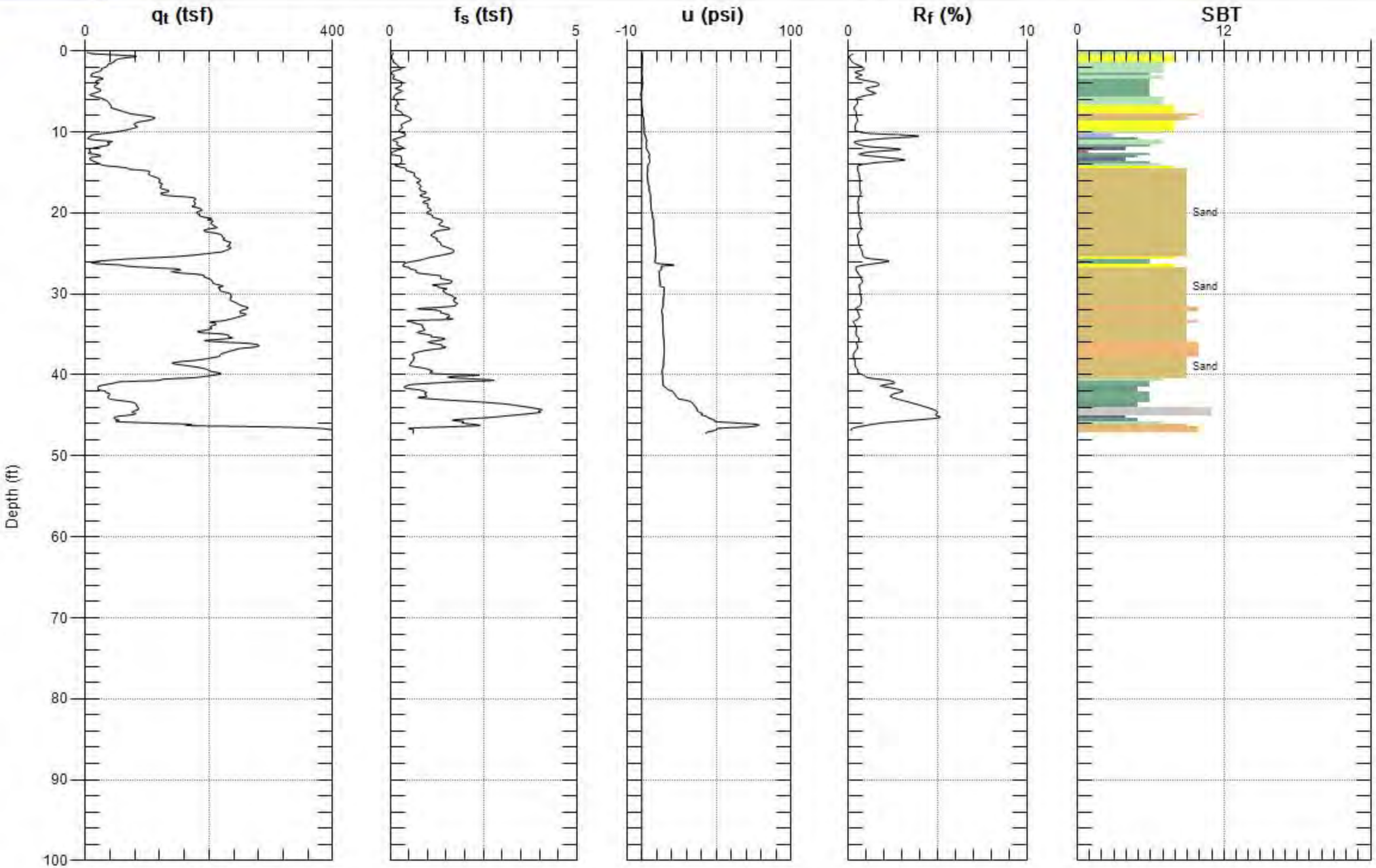


Max. Depth: 62.828 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-13
Engineer: G. SPAULDING
Date: 10/3/2008 10:03

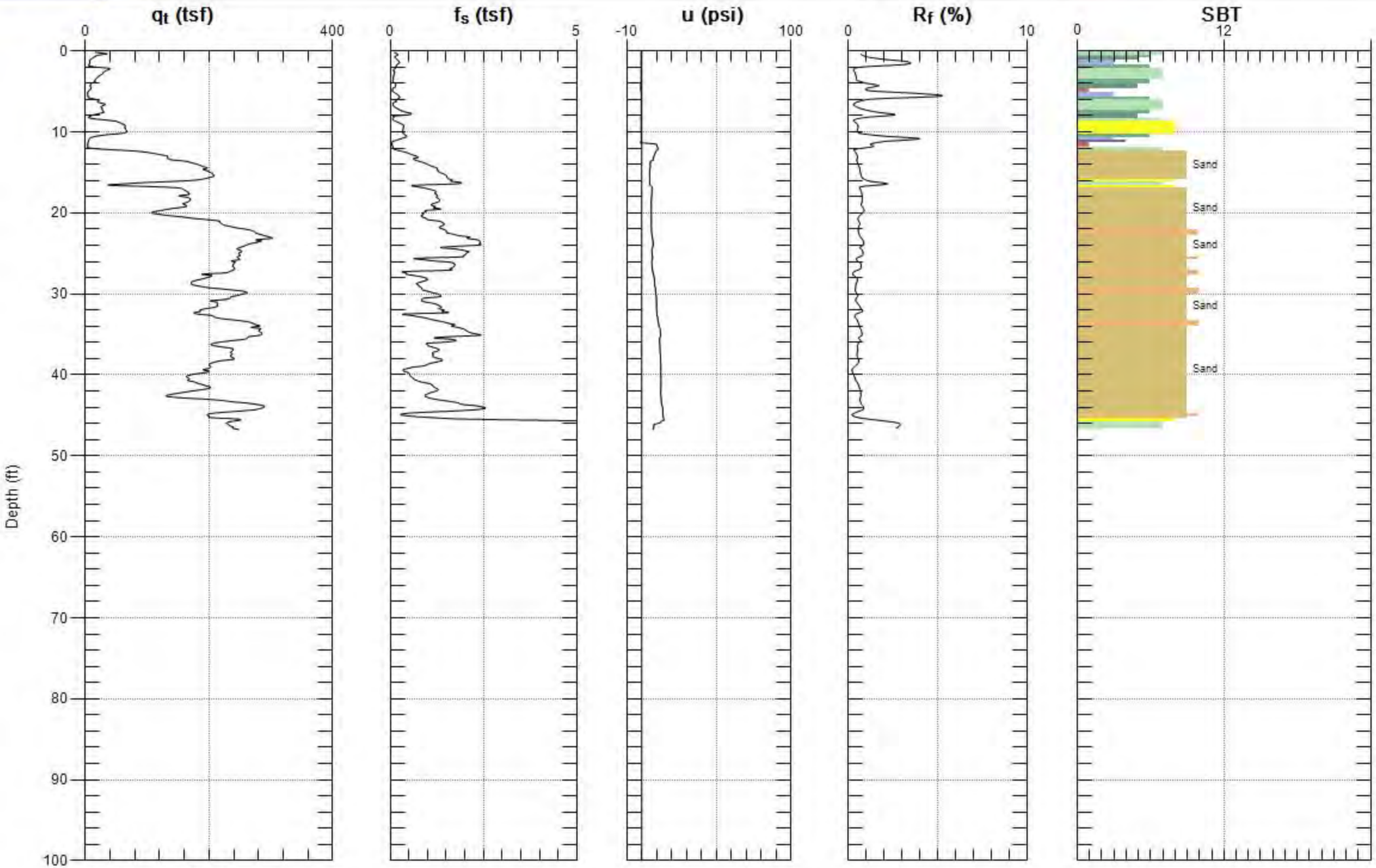


Max. Depth: 47.244 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-14
Engineer: G. SPAULDING
Date: 10/3/2008 11:19

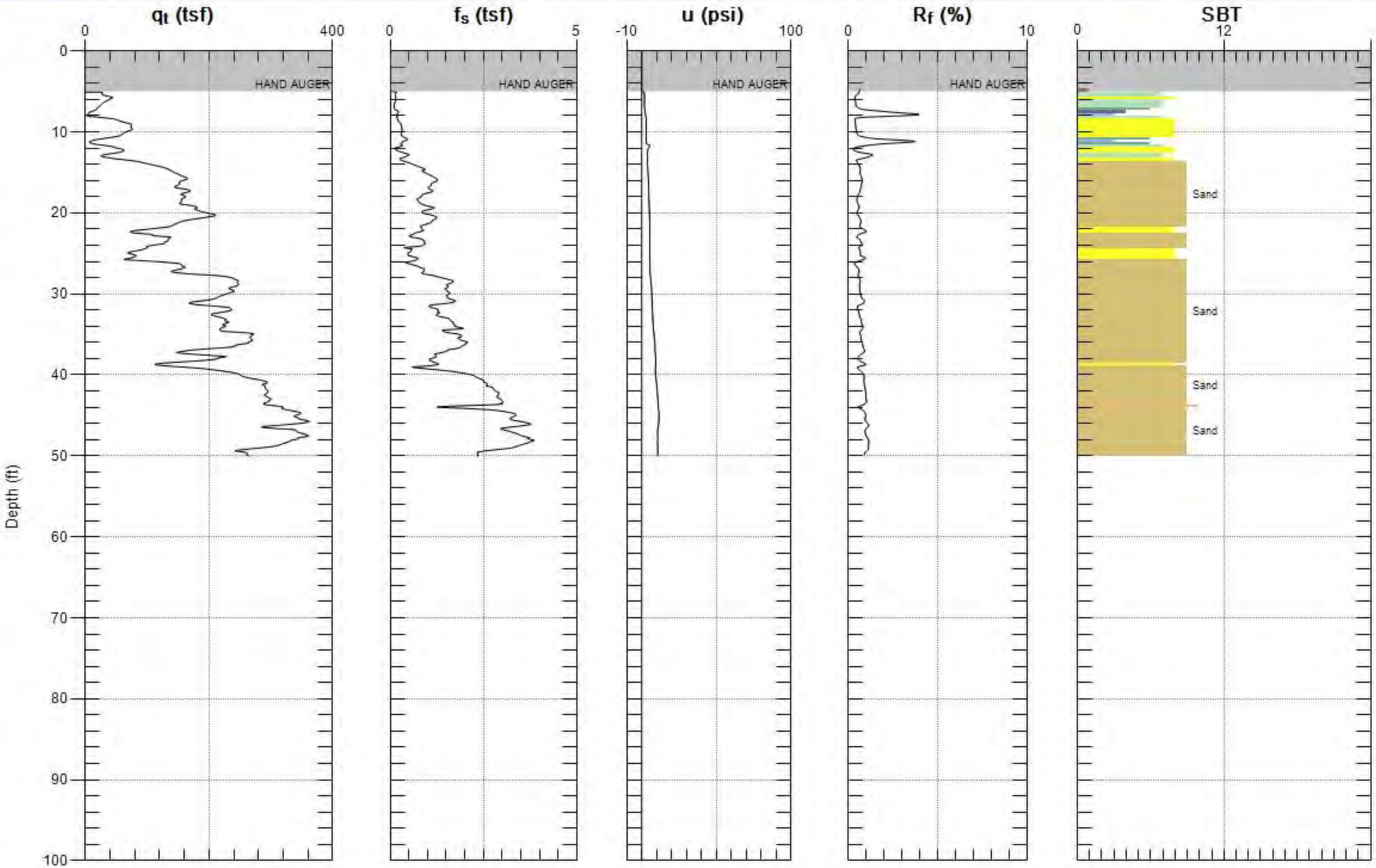


Max. Depth: 46.752 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-15
Engineer: G. SPAULDING
Date: 10/6/2008 08:15

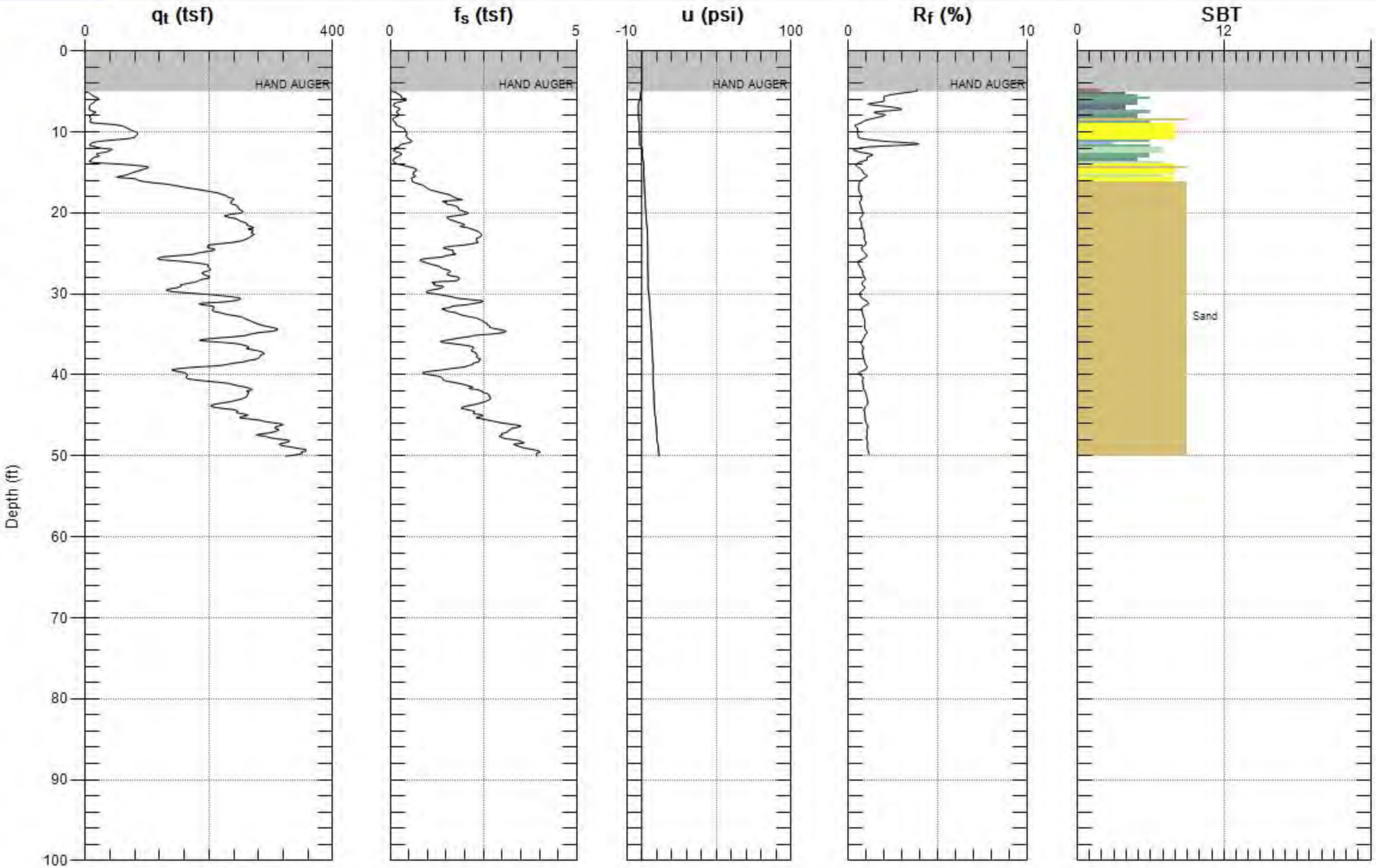


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-16
Engineer: G. SPAULDING
Date: 10/6/2008 08:40

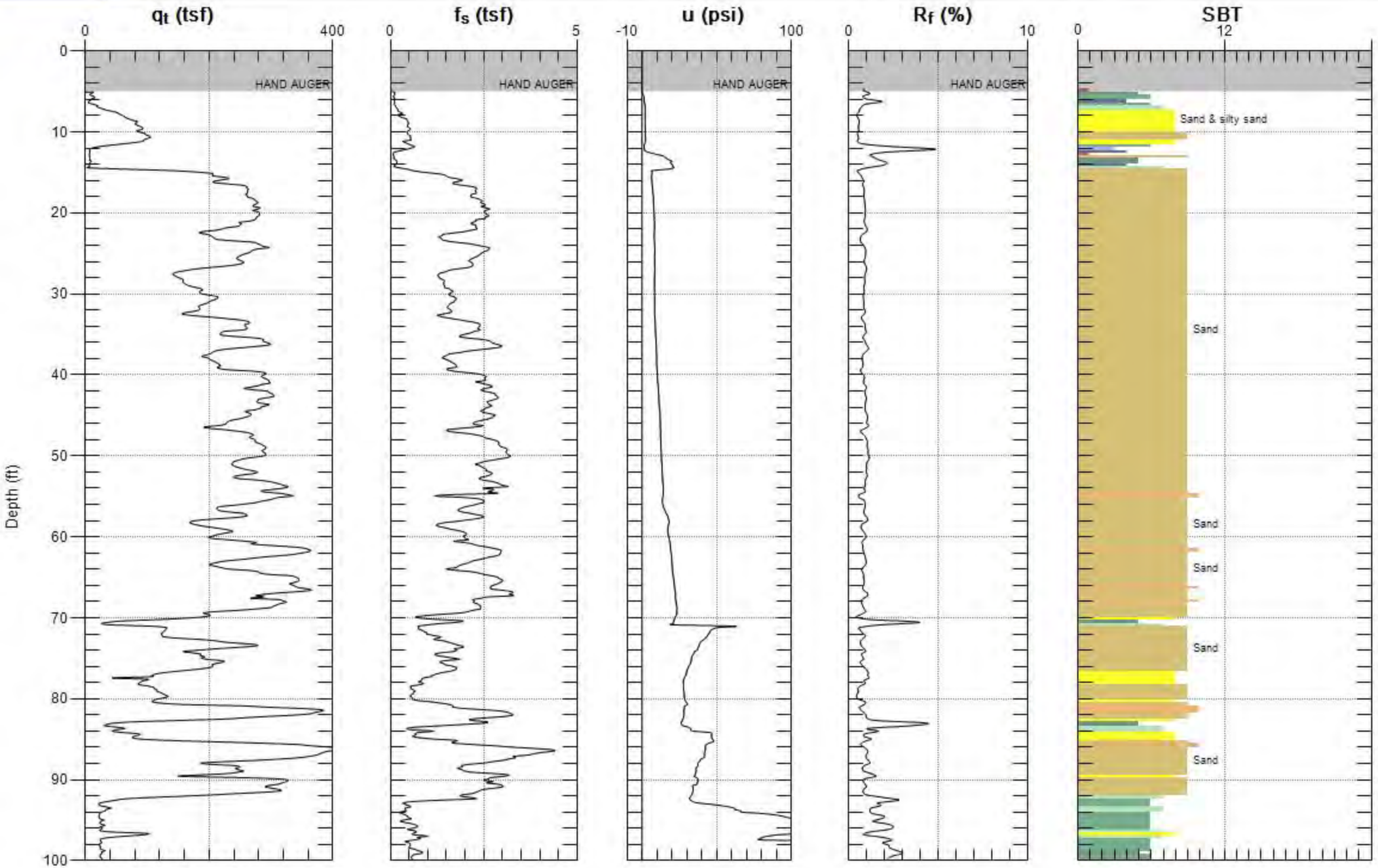


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-17
Engineer: G. SPAULDING
Date: 10/6/2008 09:44

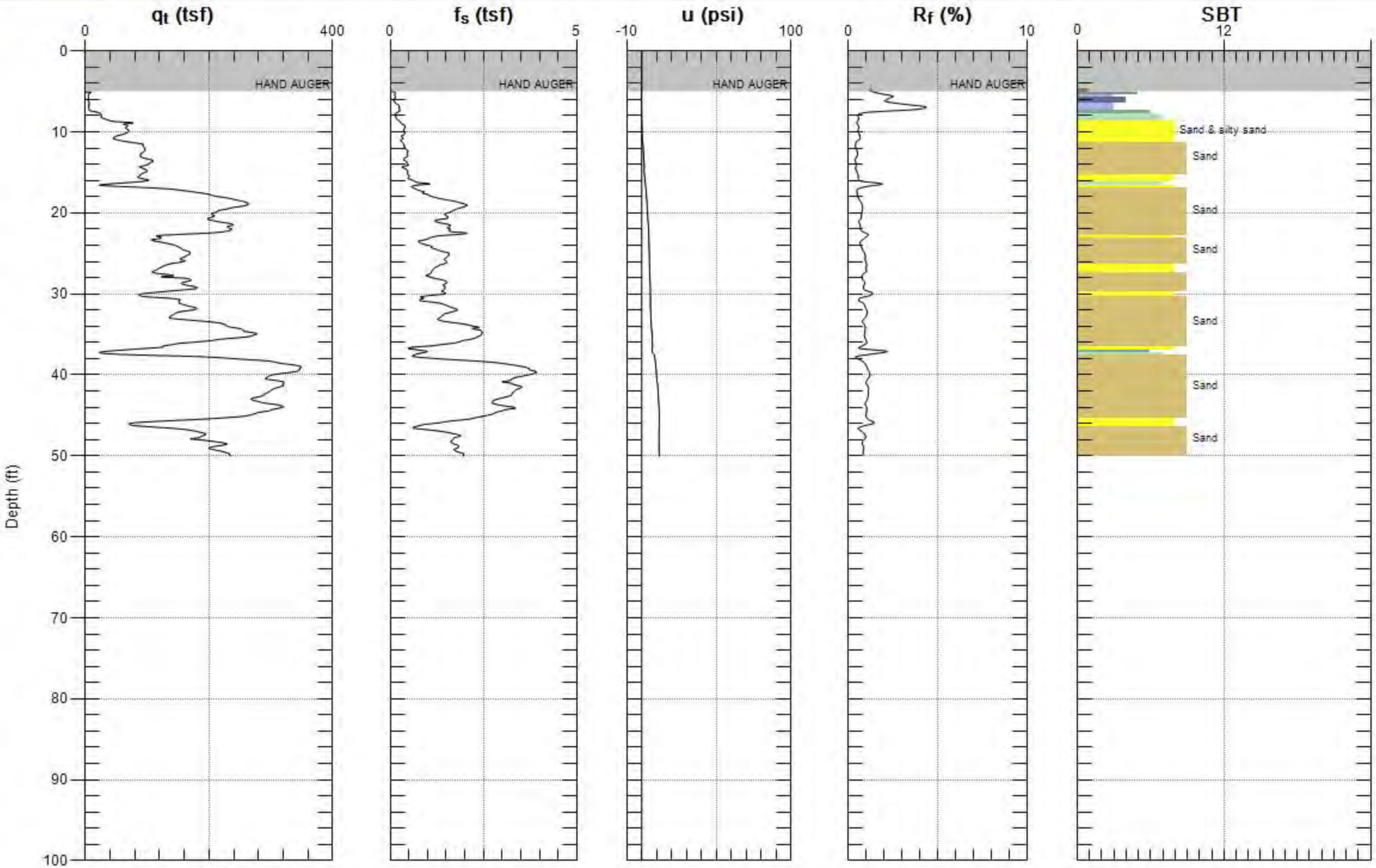


Max. Depth: 100.066 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-18
Engineer: G. SPAULDING
Date: 10/6/2008 10:51

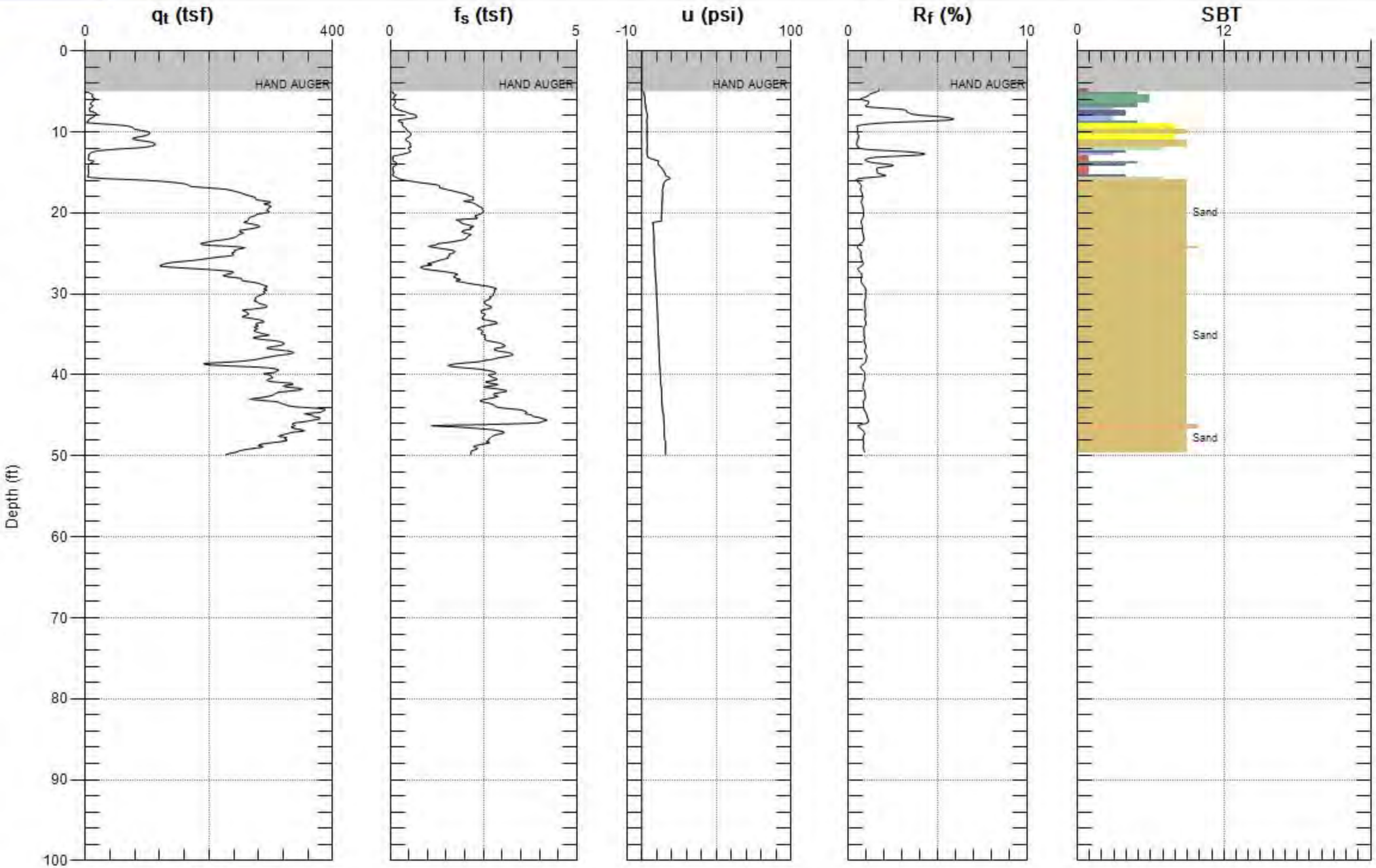


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-19
Engineer: G. SPAULDING
Date: 10/6/2008 11:11

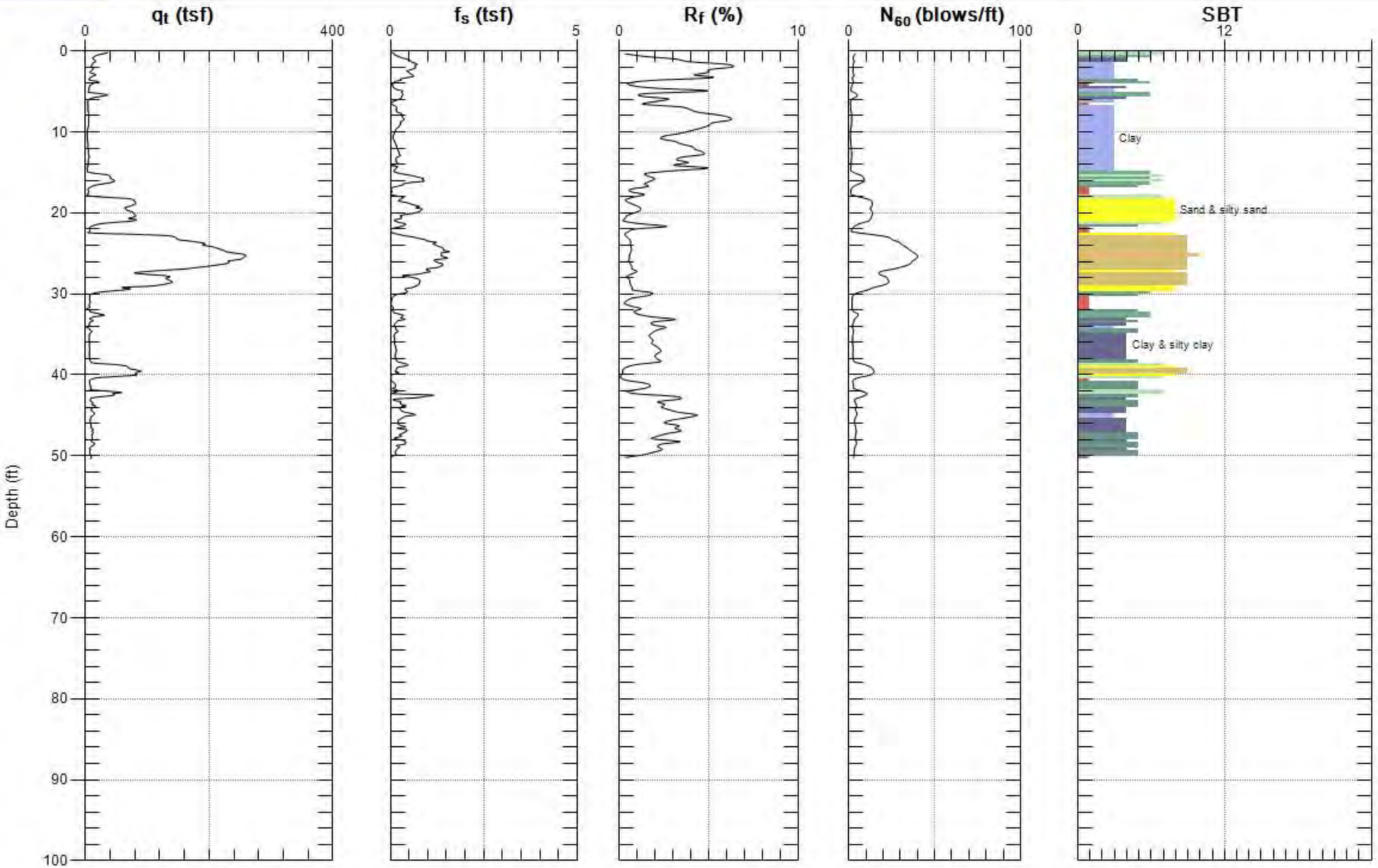


Max. Depth: 49.869 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-01
Engineer: G. SPAULDING
Date: 10/1/2008 09:05



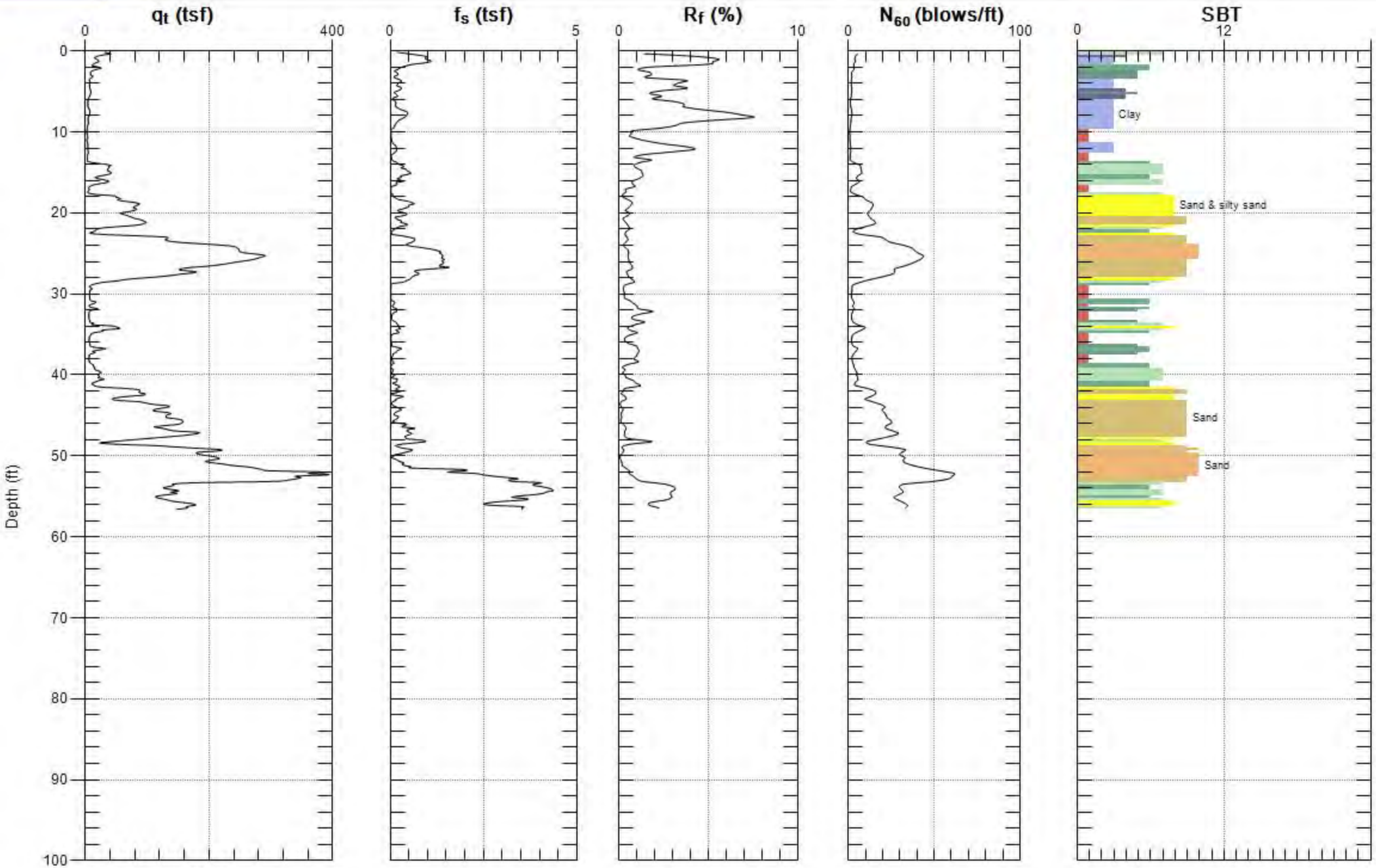
Max. Depth: 50.361 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-02

Engineer: G. SPAULDING
Date: 10/1/2008 10:14

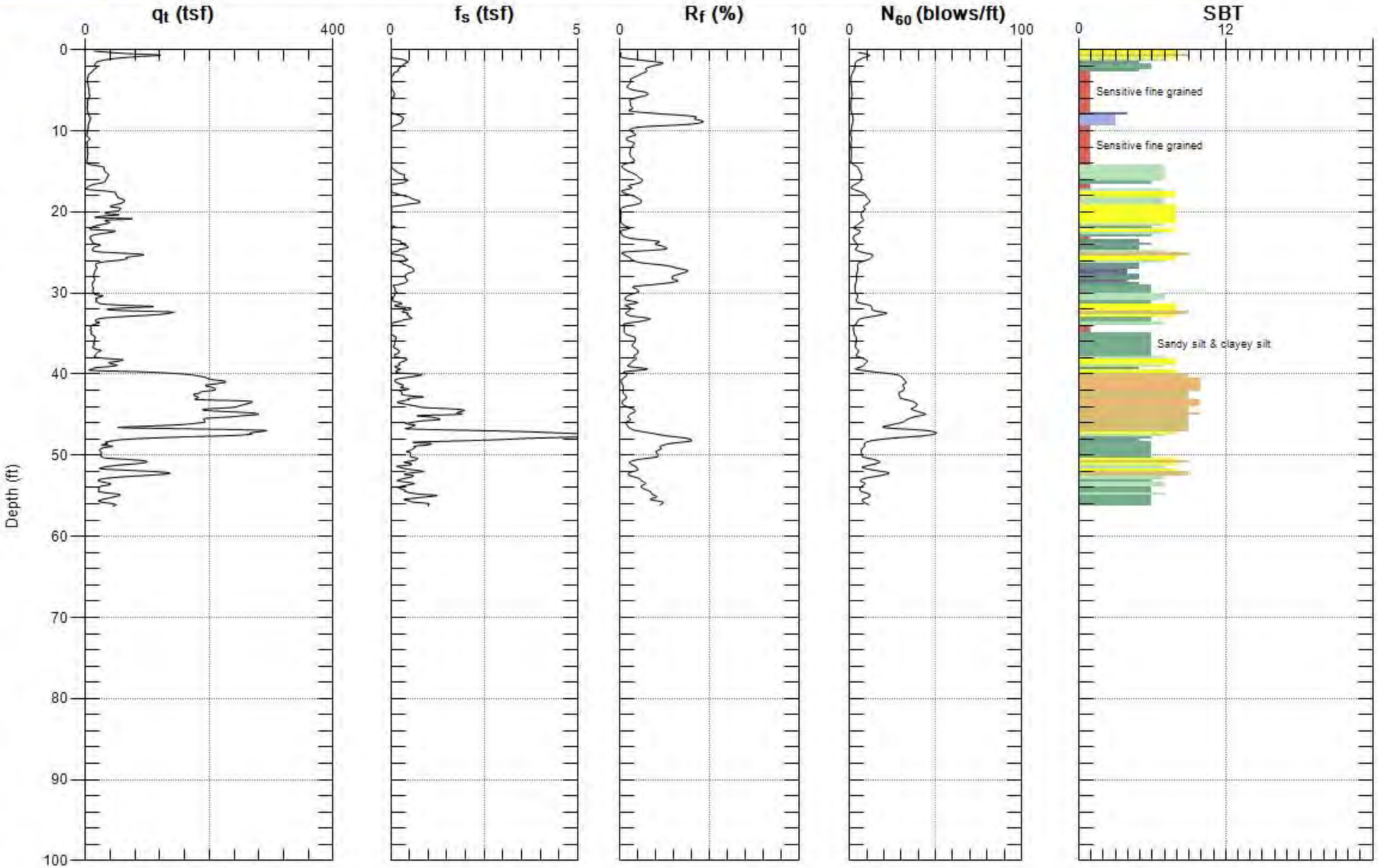


Max. Depth: 56.594 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-03
Engineer: G. SPAULDING
Date: 10/1/2008 11:20

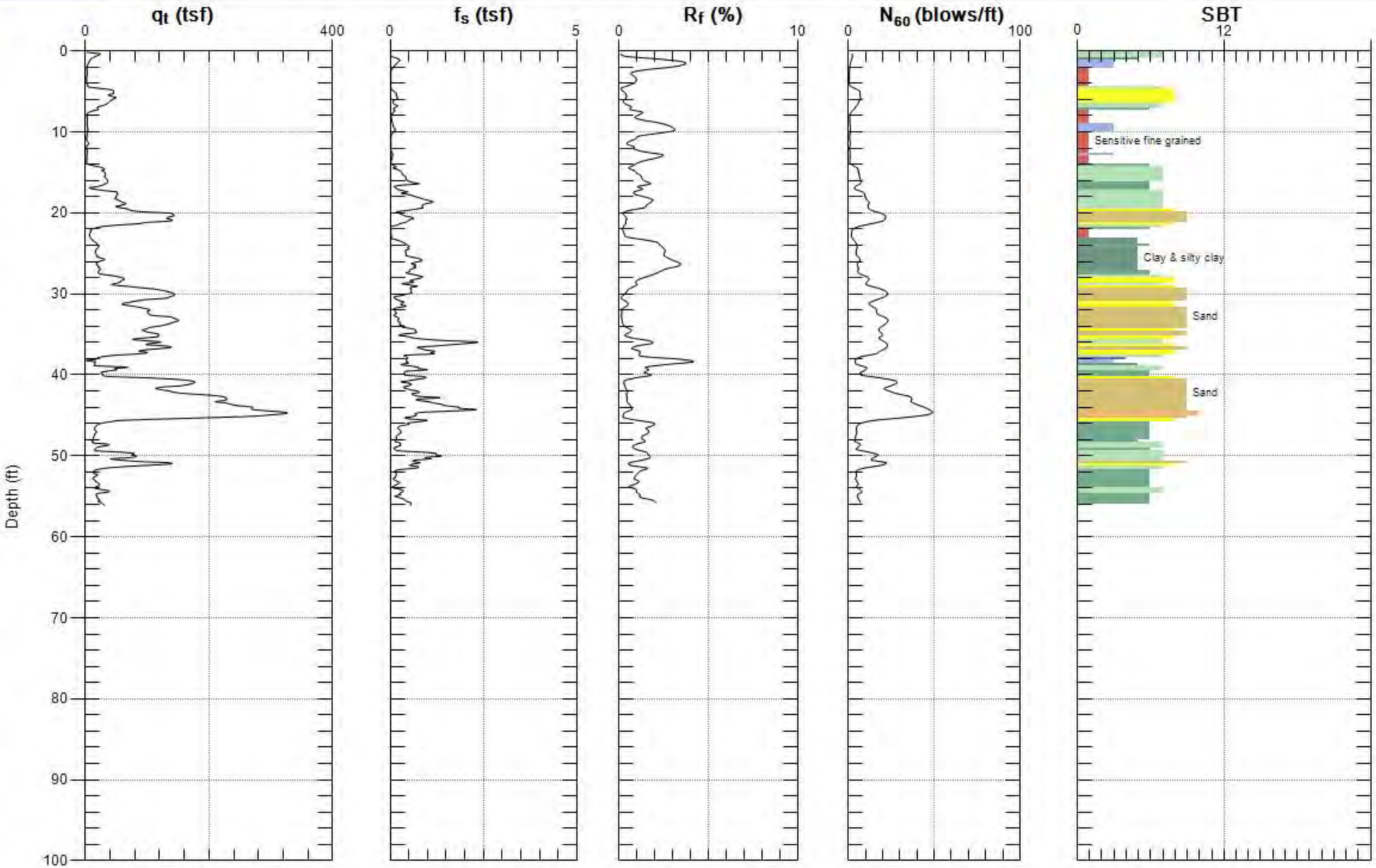


Max. Depth: 56.266 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-04
Engineer: G. SPAULDING
Date: 10/1/2008 12:16

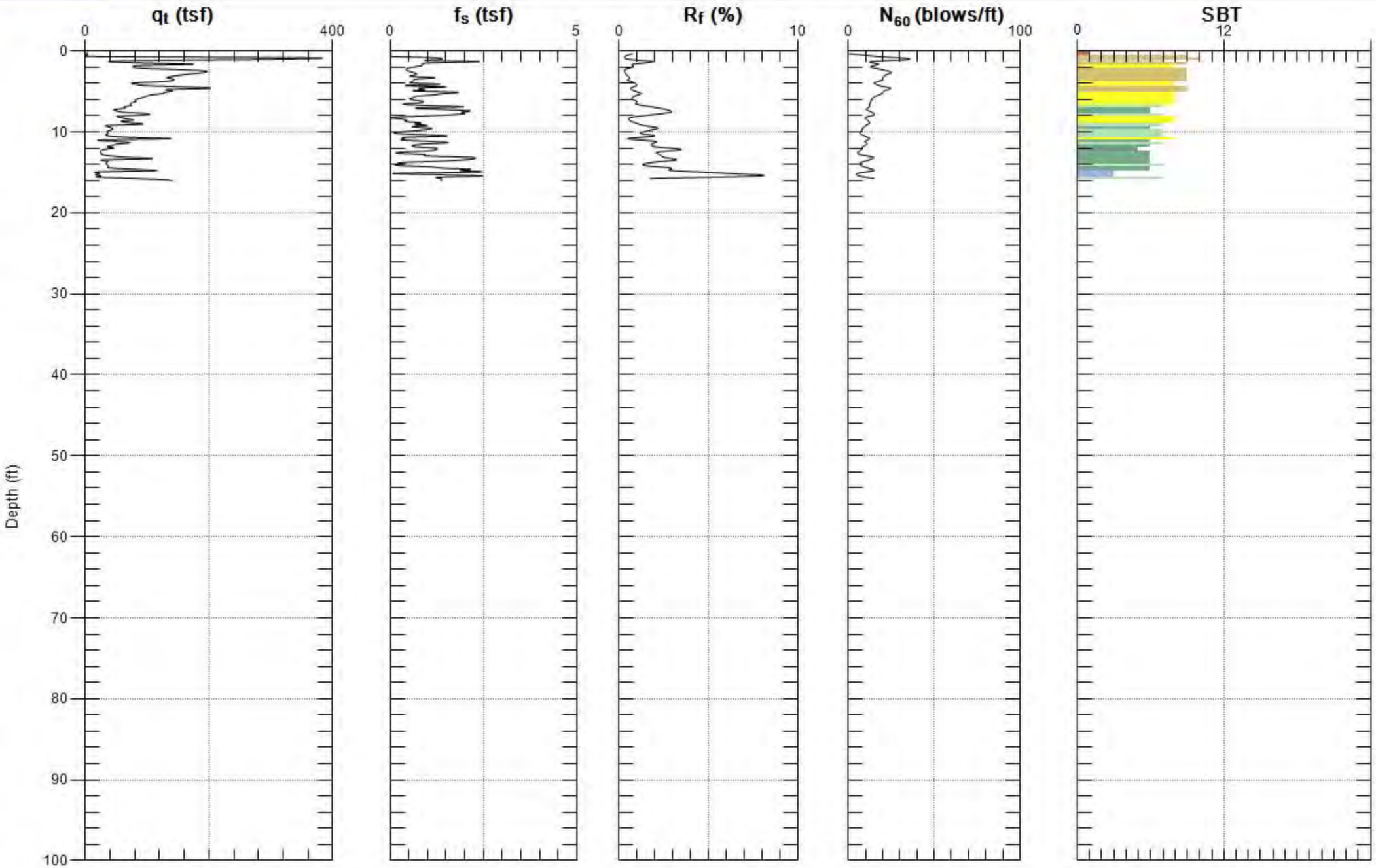


Max. Depth: 56.102 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-05
Engineer: G. SPAULDING
Date: 10/1/2008 02:44



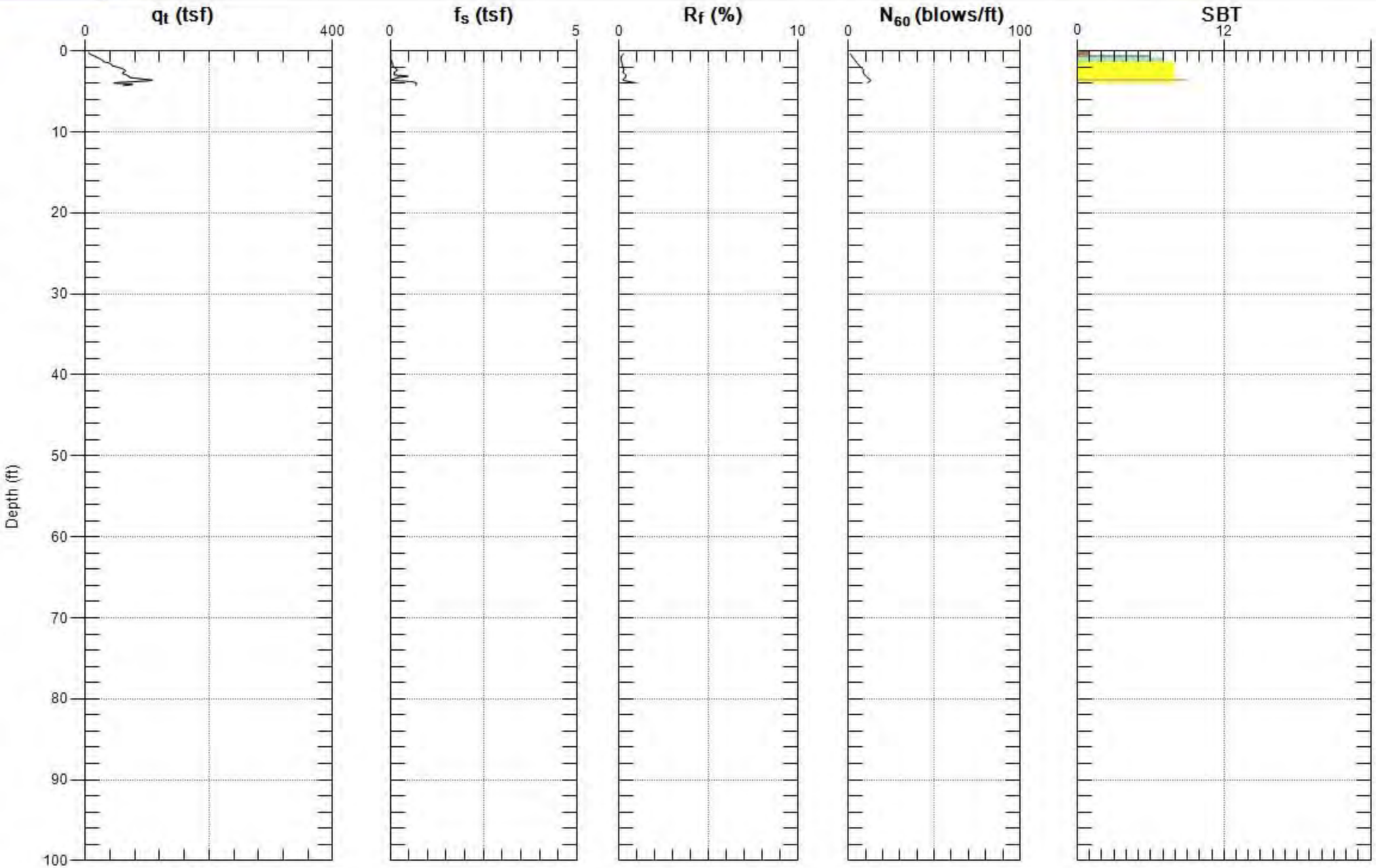
Max. Depth: 16.076 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON Engineer: G. SPAULDING

Sounding: CPT-06a Date: 10/2/2008 08:29



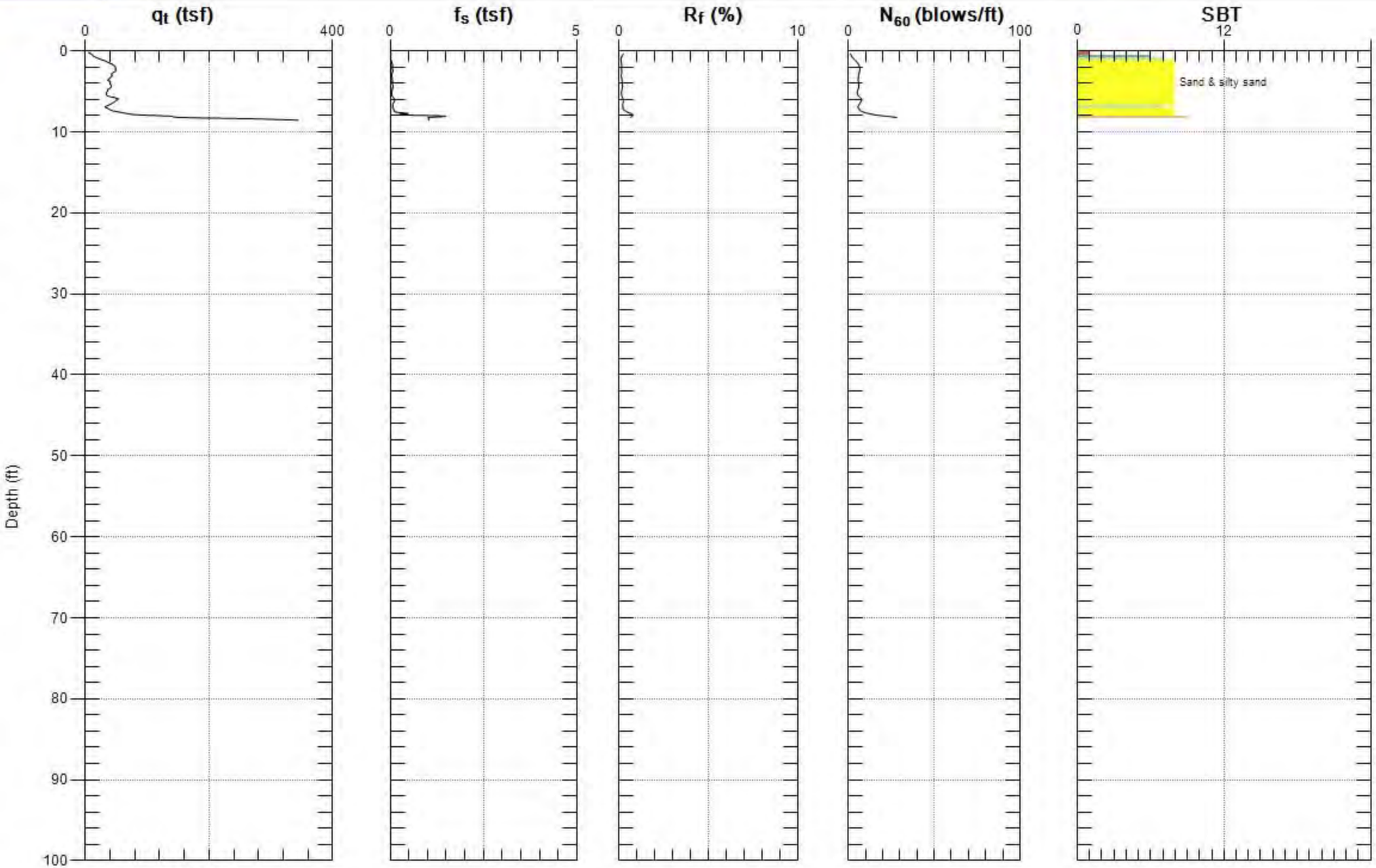
Max. Depth: 4.265 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-06b

Engineer: G. SPAULDING
Date: 10/2/2008 08:55



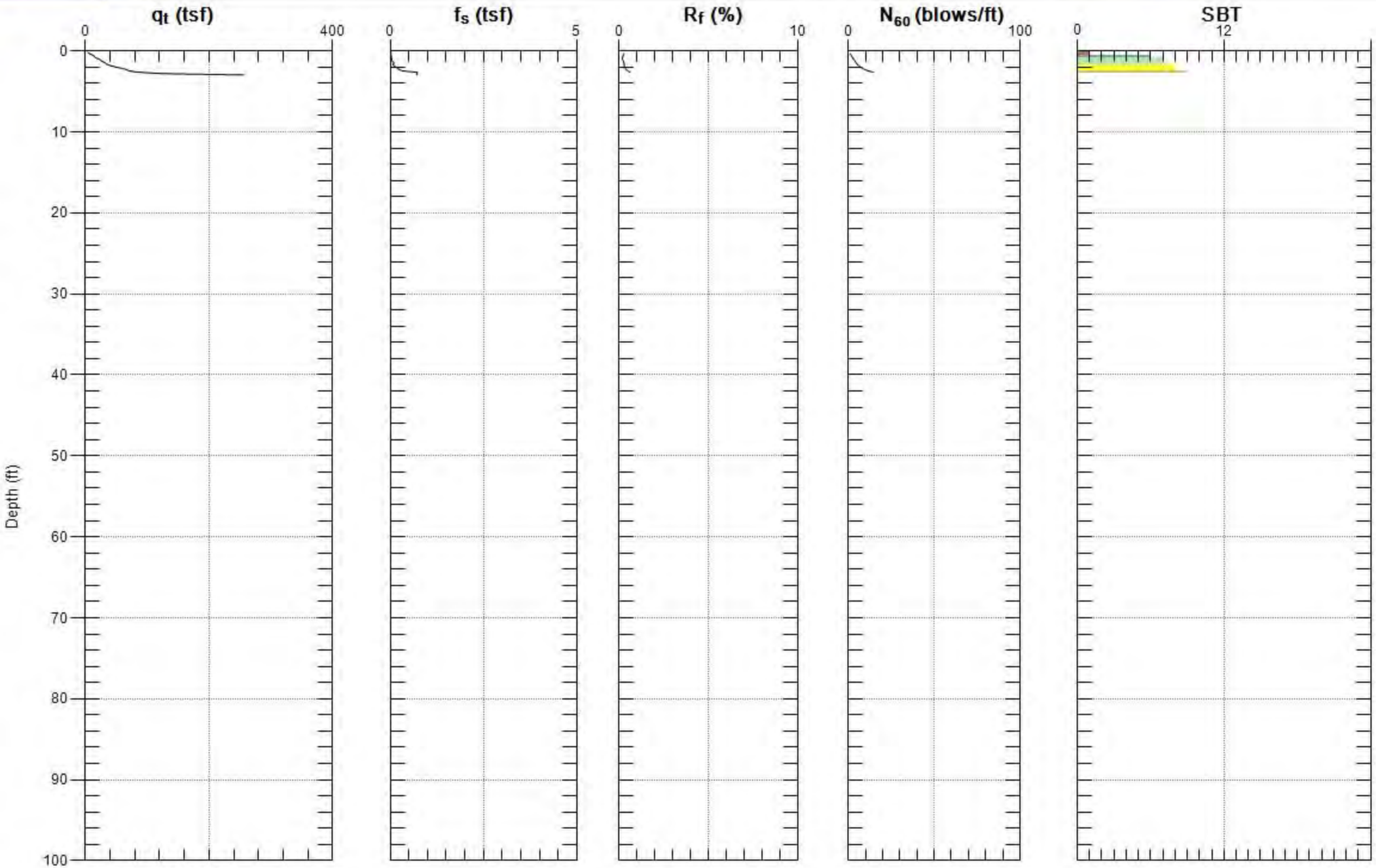
Max. Depth: 8.530 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON Engineer: G. SPAULDING

Sounding: CPT-06 Date: 10/2/2008 08:06

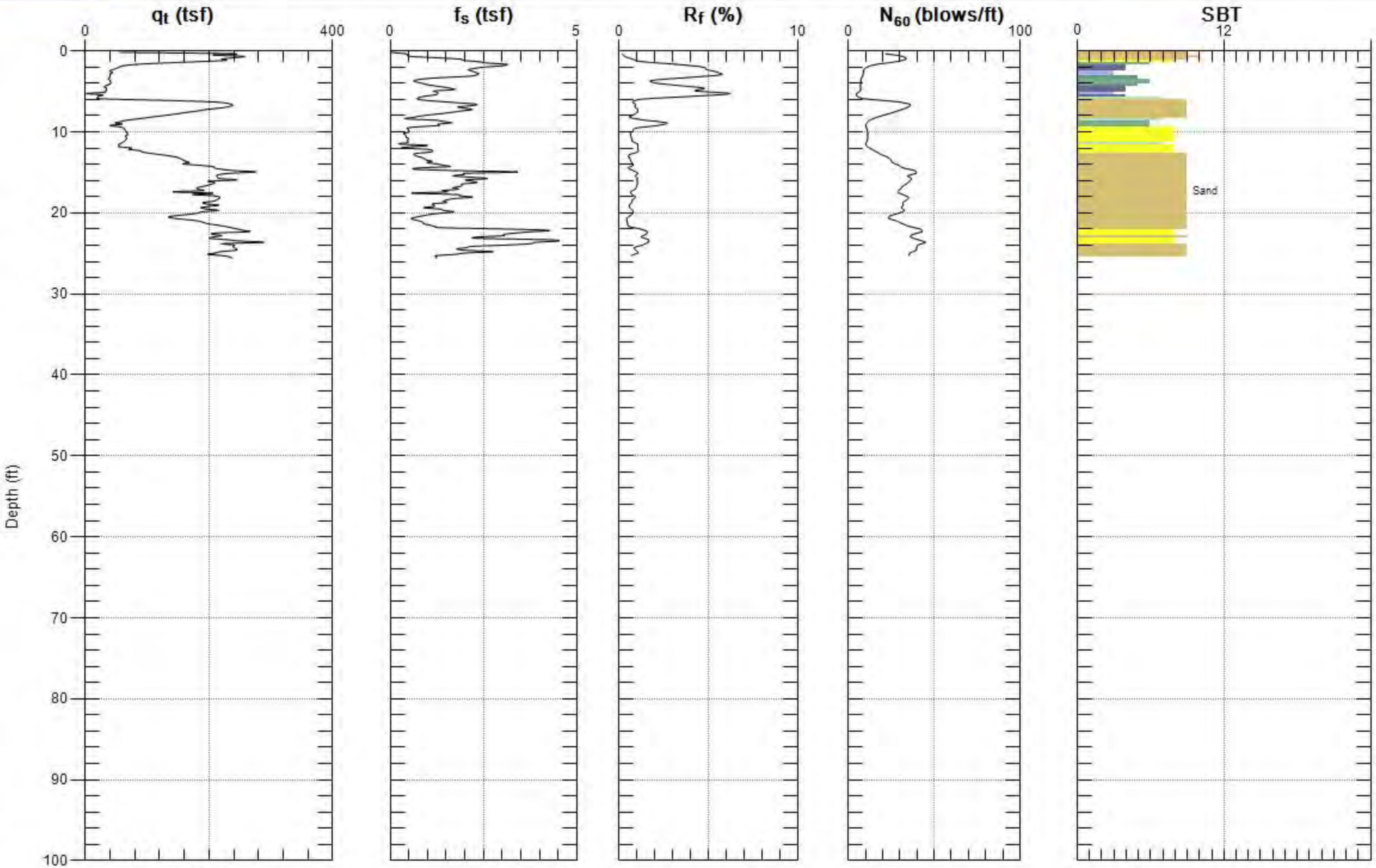


Max. Depth: 2.953 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-07
Engineer: G. SPAULDING
Date: 10/2/2008 09:25

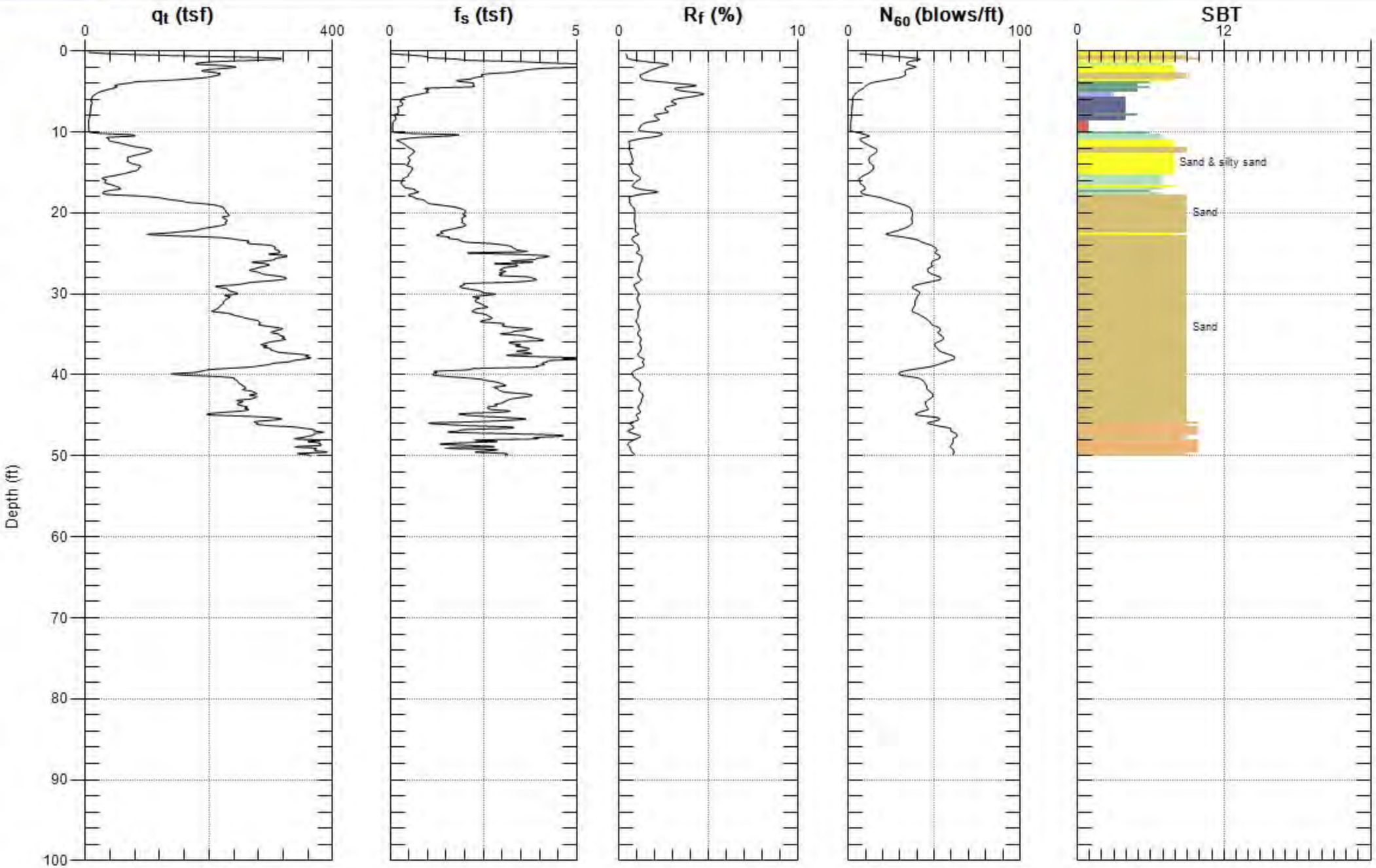


Max. Depth: 25.591 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-08
Engineer: G. SPAULDING
Date: 10/2/2008 11:23

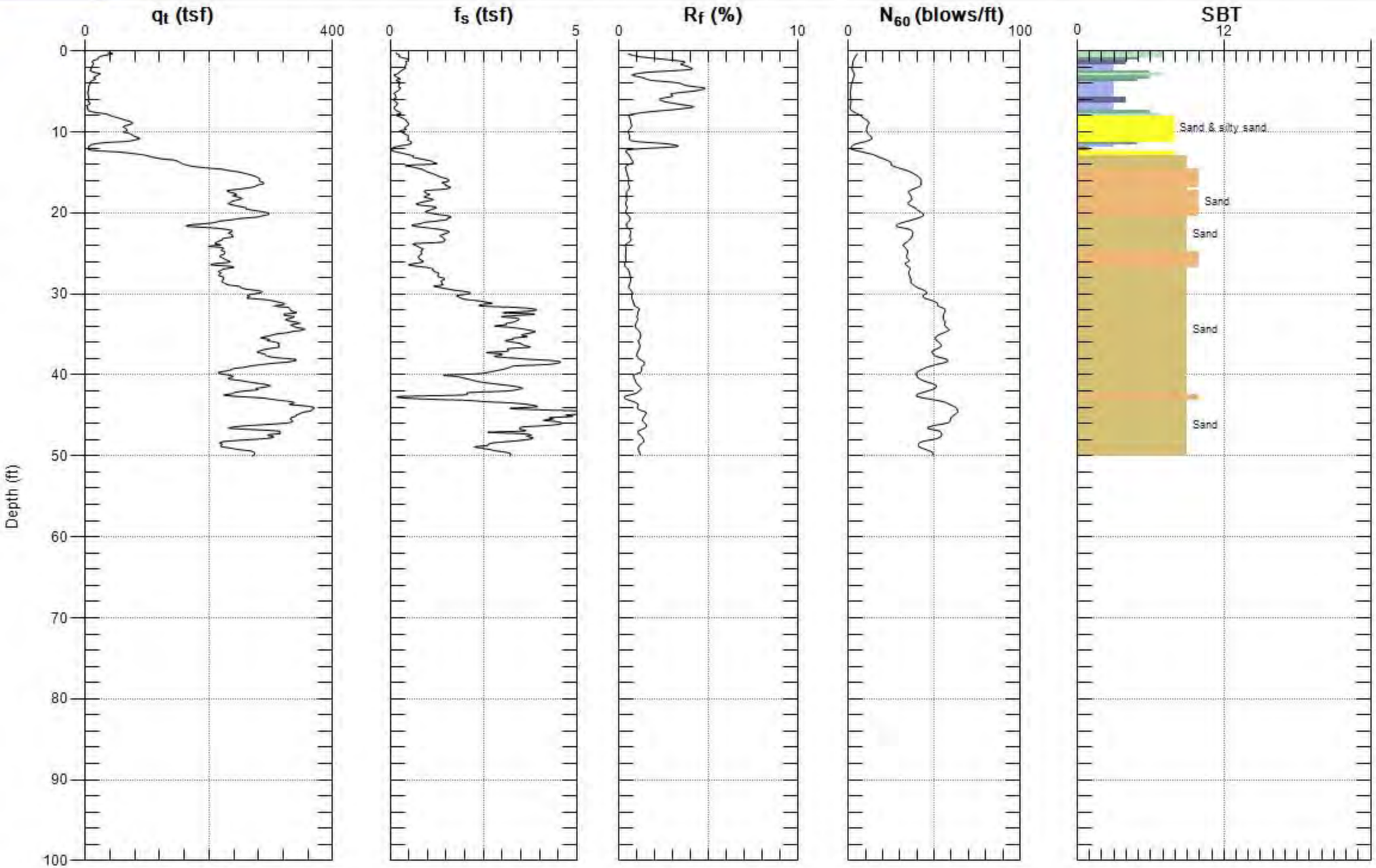


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Engineer: G. SPAULDING
Sounding: CPT-09
Date: 10/2/2008 02:20

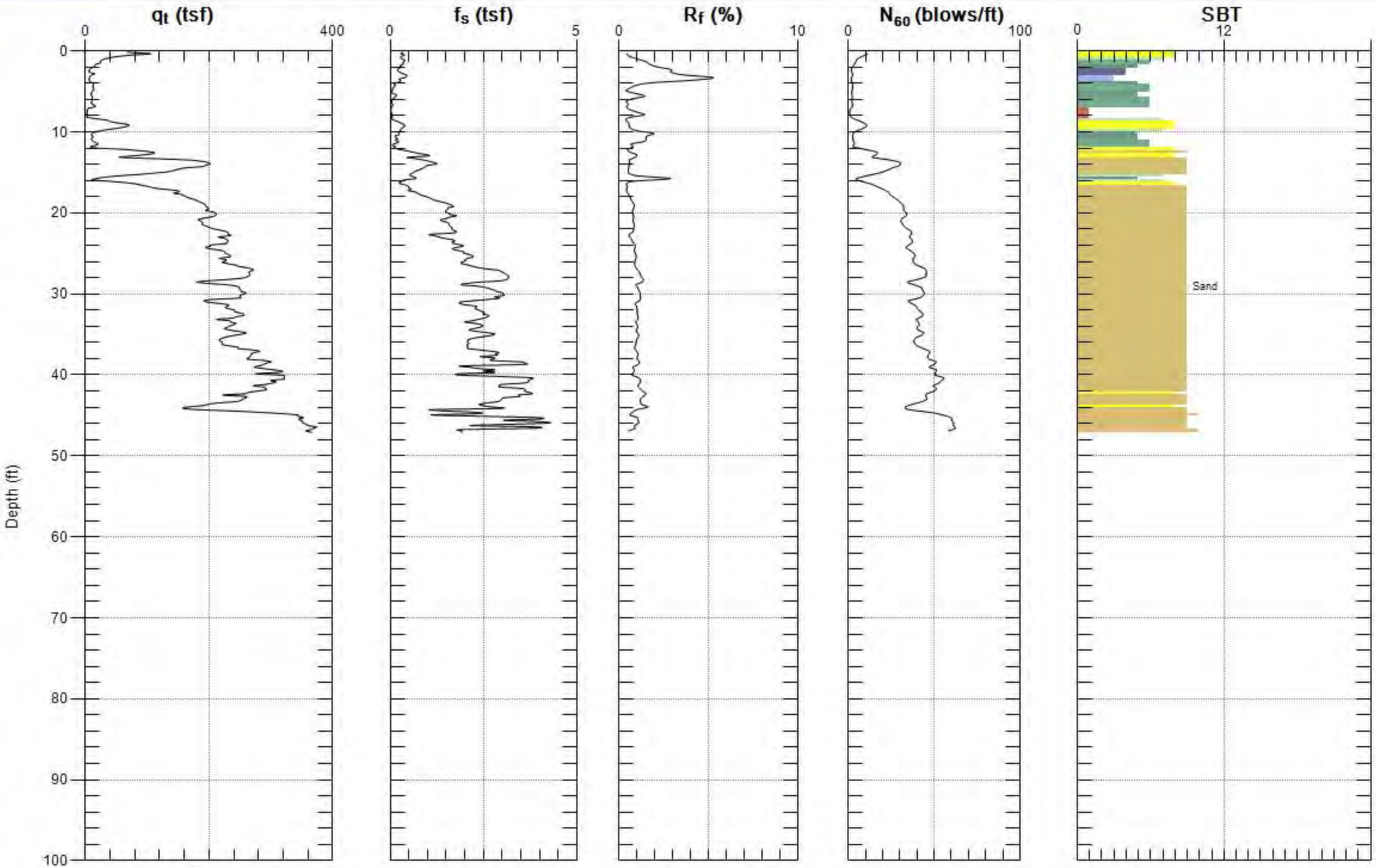


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-10
Engineer: G. SPAULDING
Date: 10/2/2008 03:31

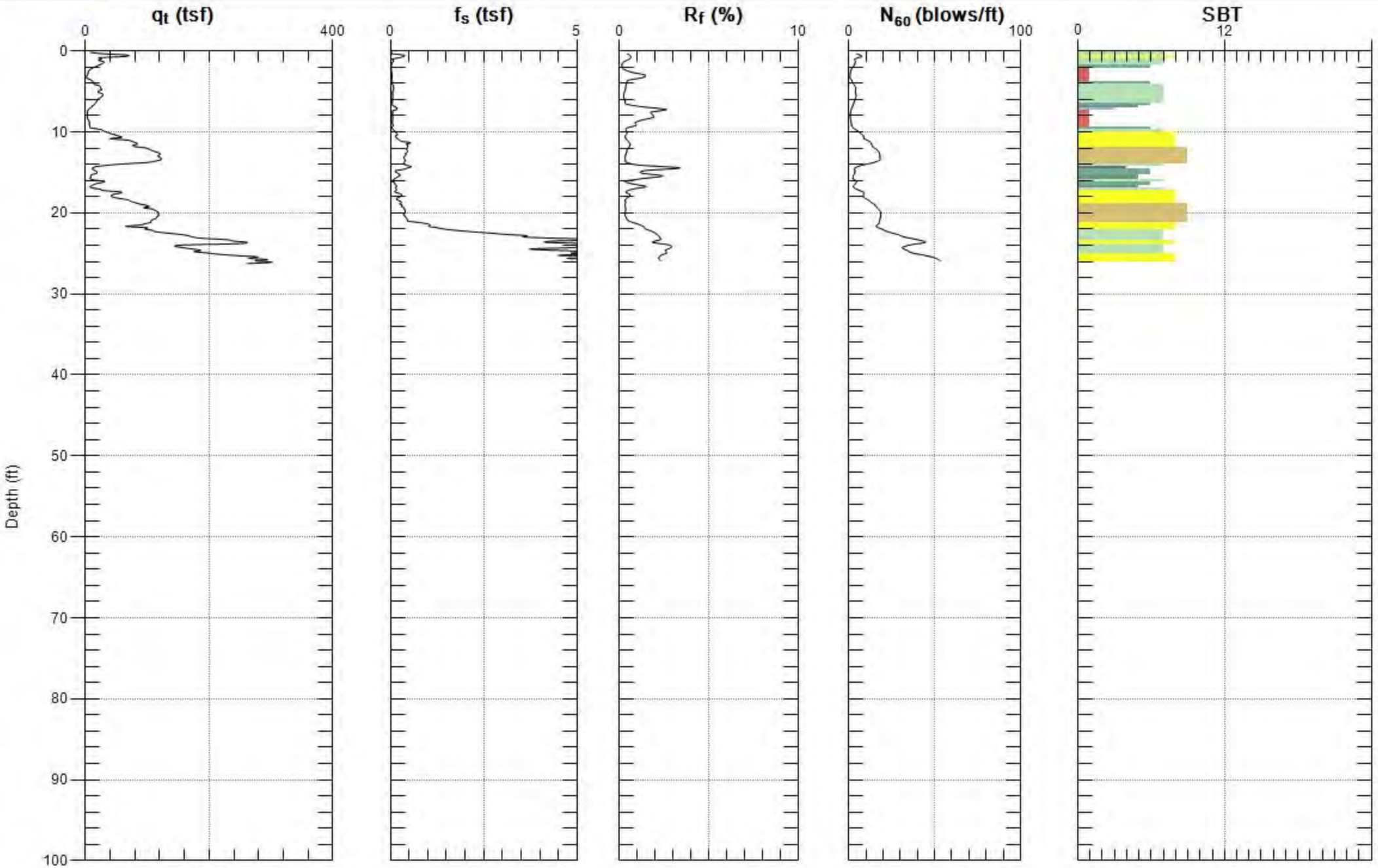


Max. Depth: 47.080 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-11
Engineer: G. SPAULDING
Date: 10/3/2008 08:07

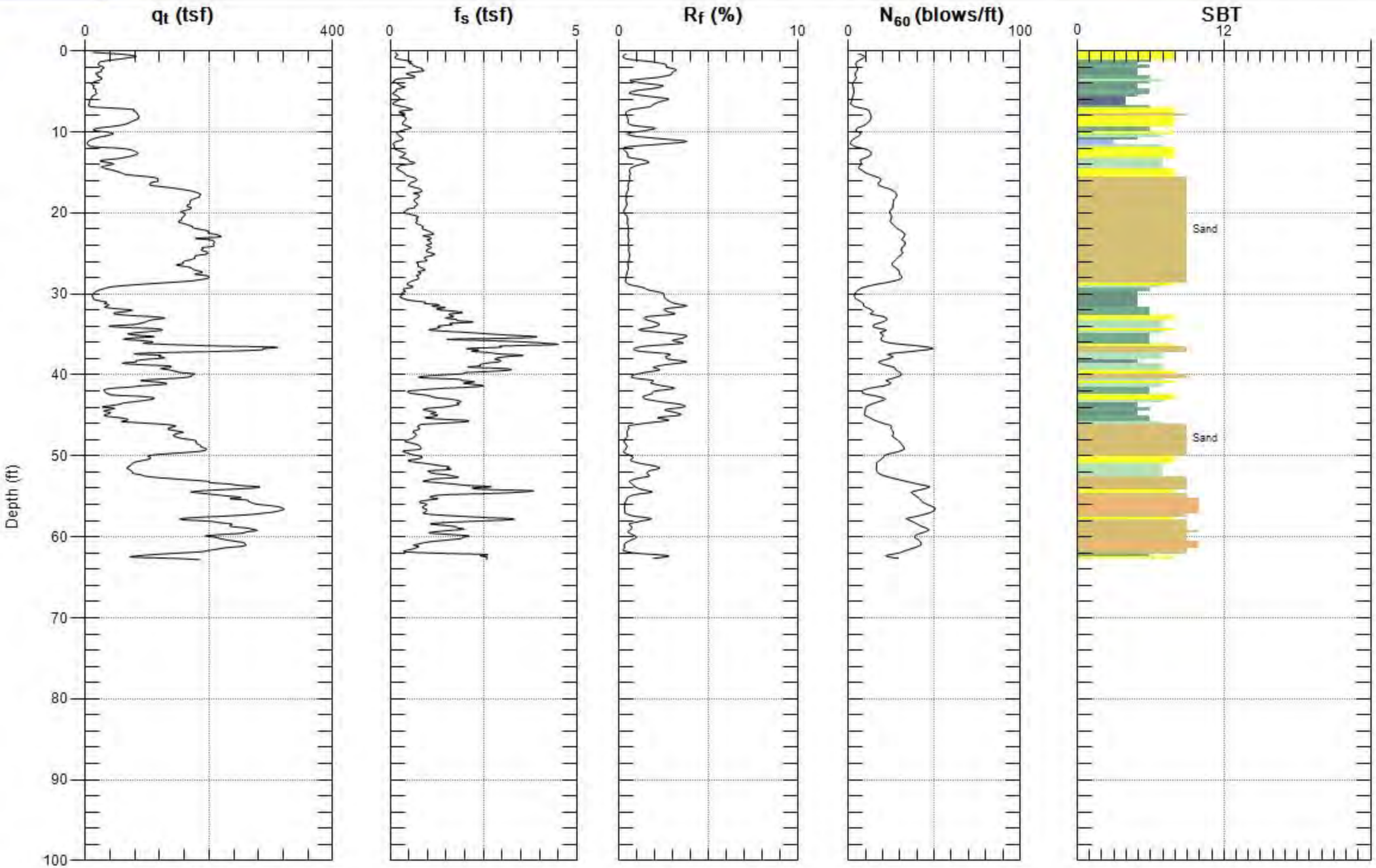


Max. Depth: 26.247 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Engineer: G. SPAULDING
Sounding: CPT-12
Date: 10/3/2008 08:57

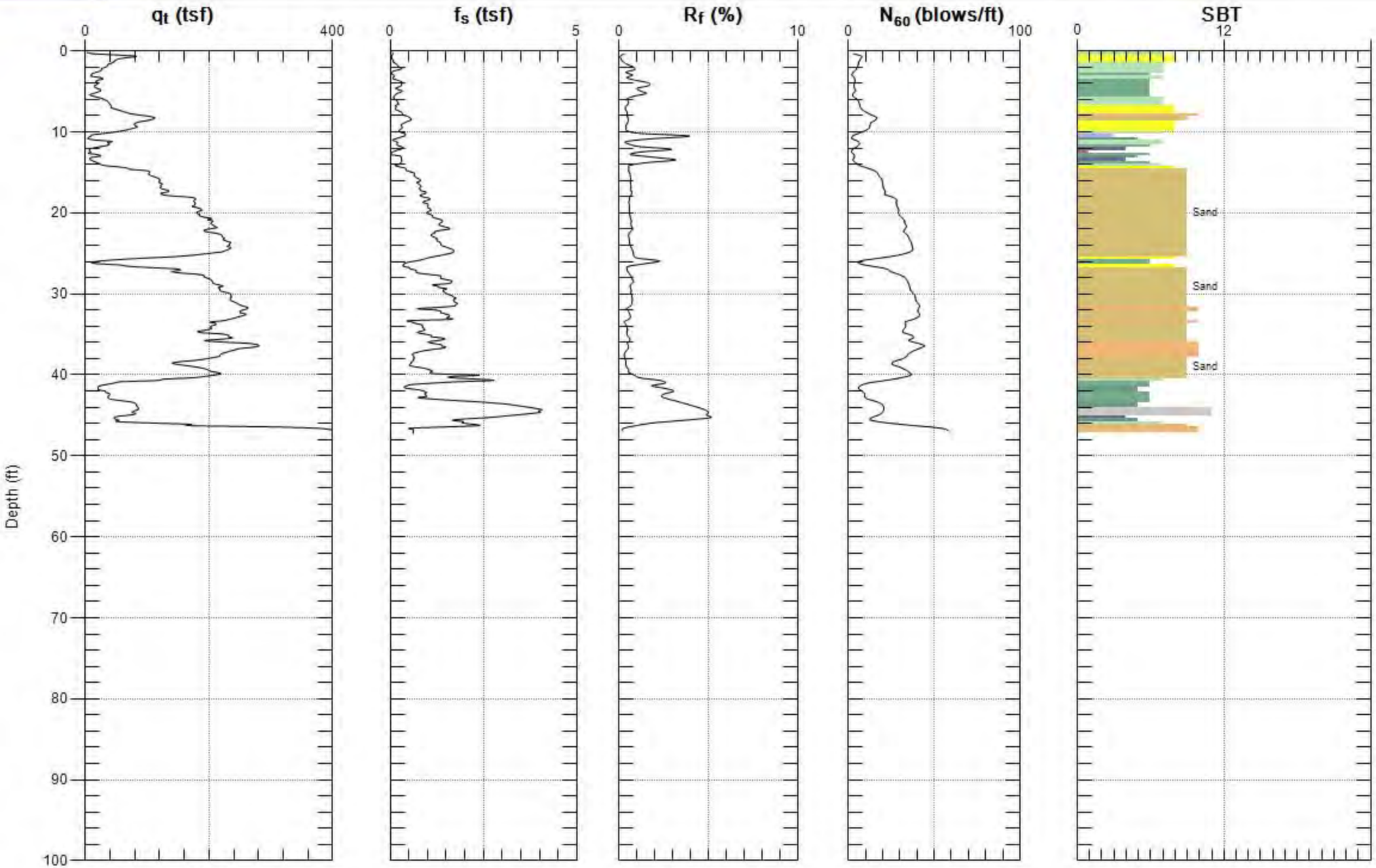


Max. Depth: 62.828 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Engineer: G. SPAULDING
Sounding: CPT-13
Date: 10/3/2008 10:03

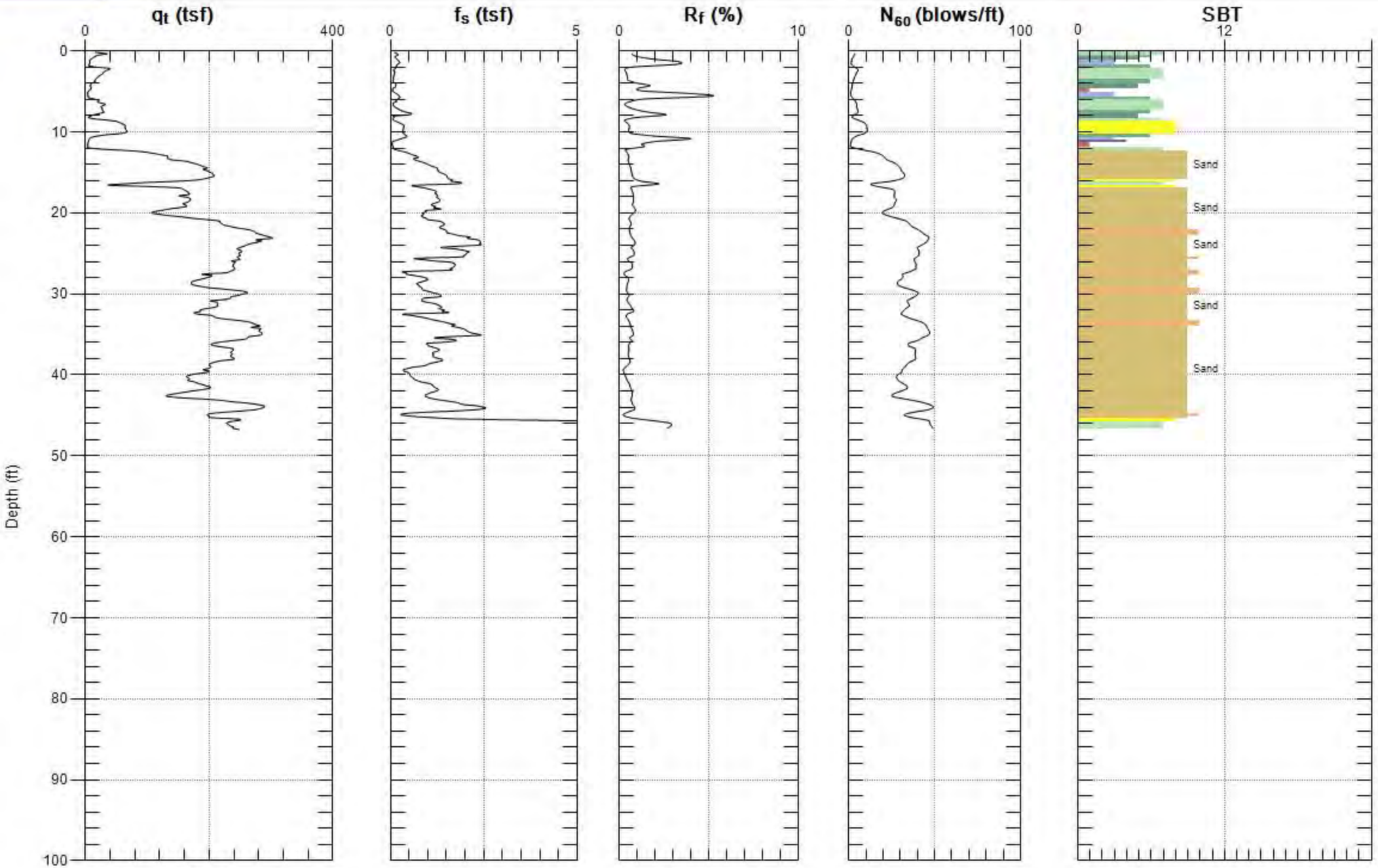


Max. Depth: 47.244 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-14
Engineer: G. SPAULDING
Date: 10/3/2008 11:19

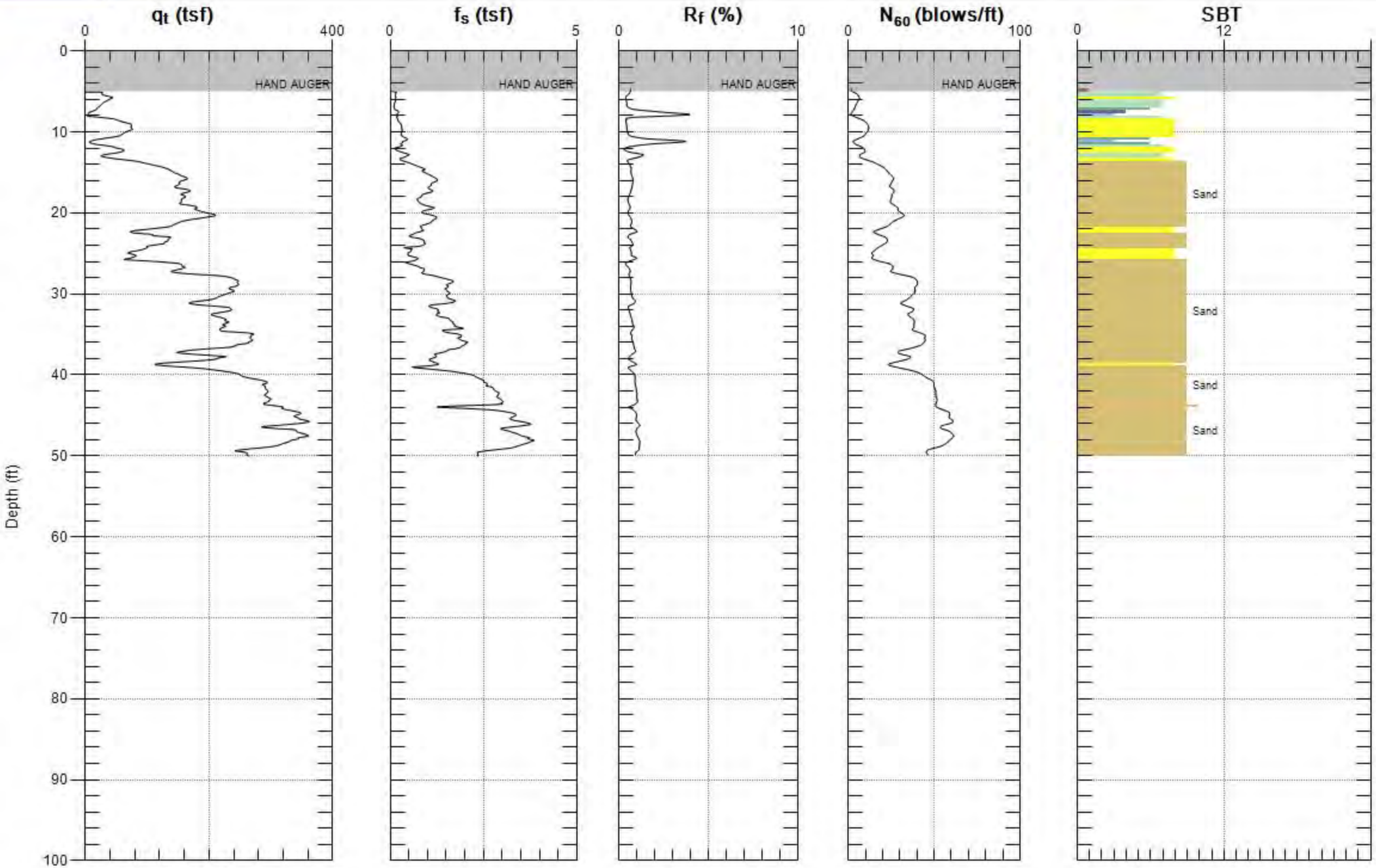


Max. Depth: 46.752 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-15
Engineer: G. SPAULDING
Date: 10/6/2008 08:15

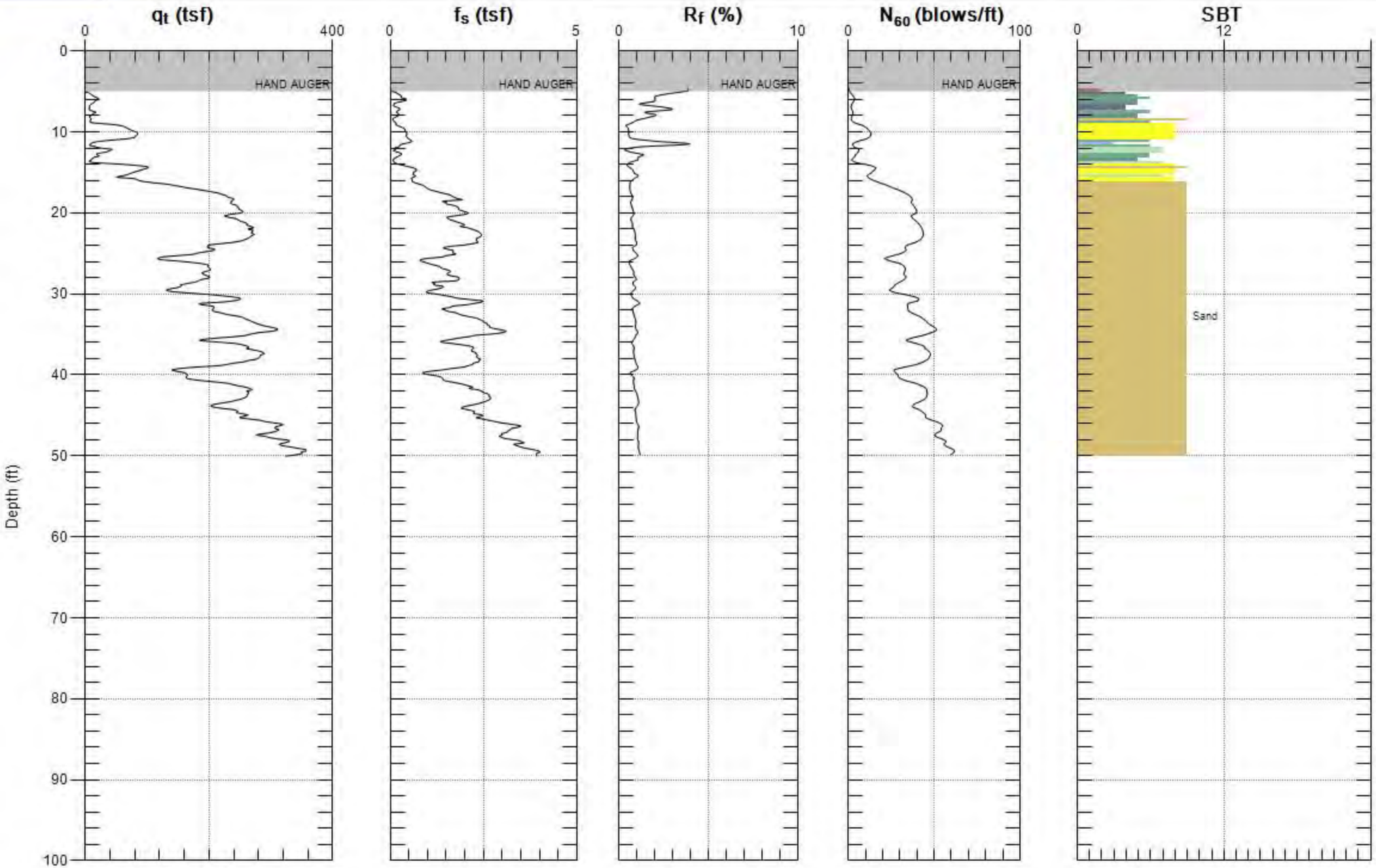


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-16
Engineer: G. SPAULDING
Date: 10/6/2008 08:40

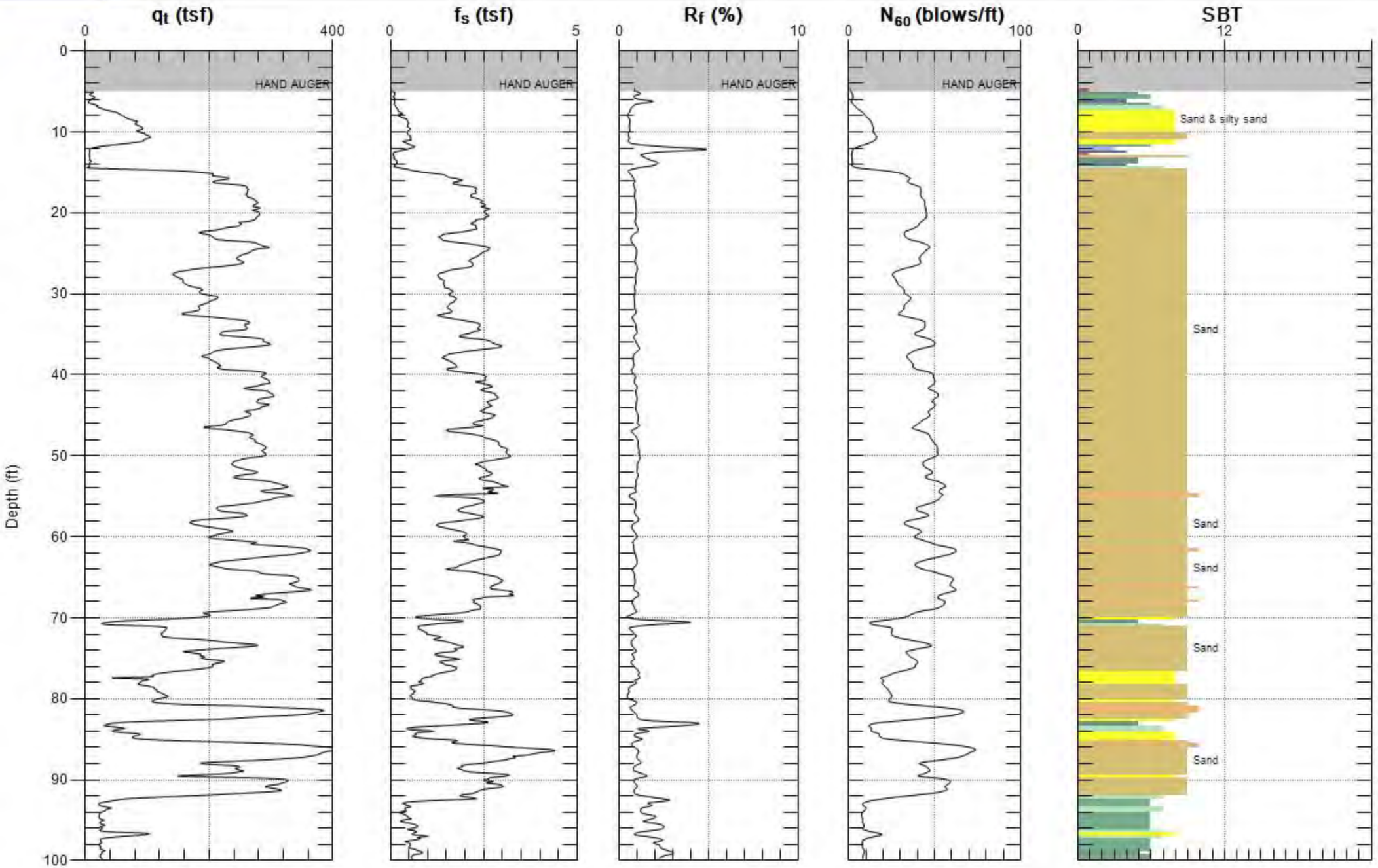


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-17
Engineer: G. SPAULDING
Date: 10/6/2008 09:44

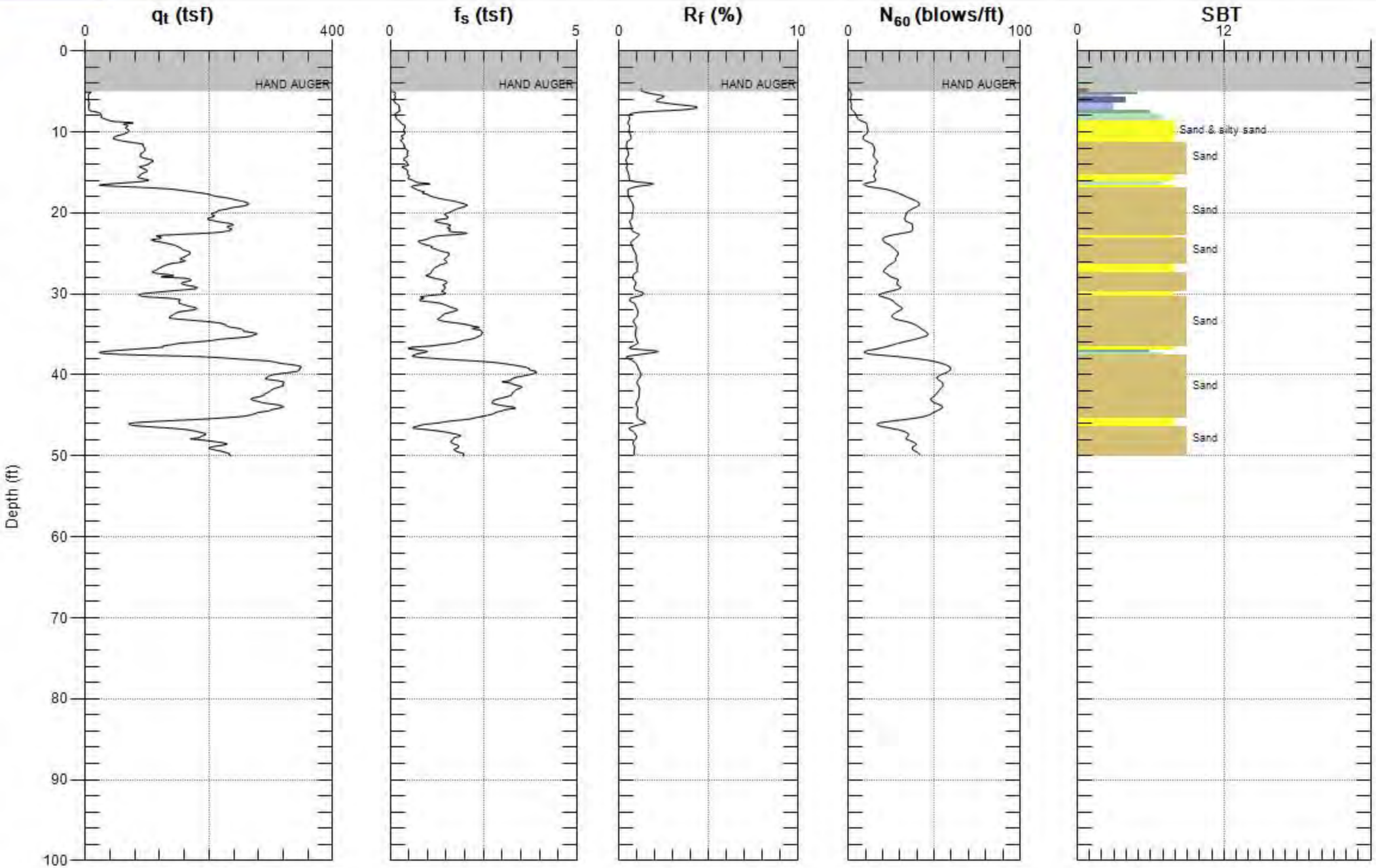


Max. Depth: 100.066 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-18
Engineer: G. SPAULDING
Date: 10/6/2008 10:51

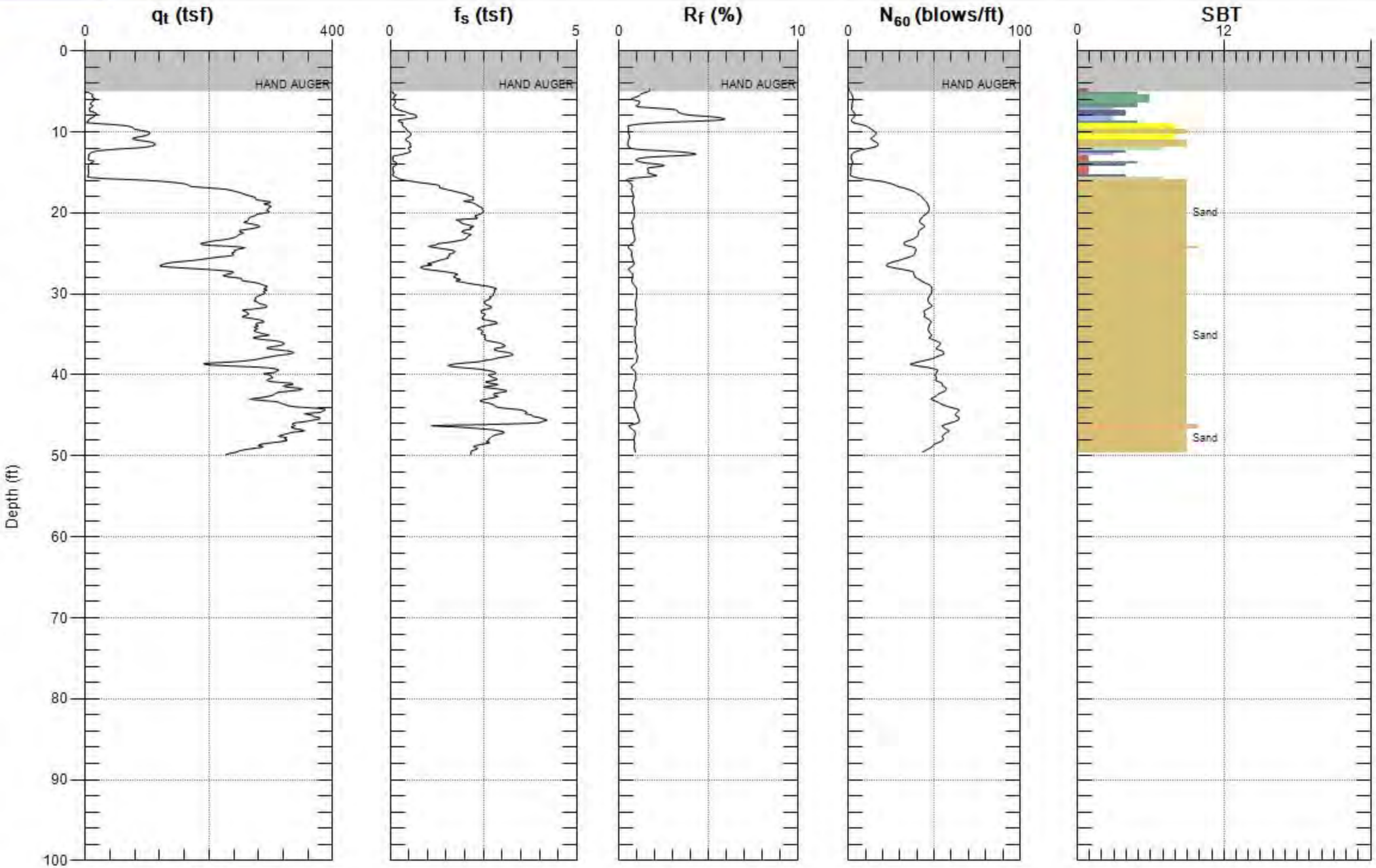


Max. Depth: 50.033 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

TERRA COSTA

Site: BUENA VISTA LAGOON
Sounding: CPT-19
Engineer: G. SPAULDING
Date: 10/6/2008 11:11



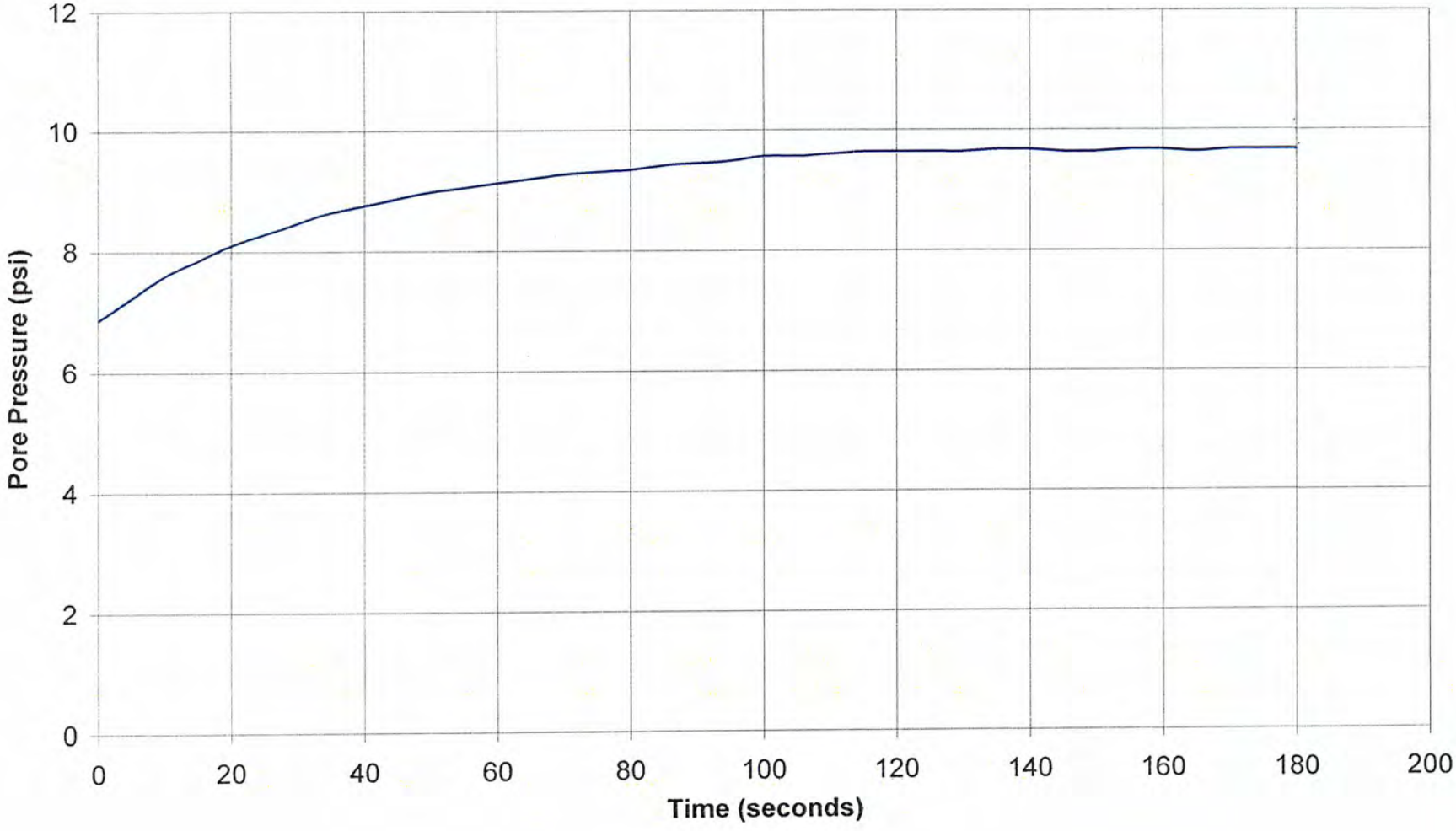
Max. Depth: 49.869 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

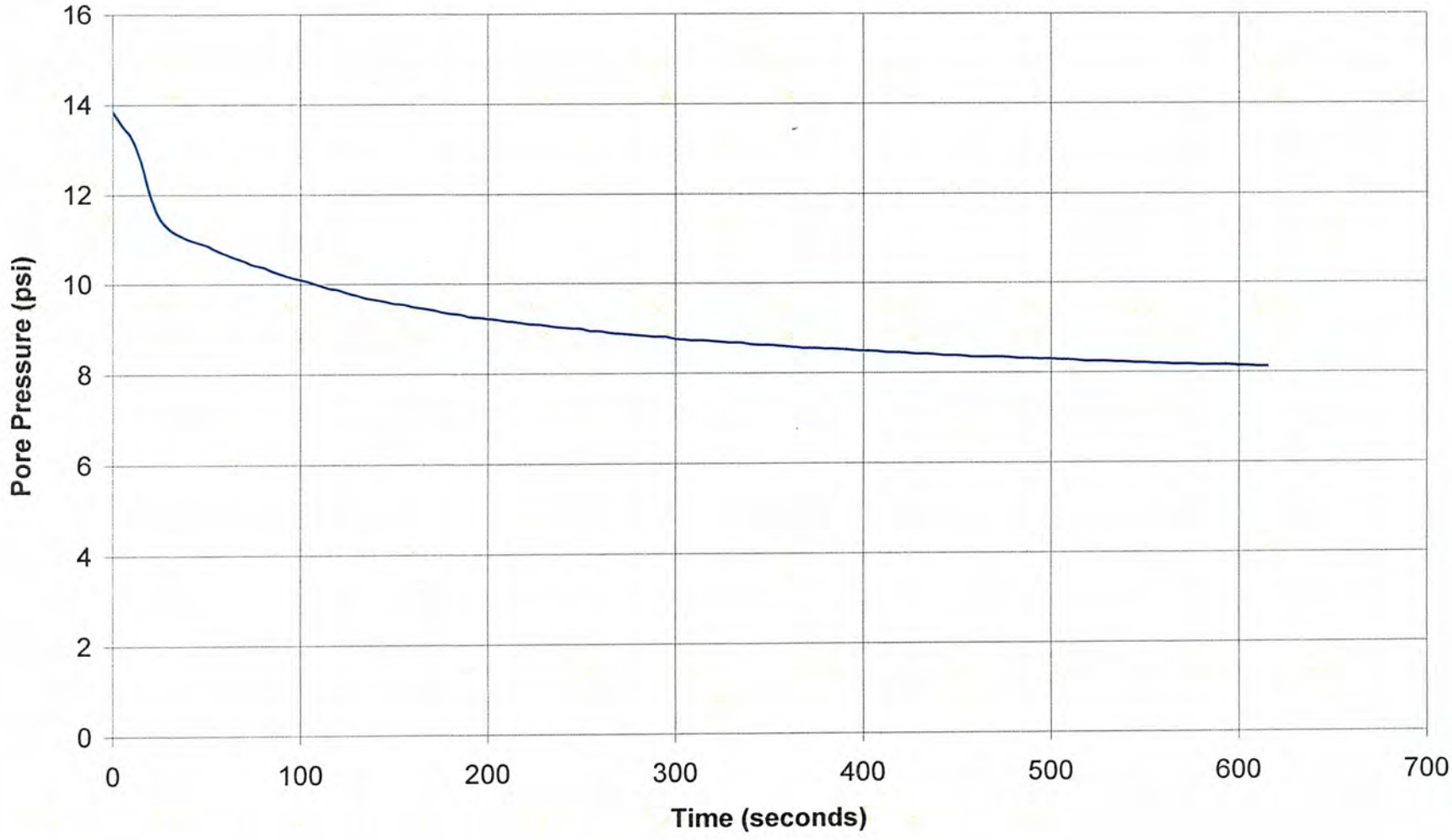
Sounding: CPT-02
Depth: 23.786
Site: BUENA VISTA
Engineer: G. SPAULDING



GREGG DRILLING & TESTING

Pore Pressure Dissipation Test

Sounding: CPT-19
Depth: 21.161
Site: BUENA VISTA
Engineer: G. SPAULDING



TERRACOSTA CONSULTING GROUP VIBRACORE LOGS
(CURRENT INVESTIGATION)

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** LEGEND
SITE LOCATION Buena Vista Lagoon (east)	**START** 9/30/2008	**FINISH** 10/3/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 20	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						

5

10

15

KEY TO EXCAVATION LOGS

SAMPLE TYPE

"Plastic Bag"- A disturbed, but representative sample obtained from a specific depth interval placed in a small sealable plastic bag.

NOTES ON FIELD INVESTIGATION

Vibracore sampling was performed from a pontoon barge by TEG Oceanographic Services for environmental testing by SAIC. The vibracore sampling was completed using a 4-inch-diameter, 10- to 13-foot-long electric vibracore. Vibracores were logged by a Registered Geologist from TerraCosta Consulting Group, and cores selectively sampled for geotechnical laboratory testing.

Classifications are based upon the Unified Soil Classification System and include color, moisture, and consistency. Field descriptions have been modified to reflect results of laboratory inspection where deemed appropriate.

NOTE: VIBRACORE BORING NO. V-I5-01 WAS NOT DRILLED, DUE TO INACCESSIBLE LOCATION.

TerraCosta Consulting Group, Inc.
4455 Murphy Canyon Road, Suite 100
San Diego, California 92123

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-1

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** **V-I5-02**
SITE LOCATION Buena Vista Lagoon (east)	**START** 9/30/2008	**FINISH** 9/30/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7.66	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Silty CLAY to Clayey SILT (CL-ML)** very soft, dark gray-black, saturated, some organics, less flocculated with depth; gradational to:
			2						**Silty CLAY (CL-CH)** very soft to soft, dark gray-black with occasional dark brownish-gray (to ±3/4"), saturated, occasional orgnic-rich laminae, fairly uniform texture, more consolidated with depth.
5			3						
			4						**Silty to Very Fine Sandy CLAY (CI-CH)** soft, dark brownish gray, wet to saturated, micaceous. *Total Length of Core: 7.66 feet*
10									
15									

TCG_METRIC_LOG(3) 2615-02.GPJ GDCLOGMT.GDT 11/7/08

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San Diego, California 92123

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-2

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-03
SITE LOCATION Buena Vista Lagoon (east)	**START** 9/30/2008	**FINISH** 9/30/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Silty CLAY to Clayey SILT (CL-ML)** very soft, dark gray-black saturated, less flocculated with depth; gradational to:
			2						**Silty CLAY (CL-CH)** very soft to soft, dark gray-black, saturated, fairly uniform texture.
			3						**Silty CLAY to Clayey SILT (CL-ML)** soft, dark brownish gray, wet, fairly uniform texture.
5			4						**Silty Fine SAND (SM)** medium dense, red-brown, moist, micaceous.
			5						**Silty CLAY (CL-CH)** firm olive-gray, moisst, less silty than layer above, shells (clam-like) in upper few inches.
									Total Length of Core: 7.0 feet
10									
15									

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FIGURE A-3

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-04
SITE LOCATION Buena Vista Lagoon (east)	**START** 9/30/2008	**FINISH** 9/30/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7.58	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS
									Silty CLAY to Clayey SILT (CL-ML) very soft, dark gray-black, saturated, minor organics, less flocculated with depth; gradational to:
			1						**Silty CLAY (CL-CH)** very soft to soft, dark gray-black, saturated, occasional organic fragment, fairly uniform texture.
			2						
			3						**Silty CLAY (CL-CH)** soft dark gray-black, moist to wet.
5									
									Silty CLAY (CL-CH) soft, olive-gray, moist, shell (turitella); less silty than above layer.
			4						**Silty Fine SAND (SM)** medium dense, red-brown, moist, micaceous.
			5						**Silty CLAY (CL-CH)** soft to firm, olive-gray, moist, less silty than layer at 4 to 5.17 feet, similar to layer at 5.2 to 5.83 feet.
									Total Length of Core: 7.58 feet
10									
15									

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FIGURE A-4

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-05
SITE LOCATION Buena Vista Lagoon (east)	**START** 9/30/2008	**FINISH** 9/30/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 8.5	**GROUND ELEV (ft)**	**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**			

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft to soft, dark brownish-gray, saturated, less flocculated with depth, slight sulfurous odor; gradational to:
									Silty CLAY to Clayey SILT (CL-ML) soft, dark gray-black, wet to saturated, fairly uniform texture.
5			2						
			3						**Silty Very Fine to Fine SAND (SM)** medium dense, mottled orange-brown and olive-gray, wet to saturated, less silt with depth, more "coarse" grain size (to fine) with depth.
			4						**Silty CLAY (CL-CH)** soft to firm, olive-gray, wet, shells in upper 4 inches.
10									*Total Length of Core: 8.5 feet*
15									

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FIGURE A-5

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-06
SITE LOCATION Buena Vista Lagoon (east)	**START** 9/30/2008	**FINISH** 9/30/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 8	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a	**NOTES**	

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Silty CLAY to Clayey SILT (CL-ML)** very soft, dark gray-black, saturated, uniform texture, slight sulfur odor; transitional from 3 to 4 feet, grades to:
			2						**Silty CLAY (CL-CH)** soft to firm (with depth), dark gray-black, wet to saturated.
5			3						**Silty Very Fine SAND (SM)** loose to medium dense, mottled orange-brown and olive-gray, wet, micaceous, orange iron-oxide stained.
			4						**Silty CLAY to Clayey SILT (CCL-ML)** soft to firm (with depth), dark gray, moist to wet.
									Total Length of Core: 8 feet
10									
15									

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FIGURE A-6

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-07
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/1/2008	**FINISH** 10/1/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 10.5	**GROUND ELEV (ft)**	**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a
SAMPLING METHOD Vibracore plastic sleeve	**NOTES** *Disturbed because of difficult retrieval.		

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS
									Silty CLAY (CL-CH) very soft, gray-black, saturated, organics and organic odor.
									Silty CLAY (CL-CH) very soft to soft, gray-black, wet to saturated, becomes more firm at 2.8 feet, minor organics.
			1						
			2						**Silty Very Fine SAND (SM-ML)** medium dense, mottled olive-gray with yellowish-brown stringers (iron oxide staining), moist to wet, micaceous, becomes less silty with depth.
5									
			3						**Very Fine Sandy and Clayey SILT (ML-MH)** soft to firm, olive-gray, moist to wet, fairly uniform texture.
			4						**Silty Fine SAND (SM-SP)** medium dense, mottled olive-gray and yellowish-brown, moist, micaceous.
10			5						**Silty Very Fine SAND (SM-ML)** medium dense, dark olive-gray, moist, micaceous.
									Total Length of Core: 10.5 feet
15									

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FIGURE A-7

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-08
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/1/2008	**FINISH** 10/1/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 6	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft, olive-gray, saturated, less flocculated with depth; gradational to:
			2						**Silty CLAY (CL-CH)** very soft to soft, dark olive-gray, saturated, with black organics.
			3						**Silty CLAY (CL-CH), soft, olive-gray, moist to wet, with very occasional fine sand grains, fairly uiform texture.**
			4						**Clayey Fine to Medium SAND (SC)** medium dense, olive-gray, wet.
			5						**Silty CLAY (CL-CH)** soft, olive-gray with dark olive-gray, laminae and cross laminae.
5			6						**Clayey SILT to Silty CLAY (CL-ML)** soft, dark grayish-black, wet, (not really any organic odor), black organics?
			7						**Fine to Medium SAND (SP)** gray, medium dense to dense, moist, "beach sand" appearance, micaceous. *Total Length of Core: 6.0 feet*
10									
15									

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FIGURE A-8

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-09
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/2/2008	**FINISH** 10/2/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 5.5	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft, olive-gray, saturated, organics, less flocculated with depth.
			2						**Silty CLAY (CL-CH)** very soft, olive-gray, saturated, organics.
			3						**Fine Sandy CLAY (CL-CH)** soft, olive-gray, wet to saturated.
			4						**Silty SAND (SM-SP)** medium dense, olive-gray, wet, micaceous, less silt with depth. - Mottled with orange iron oxide staining at 2.6 to 3.6 feet.
5									**Silty Very Fine SAND (SM-ML)** medium dense, dark olive-gray, moist to wet, micaceous. *Total Length of Core: ±5.5 feet.*
10									
15									

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FIGURE A-9

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-10
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/2/2008	**FINISH** 10/2/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 6.08	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a		

NOTES *Most odoriferous of project core.

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS
									Silty CLAY (CL-CH) very soft, olive-gray, saturated, organics, less flocculated with depth, distinctorganic odor.
			1						**Silty CLAY (CL-CH)** very soft, olive-gray, saturated, organics.
			2						**Silty Fine SAND (SM)** loose to medium dense, dark gray, wet.
			3						**Silty Fine SAND (SP)** medium dense, dark gray, moist to wet, less silt with depth, laminae of alternating lighter and darker sand (though texture is fairly uniform), "beach sand" appearance.
5			4						
									Total Length of Core: 6.08 feet
10									
15									

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FIGURE A-10

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-11
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/2/2008	**FINISH** 10/2/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7.17	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft, dark olive-gray, saturated, less flocculated with depth, organics, organic odor.
			2						**Silty CLAY (CL-CH)** very soft, dark olive-gray, saturated.
									Very Fine Sandy to Clayey SILT (ML-MH) soft, olive-gray, saturated, micaceous.
									Silty Very Fine to Fine SAND (SM-SP) medium dense, dark gray, wet, micaceous.
5			3 4						**Silty CLAY (CL-CH)** soft to firm, dark olive-gray, wet.
									Silty Fine SAND (SM-SP) medium dense, dark gray, wet, micaceous. - Shell (clam) at 6.5 feet
									Total Length of Core: ±7.17 feet.
10									
15									

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FIGURE A-11

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-12
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/2/2008	**FINISH** 10/2/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7.33	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft, (flocculated), grayish-brown, saturated, some minor sand grains, less flocculated with depth.
			1						
			2						**Silty CLAY (CL-CH)** very soft to soft, grayish brown, saturated.
									Slightly Silty Fine SAND (SM-SP) loose to medium dense, grayish-brown, mottled with black organics? and orange iron oxidfe staining, saturated, less silt with depth, micaceous, more "beach sand" appearance with depth.
			3						
5			4						
			5						**Silty Very Fine SAND (SM)** medium dense, brownish-gray, saturated, micaceous.
									Total Length of Core: ±7.33 feet
10									
15									

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FIGURE A-12

LOG OF TEST BORING

PROJECT NAME	PROJECT NUMBER	BORING
BUENA VISTA LAGOON	2615-02	**V-I5-13**

SITE LOCATION	START	FINISH	SHEET NO.
Buena Vista Lagoon (east)	10/3/2008	10/3/2008	1 of 1

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
TEG/Shallow Draft Barge	Vibracore	S. Tanges	

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUND WATER (ft)
Vibracore	4	8		▼ n/a

SAMPLING METHOD
Vibracore plastic sleeve

NOTES

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft, brownish gray, saturated, with organics.
			1						**Silty Very Fine SAND (SM-SP)** medium dense, olive-gray with black organic mottling, saturated, micaceous.
			2						**Slightly Silty Fine SAND (SM-SP)** loose, brownish-gray, saturated, less silt with depth, micaceous.
5									From 4.3 to 6.5 feet: Alternating layers of **Clayey SILT to Silty CLAY (ML-CL)**, soft, olive-gray with some brown mottling, wet to saturated, and **Silty Very Fine SAND (SM)** loose, olive-gray, saturated, micaceous.
			3						
			4						**Silty Fine SAND (SM)** medium dense, olive-gray, wet to saturated, micaceous.
									Total Length of Core: 8.0 feet
10									
15									

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FIGURE A-13

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-14
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/3/2008	**FINISH** 10/3/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7.66	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a	**NOTES**	

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			1						LAGOON DEPOSITS **Clayey SILT (ML-MH)** very soft, olive-gray, saturated, organics, some very fine-grained sand particles.
			2						**Clayey to Silty Very Fine SAND (SM-SC)** loose to medium dense, olive-gray, saturated, micaceous.
5			3						**Slightly Silty Fine SAND (SM-SP)** medium dense, dark gray, wet, micaceous, fairly uniform texture, slight hints of occasional dark mineral laminae.
			4						*Total Length of Core: ±7.66 feet*
10									
15									

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FIGURE A-14

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-15
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/3/2008	**FINISH** 10/3/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 5	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**NOTES** Difficult penetration per J. Evans (SAIC rep)		**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS
			1						**Silty CLAY (CL-CH)** very soft, dark olive-gray, saturated, organics, less flocculated with depth.
									Silty Fine SAND (SM-SP) loose to medium d3ense, dark gray, saturated, micaceous, slight decrease in silt with depth.
			2						
			3						
5									- Dark gray-black organic layering at end of core, organic odor in sand.
									Total Length of Core: ±5.0 feet
10									
15									

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FIGURE A-15

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** V-I5-16
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/3/2008	**FINISH** 10/3/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7.9	**GROUND ELEV (ft)**	**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a
SAMPLING METHOD Vibracore plastic sleeve	**NOTES**			

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS
									Silty CLAY (CL-CH) very soft, dark olive-gray, saturated.
			1						**Silty CLAY to Clayey SILT (CL-ML)** very soft, brownish olive-gray, saturated, less flocculated with depth.
			2						
5			3						**Slightly Silty Fine to Medium SAND (SM-SP)** medium dense, dark gray, saturated, shells, fairly uniform texture, micaceous.
			4						
			5						**Silty CLAY (CL-CH)** soft, olive-gray, wet, some dark gray mottling.
									Silty Very Fine SAND (SM-ML) medium dense, dark olive-gray, saturated, micaceous, minor organics.
									Total Length of Core: 7.9 feet
10									
15									

TerraCosta Consulting Group, Inc.
4455 Murphy Canyon Road, Suite 100
San Diego, California 92123

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-16

LOG OF TEST BORING

PROJECT NAME	PROJECT NUMBER	BORING
BUENA VISTA LAGOON	2615-02	**V-I5-17**

SITE LOCATION	START	FINISH	SHEET NO.
Buena Vista Lagoon (east)	10/4/2008	10/4/2008	1 of 1

DRILLING COMPANY	DRILLING METHOD	LOGGED BY	CHECKED BY
TEG/Shallow Draft Barge	Vibracore	S. Tanges	

DRILLING EQUIPMENT	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GROUND WATER (ft)
Vibracore	4	5.5		▼ n/a

SAMPLING METHOD
Vibracore plastic sleeve

NOTES
*Drilled on Oct 4, logged on Oct 10; core disturbed in transport (judgment on moisture & dept

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft, olive-gray, saturated (flocculated).
									Silty CLAY (CL-CH) very soft, olive-gray, saturated, organics.
		■	1						**Clayey SILT (ML-MH)** soft, olive-gray, wet?, some very fine-grained sand, fairly uniform texture.
		■	2						**Sandy to Clayey SILT (ML-MH)** soft, dark olive-gray, moist?, some fine-grained sand, occasional shell fragments, less clay than above silt layer.
5		■	3						**Slightly Silty Fine to Medium SAND (SM-SP)** medium dense, gray-black, moist?, micaceous, upper 6 inches shell fragments.
									Total Length of Core: ±5.5 feet
10									
15									

TCG_METRIC_LOG(3) 2615-02.GPJ GDCLOGMT.GDT 11/7/08

TerraCosta Consulting Group, Inc.
4455 Murphy Canyon Road, Suite 100
San Diego, California 92123

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-17

LOG OF TEST BORING

PROJECT NAME BUENA VISTA LAGOON		**PROJECT NUMBER** 2615-02	**BORING** **V-I5-18**
SITE LOCATION Buena Vista Lagoon (east)	**START** 10/4/2008	**FINISH** 10/4/2008	**SHEET NO.** 1 of 1
DRILLING COMPANY TEG/Shallow Draft Barge	**DRILLING METHOD** Vibracore	**LOGGED BY** S. Tanges	**CHECKED BY**
DRILLING EQUIPMENT Vibracore	**BORING DIA. (in)** 4	**TOTAL DEPTH (ft)** 7	**GROUND ELEV (ft)**
SAMPLING METHOD Vibracore plastic sleeve	**DEPTH/*ELEV.* GROUND WATER (ft)** ▼ n/a		

NOTES *Drilled on Oct 4, logged on Oct 10; core disturbed in transport (judgment on moisture & dept

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS/ft)	DRY DENSITY (pcf)	MOISTURE (%)	OTHER TESTS	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
									LAGOON DEPOSITS **Silty CLAY (CL-CH)** very soft, dark brownish-gray, saturated (flocculated).
			1						**Silty CLAY (CL-CH)** very soft to soft, dark brownish-gray, wet to saturated.
									Slightly Silty fine to medium SAND (SP) medium dense, gray, moist?, micaceous, "beach sand" appearance, slight odor (diesel).
			2						
5									
			3						**Silty CLAY (CL-CH)** soft to firm, laminations of olive-gray, gray-black, and grayish brown, moist?, slight odor (diesel) to strong odor. - 1/2-inch laminae of **Silty Fine SAND**, medium dense, grayish-brown, moist.
			4						- 1/8-inch laminae of **Silty Very Fine SAND to Sandy SILT**, medium dense, grayish-brown, moist. *Total Length of Core: ±7.0 feet*
10									
15									

TCG_METRIC_LOG(3) 2615-02.GPJ GDCLOGMT.GDT 11/7/08

TerraCosta Consulting Group, Inc.
4455 Murphy Canyon Road, Suite 100
San Diego, California 92123

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-18

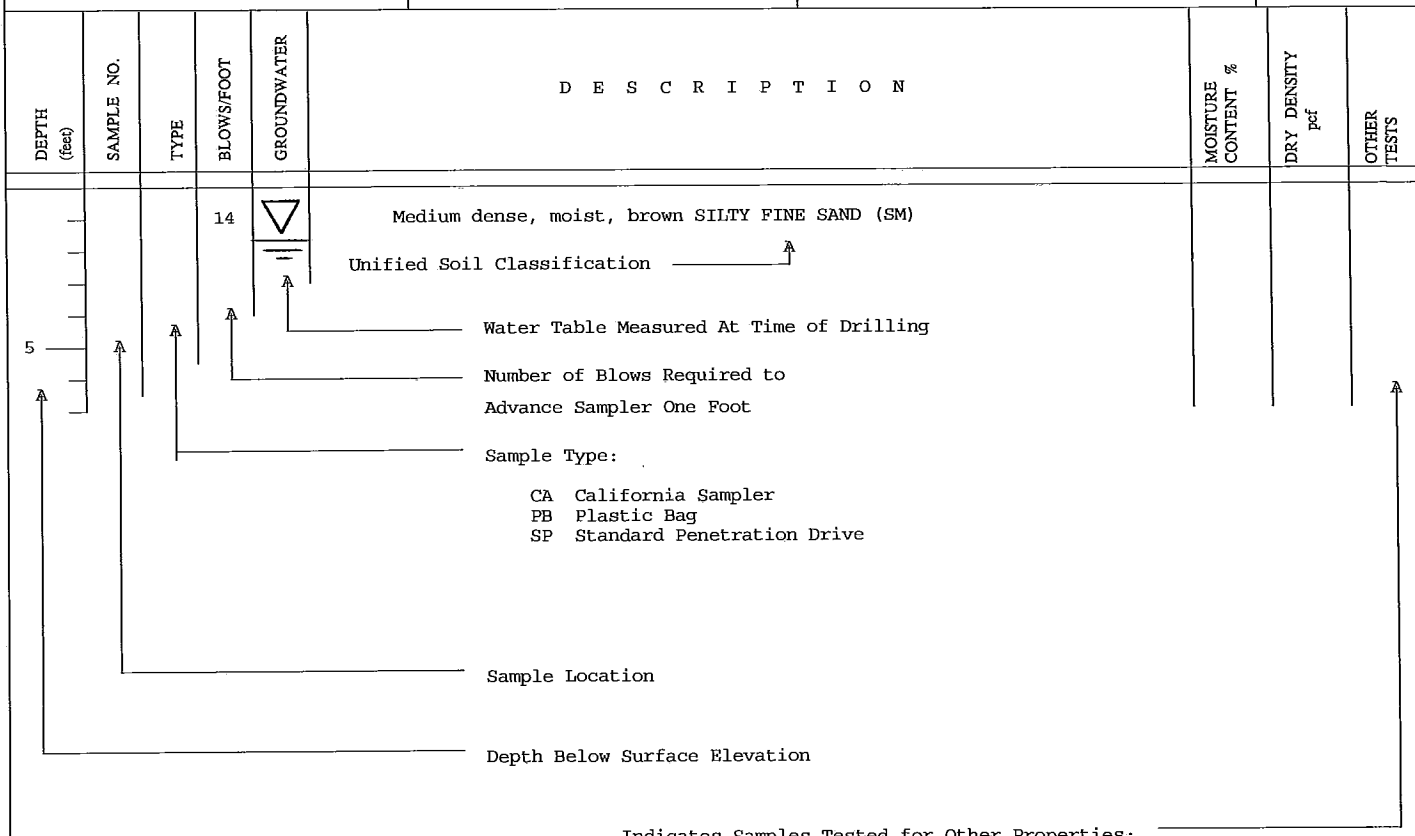
GROUP DELTA CONSULTANTS BORING LOGS

(1999)

TerraCosta Consulting Group

K E Y T O E X C A V A T I O N L O G S

LOGGED BY:	DATE DRILLED:	BORING ELEVATION:	BORING NO.:
DRILL RIG:	BORING DIAMETER:	HAMMER WT.: DROP:	



N O T E S O N F I E L D I N V E S T I G A T I O N

1. Borings were advanced using a truck-mounted Mobile B-61 drill rig with an 8-inch-diameter, continuous-flight, hollw-stem auger, a tripod-mounted, hydraulically-operated Pacific "Beaver" drill rig, with a 6-inch-diameter solid-stem auger, or a small, manually operated 2½-inch-diameter hand auger.

2. The Standard Penetration Test (SPT) and California (CA) samplers were used to obtain soil samples. The samplers were driven into the soil at the bottom of the borings with a 140-pound hammer falling 30 inches. When the samplers were withdrawn from the boring, the sample was removed, visually classified, sealed in plastic containers, and taken to the laboratory for testing.

   The Standard Penetration Test (SPT) is an 18-inch-long, 2-inch O.D., 1-3/8-inch I.D. drive sampler.

   The California Sampler is an 18-inch-long, 2½-inch I.D., 3-inch O.D., thick-walled sampler. The sampler is lined with eighteen 2-3/8-inch I.D. brass rings. Relatively undisturbed, intact soil samples are retained in the brass rings.

3. Free groundwater was encountered in some excavations, as shown on the logs.

4. Classifications are based upon the Unified Soil Classification System and include color, moisture, and consistency. Field descriptions have been modified to reflect results of laboratory inspection where deemed appropriate.

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	B U E N A V I S T A L A G O O N	FIGURE NO.: A - 1

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/3/99	BORING ELEVATION: 10.0 feet (MSLD)	BORING NO.: B - 1
DRILL RIG: Tripod Auger	BORING DIAMETER: 6 inches	HAMMER WT.: 140 lbs. DROP: 30 inches	

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
1	1A	PB			Wet, dark brown SILTY CLAY with some SAND (CH-MH) FILL			
1	1	SP	Push	▽	Wet, olive-gray SILTY CLAY (CH) AND SAND	51.5		PI SA
5	2	SP	Push					
8					poor recovery			
9	3	SP	2		Soft, wet, olive-brown SILTY TO FINE SANDY CLAY (CL-CH) with some organic materials ALLUVIUM			
13	4	SP	8		Soft, wet, olive-brown-gray FINE SANDY SILT (ML-MH)			
17	5	SP	10		Loose to medium dense, wet, gray SILTY VERY FINE SAND (SM)			
20					with shell fragments			
	6	SP	22					

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 2a

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/3/99	BORING ELEVATION: 10.0 feet (MSLD)	BORING NO.:
DRILL RIG: Tripod Auger	BORING DIAMETER: 6 inches	HAMMER WT.: 140 lbs. DROP: 30 inches	B - 1

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
	6	SP	22		Loose to medium dense, wet, gray SILTY VERY FINE SAND (SM) ALLUVIUM			
21					BOTTOM OF BORING at 21 feet			
					Groundwater encountered at 1.5 feet at time of drilling			
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 2b

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/3/99	BORING ELEVATION: 6.5 feet (MSLD)	BORING NO.:
DRILL RIG: Tripod Auger	BORING DIAMETER: 6 inches	HAMMER WT.: 140 lbs. DROP: 30 inches	B - 2

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
	1A	PB			Moist, light brown SANDY CLAY TO CLAYEY SAND (CL-SC) FILL			
1	1	SP	6	▽	Moist, light olive-gray CLAYEY SAND WITH SOME MEDIUM SAND (SC), high percentage of organic materials			
2					Moist, dark gray SILTY SAND AND FINE SAND (SW-SC)			
3								
4					poor recovery			
5	2	SP	5		Wet, dark gray-brown SILTY SAND (SW-SC), with medium gravel			
6								
7					Soft, wet, gray-brown SILTY CLAY (CH), with organic material ALLUVIUM			
8								
9	3	SP	3		Soft, wet, gray-brown SILTY CLAY (CH), with organic materials	55.0		SA
10								
11								
12								
13	4	SP	4		Soft, wet, olive-gray-brown SILTY CLAY (CH), with trace of FINE SAND			
14								
15								
16								
17	5	SP	8		Loose to medium dense, wet, olive-gray-brown, SILTY MEDIUM TO FINE SAND (SP-SM), with shells and shell fragments	23.5		SA
18								
19					BOTTOM OF BORING at 18 feet Groundwater encountered at 1.5 feet at time of drilling			
20								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 3

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: **A. Choriego**	DATE DRILLED: **9/3/99**	BORING ELEVATION: **9.6 feet (MSLD)**	BORING NO.: **B - 3**
DRILL RIG: **Tripod Auger**	BORING DIAMETER: **6 inches**	HAMMER WT.: **140 lbs.** DROP: **30 inches**	

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
1	1A	PB			Dry to moist, light red-brown SILTY SAND (SM), with some organic materials — FILL			
1	1	SP	4	▽				
2								
3								
4					↓ increasing FINE TO MEDIUM SAND (SM)			
5	2	SP	8					
6								
7								
8								
9	3	SP	12		Loose to medium dense, wet, gray-brown SILTY FINE SAND (SM), micaceous — ALLUVIUM	47.7		SA
10								
11								
12								
13	4	SP	10					
14								
15								
16								
17	5	SP	24		↓ with shells and shell fragments (SP)	27.9		SA
18								
19								
20								
	6	SP	21					

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: **1911**	**B U E N A V I S T A L A G O O N**	FIGURE NO.: **A - 4a**

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/3/99	BORING ELEVATION: 9.6 feet (MSLD)	BORING NO.:
DRILL RIG: Tripod Auger	BORING DIAMETER: 6 inches	HAMMER WT.: 140 lbs. DROP: 30 inches	B - 3

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
	6	SP	21		Loose to medium dense, wet, gray-brown SILTY FINE SAND (SM), micaceous — ALLUVIUM			
21					BOTTOM OF BORING at 21 feet			
22					Groundwater encountered at 2 feet at time of drilling			
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 4b

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: **A. Choriego**	DATE DRILLED: **9/7/99**	BORING ELEVATION: **7.0 feet (MSLD)**	BORING NO.: **B - 4**
DRILL RIG: **Tripod Auger**	BORING DIAMETER: **6 inches**	HAMMER WT.: **140 lbs.** DROP: **30 inches**	

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
	1	PB			Moist, brown CLAYEY SAND (SC) — FILL			
1	2	SP	Push		poor recovery			
2				▽	becoming wet			
3								
4								
5	3	SP	2		Loose to medium dense, wet, olive-brown SILTY MEDIUM-FINE SAND (SM), with some gravel — ALLUVIUM			
6								
7								
8								
9	4	SP	8		Firm, wet, gray SILTY CLAY (CH)			
10					Medium dense, wet, olive-gray SILTY TO CLAYEY FINE SAND (SC)			
11								
12								
13	5	SP	11					
14								
15								
16								
17	6	SP	6		Medium dense, wet, gray FINE SAND (SP), with abundant shell fragments			
18								
19								
20								
	7	SP	24					

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: **1911**	**B U E N A V I S T A L A G O O N**	FIGURE NO.: **A - 5a**

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/7/99	BORING ELEVATION: 7.0 feet (MSLD)	BORING NO.:
DRILL RIG: Tripod Auger	BORING DIAMETER: 6 inches	HAMMER WT.: 140 lbs. DROP: 30 inches	B - 4

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
	7	SP	24		Medium dense, wet, gray FINE SAND (SP), with abundant shell fragments — ALLUVIUM			
21					BOTTOM OF BORING at 21 feet			
					Groundwater encountered at 2 feet at time of drilling			
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 5b

GROUP DELTA CONSULTANTS, INC.
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B O R I N G L O G

LOGGED BY: **A. Choriego**	DATE DRILLED: **9/7/99**	BORING ELEVATION: **6.5 feet (MSLD)**	BORING NO.: **B - 5**
DRILL RIG: **Tripod Auger**	BORING DIAMETER: **6 inches**	HAMMER WT.: **140 lbs.** DROP: **30 inches**	

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
1	1	PB			Dry, light brown CLAYEY SAND (SC), with cobbles (1½" to 2") FILL			
	2	SP	2	▽				
2					Loose, wet, gray SILTY SAND (SM) ALLUVIUM			
3								
4								
5	3	SP	2					
6								
7								
8								
9	4	SP	10					
10								
11								
12								
13	5	SP	31		Dense, wet, light gray FINE SAND (SP)			
14								
15								
16								
17	6	SP	35		no sample recovery			
18					BOTTOM OF BORING at 17.5 feet Groundwater encountered at 1.5 feet at time of drilling			
19								
20								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: **1911**	**B U E N A V I S T A L A G O O N**	FIGURE NO.: **A - 6**

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/8/99	BORING ELEVATION: 9.4 feet (MSLD)	BORING NO.:
DRILL RIG: Mobile B-61	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 lbs. DROP: 30 inches	B - 6

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
1					Damp, brown SILTY FINE SAND (SM) FILL			
2	1	SP	9					
3								
4				▽	Very loose, wet, gray SILTY FINE SAND (SM) ALLUVIUM			
5								
6	2	SP	1					
7								
8								
9								
10					Medium dense, wet, gray SILTY FINE SAND (SM-SP)			
11	3	CA	29			93.6		SA PI
12								
13								
14								
15								
16	4	SP	1		Soft, wet, light olive-gray SILTY CLAY (CH)			
17								
18								
19								
20					Medium dense to dense, wet, light gray FINE SAND (SP),			
	5	SP	32		with shell fragments			

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BURNA VISTA LAGOON	FIGURE NO.: A - 7a

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/8/99	BORING ELEVATION: 9.4 feet (MSLD)	BORING NO.:
DRILL RIG: Mobile B-61	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 lbs. DROP: 30 inches	B - 6

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
21	5	SP	32		Medium dense to dense, wet, light gray FINE SAND (SP), with shell fragments — ALLUVIUM			
22								
23								
24								
25								
26	6	SP	29			28.7		SA
27								
28								
29								
30								
31	7	SP	57					
32					BOTTOM OF BORING at 31.5 feet Groundwater encountered at 4.5 feet at time of drilling			
33								
34								
35								
36								
37								
38								
39								
40								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 7b

B O R I N G L O G

LOGGED BY: **A. Choriego**	DATE DRILLED: **9/8/99**	BORING ELEVATION: **9.4 feet (MSLD)**	BORING NO.: **B - 7**
DRILL RIG: **Mobile B-61**	BORING DIAMETER: **8" HSA**	HAMMER WT.: **140 lbs.** DROP: **30 inches**	

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
1					Damp, brown SILTY FINE SAND (SM) — FILL			
2	1	SP	12					
3								
4								
5					Loose, wet, gray SILTY FINE SAND (SM-SP) — ALLUVIUM			
6	2	SP	8	▽				
7								
8								
9								
10								
11	3	SP	9		Loose to medium dense, wet, gray FINE SAND (SP)			
12								
13								
14					Dense to very dense, wet, gray FINE SAND (SP)			
15								
16	4	CA	64					
17								
18								
19								
20	5	SP	36		with shell fragments	26.3		SA

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: **1911**	**B U E N A V I S T A L A G O O N**	FIGURE NO.: **A - 8a**

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/8/99	BORING ELEVATION: 9.4 feet (MSLD)	BORING NO.:
DRILL RIG: Mobile B-61	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 lbs. DROP: 30 inches	B - 7

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
21	5	SP	36		Medium dense to dense, wet, gray SILTY FINE SAND (SP), with shell fragments — ALLUVIUM	26.3		SA
22								
23								
24								
25								
26	6	SP	42					
27								
28								
29								
30								
31	7	SP	73					
32					BOTTOM OF BORING at 31.5 feet Groundwater encountered at 6 feet at time of drilling			
33								
34								
35								
36								
37								
38								
39								
40								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 8b

GROUP DELTA CONSULTANTS, INC.
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B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/8/99	BORING ELEVATION: 12.0 feet (MSLD)	BORING NO.: B - 8
DRILL RIG: Mobile B-61	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 lbs. DROP: 30 inches	

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	DESCRIPTION	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
1	1A	PB			Dry, light brown CLAYEY SAND (SC) — FILL			
2	1	SP	23					
3	2	SP	11					
4								
5								
6	3	SP	23	▽	Moist, loose, gray MEDIUM TO FINE SAND (SP) — ALLUVIUM			
7								
8								
9								
10								
11	4	SP	1					
12								
13								
14								
15					↓ becoming dense to very dense with shell fragments			
16	5	CA	84					
17								
18								
19								
20								
	6	SP	Not Rptd					

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	BUENA VISTA LAGOON	FIGURE NO.: A - 9a

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

B O R I N G L O G

LOGGED BY: A. Choriego	DATE DRILLED: 9/8/99	BORING ELEVATION: 12.0 feet (MSLD)	BORING NO.: B - 8
DRILL RIG: Mobile B-61	BORING DIAMETER: 8" HSA	HAMMER WT.: 140 lbs. DROP: 30 inches	

DEPTH (feet)	SAMPLE NO.	TYPE	BLOWS/FOOT	GROUNDWATER	D E S C R I P T I O N	MOISTURE CONTENT %	DRY DENSITY pcf	OTHER TESTS
21	6	SP	Not Rptd		Moist, loose, gray MEDIUM TO FINE SAND (SP) ALLUVIUM with traces of cobble approximately 5 to 10 percent			
22								
23								
24								
25								
26	7	SP	63		with more cobble and 15 percent shell fragments			
27								
28								
29								
30								
31	8	SP	65					
32					BOTTOM OF BORING at 31.5 feet Groundwater encountered at 6 feet at time of drilling			
33								
34								
35								
36								
37								
38								
39								
40								

Descriptions on this boring log apply only at the specific boring location and at the time the boring was made. The descriptions on this log are not warranted to be representative of subsurface conditions at other locations or times.

PROJECT NO.: 1911	B U E N A V I S T A L A G O O N	FIGURE NO.: A - 9b

GROUP DELTA CONSULTANTS, INC.
Engineers and Geologists

GROUP DELTA CONSULTANTS, INC.

TEST BORING NOS. B-9 THROUGH B-21

Boring No.	Boring Elevation (in feet - MSLD)	Soil Description (2.0 to 2.5 feet of depth)	Soil Type
B-9	8.5	Wet, light olive-brown SILTY CLAY-CLAYEY SILT (CH-MH)	Fill
B-10	7.0	Wet, light brown FINE TO MEDIUM SAND (SP)	Fill
B-11	6.0	Loose, wet, light gray-brown SILTY FINE SAND (SM)	Alluvium
B-12	7.0	Loose, wet, light gray-brown CLAYEY FINE SAND (SC)	Alluvium
B-13	7.0	Loose, wet, light gray-brown SILTY FINE TO MEDIUM SAND (SM)	Alluvium
B-14	6.0	Loose, wet, light gray-brown FINE SAND (SP)	Alluvium
B-15	5.5	Wet, brown FINE SANDY CLAY (CL)	Fill
B-16	6.5	Wet, brown FINE SANDY CLAY (CL)	Fill
B-17	7.5	Wet, dark brown-gray SILTY FINE SAND (SM-SP)	Fill
B-18	6.5	Wet, light gray-brown SILTY MEDIUM SAND (SM-SP)	Fill
B-19	6.5	Wet, brown FINE SANDY CLAY (CL)	Fill
B-20	6.0	Wet, brown CLAYEY SILT (MH)	Fill
B-21	7.5	Wet, light brown FINE SANDY SILT (ML)	Fill

GROUP DELTA CONSULTANTS

IRVINE CONSULTING GROUP BORING LOGS

(1997)

TerraCosta Consulting Group

GEOTECHNICAL BORING LOG

Date 9-18-97 Drill Hole No. B-1 Sheet 1 of 2

Project LEVY\CARLSBAD Job No. 971611-1

Drilling Co. TRI-COUNTY DRILLING Type of Rig 35 SIMCO

Hole Diameter 8" Drive Weight _____ Drop _____ in.

Elevation Top of Hole +\- 12' Ref. or Datum SEA LEVEL

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KAR Sampled By _____
0								@0-4' FILL SLIGHTLY SILTY SAND: Tan to Light Grey, Damp to Moist, Loose to Medium Dense
5						▼		@+\- 6' Standing Groundwater
			1	15			SM	@4-23' ALLUVIUM SLIGHTLY SILTY SAND: Light to Medium Grey, Fine Grained, Saturated, Medium Dense to Dense.
10			(1)					
			2	27			SP	
15								
			3	40			SP	
20								@18-20' scattered gravel and shell fragements
			4	41			SP	
25								@23 - 60' SANDSTONE SLIGHTLY SILTY SAND: Light to Medium Grey, Medium to Coarse Grained, Saturated, Dense.
			5	70			SP	
30			(2)					

see sheet 2

FIGURE NO. 5

GEOTECHNICAL BORING LOG

Date 9-18-97 Drill Hole No. B-1 Sheet 2 of 2

Project LEVY\CARLSBAD Job No. 971611-1

Drilling Co. TRI-COUNTY DRILLING Type of Rig 35 SIMCO

Depth Feet	Graphic Log	Attitudes	Tube Sample No	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged By KAR Sampled By
30								@23 – 60' SANDSTONE (cont.):
								SLIGHTLY SILTY SAND: Light to Medium Grey, Medium to Coarse Grained, Saturated, Dense.
35			6	76			SP	
40								
								Firm drilling to bottom of boring
45								
50								
55								
								Total Depth = 60' (depth of hole)
60								

GEOTECHNICAL BORING LOG

Date 9-18-97 Drill Hole No. B-2 Sheet 1 of 2

Project LEVY\CARLSBAD Job No. 971611-1

Drilling Co. TRI-COUNTY DRILLING Type of Rig 35 SIMCO

Hole Diometer 8" Drive Weight _____ Drop _____ in.

Elevation Top of Hole +\- 12' Ref. or Datum SEA LEVEL

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By KAR Sampled By _____
0								@0-5' FILL SLIGHTLY SILTY SAND: Tan to Light Grey, Damp to Moist, Loose to Medium Dense
5						▼		@+\- 6' Standing Groundwater
								@4-21' ALLUVIUM
10			1	17			SM	SLIGHTLY SILTY SAND: Light to Medium Grey, Fine Grained, Saturated, Medium Dense to Dense.
15								
			2	36			SP	
20			3	44			SP	@18-20' scattered gravel and shell fragements
								@21 - 40' SANDSTONE SLIGHTLY SILTY SAND: Light to Medium Grey, Medium to Coarse Grained, Saturated, Dense.
25			(1) 4	73			SP	
30								

see sheet 2

FIGURE NO. 6

GEOTECHNICAL BORING LOG

Date 9-18-97 Drill Hole No. B-2 Sheet 2 of 2

Project LEVY\CARLSBAD Job No. 971611-1

Drilling Co. TRI-COUNTY DRILLING Type of Rig 35-SIMCO

Depth Feet	Graphic Log	Attitudes	Tube Sample No	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								Logged By KAR Sampled By
30								@21 – 40' SANDSTONE (cont.) SLIGHTLY SILTY SAND: Light to Medium Grey, Medium to Coarse Grained. Saturated. Dense.
35								
40			5	85			SP	
								Firm drilling to bottom of boring
45								
50								
55								
								Total Depth = 40' (depth of hole)
60								

CALTRANS BORING LOGS

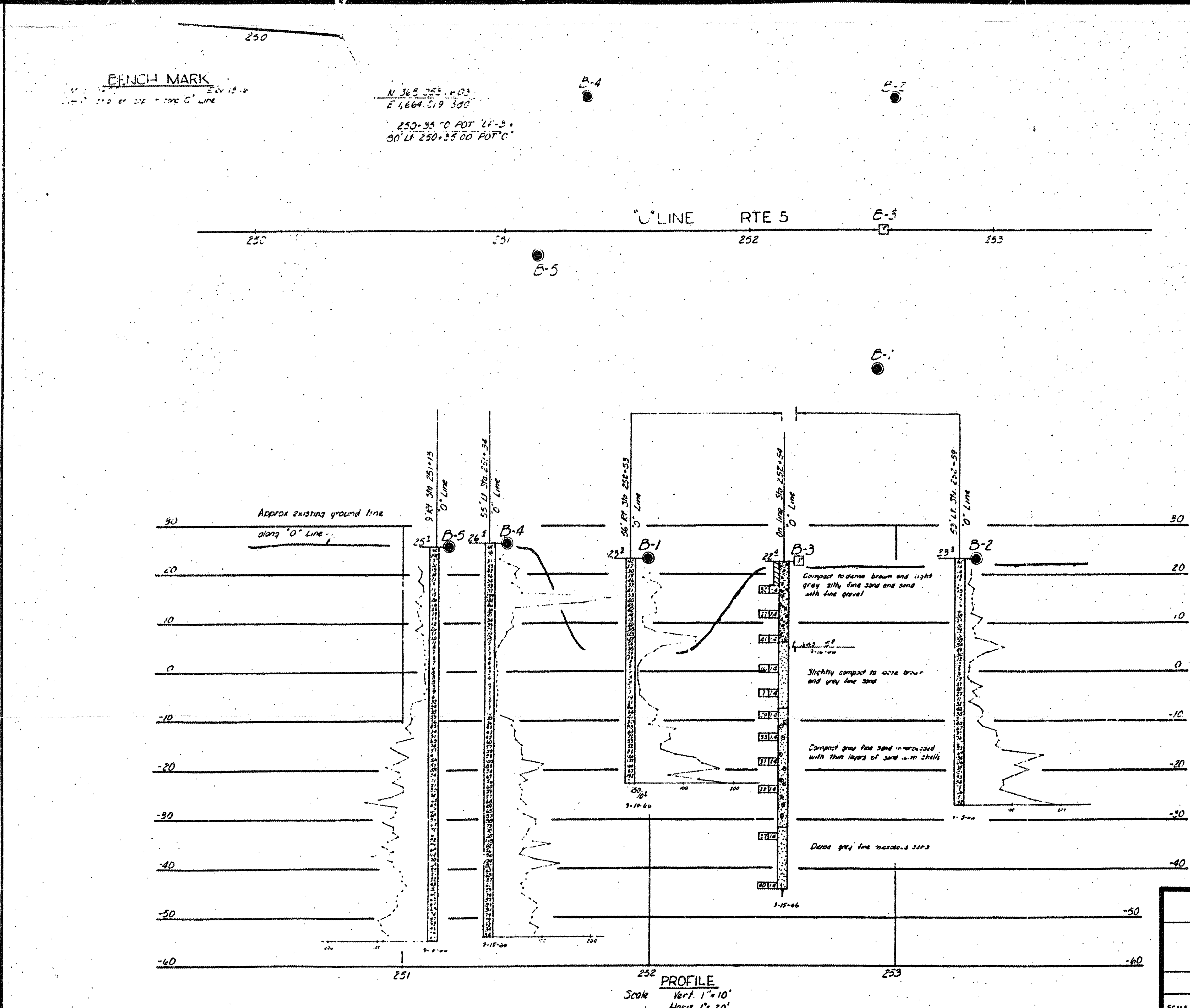
(1968 & 1981)

TerraCosta Consulting Group

FED. ROAD DIV. NO.	STATE	F.A. PROJECT NO.	SHEET NO.	TOTAL SHEETS
7	CALIF			

DIST	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
11	SD	5	47.3/50.0	69	141

May 13, 1968



LEGEND OF BORING OPERATIONS

ROTARY BORING — 1" SOIL TUBE — PENETRATION BORING

LEGEND OF EARTH MATERIALS

Gravel — Sand — Silt — Clay — Sandy Clay or Clayey Sand — Silty Sand — Peat or Organic Matter — Fill Material — Igneous Rock — Sedimentary Rock — Metamorphic Rock

CLASSIFICATION OF MATERIAL BASED ON STANDARD GRADE SIZE LIMITS

NOTE: Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis.

BRIDGE DEPARTMENT
ENGINEERING GEOLOGY SECTION

AS BUILT PLANS
Contract No. 11-039744
Date Completed
Document No. A0000793

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BUENA VISTA CREEK BRIDGE
(WIDEN)

LOG OF TEST BORINGS

SCALE As Noted	BRIDGE 57-277	FILE	DRAWING 57277-7

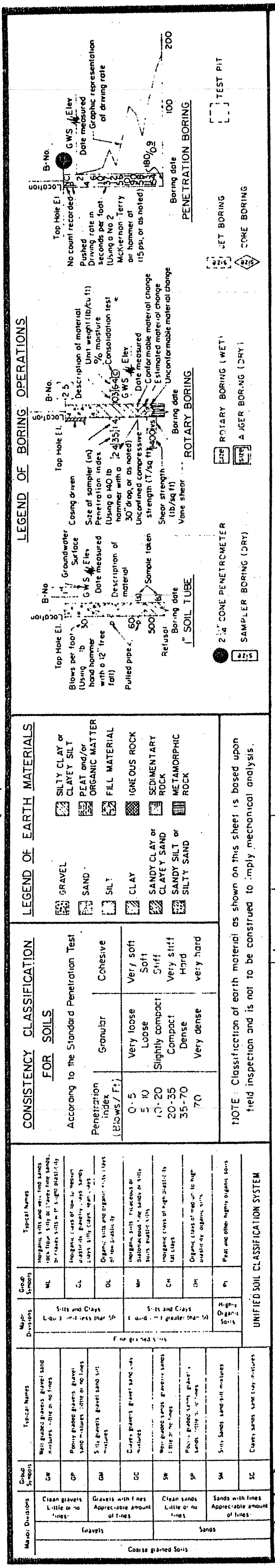
Charge 11203
W.A. 039741

PREL. DRAWING NO. PR-

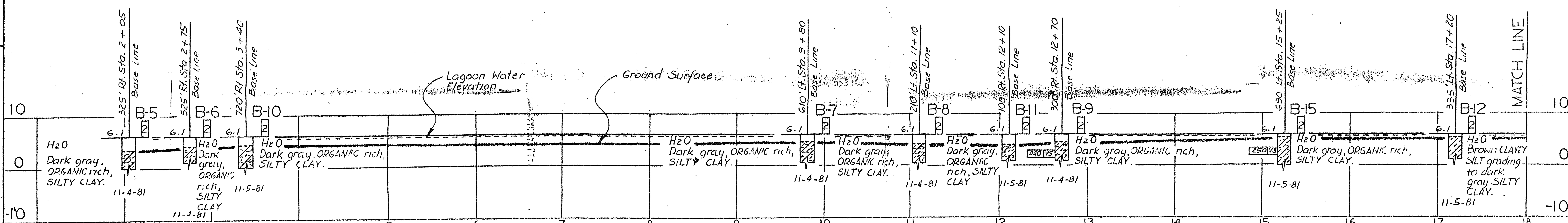
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE ____ SIGNATURE ____ TITLE ____

DIST	COUNTY	ROUTE	POST MILES	TOTAL PROJECT
11	SD	78/5		



For Plan View and Bench Marks
Refer to Sheet 1 of 3



SCALE
HORIZ. 1"= 60'
VERT. 1"= 10'

SHEET 2 OF 3

JAN 15 1982

ENGINEERING GEOLOGY AND TECHNICAL SERVICES BRANCH – TRANSPORTATION LABORATORY

			CHARGE UNIT	EXPEND. AUTHOR.	SPEC. DESIGN.
DRAWN BY	VICTOR SESTOKAS 12-30-81	PROJECT GEOLOGIST / ENGINEERING GEOLOGIST	19305	926282	
CHECKED BY	W.C. CAIN, 12-31-81				

State of
CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES - DESIGN

BRIDGE NO.
POST MILE

BUENA VISTA LAGOON
LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS

CU 19305
WO 926282

Disregard prints bearing earlier revision dates

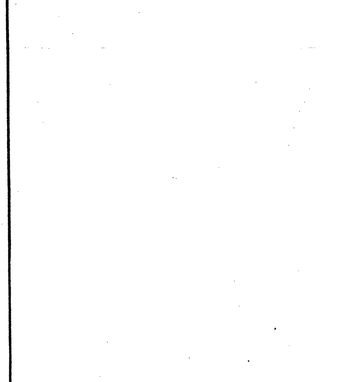
REVISION DATES (PRELIMINARY STAGE ONLY) | SHEET | OF

DIST	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	PROJECT NO.	SHEET NO.
11	SD	78/5			

ENGINEER IN RESPONSIBLE CHARGE — REGISTERED CIVIL ENGINEER

DATE APPROVED

LEGEND OF BORING OPERATIONS



LEGEND OF EARTH MATERIALS

GRAVEL · SAND · SILT · CLAY · SILTY CLAY or CLAYEY SILT · PEAT and/or ORGANIC MATTER · FILL MATERIAL · IGNEOUS ROCK · SANDY CLAY or CLAYEY SAND · SANDY SILT or SILTY SAND · SEDIMENTARY ROCK · METAMORPHIC ROCK

CONSISTENCY CLASSIFICATION FOR SOILS

According to the Standard Penetration Test

Penetration Index (Blows/Ft)	Granular	Cohesive
0-5	Very loose	Very soft
5-10	Loose	Soft
10-20	Slightly compact	Stiff
20-35	Compact	Very stiff
35-70	Dense	Hard
70	Very dense	Very hard

NOTE Classification of earth material as shown on this sheet is based upon field inspection and is not to be construed to imply mechanical analysis

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions	Group Symbols	Typical Names
Fine grained soils: 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 silts 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 soils
Coarse grained soils: Gravels, Clean gravels, Little or no fines	GW	Well graded gravels, gravel sand mixtures, little or no fines
	GP	Poorly graded gravels, gravel sand mixtures, little or no fines
Gravels with fines, Appreciable amount of fines	GM	Silty gravels, gravel sand silt mixtures
	GC	Clayey gravels, gravel sand clay mixtures
Sands, Clean sands, Little or no fines	SW	Well graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
Sands with fines, Appreciable amount of fines	SM	Silty sands, sand silt mixtures
	SC	Clayey sands, sand clay mixtures

For Plan View and Bench Marks
Refer to Sheet 1 of 3

SCALE
HORIZ. 1"=60'
VERT. 1"=10'

SHEET 3 OF 3

JAN 15 1982

ENGINEERING GEOLOGY AND TECHNICAL SERVICES BRANCH — TRANSPORTATION LABORATORY

				CHARGE UNIT	EXPEND. AUTHOR	SPEC. DESIGN.
DRAWN BY	VICTOR SESTOKAS, 1-4-82	Approved	Recommended By	19305	926282	
CHECKED BY	WILLIAM C. CAIN, 1-5-82	W. C. Cain 732 PROJECT GEOLOGIST CEG NO.	ENGINEERING GEOLOGIST CEG NO.			

State of CALIFORNIA
DEPARTMENT OF TRANSPORTATION

STRUCTURES - DESIGN
PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO.

BRIDGE NO.
POST MILE

BUENA VISTA LAGOON
LOG OF TEST BORINGS

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 19305
WO926282

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY) | SHEET | OF

OS 0146

APPENDIX B

DETERMINISTIC ESTIMATION OF PEAK ACCELERATION FROM DIGITIZED FAULTS

TerraCosta Consulting Group

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**********************
*                    *
*    E Q F A U L T   *
*                    *
*    Version 3.00    *
*                    *
**********************
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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 2615

DATE: 10-29-2008

JOB NAME: Buena Vista Lagoon

CALCULATION NAME: Seismic Analysis

FAULT-DATA-FILE NAME: C:\Program Files\EQFAULT1\CGSFLTE.DAT

SITE COORDINATES:
   SITE LATITUDE: 33.1703
   SITE LONGITUDE: 117.3525

SEARCH RADIUS: 62 mi

ATTENUATION RELATION: 14) Campbell & Bozorgnia (1997 Rev.) - Alluvium
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   DISTANCE MEASURE: cdist
   SCOND: 0
   Basement Depth: 5.00 km   Campbell SSR: 0   Campbell SHR: 0
   COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: C:\Program Files\EQFAULT1\CGSFLTE.DAT

MINIMUM DEPTH VALUE (km): 3.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	ESTIMATED MAX. EARTHQUAKE EVENT: PEAK SITE ACCEL. g	ESTIMATED MAX. EARTHQUAKE EVENT: EST. SITE INTENSITY MOD.MERC.
NEWPORT-INGLEWOOD (Offshore)	4.9(7.9)	7.1	0.434	X
ROSE CANYON	5.6(9.0)	7.2	0.428	X
CORONADO BANK	21.2(34.1)	7.6	0.216	VIII
ELSINORE (TEMECULA)	23.9(38.5)	6.8	0.103	VII
ELSINORE (JULIAN)	24.4(39.2)	7.1	0.128	VIII
ELSINORE (GLEN IVY)	32.7(52.6)	6.8	0.070	VI
SAN JOAQUIN HILLS	34.1(54.9)	6.6	0.058	VI
PALOS VERDES	34.9(56.2)	7.3	0.098	VII
EARTHQUAKE VALLEY	44.6(71.8)	6.5	0.036	V
NEWPORT-INGLEWOOD (L.A.Basin)	44.8(72.1)	7.1	0.061	VI
SAN JACINTO-ANZA	46.4(74.7)	7.2	0.063	VI
CHINO-CENTRAL AVE. (Elsinore)	46.6(75.0)	6.7	0.041	V
SAN JACINTO-SAN JACINTO VALLEY	46.8(75.3)	6.9	0.048	VI
WHITTIER	50.5(81.2)	6.8	0.040	V
SAN JACINTO-COYOTE CREEK	52.8(84.9)	6.6	0.032	V
SAN JACINTO-SAN BERNARDINO	58.9(94.8)	6.7	0.030	V
ELSINORE (COYOTE MOUNTAIN)	59.0(95.0)	6.8	0.033	V
PUENTE HILLS BLIND THRUST	60.2(96.9)	7.1	0.039	V

-END OF SEARCH- 18 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE NEWPORT-INGLEWOOD (Offshore) FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 4.9 MILES (7.9 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.4345 g