F-4 Fault Activity Investigation for Yucca-Argyle Apartments

GROUP DELTA

Fault Activity Investigation

Yucca-Argyle Apartments
Champion Site
SE Corner of Yucca Street and Argyle Avenue
1756 and 1760 Argyle Avenue
Hollywood District
City of Los Angeles, California

September 7, 2014
GDC Project No. LA-1183A

GROUP DELTA

Riley Realty, LTD
11601 Wilshire Boulevard, Suite 1650
Los Angeles, CA 90025

September 7, 2014

Attention: Mr. Greg Beck

Subject: Fault Activity Investigation
Yucca-Argyle Apartments - Champion Site
SE Corner of Yucca Street and Argyle Avenue
1756 and 1760 Argyle Avenue
Hollywood District, City of Los Angeles, California
GDC Project No. LA-1183A

Dear Mr. Beck,

Group Delta Consultants (GDC) is pleased to submit this Fault Activity Investigation report for the proposed Yucca-Argyle Apartments (Champion Site) in the Hollywood District of the City of Los Angeles. Under the Alquist-Priolo (AP) Earthquake Fault Zoning Act of 1972, the City of Los Angeles, Department of Building and Safety and the California Mining and Geology Board issued a preliminary map showing several inferred "active faults," that are part of the Hollywood fault zone. The Yucca-Argyle project is affected by these faults and therefore requires geologic standard-of-practice investigation. Although the zoning is still preliminary, the City of Los Angeles requires that all sites within the zone be investigated in conformance with the AP Act.

GDC appreciates the opportunity to provide geotechnical and geological services for this project. Should you have any questions, please call at 310 320-5100.

Yours Sincerely,
GROUP DELTA CONSULTANTS, INC.

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TECHNICAL SUMMARY

Based on the GDC geologic investigations at and near the proposed Yucca-Argyle Apartments (Champion site), GDC concludes that, from a fault rupture potential viewpoint, the project site is suitable for development.

The investigation included:

- Initial evaluation of published reports, aerial photographs, and other pertinent geologic information; and advancement and interpretation of 13 CPT's and 5 soil cores up to 60 feet deep;
- Observation and documentation of one 120-feet long trench placed between Argyle Avenue and the west side of an existing apartment building (as shown on Plate 1 and Photograph 1 in Appendix C). The trench trended north-south and was typically seven to eight feet deep;
- Owing to the absence of sediments useful for numeric and relative dating of last fault slip at the Champion site, GDC took advantage of its recent investigations of three adjacent sites with trench-exposed sediments that were amenable to numeric and relative dating methods;
- The Champion geologic information was particularly correlated with and, as appropriate, extrapolated to the "Yucca" site, immediately adjacent to the west across Argyle Street.

Principal findings for the Champion site (Site 3) are:

- A layer of artificial fill up to perhaps ten feet thick caps the trench-exposed older alluvium. The older alluvium is estimated to be at least 300,000 years old. These deposits rest on the Miocene-aged Modelo Formation.
- The ~300 ka alluvium has offsets generally less than 2 feet vertically by normal faults. The faulted alluvium caps the older Miocene Modelo Formation, a now-eroded, "high-level" geomorphic surface and is therefore not overlain by Holocene sediments amenable to site-specific dating;
- Both the Site 2 and Site 3 cores and trenches now reveal the presence of a buried anticline (fold) that underlies this site and its surroundings. The folding affects the Modelo Formation and the older alluvium. The "Champion faults" do not extend to Site 2 where only one questionable bedding plane slip surface was encountered. For conservatism, the Site 2 slip surface on the south limb of the anticline is deemed to be a bedding plane slip surface fault. Site 2 trench exposures show that it is covered by unbroken and undeformed sediments and soils (pedogenic profiles) at least ~40 ka;
- Based on site-specific and regional characteristics, the Champion faults most likely are local "bending moment" structures that formed during anticlinal folding. As documented in the peer-reviewed technical literature, these faults are typically not through-going, relatively shallow and non-seismogenic;

- Coupled with the adjacent Yucca investigations, GDC finds that no active (Holocene) faults affect the Champion site. The investigations meet current geologic standards-of-practice in conformance with requirements of the City of Los Angeles and the AP Act. Therefore, from a fault-activity standpoint, the site is suitable for development.

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1.0 INTRODUCTION

This report presents the Group Delta Consultants, Inc. (GDC) Fault Activity Investigation of the "Champion Site" at the southeast corner of Yucca Street and Argyle Avenue in the Hollywood area of the City of Los Angeles. This report provides maps, cross-sections, numeric and relative dating assessments and interpretations consistent with current geologic "standards of practice" applicable to an Alquist-Priolo (AP) Earthquake Fault Investigation. The Alquist-Priolo Act was initiated in early 1972. It requires geologic investigations for faults identified by the California Geological Survey (CGS) as "***sufficiently active and well-defined.***"

Several major California faults have been placed in AP "Earthquake Fault Zones" that require site specific investigations; for example, the San Andreas and the Newport-Inglewood systems. Accordingly, based on ongoing compilation of documented or suspected fault activity, the California Geological Survey (CGS) then places additional faults, now including the Hollywood Fault Zone, in such zones. The inferred fault zones are then reviewed by local geological and other knowledgeable parties. When warranted, the zone is officially approved by the controlling agency, the State Mining and Geology Board.

From literature compilation and independent interpretation, the CGS placed the Hollywood Fault Zone within a Preliminary Earthquake Fault Zone (Figure 1). The map designates this as a "**fault that has had surface or near surface ground rupture within the last 11,500 years (Holocene Epoch)**". The CGS also postulated individual "active fault" strands within the Hollywood Fault Zone. Of particular interest is a strand, herein informally deemed the "Argyle Strand", inferred to be immediately south of the Champion site (Site 3, Figure 1). The CGS interpretation stems mainly from groundwater level differentials recorded in two nearby geotechnical borings (GDC, 2006) drilled during a preliminary site engineering investigation, and on topographic expression, namely, a south-facing slope south of the study site (Plate 1; Figure 1).

With the recent (CGS) zonation, site-specific geologic investigations are now required. These investigations must inherently confirm or deny the age and/or existence of any faults on or within 50 feet of the property and must and should follow current "geological standards of practice." Procedurally, the City of Los Angeles is the lead agency that will approve the investigation. The CGS will review this report and give its opinion to the City of Los Angeles.

1.1 PROPERTY DESCRIPTION

The Champion site (Site 3) is bounded on the north by Yucca Street, on the east by developed property, on the south by Carlos Avenue, and on the west by Argyle Avenue (Plate 1) in the Hollywood District of the City of Los Angeles. Four 2-story apartment buildings currently occupy the site (Photograph 1 in Appendix C). The north side fronts Yucca Street. Block retaining walls topped with chain link fences bound the south and east margins. An iron fence borders the west property line (Photograph 1 in Appendix C). Parking structures occupy the south part of the pad area north-adjacent to a south-facing, west-trending slope that is about 20 to 25 feet high (Plate 1).

For context, this document refers to four adjacent sites investigated concurrently with the Champion site. These are identified (Plate 1) as: Site 1 for the Millennium development; Site 2 for the second Street Ventures development; Site 3 for this (Champion) development; and Site 4 for the Green development.

1.2 PURPOSE

This investigation specifically evaluates whether CGS inferred strands of the Hollywood Fault Zone constrain redevelopment of Site 3 (Champion). The CGS (2014) preliminarily places the Argyle Strand immediately south of Site 3 (Plate 1; Figure 1) thereby putting Site 3 within a zone of required investigation. The City of Los Angeles also requires similar investigations.

1.3 SCOPE OF WORK

For initial evaluation, GDC advanced continuous and undisturbed soil cores and Cone Penetrometer Tests (CPT) soundings. The rationale was to determine if near-surface faults are present. GDC also reviewed pertinent aerial photographs, geologic and topographic maps, peer-reviewed published articles, and proprietary geotechnical reports available at reviewing agencies. Additionally, GDC reconnoitered the site and its environs for geomorphic evidence of possible surface fault ruptures.

GDC placed 13 CPT-soundings, 5 soil cores and 1 trench (Site 3, Plate 1). The trench, approximately 120 feet long and about 8 feet deep, was used to "calibrate" the cores and CPT-soundings. The trench was also used to examine near-surface sediments, capping soil (pedogenic) profiles, and geologic structure.

Site 3 (Plate 1) is capped by estimated ~300 ka "older alluvium"; accordingly, this deposit was dated by conservative projection across Argyle Avenue into the 35-ft deep trenches in Sites 1 and 2 (Plates 1 through 6). GDC has now completed and submitted its report for the Yucca site, west and immediately adjacent to Argyle Avenue (Site 2; Plate 1). Additionally, GDC is currently finishing geologic documentation for Site 4 (Plate 1) immediately north of Yucca Street. Trench exposures at both sites provided geologic data directly applicable to the Champion site.

For the Champion site, in summary, the GDC investigation included the following:

- Retention of Dr. Roy J. Shlemon to assist GDC with analysis of the local Quaternary geology, soil stratigraphy and paleoseismology; and to provide an independent QA assessment of the investigation (Appendix B). In this report GDC uses the term "soil" as a pedogenic (weathering) feature and as a tool for dating sediments, and not in reference to engineering material.

- Review and analysis of relevant geotechnical and geologic investigations, published geologic and geotechnical maps and reports. Specific references are documented in Section 6. This includes careful review, interpretation and extrapolation of geologic information from adjacent Sites 1, 2, and 3 (Plate 1).
- Interpretation of vertical stereo and oblique aerial photographs from the 1920's and 1930's archived with the Continental Aerial collection and the Spence collection at UCLA.
- Geomorphological and geologic reconnaissance.
- Coordination with the owner, with Underground Service Alert (USA) and with the City of Los Angeles Department of Building and Safety to locate utilities and to coordinate the logistics of the field investigation.
- Initial site observation to assess existing conditions relative to the planned development. Prior to drilling the soil cores or pushing the CPT's, initial advancement of a soil hand auger to 5 feet was performed to satisfy USA requirements.
- Advancing 13 in-line CPT-soundings up to 60 feet deep along a north-south transect in the center of the property by Gregg Drilling & Testing, Inc. Logs and interpretations of the CPT data are given in Appendix A. Locations are given on Plate 1. Plate 9 is Cross-Section (G-G') interpreted from the 13 CPT-soundings and 5 soil core borings.
- Drilling 5 in-line soil cores to 60 feet between the CPT soundings along the aforementioned north-south transect. This was carried out by Gregg Drilling & Testing, Inc., using an 8-inch diameter hollow stem auger with a 3-inch diameter and 5-foot long split coring barrel down the auger annulus. The recovered cores were placed in 2.5 feet long cardboard core boxes and transported to the GDC laboratory for further examination. Core logs are provided in Appendix A. Locations are indicated on Plate 1.
- Excavating one exploratory trench along the west margin of the site (Photograph 1 in Appendix C). The trench was about 3 feet wide, 120 feet long, and 7 to 8 feet deep. The trench was shored to conform to California OSHA regulations. This trench allowed pertinent extrapolation of soil core and CPT data for analysis of sediments. The excavated soil was stockpiled along the west property line and later used as trench backfill. Location of the trench is indicated on Plate 1 and the log is illustrated on Plate 8.
- Brushing and scraping of the trench walls, setting up of level string lines, and geologic logging and photographing of the trench. The trench was observed at different times by

geologists from the City of Los Angeles Department of Building and Safety and the California Geological Survey.

- Illustration of the subsurface structure and stratigraphy with CPT and soil core logs on geologic Cross-Sections G-G’ and H-H’ (Plates 9 and 10) and the trench log (Cross-Section F-F’) as shown on Plate 8.
- Preparation and summary of GDC findings and conclusions with attachments and appendices.

2.0 PREVIOUS AND CURRENT INVESTIGATIONS

2.1 PREVIOUS INVESTIGATIONS

Previous geological maps, based mainly on geomorphic expression; and also on but few local outcrops, and on ground-water differentials between two or more wells, inferred one or more fault strands that are now included in the “Hollywood Fault Earthquake Zone” (Hoots, 1930; Hoots and Kew, 1931 (Figure 3); Dolan, 1997, 2000; Dibblee, 1988). These maps and the various investigations were recently compiled by the California Geological Survey (CGS) as a draft fault evaluation report (FER 253, 2014) to complement the Preliminary AP map for the Hollywood 7.5' Quadrangle (Figure 1).

The CGS (2014) depicts an inferred active (Holocene) trace of a Hollywood Fault (Argyle Strand; Figure 1) as trending east immediately south of the study site and then northwest across the west-adjacent Site 2. Additionally, as documented in the readily available literature, site-specific fault activity and geotechnical investigations were carried out in the area, similarly addressing potential impact of the Hollywood Fault (Law, 2000; GeoPentech, 2001, 2005; Leighton, 2011; City of Los Angeles, 2009; Langan, 2013).

2.2 PRESENT INVESTIGATION

Thus far few, if any, site specific investigations relied on trench exposures to evaluate the presence and activity-level of a postulated Hollywood Fault. Most assessments were based solely on interpretation of CPT/soil core transects and tectonic-geomorphic modeling. Therefore, this and nearby investigations by GDC (2014) are the first to use trenches to investigate the presence or absence of one or more inferred splays of the Hollywood Fault (CGS, 2014).

The investigation was completed in accordance with the aforementioned scope of work and with current standards of practice for AP-level fault investigations. Field investigation included the following:

2.2.1 CONE PENETRATION TESTS

The site exploration was initially conducted with the CPT soundings and soil cores. CPT's were centered every 10 feet and pushed up to a depth of 60 feet or to refusal. The tip and side resistance of the CPT cone was recorded and plotted on applicable cross-sections (see Plates 1, 2 and 9). CPT field data are contained in Appendix A.

2.2.2 CONTINUOUS SOIL CORES

The soil cores were placed between CPT's to calibrate the subsurface geology. Cores were drilled using an 8-inch hollow stem auger with a 3-inch diameter core barrel. The barrel was placed down the annulus of the augers and pushed about 3 to 4 inches in front of the bit as the auger advanced downward. The barrel was connected and held stationary with respect to the rig rotary head system with a series of rods that pushed the barrel ahead of the bit to prevent the barrel from spinning. This results in a relatively undisturbed continuous core sample. The cores provide a physical view of the subsurface soil conditions used to calibrate the CPT data.

The cores in the upper sandy sediments were drilled in 2.5 foot runs to optimize recovery. Where the drilling recovery exceeded 90%, as in clayey sediments and bedrock, the runs were increased to 5 feet. The cores were placed in boxes, field logged, and returned to the GDC laboratory for detailed logging. After analysis, the core information was combined with the CPT data to calibrate the CPTs to the sediments recovered (Plate 1, Plate 9). The trenches were then used to correlate sediments to the north and south of the trench and along the CPT-soil core transect line (Plate 9, Cross-Section G-G'). Boring Logs are provided in Appendix A.

2.2.3 TRENCHING

2.2.3.1 CHAMPION TRENCH

One fault trench was excavated at the Champion site (Site 3; Plate 1). It was oriented north-south to intersect possible projected splays of the inferred Argyle Strand of the Hollywood Fault Zone as mapped by CGS (2014; Figure 1). Prior to excavation, Underground Services Alert (USA) located all underground utilities. The 120 feet long, 7 to 8 feet deep trench was placed between an existing onsite apartment building and Argyle Avenue (Photograph 1, Appendix C). The trench was shored in accord with CAL-OSHA requirements.

2.2.3.2 YUCCA TRENCHES

Two trenches placed and logged by GDC (2014a) at the Yucca site (Site 2) west of Champion (Figure 1; Plates 1, 3, 5 and 6) proved vital to determine the presence or absence of active faults at Champion.

- WEST TRENCH
  The west trench was the first of two trenches excavated on the Yucca site. The top 13 feet along the west side of the trench was cut with a 1:1 slope to the first bench. Benches

2 through 4 were excavated with ~4 foot vertical walls to the bottom of the trench. This benching improved the stability of the trench and provided good exposures for logging (Plates 3 and 4). The eastern side of the trench was sloped at 1:1 horizontal to vertical from top to bottom. The trench was up to 35 feet deep.

- EAST TRENCH
  A second trench was excavated east of the west trench to further evaluate sediment properties and age (Plates 5 and 6). Because the pre-Holocene sediments were shallow, the trench was excavated to a depth of about 15 feet. The older alluvium encountered in the trench was very hard and dense and benched with 4-5 foot vertical walls. The trench was oriented N-S, overlapped the west trench, and extended about 50 feet south of the property line of Site 2 onto Site 1 (Plate 1).

2.2.4 SOIL-STRATIGRAPHIC AGE ESTIMATES

As documented in Appendix B, the west trench exposed the thalweg of the Argyle Channel and an overlying 30-ft thick sequence of interbedded, grossly fining-upward fluvial sediments within the Argyle Channel. Soil-stratigraphic measurements and descriptions show that the Argyle Channel sediments are capped by a remnant, very slightly developed surface soil, and by four, intercalated interval buried paleosols, ranging in relative development from very slight to slight. Based on relative profile development with numerically dated soils elsewhere in Mediterranean climates, the cumulative time of weathering for formation of the channel sediments is an estimated ~8-10 ka years.

The Argyle Channel incises underlying, relatively impermeable clay that bears a truncated, moderately developed buried paleosol. This soil, with its distinct translocated clay films, represents another ~8 ka-15 ka of weathering. Additionally, the abrupt unconformity between the base of the channel and the underlying clay suggests onset of Argyle Channel deposition during an epoch of regional pluviality, conservatively estimated as ~12 ka-16 ka (marine isotope stage 2). From a pedogenic standpoint, the cumulative age of the trench-exposed Argyle Channel and the underlying clay exceeds ~15 ka.

2.2.5 RADIOCARBON DATING

Four conventional radiocarbon dates from the east and west trenches (Yucca-1, Yucca-2, Yucca-4 and Mill-1) in the Argyle Channel sediments were collected (Site 2, Plate 1) to evaluate the numeric age of the Argyle Channel sediments. The west trench samples, Yucca-1 and Yucca-2, are suspect, owing to the high potential for younger contamination by modern groundwater (~4,310 bp), and to the likely re-deposition of older “organic sediment” (~41 ka) resulting in an unreliable old age. In the east trench, sample Yucca-3 could not be dated; Yucca-4 yielded a ~4170 bp age.

The east trench was extended south to evaluate the active fault potential on the adjacent property and to establish a 50 foot buffer zone for this site. Charcoal samples were also collected and identified as Yucca-4 and Mill-1, on the west wall of the east trench. These yielded radiocarbon dates of ~4170bp and ~4280bp, respectively (GDC, 2014). Other samples (Mill-2 though Mill-7) were retained for age assessments of sediments on the adjacent property, site 1 (Plate 1) to the south.

3.0 GEOLOGIC FRAMEWORK

3.1 REGIONAL GEOLOGIC SETTING

3.1.1 STRUCTURE

The Santa Monica Mountains began uplift in the Jurassic; and intermittent tectonic movement continues to the present (Hoots, 1930; Hoots and Kew, 1931; Dibblee, 1991). By the middle Miocene, deformation affected the Topanga sediments, resulting in simple, west-plunging folds. Later, in response to continued movement of San Andreas plate boundary faults, high-angle normal offset gave rise to an incipient Hollywood Fault Zone.

Periodic faulting since the late Miocene produced more complex deformation. In the study area, the southeastern limbs of local folds were “down-dropped” along the Hollywood Zone. By the onset of the Quaternary, many folds were buried by episodic, climatically controlled alluvial deposits that covered most of the study area. Starting at least by mid-Quaternary time, the surface expression of local left-lateral and thrust faults were generally buried by continuing region-wide alluviation. Topographic relief locally exceeded 50 ft, generally expressed by major south-trending canyons that incised the alluvial cap(s), only to be filled and again partially filled in response to regional change in climate.

3.1.2 HOLLYWOOD FAULT

The Hollywood Fault Zone forms the general boundary separating the LA Basin (Hollywood Sub-basin) from the Transverse Ranges on the north and the Peninsular Ranges on the south. From west to east, the Hollywood Fault is generally divided into five segments all characterized by left-lateral oblique slip (Figure 9). The eastern terminus of Segment 2 and the western terminus of Segment 3 are north-east of the site of this study (FER 253). The part of Segment 2 that is inferred (CGS, 2014) to trend south of Site 3 is deemed the “Argyle Strand.”

The location and relative activity of the Hollywood Fault segments stems mostly from the investigations of Dolan (1997, 2000) who based his conclusions mainly on geomorphic expression, on possible offset of alluvial fans flanking the southern Santa Monica Mountains, on previous geotechnical studies by LA Metro, and on differences in groundwater levels as depicted in geotechnical borings.

When drilling in 2006, GDC encountered groundwater in B-1 and B-2 at depths of 24 and 44 feet, respectively. In the west trench, GDC found that the mudflow was wet near and below the contact with the Argyle Channel Deposits at ~27 feet below ground surface (bgs). Free water occurred at about ~35 feet bgs.

Based on the California Division of Mines and Geology (CDMG) Open-File Report 98-026, the historic highest groundwater at the Yucca site was more than 80 feet. Because the site is on the toe of the hills to the north and underlain by interbedded alluvial sediments, it is not unusual for perched groundwater elevations to vary significantly. From the site-specific trench exposures, we document and thus conclude that differing groundwater levels in the geotechnical borings stem from local perching on the several different subsurface clayey beds.

The east and west trench exposures also explain the origin of an apparent 20-ft vertical offset of piezometric surfaces recorded in adjacent, on-site geotechnical borings. This separation was the likely basis for the CGS postulated presence of a Hollywood Fault, “Argyle Strand” (CGS, 2014). Again, from the site-specific trench exposures, GDC documents that the local perched water levels are not caused by any inferred fault.

3.2 TECTONIC-GEOMORPHIC SETTING

3.2.1 REGIONAL ANALYSIS

Hoots and Kew (1931; Figure 3) initially identified a “bedrock fault” about 2000 feet north of Site 3 (Figure 3) that is inferred to be a strand of the Hollywood Fault Zone. The fault characteristically superposed Miocene Topanga Formation rocks over the younger upper Miocene Modelo Formation (Hoots and Kew, 1930).

Recently, fault locations have been based on tectonic geomorphic expression (CGS, 2014; Crook and others, 1983; Dolan and others, 2000; Dolan and Pratt, 1997; Dolan and others, 1997; Tsutsumi and others, 2001; U.S. Geological Survey, 2005). It is the trench exposures that best provide locations as well as relative activity information useful for dating last time of surface rupture.

GDC analyzed the geomorphic and topographic expression of the northern Los Angeles Basin/Hollywood area that encompasses Site 3 and its environs. We find, for example, that the USGS Burbank 7.5’ Quadrangle (1926 edition; reprinted in 1941) depicts west-to-east topographic breaks and truncated ridges that mark the traditional trend of the Hollywood Fault near Site 3 (Figures 5, 7 and 8). Presumably, the topography stemmed from surface rupture. However, the GDC investigations of Sites 1, 2, and 4 show that the truncated ridge immediately south of Site 3 is erosional in origin and not fault related.

From the geomorphic expression, as well as from trench exposures and core data, we reconstruct general landscape evolution in the area over the past ~300 ka. In brief, throughout the

Quaternary, regional changes in climate and vegetation resulted in deep channel cutting, partial alluvial filling and locally later re-incision.

The most recent regional depositional event is expressed geomorphically by late Pleistocene and Holocene alluvial fans that emerge from the mouths of three canyons at Argyle Avenue, Vine Street and Beachwood Drive. These are informally called the "Argyle," "Cahuenga" and "Beechwood" fans, respectively (Figure 6). As exposed in the Yucca (Site 2) trenches, the Argyle Fan includes a distinct basal channel (thalweg and basal gravel beds) and overlying mid-Holocene distributaries. The eastern distributaries lapped against a now-buried "channel wall" mantled with older mud- and debris-flow deposits (Plate 2).

A pre-Holocene channel similarly extended immediately southwest of the Champion site as sediments exposed in the Yucca east trench and in adjacent cores. The channel incised into the base of the ~300 ka "old alluvium" (Qoal) that once extended across the entire area but is now surficially preserved only at Champion site. The eastern boundary of this old channel was then filled with likely climatically controlled upslope and sideslope debris flows (Qdf). These in turn, were remobilized to give rise to their locally covering mudflows (Qm). As shown in the Yucca trenches, the mudflows typically mantle the debris flows and underlie the basal Argyle (Holocene) channel deposits (Plate 2, Cross-Section A-A).

3.2.2 AERIAL PHOTOGRAPH ASSESSMENT

GDC also interpreted aerial photographs to evaluate possible presence of Hollywood Fault strands (Dolan and others, 1997, 2000, 2000a) that potentially could affect the Champion site (Site 3). Specifically reviewed were oblique aerial photos from the UCLA Benjamin and Gladys Thomas Air Photo archives and Continental Aerial Photo collections. The aerial photographs show that the area south of the truncated ridges, usually given as evidence of fault surface breaks, was graded and developed prior to the dates of the flights thereby eliminating geomorphic expression of inferred faulting in the immediate area.

The aerial photos do, however, depict a distant break in slope near Franklin Avenue, an area thus suspect for possible surface rupture (Figures 7 and 8).

3.3 LOCAL GEOLOGIC SETTING

Site 3 (Champion) lies on pre-Holocene older alluvium that rests on bedrock of the Modelo Formation (Figures 10 and 12). The older alluvium, and to some degree the underlying Modelo Formation, form the west facing slope of Argyle Canyon. After channel incision, younger deposits, useful for determining fault ages, were laid down in Argyle Channel, including Pleistocene debris flows (Qdf) and mudflows (Qm); and, finally, the Holocene sand deposits (Qs).

None of the younger sediments useful for dating last fault slip were exposed at Site 3. However, their presence at the Yucca (Site 2) trenches permits conservative projection of Champion fault trends into the Yucca site where trenches expose a suite of sediments useful for soil-stratigraphic and numeric dating.

3.3.1 STRATIGRAPHY

Importantly, because the Site 3 trench logs document the presence of several post-older alluvium faults (Plate 8), it is therefore the detailed stratigraphy exposed in the adjacent Yucca that dates last movement of the Site 3 faults (Figure 10). From the youngest to the oldest, the dated Yucca site (Site 2) units are: Holocene sands of the Argyle Channel (Qs), locally discontinuous mudflows (Qm); upslope and side-slope debris flow flows (Qdf); basal sections of older alluvium (Qoal) and the underlying Modelo Formation (Tm).

3.3.2 ARTIFICIAL FILL (Qaf)

Surficial artificial fill blankets most of the explored area at Champion. In general, where encountered, the fill excavated with little difficulty. Near the south end of the Champion trench, however, utility trench pipes and fill constrained but did not stop exploration.

3.3.2 HOLOCENE SAND (Qs) (ARGYLE CHANNEL DEPOSITS; SITE 2)

As documented on the Yucca trench logs (Plates 2 through 6), the Holocene Argyle Channel Deposits (Qs) vary from loose to moderately dense and display graded bedding. Sub-rounded to sub-angular sands and gravely sands that are uncemented to lightly cemented are common. The sands and gravels are mainly basaltic and meta-quartzite with occasional granitic pebbles and cobbles. The granitic pebbles and cobbles are mostly decomposed to angular gruss that disintegrates when dislodged. The sand ranges from fine- to coarse-grained with occasional pebbles and rare cobbles and weathered silty soil horizons. Gravels and cobbles are usually basal or lag gravels along unconformities and channel floors. Channeling is common throughout the sedimentary packets in the upper sand. The clastic sands and gravels contain slightly developed paleosols indicative of relative landscape stability (Appendix B).

3.3.3 PLEISTOCENE MUDFLOW (Qm); SITE 2 ONLY

A discontinuous mudflow (Qm) was exposed below the Argyle Channel Deposits in both the west and east Yucca trenches (Plates 2 through 6). Based on soil-stratigraphic assessments (Appendix B), remnant mudflows bear paleosols ranging in age from ~12 ka-15 ka up to ~35 ka-40 ka. The mudflows were derived from reworking and redeposition of the underlying and adjacent debris flows that were particularly exposed in the Yucca east trench (Plates 5 and 6).

3.3.4 PLEISTOCENE DEBRIS FLOW UNIT (Qdf); SITE 2 ONLY

The debris flow deposits (Qdf) underlie the mudflows (Qm). Stratigraphically, they are below the older alluvium at Site 3 (Figure 10). Based on stratigraphic position and reconstruction of local geomorphic evolution, these sediments, *in toto*, are an estimated ~150 ka old and are the youngest faulted and folded beds within Site 2 or 3.

These debris flows are typically moderately to poorly sorted clays, sands, and gravel. Clasts within the beds are usually chaotically arranged. Distinct interspersed silty beds and paleosols allow for clear recognition of the presence or absence of faults.

3.3.5 OLDER ALLUVIUM (Qoal); SITE 3

The Site 3 (Champion) trench exposed older alluvium composed of consolidated non-marine sand, silt and gravel beds. Based on the CPT-soil core transect (Plate 9, Cross Section G-G'), the older alluvium lies unconformably on the Miocene Modelo Formation and varies in thickness from about 7 feet deep in the north to greater than 60 feet in the south.

The older alluvium is a vestige of a once extensive alluvial plain later incised by local south-trending canyons. The older alluvial deposits are judged to be about 300 ka old (Appendix B).

Distinctly bedded gravelly, sandy, and reddish silty beds typify the older alluvium. Generally, alternating sequences include coarse-grained, sometimes cobbly, sand overlain by finer grained silt beds (Photograph 2 in Appendix C). These provide excellent key beds for determining the presence or absence of faults.

In summary, based on a great degree on stratigraphy exposed in the Yucca trenches, GDC reconstructed a regional model for landscape evolution and age for the Site 3 trench-exposed sediments (Section 3.2.1).

3.3.6 MIOCENE BEDROCK (Tm) – SITES 2 AND 3

Miocene Modelo Formation underlies the Champion site as mapped by Hoots and Kew (1931). Borings and CPT-soundings (Plate 9) show that it is overlain by older alluvium and artificial fill for about 13 feet in the north and greater than 60 feet in the south (Plate 9).

The Modelo Formation within the Santa Monica Mountains is generally soft, light-gray to brown, well bedded shale with isolated hard platy siliceous shale and massive to thin beds of sandstone, siltstone and massive conglomeratic sandstones. Volcanic ash is also locally present.

At Site 3, the upper weathered Modelo is plastic to stiff and lacks sedimentary and pedological structure. With depth, the Modelo Formation is gradually less saturated; and grades to dark gray to black, thinly bedded fine sand, clay, and moist hard clayey shale. Carbonate filled macro-fractures were not evident.

3.4 GROUNDWATER

All five Site-3 borings encountered groundwater; Borings 1 through 4; at 30, 27, 28, and 31 feet bgs, respectively, and Boring 5 at 45 feet bgs. GDC plotted the inferred potentiometric surface on Cross-Section G-G'. It is not clear from available information whether this represents a perched or actual regional water surface. From Boring 1 to immediately north of Boring 4 (Plate 9) the surface is not "offset" by some heretofore unknown fault. South of Boring 4, the piezometric mimics the steepening contact between the older alluvium-bedrock (Plate 9).

3.5 LOCAL STRUCTURE

3.5.1 YUCCA STREET ANTICLINE

Investigations of the Champion (Site 3) and nearby properties to the west and north, respectively (Sites 2 and 4), show an anticline with an axis almost coincident with Argyle Avenue (Plate 1). This structure is a low amplitude local fold; although, alternatively, it might be the "crest" of a larger regional anticline. A more complete characterization awaits more data from other investigations in the central Hollywood area. For description, GDC deems the fold as the "Yucca Street Anticline."

The Yucca Street Anticline was first recognized in Site 3 and 4 trenches (Plates 1, 8, and 10). The Site 3 trench exposed near-horizontal older alluvium in the north (near Yucca Street) that increasingly dips 15 to 30+ degrees to the south in the southern part of the trench (Plates 1 and 8). Trenches on the Site 2 (Plates 3, 5, and 6) revealed south-dipping Pleistocene debris flows younger than the Site 3 older alluvium. In contrast, exposures north of Yucca Street exposed north-dipping older alluvium, thereby defining an anticline with an axis about coincident with Yucca Street. The general geologic relationships are schematically illustrated in Plate 10.

Based on the site-specific exposures and from models of such folds, GDC reasonably infers that the anticline owes its origin mainly to regional transpression and not to local faulting. This reasoning is exemplified in Site 2 Cross-Sections A-A' (Plate 2) and B-B'B" (Plate 4) that depict the folded sediments and their relation to overlying - and unbroken - upper Pleistocene and Holocene deposits. Additionally, stratigraphic form lines inferred to be representative of bedding within the Modelo Formation suggest that the axis trends west-northwest (Plate 1). A stereonet plot of the bedding attitudes at Champion and to some north of the site are consistent with a fold that trends west-northwest (Figure 11).

3.5.2 FAULTS

The Site 3 trench exposed several low-displacement normal-slip faults with stratigraphic separations of less than about 2 feet (Plates 8, 9 and 10). Photograph 3 in Appendix C illustrates a typical Champion fault. The light tan sand bed in the photograph has slipped down to the left about one foot along a normal fault that trends from upper right to lower left of the photograph. The fault dips to the north and the sand bed to the south.

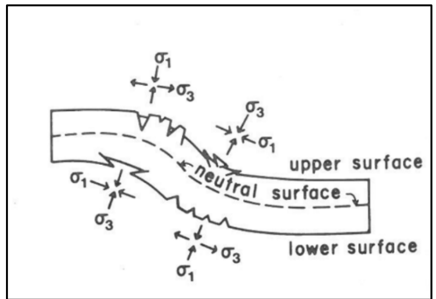

Figure A. Bending-moment faults showing local stress fields. Note: Upper surface faults cannot propagate below the neutral surface (Yeats, 1986).

These are classic "bending-moment" faults stemming solely from localized stress fields that are active only during the folding event(s) (Billings, 1956; Zolnai, 1986; Yeats 1986). At Site 3, the normal faults dip characteristically north toward fold axis near Yucca Street; and north of the site, faults dip south toward the axis. Faults such as these are shallow-rooted aseismic normal faults that form on the upper surfaces of anticlines as portrayed in Figure A from Yeats (1986).

Also present in the Site 3 trench (Plate 8) are scattered well-developed joints that plot on the stereograph (Figure 11) as possible complements.

Billings (1956) depicted similar faults as "shear joints" along which relative small displacements occur (Figure B). The dominant strikes of both the Site 3 and Site 4 faults are northeast-southwest. Assuming the fault attitudes measured near the ground surface in the trenches represent the entire fault planes, the principal trends are not parallel to the anticline axis. This suggests that stress also involved some lateral shear; and this, too, is consistent with the Billings models.

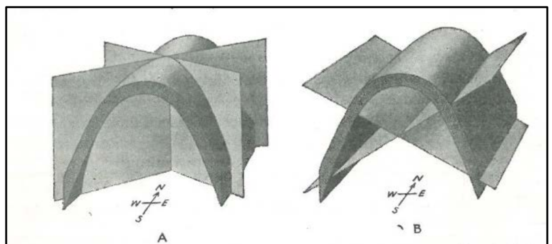

Figure B. Idealized representation of shear joints and faults associated with anticlines. From Billings (1956).

The Champion faults do not extend to the Site 2 trenches or CPT-soil core cross-sections. GDC thus concludes that the Site 3 trench faults either do not displace the Site 2 sediments that are, minimally, 35 ka; or are geographically limited to the anticline crest and die out laterally.

3.5.3 DATE OF LAST FAULT SLIP/FOLDING

Growth of the fold and slip along the Champion bending-moment faults ceased prior to at least ~35 ka based on trench documentation in the adjacent Yucca (Site 2) area. Geologic data from Sites 2 and 4, to the west and north, respectively, provide data to determine the likely cause and age of the Champion faults. For example, as shown on Plates 3 through 6, no Champion-projected faults were documented. Rather, the single slip-surface and a fold limb are now shown to be demonstrably overlain by an unbroken or folded mudflow (Qm) that bears a remnant buried paleosol at least 30-35 ka (Appendix B).

In sum, the upper Pleistocene mudflows and overlying Argyle sand are not disrupted by either faults or folds. Therefore, even conservatively, the displacements of the Champion older alluvium took place prior to 30-35 ka; and therefore the faults are not active according to Alquist-Priolo definitions.

3.5.4 CAUSATION OF FOLD/FAULTS

Owing to the paucity of regional deep subsurface information, the kinematics for the formation of the Yucca Street Anticline remain enigmatic. However, the GDC investigations now provide much new information regarding evolution of the Hollywood Fault system.

Several hypotheses might explain origin of the Yucca Street Anticline. One is that it is a local fold on the upper plate of a south-vergent thrust fault. Recent GDC investigations at Sites 1 and 2 (GDC, 2014, and in preparation) placed trenches, borings and CPT-lines across reasonable northwest and west projections of a postulated fault near the base of an escarpment along Carlos Avenue, east of Argyle Avenue. The explorations exposed or encountered only unbroken upper Pleistocene (Appendix B) sediments; any faults therefore are demonstrably pre-Holocene. It follows then that the escarpment owes its presence to geological processes other than fault surface rupture along a footslope fault.

A second hypothesis is that the anticline originated from a short duration perturbation in the stress-strain pattern along the Hollywood Fault. Inferentially, a short term pulse of compression might have led to folding; or, rather, the fold is part of the strain along an oblique fault, such as the Hollywood Fault. Figure C in accordance with Zolnai (1988) is one of several graphical renditions of this model.

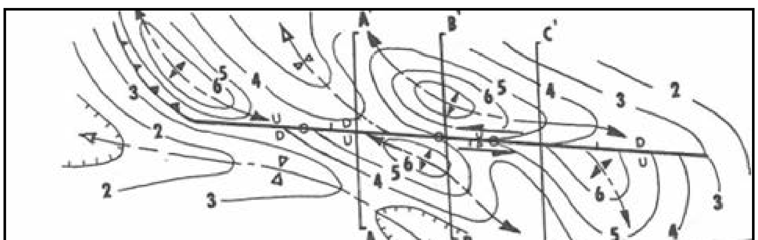

Figure c. Drag-effects along left oblique fault (Zolnai, 1988).

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on a trench exposure and detailed investigations of Site 3 and three adjacent properties in the Yucca-Argyle area of Hollywood that included fault trenches, CPT-soundings and soil cores, GDC concludes that:

1. The Champion site (Site 3) is underlain by ~300 ka "old alluvial" deposits that are tilted ("Argyle Street anticline") and locally displaced ~1-2 ft by generally vertical faults. These faults cannot be dated (time of last movement) onsite owing to a lack of younger, covering sediments.
2. The Champion faults are, however, dated by reasonable projection into the trench exposures at the Yucca site (Site 2), across Argyle Street to the west.
3. A fold limb and a slip surface exposed in the east Yucca trench is covered by a horizontal, unbroken mudflow that bears a moderately developed paleosol estimated to be at least ~30 ka old. The mudflow, in turn, is overlain by another ~12 k sequence of "Argyle Channel" sand; thus indicating that last site-specific deformation occurred prior to at ~40 ka ago.
4. Based on structural modeling, the Champion faults most likely originated as near-surface tensional slip during folding of the Yucca Street anticline. Accordingly, such faults are typically neither seismogenic nor of regional extent, reasonable scenarios documented by exposures in the nearby Yucca trenches.
5. Last displacement of the Champion site faults therefore took place prior to the Holocene, and hence are "not active" according to present State of California definition.

5.0 LIMITATIONS

The overall assessment of the geologic and fault hazard conditions, in this report, reflects GDC's professional opinions and is intended for the use by Riley Realty, LTD, and its design consultants. This report has been prepared solely for assessing seismic hazard impact on the proposed development and may not contain sufficient information for environmental (hazardous waste) and geotechnical (foundation) purposes for this study. The recommendations shall not be extrapolated to areas not covered by this report, or used for other facilities, without the review and approval of GDC and from Riley Realty, LTD. This report or any portion of this report may be provided to state, county or city agents for informational purposes only.

The GDC investigation and evaluations were performed in accordance with generally accepted local standards using that degree of care and skill ordinarily exercised under similar circumstances by reputable engineering geology and geotechnical consultants practicing in this or similar localities. No other warranty, expressed or implied, is made as to the professional advice included in this report.

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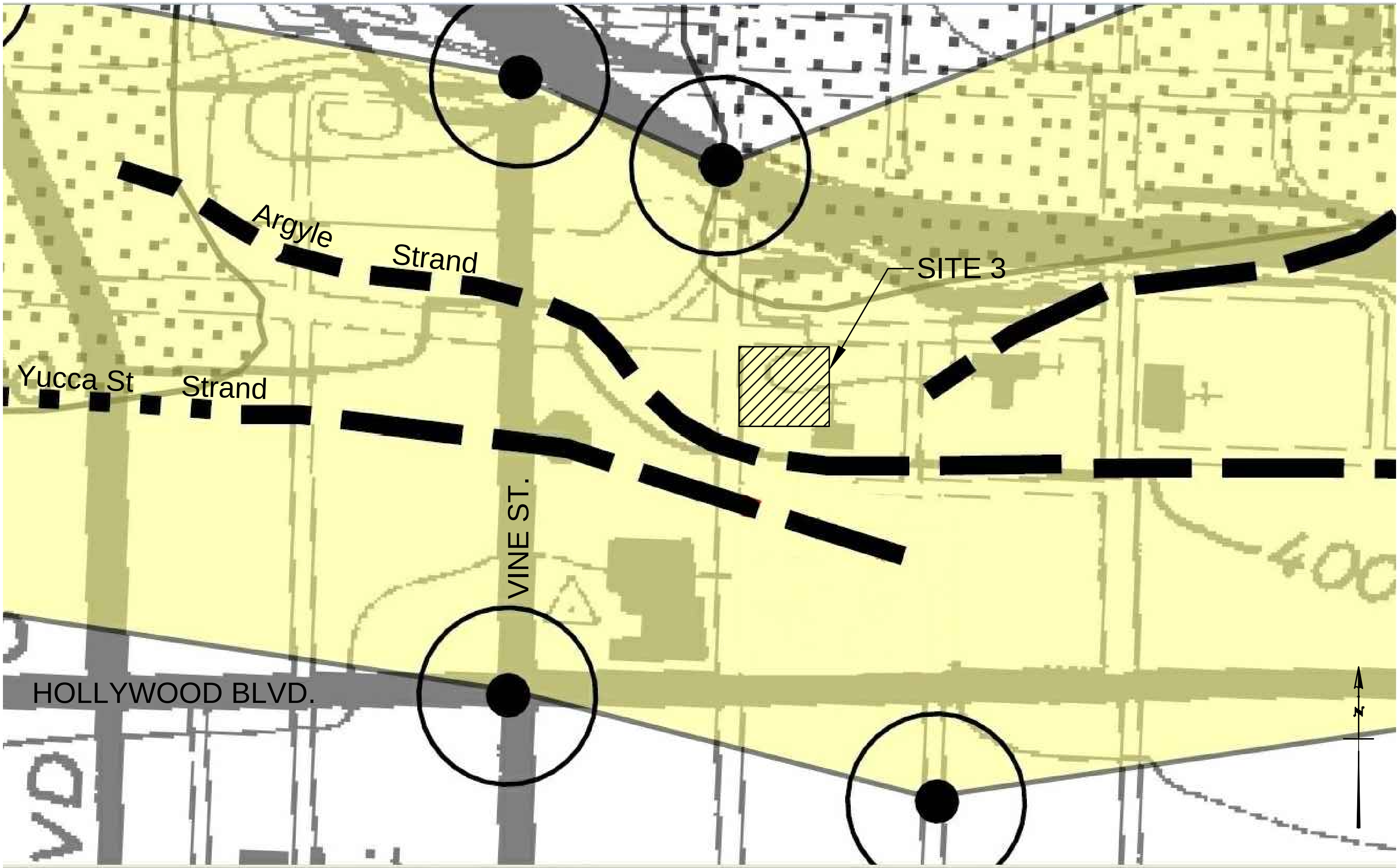
FIGURES



Reference: California Survey FER 253, Jan 8, 2014
LA Weekly 1-8-14

DATE: 5/2/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	SITE MAP PROPOSED AP ZONE	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: SK			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: NO SCALE
REVISION: --					FIGURE NUMBER: 1

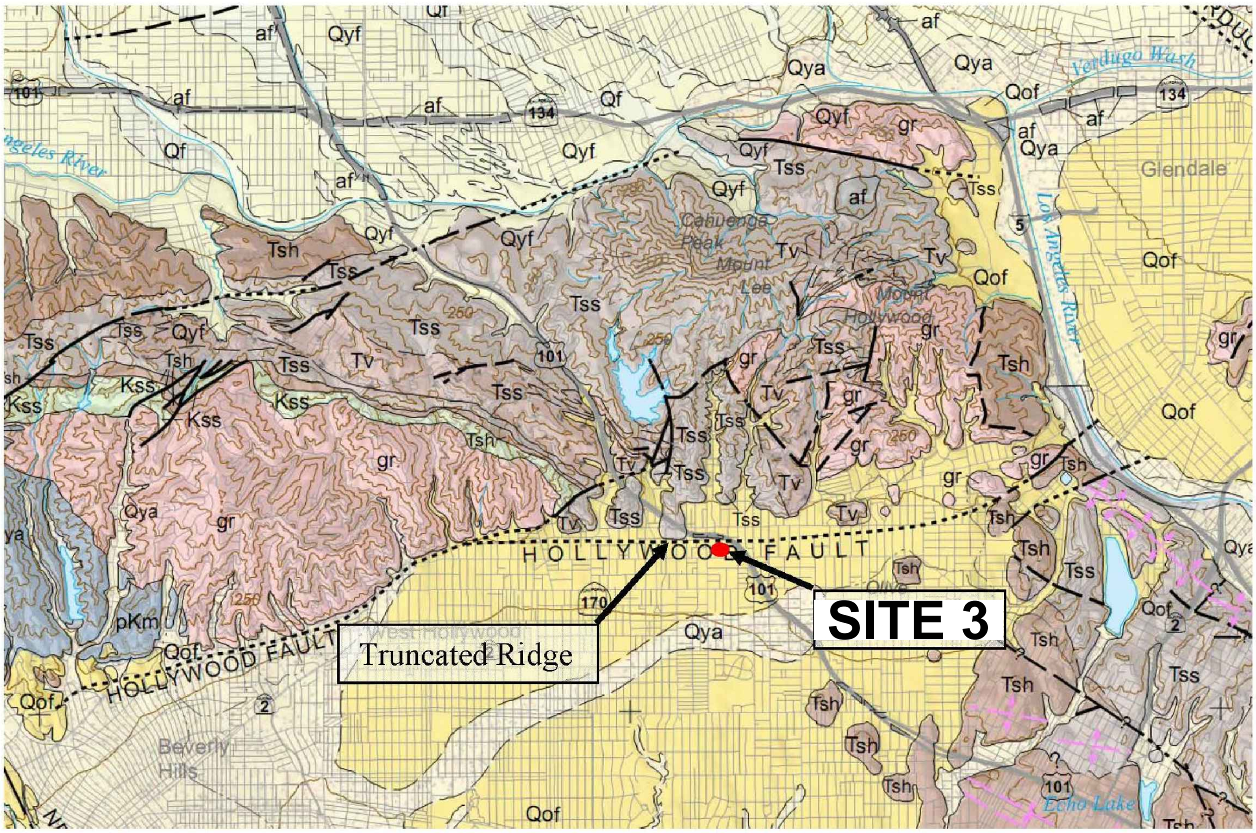
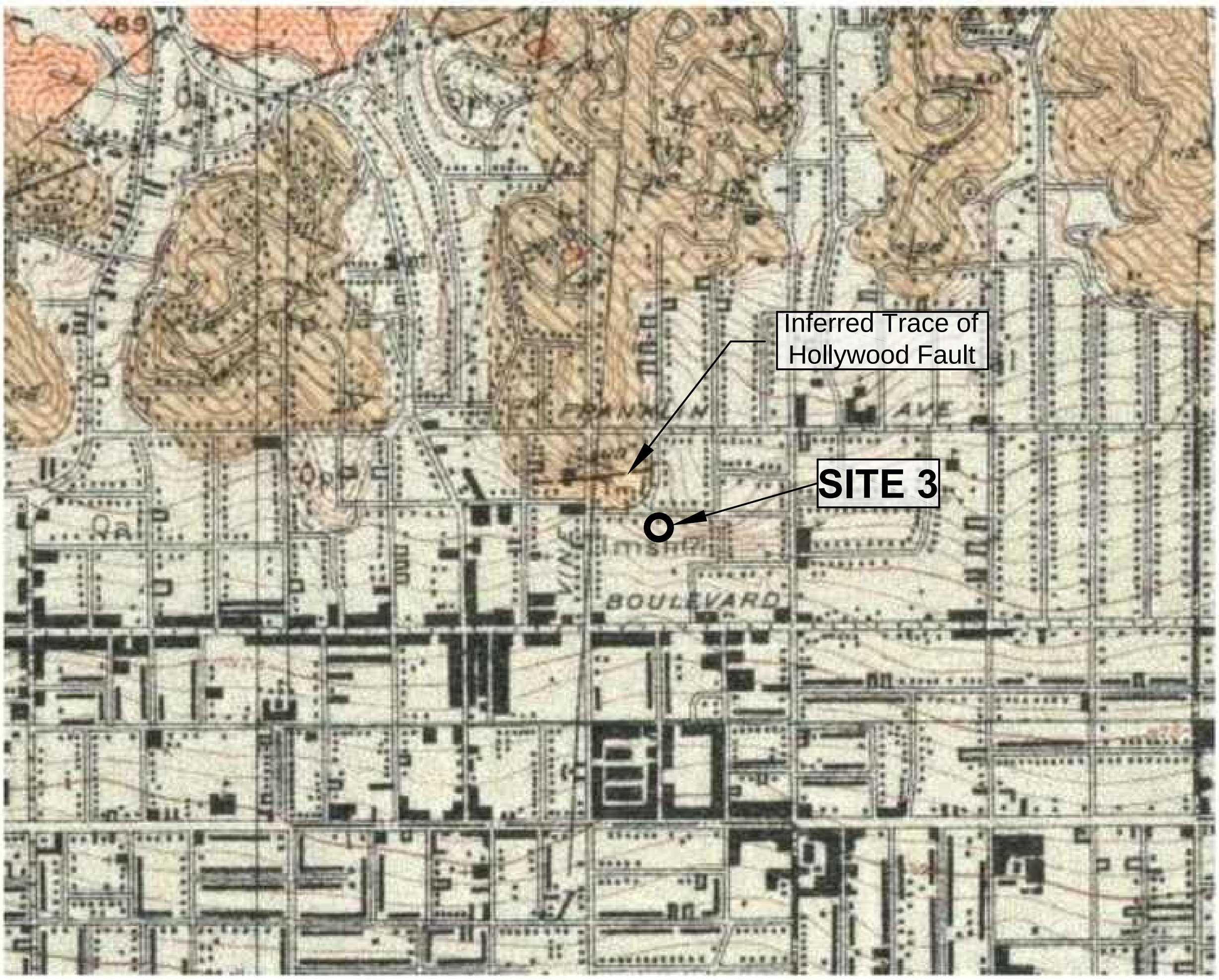


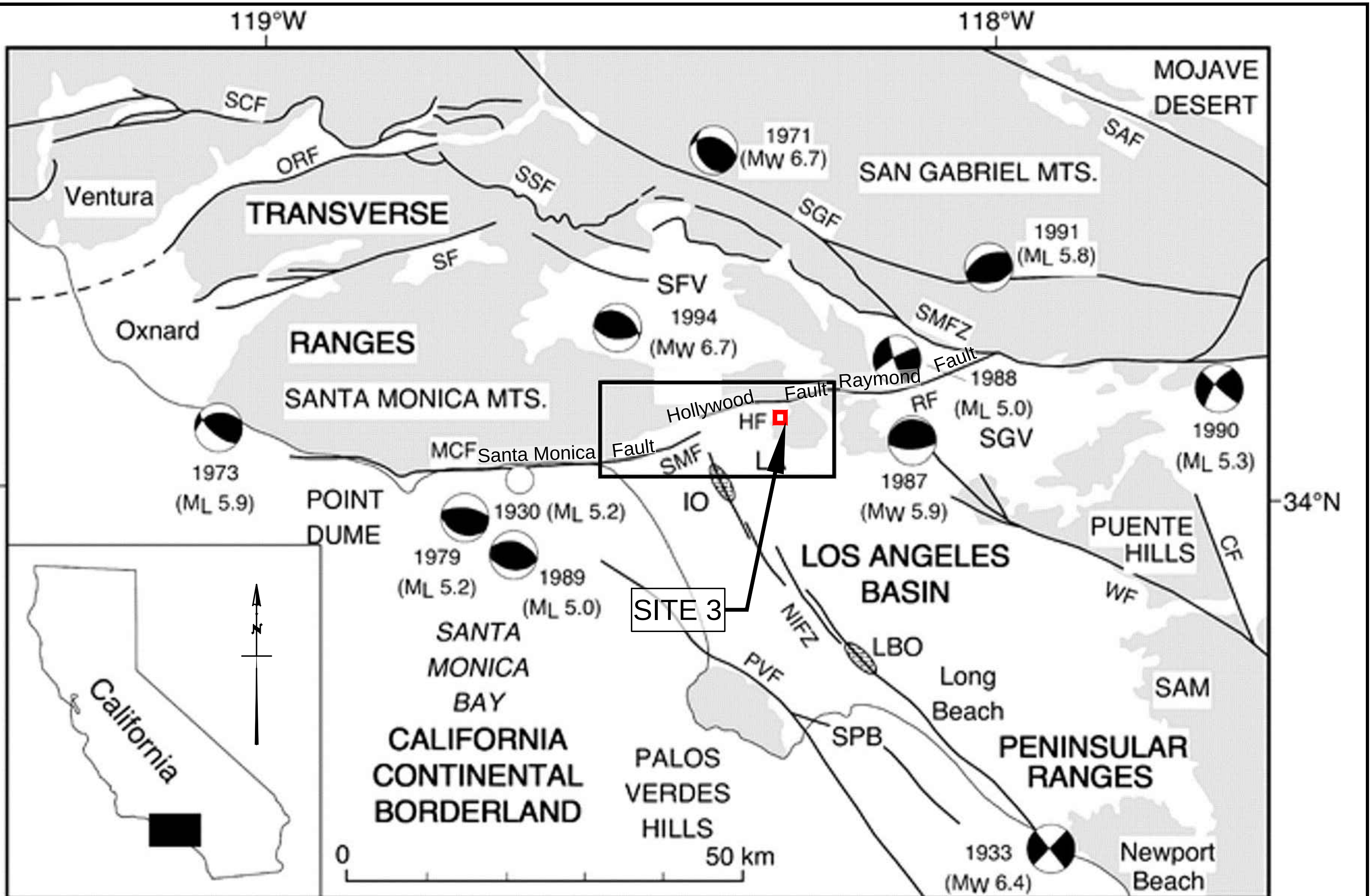
Figure 2: Geologic map of the area. Scale ~1:100,000. (California Geological Survey, Quaternary Geology Map of the Los Angeles 30x60 Quadrangle).

DATE: 4/21/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC	CGS QUATERNARY GEOLOGIC MAP	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: SK		370 Amapola Ave. Suite 212 Torrance, CA. 90501		SCALE: NO SCALE
REVISION: --				1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	FIGURE NUMBER: 2



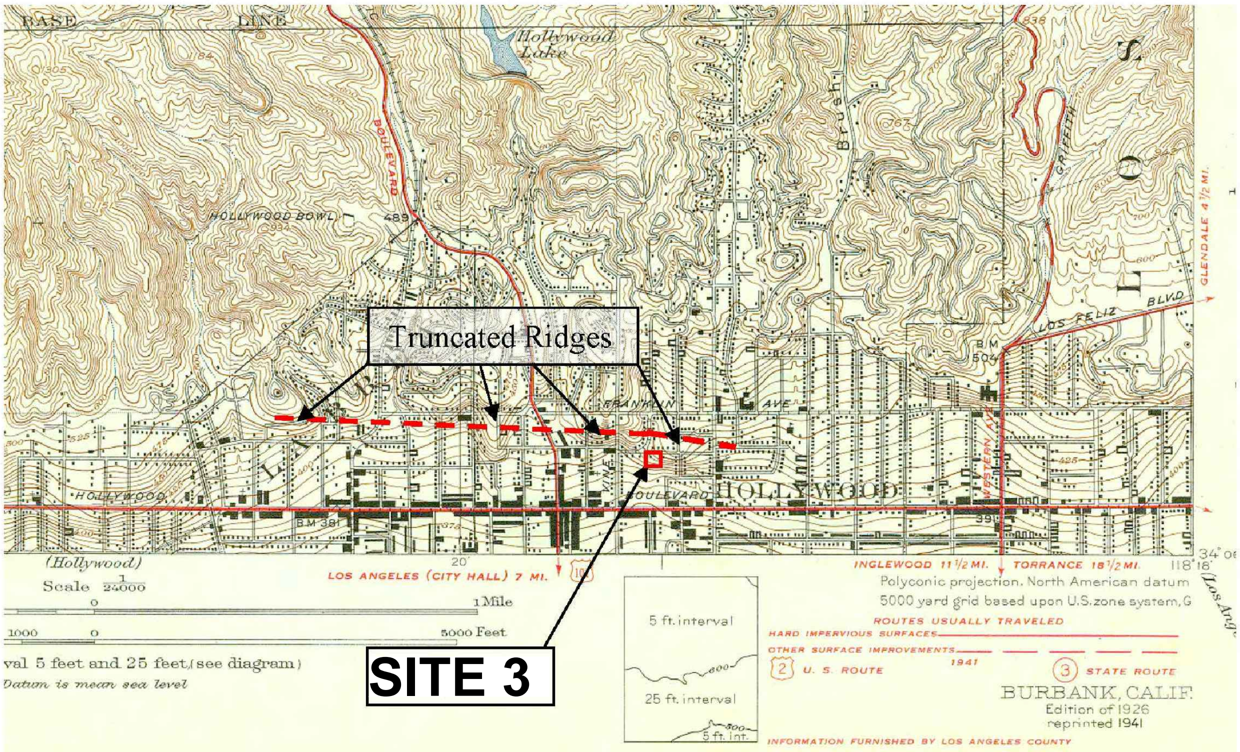
Geologic map of SITE 3 (Champion) and vicinity (after Hoots and Kew, 1931) showing inferred trace of a Hollywood Fault separating Modelo (T_m), and Topanga (T_p) Formations and granite rocks and alluvium (Q_{al}).

DATE: 4/11/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC	LOCAL GEOLOGIC MAP, HOOTS AN KEW, (1931)	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: SK		370 Amapola Ave. Suite 212 Torrance, CA. 90501	1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: NO SCALE
REVISION: --					FIGURE NUMBER: 3



Regional fault map of Los Angeles area (after Tsutsumi, Yeats, Huftile, 2001)

DATE: 5/2/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	REGIONAL FAULTS AND HISTORIC EARTHQUAKE MAP	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: SK			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: NO SCALE
REVISION: --					FIGURE NUMBER: 4



Possible topographic expression of the Hollywood Fault (red dashed line) reflecting truncated ridges.

DATE: 4/21/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	BURBANK 6' QUADRANGLE, SHOWING GEOMORPHIC FEATURES, 1926, REV, 1941	PROJECT NUMBER: LA1183A
REVISION: 9/7/2014	APPROVED BY: SK			SCALE: NO SCALE
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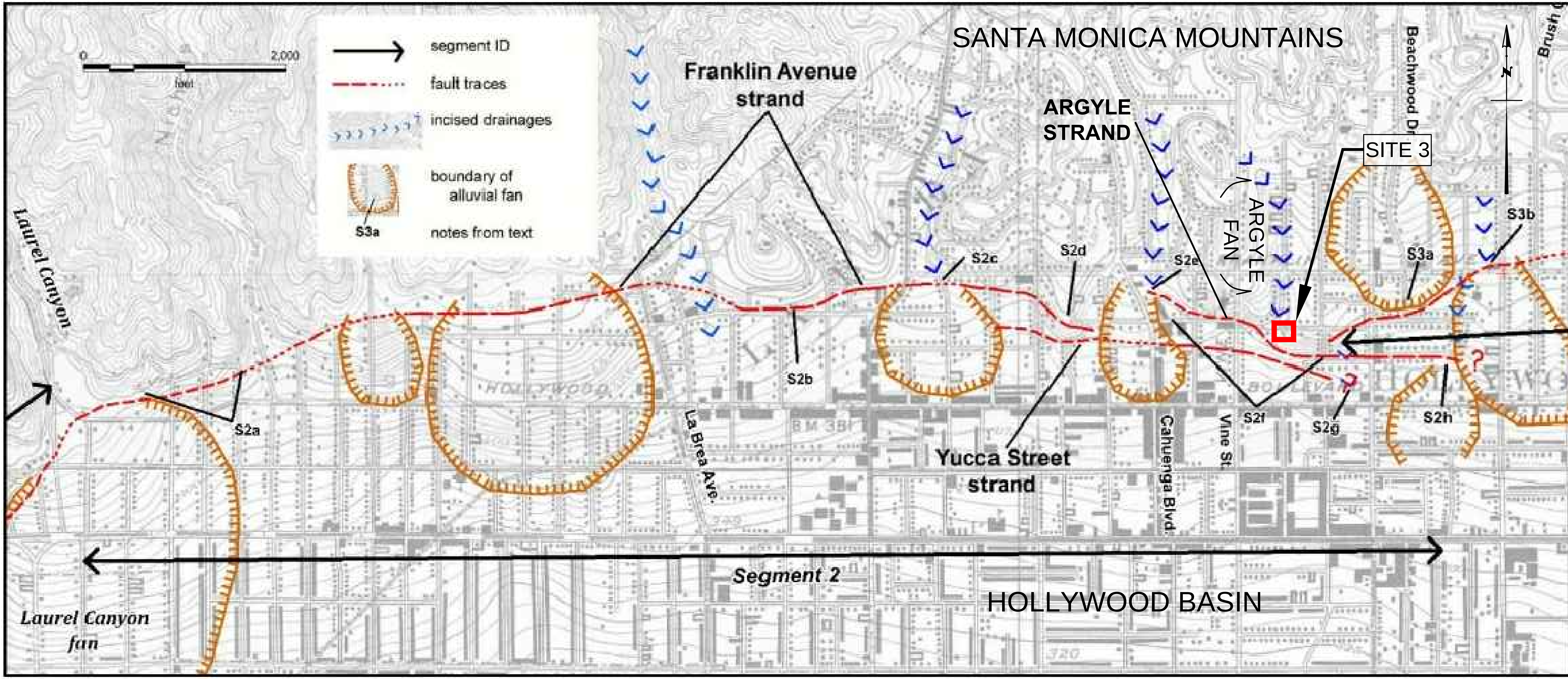


Figure 6: General distribution of Holocene fans and inferred traces of the Hollywood fault (after CGS, FER 253 (2014)); base map (Hollywood & Burbank 6' Quad, 1926)

DATE: 4/9/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	HOLLYWOOD FAULT GEOMORPHIC FEATURES, FER 253	PROJECT NUMBER: LA1183A
REVISION: --	APPROVED BY: SK			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: 1" = 1000'
REVISION: --					FIGURE NUMBER: 6

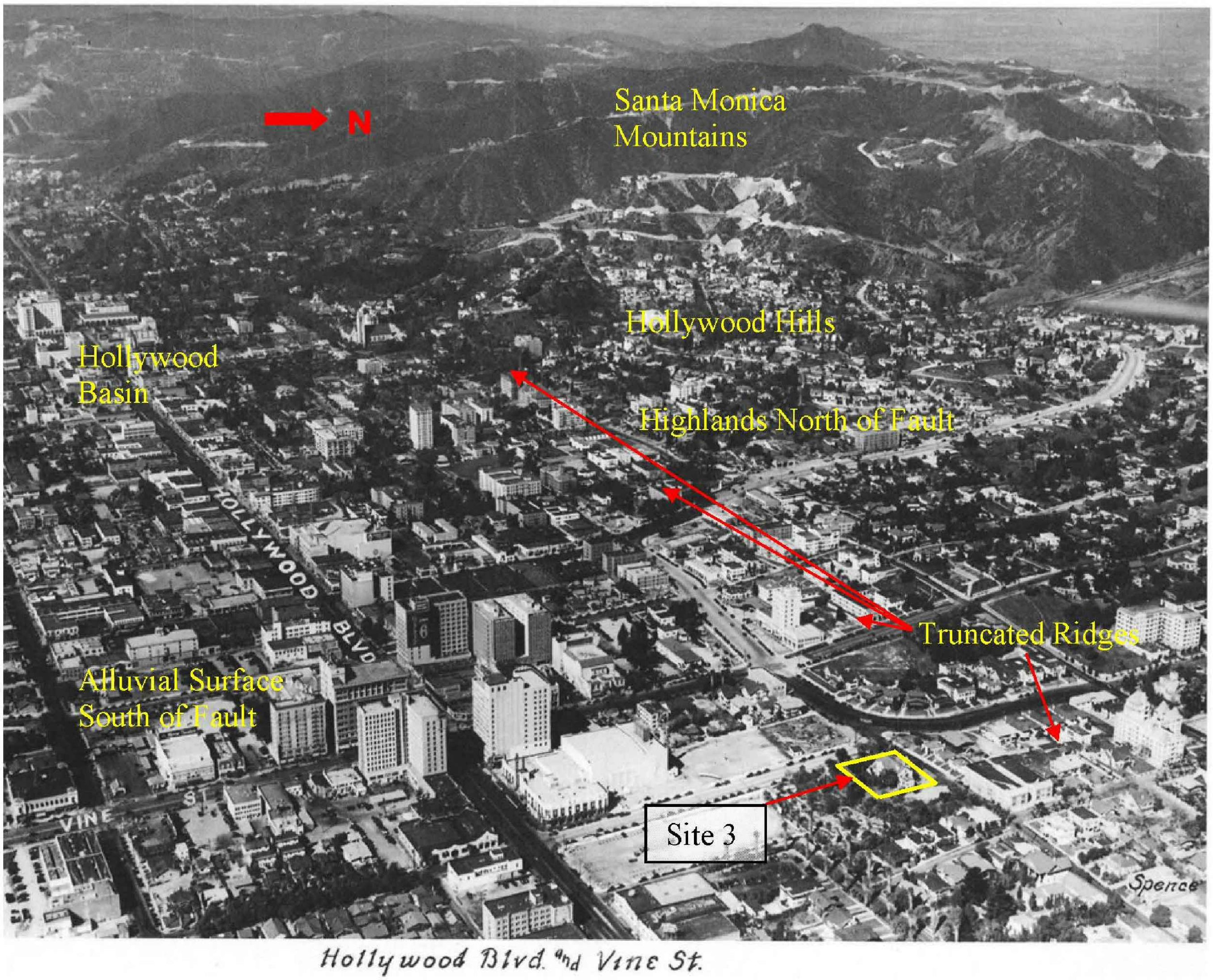


Figure 7: Approximate lineaments of the truncated ridges (red dashed line). (Spence Collections, 3-2-31, The Benjamin and Gladys Thomas Air Photo Archives, UCLA).

DATE: 4/21/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	SPENCE 1930 OBLIQUE AERIAL PHOTO SHOWING GEOMORPHIC FEATURES	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: SK				SCALE: NO SCALE
REVISION: --				1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	FIGURE NUMBER: 7

Figure 8: Approximate linear expression of the truncated ridges (red dashed line) based on aerial photo analysis. See Figure 6 for other geomorphic details. Scale unknown. (Continental Aerial Photo, 10-27-54).

N

DATE: 4/21/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CONTINENTAL 1954 AERIAL PHOTO SHOWING GEOMORPHIC FEATURES	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: SK			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: NO SCALE
REVISION: --					FIGURE NUMBER: 8

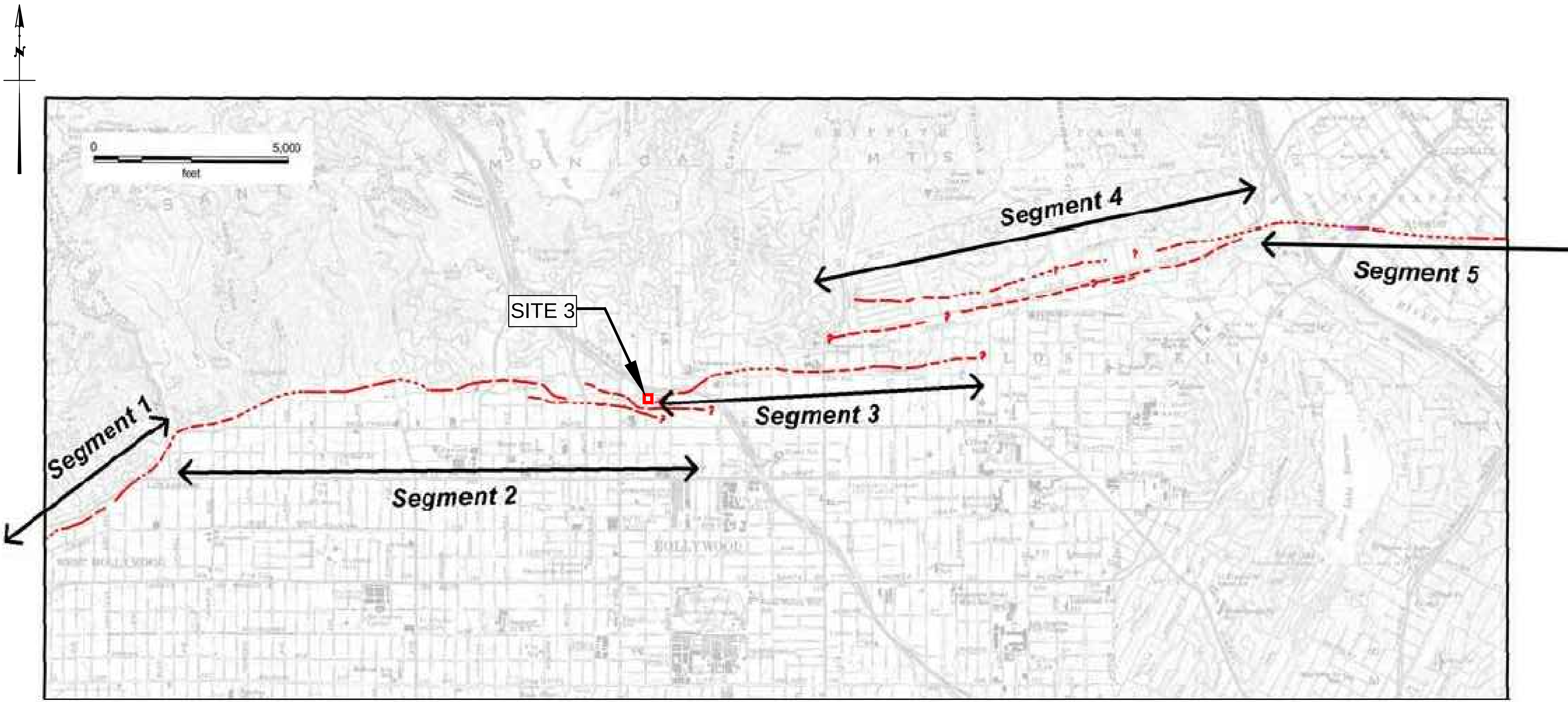


Figure 9: Relationship SITE 3 (Champion) to Hollywood Fault segment depicted in CGS FER 253 (2014).

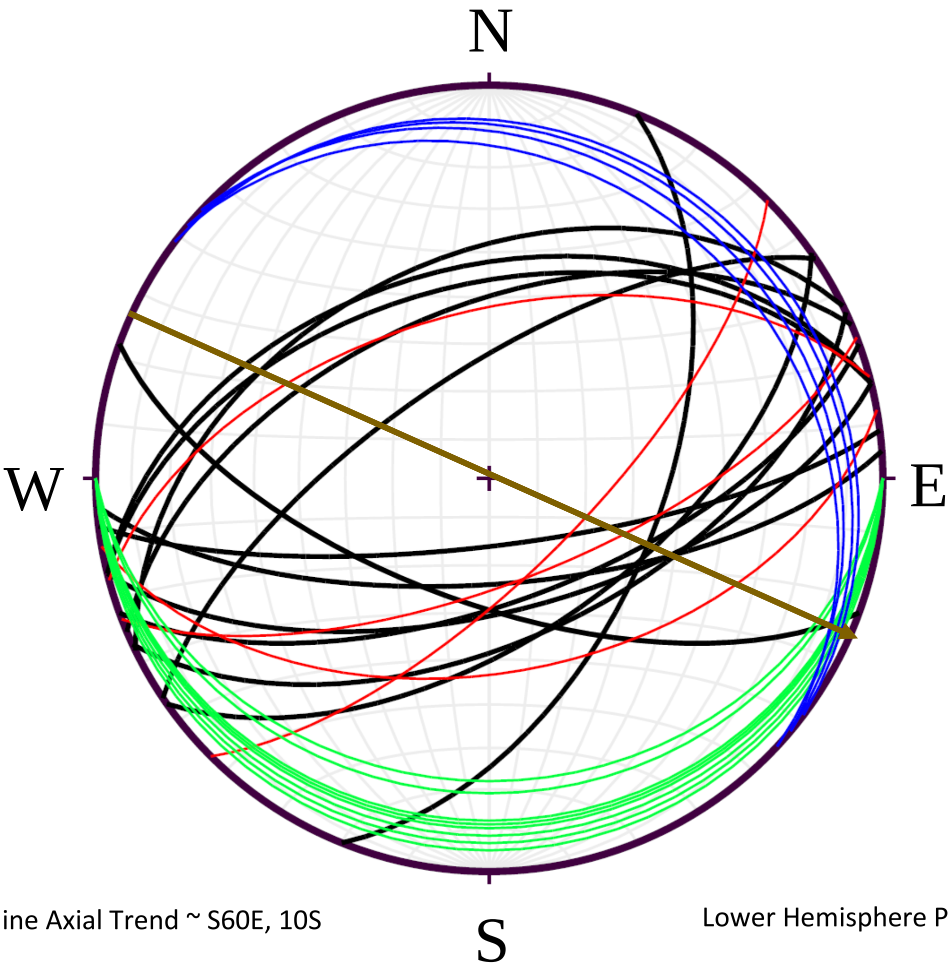
DATE: 4/9/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	HOLLYWOOD FAULT SEGMENT PLAN	PROJECT NUMBER: LA1183A
REVISION: --	APPROVED BY: SK			SCALE: AS SHOWN
REVISION: --			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	FIGURE NUMBER: 9

LOCAL STRATIGRAPHIC SECTION

	Symbol	Thickness	Sediment Type	Name
Holocene	Q_{af}	0 - 10'		Artificial Fill
Holocene	Q_s	0 - 30'		Upper Sand Argyle Channel Deposits
Pleistocene	Q_m	0 - 13'		Older Mud Flow
Pleistocene	Q_{df}	0 - 25'		Older Debris Flow
Pleistocene	Q_{oal}	0 - >60'		Older Alluvium
Miocene	T_m	100+		Modelo Formation "Bedrock"

Figure 10

STEREOGRAPHIC PROJECTION



Anticline Axial Trend ~ S60E, 10S

Intersection of Faults ~ S66-70E

Lower Hemisphere Plot

Black= Faults

Red = Joints

Green = Site 3 (Champion) Bedding Planes

Blue = North Offsite Bedding Planes

Brown = ~ Anticline Axial Trend

Figure 11. Stereo plot of geologic-structural elements of faults, joints and bedding planes at Proposed Yucca-Argyle Apartments.

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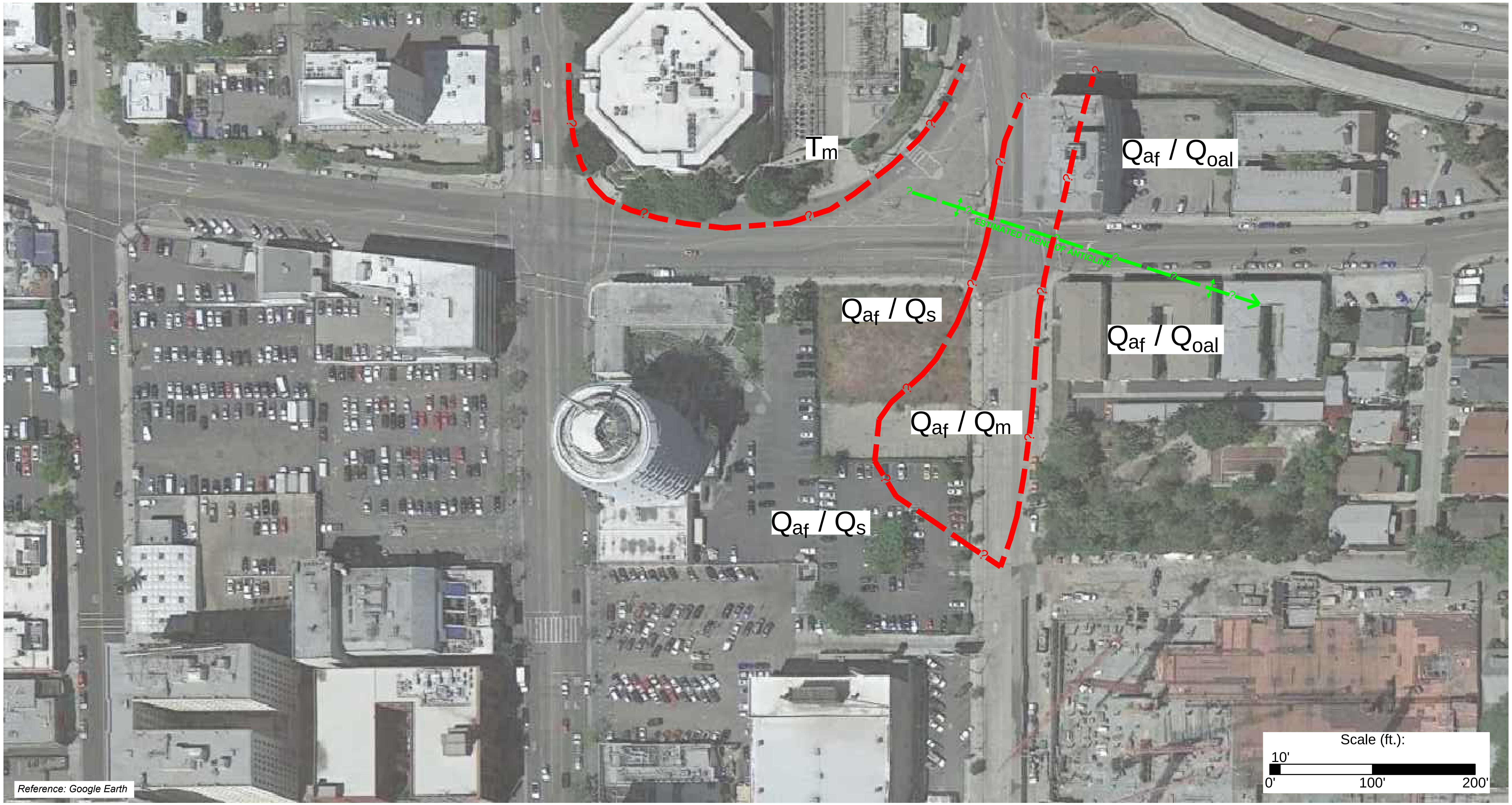
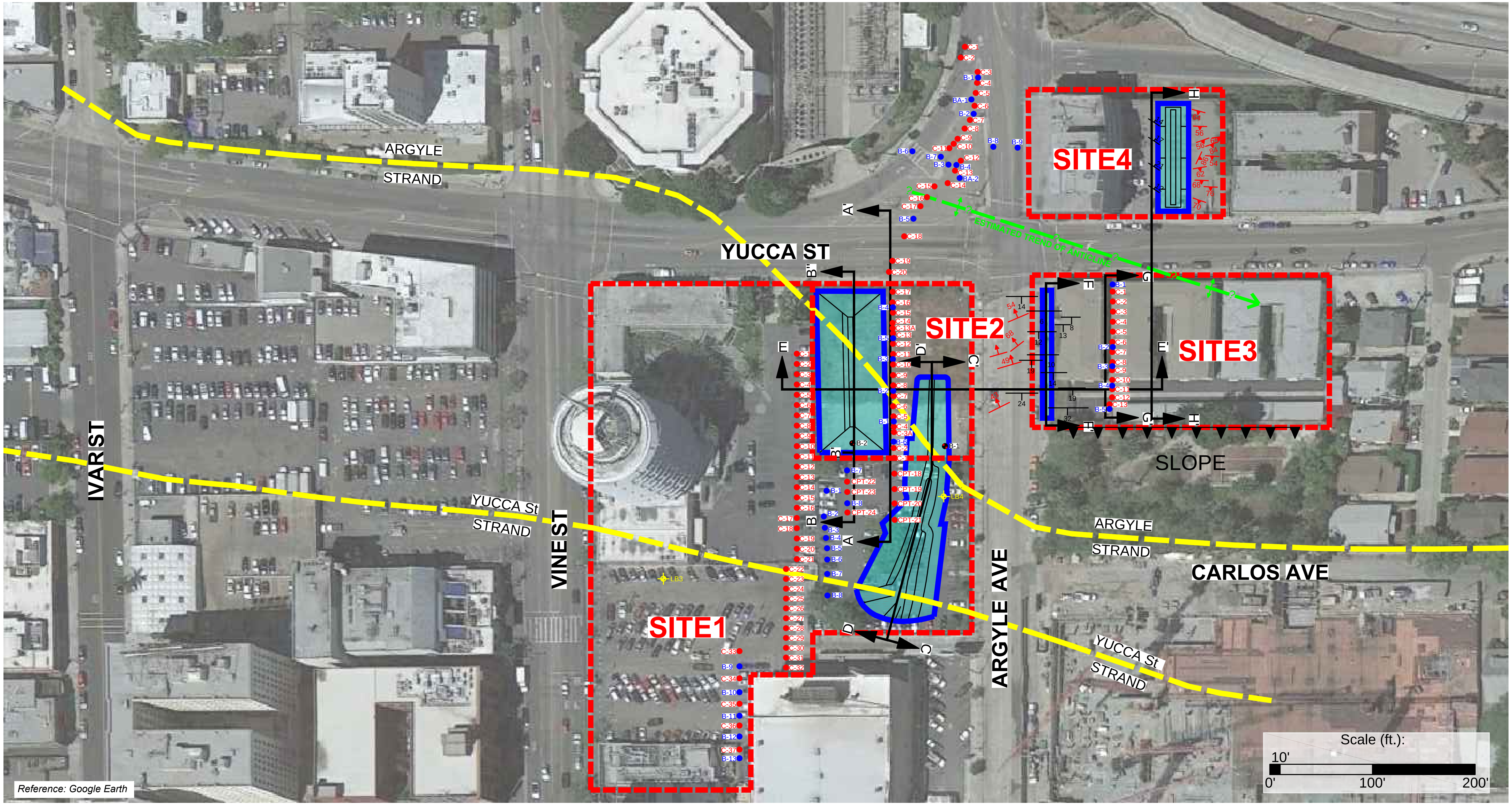


DATE: 8/5/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	GEOLOGIC MAP	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: MR		1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: AS SHOWN
REVISION: 9/8/2014				FIGURE NUMBER: 12

PLATES



LEGEND

- B-6 Boring Location and Test Number, GDC 2014
- BA-2 Bucket Auger Location and Test Number, GDC 2014
- C-20 CPT (Cone Penetration Test) Location and Test Number, GDC 2014
- B-2 Boring Location and Test Number, GDC 2006
- LB3 Boring Location and Test Number, Langan
- Trench Location Outlines
- 43 Strike and Dip of Faults
- 24 Strike and Dip of Bedding
- ? ? Approximate location of anticline. Barb indicates direction of plunge.
- Top of Slope

DATE: 8/5/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	BORING CPT AND TRENCH LOCATIONS PLAN MODIFIED FROM GDC PN: LA1161A (2014)	PROJECT NUMBER: LA1183A
REVISION: 9/4/2014	APPROVED BY: MR			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA SITE 3	SCALE: AS SHOWN
REVISION: 9/8/2014					PLATE NUMBER: 1

LEGEND

Qaf	Qs	Qm	Qdf	Tm
Artificial Fill	Upper Sand "Argyle Channel Deposits"	Mud Flow	Older Debris Flow	Modelo Formation "Bedrock"
HOLOCENE		PLEISTOCENE		MIOCENE

Legend

* = Data interpreted from off site borings and CPT logs to project cross section to the North.

DATE: 10/23/2013	DRAWN BY: K. MADAMBA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION A-A' (CPT/SOIL CORE)
REVISION: 4/18/2014	APPROVED BY: P. KASHIGHANDI		6230 YUCCA ST, HOLLYWOOD, CA
REVISION: 8/29/2014			

PROJECT NUMBER: LA-1161A

SCALE: AS SHOWN

PLATE NUMBER: 2

CHARCOAL SAMPLE

K = Krotovina

115 — 110 TRENCH REFERENCE STATIONING

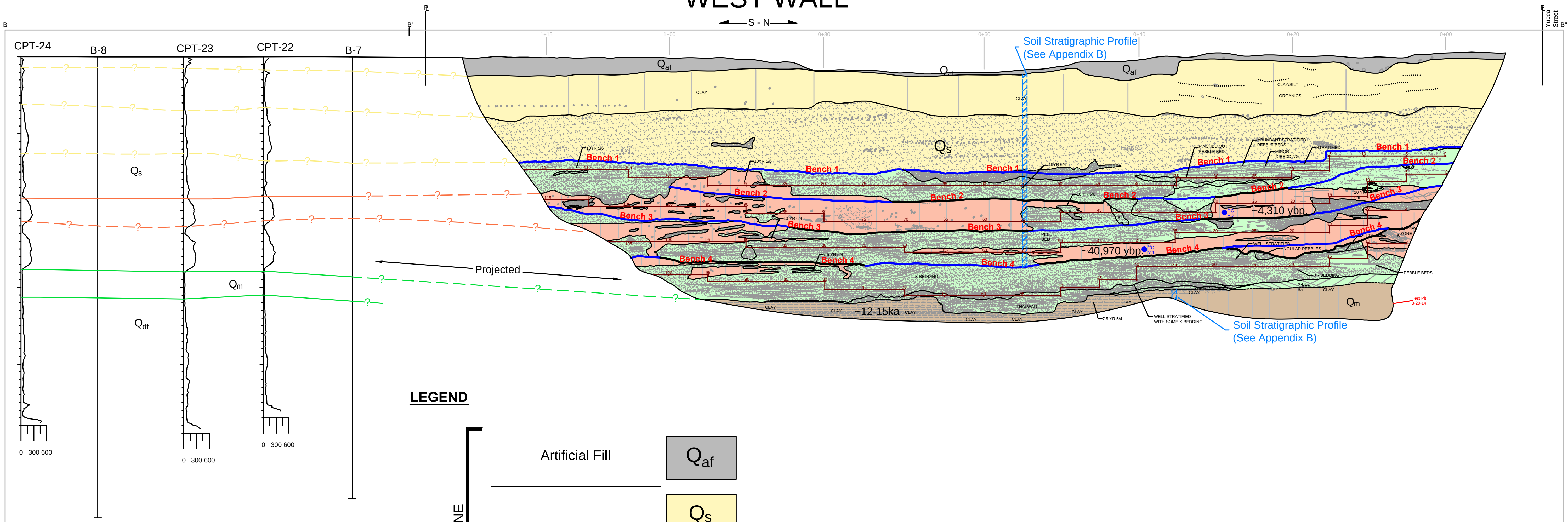
DATE: 5/2/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION B'-B" (West Trench)
REVISION: 9/7/2014	APPROVED BY: SK		6230 YUCCA ST, HOLLYWOOD, CA
REVISION: --			

PROJECT NUMBER: LA-1161A

SCALE: AS SHOWN

PLATE NUMBER: 3

WEST WALL



LEGEND

HOLOCENE	Artificial Fill	Qaf
	Upper Sand "Argyle Channel" Deposits	Qs
		Qs
		Qs
PLEISTOCENE	Mud Flow	Qm

● C14 SAMPLE

K = Krotovina

115 — 110 TRENCH REFERENCE STATIONING

Approximate Scale:

0' 10' 20'

DATE: 5/2/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION B-B'-B'' (West Trench and Logs)
REVISION: 8/30 /2014	APPROVED BY: SK		6230 YUCCA ST, HOLLYWOOD, CA
REVISION: --			

PROJECT NUMBER:	LA-1161A
SCALE:	AS SHOWN
PLATE NUMBER:	4

East Trench - East Wall

LEGEND

HOLOCENE
- Artificial Fill — Q_{af}
- Upper Sand "Argyle Channel Deposits" — Q_s

PLEISTOCENE
- Mud Flow — Q_m
- Older Debris Flow — Q_{df}

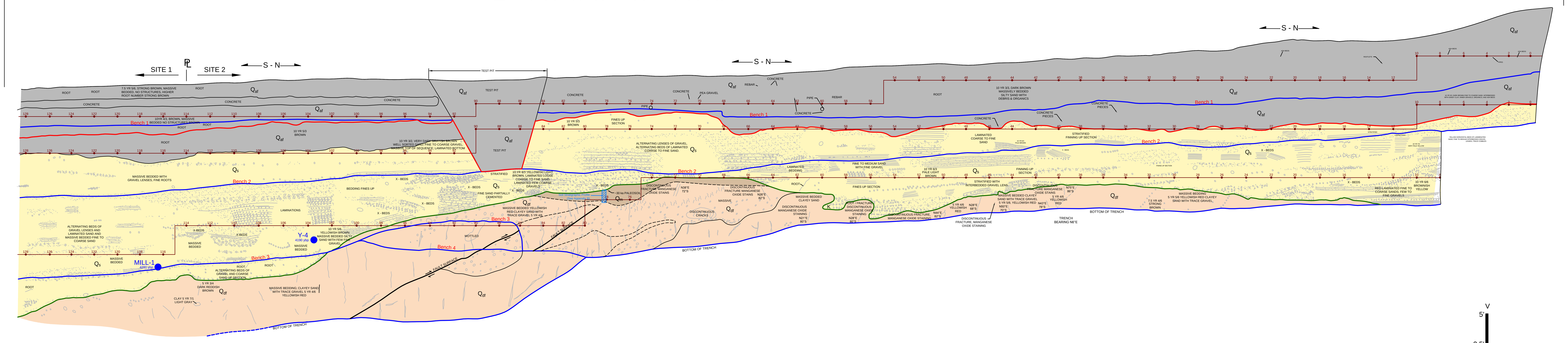
K = Krotovina

115 110 TRENCH REFERENCE STATIONING

Scale (ft.): V 5' 2.5' 0' ; H 0' 2.5' 5'

DATE: 8/14/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC	CROSS SECTION C-C' (EAST TRENCH - EAST WALL)	PROJECT NUMBER: LA-1161A
REVISION: 8/30/2014	APPROVED BY: SK	370 Amapola Ave. Suite 212		SCALE: AS SHOWN
REVISION: 9/9/2014		Torrance, CA. 90501	6230 YUCCA ST, HOLLYWOOD, CA	PLATE NUMBER: 5

East Trench - West Wall



LEGEND

HOLOCENE
- Artificial Fill — Q_{af}
- Upper Sand "Argyle Channel Deposits" — Q_s

PLEISTOCENE
- Mud Flow — Q_m
- Older Debris Flow — Q_{df}

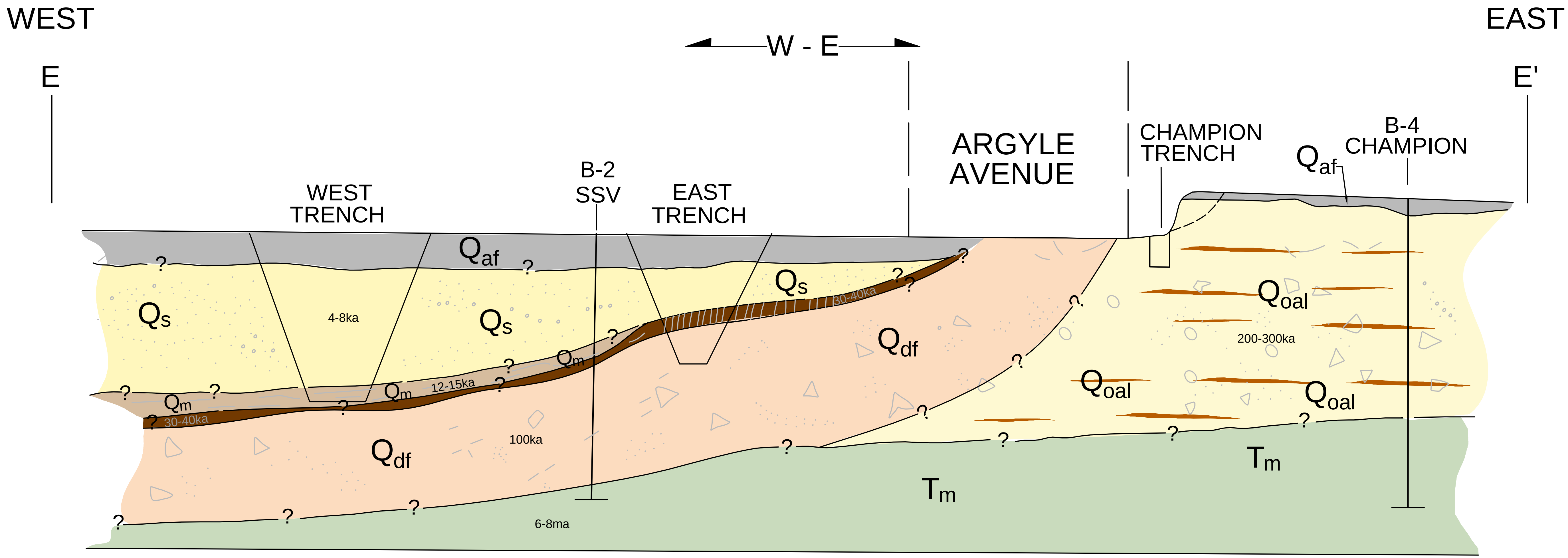
K = Krotovina

115 110 TRENCH REFERENCE STATIONING

● MILL-1 = C^{14} Sample

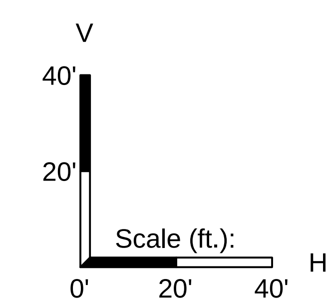
Scale (ft.): V 5' 2.5' 0' ; H 0' 2.5' 5'

DATE: 8/14/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC	CROSS SECTION D-D' (EAST TRENCH - WEST WALL)	PROJECT NUMBER: LA-1161A
REVISION: 9/9/2014	APPROVED BY: SK	370 Amapola Ave. Suite 212		SCALE: AS SHOWN
REVISION: --		Torrance, CA. 90501	6230 YUCCA ST, HOLLYWOOD, CA	PLATE NUMBER: 6



LEGEND

HOLOCENE	Artificial Fill	Q_{af}
HOLOCENE	Upper Sand "Argyle Channel Deposits"	Q_s
PLEISTOCENE	Mud Flow	Q_m
PLEISTOCENE	Older Debris Flow Buried Paleosol	Q_{df}
PLEISTOCENE	Older Alluvium	Q_{oal}
MIOCENE	Modelo Formation "Bedrock"	T_m



DATE: 8/5/2014
REVISION: 9/4/2014
REVISION: 9/8/2014
DRAWN BY: KM
APPROVED BY: SK

GROUP DELTA CONSULTANTS, INC
370 Amapola Ave.
Suite 212
Torrance, CA. 90501

CROSS SECTION E-E'
(EAST-WEST SCHEMATIC)

6230 YUCCA ST, HOLLYWOOD, CA

PROJECT NUMBER: LA-1161A
SCALE: AS SHOWN
PLATE NUMBER: 7

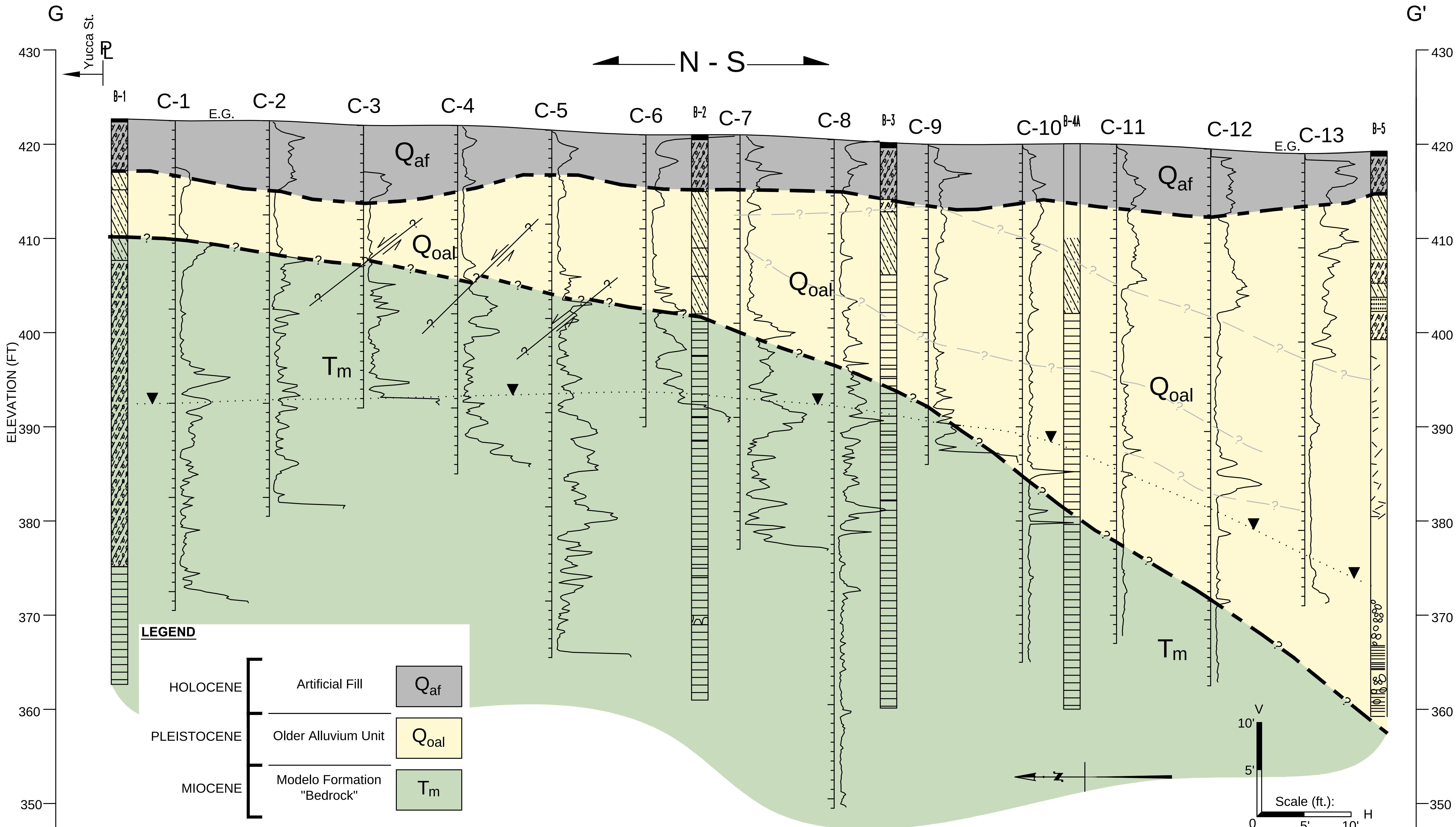
LITHO-STRATIGRAPHIC UNITS

HOLOCENE		Q_{af}	10 YR 6/4 (light yellowish brown) Silty SAND (SM); (10% coarse, 40% medium, 50% fine SAND; 20% fines); few fine to medium GRAVEL; trace cobbles; trace mica; trace debris; trace organic matter; unconsolidated.
UPPER PLEISTOCENE	OLDER ALLUVIUM Q_{oal}	Unit 1	10 YR 6/3 (pail brown) Silty SAND (SM); (10% fine GRAVEL, 30% coarse, 50% medium; 20% fine SAND; 20% fines); weak to moderately cemented; moderately developed bedding.
		Unit 2	10 YR 6/6 (brownish yellow) SAND with SILT (SP-SM); (90% fine SAND, 10% SILT); massive; moderately to well cemented.
		Unit 3	10 YR 8/2 (very pail brown) Sandy CLAY (CL); (15% very fine SAND); moderately well to well indurated blocky.
		Unit 4	7.5 YR 6/8 (reddish yellow) Silty SAND (SM); (10% coarse, 15% medium, 50% fine SAND; 20% fines); fine GRAVEL; trace cobbles; poorly developed bedding.
		Unit 5	7.5 YR 5/6 (strong brown) Cobble Conglomerate; (10% coarse, 10% fine GRAVEL; trace cobbles; 10% coarse, 20% medium, 30% fine SAND; 20% fines); cobbles are subrounded and deposited in lenses, poorly cemented.
		Unit 6	7.5 YR 4/6 (strong brown) SAND with SILT; (10% medium, 80% fine SAND; 10% fines); poorly cemented, massive, holds moisture.
		Unit 7	10 YR 6/4 (light yellowish brown) SAND; (trace coarse GRAVEL, few fine GRAVEL, 15% coarse SAND, 30% medium SAND, 50% fine SAND); GRAVEL is subrounded, weakly cemented, friable, moderately well stratified, discontinuous lenses of fine to coarse GRAVEL. Sharp contacts above and below unit.
		Unit 8	7.5 YR 4/6 (strong brown) mottled with 10 YR 6/3 (pail brown) Sandy CLAY to CLAY; (10% - 20% fine SAND, 80% - 90% CLAY);

Legend

- 10 Bedding
- 68 Fracture / Joint
- 68 Fault and direction of movement
- K Krotovina
- 115 110 Trench Reference Stationing

DATE: 5/2/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION F-F' (CHAMPION TRENCH)	PROJECT NUMBER: LA-1183A
REVISION: --	APPROVED BY: SK			SCALE: AS SHOWN
REVISION: --			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	PLATE NUMBER: 8



LEGEND

HOLOCENE	Artificial Fill	Q_{af}
PLEISTOCENE	Older Alluvium Unit	Q_{oal}
MIOCENE	Modelo Formation "Bedrock"	T_m

E.G. Existing Grade

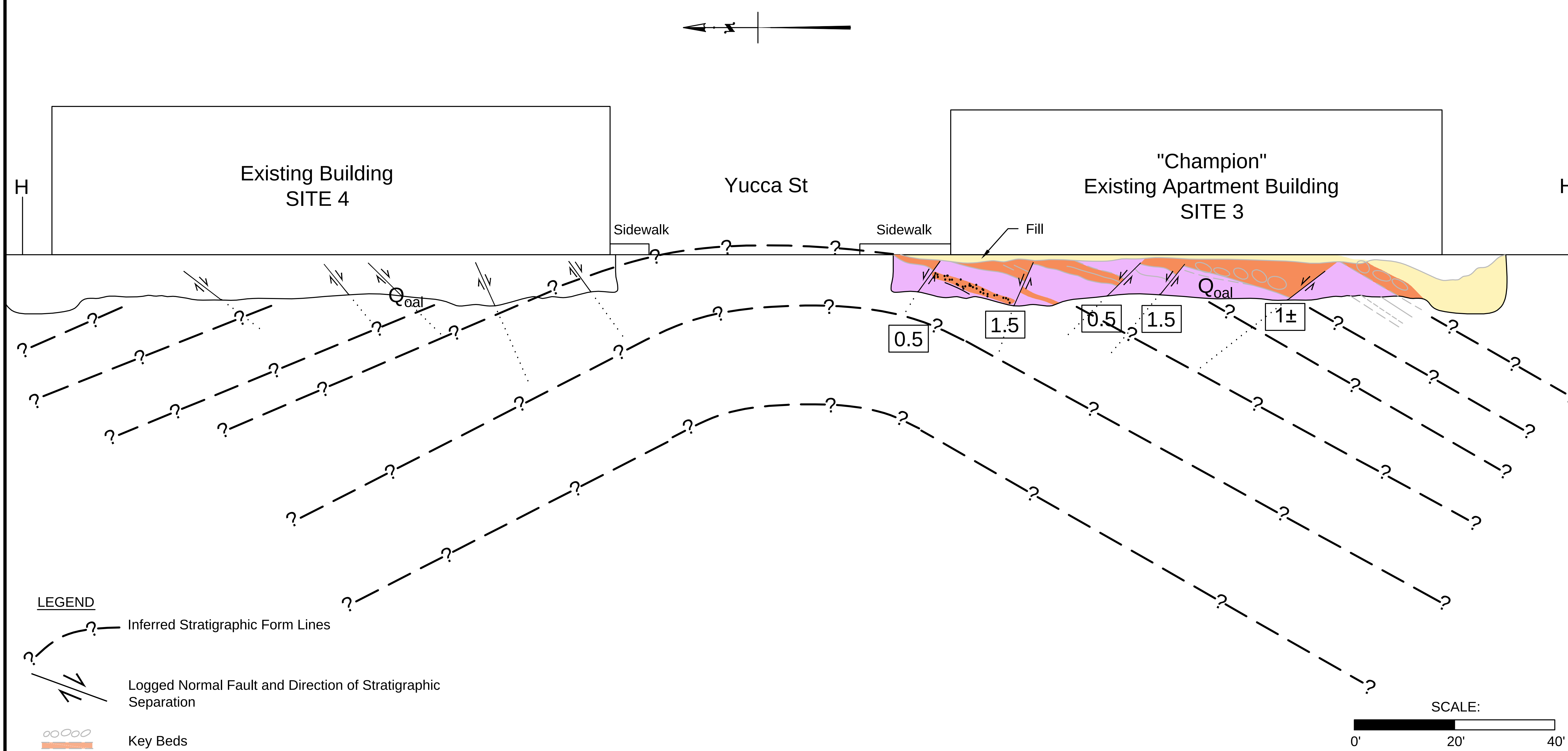
C-1 CPT Location and Number

Estimated Projections of Fault from (Champion) Trench (Cross Section F-F')

Inferred Stratigraphic Style Lines

Water Level and Inferred Ground Water Level Across Site

DATE: 1/22/2014	DRAWN BY: KM	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION G-G'	PROJECT NUMBER: LA1183A
REVISION: 9/5/2014	APPROVED BY: MM			1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: AS SHOWN
REVISION: --					PLATE NUMBER: 9



LEGEND

Inferred Stratigraphic Form Lines

Logged Normal Fault and Direction of Stratigraphic Separation

Key Beds

0.5 Amount of Observed Stratigraphic Separation in feet

DATE: 7/15/2014	DRAWN BY: KM	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	SCHEMATIC CROSS SECTION H-H'	PROJECT NUMBER: LA1183A
REVISION: 9/8/2014	APPROVED BY: MM		1756 AND 1760 ARGYLE AVE, HOLLYWOOD, CA	SCALE: AS SHOWN
REVISION: --				PLATE NUMBER: 10

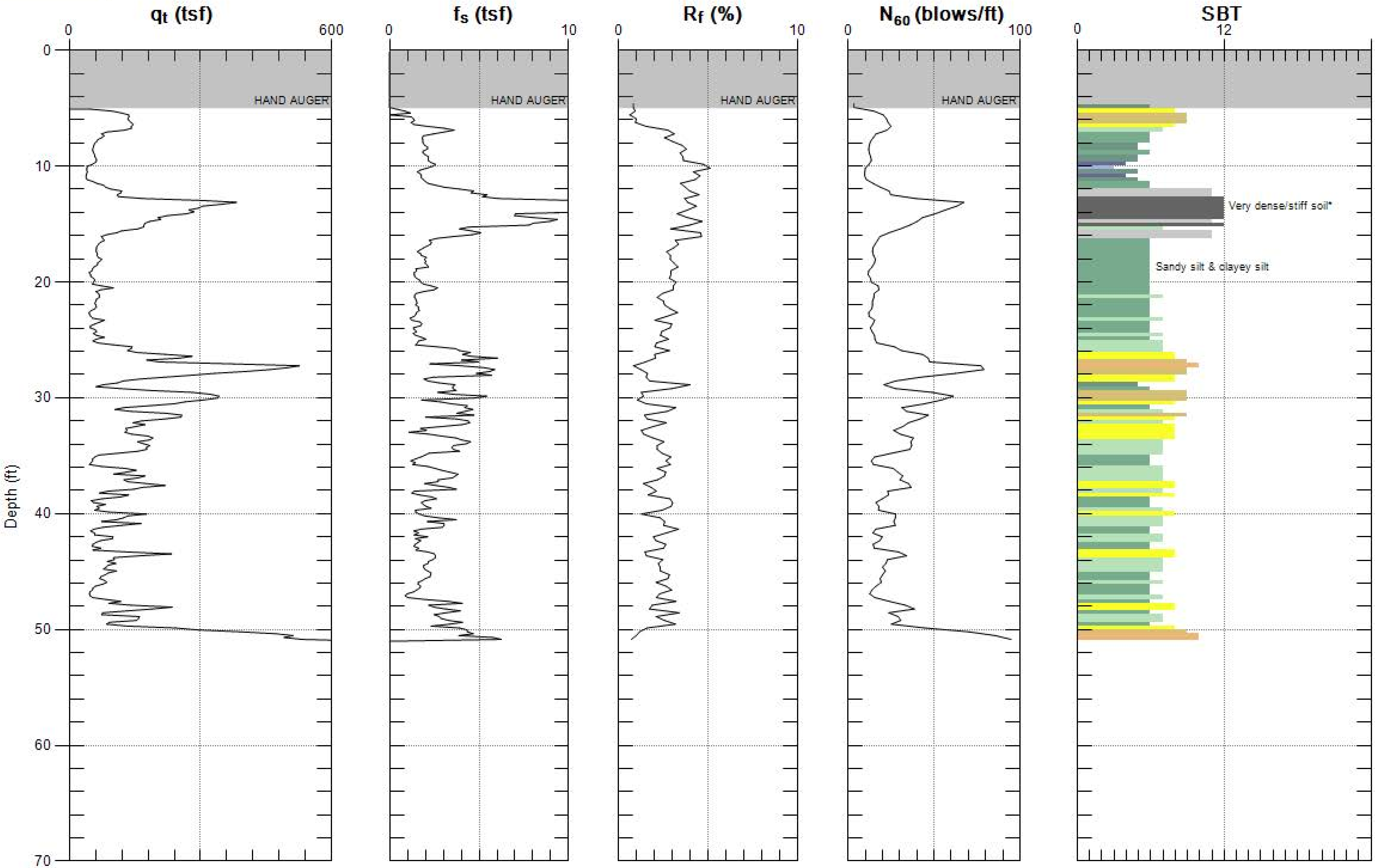
APPENDIX A: FIELD EXPLORATION – CPT DATA AND SOIL CORE LOGS SITE 3

Figure A - 1

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-1

Engineer: S.KOLTHOFF
Date: 1/21/2014 07:17



Max. Depth: 51.181 (ft)
Avg. Interval: 0.328 (ft)

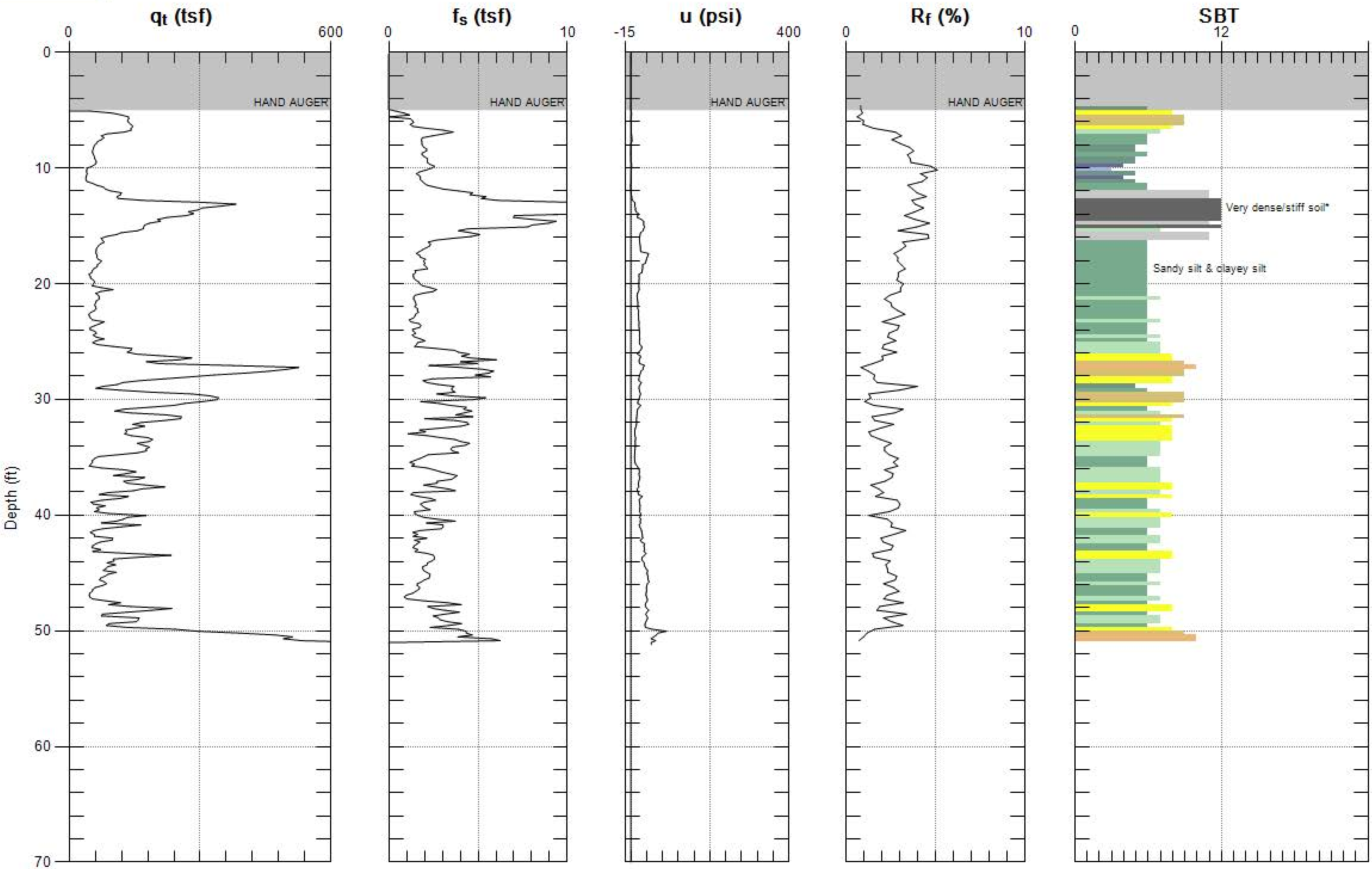
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 2

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-1

Engineer: S.KOLTHOFF
Date: 1/21/2014 07:17



Max. Depth: 51.181 (ft)
Avg. Interval: 0.328 (ft)

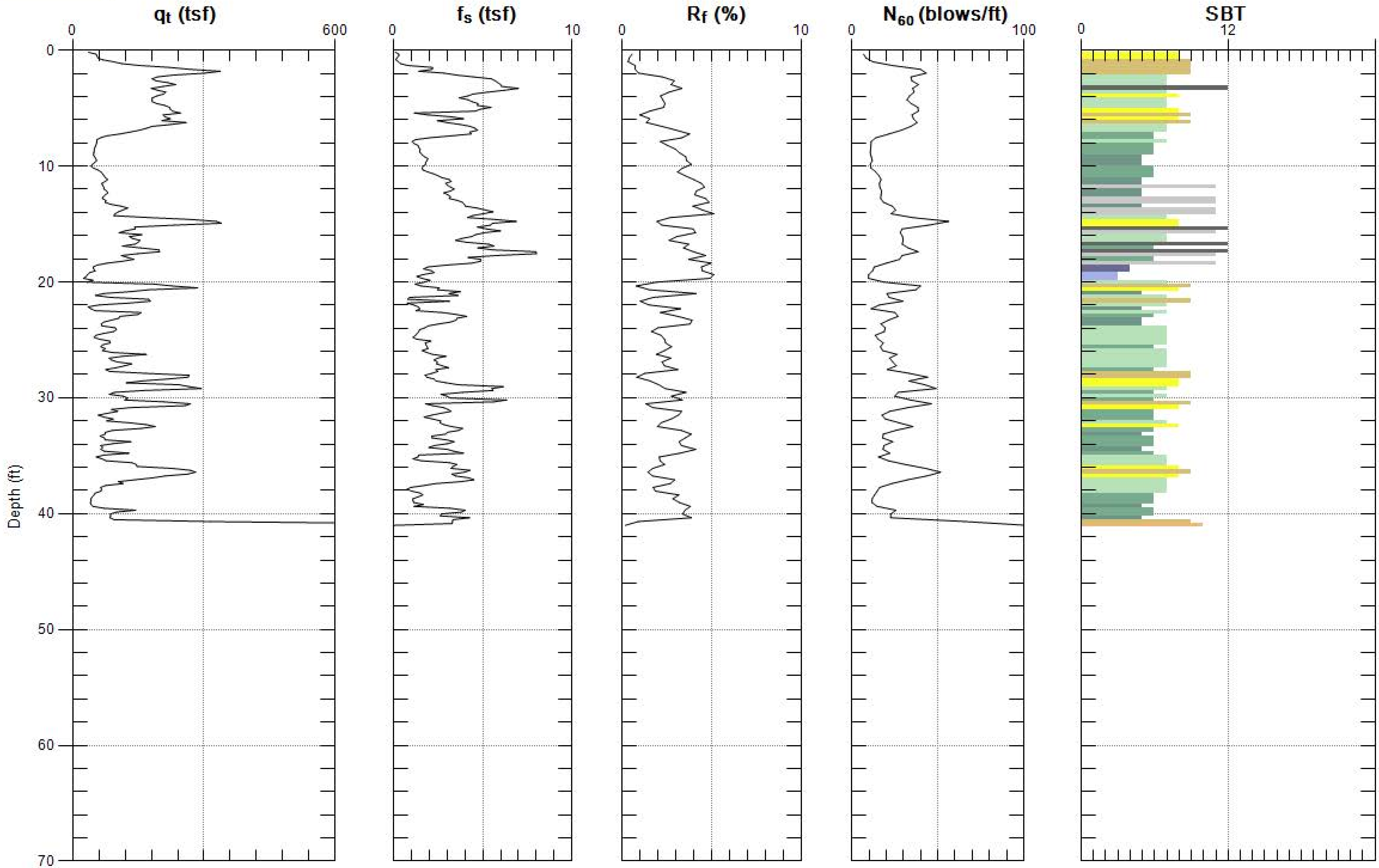
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 3

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-2

Engineer: S.KOLTHOFF
Date: 1/21/2014 08:52



Max. Depth: 41.175 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

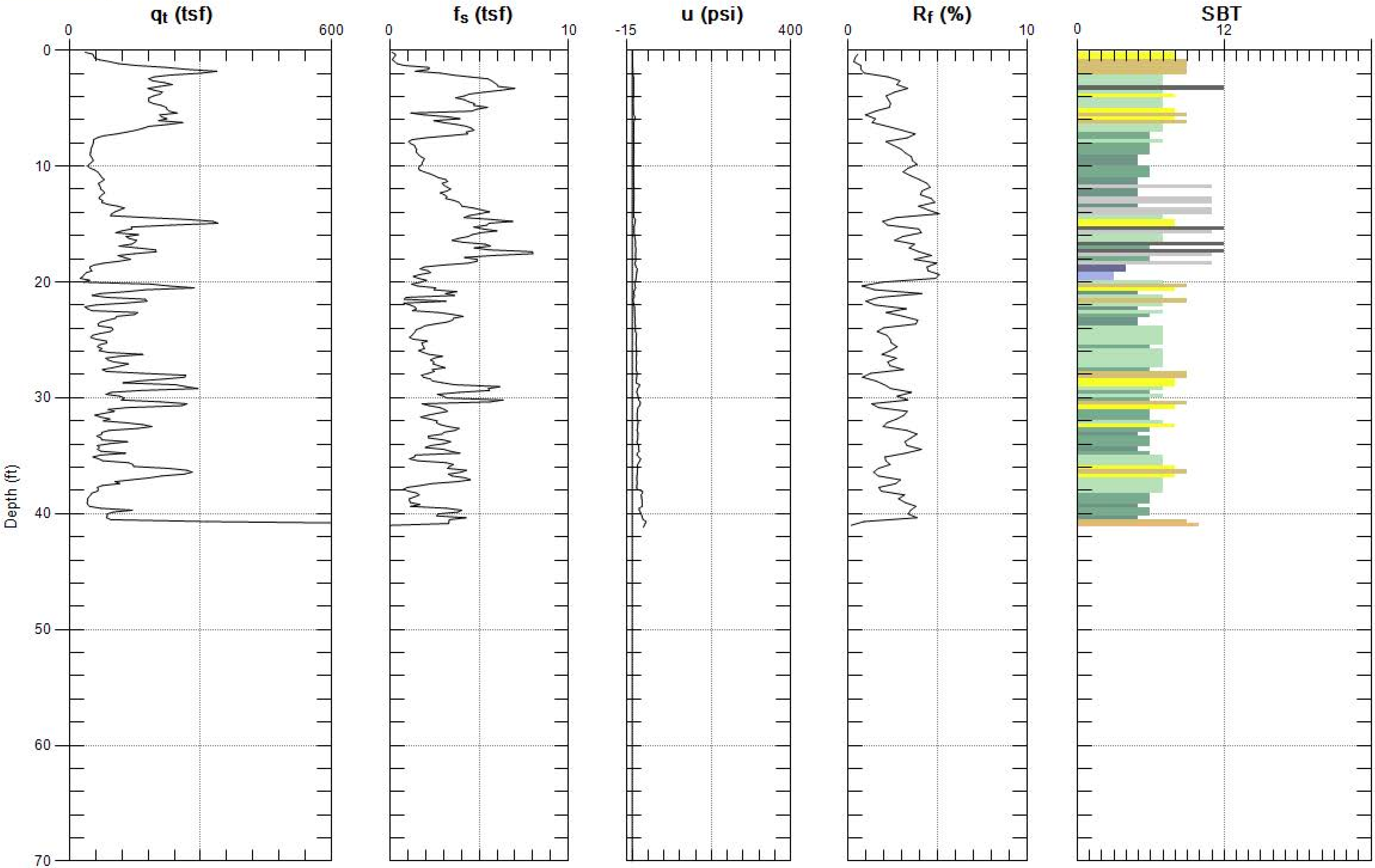
Figure A - 4

GREGG

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-2

Engineer: S.KOLTHOFF
Date: 1/21/2014 08:52



Max. Depth: 41.175 (ft)
Avg. Interval: 0.328 (ft)

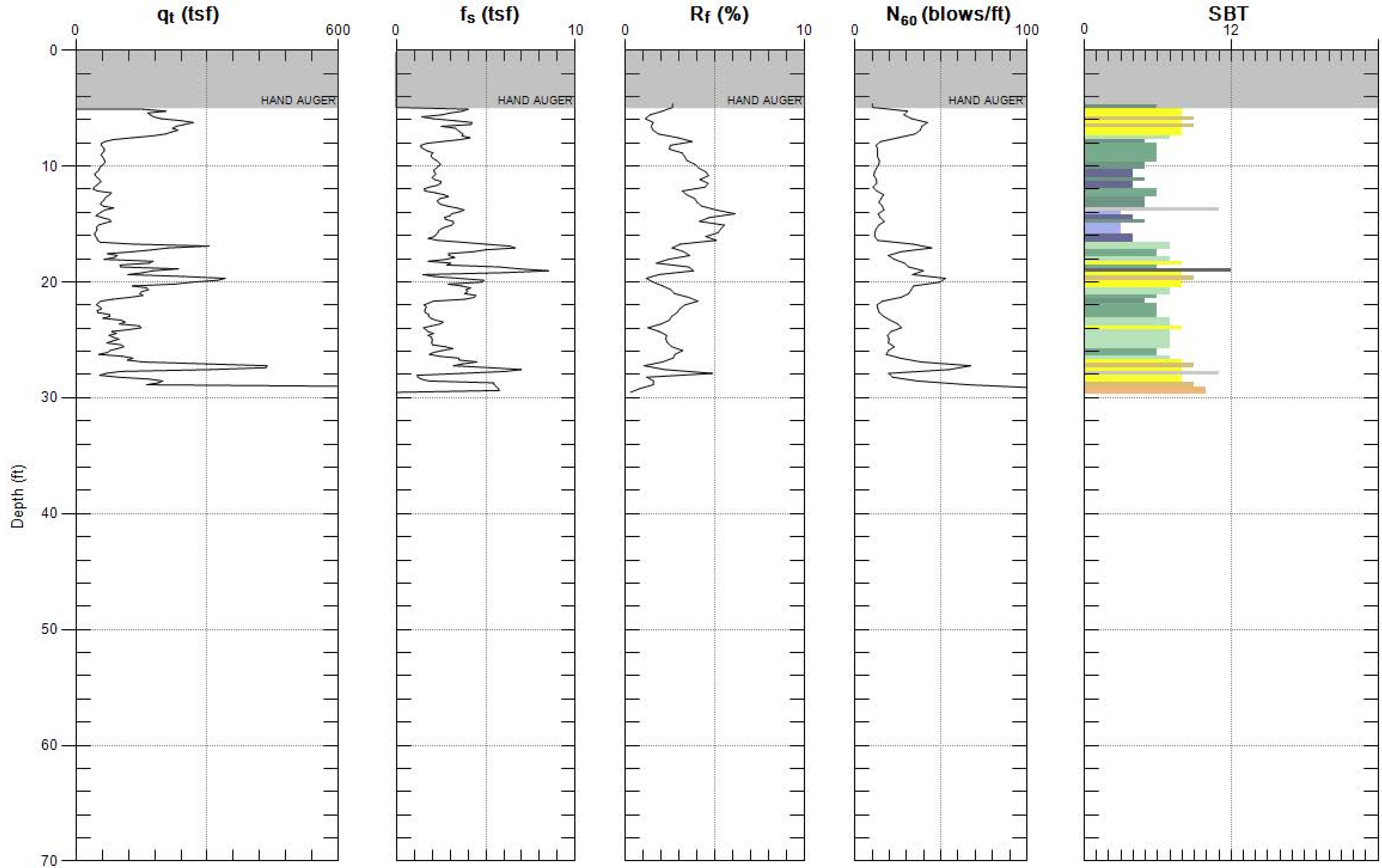
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 5

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-3

Engineer: S.KOLTHOFF
Date: 1/21/2014 09:18



Max. Depth: 29.692 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 6

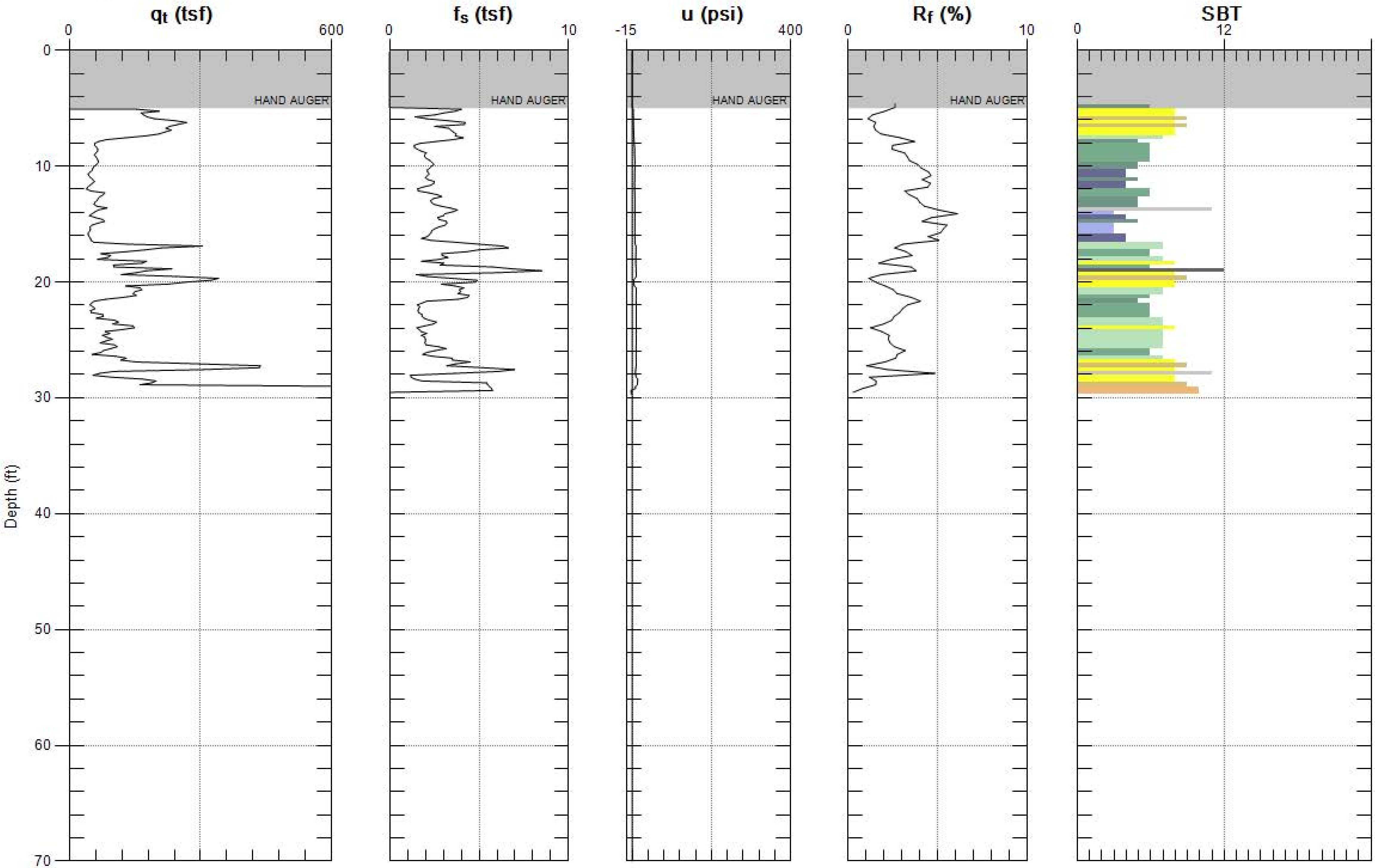
GROUP DELTA

Site: YUCCA CHAMPION

Sounding: CPT-3

Engineer: S.KOLTHOFF

Date: 1/21/2014 09:18



Max. Depth: 29.692 (ft)
Avg. Interval: 0.328 (ft)

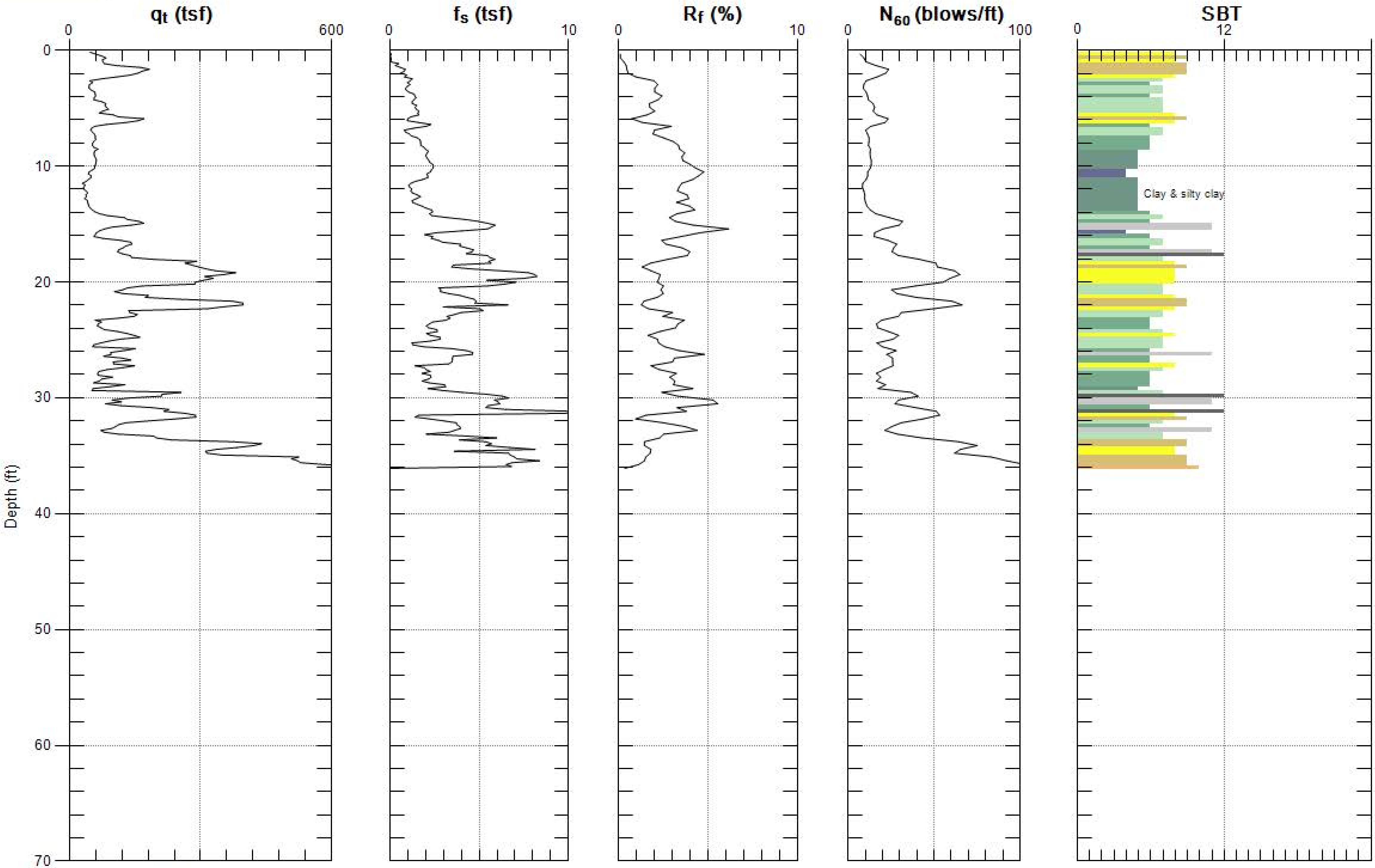
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 7

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-4

Engineer: S.KOLTHOFF
Date: 1/21/2014 10:02



Max. Depth: 36.253 (ft)
Avg. Interval: 0.328 (ft)

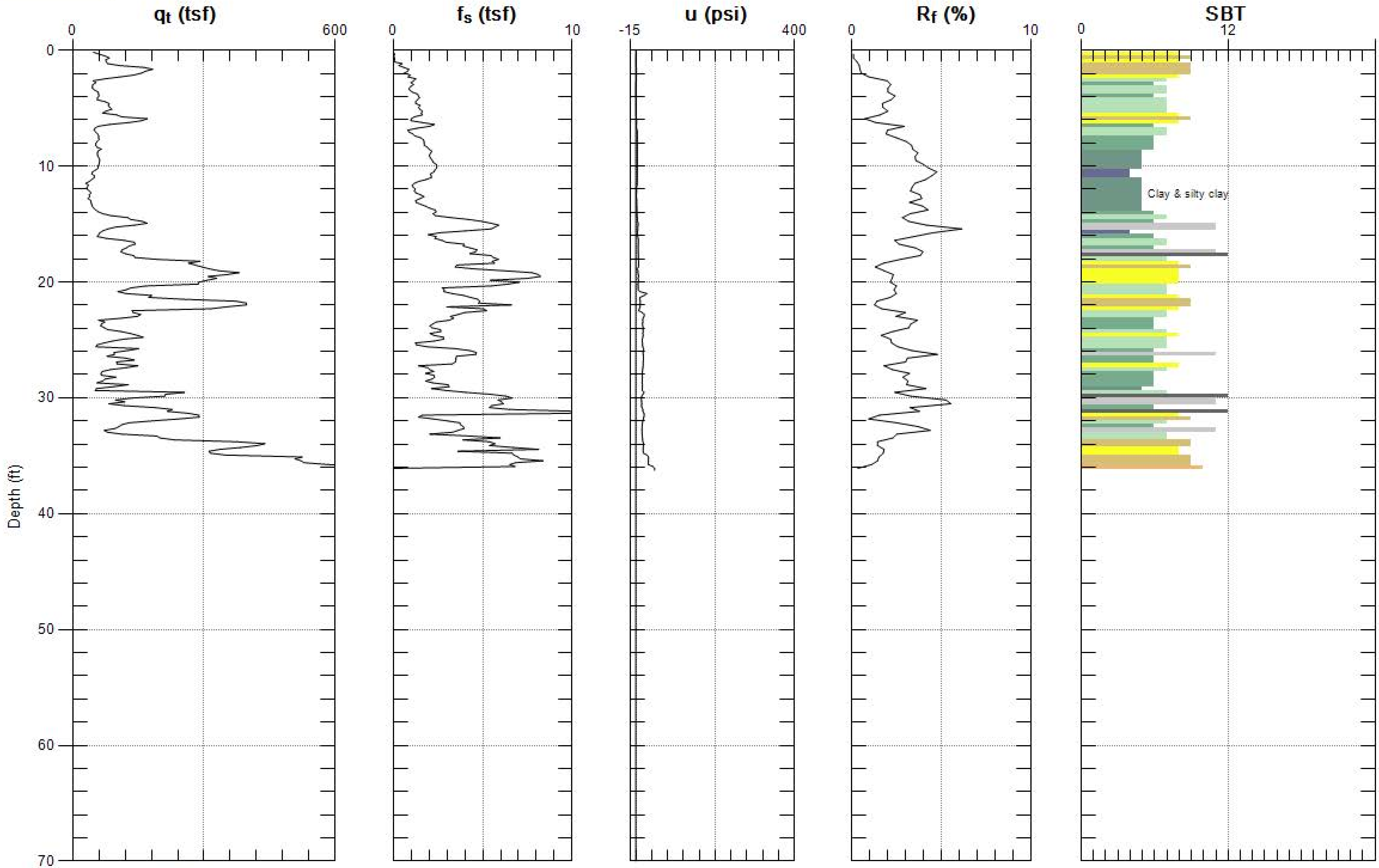
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 8

GREGG **GROUP DELTA**

Site: YUCCA CHAMPION
Sounding: CPT-4

Engineer: S.KOLTHOFF
Date: 1/21/2014 10:02

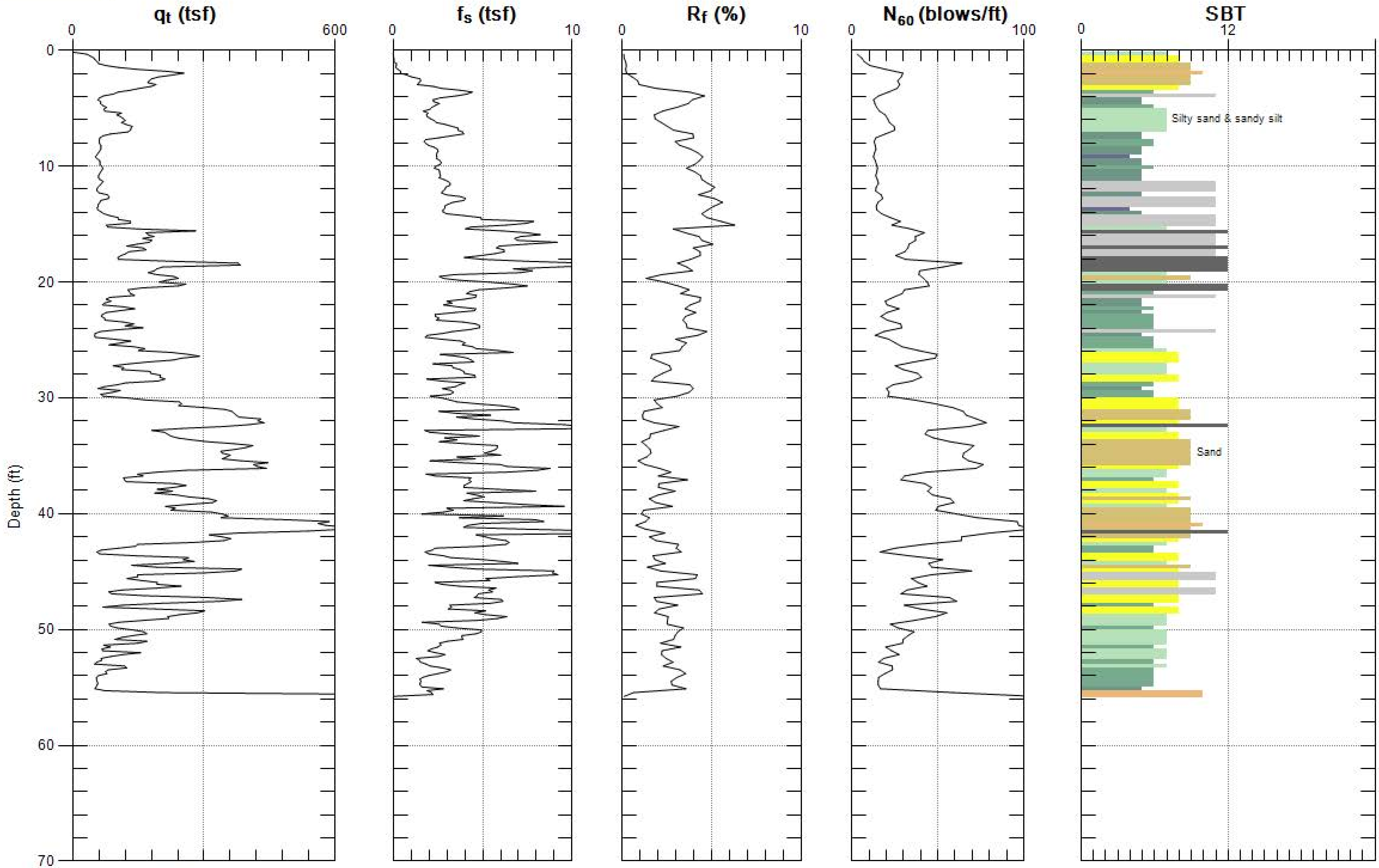


Max. Depth: 36.253 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 9

Site: YUCCA CHAMPION
Sounding: CPT-5
Engineer: S.KOLTHOFF
Date: 1/21/2014 10:27



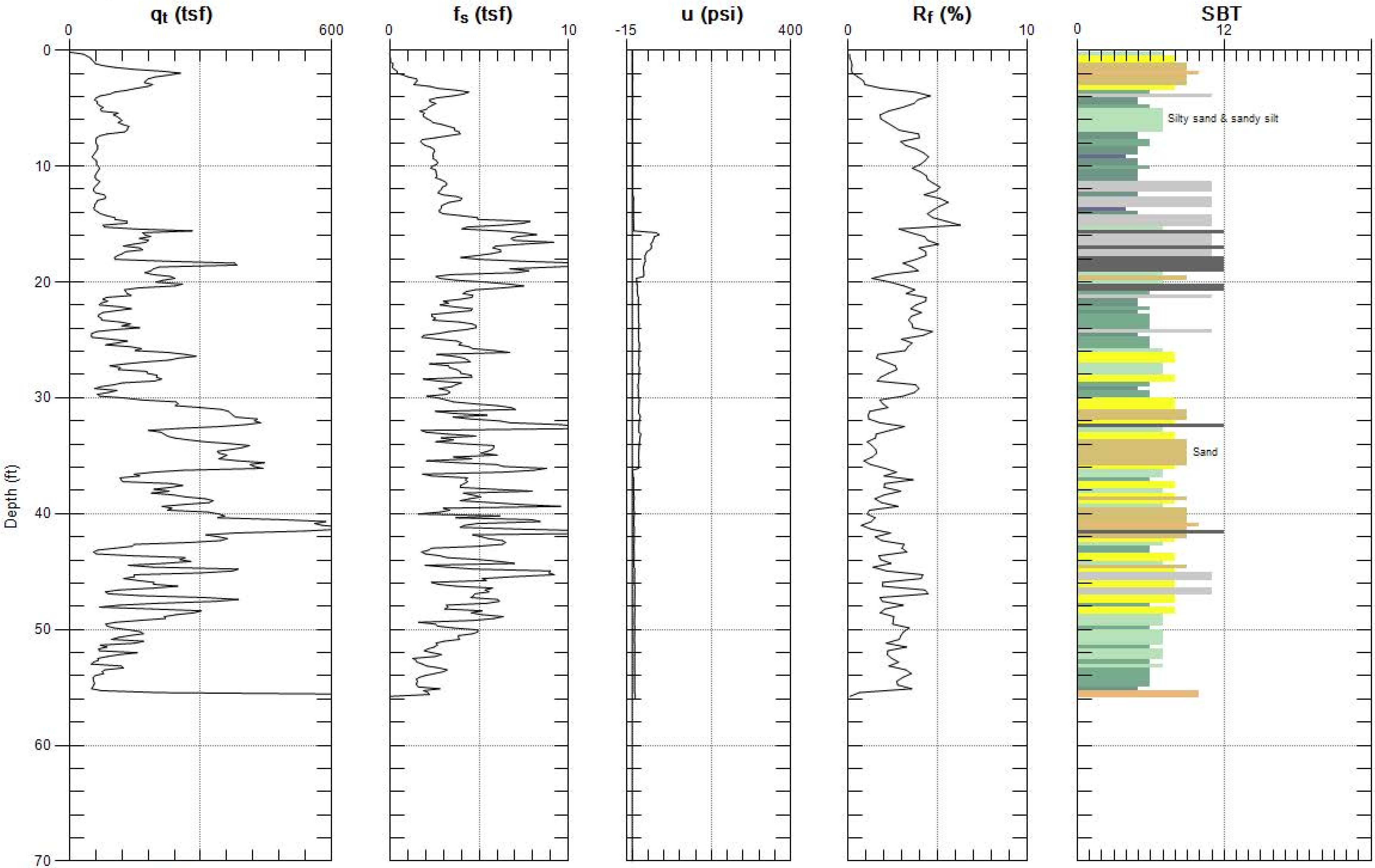
Max. Depth: 55.938 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 10

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-5
Engineer: S.KOLTHOFF
Date: 1/21/2014 10:27



Max. Depth: 55.938 (ft)
Avg. Interval: 0.328 (ft)

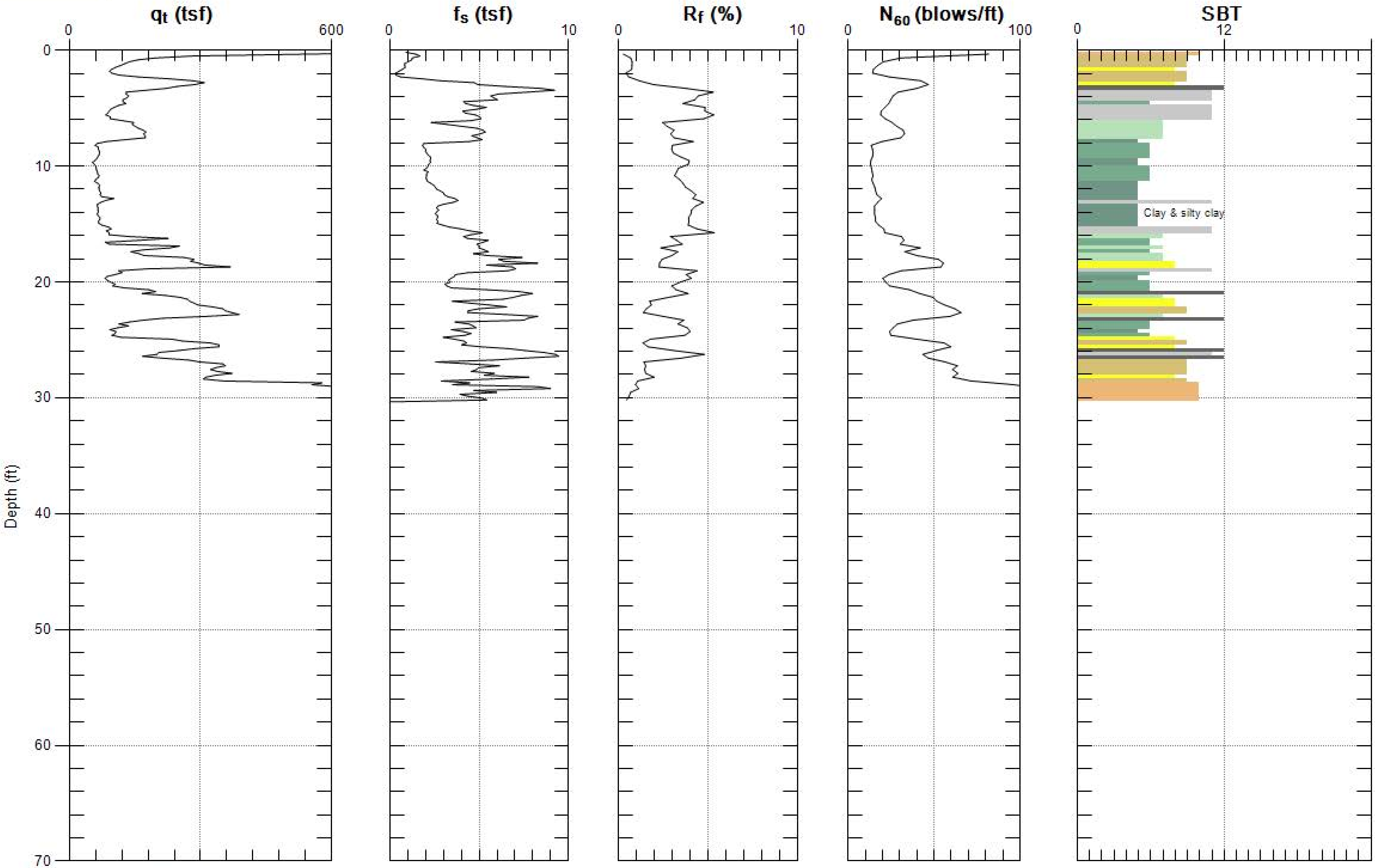
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 11

GREGG

GROUP DELTA

Site: YUCCA CHAMPION | Engineer: S.KOLTHOFF
Sounding: CPT-6A | Date: 1/21/2014 12:05



Max. Depth: 30.512 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 12

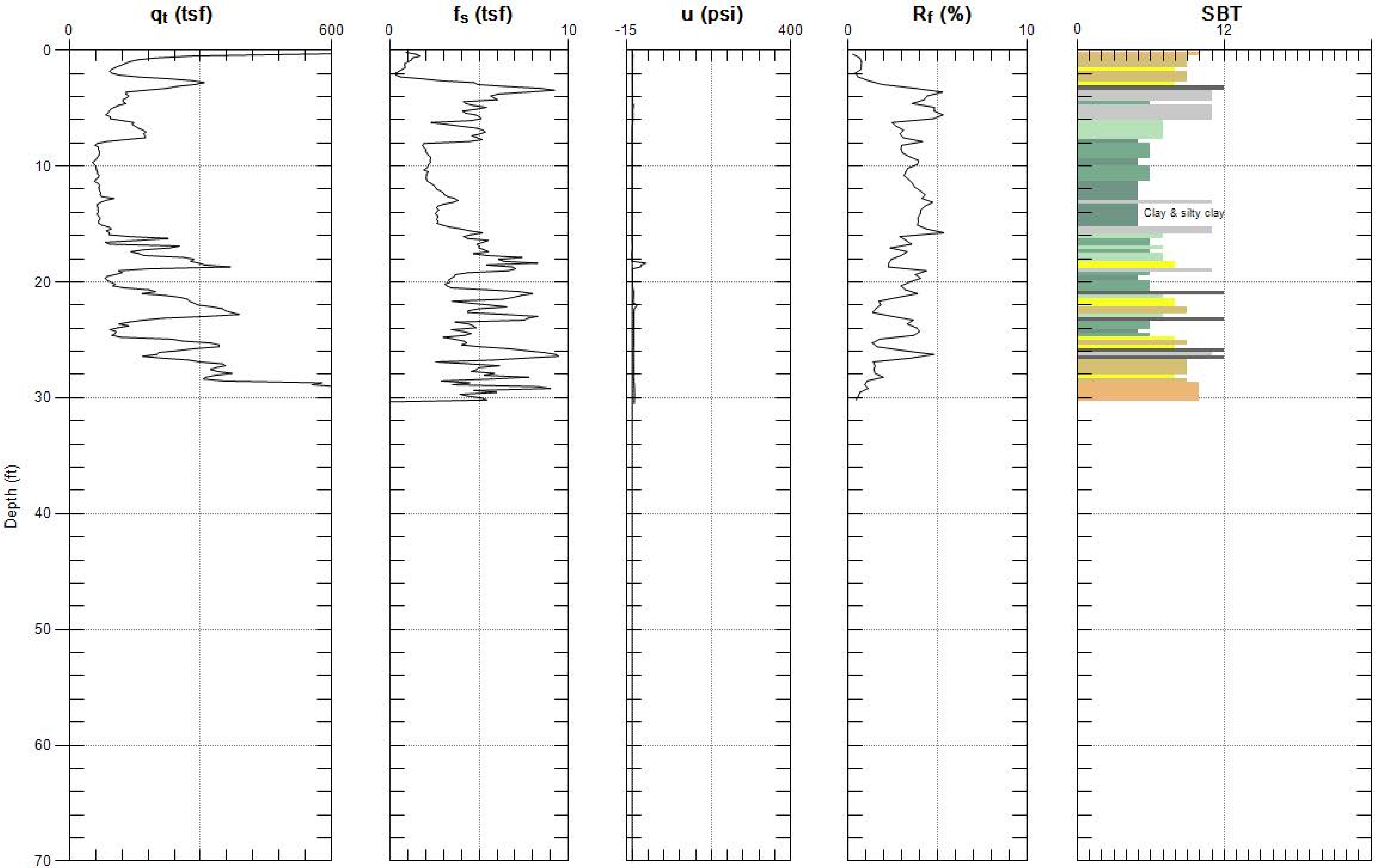
GROUP DELTA

Site: YUCCA CHAMPION

Sounding: CPT-6A

Engineer: S.KOLTHOFF

Date: 1/21/2014 12:05



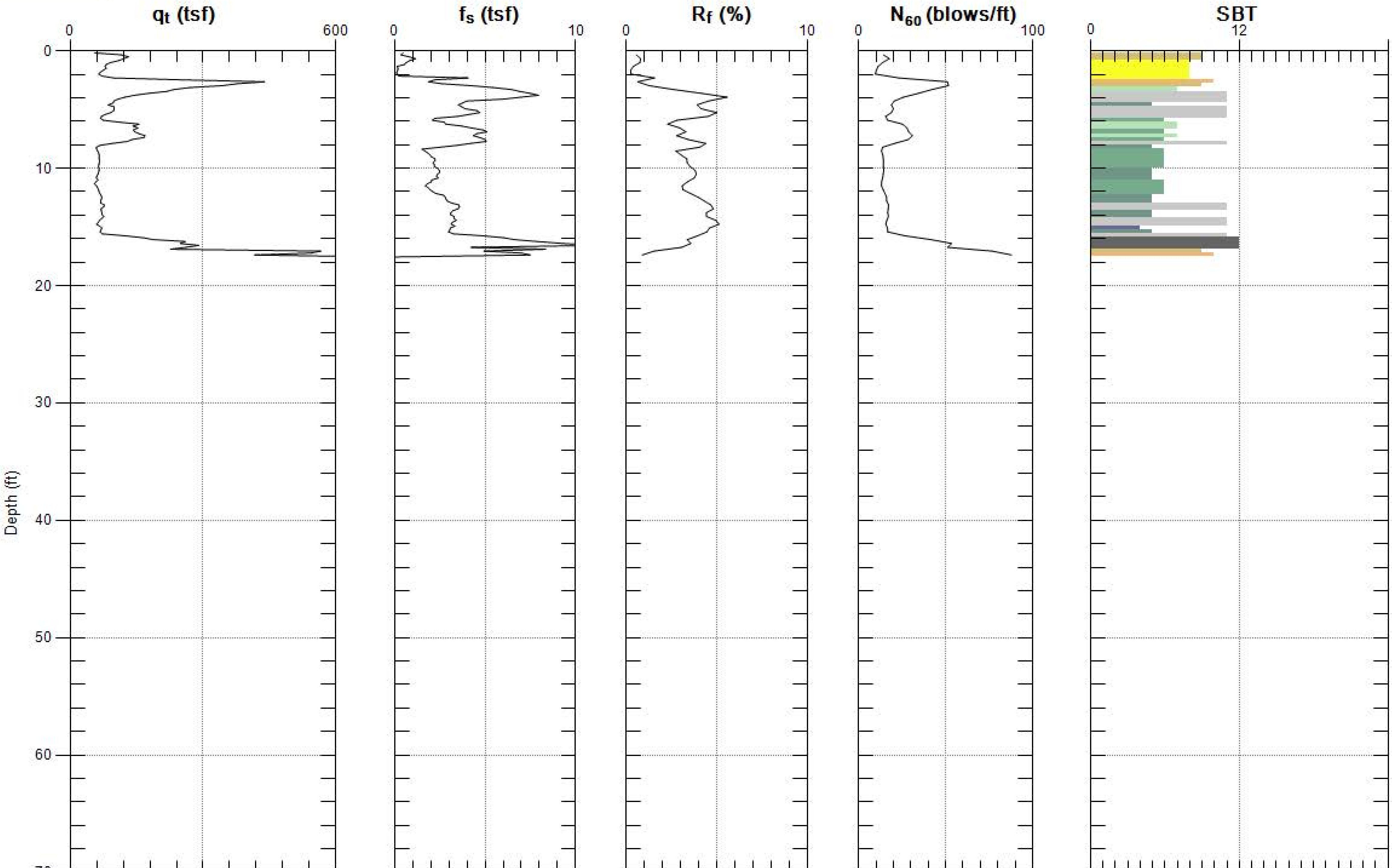
Max. Depth: 30.512 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 13

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-6
Engineer: S.KOLTHOFF
Date: 1/21/2014 11:32



Max. Depth: 17.717 (ft)
Avg. Interval: 0.328 (ft)

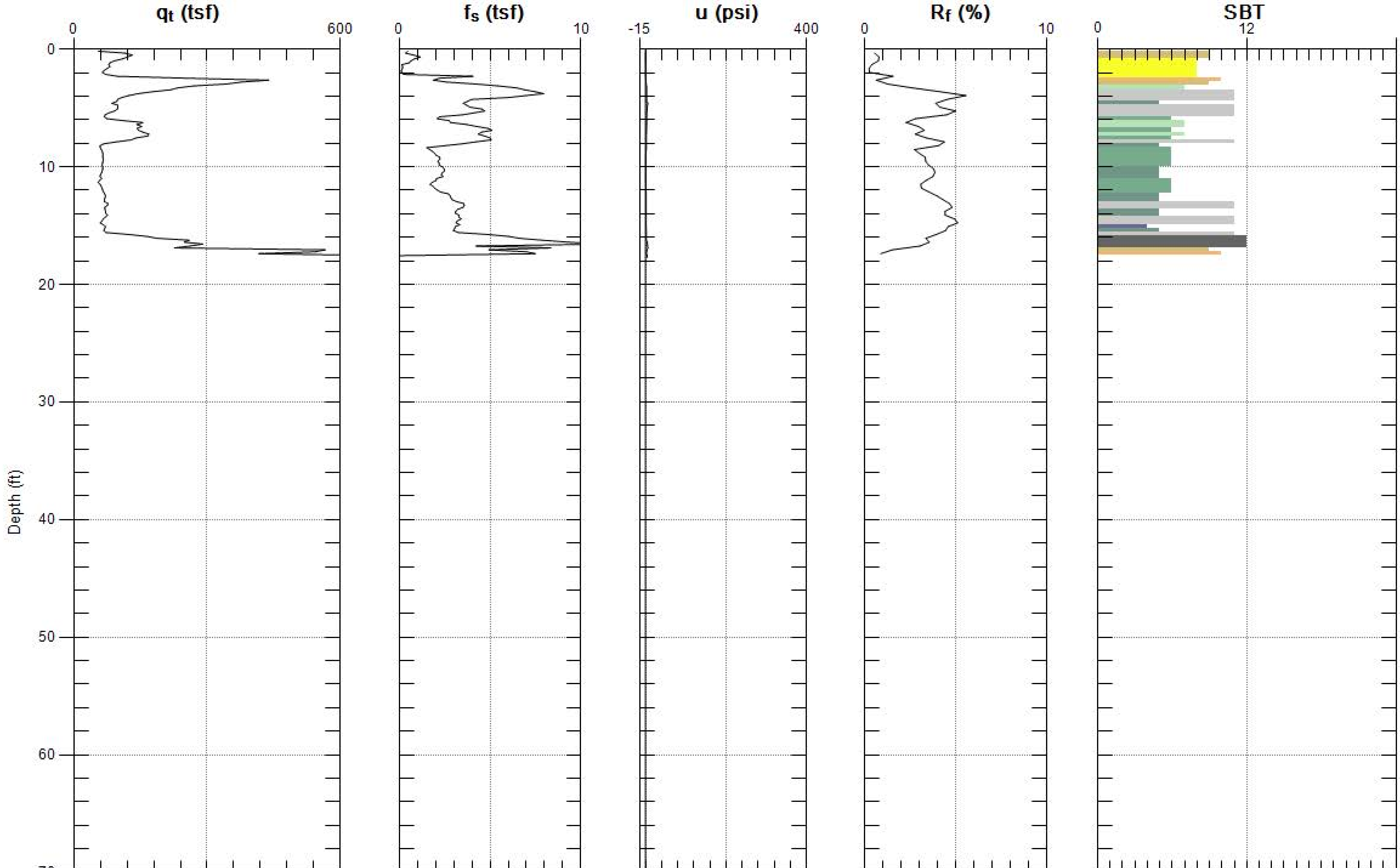
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 14

GROUP DELTA

Site: YUCCA CHAMPION **Engineer: S.KOLTHOFF**

Sounding: CPT-6 **Date: 1/21/2014 11:32**



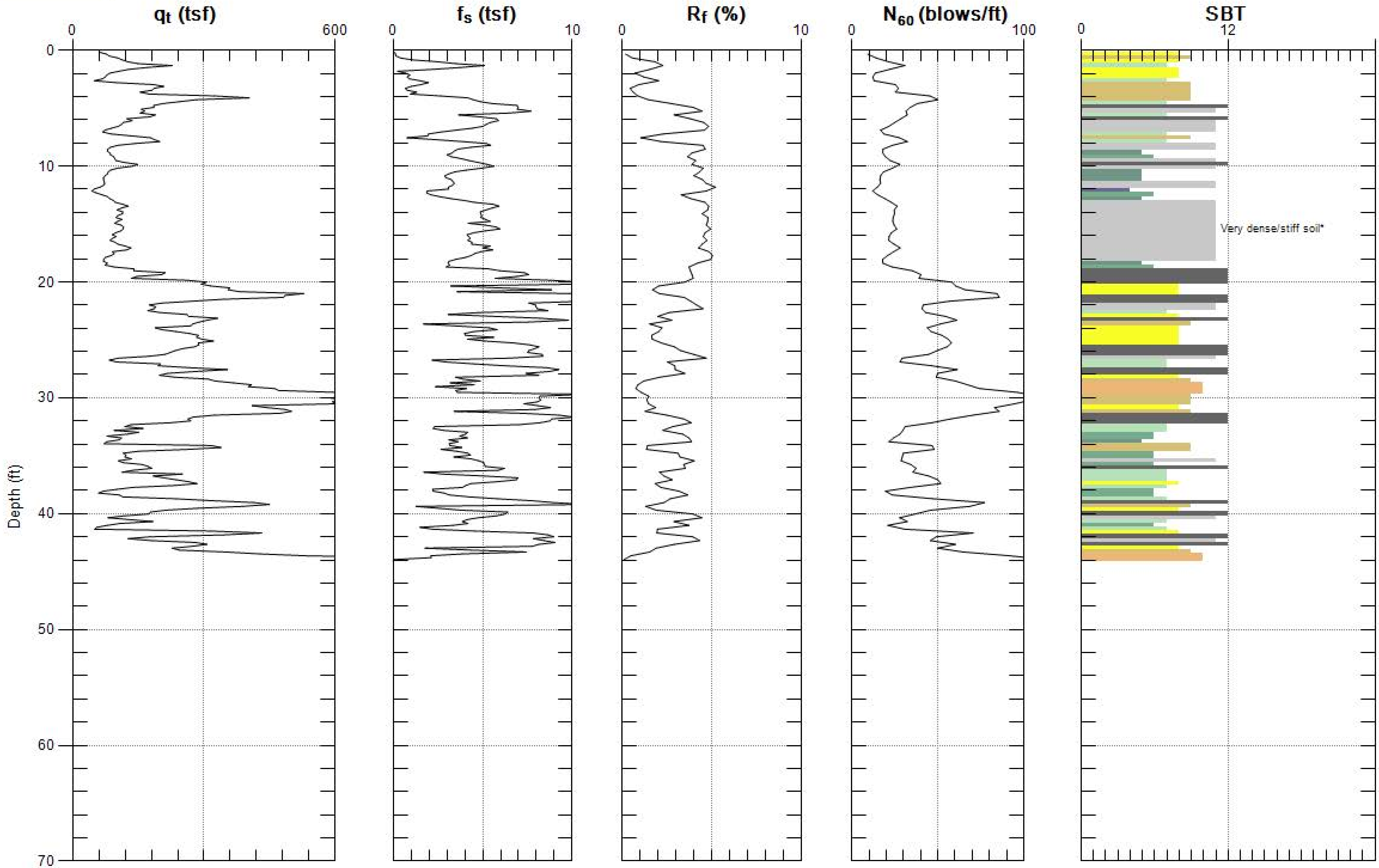
Max. Depth: 17.717 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 15

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-7
Engineer: S.KOLTHOFF
Date: 1/21/2014 12:34



Max. Depth: 44.127 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 16

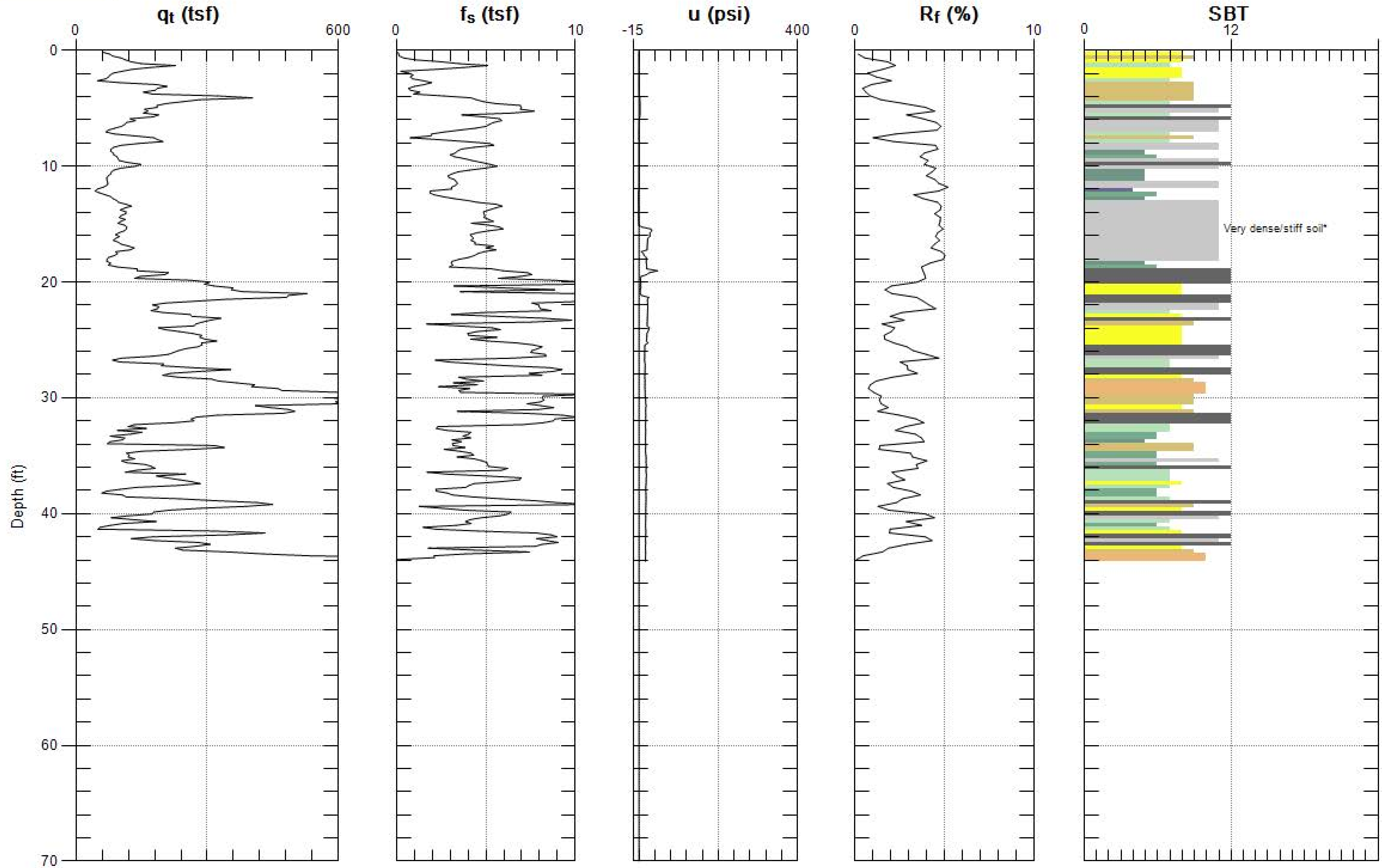
GROUP DELTA

Site: YUCCA CHAMPION

Sounding: CPT-7

Engineer: S.KOLTHOFF

Date: 1/21/2014 12:34



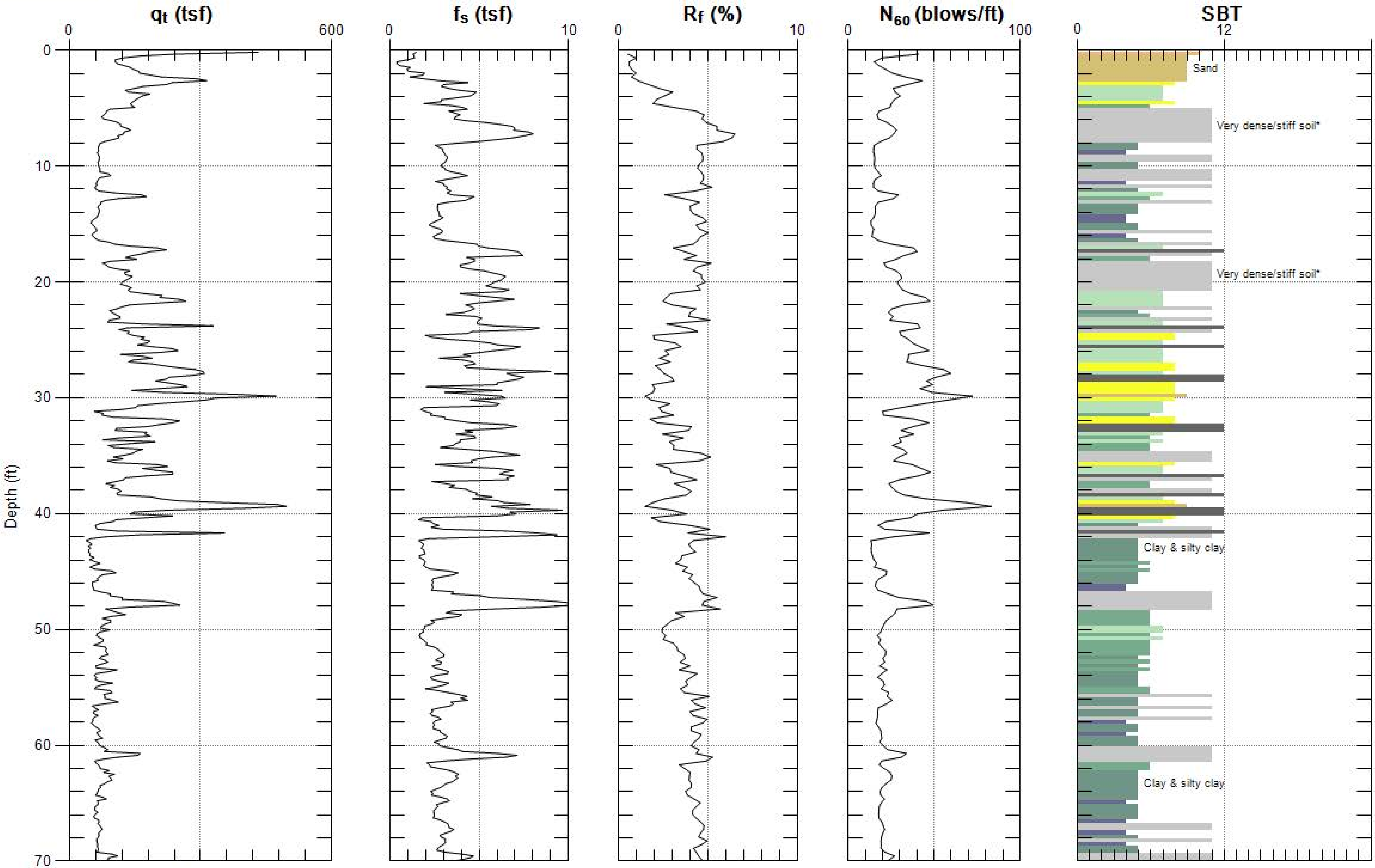
Max. Depth: 44.127 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 17

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-8
Engineer: S.KOLTHOFF
Date: 1/21/2014 01:10



Max. Depth: 70.866 (ft)
Avg. Interval: 0.328 (ft)

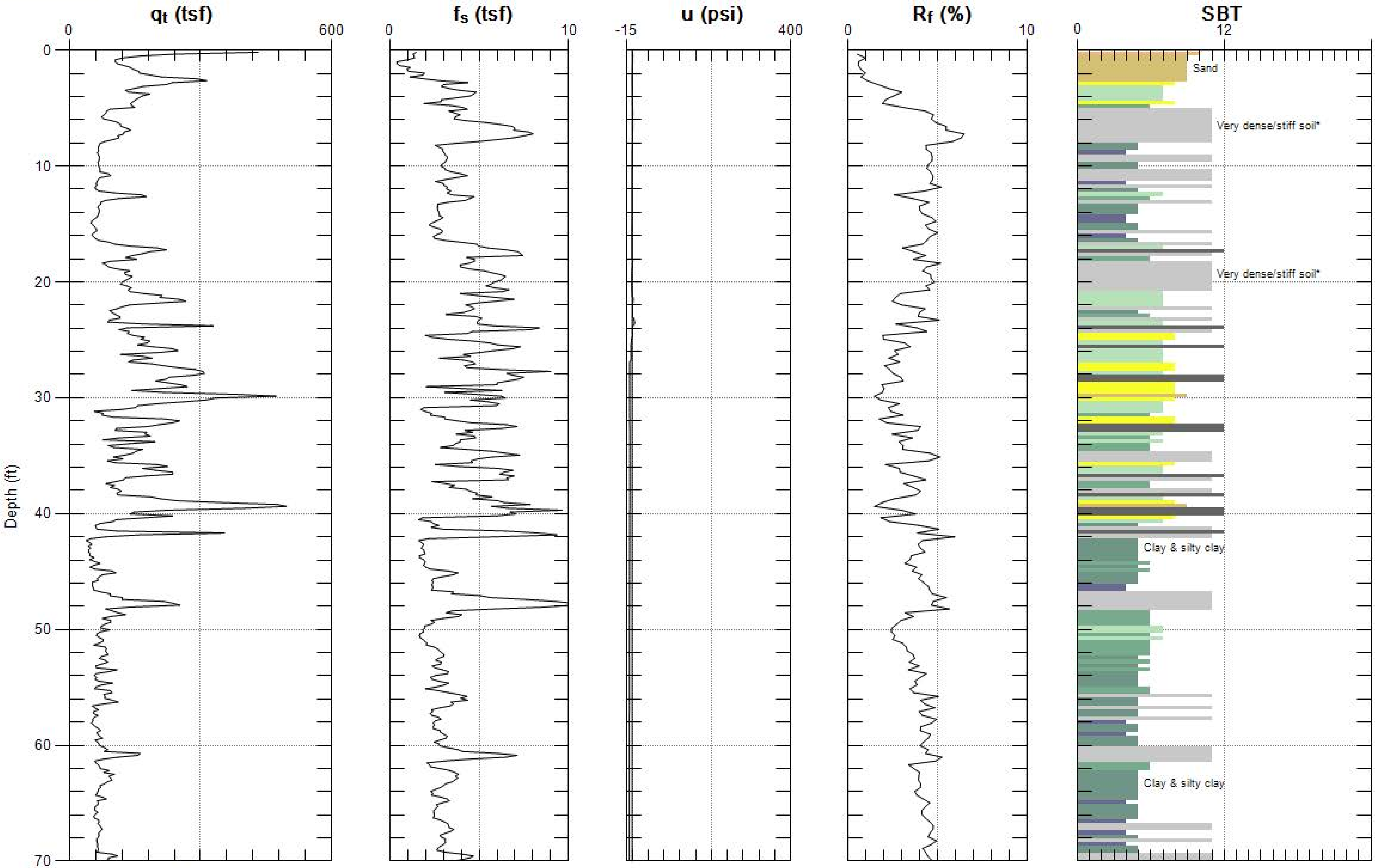
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 18

GREGG **GROUP DELTA**

Site: YUCCA CHAMPION
Sounding: CPT-8

Engineer: S.KOLTHOFF
Date: 1/21/2014 01:10



Max. Depth: 70.866 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

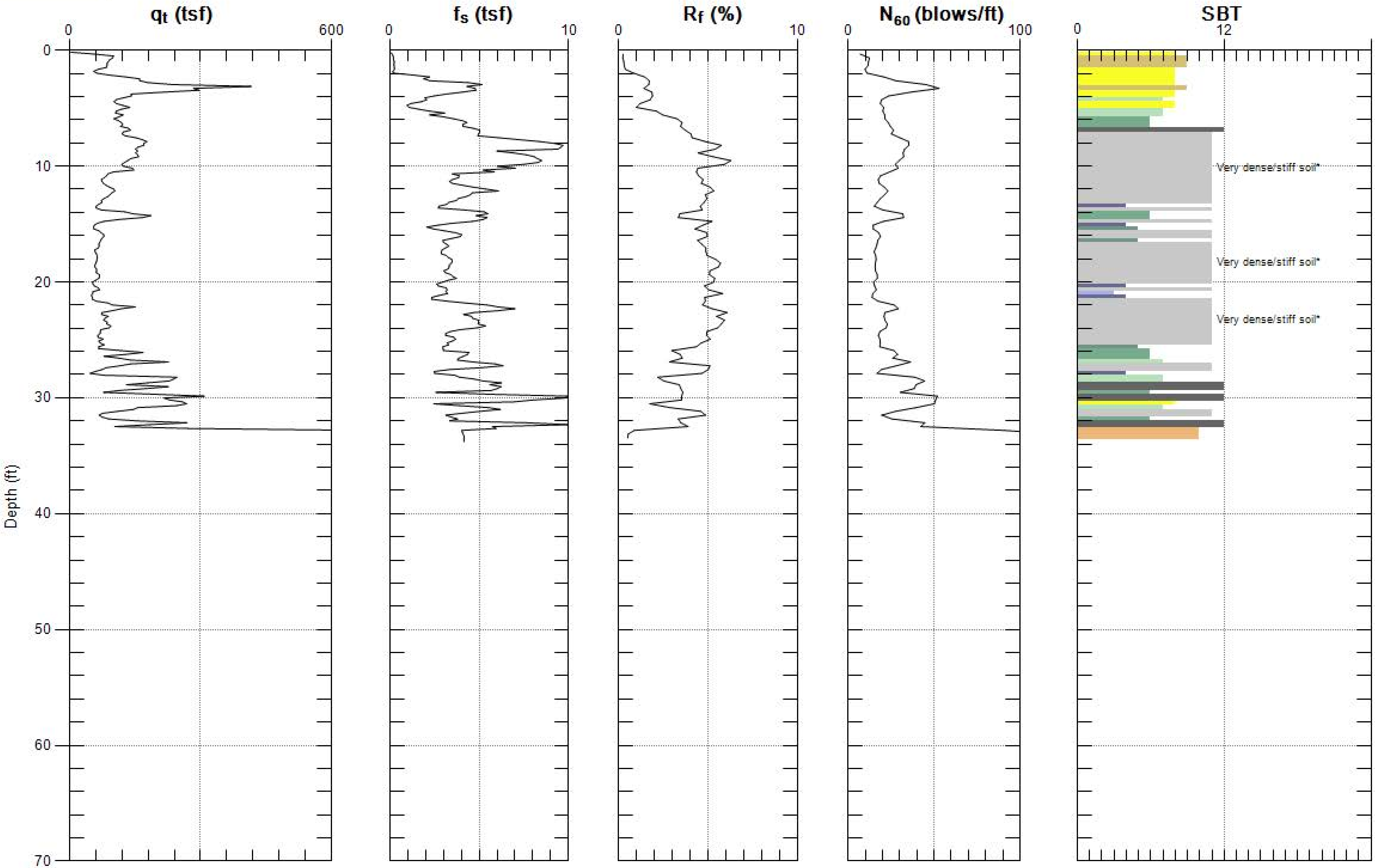
GROUP DELTA

Site: YUCCA CHAMPION

Engineer: S.KOLTHOFF

Sounding: CPT-9

Date: 1/22/2014 02:38

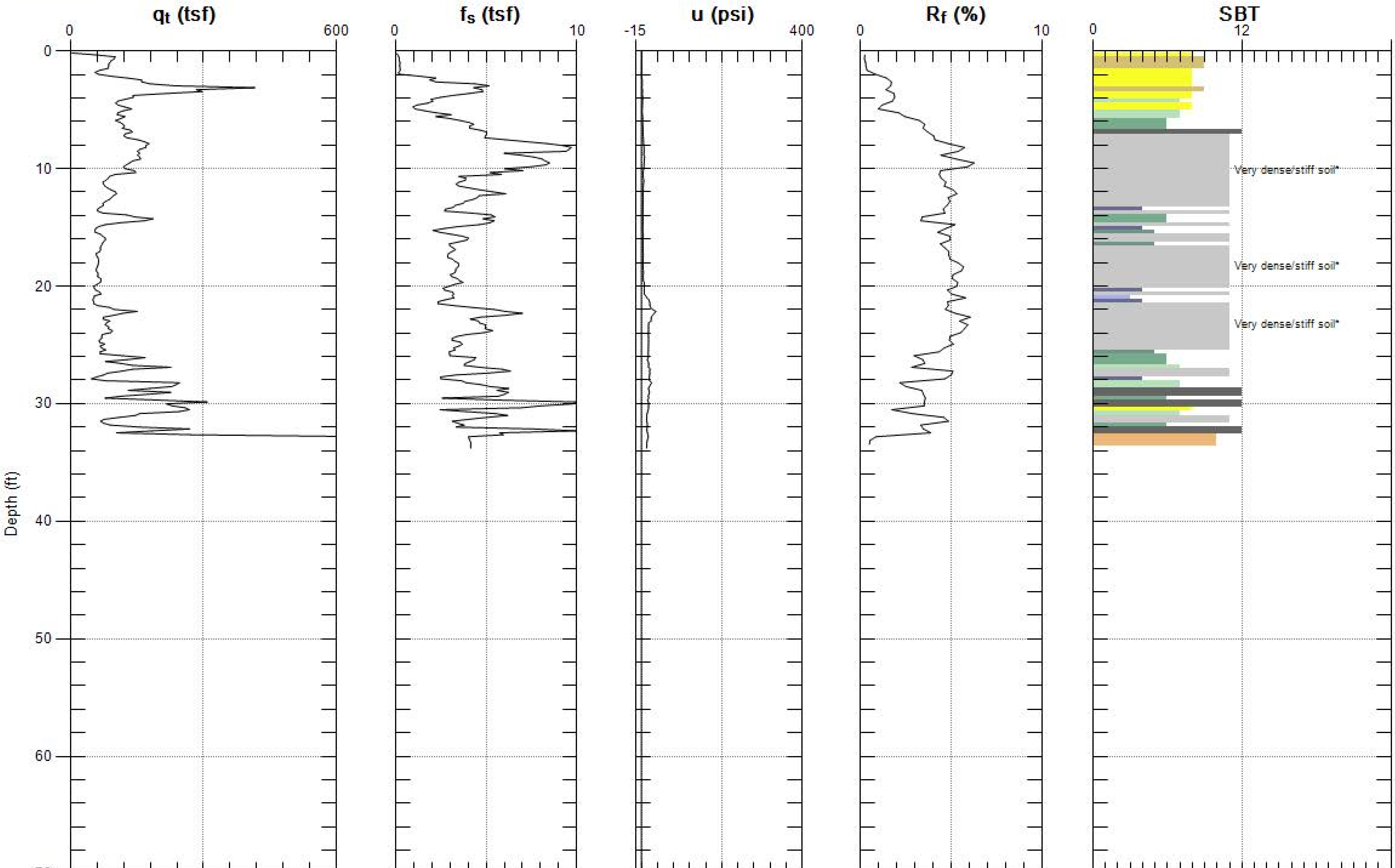


Max. Depth: 33.793 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-9
Engineer: S.KOLTHOFF
Date: 1/22/2014 02:38



Max. Depth: 33.793 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 21

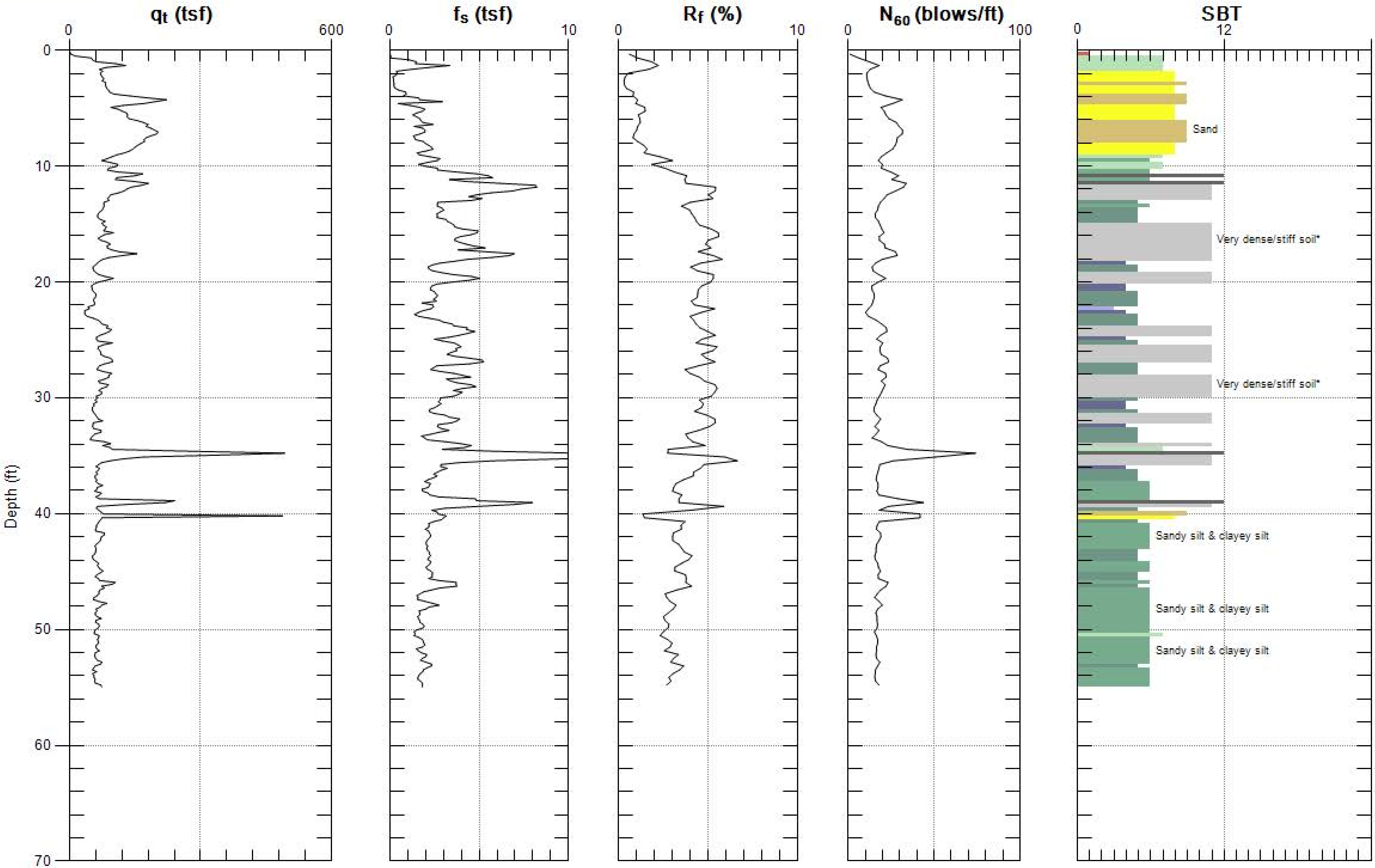
GROUP DELTA

Site: YUCCA CHAMPION

Sounding: CPT-10

Engineer: S.KOLTHOFF

Date: 1/22/2014 03:25



Max. Depth: 54.954 (ft)
Avg. Interval: 0.328 (ft)

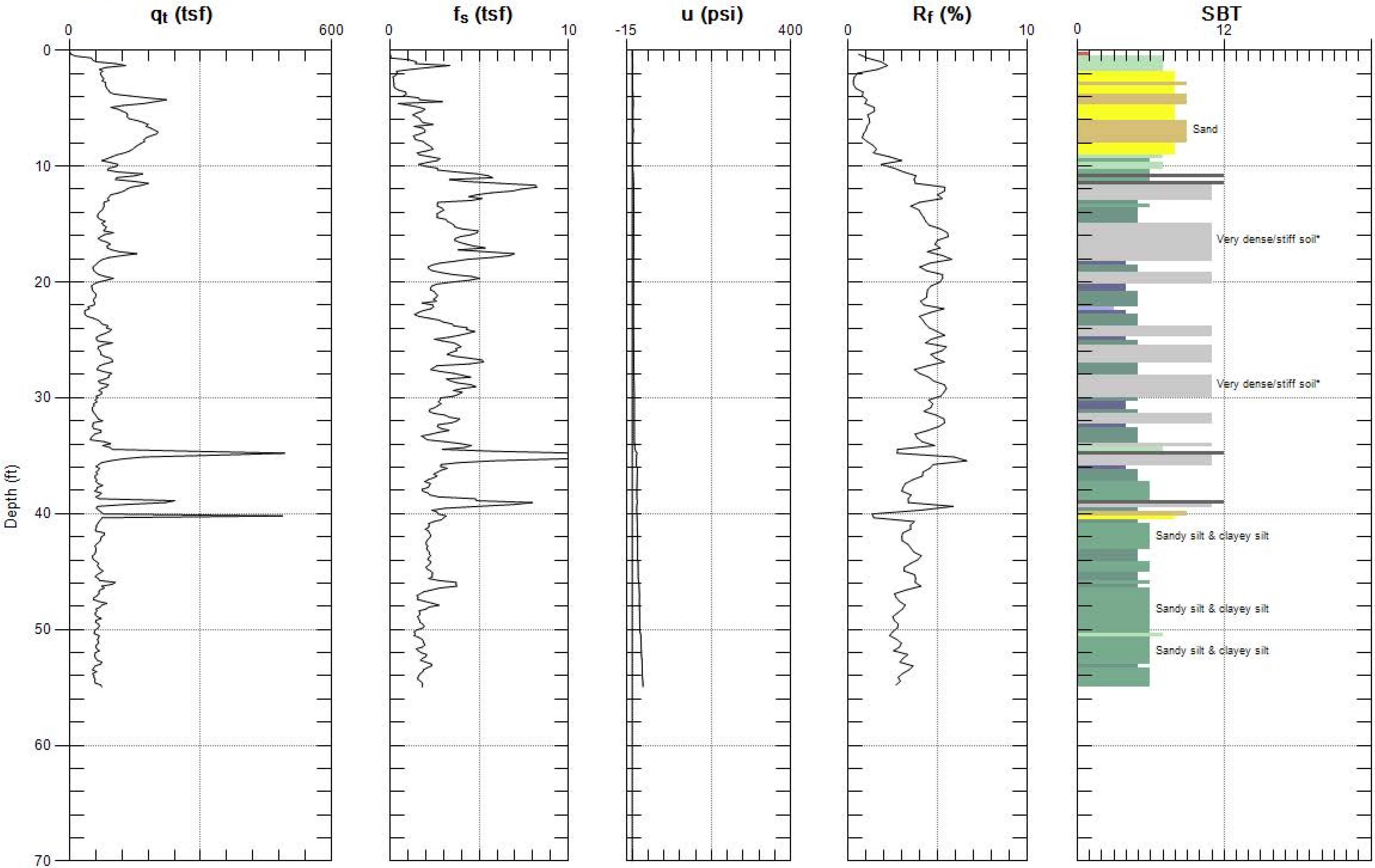
SBT: Soil Behavior Type (Robertson 1990)

GREGG

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-10

Engineer: S.KOLTHOFF
Date: 1/22/2014 03:25



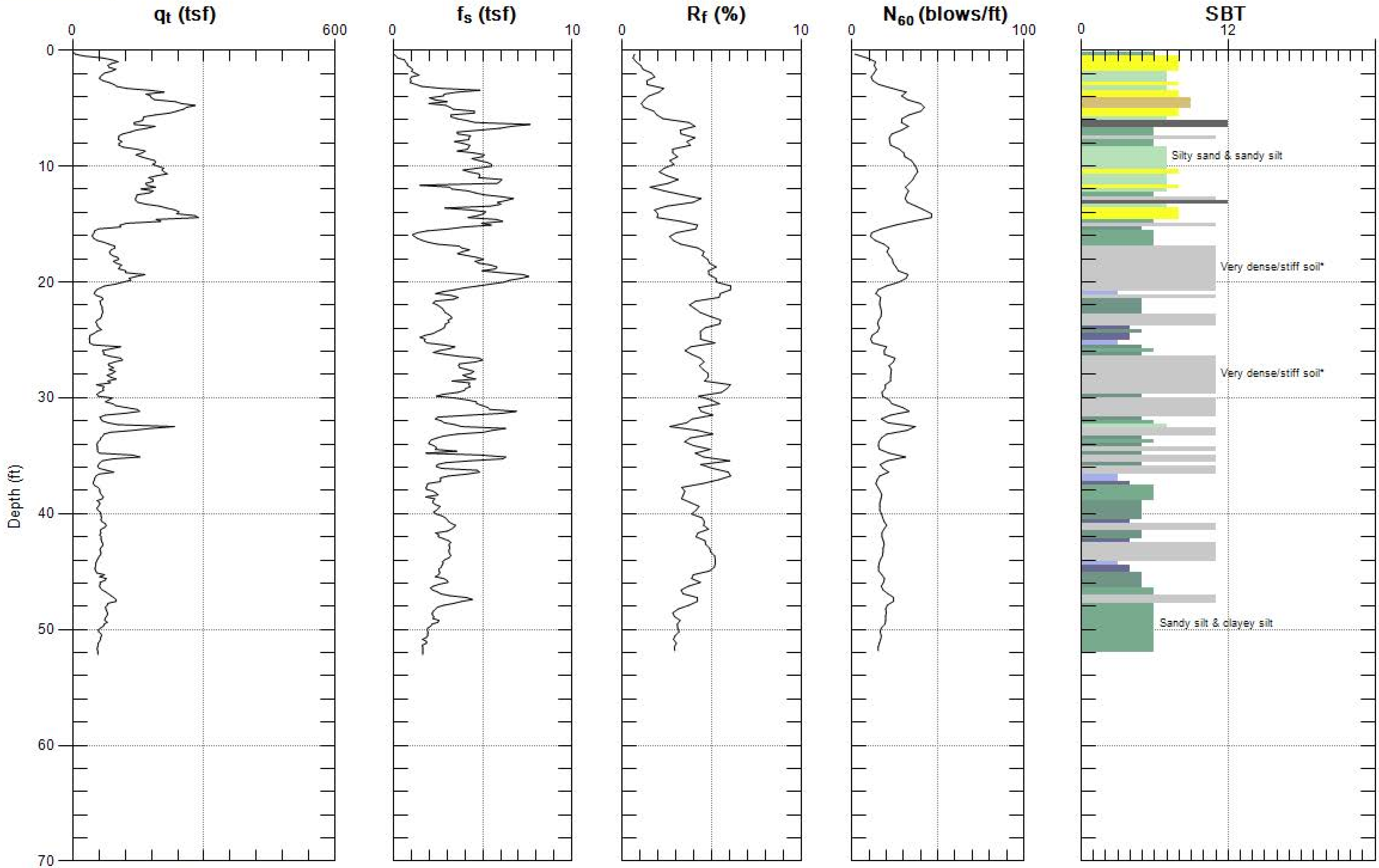
Max. Depth: 54.954 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 23

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-11
Engineer: S.KOLTHOFF
Date: 1/22/2014 04:12



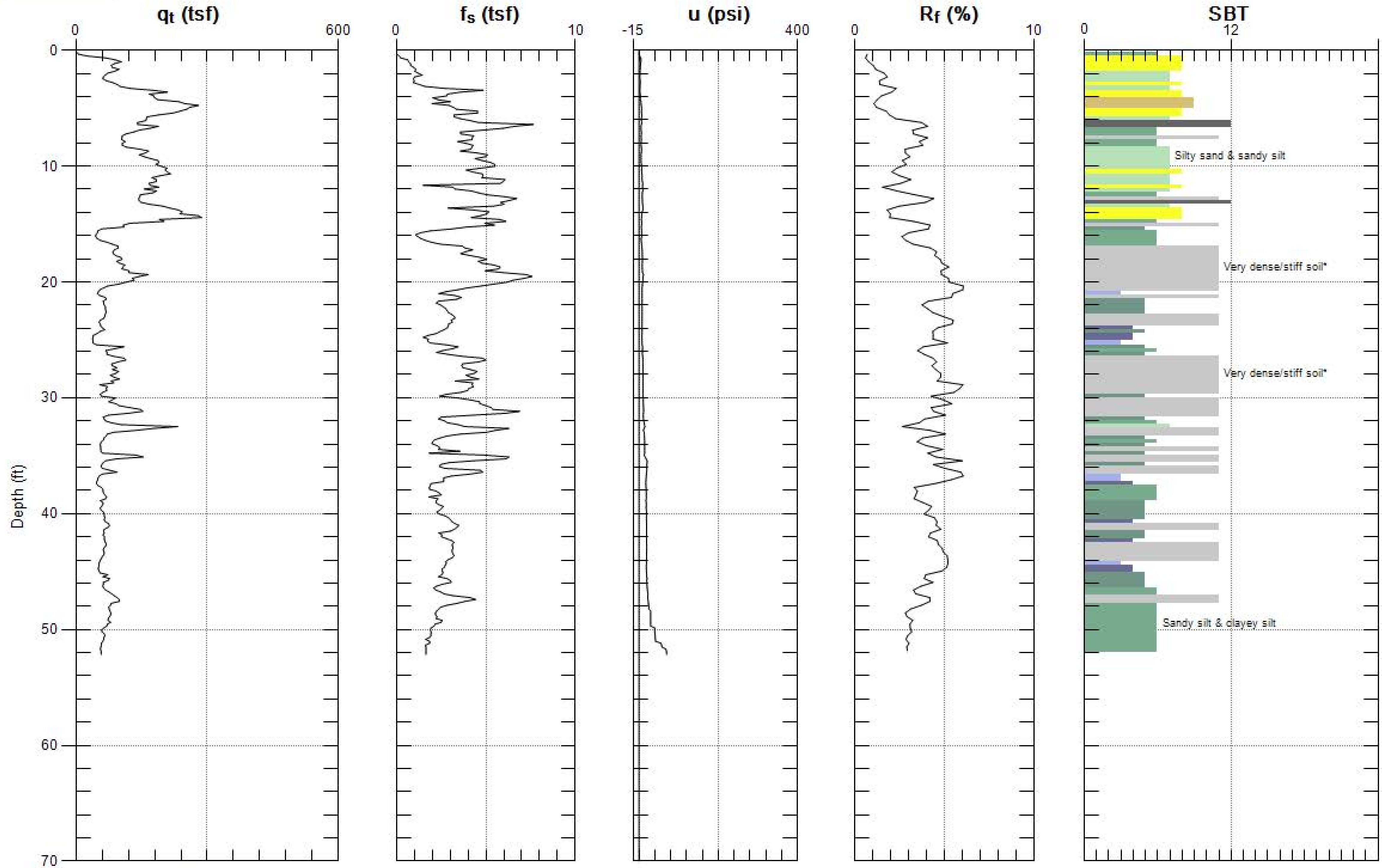
Max. Depth: 52.165 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 24

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-11
Engineer: S.KOLTHOFF
Date: 1/22/2014 04:12



Max. Depth: 52.165 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

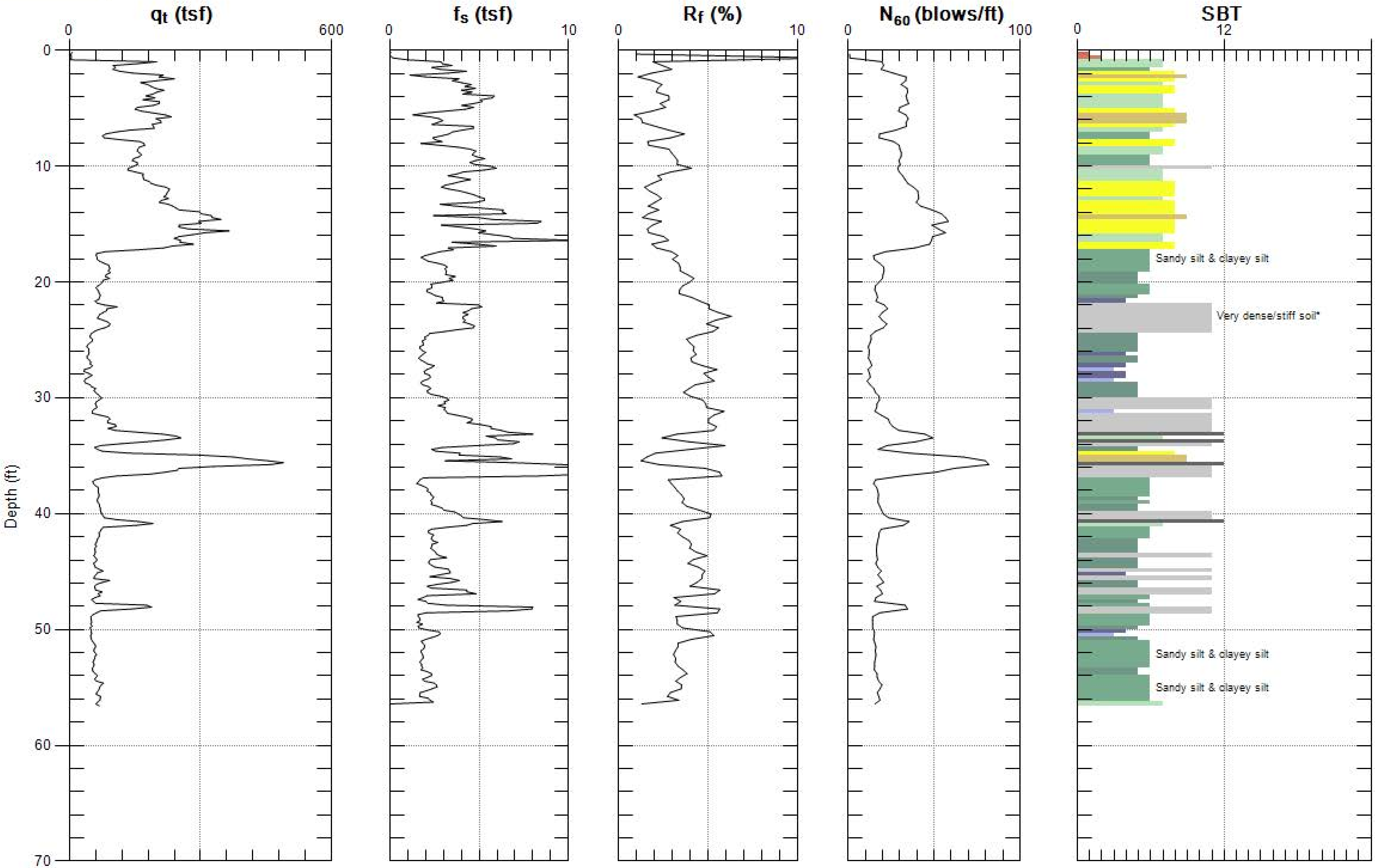
GROUP DELTA

Site: YUCCA CHAMPION

Sounding: CPT-12

Engineer: S.KOLTHOFF

Date: 1/22/2014 04:52



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

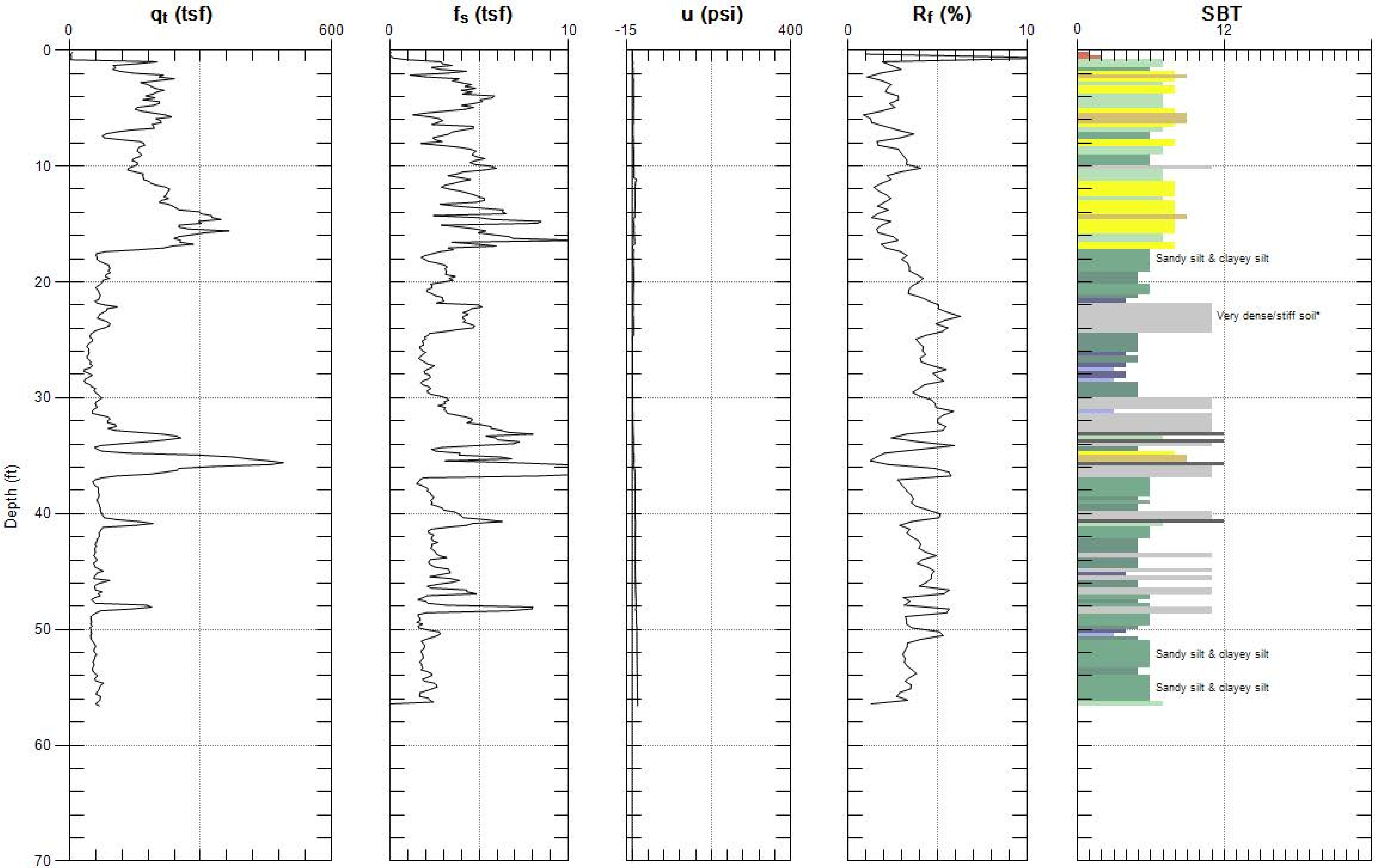
SBT: Soil Behavior Type (Robertson 1990)

Figure A - 26

GREGG

GROUP DELTA

Site: YUCCA CHAMPION | Engineer: S.KOLTHOFF
Sounding: CPT-12 | Date: 1/22/2014 04:52



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

SBT: Soil Behavior Type (Robertson 1990)

GREGG

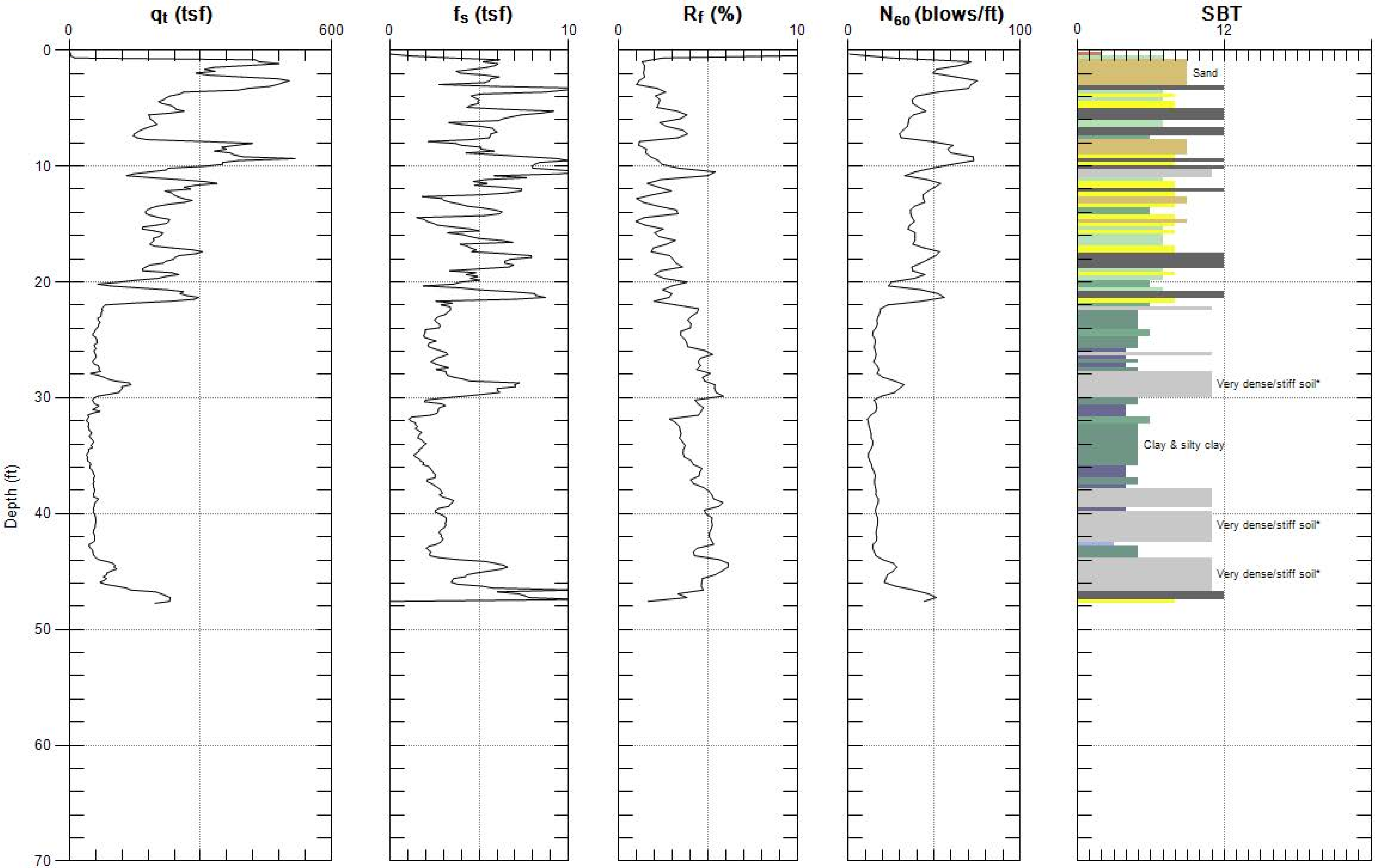
GROUP DELTA

Site: YUCCA CHAMPION

Sounding: CPT-13

Engineer: S.KOLTHOFF

Date: 1/22/2014 12:18



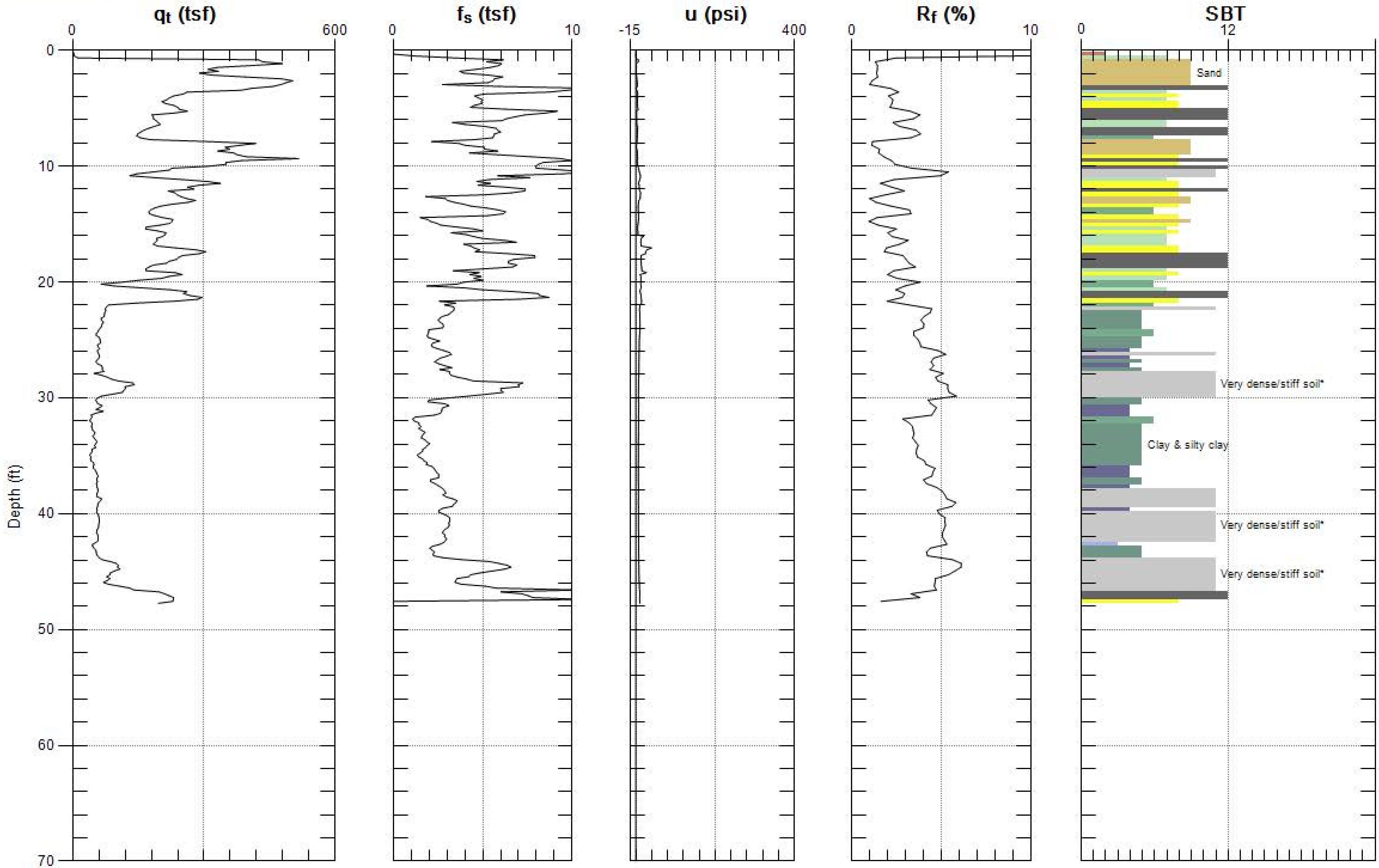
Max. Depth: 47.736 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure A - 28

GROUP DELTA

Site: YUCCA CHAMPION
Sounding: CPT-13
Engineer: S.KOLTHOFF
Date: 1/22/2014 12:18



Max. Depth: 47.736 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-1	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/31/14 to 1/31/14	**LOGGED BY** TO	**SHEET NO.** 1 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 30 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 418	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
0									Approximately 3.5 inches of Asphalt				
	415								**Artificial FIll** **Silty SAND to Clayey SAND**, 7.5 YR 6/8 (Reddish Brown) , dry, fine to medium grained sand, some fine to coarse gravel with cobbles.				
5	410								**Older Alluvium (Qoal)** **Clayey SAND**, 7.5 YR 5/6 (Strong Brown), humid to moist, fine to medium grained sand, some coarse sand, trace fine gravel and cobbles. **Sandy Clay to Clayey Sand**, mottled 5 YR 7/1 (Yellowish red) and 5 YR 7/1 (Light Gray), humid to moist, some fine gravel and coarse sand, well developed soil.				
10	405												
15	400								**Modelo Formation (TM)** **Sandstone, Siltstone, Claystone**, 10YR 6/1 (Strong brown) to 7.5YR 7/1 (light gray), thinly bedded, some oxidation, some caliche. **Poorly Graded Sand, Silt and Clay**, 10 YR 7/6 (Yellowish Brown) to 10 YR 6/1 (Light Gray) moist, mostly sand, cobbles and gravels throughout.				
20	395								**Modelo Formation (TM)**				

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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-29 a

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-1	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/31/14 to 1/31/14	**LOGGED BY** TO	**SHEET NO.** 2 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 30 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 418	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
	390												
30									**Sandstone, Siltstone, Claystone**, 7.5YR 7/1 (light gray), wet, thinly bedded, some oxidation.				Water @ 30 Ft.
	385												
35													
	380												
40													
	375												
45													
	370								**Interbedded Sandstone, Siltstone and Claystone**, 7.5 YR 7/1 (Strong Brown) to 7.5 YR 7/1 (Light Gray), wet, fine grained sand, some oxidation.				

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FIGURE A-29 b

LOG OF CORE BORING

PROJECT NAME	Yucca & Agryle Fault Investigation
PROJECT NUMBER	LA-1183
BORING	B-1
SITE LOCATION	Yucca and Argyle, Hollywood, Ca
DATE(S) DRILLED	1/31/14 to 1/31/14
LOGGED BY	TO
SHEET NO.	3 of 3
DRILLING METHOD	Hollow Stem Auger
DRILL BIT SIZE/TYPE	6"
CHECKED BY	SK
TOTAL DEPTH DRILLED (feet)	60
DRILL RIG TYPE	Marl M12
DRILLED BY	Gregg In-Situ Drilling
INCLINATION FROM VERTICAL/BEARING	0
APPARENT GROUNDWATER DEPTH	30 ft.
APPROXIMATE SURFACE ELEVATION (feet)	418
COMMENTS	
BOREHOLE BACKFILL	Soil Cuttings

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
	365												
55													
	360												
60									Total Depth: 60 Ft Groundwater: Encountered at 30 Ft Boring backfilled with tamped soil cuttings and asphalt patched.				
	355												
65													
	350												
70													
	345												

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FIGURE A-29 c

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-2	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/30/14 to 1/30/14	**LOGGED BY** TO	**SHEET NO.** 1 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 27 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 415	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Asphalt				
									Artificial Fill				
									Silty SAND, 7.5 YR 5/8 (Strong Brown) , moist, mostly medium to coarse sand, some fine sand, some fines, little fine to coarse gravel, trace cobbles.				
5	410												
									Older Alluvium (Qoal)				
									Clayey SAND, 7.5 YR 5/6 (Strong Brown) with grayish mottling, moist, fine sand.				
									-Trace fine gravel				
10	405												
									-Polished surfaces				
									Sandy CLAY, 5 YR 4/6 (Yellowish Red), dry to moist, fine sand.				
15	400								**Caliche** ,10 YR 7/6 (Yellow), layers of well deveoped carbonate.				
									Modelo Formation (TM)				
20	395								**Sandstone**, 10YR 7/8 (Yellow), dry to moist, mostly fine to medium sand, abundant carbonate infilling.				
									Modelo Formation (TM)				
									Clayey Sandstone, 7.5 YR 8/1 (White) and 7.5 YR 6/8 (Reddish Yellow), dry to moist, mostly fine to medium sand, abundant carbonate.				
									Sandstone, 7.5 YR 6/8 (Reddish Yellow), moist to wet, mostly fine to medium sand, with some carbonate infilling in joints.				

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-2	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/30/14 to 1/30/14	**LOGGED BY** TO	**SHEET NO.** 2 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 27 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 415	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									-Layer of Clayey Sandstone, 7.5 YR 5/8 with carbonate infilling -Wet, 7.5 YR 5/6 (Strong Brown)				Ground water @ 27'
									-Mottled 10 YR 6/8 (Brownish Yellow) and 10 YR 8/1 (White)				
30	385								**Clayey Sandstone**, 7.5 YR 5/8 (Strong Brown), wet, fine to medium sand, minor white mottling.				
									Sandstone, mottled 7.5 YR 8/1 (White) and 7.5 YR 5/8 (Strong Brown), wet, fine to medium sand.				
35	380								-Becomes 10 YR 6/6 (Brownish Yellow) -Layer of Clayey Sandstone, 7.5 YR 6/8 (Reddish Yellow), carbonate infilling of fractures.				
40	375												
									Sandy Claystone, mottled 7.5 YR 8/1 (White) and 7.5 YR 5/8 (Strong Brown), wet, fine sand.				
45	370								**Sandstone**, 7.5 YR 5/6 (Strong Brown), wet, fine sand. **Sandy Claystone to Clayey Sandstone**, mottled 7.5 YR 8/1 (White) to 7.5 YR 5/8 (Strong Brown), wet, fine to medium sand.				

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FIGURE A-30 b

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-2	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/30/14 to 1/30/14	**LOGGED BY** TO	**SHEET NO.** 3 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 27 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 415	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Conglomerate Bed				
									Sandy Claystone to Clayey Sandstone, mottled 7.5 YR 4/1 (Dark Gray) and 7.5 YR 5/8 (Strong Brown), wet, mostly fine sand.				
55	360												
									-Sand lense with carbonate infilled fracture				
60	355								Total Depth: 60 Ft Groundwater: Encountered at 27 Ft Boring backfilled with tamped cuttigns and asphalt patched.				
65	350												
70	345												

GDC_ROCK_CORE_ENG_REV LA-1183 CORE LOGS.GPJ ROCK2.GDT 9/5/14

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FIGURE A-30 c

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-3	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/30/14 to 1/30/14	**LOGGED BY** TO	**SHEET NO.** 1 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 28 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 414	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Asphalt				
									Artificial Fill				
									Silty SAND, 7.5 YR (Strong Brown), moist, mostly medium to coarse sand, some fine sand, few fine gravel, trace cobbles.				
	410												
5													
									Older Alluvium (Qoal)				
									Silty SAND, 7.5 YR 5/8 (Strong Brown), moist, mostly fine sand.				
									Clayey SAND, 7.5 YR 5/8 (Strong Brown), moist, mostly fine sand, trace fine gravel.				
	405												
10													
									-Few medium sand and trace coarse sand				
	400												
									Sandy Clay, mottled 7.5 YR 6/8 (Reddish yellow) to 7.5 YR 7/1 (Light Gray), moist, fine sand, oxide staining, polished surface along bedding, very weathered.				
15													
									-Carbonate infilled fractures				
	395												
20													
									-Coarsening sand, carbonate infilling continues				
	390								**Modelo Formation (TM)**				

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FIGURE A-31 a

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-3	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/30/14 to 1/30/14	**LOGGED BY** TO	**SHEET NO.** 2 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 28 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 414	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Sandstone, mottled 7.5 YR 8/2 (Pinkish White) and 7.5 YR 6/8 (Reddish Yellow), moist to wet, mostly fine to medium sand.				
	385								**Clayey Sandstone**, mottled 7.5 YR 5/6 (Strong Brown) with 7.5 YR 7/1 (Light Gray), moist to wet, mostly fine sand with some medium sand, trace black oxide staining.				
30									**Sandstone** mottled 7.5 YR 5/6 (Strong Brown) and 7.5 YR 7.1 (Light Gray), wet, mostly fine to medium sand, few fine to coarse gravel, trace cobbles, trace black peat.				
									Clayey Sandstone, 7.5 YR 5/8 (Strong Brown), wet, mostly fine to medium sand with a minor gravel and cobble layer and lamination of sandstone.				
	380								**Clayey Sandstone**, mottled 7.5 YR 5/8 (Strong Brown) and 7.5 YR 8/1 (Gray), wet, mostly fine to medium sand, abundant carbonate infilling.				
35									-Sandstone Layer				
	375								**Clayey Sandstone to Sandy Claystone**, mottled 7.5 YR 5/8 (Strong Brown) and 7.5 YR 7/1 (Light Gray), wet, mostly fine to medium sandstone, carbonate infilling of fractures.				
40									-Well cemented zone				
	370												
45													
	365												

GDC_ROCK_CORE_ENG_REV LA-1183 CORE LOGS.GPJ ROCK2.GDT 9/5/14

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FIGURE A-31 b

LOG OF CORE BORING

PROJECT NAME	PROJECT NUMBER	BORING
Yucca & Agryle Fault Investigation	LA-1183	B-3

SITE LOCATION	DATE(S) DRILLED	LOGGED BY	SHEET NO.
Yucca and Argyle, Hollywood, Ca	1/30/14 to 1/30/14	TO	3 of 3

DRILLING METHOD	DRILL BIT SIZE/TYPE	CHECKED BY	TOTAL DEPTH DRILLED (feet)
Hollow Stem Auger	6"	SK	60

DRILL RIG TYPE	DRILLED BY	INCLINATION FROM VERTICAL/BEARING
Marl M12	Gregg In-Situ Drilling	0

APPARENT GROUNDWATER DEPTH	APPROXIMATE SURFACE ELEVATION (feet)
28 ft.	414

COMMENTS	BOREHOLE BACKFILL
	Soil Cuttings

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
	360												
55													
									-Gravel and Cobble Layer				
	355												
60									Total Depth: 60 Ft Groundwater: Encountered at 28 Ft Boring backfilled with tamped cuttings and asphalt patched.				
	350												
65													
	345												
70													
	340												

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FIGURE A-31 c

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-4	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/29/14 to 1/29/14	**LOGGED BY** TO	**SHEET NO.** 1 of 2
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 36
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 31 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 413	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Asphalt				
									Artificial Fill				
									Artificial FIll **Silty SAND**, 7.5 YR 5/8 (Strong Brown), moist, fine to medium sand, little fine gravel, trace cobbles.				
	410												
5									**Clayey SAND**7.5 YR 4/6 (Strong Brown), moist, medium to coarse sand, some fine sand, few fine to coarse gravel, trace cobbles.				
	405												
10									**Older Alluvium (Qoal)** **Clayey SAND**, 7.5 YR 5/8 (Strong Brown), moist, fine to medium sand, little coarse sand, some fine gravel, trace cobbles.				
									Silty SAND, 7.5 YR 5/8 (Strong Brown), moist, medium to coarse sand, some fine sand, trace fine gravel.				
	400								**Clayey SAND**, 7.5 YR 5/8 (Strong Brown), moist, medium to coarse sand, some fine sand, trace fine gravel.				
15									-No recovery				
	395												
20									**Sandy Claystone to Clayey Sandstone**, mottled 7.5 YR 4/6 (Strong Brown) and 7.5 YR 6/1 (Gray), moist, fine to medium sand, trace coarse sand, trace cobbles.				
	390												

LOG OF CORE BORING

PROJECT NAME	PROJECT NUMBER	BORING
Yucca & Agryle Fault Investigation	LA-1183	B-4

SITE LOCATION	DATE(S) DRILLED	LOGGED BY	SHEET NO.
Yucca and Argyle, Hollywood, Ca	1/29/14 to 1/29/14	TO	2 of 2

DRILLING METHOD	DRILL BIT SIZE/TYPE	CHECKED BY	TOTAL DEPTH DRILLED (feet)
Hollow Stem Auger	6"	SK	36

DRILL RIG TYPE	DRILLED BY	INCLINATION FROM VERTICAL/BEARING
Marl M12	Gregg In-Situ Drilling	0

APPARENT GROUNDWATER DEPTH	APPROXIMATE SURFACE ELEVATION (feet)
31 ft.	413

COMMENTS	BOREHOLE BACKFILL
	Soil Cuttings

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
	385												
30													
									-Thin layer of Sandstone, wet, medium to coarse sand				
	380												
35													
									-Very hard drilling Total Depth: Refusal at 36 ft Groundwater: Encountered at 31 Ft Boring backfilled with tamped cuttings and concrete patched.				
	375												
40													
	370												
45													
	365												

GDC_ROCK_CORE_ENG_REV LA-1183 CORE LOGS.GPJ ROCK2.GDT 9/5/14

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FIGURE A-32 b

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183		**BORING** B-4A
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/31/14 to 1/31/14	**LOGGED BY** TO	**SHEET NO.** 1 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 31 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 413	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Asphalt				
									Artificial Fill				
									Silty SAND, 7.5 YR 5/8 (Strong Brown), moist, mostly fine to medium sand, little fine gravel, trace cobbles.				
	410												
5									**Older Alluvium (Qoal)**				
									Clayey SAND7.5 YR 4/6 (Strong Brown), moist, mostly medium to coarse sand, some fine sand, few fine to coarse gravel, trace cobbles.				
	405												
10									**Clayey SAND**, 7.5 YR 5/8 (Strong Brown), moist, mostly fine to medium sand, few coarse sand, trace fine gravel, trace cobbles.				
	400												
15													
									-Becomes 7.5 YR 4/4 (Reddish Brown)				
	395								**Clayey Sand to Sandy Clays**, mottled 7.5 YR 5/8 (Strong Brown) and 7.5 YR 7/1 (Light Gray), moist, mostly fine grained sand, few medium to coarse sand, trace fine gravel, some silt.				
20													
	390												
									-5 YR 4/4 (Reddish Brown) and 5 YR 6/1 (Gray), with white carbonate infilling.				

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FIGURE A-33 a

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183		**BORING** B-4A
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/31/14 to 1/31/14	**LOGGED BY** TO	**SHEET NO.** 2 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 31 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 413	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
	385												
30									Ground Water @ 31 ft.				
	380												
35									-Mottled 10 YR 6/6 (Brownish Yellow) and 10 YR 7/1 (Light Gray), abundant carbonate infilling				
	375								**<u>Modelo Formation (TM)</u>** **Sandstone, Siltstone, Claystone** 10YR 6/1 (Strong brown) to 7.5YR 7/1 (light gray), thinly bedded, some oxidation. **<u>Modelo Formation (TM)</u>** cont..				
40													
	370												
45													
	365												

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FIGURE A-33 b

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-4A	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/31/14 to 1/31/14	**LOGGED BY** TO	**SHEET NO.** 3 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 31 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 413	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
	360												
55													
	355												
60									Total Depth: 60 Ft Groundwater: Encountered at 31 Ft Boring backfilled with tamped cuttings and asphalt patched.				
	350												
65													
	345												
70													
	340												

GDC_ROCK_CORE_ENG_REV LA-1183 CORE LOGS.GPJ ROCK2.GDT 9/5/14

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FIGURE A-33 c

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-5	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/29/14 to 1/29/14	**LOGGED BY** TO	**SHEET NO.** 1 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 45 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 410	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Asphalt				
									Artificial Fill				
									SIlty SAND, 7.5 YR 4/3 (Brown), moist, mostly fine sand, few medium sand, some fine to coarse gravel, trace cobbles.				
5	405								**Older Alluvium (Qoal)**				
									Clayey SAND, 7.5 YR 4/6 (Strong Brown), moist, mostly fine to medium sand, some coarse sand, some fine gravel.				
10	400												
									Sandy SILT, mottled 10 YR 7/3 (Pale Brown), and 7.5 YR 5/8 (Strong Brown), moist, mostly fine sand, trace fine gravel.				
									Clayey SAND, 7.5 YR 4/6 (Strong Brown), moist, mostly fine to medium sand, some cobbles and gravel.				
15	395								**SAND** , 7.5 YR 5/8 (Strong Brown), moist, mostly medium to coarse sand, few fine gravel, trace cobbles.				
									Silty SAND, 7.5 YR 4/6 (Yellowish Brown), moist, mostly fine sand, trace fine gravel.				
20	390												

FIGURE A-34 a

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-5	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/29/14 to 1/29/14	**LOGGED BY** TO	**SHEET NO.** 2 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 45 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 410	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
30	380												
35	375								**Buried Paleosol**, Mottled 5YR 3/3 (Dark Reddish Brown) to 5YR 6/1 (Gray).				
40	370												
45	365								**Clayey Sand**, 5 YR 5/6 (Yellowish Brown), moist, mostly fine to medium sand, few coarse sand, trace fine gravel. Ground water @ 45 ft.				
									-Mottled 5YR 5/6 (Yellowish Brown) to 5YR 6/1 (Gray)				

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FIGURE A-34 b

LOG OF CORE BORING

PROJECT NAME Yucca & Agryle Fault Investigation	**PROJECT NUMBER** LA-1183	**BORING** B-5	
SITE LOCATION Yucca and Argyle, Hollywood, Ca	**DATE(S) DRILLED** 1/29/14 to 1/29/14	**LOGGED BY** TO	**SHEET NO.** 3 of 3
DRILLING METHOD Hollow Stem Auger	**DRILL BIT SIZE/TYPE** 6"	**CHECKED BY** SK	**TOTAL DEPTH DRILLED (feet)** 60
DRILL RIG TYPE Marl M12	**DRILLED BY** Gregg In-Situ Drilling	**INCLINATION FROM VERTICAL/BEARING** 0	
APPARENT GROUNDWATER DEPTH 45 ft.		**APPROXIMATE SURFACE ELEVATION (feet)** 410	
COMMENTS		**BOREHOLE BACKFILL** Soil Cuttings	

DEPTH (ft)	ELEVATION (ft)	ROCK CORE: RUN NO.	BOX NO.	RECOVERY, %	FRAC. FREQ.	R.Q.D., %	FRACTURE DRAWING/ NUMBER	LITHOLOGY	MATERIAL DESCRIPTION	PACKER TESTS	LABORATORY TESTS	DRILL RATE, FEET/HOUR	FIELD NOTES
									Sand, 7.5 YR 6/2 (Strong Brown), wet, mostly medium to coarse sand, some fine sand, few fine gravel.				
									Clayey Sand, 5YR 4/4 (Reddish Brown) mottled with 7.5YR 6/2 (Pinkish Gray), wet, mostly fine to medium sand, trace coarse sand, trace fine gravel.				
									Clayey Sand, 5YR 4/4 (Reddish Brown), wet, mostly fine sand, few medium sand.				
55	355								**Sand** 5YR 5/6 (Yellowish Brown), wet, mostly medium to coarse sand, some fine sand, few fine gravel.				
									Modelo Formation (Tm) **Sandy Claystone** 5YR 4/4 (Reddish Brown), wet, mostly fine sand, some fines.				
60	350								Total Depth: 60 Ft Groundwater: Encountered at 45 Ft Boring backfilled with tamped cuttings and asphalt patched.				
65	345												
70	340												

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FIGURE A-34 c

APPENDIX B: SOIL STRATIGRAPHIC AGE ASSESSMENTS

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Quaternary Geology
Economic Geomorphology
Soil Stratigraphy
Geoarchaeology
PG 2867; CPG 1766; CPESC 2167

APPENDIX B

SOIL-STRATIGRAPHIC AGE ASSESSMENTS AND PALEO-ENVIRONMENTAL RECONSTRUCTION, GROUP DELTA CONSULTANTS EAST AND WEST TRENCHES, 6230 YUCCA STREET, HOLLYWOOD AREA, CITY OF LOS ANGELES, CALIFORNIA

INTRODUCTION

This Appendix summarizes soil-stratigraphic field measurements and descriptions for dating relative fault activity (time of last displacement) and for reconstructing local geomorphic evolution over the last ~200-300 ka at and near the proposed "Yucca Street" development (Group Delta Consultants, Inc. [GDC], Plate 1, Site 2). The main purpose of the GDC investigation was to determine whether or not the inferred "Argyle Strand" of the Hollywood fault zone affects the proposed site (GDC Plate 1; Hernandez and Treiman, 2014). Accordingly, in addition to onsite and adjacent-site cone penetrometer tests (CPT) and continuous cores, GDC excavated and logged two onsite trenches, informally deemed the "west" and the "east" trenches, respectively (GDC, Plate 1). The two Yucca (Site 2) trenches, excavated and logged under the direction of GDC, complement other site-specific geological and geotechnical analyses (GDC narrative and appendices) to assess possible fault presence and relative activity.

The main purposes of this investigation (Appendix B) were several-fold:

1. To measure and describe a representative soil-stratigraphic section from initial exposures in the west trench;

2. To determine the approximate age of the west-trench sediments based mainly on relative soil-profile development of the several paleosols encountered in the trench;

3. To reconstruct the latest Pleistocene-Holocene fluvial environment of deposition as recorded in the west trench exposures; and, from the east trench exposures, to explain the geomorphic evolution of the site and adjacent properties to the east (GDC Plate 1; Site 3) and the northeast (Site 4);

4. To assess the validity of two radiocarbon dates for the west trench sediments, particularly focusing on potential sample contamination; and to evaluate the stratigraphic validity of east-trench dates for age of “middle” Argyle Channel deposits;

5. To assist GDC with correlation of trench exposures and adjacent cone penetrometer test (CPT) transects and continuous cores; specifically, those data obtained onsite as well as from on-going investigations at Site 1 on the south and at Site 3 to the east (GDC, Plate 1).

6. To deduce the likely characteristics and relative activity of various Hollywood fault segments inferred to potentially impact the site based on review of the published literature and on exposures in the two, on-site trenches; and

7. To provide an independent “Quality Assurance” critique of the GDC draft report in compliance with current geologic standards-of-practice applicable to fault-activity investigations.

The field work was commissioned by GDC and included various field, office and laboratory meetings with GDC personnel and with reviewers from the California Geological Survey and the City of Los Angeles. These took place from February through July 2014. The west trench field measurements were carried out on 13 February and 29 March; and the east trench documentation took place on 11 June and 7 July, respectively.

GDC personnel and Engineering Geologist Steven Kolthoff logged the trenches and kindly provided field logistical support. I particularly thank Steven Kolthoff and GDC engineers Michael Reader and Thomas Swantko for their much-appreciated courtesy and assistance.

Two formal soil-stratigraphic sections were measured at the Yucca west trench; on the west wall at station 0+55 (Table 1), and in a basal “trench box” at station 0+35 (Table 2). Representative east-trench sections were documented on the east wall at station 0+60 (Table 3) and on the west wall at station 0+78 (Table 4). Pertinent location and geologic maps, trench logs, and CPT and continuous core data are given in the GDC narrative and hence are referred to, but not replicated in this document.

This Appendix uses traditional pedological (soil science) terminology and field methodology described in Soil Survey Division Staff (1993), in Soil Survey Staff (1999) and in Schaetzl and Anderson (2005). The applicability of soil-stratigraphy to fault-activity assessments for construction of residential and commercial properties, dams, landfills and other large engineered structures is summarized in Shlemon (1985). Numeric dating and “calibration” with relative soil profile development is reviewed in Birkeland (1999), McFadden (1989), and Eppes and others (2002).

Quantifying several key soil (pedogenic) properties by use of the “soil development index” (SDI) may provide an “age of weathering” (Harden, 1982). The index generally works well to determine the age of surface profiles, particularly chronosequences on flights of fluvial terraces. For buried soils, however, such as those at the Yucca site, the “Harden index” may yield incorrect results. Specifically, physical truncation or chemical alteration usually leaves only two or three soil characteristics amenable for quantification; for example, color change (rubification) with depth, expressed by Munsell notation; frequency and relative development of secondary clay films; and decrease in clay content from an argillic (Bt) horizon compared with primary (depositional) clay in the parent material (C horizon). Typically, however, as exposed in the Yucca west trench fluvial deposits, the laterally discontinuous, grossly fining-upward deposits make it almost impossible to confidently calculate the amount of translocated (pedogenic) clay compared with that inherent in the parent material. Moreover, local rubification may be derived from erosion of nearby, previously weathered sediments, a problem particularly affecting age assessments of paleosols identified in subsurface cores. In brief, age quantification of truncated buried soils, based only on a few preserved physical and chemical “signatures,” too often results in dates with high uncertainty, even though some practitioners provide numbers to two or more significant figures. The age estimates for the Yucca trench soil-stratigraphy are therefore given in realistic ranges (Tables 1 through 4) to encompass uncertainty inherent in dating partially preserved paleosols.

WEST TRENCH STRATIGRAPHY

The Argyle Channel

The Yucca west trench, locally up to ~35-ft deep, exposed several interbedded and laterally discontinuous, grossly fining-upward sedimentary “packets” laid down in a former stream channel (fan distributary ?) informally named the “Argyle Channel” after its southwest trend down the street of that name and through the site (GDC Fig. 6). The channel thalweg is exposed near the bottom of the west trench (GDC Plate 2 and Appendix D; photographs 1 and 3). The Argyle sediments are mainly bar and channel, capped by a remnant, slightly developed surface soil and replete with four intercalated buried paleosols. Each soil represents an epoch of relative landscape stability and hence a time of weathering (soil formation).

The basal trench unit, incised into and unconformably overlain by the Argyle Channel, is a truncated mudflow (Qm) bearing a remnant soil (dark yellowish brown [10YR 3/6] to dark brown [7.5YR 3/3] silty clay loam [Table 2]). This, in turn, is underlain by matrix-supported angular clasts (debris flows; Qdf) clearly exposed in the east trench (GDC Plate 5) and recognized in CPT transects and in continuous cores (GDC Plates 1 and 4). Topographically, the Argyle Channel no longer exists, its “upstream” source apparently “cut off” by early development in this area. Significantly, however, its sedimentary characteristics and incision into underlying, older clayey deposits indicates relatively abrupt, regional environmental change from deposition of mud- and debris-flows to relatively clean, high-energy fluvial gravels and silts. This major unconformity most likely stems from regional climate and vegetation change, and therefore ostensibly identifies onset of “pluvial” conditions in this area. For conservatism, this is judged to have taken place as recently as ~12-16 ka ago, temporally associated with marine oxygen-isotope stage 2. Accordingly, based on the abrupt change in fluvial environments, the base of the Argyle Channel is at least ~10-12 ka old; an age corroborated by the cumulative age of its several, intercalated buried soils.

Soil-Stratigraphic Measurements and Descriptions

The ~35-ft thick Argyle Channel sediments and paleosols were described from west-trench exposures on the west wall at Station 0+55 (Table 1); and the lower several ft were described from a “box trench” exposure at the base of the trench at Station 0+35 (Table 2).

Station 0+55

The Station 0+55 soil-stratigraphic section was measured to a depth of 18.5 ft, essentially the top of Bench 4 (GDC Plate 2). As documented in Table 1, artificial fill is underlain by about 3-ft of gravelly coarse sand grading upward to a loamy medium sand. The section is sufficiently weathered to have developed ~0.8-ft thick cambic (color) horizons (Bw1 and Bw2). No translocated clay is apparent. Nevertheless, weathering in Mediterranean climate, coarse-grained sediments requires at least an estimated 1 ka of weathering (McFadden, 1989). This surface soil is therefore deemed to be “very slightly developed.”

Another grossly fining-upward packet of sediments occurs between ~3.8 to 7.8 ft (Table 1). A similar, “very slightly developed” buried soil caps this packet. The upper cambic horizon (2Bw1b) is truncated but, combined with the lower horizon (2Bw2b), similarly represents about ~1-2 ka of weathering.

A second, truncated buried paleosol occurs at a depth of 7.8 ft (Table 1). This soil, however, bears a weak argillic horizon (3Btb) typified by strong brown (7.5YR 4/6) thin clay films that bridge mineral grains and line ped faces. Based on relative development, this “slightly developed” paleosol is judged to represent ~2-3 ka of weathering.

The top of a third, similarly truncated buried paleosol is identified at 10.4 ft (Table 1). Two weak argillic horizons (4Bt1b and 4Bt2b) are characterized by fine, dark yellowish brown (10YR 4/4) fine clay films that line ped faces and locally bridge root pores. A “slightly developed” profile suggests that ~2-3 ka of weathering took place before burial by overlying sediments.

A fourth paleosol caps another fining-upward sequence at a depth of 14.5 ft (Table 1). The identified argillic horizon (5tb) is only 0.5-ft thick, probably truncated by deposition of the overlying coarse gravelly sand. Here, too, the horizon probably formed in ~2 ka. These particular deposits locally incise 2-3 ft into the underlying sediments, typical “cut-and-fill” deposition within the Argyle Channel.

In brief, relative development of the surface and the four buried paleosols suggests a cumulative age of at least ~10-12 ka of weathering, a minimum age for the Argyle Channel deposits. More likely, however, based on thalweg incision into the underlying clay and the dramatic change in the fluvial environment, the basal deposits are older, ostensibly initially laid down at least ~12-15 ka ago during onset of marine isotope stage 2.

Station 0+35

In order to assess relative profile development below the base of the Argyle Channel, GDC locally deepened the Yucca trench several ft, providing safe access by means of a “Trench Box” (GDC Appendix D, Photograph 7). As measured and described from Station 0+35, the trench box exposed ~7 to 8-ft of silty clay loam coarsening downward to sandy clay loam, and ultimately to interbedded, mixed coarse sand and granitic gravel lenses at the base (Table 2). The clayey parent material (Qm) is a regional stratigraphic marker, exposed continuously at the base of the Yucca west trench, discontinuously throughout the east trench, and identified in adjacent continuous cores and on CPT transects.

A distinct, though truncated, buried paleosol was identified at the box trench exposure. This soil has two discrete, buried argillic horizons (6Bt1b and 6B2tb; Table 2). The argillic horizons are mainly silty to sandy clay loam, dark brown (7.5YR 3/3) to dark brown (7.5YR 4/4) in color, and replete with few to common fine, dark brown (7.5YR 3/4) clay films that line ped faces, bridge mineral grains and fill old root pores. The trench box exposures show that basal Argyle channel gravels are incised and truncate the underlying paleosol at least about one ft. Nevertheless, sufficient argillic horizon characteristics remain to deem the soil as “moderately developed,” thereby representing an additional ~8-15 ka of weathering.

West Trench Radiocarbon Dates

Two “charcoal” samples were collected for potential radiocarbon assay (GDC Appendix C): “Charred material” at ~14-ft (Yucca # 2); and “organic sediments” at ~18-ft (Yucca # 1; GDC Appendix C). The Yucca samples were dated by “standard radiocarbon assay.” Such dates may be questionable when sample size is small, where there is potential for modern groundwater contamination, and where samples are taken from high-energy environments and thus potentially reworked from older, “upstream” sediments.

As shown on the trench log (GDC Plate 2), the Yucca sediments are generally very coarse grained and devoid of laterally continuous, relatively impermeable clay beds to “perch” or otherwise prevent modern surface water from penetrating the entire section. Accordingly, the Yucca # 2 sample, dated as ~4300 BP (conventional) has been likely subject to contamination by younger gravitational water. It is therefore likely at least 10 or 15 percent too young (Pigati and others, 2007). Similarly, and very highly suspect is the 41,000 BP age for Yucca # 1, obtained from sediments realistically not more than ~12 ka old. Most likely, therefore, this “disseminated organic sediment” was derived from “upstream” weathering of older sediments and transported in the high-energy, coarse fluvial sediment at the base of the Argyle Channel. This “too old” sample age is therefore rejected in favor of more reasonable, and conservative, soil-stratigraphic and paleo-environmental reconstruction.

EAST TRENCH STRATIGRAPHY

GDC excavated the ~160-ft long and ~30-35-ft deep east that overlapped the west trench and continued south across the Yucca property (Site 2) onto the adjacent Site 1 (GDC Plate 1). The east trench generally encountered four discrete Quaternary stratigraphic units, some bearing buried paleosols amenable to measurement, description and relative age assessments. As described by GDC (stratigraphic section, Fig. 10), the uppermost unit (youngest) pertains to the Argyle Channel, mainly fluvial and locally cross-bedded, medium- to coarse-sand and lenticular gravel beds (Qs). These are underlain by discontinuous mudflows locally capped by slightly to moderately developed buried paleosols (Qm). Underlying the mudflows are extensive debris flows, locally bearing discrete paleosols indicative of periodic (climatically controlled ?) landscape stability and soil formation (Qdf). The debris flows are mainly derived from adjacent upstream and sideslope “older alluvium” (Qoal) that once extended across the entire area. As encountered in onsite and adjacent cores, the Yucca area is underlain by Modelo formation “bedrock” (Tm).

Paleo-Environmental Reconstruction - East Trench Exposures

The east trench exposures supported initial interpretations of core and CPT data about the likely origin and relative age of the mud- and debris flows that underlie the Yucca (Site 2) area. Specifically, as shown on GDC Fig. 7, a veneer of old (likely ~300 ka), “high-level” channel and fan deposits still mantle the eroded surface at Site 3, east of Argyle Street (GDC Plate 1). Based mainly on paleo-environmental interpretation of regional cores and on the east trench exposures, an ancestral drainage apparently incised the area ostensibly ~300 ka ago, giving rise to a steep channel wall underlying the present Argyle Street (GDC Plate 1). This channel was then filled by multiple debris flows emanating from upstream as well as from adjacent sideslopes. Debris-flow deposition was apparently episodic, or possibly even periodic, as deduced from preservation of slightly to moderately developed buried paleosols observed in the east trench. Many debris flows retain their original “brown to reddish brown” color, a result of previous, deep weathering of the their source sediments, the “high level” fan deposits (GDC Fig. 7).

The debris flows (Qdf) were, in turn, eroded and reworked, giving rise to relatively thin but readily discernible mudflows (Qm) that locally cover the debris flows and underlie the Argyle channel sands (Qs).

Additionally, as shown on the GDC trench log (Plate 5), the east trench exposed a south-verging anticline replete with an apparent slip surface (GDC Plate 5). Last apparent “movement” of this structure involved the debris flows (Qdf), but not the overlying mudflows (Qd) and the Argyle (Qs) deposits, as documented on the GDC logs (Plates 4 and 5).

Soil-Stratigraphic Measurements and Descriptions

Two representative soil sections were measured from the east trench exposures: on the east wall at station 0+60 (Table 3); and on the west wall at station 0+78 (Table 4). The station 0+60 descriptions particularly document the relative profile development of a buried paleosol that caps mudflows (Qm) deposits, which, in turn, unconformably overlie a buried paleosol formed on a local mud- debris flow transitional unit (Qm-Qdf). The station 0+78 soil section provides a detailed measurement and description of a buried paleosol that caps a horizontal, unbroken mudflow (Qm) directly overlying a slip surface (inferred fault) along a south-tilted, debris-flow bedding plane illustrated in GDC Fig. .

East Wall, Station 0+60

As documented in Table 3, the upper ~2.9-ft of section represent the base of the Argyle channel sands (Qs). These deposits are typically dark brown (10YR 4/3) to dark yellowish brown (10YR 4/4) sandy clay loam to fine sand with local, lenticular gravel lenses. Structure is typically massive to weak, fine angular, and thus indicative of the non-consolidation and relatively “youth” of Argyle channel sediments. At the measured section, the Argyle sediments are ~40-50 ft east of, and about halfway above the elevation of the main thalweg (see west trench log). Accordingly, based on stratigraphic position, their age is estimated to be ~4 - 5 k.

Horizons 2b1-2b2 (Table 3) mark a ~2.5-ft thick, remnant buried paleosol that caps underlying mudflow (Qm) deposits. The paleosol is a brown to dark brown (7.5YR 4/4 - 7.5YR 4/6) silt to loamy clay with moderate to strong, fine angular blocky structure. The paleosol is also very hard and sticky and plastic; and typified by few fine, yellowish brown (10YR 5/4) clay films that line ped faces and fill root pores. Based on its "moderate" relative development, this remnant soil represents an estimated ~20-30 ka of weathering before truncation and burial by Argyle channel (Qs) deposits.

A second, deeper paleosol (horizons 3B1b–3B3b) was also measured and described at station 0+60 (Table 3). This particular paleosol formed across a thin mudflow and is superimposed onto an underlying debris flow. Specifically, the truncated 3B1b horizon is a yellowish brown (10YR 5/6) to strong brown (7.5YR 5/6) sandy clay loam with moderate medium blocky structure. Characteristic are few to common, strong brown (7.5YR 5/6) clay films that line ped faces, bridge mineral grains and line root pores. The underlying parent material (horizons 3C1b through 3c3b) generally grade into debris flows with matrix supported, ~0.7-in angular clasts at the base (Table 3). Based on relative profile development, this buried paleosol represents another ~25-30 ka of local landscape stability and related weathering.

West Wall, Station 0+78

A very detailed, approximately 2.7-ft thick profile was measured at Station 0+78 on the west wall of the Yucca east trench (Table 4). This section specifically addressed the relative age of a mudflow and capping paleosol that lie horizontal and unbroken over tilted debris flows (Qdf) containing an interbedded slip surface conservatively assumed to be a fault (GDC Plate 6). The upper ~0.7 inches of the mudflow bear four discrete, now-buried argillic horizons (2B1b through 2b4b; Table 4) truncated by basal coarse sand and gravel associated with Argyle channel sediments (Qs). The paleosol horizons range in color from dark brown (7.5YR 5/4) to dark reddish brown (5YR 3/4) and formed on fine to coarse medium sandy loam parent material. The diagnostic argillic is the 2b3b (Table 4) with fine subangular blocky structure and few fine brown (7.5YR 5/4) clay films that line ped faces and bridge grains. Any reasonable "upward" projection of the GDC-logged slip surface does not offset the mudflow and its capping buried paleosol (GDC Appendix D [photograph]). Based on relative profile development, the buried paleosol represents at least ~30 k of weathering. Its parent material, the horizontal, unbroken mudflow (Qm) is inherently older. Last movement along the underlying slip surface therefore took place prior to at least ~30 k ago, and probably well before that time.

East Trench Radiocarbon Dates

GDC collected eight, west-trench charcoal samples for potential radiocarbon assay, all obtained from Argyle Channel sediments. As documented in Appendix C, the samples are identified as Mill-1 through Mill-7 and Yucca 4; and cumulatively provide standard radiocarbon ages ranging from about 4.1 to 4.4 ka. These values were anticipated based on stratigraphic position and are therefore accepted as reasonable; and they support the estimated age for west-trench exposures at this same stratigraphic level.

CORRELATION OF YUCCA TRENCH SEDIMENTS AND SOILS WITH ADJACENT CONTINUOUS CORES AND CPT SOUNDINGS

The Yucca (Site 2) east and west trenches provided an additional three major benefits to assess potential presence and activity of the inferred Argyle Strand of the Hollywood fault. First, the west trench exposed not only Argyle Channel sediments (Qs), but also underlying, relatively impervious clay (Qm). When initially opened, this clay perched water, essentially at the base of the thalweg. Perched water also was present on clayey channel-bordering mudflows and debris flows into which the Argyle Channel was incised. The several different clay beds are vertically separated ~20 ft, as deduced from on-site geotechnical borings (GDC, 2006). The elevation difference was apparently interpreted (Hernandez and Treiman, 2014) as evidence for a possible “Argyle Strand” of the Hollywood fault system (GDC Plate 1; Fig. 4). Now, however, the trench exposures show that the difference in water-level elevation stems from local Argyle Channel incision into several different, relatively impermeable clayey mud- and debris flows (stratigraphic units Qm and Qdf).

Second, until excavation of the Yucca trenches, several other nearby, Hollywood fault investigations (GDC Fig. 1) did not employ site-specific trenching. Rather, fault-activity assessments were based mainly on correlation of CPT data and locally on extrapolation of often widely spaced cores. In contrast, the 6230 Yucca Street (Site 2) trenches provide geologic “calibration” for correlation with adjacent CPT soundings and continuous cores. This allows for high-confidence “extrapolation” of site stratigraphy north and south of the Yucca trenches (GDC Plates 1, and 2), and thus better assesses whether or not the adjacent sediments are fault displaced.

Third, the Yucca trenches provide the first complete exposure of post-bedrock (Tm) Quaternary sediments in the Hollywood area. Accordingly, based on geomorphic reconstruction and on numeric (radiocarbon) and relative dating (soil stratigraphy), the Yucca trenches expose an excellent stratigraphy from which to reconstruct local late Quaternary geomorphologic evolution, to determine the characteristics and age of local faults, and to reasonably date the last displacement of those observed at nearby Site 3 immediately east of Argyle Street (GDC Plate 1).

And finally, as particularly observed in the west trench, the Argyle Channel deposits are internally incised, often up to several ft (GDC Fig. 2). This local fluvial incision may well explain “inverted,” core-collected radiocarbon dates previously reported at the then, non-trenched Site 1, adjacent to the south (Langan, 2012; GDC Plate 1).

SUMMARY AND CONCLUSIONS

As part of standard-of-practice fault assessments, GDC emplaced and logged two trenches across a proposed development at 6230 Yucca Street (Site 2) in the Hollywood area of Los Angeles. The west trench, about 100-ft long and up to ~35 ft deep, and the east trench, over ~160 ft long and of similar depth, were purposely sited to determine the possible presence and relative activity (time of last surface or near-surface displacement) of the “Argyle Strand” of the Hollywood fault, recently included within a “Fault Hazard Zone” by the California Geological Survey (Hernandez and Treiman, 2014).

The west trench exposed the thalweg and an overlying 30-ft thick sequence of interbedded, grossly fining-upward fluvial sediments within the “Argyle Channel.” Soil-stratigraphic measurements and descriptions show that the Argyle Channel sediments are capped by a remnant, very slightly developed surface soil, and by four, underlying buried paleosols, ranging in relative development from very slight to slight. Based on “calibration” with numerically dated soils elsewhere in Mediterranean climates, the cumulative time of weathering for formation of the channel sediments is an estimated ~10-12 ka.

The Argyle Channel incises underlying, relatively impermeable clay that bears a truncated, slightly to moderately developed buried paleosol. This soil, with its distinct translocated clay films, represents another ~8-15 ka of weathering. Additionally, the abrupt unconformity between the base of the channel and the underlying clay, suggest onset of Argyle channel deposition during an epoch of regional pluviality, conservatively estimated as ~12-16 ka ago (marine isotope stage 2). From a pedogenic standpoint, the cumulative age of the trench-exposed Argyle channel and the underlying clay exceeds ~15 ka.

The lower of the two conventional radiocarbon dates from the west trench, Argyle Channel deposits is particularly suspect, owing to likely re-deposition of “organic sediment” (~41,000 bp) resulting in older contamination. Accordingly, more realistic estimates are derived from the cumulative age of the surface and four trench-exposed buried soils and from likely fluvial deposition onset during isotope stage 2.

The east Yucca trench overlapped the west trench to the north and extended onto Site 1 to the south. It exposed multiple debris flows that emanated both from upstream and from sideslope sources. The debris flows are overlain by locally discontinuous mudflows, similar to that observed at the base of the Argyle Channel deposits in the west trench.

A representative soil-stratigraphic section shows that the mudflows bear truncated paleosols with moderate relative profiles development, similar, if not exceeding the soil described in the west trench “box cut.” The better preserved east-trench buried soils reflect ~ 25-30 ka of weathering.

Another east-trench soil profile was specifically described from an unbroken, horizontal mudflow that overlies an apparent slip surface within the south-dipping limb of a subsurface anticline. The buried soil is similarly moderately developed, again reflecting – in this case - at least ~30 k of weathering. The soil and its underlying mudflow parent material are undisplaced; therefore, last slip of the presumed fault at this location occurred well before ~30 ka ago.

The Yucca trench exposures also explain the origin for an apparent 20-ft vertical “offset” of piezometric surfaces recorded in adjacent, on-site geotechnical borings. This separation was a main line of evidence for CGS postulation of a possible “Argyle Strand fault.” However, rather than fault caused, the “offset” water stems from perching on separate clayey mud- and debris-flows.

The trenches also show that the Argyle Channel sediments typically incise older deposits a few to locally several ft. Thus, without the benefit of trench exposures, charcoal obtained from continuous cores on the adjacent (Site 1) property, the consultants-of-record found that several radiocarbon ages were stratigraphic inverted, thus lowering their confidence to date on-site sediments.

The Yucca trenches also provide "calibration" to more confidently identify the lithology and grain size and to correlate sediments in adjacent continuous cores and CPT transects. The GDC trench logs and extrapolation to adjacent and logs show that the Argyle Channel overlapping sediments and the underlying clay marker-bed are continuous and unbroken by any fault. Accordingly, if an Argyle Strand of the Hollywood fault truly exists, last surface displacement occurred prior to at least ~30 ka ago.

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TABLE 1

Soil-Stratigraphic Measurements and Descriptions

GDC "Yucca Street" Trench, West Wall, Station 0+55; and Basal "Trench Box;" Station 0+35

Depth (ft)	Horizon	Description
0.0 – 0.8	"Af"	**Artificial Fill**: Un-engineered fill; asphalt and bottle fragments; organic material.
0.8 – 1.5	A-B	Brown to dark brown (10YR 4/3) to very dark grayish brown (10YR 3/2) when moist loamy medium sand; moderate medium angular blocky structure; slightly hard, slightly firm, non-sticky and non-plastic; few to common fine vertical roots; few to common granitic clasts to 1.5-in dia., gradual wavy boundary.
1.5 – 1.9	Bw1	Yellowish brown (10YR 54) to brown to dark brown (10YR 4/3) when moist silty medium sand; weak fine subangular blocky structure to massive; very hard, very firm, non-sticky and non-plastic; few very fine vertical roots; locally few to common subrounded to angular clasts to 0.5-1.0 in long dia; gradual wavy boundary.
1.9 – 2.3	Bw2	Yellowish brown (10YR 5/4) to yellowish brown (10YR 5/6) when moist silty fine sand; weak to fine subangular blocky structure; extremely hard to locally very firm; few very fine vertical roots; gradual wavy to abrupt wavy boundary (base of cambic horizon).
2.3 – 3.8	C1	Brownish yellow (10YR 6/6) to yellowish brown (10YR 5/4 when moist gravelly coarse sand; massive loose, non-sticky and non-plastic; many angular clasts to ~3-in long diameter; many subrounded pebbles to ~0.8-in dia; abrupt wavy boundary (base of grossly fining-upward channel deposits; laterally discontinuous; unconformity).
3.8 – 4.6	2Bw1b	**Buried Paleosol** (very slightly developed): Yellowish brown (10YR 5/6) to dark yellowish brown (10YR 5/4) when moist fine to medium sand; weak subangular blocky structure; hard, friable, non-sticky and non-plastic; few subrounded pebbles to ~0.5-in dia., abrupt smooth to abrupt wavy boundary.
4.6 – 5.2	2Bw2b	Dark yellowish brown (10YR 4/6) dark yellowish brown (10YR 3/6) when moist loamy fine sand; weak to moderate subangular blocky structure; slightly hard, firm, slightly sticky and non-plastic; gradual wavy boundary.

Table 1 (continued)

Depth (ft)	**Horizon**	**Description**
5.2 – 6.0	2C1b	Pale Brown (10YR 6/3) to dark yellowish brown (10YR ¾) when moist medium to coarse sand; moderate to fine coarse blocky structure; extremely hard, firm to friable; non-sticky and non-plastic; subrounded clasts to 1-in dia.; gradual wavy boundary.
6.0 – 6.3	2C2b	Yellowish brown (10YR 5/6) to dark yellowish brown (10YR 4/4) when moist coarse loamy sand; massive; loose, friable, non-sticky and non-plastic; few subrounded clasts to 1-in. dia., gradual wavy boundary.
6.3 – 7.0	2C3b	Brownish yellow (10YR6/6) to dark yellowish brown (10YR 4/4) when moist gravelly coarse sand; structureless (loose), very friable; non-sticky and non-plastic; common to many subangular and angular clasts to 2-in dia., base of grossly fining-upward sequence; abrupt wavy boundary.
7.0 – 7.8	2C4b	Dark yellowish brown (10YR 4/6) to strong brown (7.5YR 4/6) when moist coarse sand; massive to weak, fine angular blocky structure; soft, friable, non-sticky and non-plastic; very few angular clasts 0.5 to 1.0-in dia., few to common subrounded clasts to 1-in. dia. near base; abrupt wavy boundary (unconformity).
7.8 – 8.2	3Btb	**Buried Paleosol** (slightly developed): Yellowish brown (10YR 5/6) to strong brown (7.5YR 4/6) when moist loamy fine sand; moderate medium angular blocky structure; slightly hard to hard, firm non-sticky and slightly plastic; few very fine clay films bridging mineral grains and lining ped faces; abrupt smooth boundary.
8.2 – 10.4	3Cb	Light yellowish brown (10YR 6/4) to dark yellowish brown (10YR 4/4) when moist coarse sand,; massive structure; loose, very friable, non-sticky and non-plastic; local gravel lenses to 1.5-in thickness; gravel lenses and horizontal stringers of interbedded sand and gravel; laterally discontinuous; poorly sorted; medium energy environment of deposition; abrupt wavy to abrupt irregular boundary (unconformity).
10.4 – 12.6	4Bt1b	**Buried Paleosol** (slightly developed): Brownish yellow (10YR 6/6) to dark yellowish brown (10YR 4/6) when moist moderate very fine subangular blocky structure in clayey lenses; friable,

Table 1 (continued)

Depth (ft)	Horizon	Description
		slightly sticky; non-plastic; few very fine dark yellowish brown (10YR 4/4) clay films lining ped faces and bridging mineral grains; locally few to common pebble lenses 0.5 to 1.0 in thick laterally increasing in width; locally discontinuous; local isolated, very angular clasts to 2-in. dia., abrupt wavy boundary
12.6 – 13.4	4Bt2b	Dark yellowish brown (10YR 4/4) to dark yellowish brown (10YR ¾) when moist pebbly clay loam; moderate to strong very angular blocky structure; very hard, very firm, slightly sticky and slightly plastic; few very fine dark brown (10YR 3/3) clay films lining ped faces and bridging mineral grains; few to common fine roots and vertical pores; local sand and pebble lenses near base to 2-in. thick; laterally discontinuous; top of grossly fining-upward sequence; gradual to locally abrupt smooth lower boundary.
13.4 – 14.5	4Bt3b	Dark yellowish brown (10YR 4/4) to dark yellowish brown (10YR 3/4) when moist pebbly loamy sand; weak to moderate angular blocky structure; slightly hard to hard, firm, slightly sticky and plastic; few very fine vertical roots; few very fine clay films lining ped faces and bridging mineral grains; few disseminated detrital charcoal fragments to 0.2-in dia., throughout horizon (see notes), collected near base; few to common pebbly gravel lenses increasing near base; few lenticular subrounded to rounded clasts to 2-in. dia. throughout horizon; abrupt wavy boundary (unconformity).
14.5 – 15.0	5tb	**Buried Paleosol** (slightly developed): Yellowish brown (10YR 5/6) to dark yellowish brown (10YR 3/6) when moist pebbly loamy clay; moderate medium angular blocky structure; hard, firm to friable, non-sticky and slightly plastic; few thin lenticular clay lenses; locally few very fine dark yellowish brown (10YR 4/4) clay films lining ped faces and bridging mineral grains; united truncated gradual wavy to abrupt wavy boundary.
15.0 – 18.4	5C1b	Yellowish brown (10YR 5/8) to dark yellowish brown (10YR 4/6) when moist medium coarse sand; massive structure; very friable, loose; non-sticky and non-plastic; coarsening near base; gradual smooth to locally abrupt boundary.
18.4 – 18.8	5C2b	Dark yellowish brown (10YR 4/6) to dark yellowish brown (10YR ¾) silty clay; weak to moderate angular blocky structure; hard very firm, slightly sticky and slightly plastic; laterally extensive marker horizon; thickness variable 2-3 in., continuous unbroken unit below base of locally incised channel

Table 1 (continued)

Depth (ft)	Horizon	Description
		gravels and laminated sand); gradual wavy boundary; base of trench wall measured section approximately 6-ft above trench base at Sta. 0+55.

Notes *(Trench Wall exposures, Sta. 0+55)*:

1. Soil profile measurement by RJS and SK, 13 February 2014; GDC “Yucca Trench, west wall; Station 0+55.

2. The surface and four very slightly to slightly developed buried paleosols cap grossly fining-upward sequences; typified by cambic (Bwb) or by cumulic, “weak” argillic (Btb) horizons. Buried paleosols, in generally coarse-grained parent material, each represent ~1-2 k of relative landscape stability soil weathering.

3. Trench exposes thalweg of SW-trending fluvial channel deposits and interbedded paleosols at ~25 ft. Main paleo-channel contains multiple, laterally discontinuous bar and channel sediments; grossly fining upward, and each capped by a truncated buried paleosol.

4. Present geomorphic setting, stratigraphic position and onset of basal channel-gravel deposition implies formation under a more “pluvial” climate; conservatively estimated to be during oxygen-isotope stage 2, ~12-16 ka ago.

5. Cumulatively, the surface and the four buried paleosols represent ~8-10 ka of weathering.

TABLE 2

GDC Yucca Soil Profile Measurement and Description in "Box Trench" (~6-ft below base of "18.4-18.8-ft depth horizon;" Sta. 0+35)

Depth (ft)	Horizon	Description
25.0 – 25.5	6Bt1b	**Buried Paleosol** (truncated; slightly to moderately developed): Dark yellowish brown (10YR 3/6) to dark brown (7.5YR 3/3) when moist silty clay loam; moderate medium angular blocky structure; hard, firm, slightly sticky and slightly plastic; few to common fine dark brown (7.5YR ¾) clay films lining ped faces; common fine root pores ; gradual diffuse boundary.
25.5 – 27.0	6Bt2b	Brown to dark brown (7.5YR 4/4) sandy clay loam; weak to moderate subangular blocky structure; soft, friable, non- sticky and slightly plastic; few very fine clay films decreasing with depth; gradual wavy boundary.
27.0 – 33.0	6Cb	Sandy loam grading downward to interbedded granitic clast lenses to 0.5-in. dia., increasing at base; base of Trench Box exposure.

Notes *(Box cut at base of trench; sta. 0+35)*:

1. Soil measured and described by RJS, 29 March 2014.
2. Basal clay is truncated by overlying, high-energy channel deposits; only remnant buried paleosol is preserved (slightly to moderately developed with argillic [6Bt1b/6Bt2b] horizons).
3. Buried paleosol is estimated to conservatively represent ~8-10 ka of weathering. The clay parent material is a regional stratigraphic marker, exposed continuously at the base of GDC "Yucca Box Trench" and identified in adjacent continuous cores.
4. Cumulatively, the "Box Trench" soil and the overlying paleosols within the overlying channel gravels represent – at a minimum ~16-20 ka of weathering.

Table 3

Soil-Stratigraphic Measurement and Description, GDC East Trench, East Wall, Station 0+60

Depth (ft)	Horizon	Description
0.0 - 0.7	C1	Brown to dark brown (10YR 4/3) to dark yellowish brown (10YR 3/4) when moist gravely sandy clay loam; weak medium subangular blocky structure; extremely hard, extremely firm, locally friable, slightly sticky and slightly plastic; common angular clasts to 2-in dia. near base; abrupt wavy boundary.
0.7 – 2.0	C2	Dark yellowish brown (10YR 4/4) to dark yellowish brown (10YR 3/4) when moist sandy clay loam; massive structure; very hard and very firm; slightly sticky and slightly plastic; common angular clasts to 2.0 in dia. near base; few detrital charcoal fragments near base; abrupt wavy boundary.
2.0 – 2.9	C3	Yellowish brown (10YR 5/4) to dark yellowish brown (10YR 3/6) when moist fine gravelly silt loam; massive to weak fine angular blocky structure; extremely hard, extremely firm; slightly sticky and slightly plastic; few to common angular clasts to 0.2 in dia. near base; abrupt smooth boundary (unconformity).
2.9 – 3.9	2B1b	**Buried Paleosol:** Brown to dark brown (7.5YR 4/4) to strong brown (7.5YR 4/6) when moist loamy clay; massive to weak fine subangular blocky structure; very hard, very firm, sticky and plastic; few very fine dark brown (7.5YR 3/4) clay films lining ped faces and bridging mineral grains; parent material = mudflow; upper horizon truncated; abrupt wavy boundary.
3.9 – 4.8	2B2b	Yellowish brown (10YR 5/6) to dark yellowish brown (10YR 4/6) when moist silty clay; moderate to strong fine angular blocky structure; extremely hard, extremely firm; sticky and very plastic; few very fine rootlets along ped faces; few, very fine yellowish brown (10YR 5/4) clay films along ped faces decreasing near base; parent material = local mud and debris flow; abrupt wavy boundary.
4.8 – 5.4	2Cb	Pale brown (10YR 6/3) to brown (10YR 5/3) when moist sandy loamy clay; massive structure; very hard, very firm; slightly sticky and slightly plastic; abrupt wavy boundary (unconformity).
5.4 – 5.8	3B1b	**Buried Paleosol**: Yellowish brown (10YR 5/6) to strong brown (7.5YR 5/6) when moist fine sandy clay loam; moderate medium blocky structure; extremely hard, extremely firm, slightly sticky and slightly plastic; very few strong brown (7.5YR 5/8) clay films

Table 3 (continued)

Depth (ft)	Horizon	Description
		lining ped faces and bridging mineral grains; parent material = mudflow bearing a moderately developed buried paleosol; gradual wavy boundary.
5.8 – 6.3	3B2b	Yellowish brown (10YR 5/6) to strong brown (7.5YR 5/6) medium to coarse angular sand; massive structure; extremely hard; extremely firm; non-sticky and non-plastic; gradual wavy boundary.
6.3 – 7.1	3B3b	Yellowish brown (10YR 5/6) to strong brown (7.5YR 5/6) when moist medium sandy loam; massive structure; extremely hard; extremely firm; non-sticky and non-plastic; gradual smooth boundary.
7.1 – 7.6	3C1b	Yellow (10YR 7/6) to brownish yellow (10YR 6/6) when moist fine sandy loamy clay; massive structure; extremely hard; extremely firm; non-sticky and non-plastic; gradual smooth boundary.
7.6 – 8.2	3C2b	Brownish yellow (10YR 6/8) to brownish yellow (10YR 6/6) when moist medium sandy clay loam; massive structure; extremely hard, extremely firm; non-sticky and non-plastic; abrupt smooth boundary.
8.2 – 9.2	3C3b	Very pale brown (10YR 7/4) to yellowish brown (10YR 5/6) when moist stratified loamy lay to silt loam; massive structure to fine medium subangular blocky ear base; common mn staining on ped faces increasing near base; extremely hard, extremely firm; slightly sticky and slightly plastic; common matrix supported angular clasts to 0.7-in dia. (debris flow) near base of measured section; based of third wall (GDC trench log).

Table 4

Soil-Stratigraphic Measurement and Description, GDC East Trench, Bench 2, West Wall, Sta. 0+78

Depth (ft)	Horizon	Description
0.00 – 0.15	2B1b	Brown to dark brown (7.5YR 4/3) to dark brown (7.5YR 3/3) when moist coarse sandy loam; moderate medium subangular blocky structure; hard to very hard, very firm, plastic and slightly sticky; few very fine dark brown (7.5YR 3/3) clay films ling ped faces and bridging mineral grains; gradual wavy boundary.
0.15 – 0.20	2B2b	Dark brown (7.5YR 3/3) to brown (7.5YR 5/4) when moist medium sandy loam; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; few very fine dark brown (7.5YR 3/3) clay films bridging mineral grains; gradual wavy to gradual smooth boundary.
0.20 – 0.40	2B3b	Dark reddish brown (5YR 3/4) to brown (7.5YR 5/4) when moist fine sandy clay loam; massive to weak fine subangular blocky structure; very hard, very firm, slightly sticky and plastic; few very fine brown (7.5YR 5/4) clay films lining ped faces and bridging mineral grains; few very angular clasts to 0.2-in dia., lenticular unit to 3-in thick; gradual wavy boundary.
0.40 – 0.60	2B4b	Dark brown (7.5YR 3/3) to brown (7.YR 5/4) when moist coarse sandy clay loam; massive structure; hard, firm, sticky and plastic; few brown to dark brown (7.5YR 4/4) clay films lining ped faces and bridging mineral grains; few very angular pebbles increasing in frequency near base; gradual wavy boundary.
0.60 – 0.75	2C1b	Dark brown (10YR 3/3) to brown to dark brown (10YR) 4/3) when moist sandy clay loam; massive structure; hard, firm to very firm, slightly sticky and plastic; few very angular to common subrounded clasts near base; gradual wavy to abrupt wavy boundary.
0.75 – 1.00	2C2b	Dark brown (10YR 3/3) to brown to dark brown (7.5YR 4/3) when moist pebbly clay loam; massive structure; hard, very fir, slightly sticky and plastic; few very angular pebbles to 0.1 in dia., increasing near base; gradual wavy boundary.
1.00 – 1.10	2C3b	Dark yellowish brown (10YR 3/4) to dark brown (7.5YR 3/4) when moist sandy loamy clay; massive structure; hard to very hard, very firm, slightly sticky and slightly sticky; lenticular angular pebbles to 0.1-in dia. near base; gradual wavy to angular wavy boundary.

APPENDIX C: PHOTOGRAPHS

Photo 1:

Site 3. Looking northeast. Note Champion trench between Argyle Avenue sidewalk and apartment building.

Photo 2:

Site 3 Trench. Typical older alluvium. Note the distinctive stratification that is useful for judging the presence or absence of faults.

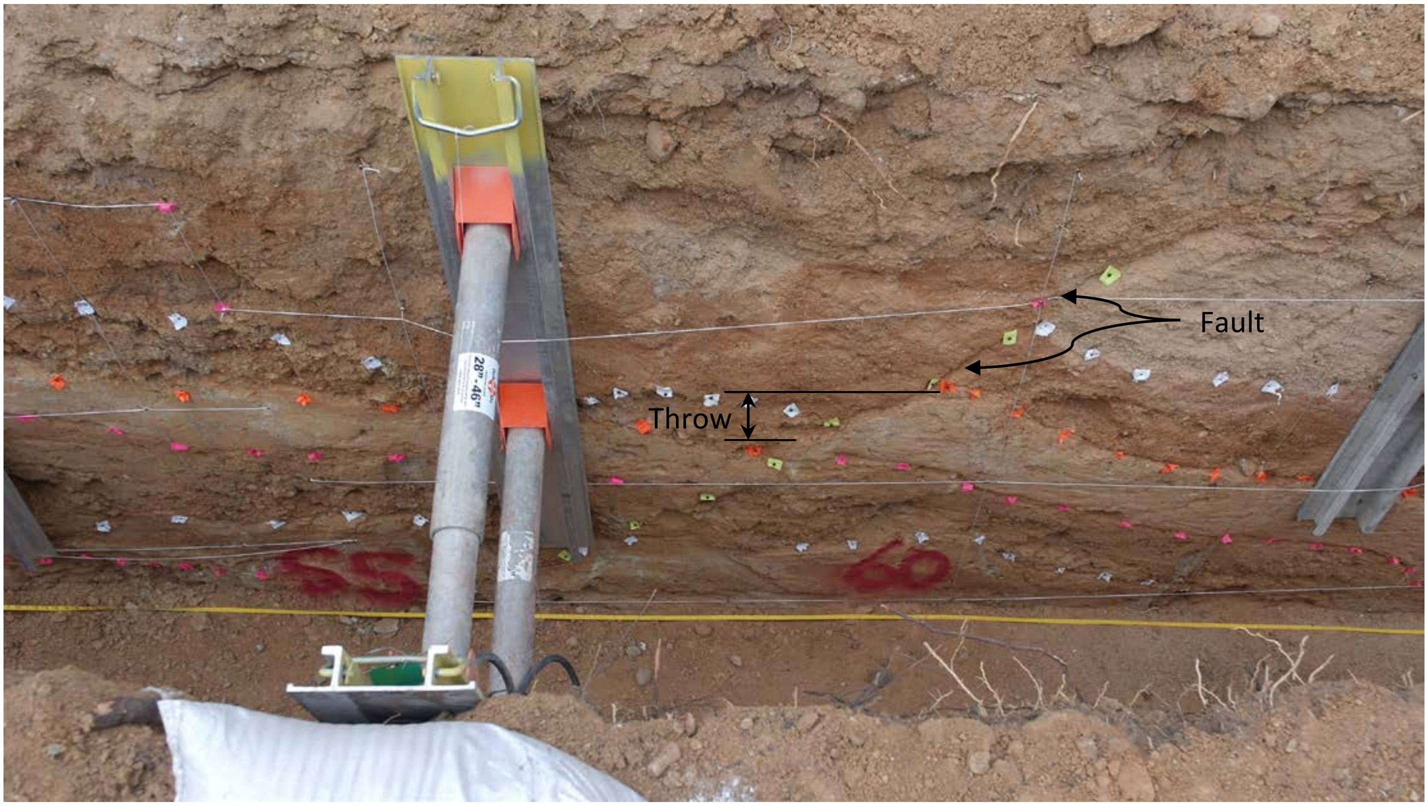

Photo 3:

Site 3 Trench. Typical small displacement fault. Note throw. For scale, the horizontal white string lines are two feet apart.

Photo 4:

Site 2 (Eastern Trench). Flexural-slip fault within tilted (folded) older debris flow beds that are unconformably overlain by four unbroken colluvial wedges that are part of the upper Pleistocene mudflow deposit that is judged to be on the order of 40bp.