SURFACE FAULT RUPTURE HAZARD ASSESSMENT

Proposed Residential and Commercial Development
8150 Sunset Boulevard
City of Los Angeles, California

Submitted To: AG-SCH 8150 Sunset Boulevard Owner, L.P.
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EXECUTIVE SUMMARY

Golder Associates Inc. has completed a surface fault rupture hazard study at a 2.56 acre site (Lot 1 of Tract No. 31173 in the City of Los Angeles) located at 8150 Sunset Boulevard, Los Angeles (the Site). The study comprises office- and field-based investigations within the proposed Alquist-Priolo Earthquake Fault Zone of the Hollywood fault.

Office investigations included the acquisition, review and analysis of historical geological and topographic maps, historical aerial photographs, published academic papers and unpublished consultant reports. Field investigations included extending two continuously-cored, hollow-stem auger boreholes to about 100 and 155 feet below the site; and 14 CPT soundings that extended up to about 185 feet below the site. Subsurface investigations revealed three major geological units that record the development of the Laurel Canyon fan at the base of the Santa Monica Mountains over about the last 35,000 years. Yellow-brown upper fan sandy sediments overlie dark brown and reddish dark brown lower fan and older alluvial sediments that contain several buried soils. Four radiocarbon dates of the bulk organic fraction of sediments and buried soils sampled from about 45 to 119 feet below the site range in age from about 7,000 to 31,000 years ago.

Golder’s opinion is that while the site is located within the proposed Hollywood fault earthquake fault zone, the principal trace of the active Hollywood fault is not present within the Site. Golder’s opinion is based on:

- Analysis and review of available maps, historical aerial photographs, published academic papers and consultant reports. The data review indicates that a tectonic geomorphology that would indicate the presence of a surface fault trace of the Hollywood fault is not present on the site.
- The January 8, 2014 Preliminary Alquist-Priolo Earthquake Fault Zone Map indicates that the mapped Hollywood fault trace is located more than 100 feet northwest of, but not within, the site.
- A soil stratigraphy that records deposition throughout the Holocene and latest Pleistocene Epochs (present day to more than 30,000 years ago) is generally continuous across the site. Major stratigraphic discontinuities that could indicate the presence of a vertical fault offset are absent.
- An absence of groundwater to depths of at least 100 to 155 feet across the site.

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1.0 INTRODUCTION

Golder Associates Inc. (Golder) has prepared this report to present the results of a surface fault rupture hazard assessment at the proposed residential and commercial development site located at 8150 Sunset Boulevard in the City of Los Angeles, California (the Site). The Site location is shown in Figure 1. The following sections present the purpose for this investigation; current Site description and proposed development; the regional geologic tectonic setting; the scope of work performed for this assessment, and the results of our assessment. As indicated in the following sections, the Hollywood fault is the closest known fault to the Site, and is the subject of this fault rupture hazard assessment.

1.1 Purpose of Study

The proposed Alquist Priolo Earthquake Fault Zone Act map for the Hollywood fault (draft for public comment released 8 January 2014) indicates that the Site is within the earthquake fault zone of the Hollywood fault. The mapped trace of the fault is located approximately 100-120 feet northwest of the Site, near the northwest corner of the Sunset Boulevard and Havenhurst Drive intersection. The exact location of the fault trace, however, is not known. The objective of this surface fault rupture hazard assessment is to evaluate evidence for the presence of an active trace of the Hollywood fault in the Site and within the footprint of structures proposed at the Site.

1.1.1 Regulatory Framework

The Alquist-Priolo Earthquake Fault Zoning Act, originally passed in 1972, requires the State Geologist to delineate boundaries around known active faults. The purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to regulate development near active faults so as to mitigate the hazard of surface fault rupture (CGS 2007). Under California law, an active fault is one that has evidence for surface rupture in the Holocene Epoch (the last 11,000 years).

Since 1972, earthquake fault zone maps have been prepared by the State Geologist. Earthquake fault zones have been defined around most of the known active faults in California. Where mapped, the boundaries of these earthquake fault zones are generally about 500 feet on either side of the mapped active fault trace(s). If a proposed development is located within the boundaries of the earthquake fault zone drawn by the State Geologist, then an investigation must be undertaken to establish whether the trace of an active fault is located on a site. If an active fault is found at the site, then a structure for human occupancy cannot be constructed over the trace of the fault and must be set back from the fault trace (generally 50 feet) to avoid the fault rupture hazard. Full details of the Alquist-Priolo Act and the relevant state regulations and policies can be found on the California Geological Survey (CGS) website (www.conservation.ca.gov/cgs), and in CGS, 2007.

Until January 8, 2014, an earthquake fault zone had not been defined by the State Geologist for the Hollywood fault. When the major earthquake fault zone mapping effort was undertaken by the CGS in the

1970s to 1990s, the Hollywood fault was not generally considered to have had surface rupture during the Holocene Epoch. The fault was, therefore, not considered to be, or regulated as an active fault under the Alquist–Priolo Earthquake Fault Zoning Act. Dolan et al. (1997) was the first to present positive evidence for surface rupture along part of the Hollywood fault in the Holocene Epoch (about 8,000 years ago).

The State of California has now published a preliminary review earthquake fault zone map for the Hollywood fault and proposes to officially designate it as an active fault on or after July 8th 2014. In anticipation of the release of the official earthquake fault zoning map and formal designation of the Hollywood fault as an active fault under the Alquist-Priolo Earthquake Zoning Act, the City of Los Angeles (the City) has required this site-specific active fault rupture assessment to evaluate the presence and/or activity of the Hollywood fault at the Site.

The City of West Hollywood, which adjoins the Site on the south and west, mapped the location of active faults within its city limits. To assist with planning existing and future developments in the city, the city defined “Fault Precaution Zones” around the mapped faults. The West Hollywood Fault Precaution Zone ends approximately one city block to the south and west of the Site. The end of the West Hollywood Fault Precaution Zone corresponds with the border between the City of West Hollywood and the City of Los Angeles.

1.2 Site Description

1.2.1 Existing Site Conditions

The Site consists of Lot 1 of Tract No. 31173 in the City of Los Angeles, California, and has an area of approximately 2.56 acres (Figure 1 inset). The Site is bordered to the east by Crescent Heights Boulevard, to the north by Sunset Boulevard, to the west by Havenhurst Drive; and to the south by two existing apartment buildings. Havenhurst Drive and Crescent Heights Boulevard slope to the south with an elevation of approximately 405 feet (ft) above mean sea level (amsl) at Sunset Boulevard to an elevation of approximately 385 ft amsl at the southern end of the Site. The City of West Hollywood is one block to the west of the Site and adjacent to the south of the Site.

The Site is currently occupied by a commercial development that includes one two-story stucco building in the northwest corner and a centrally-located two-story stucco building containing multiple retail spaces. The retail structures are at the elevation of Sunset Boulevard. There is an east-west oriented retaining wall under the two-story building with a height of approximately 20 feet constructed to achieve the grade change from Sunset Boulevard to the southern end of the site. There is at-grade parking in most of the areas not occupied by the site buildings, and a parking garage and storage area located below portions of the building. The parking garage and storage area are below grade as compared to Sunset Boulevard and at grade as compared to the south end of the Site. The storage area extends from the western half of the centrally located retail spaces towards Sunset Blvd, while the underground parking garage is located underneath the eastern section of the centrally located retail spaces.

1.3 Proposed Development

The proposed project consists of a commercial and residential development with two buildings over a single podium structure with various elements ranging in height from two stories to 16 stories above the Sunset Boulevard elevation. The lower two levels will consist of basement levels along Sunset Boulevard and partial basement to the south.

1.4 Scope of Work

The principal objective of the investigation described in this report is to evaluate any evidence for the presence of an active fault(s) within the Site. Information for the evaluation of the presence of an active fault at the Site has been gathered from an analysis of topographic data, photographic and digital imagery analysis; and a range of subsurface investigation techniques. Guidelines for the investigation, analysis and reporting of studies of active faults in California are provided by CGS (2002a) Note 49--“Guidelines for Evaluating the Hazard of Surface Fault Rupture”. These guidelines have been used to develop the scope of work for this study.

Typically, active fault investigations include an excavation(s) of a shallow (< 20 feet deep) trench(s) to provide continuous exposure of subsurface soils across the entire site. Detailed mapping and analysis of the soil layers exposed in the trench sides can then be used to identify any soil units that may have been offset by surface fault displacements, if present. For this study, however, subsurface trenching was not feasible because of existing on-site structures and the expected thickness of Holocene soils (more than 30 feet) exceeded practical excavation depths. Established alternative investigation methods using continuously cored hollow stem auger (HSA) borings and cone penetration testing (CPT) soundings were used as indicated by CGS (2002a).

The following work was performed during the course of this site-specific active fault rupture hazard investigation:

- Acquisition and review of available published information and data from previous studies on the regional geologic and tectonic setting, and on the Hollywood fault and the Santa Monica-Hollywood-Raymond fault system.
- Records search at the City of Los Angeles and the City of West Hollywood.
- Development and execution of a subsurface field investigation program.

- Analysis and interpretation of surface and subsurface data for any evidence for Holocene fault displacement.
- Preparation of this report with applicable figures, tables, illustrations and conclusions.

1.5 Report Structure

Section 1 of this report provides details on the purpose and scope of this study. Section 2 is a discussion of the regional geologic conditions surrounding the site, including the geology, faulting and historic earthquakes. Section 3 presents details on our data review for the Hollywood fault. Section 4 presents the details of the field investigation activities at the Site. Section 5 summarizes our interpretation and findings, and the principal conclusions and recommendations are summarized in Section 6. Section 7 provides the limitations our findings and this report. Section 8 lists the references cited within the body of text and/or consulted for this assessment. Tables are presented throughout the text. Figures and Appendices follow the text.

2.0 REGIONAL GEOLOGIC AND TECTONIC SETTING

The seismotectonic history of Southern California and the greater Los Angeles area (Figure 2) includes several major phases of deformation that have resulted in its complex surficial geology. The Los Angeles Basin (Figures 2 & 3) comprises a deep structural depression located at the northern end of the Peninsular Ranges geomorphic province at the boundary of the Transverse Ranges geomorphic province (CGS 2002b). Portions of the Los Angeles Basin have been the site of depositional “pulses” and continuous subsidence, folding and faulting since the middle-Miocene Period (about the last 15 million years), and resulted in the basement rock surface being about 4.5 miles beneath the deepest part of the basin (e.g. Yerkes et al. 1965). The present form and geometry of the Los Angeles Basin was largely developed during the phase of accelerated subsidence and deposition that began in late-Miocene time and continued through to the early Pleistocene Epoch (about 1 million years ago) (Yerkes et al. 1965).

Critical for the interpretation of the Hollywood fault is the nature of the pattern of deformation that developed after the late Miocene and through the Quaternary Period (about the last 1.8 million years) to the present day. Regionally, crustal deformation that includes repeated moderate to large earthquakes and the formation and movement along faults, is driven by the relative motions and interactions of structures along the boundary of the lithospheric Pacific and North American plates—two of the 15 or so large plates that make up the surface of the Earth. These interactions along the Pacific-North America plate boundary have resulted in the formation of wide zones (more than 300 miles) of faults and associated earthquakes. In in Southern California, deformation zone extends from the off-shore Continental Borderland into southern Nevada.

Major northwest-southeast striking faults within the Peninsular Ranges province recognized in the Los Angeles Basin include the Newport-Inglewood fault, the Whittier fault and the Palos Verdes and Cabrillo faults. Other more east-west striking faults that are part of the Transverse Ranges province include the Malibu Coast-Santa Monica-Hollywood-Raymond fault system. Within the Los Angeles Basin, the Newport-Inglewood and Raymond faults fault zones. Within the Hollywood Quadrangle (1:24,000 scale), a section of the Newport-Inglewood fault has a mapped earthquake fault zone.

2.1 Santa Monica Mountains

The Santa Monica Mountains are on the northern and upthrown side of the Hollywood fault. Rocks exposed in the Santa Monica Mountains are layered sequences of sedimentary rocks that are mostly conglomerate, sandstone and silt/claystone. The Santa Monica Mountains also contain outcrops of granitic rocks such as those immediately north of the Site. The granitic rocks are typically of quartz diorite composition. Locally, the Nichols Canyon Diorite Pluton (Ingersol and Brager 2001) forms a 4.5-mile long by 2.3 mile wide block that is mantled by younger sedimentary rocks. This granitic rock mass extends along the Santa Monica Mountains south-facing front for more than 1.5 miles on either side of the Site (Figure 3).

2.2 Alluvium and Alluvial Fan Deposits

The Hollywood area of the City of Los Angeles is situated at the northern extent of the Los Angeles Basin. The basin was a deep marine trough at the beginning of the Pliocene Epoch (5.3 to 1.8 Ma), and was filled successively with marine sediments until the early Pleistocene Epoch (1.8 to 0.01 Ma). During the Pleistocene, continental (non-marine) clastic sediments were the major sediments filling the basin (e.g. Woodford et al. 1954). The Los Angeles Basin contains more than 20,000 feet of Miocene Epoch (23.0 to 5.3 Ma) and younger sediments above the basement rocks. South of the Santa Monica Mountains, the Los Angeles Basin sedimentary sequence includes more than 13,000 feet of mostly marine sediments with less than 1000 feet of non-marine alluvial deposits (Woodford et al. 1954). The relatively thin non-marine alluvium was deposited in the Pleistocene Epoch.

The near-surface, Pleistocene Epoch sediments of the Los Angeles Basin are composed of three principal stratigraphic units:

- "*Older Alluvium*" – sediments or soils that are relatively loose or unconsolidated (not cemented into a solid rock mass). The sediments have been transported, deposited, eroded, and, in some cases, modified by water and re-deposited in a non-marine setting.
- "*Younger Alluvium*" – sediments that have been deposited within or adjacent to a river, stream, creek or other natural drainage. A presently active alluvial fan is considered young alluvium.
- "*Alluvial Fan Deposits*" - a fan- or cone-shaped deposit usually occurring where a canyon drains from a mountain and emerges out onto a flatter plain. These deposits are common along fault-bounded mountain fronts. The deposits are derived from a single origin located at the apex of the fan. Over time the active deposition drainage course moves to occupy many positions on the fan surface.

Geologic maps and our investigations indicate that the Site is located on the Laurel Canyon alluvial fan that overlies Older Alluvium. At depth, the alluvial sediments overlie pre-Quaternary bedrock and basement rocks. In the vicinity of the Site, the total thickness of alluvial sediments is unknown, but may be up to 300 feet (Dolan et al. 1997).

2.3 Historical Earthquakes

Figure 2 shows historical earthquake epicenters recorded and located over about the last 100 years in and around the Los Angeles basin. The epicenters of major historic and damaging earthquakes are indicated on Figure 2. Table 2.1 lists the major parameters for earthquakes of M ≥ 6 within about 62 miles of the Site.

Table 2.1: Historical Epicenters for Earthquakes of M ≥ 6 within 62 miles of the Site[1]

Year	Month	Day	Latitude (°N)	Longitude (°W)	Magnitude	Distance from Site (Miles)[2,3]
1812	12	8	34.4	117.7	7.5	45
1994	1	17	34.2	118.6	6.7	12
1918	4	21	33.8	117.4	6.6	57
1971	2	9	34.4	118.4	6.5	21
1933	3	11	33.7	118.0	6.4	35
1899	7	22	34.3	117.5	6.4	52
1857	1	16	34.5	118.0	6.3	35
1894	7	30	34.3	117.6	6.2	46
1855	7	11	34.1	118.1	6.0	16
1769	7	28	34.0	118.0	6.0	22
1827	9	24	34.0	119.0	6.0	37
1858	12	16	34.2	117.4	6.0	56
1910	5	15	33.7	117.4	6.0	62

Notes:

[1] Epicenter locations and dates from NEIC PDE and California earthquake catalogs

[2] Distances to site are approximate only.

[3] Distance to Site based on its location at 34.098N 118.367W.

The earthquake epicenters (within 62 miles of the Site) listed in Table 2.1 indicate a relatively high level of historical earthquake activity in this part of Southern California. While an alignment of earthquake epicenters is apparent for some faults in the Los Angeles basin (e.g. the Newport-Inglewood fault), few if any of the recorded earthquakes, and none of the major historic earthquakes, are associated with the mapped trace of the Hollywood fault. No historic earthquakes are known to have been associated with surface rupture or ground deformation along the Hollywood fault.

2.4 The Hollywood Fault

The Hollywood fault is a reverse, left-lateral, oblique-slip fault that extends for about 9 miles along the southern edge of the eastern portion of the Santa Monica Mountains (Dolan et al. 1997). Geologic data indicate that the Hollywood fault dips steeply north and separates Mesozoic plutonic rocks and Miocene sedimentary and volcanic rocks of the Santa Monica Mountains from Pleistocene-Holocene alluvial deposits and deeper Neogene-age sedimentary rocks to the south (e.g. Hoots 1931; Lamar, 1961; Wright 1991; Dibblee 1991a,b; Dolan et al. 1997; 2000). The fault trace generally extends eastward from the West Beverly Hills Lineament (WBHL—the northern extent of the Newport-Inglewood fault), along the northern boundaries of Beverly Hills, through the City of West Hollywood and Hollywood to the Los Angeles River where it flows from the Santa Monica Mountains. Tectonic geomorphology suggests that the fault trace steps about 1 mile southward along the WBHL to the Santa Monica fault (Figure 2) (Dolan et al. 1997).

3.0 HOLLYWOOD FAULT DATA REVIEW

This section summarizes the results of our review of existing and project-specific information on the location and activity of the Hollywood fault. Figure 4 illustrates the main tectonic geomorphologic and subsurface observations within about 3 miles of the Site.

3.1 Existing Information

Several sources for information on the nature and location of the Hollywood fault were acquired and reviewed for this investigation. We reviewed historical aerial photographs, historical geologic and topographic maps, published research studies; and site-specific fault and geotechnical reports by local engineering consultants available from the Cities of West Hollywood and Los Angeles. The objectives of the existing data acquisition, review and analysis were to:

- Understand the local surficial geologic conditions, the nature of Holocene and late Quaternary sediments, and in particular, locations where the sediments had been dated (e.g. Dolan et al. 1997; 2000).
- Identify locations within about 5 miles either side of the Site where surface and subsurface evidence for the Hollywood fault had been mapped and/or inferred.
- Review geomorphic and non-geomorphic fault indicators (e.g. groundwater levels) established by others within about 2 miles of the Site.
- Evaluate the quality and certainty of fault traces located within about 1 mile of the Site.
- Establish the likely site soil stratigraphy and groundwater conditions to assist in the development of the on-site drilling investigation sites.
- Identify any target areas for additional on-site fault trace investigations, if necessary.

3.1.1 Aerial Photographs

In studies of active faults it is common practice to review aerial photographs and other imagery, particularly pre-development imagery, if available. The purpose of the aerial photo and imagery review is to identify the existence of fault scarps, offset drainages, vegetation lineaments or other topographic and surface features that may indicate the presence of an active fault.

Most of the land along and between Hollywood and Sunset Boulevards was already developed by 1920. By the late 1920s when the first aerial photographs were taken, Hollywood Boulevard, Sunset Boulevard, Crescent Heights and the majority of the surrounding streets had been developed and contained single and multi-story structures. Thus, grading for road and building construction may have eliminated some of the smaller-scale features marking the trace(s) of the Hollywood fault about 100 years ago.

There are, however, several collections of early aerial photographs that cover the Site. For this study, we searched the archives of the University of California Santa Barbara (UCSB) that includes the “Fairchild Collection” of Whittier College. We limited our acquisition and review to the oldest available prints (1927) and stereoscopic pairs taken between 1952 and 1998 as listed in Table 3.1.

Table 3.1: Aerial Photographs Reviewed for This Study

Source	Date of Acquisition	Flight Number	Frame Number	Photograph Scale
UC Santa Barbara	1927	C113	122, 123	1:18,000
UC Santa Barbara	1928	C300	72, 73	1:18,000
Continental Air Photo	04 Nov 1952	AXJ-4K	148, 149	1:24,000
Continental Air Photo	04 Mar 1969	25-16	86, 87	1:24,000
Continental Air Photo	30 Jan 1970	60-4	119, 120	1:24,000
Continental Air Photo	07 Nov 1976	76162	202, 203	1:24,000
Continental Air Photo	12 May 1979	FC-LA	162, 163	1:24,000
Continental Air Photo	27 Jan 1986	F	412, 413	1:24,000
Continental Air Photo	07 Jul 1988	Hollywood1, 4	19290, 19291	1:26,000
Continental Air Photo	25 May 1990	C81-9	46, 47	1:24,000
Continental Air Photo	13 May 1993	C89-21	216, 217	1:24,000
Continental Air Photo	11 Jul 1995	C115-26	33, 34	1:24,000
Continental Air Photo	18 Oct 1998	C128-26	16, 17	1:24,000

Notes:

1. U.C. Santa Barbara collection can be accessed at http://www.library.ucsb.edu/mil/airs.
2. Continental Aerial Photo is an Orange County based aerial photography provider that can be found on-line at http://www.continentalaerialphoto.com/5043.html.

Review of single photographs and stereo aerial photograph pairs indicated that the major topographic break in slope that might indicate the presence of an active fault trace was located 100 to 200 feet northwest of the site. We found no evidence for a topographic break in slope, presence of springs or alignment of vegetation or other features that might indicate the presence of an active fault trace within the boundaries of the Site.

3.1.2 Published Studies of the Hollywood Fault

The existence of the Hollywood fault at or near the base of the Santa Monica Mountains has been well known for more than 50 years. Interest in the fault's precise location increased following the 1971 San Fernando earthquake and the active fault mapping program authorized by the Alquist-Priolo Earthquake Fault Zoning Act. For example, Crook et al. (1983)—under contract with the U.S. Geological Survey as part of the National Earthquake Hazards Reduction Program (NEHRP)—identified six locations in the Cities of Los Angeles and Beverly Hills where they investigated the location, characteristics and age of the most surface ruptures of the Santa Monica and Hollywood faults. Their investigations included the excavation and logging of soils exposed in 11 backhoe trenches at sites selected based on the geomorphic evidence for faulting and site accessibility. They found evidence for the Hollywood fault in trenches located in Wattles Park (about 0.8 miles northeast of the Site) and Greystone Park (about 2 miles west-southwest of the Site.

Dolan et al. (1997) published the first comprehensive synthesis of the known locations, tectonic geomorphology and ages of past surface rupture events on the Hollywood fault. They compiled information from geotechnical boreholes and trenches, tectonic geomorphic mapping, groundwater measurements and radiocarbon dating of offset soils to show that the Hollywood fault has an oblique slip sense (reverse–left-lateral) with at least one surface rupturing earthquake in latest Pleistocene to middle or late Holocene time. Tectonic geomorphology indicates that the Hollywood fault extends for at least 9 miles (14 km) along the southern edge of the eastern Santa Monica Mountains, from the Los Angeles River area westward through downtown Hollywood to northwestern Beverly Hills. To the west, the surface fault trace steps about 1 mile (1.2 km) southward along the West Beverly Hills lineament to the Santa Monica fault. Dolan et al. (1997) provide an estimate for an earthquake magnitude of about **M** 6.6, a minimum average slip rate of about 0.35 mm/year and an average recurrence interval range of ≤ 4,000 years for the Hollywood Fault.

A key indicator for the presence of the fault west of downtown Hollywood adopted by Dolan et al. (1997) was the presence of shallow groundwater within foundation excavations, trenches and boreholes. Dolan et al. (1997) argued that the presence of shallow groundwater (depth less than about 30 ft [10 m]) at a site close to the fault probably indicates its location on the upthrown side of the fault. Deep groundwater, or typically an absence of groundwater in boreholes deeper than about 100 feet, probably indicates that a site is located on the downthrown side of the fault. For example, Dolan et al. (1997) argued that the presence of shallow ground water in an excavation about 1000 feet (300 m) east of La Cienega Boulevard and just south of Sunset Boulevard at the Kings Road intersection indicates a location very near the fault because a site about 500 feet (160 m) south had no groundwater.

Dolan et al. (1997) report no groundwater data or tectonic geomorphic evidence for the Hollywood fault trace at or close to the Site. They do note, however, that shallow groundwater associated with very steep slopes to the west of the Havenhurst-Sunset Boulevard intersection between Doheny Drive and La Cienega Boulevard probably mark the Hollywood fault location on the south side of this part of Sunset Boulevard. Their Figure 2 does not show a trace mapped from just west of the Havenhurst-Sunset Boulevard intersection to east of Laurel Canyon at Hollywood Boulevard. The lack of a mapped trace reflects the lack of any fault tectonic geomorphology because the more recent sediments from Laurel Canyon bury the fault scarp and post-date the last movement.

Dolan et al. (2000) report the results of a very detailed study of the recent paleoseismology of the Hollywood Fault. To try and more accurately date the location and age of the last surface fault displacement, they excavated nine 30 to 50 feet deep (9 to 15 m), large-diameter bucket-auger borings (24-inch) in a 12-m long transect along Franklin Avenue. They found evidence for one and possibly two surface rupture events on the Hollywood fault as judged by offset soil layers and steps in local ground water levels at the fault. Groundwater was a relatively uniform 30. 5 ft (9.3 m) below ground surface up to the fault zone, while to the south (downthrown side) ground water was not encountered. At this location the fault was acting as a groundwater barrier with at least a 4 feet (1.1 m) step in groundwater level occurring across the fault.

Radiocarbon dates from 10 charcoal and buried soil samples indicated that at least one surface rupture has occurred within the past 22,000 years. A faulted, buried soil located between 23 and 26 feet below ground surface (7 and 8 m) indicated that the last surface rupture occurred during the early to mid-Holocene with a preferred time range from about 7,000 to 9,500 years ago.

The Dolan et al (2000) study established the Holocene age of the last surface rupture along this part of the Hollywood fault and that it can be considered an active fault as defined in the Alquist-Priolo Earthquake Fault Zoning Act.

4.0 SITE FIELD INVESTIGATION

This describes the details of the field investigation that was undertaken to evaluate whether the active trace of the Hollywood fault is located on the Site and within the footprint of the proposed structures.

4.1 Development of Field Investigation Program

Golder developed a field investigation program, in consultation of the City of Los Angeles Department of Building and Safety Grading Division, to evaluate the presence of the active trace of the Hollywood fault. Our field investigations were developed in general accordance with the California Geological Survey Guidelines for Evaluating Surface Fault Rupture Hazard (CGS 2002b). Site subsurface conditions were evaluated using geologic data obtained from the advancement of two HSA boreholes and 14 CPT soundings.

Subsurface explorations at the Site and within the public right-of-way (ROW) along Havenhurst Drive were undertaken during October and November 2013. The purposes of the subsurface exploration were to:

- Establish the thicknesses and lateral variations of the shallow subsurface sedimentary layers beneath the site. Stratigraphic layers were traced across the site as a way to indicate any rapid lateral changes that may indicate the presence of near surface fault traces.
- Establish the depth to groundwater, if present. The presence of shallow groundwater of major changes in groundwater level across the site may indicate the location of a shallow-subsurface fault.
- Obtain samples for radiocarbon dating. Because only faults with proven Holocene surface rupture are subject to the Alquist-Priolo Act, dated soil layers were required to establish the age of faulting, if present (e.g. Dolan et al. 2000).

The field investigation was undertaken in two phases. The first phase consisted of advancing one continuous core HSA boring and three (3) CPT soundings within the Site. The objective for the first phase was to:

- Describe the Site stratigraphy and to develop correlate the HSA borehole samples with the CPT soundings.
- Confirm that the CPT soundings could be advanced to the required depths. In order to meet the project objectives, the borehole and CPT soundings needed to extend below the Holocene deposits on Site.
- Evaluate the appropriate spacing of CPT soundings to establish the continuity of different soil layers.

The second field investigation phase consisted of advancing one continuous core HSA boring and 11 CPT soundings to complete the subsurface field investigation program.

4.1.1 Utility Clearance

Golder marked the proposed subsurface investigation locations on Site and contacted Underground Service Alert (Dig Alert) to clear known utilities in September 2013, prior to initiating any subsurface exploration. Southern California Gas was contacted to obtain precise location of the 2-inch gas line extending along the east side of Havenhurst Drive. Golder also consulted the ALTA Survey for the Site, the Site property manager, and the Navigate LA website prior to initiating subsurface exploration activities.

4.1.2 Permitting

Excavation and encroachment permits from the Cities of Los Angeles and West Hollywood were required for work performed in the public right-of-way (ROW) on Havenhurst Drive. The following permits were obtained prior to subsurface exploration activities on Havenhurst Drive:

- Excavation Permit (No. 2013000208): Department of Public Works Los Angeles, Bureau of Engineering.
- Encroachment Permit (No. 2013003441): Department of Public Works Los Angeles, Bureau of Street Services.
- Encroachment Permit (No. 2013004006): The Department of Public Works West Hollywood, Bureau of Engineering.

4.1.3 Health and Safety Environment Plan

Golder prepared a site-specific Health and Safety Environment Plan (HaSEP) prior to commencing fieldwork. The HaSEP identifies the main health and safety hazards associated with the work performed and contains emergency contact information, as well as information for medical facilities located close to the Site. Golder's on-Site representative conducted a brief meeting to review the information in the HaSEP with the drill crew, traffic control, and CPT contractors prior to commencing daily field activities. Some of the main issues addressed in the HaSEP included:

- Working in the public right-of-way
  - Golder contracted California Barricade to develop a traffic control plan and implement the measures in the plan for work performed on Havenhurst Drive. The traffic control plan was signed by a licensed California civil engineer and was approved by the Los Angeles Department of Transportation (LADOT).
  - Work areas on Havenhurst Drive were "coned off" to prevent access to members of the public from entering the work area.
- Working in an active parking lot
  - Work areas on Site were coned off to prevent access to members of the public from entering the work area

- Working around drill and CPT rigs
  - Hazards associated with working around heavy equipment were addressed in the HaSEP. Golder and contractor representatives were made aware of the hazards and required to wear appropriate personal protection equipment (PPE).

The project-specific HaSEP is available for review upon request.

4.2 Subsurface Exploration

Subsurface exploration at the Site and within the public right-of-way (ROW) occurred during October and November 2013.

4.2.1 Hollow-Stem Auger (HSA) Drilling

Two HSA borings were advanced during this investigation to a maximum depth of 155 feet below existing ground surface. The borings were performed by Cascade Drilling, L.P. of La Habra, California using a CME 95 HSA drill rig. The HSA rig was equipped with 5-feet long augers of 7.25-inch outside diameter (O.D.) and 3.25-inch inside diameter (I.D.). Samples were obtained using an unlined split-barrel sampler with a 2.5-inch inside diameter. Because of the relatively loose nature of the Laurel Canyon Fan deposits, the best core recovery was obtained when the sampler was advanced in runs of 2.5 feet.

The HSA borings are identified as B-105 and B-106 (Figure 5). Boring B-105 was excavated in the lower site parking lot in early October 2013. Borehole B-106 was excavated within Havenhurst Drive near the intersection with Sunset Boulevard in mid-November. The borings were advanced to 155 feet and 97.5 feet, respectively. Boring locations are shown on Figure 5 and the boring logs are presented in Appendix A.

The first five feet of each boring were excavated by hand to confirm the absence of utilities. Initial attempts at collecting continuous core in 5-foot runs proved less-than-desirable, so subsequent cores were run at 2.5-foot intervals with improved results. Soil collected inside the split barrel was visually classified in the field, photographed, placed in wax core boxes and stored for future reference and laboratory testing. The core within boxes was then re-logged at our storage facility to verify initial descriptions. The boxes were then laid end-to-end and photographed to get an overall sense of change of material properties throughout the boring.

B-105 was completely backfilled with soil cuttings and the upper 6-inches was capped with cold-patch asphalt mix. B-106 (performed within the City ROW) was backfilled with a bentonite slurry mix to within three feet of the ground surface. Remaining soil cuttings were placed in 55-gallon steel drums and stored on Site prior to disposal. Groundwater was not encountered in either borehole during drilling.

4.2.2 Cone Penetration Test (CPT) Soundings

CPT soundings were advanced by Kehoe Testing and Engineering of Huntington Beach, California using a 30-ton CPT rig. A probe was advanced that recorded tip resistance and sleeve friction continuously to the total depth advanced. The first five feet of each CPT location was hand-augured to confirm the absence of utilities. A total of fourteen (14) CPT locations were advanced and labeled CPT-1 through CPT-14 (Figure 5). There were seven soundings in the lower parking lot (CPT-01 through CPT-7) and seven soundings within Havenhurst Drive (CPT-8 through CPT-14). Total depths of CPT soundings ranged from 143 to 185 feet below existing grades. The CPT probe was not equipped to directly measure groundwater level. Initial CPT sounding data graphs from Kehoe is presented within Appendix B.

All CPT soundings were backfilled with soil cuttings and the upper 6-inches were capped with cold-patch asphalt mix. This method was deemed acceptable to the City Inspector due to the limited size of the hole caused by the CPT.

4.3 Laboratory Testing

Samples retrieved during the field exploration program were evaluated and selected at Golder's Irvine office, and four were shipped to an accredited radiocarbon dating laboratory for age determination. Radiocarbon dating was performed by Beta Analytic Radiocarbon Dating (BETA) in Miami, Florida. The reported results for the four samples are provided in Appendix C.

Radiocarbon dating was completed using accelerator mass spectrometry (AMS) methods because of the limited amount of carbon material sampled. AMS is generally performed by accelerating carbon ions contained within a sample to high energies and analyzing the ratios of rare (^{13}C and ^{14}C) isotopes to relatively abundant (^{12}C) isotopes. Results are then provided as measured, conventional age and 2σ Calibrated Age (Appendix C).

Very limited amounts of macroscopic carbon/charcoal were found within the buried soil sampled with the continuous HSA core. AMS was used to date the "bulk organic fraction" within the sediment. An initial sample from the lower part of B-105 @ (119 feet bgs) was analyzed by BETA in early November 2013. They reported a conventional radiocarbon age of about 26,100 ± 140 years BP for the bulk soil sample (Table 4.1). Additional samples were chosen based on their stratigraphic location within the HSA cores and the inferred relationship between apparent younger and older fan and/or alluvial deposits. Shallower bulk soil samples were taken at a visually similar boundary between the two borings (B-105 @ 69.7 feet and B-106 @ 45.5 feet), and a deeper sample within B-106 (@ 65.1 feet) were sent to BETA for age dating. The results of this analysis are provided in Table 4.1 below. Graphic representation of sample locations with dates relative to interpreted packages or units of soil deposition is shown on Figure 6.

Table 4.1: Results of radiocarbon age dating by the Accelerator Mass Spectrometer method (AMS): Sediment Dating of Bulk Organic Fraction

Borehole and Sample Depth (feet bgs)	**Sample Type**	**$^{13}C/^{12}C$ Ratio**	**Reported Age (Radiocarbon years BP)**	**2σ Calendar Age (Calendar years) and Geologic Epoch**
B-105 @ 69.7	Bulk Soil and sediment	-24.7‰	8,710 ± 40	Cal BC 7,820 to 7,600 (Cal BP 9,770 to 9,550) Early Holocene
B-105 @ 119	Bulk Soil and sediment	-23.9‰	26,080 ± 140	Cal BC 29,110 to 28,640 (BP 31,060 to 30,590) Late Pleistocene
B-106 @ 45.5	Bulk Soil and sediment	-23.8‰	6,260 ± 40	Cal BC 5,320 to 5,210 (Cal BP 7,270 to 7,160) Early to mid-Holocene
B-106 @ 65.1	Bulk Soil and sediment	-22.5‰	11,080 ± 40	Cal BC 11,160 to 10,960 (Cal BP 13,110 to 12,920) Latest Pleistocene to early-Holocene

Notes:
1. BP = Before 1950 AD

Radiocarbon dating of the bulk organic fraction sampled from buried soils (paleosols) and sediments obtained from the continuous core indicated the ages of soils present beneath the site. The four reported $^{13}C/^{12}C$ ratios at about -25‰ (Table 4.1) indicate that the dated organic fractions are probably plant organic material as expected in a buried soil. A paleosol located within older alluvium immediately below the lower boundary of the Laurel Canyon and the underlying older alluvium has a conventional age date of 11,120 ± 40 years B.P. indicating the boundary is close to the late Pleistocene-Holocene boundary. This depth and age indicates an average soil accumulation rate of between 0.07 and 0.95 in/yr.

5.0 EVALUATION OF SURFACE FAULT RUPTURE POTENTIAL

This section evaluates the evidence for the presence of an active trace of the Hollywood fault within the Site. We analyze evidence from the review of existing reports, maps and aerial photographs; and the results from the site subsurface investigations.

5.1 Tectonic Geomorphology

None of the existing information acquired and reviewed for this study found evidence for a surface trace of the Hollywood fault at the Site. While published geologic maps, consultant reports and fault maps developed by the City of West Hollywood and the State of California established that there are several traces of the Hollywood fault to the east and west of the Site, and that at least one of them is active, none of these studies have mapped an active trace within the Site.

Based on these past studies and Golder's review of historical stereoscopic aerial photographs and topographic maps, we consider that the active Hollywood fault trace is located about 100 feet northwest of the Site and not within it.

5.2 Subsurface Soil Stratigraphy

The analysis of the results from two HSA boreholes and 14 CPT soundings indicates generally distinct and continuous subsurface soil layers beneath the Site. Based on the 14 CPT soundings and the soils found within the two continuous HSA borings, we recognize the following major geologic units underlying the Site:

- *Upper Laurel Canyon Fan (ULC$_f$)*: The upper 40- to 70-feet is composed of tan to yellow-gray colored silty to gravelly sands with both laterally continuous and discontinuous layers. Many of the discontinuous layers are sub-horizontal, although major laterally traceable layers and contacts have a gentle southward gradient between CPT-14 through CPT-8. This unit probably formed from deposition in the Laurel Canyon fan caused by rapid erosion of the slopes within the Laurel Canyon fan catchment. Based on the radiocarbon dates (Table 4.1), deposition of this unit all occurred less than 7,000 years ago.
- *Lower Laurel Canyon Fan (LLC$_f$)*: Below the ULC$_f$ and to a depth of about 60 to 80+ feet below existing grades, the sedimentary layers are dark reddish brown clayey, sandy gravel and some laterally discontinuous silty clay interbeds. Radiocarbon dates from this unit in boreholes B-105 and B-106 have ages of about 9,000 to 13,000 years ago for deposition of this latest Pleistocene to earliest Holocene-age unit.
- *Older Alluvium (al$_o$)*: Below the LLC$_f$, the soils are finer-grained with laterally discontinuous sandy interbeds. In some locations the finer grained soils become reddish suggesting a longer period of non-deposition, weathering and soil development (paleosol). A bulk soil sample from a paleosol (B-105 @ 119 feet) was radiocarbon dated at 30,000 to 31,000 years ago indicating that this older alluvial unit is from the late Pleistocene Epoch. This sample is located about 40 feet below the presumed contact with the *LLC$_f$*.

Figure 6 is a cross section of the subsurface stratigraphy based on the 14 CPT soundings and two HSA cored borings. The stratigraphy is characteristic of an alluvial fan marked by periods of deposition with beds of variable grain sizes, periods of weathering marked by the increase in clay content and paleosols; and rapid lateral pinching out of minor sand and silt beds. The primary contacts shown as solid lines on Figure 6 indicate a consistent gradient toward the south, sub-parallel to the present-day ground surface. In places these contacts become sub-horizontal or, in some cases, change in elevation as across the fan parallel to the east-west orientation of the Santa Monica Mountain front. The pattern of deposition and stratigraphy are consistent with the overall geometry of 1) the Laurel Canyon fan and 2) the older and more wide-spread older alluvium deposition (al_o) that extends from the mountain front into the Los Angeles Basin.

The general continuity of the subsurface stratigraphy beneath the Site suggests that there has been no major disruption to the stratigraphy beneath the Site over about the last 31,000 years. If an active trace was present at the Site, then disruption of the Holocene stratigraphy should be apparent; particularly as at least two Hollywood fault surface rupturing events have been inferred by Dolan et al. (2000). We recognize, however, that small-scale disruption (less than 1 foot?) of the stratigraphy may not be detected because of the limits for correlation between adjacent CPT soundings and the HSA borings.

5.3 Groundwater

We did not observe groundwater beneath the Site in the two HSA boreholes that extended to depths of up to 155 feet. In B-106—the 97 feet deep borehole at the northwestern edge of the site—we found groundwater neither immediately following completion of the borehole nor three days later. Past studies of the Hollywood fault have observed relatively shallow (< 30 feet bgs) ground water on the northern, upthrown side of the fault or within the fault zone (e.g. Dolan et al. 1997; 2000) and deep (> 100 feet) groundwater on the downthrown side of the fault. We interpret, therefore, the lack of groundwater at depths of up to 155 feet (B-105) beneath the Site indicates that the Site is south of the active trace of the Hollywood fault.

5.4 Potential for Off-Fault Deformation Adjacent to the Hollywood Fault

We understand that it is City of Los Angeles Building Department policy to consider that within an Alquist-Priolo Earthquake Fault Zone the active trace of a fault is present just beyond the area that has been investigated. Because the subsurface exploration for 8150 Sunset did not extend 50 feet beyond the property, then an active fault trace is, therefore, assumed to exist immediately northwest of the boring drilled at the northwest corner of the property. In order to confirm whether an active trace of the Hollywood fault is 50 feet or greater from the property boundary at this location, explorations would need to be undertaken 50 feet northwest of the property boundary in Sunset Boulevard. If such additional exploration is not undertaken, the City will require that buildings be set back 50 feet from the property line at the northwest corner of the Project site. Alternately, according to the City geologist, in lieu of undertaking additional borings or providing a 50-foot setback, an acceptable off-fault surface rupture mitigation measure is, within the 50-foot setback area, to design the foundation to accommodate 10 inches of horizontal and 2 inches of vertical off-fault deformation, or an alternative magnitude of off-fault deformation approved by the Department of Building and Safety. [telephone communication with Daniel Schneidereit on 05/05/2015.]

6.0 SUMMARY OF CONCLUSIONS

Golder's opinion is that the active trace of the Hollywood fault is not present at the Site, and that potential off-fault displacements are insignificant. Golder's opinion is based on:

- Analysis and review of readily available maps, aerial photographs, published academic papers and consultant reports that describe the location and activity of the Hollywood fault surrounding the Site. The data review indicates that an active fault tectonic geomorphology is not present at the Site.
- The location of fault traces shown on the January 8, 2014 preliminary review Alquist-Priolo Earthquake Fault Zoning Map released by the State of California. The map indicates that the Site is located within the preliminary Hollywood fault earthquake fault zone, but the trace of the fault, as mapped by the State of California, is located approximately 100 feet northwest of the Site.
- A subsurface stratigraphy that shows general continuity across the Site that lacks major discontinuities between geological units beneath the Site. Results from the radiocarbon dating of four bulk soil samples at depths from 45 to 119 feet below the present-day ground surface confirm that the unfaulted soils beneath the Site extend through the Holocene and latest Pleistocene Epochs (last 35,000 years).
- An absence of groundwater to depths of at least 97 feet at the NW end and 155 feet at the southern end of the site as observed from HSA borings.

7.0 LIMITATIONS

This report has been prepared for the exclusive use of AG-SCH 8150 Sunset Boulevard Owner, L.P. for the Proposed Development at the 8150 Sunset Blvd project in Los Angeles, California. The findings, conclusions, and recommendations presented in this report were prepared in a manner consistent with the level of care and skill ordinarily exercised by other members of the geotechnical engineering profession currently practicing under similar conditions subject to the time limits and financial, physical, and other constraints applicable to the scope of work. No warranty, express or implied, is made.

The Owner has the responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. This report contains information that may be useful in the preparation of contract specifications and contractor cost estimates. However, this report is not written as a specification document and may not contain sufficient information for this use without proper modification.

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FIGURES

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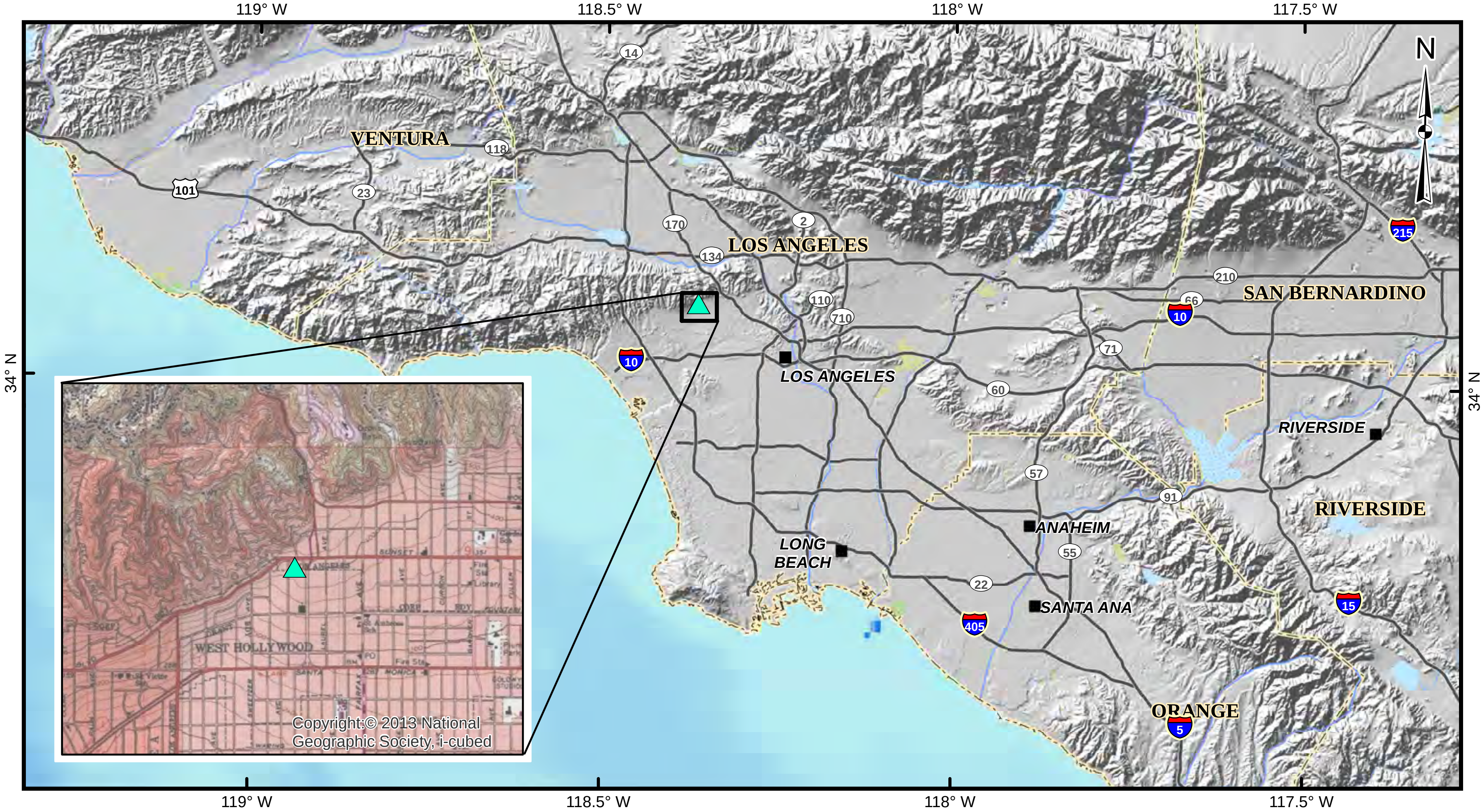

LEGEND

▲ SITE (8150 SUNSET BLVD.)

REFERENCES

1. COORDINATE SYSTEM: NAD 1983 UTM Zone 11N
2. CGS, 2014, Earthquake Zones of Required Investigation, Hollywood Quadrangle, PRELIMINARY REVIEW MAP, California Geological Survey released for comment January 8, 2014.

PROJECT

TOWNSCAPE PARTNERS
8150 SUNSET BLVD.
CITY OF LOS ANGELES, CALIFORNIA

TITLE

SITE LOCATION MAP

Golder Associates

PROJECT NO. 123-92034.02			FILE No.	Location Map.mxd
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GIS	KJK	1/22/2014		
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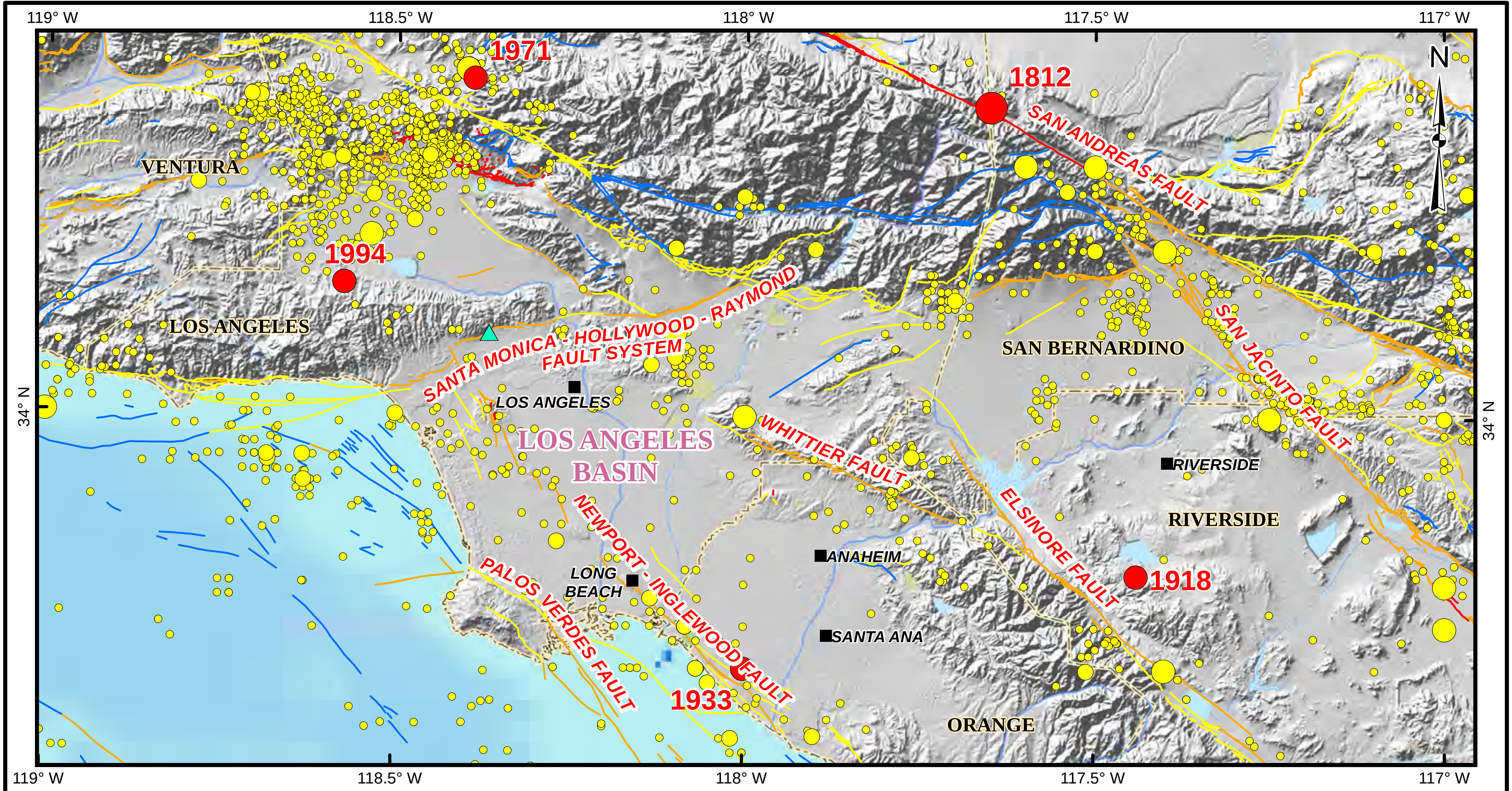

LEGEND

▲ SITE (8150 SUNSET BLVD.)

HISTORIC FAULTS

HOLOCENE FAULTS

LATE QUATERNARY FAULTS

MID-LATE QUATERNARY FAULTS

QUATERNARY FAULTS

EPICENTER MAGNITUDE

●	< 5.0
●	5.0 - 5.9
●	6.0 - 6.9
●	> 7.0
1994 ●	MAJOR HISTORIC EARTHQUAKE AND DATE

10 0 10 Miles

20 0 20 Kilometers

REFERENCES

1. COORDINATE SYSTEM: NAD 1983 UTM Zone 11N
2. PETERSON et al.(2008).
3. CGS, 2014, EARTHQUAKE ZONES OF REQUIRED INVESTIGATION, HOLLYWOOD QUADRANGLE, PRELIMINARY REVIEW MAP, CALIFORNIA GEOLOGICAL SURVEY RELEASED FOR COMMENT JANUARY 8, 2014

PROJECT

TOWNSCAPE PARTNERS
8150 SUNSET BLVD.
CITY OF LOS ANGELES, CALIFORNIA

TITLE

MAJOR REGIONAL TECTONIC STRUCTURES AND HISTORIC EARTHQUAKES

Golder Associates

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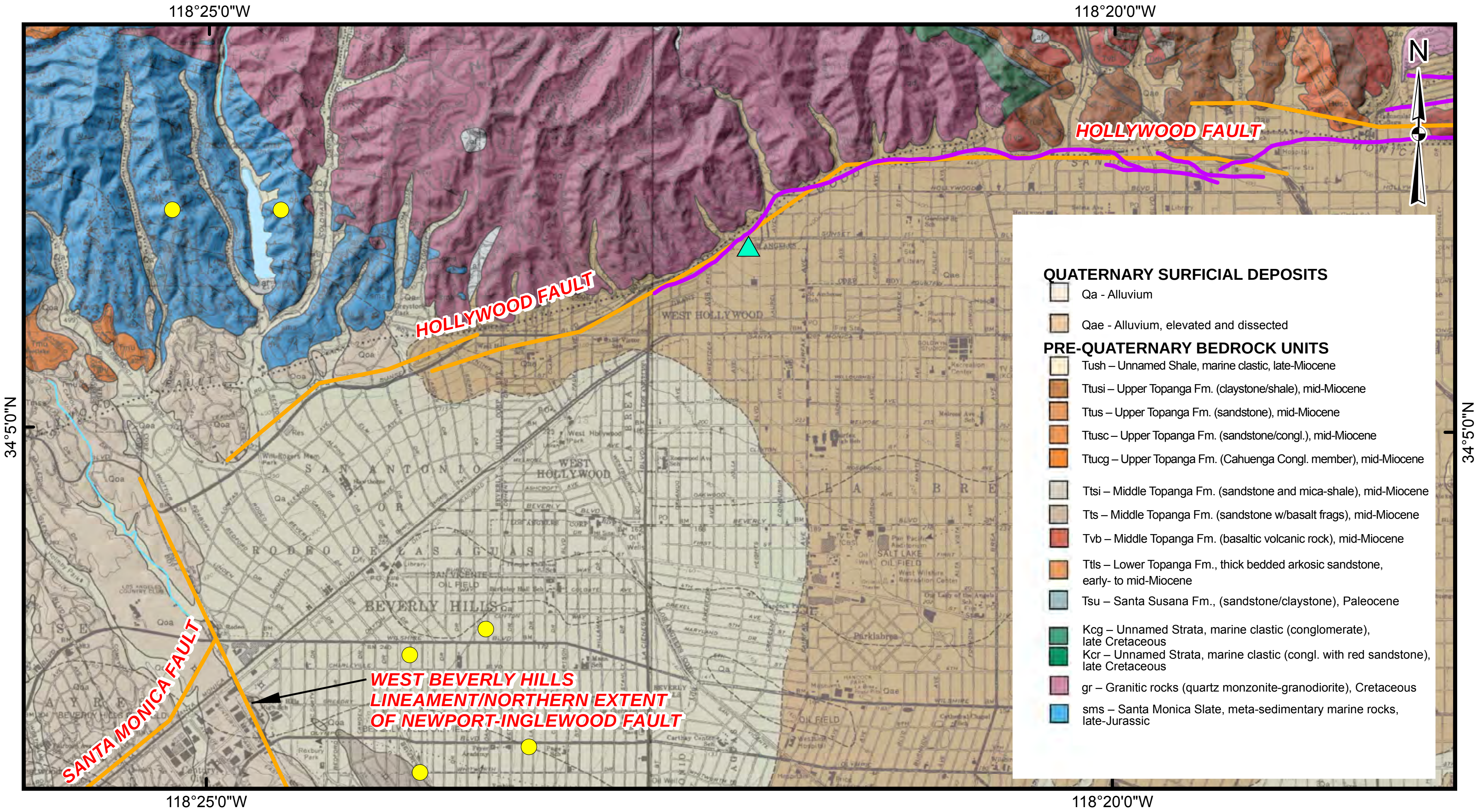

LEGEND

▲ SITE (8150 SUNSET BLVD.)

━ FAULTS (PETERSON et al., 2008)

━ FAULT (CGS 2014)

EPICENTER

MAGNITUDE

● < 5.0

REFERENCES

1. COORDINATE SYSTEM: NAD 1983 StatePlane California V FIPS 0405 Feet
2. PETERSON et al. (2008)

3,000 0 3,000 Feet

1 0 1 Kilometers

PROJECT

TOWNSCAPE PARTNERS
8150 SUNSET BLVD.
CITY OF LOS ANGELES, CALIFORNIA

TITLE

REGIONAL GEOLOGY, MAPPED FAULTS AND HISTORIC EARTHQUAKES

Golder Associates

PROJECT NO. 123-92034.02			FILE No.	Geology Base Map2.mxd
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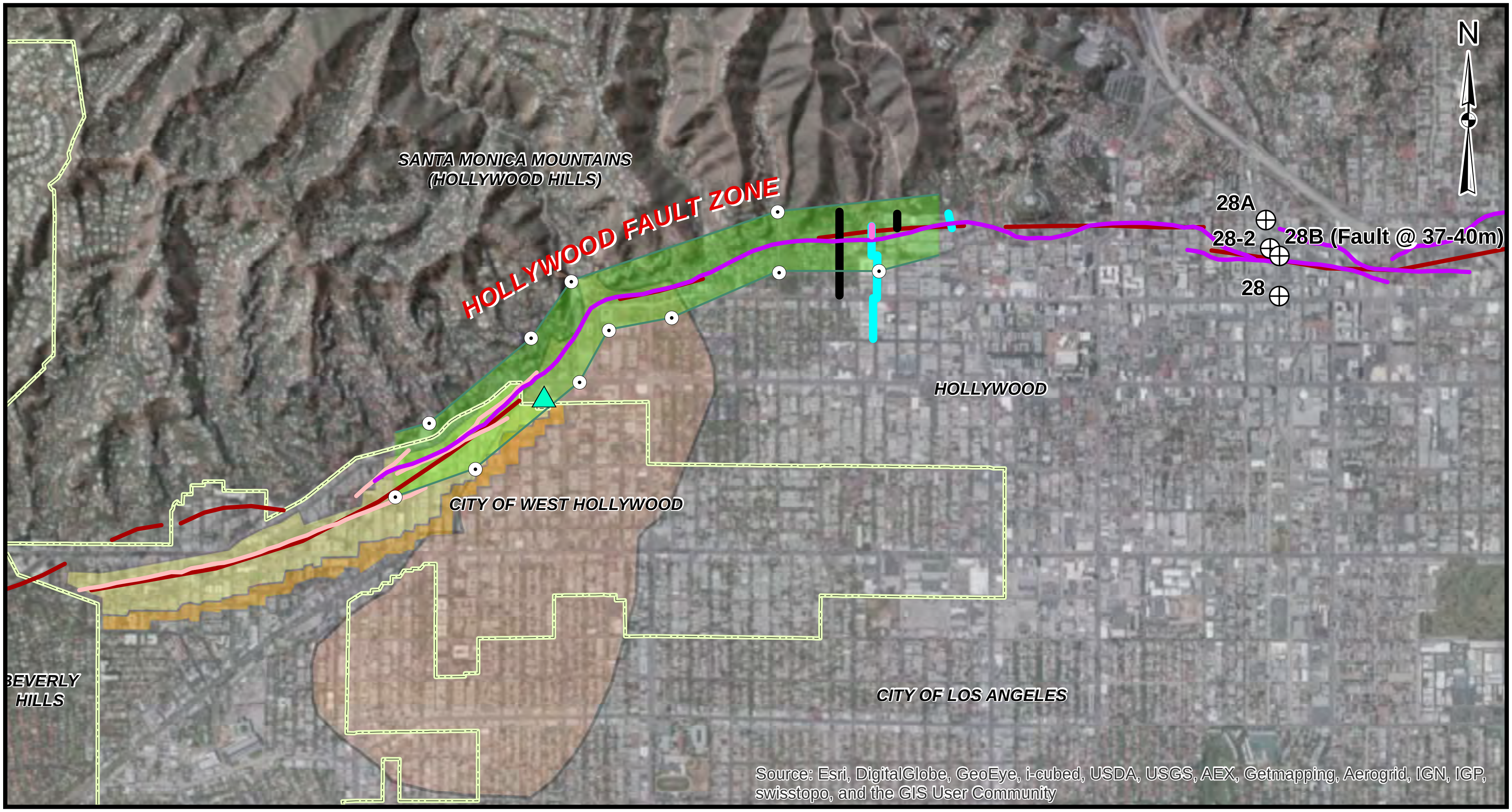

Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

▲	SITE (8150 SUNSET BLVD.)
----	CITY BOUNDARY LINE
⊕	BORINGS (CONVERSE et al., 1981)
━	FAULT (WEST HOLLYWOOD)
━	FAULT (DOLAN et al., 1997)
━	FAULT (CGS 2014)
━	FAULT TRENCH (DOLAN et al., 1997)
━	BORING TRANSECT (DOLAN et al., 1997)
━	BORING TRANSECT (DOLAN et al., 2000)
▨	ZONE FP-1 (WEST HOLLYWOOD)
▨	ZONE FP-2 (WEST HOLLYWOOD)
▨	LAUREL CANYON ALLUVIAL FAN (DOLAN et al., 1997)
🟩	HOLLYWOOD FAULT PRELIMINARY EARTHQUAKE FAULT ZONE (CGS 2014)

REFERENCES

1. COORDINATE SYSTEM: NAD 1983 StatePlane California V FIPS 0405 Feet
2. DOLAN et al. (1997, 2000)
3. KFM (2010)
4. CONVERSE et al. (1981)

0.8 0 0.8 Kilometers

PROJECT

TOWNSCAPE PARTNERS
8150 SUNSET BLVD.
CITY OF LOS ANGELES, CALIFORNIA

TITLE

EXISTING STUDIES AND CURRENT ZONING ALONG THE HOLLYWOOD FAULT

Golder Associates

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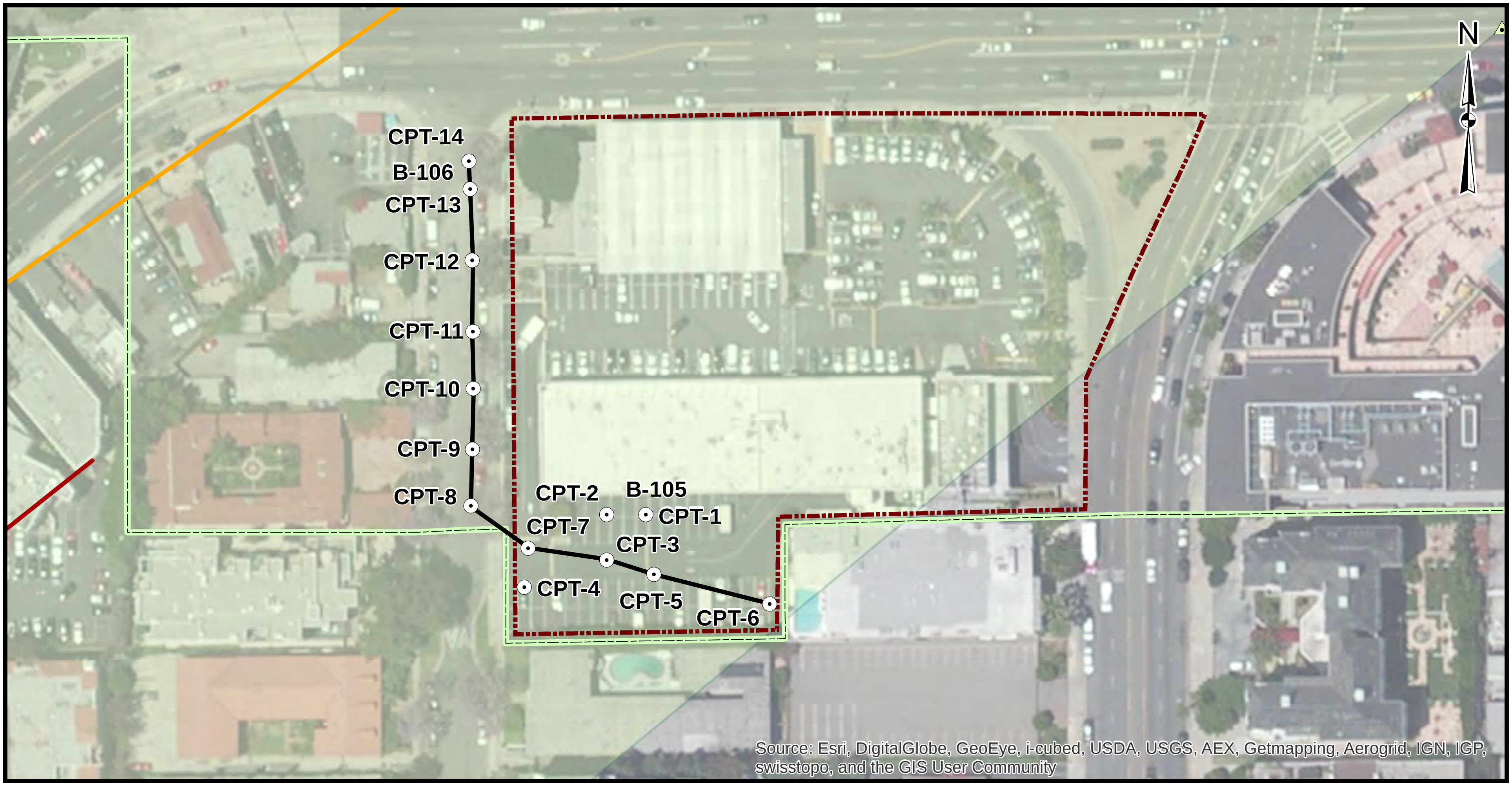


Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

- PROJECT BOUNDARY
- CITY BOUNDARY LINES
- FAULT (WEST HOLLYWOOD)
- FAULT (DOLAN et al., 1997)
- FAULT (PETERSON et al., 2008)
- FAULT (CGS 2014)
- ⌖ BORING LOCATION
- ⊙ CPT LOCATION
- HOLLYWOOD FAULT PRELIMINARY EARTHQUAKE FAULT ZONE (CGS 2014)
- TRANSECT LOCATION

100 0 100 Feet

30 0 30 Meters

REFERENCES

1. COORDINATE SYSTEM: NAD 1983 StatePlane California V FIPS 0405 Feet
2. KFM GEOSCIENCE (2010)
3. DOLAN et al. (1997)
4. PETERSON et al. (2008)
5. CGS, 2014, EARTHQUAKE ZONES OF REQUIRED INVESTIGATION, HOLLYWOOD QUADRANGLE, PRELIMINARY REVIEW MAP, CALIFORNIA GEOLOGICAL SURVEY RELEASED FOR COMMENT JANUARY 8, 2014

PROJECT

8150 SUNSET BLVD.
CITY OF LOS ANGELES, CALIFORNIA

TITLE

SITE EXPLORATION PLAN

Golder Associates

PROJECT NO. 123-92034.02

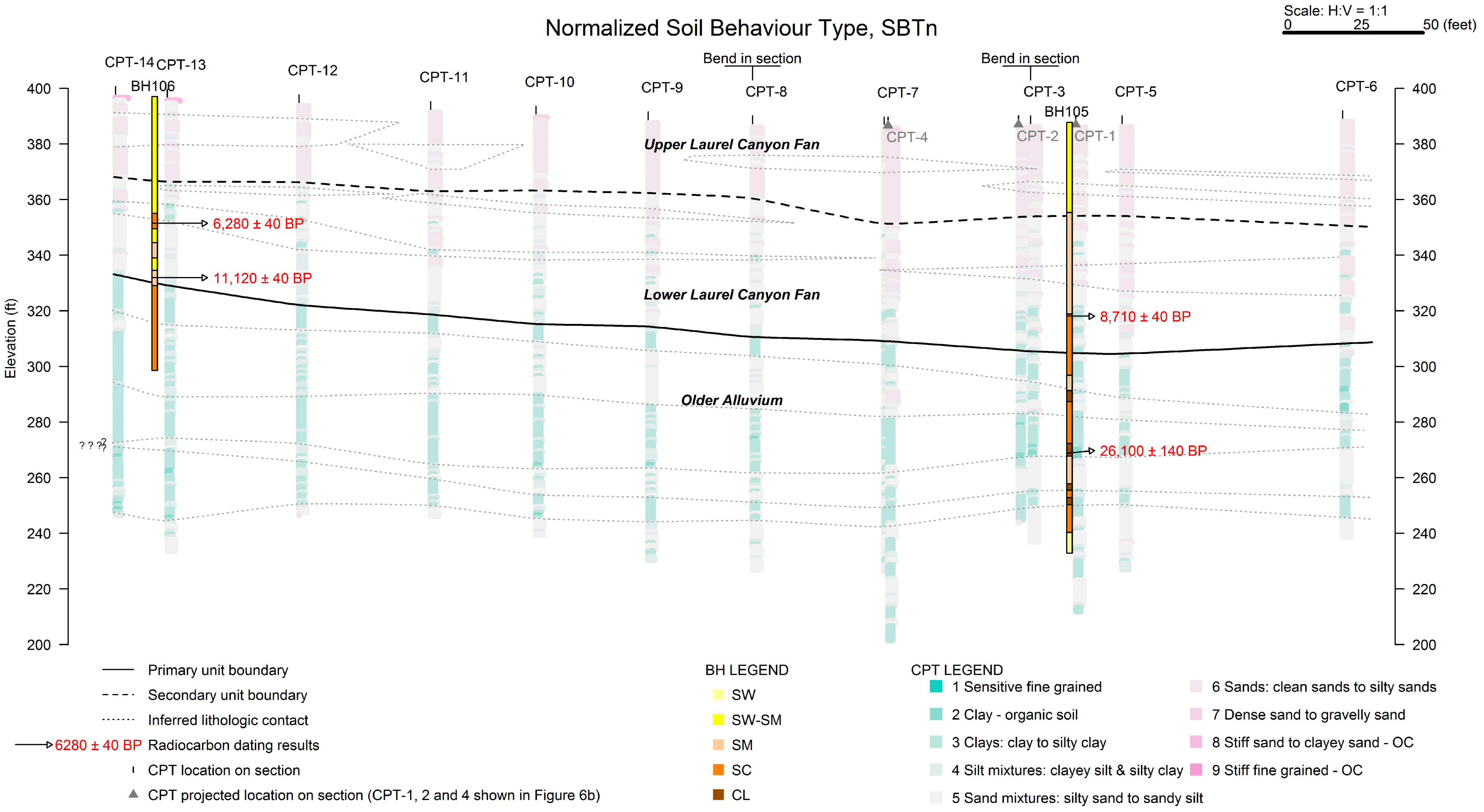
DESIGN	DL	12/18/2013
GIS	KJK	1/6/2015
CHECK	DL	12/20/2013
REVIEW	JB	12/20/2013

FILE No. Boring Location figure.mxd

SCALE: AS SHOWN REV. 0

FIGURE 5

Normalized Soil Behaviour Type, SBTn



EXPLANATION

——— Primary unit boundary
- - - Secondary unit boundary
······ Inferred lithologic contact
——▷ 6280 ± 40 BP Radiocarbon dating results
ı CPT location on section
▲ CPT projected location on section (CPT-1, 2 and 4 shown in Figure 6b)

BH LEGEND
■ SW
■ SW-SM
■ SM
■ SC
■ CL

CPT LEGEND
■ 1 Sensitive fine grained
■ 2 Clay - organic soil
■ 3 Clays: clay to silty clay
■ 4 Silt mixtures: clayey silt & silty clay
■ 5 Sand mixtures: silty sand to sandy silt
■ 6 Sands: clean sands to silty sands
■ 7 Dense sand to gravelly sand
■ 8 Stiff sand to clayey sand - OC
■ 9 Stiff fine grained - OC

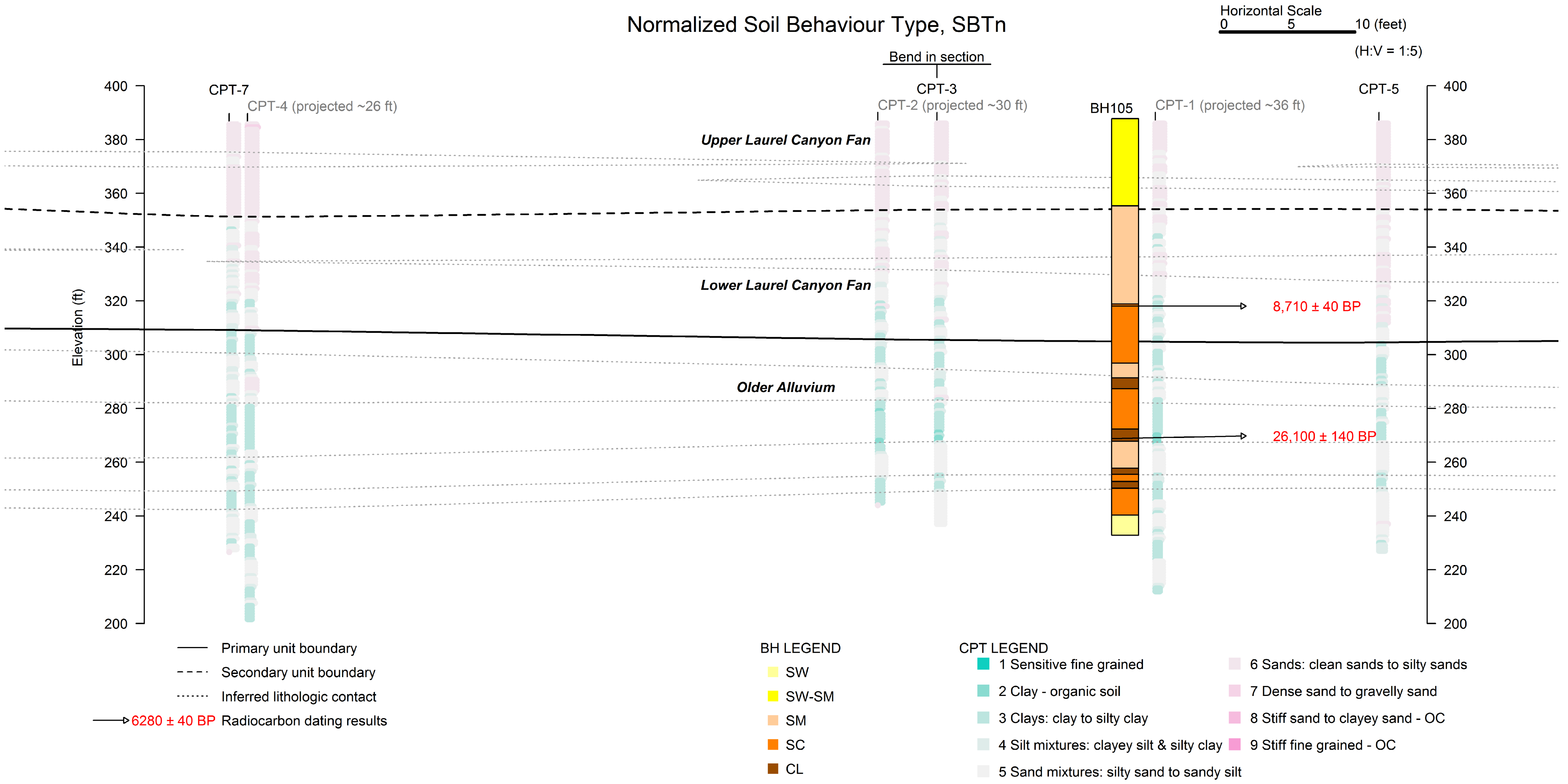
PROJECT
8150 SUNSET BLVD.
CITY OF LOS ANGELES, CALIFORNIA

TITLE
SOIL PROFILE
ALONG CPT SECTION - FULL SECTION

Golder Associates

PROJECT NO. 123-92034.02			FILE No.	Tansit figure.mxd
DESIGN	DL	12/18/2013	SCALE: AS SHOWN	REV. 0
GIS	KJK	12/18/2013		
CHECK	DL	12/20/2013		
REVIEW	JB	12/20/2013		

FIGURE 6A



EXPLANATION

——— Primary unit boundary

- - - - Secondary unit boundary

········ Inferred lithologic contact

——▷ 6280 ± 40 BP Radiocarbon dating results

BH LEGEND

- 🟨 SW
- 🟨 SW-SM
- 🟧 SM
- 🟧 SC
- 🟫 CL

CPT LEGEND

- 🟦 1 Sensitive fine grained
- 🟦 2 Clay - organic soil
- 🟦 3 Clays: clay to silty clay
- ⬜ 4 Silt mixtures: clayey silt & silty clay
- ⬜ 5 Sand mixtures: silty sand to sandy silt
- 🟪 6 Sands: clean sands to silty sands
- 🟪 7 Dense sand to gravelly sand
- 🟪 8 Stiff sand to clayey sand - OC
- 🟪 9 Stiff fine grained - OC

PROJECT

8150 SUNSET BLVD.
CITY OF LOS ANGELES, CALIFORNIA

TITLE

SOIL PROFILE
ALONG CPT SECTION - PORTION
WITH PROJECTED CPTS

PROJECT NO. 123-92034.02			FILE No.	Tansit figureCPT.mxd
DESIGN	DL	12/18/2013	SCALE: AS SHOWN	REV. 0
GIS	KJK	12/18/2013		
CHECK	DL	12/20/2013		
REVIEW	JB	12/20/2013		

FIGURE 6B

APPENDIX A
BORING LOGS B-105 AND B-106

Golder Associates

REPORT OF BOREHOLE: B-105

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 1 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			0					■		Asphalt (Packing)			
				0.8				▨	SP	ARTIFICIAL FILL Hand Augered to 5.0' Select Sand Backfill: Firm with some coarse-grained (Near drain pipe) SILTY SAND FILL rests near native contact			
			5	5.0	1	☒		░	SM	SILTY SAND, increasing coarseness with depth, brown,moist, medium denseness ; trace fine GRAVEL, arkose and biotite fragments			
			10		2	☒							
				13.0				⁘	SW	SAND, well graded, light brown, moist; trace coarse GRAVEL, arkose fragments			
				14.0				░	SM	SILTY SAND, increasing coarseness with depth, brown,moist, medium denseness ; trace fine GRAVEL, arkose, biotite and feldspar fragments			
			15		3	☒							
				18.5				⁘	SW	SAND, medium to coarse grained, moist, dense			
			20										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-105

Golder Associates

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 2 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			20		4				SW	SAND, medium to coarse grained, moist, dense *(continued)*			
				23.0	5				SM	SILTY SAND, fine to medium grained, increasing coarseness with depth, brown,moist, medium denseness ; trace fine GRAVEL, arkose fragments with some mica			
			25		6								
				26.5	7				SW	SAND, fine to coarse grained, gray-light brown, moist, dense; trace fine GRAVEL, arkose fragments with some mica Abrupt Change			
				29.5					SM	SILTY SAND, increasing coarseness with depth, brown,moist, medium denseness ; trace fine GRAVEL, arkose and biotite fragments			
			30		8					Becoming lighter brown-gray (gradational)			
				32.5	9				SW	SAND, fine to coarse grained, gray-light brown, moist, dense; trace fine GRAVEL, arkose fragments with some mica Abrupt Change			
				34.5					SW SM	Gradational Contact			
			35	35.0	10				SM	SILTY SAND, increasing coarseness with depth, brown,moist, medium denseness ; trace fine GRAVEL, arkose fragment			
				36.5					SW	SAND, fine to coarse grained, light gray, moist, medium denseness, arkose fragments with some mica			
					11					Becomes Brown			
			40										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-105

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 3 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			40	40.0	12				SW SM	SILTY SAND, brown,moist, medium denseness ; trace fine GRAVEL, arkose fragment			
				42.0					SW	Becomes light gray; some coarse GRAVEL			
					13								
				43.0					SW SM	silty SAND, brown, moist, medium denseness, arkose and mica fragments			
				44.5					SW	SAND, fine to coarse grained, light gray, moist, medium denseness; trace fine GRAVEL			
			45		14								
				46.0					SW SM	SILTY SAND, fine to coase grained, brown-gray			
				47.0					SW	SAND, fine to coarse grained; some fine GRAVEL			
					15								
			50		16								
					17								
				54.0					SW SM	SILTY SAND, brown, moist, arkose and mica fragments			
			55		18								
				56.0					CL ML SW	sandy CLAY, low plasticity, fine to coarse grained SAND, fine to coarse grained, light gray, moist, medium denseness; trace SILT, brown			
					19								
				59.0					SM	SILTY SAND, brown, moist, medium denseness; some coarse SAND; trace fine GRAVEL			
			60										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-105

Golder Associates

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 4 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			60	60.0	20				SW	SAND, fine to coarse grained, gray-brown, moist, medium denseness; trace SILT, brown; trace fine GRAVEL, arkose and mica fragments Becomes light gray brown with depth			
					21								
			65	64.9					SW	SAND, fine to medium grained; trace SILT			
				65.1	22				SM SM	SILTY SAND, brown, moist, medium denseness; trace CLAY, faintly laminated, mica fragments			
				66.5					SW	SAND, fine to coarse grained, light gray, moist, medium denseness, arkose fragments with some mica Becomes more brown with depth			
				67.5	23				SM	SILTY SAND, brown, moist, medium denseness; trace CLAY, faintly laminated, mica fragments			
				69.0					SC	coarse GRAVEL bed CLAYEY SAND, reddish brown, moist, dense, trace arkose and mica fragments			
			70		24								
				70.5					SM	SILTY SAND, brown, moist, medium denseness; some coarse SAND, arkose and mica fragments; trace CLAY			
				72.0					SW	SAND, fine to coarse grained, light gray-brown; some fine GRAVEL			
					25								
				73.5					SC	CLAYEY SAND, fine to medium grained, brown, moist, cohesive, dense; some SAND; some fine GRAVEL			
			75		26								
				76.0					SW SM	SILTY SAND, well-graded, fine to medium grained, brown, moist, dense; trace fine GRAVEL, arkose and mica fragments			
					27								
				79.0					SC				
			80										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-105

Golder Associates

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 5 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			80		28				SC	CLAYEY SAND, fine to medium grained, brown, moist, cohesive, dense; some SAND; some fine GRAVEL Slightly less clay, cohesive in the last 6", grades to SILTY SAND *(continued)*			
				82.5	29				SM	SILTY SAND, brown, moist, medium denseness			
				84.0					SW	SAND, fine to coarse grained, brown-gray, moist; trace SILT; trace fine GRAVEL			
			85	85.0	30				SC				
				85.5					SM				
				86.0					SC	CLAYEY SAND, brown, moist, cohesive, moderate cohesion dense; some fine GRAVEL, arkose and mica fragments Less cohesive towards bottom			
					31								
			90		32								
				91.0					SW SM	SILTY SAND, fine to coarse grained; some fine GRAVEL, arkose and mica fragments; trace CLAY Becomes coarser grained and less silty Wet @94.7'			
					33								
			95	95.0	34				SW	SAND, fine to coarse grained, light gray-brown, moist, dense; trace fine GRAVEL, arkose and mica fragments			
				96.5					CL	silty CLAY, moist, stiff, forms limited ribbons; some SAND			
					35								
				98.0					SW SM	SILTY SAND, brown, moist, dense			
				99.3					CL	sandy CLAY, reddish brown, moist, stiff; trace fine GRAVEL, arkose and mica fragments			
			100										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

Golder Associates

REPORT OF BOREHOLE: B-105

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 6 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			100						CL				
				100.5	36				SW SM	SILTY SAND, fine to coarse grained, brown-gray, moist, dense; trace fine GRAVEL, arkose and mica fragments			
					37								
				104.0					SC	clayey SILTY SAND, fine to medium grained, brown to reddish brown, moist, dense; trace fine GRAVEL, some mica fragments			
			105		38								
				106.5					SC	clayey SAND, medium cohesive, moist; trace fine GRAVEL, becomes coarse with depth, granite fragments More coarse sand and fine gravel from 108'-109' Gradational compaction			
					39								
			110	110.0	40				SW	SAND, increasing coarseness with depth,			
				112.0					SC	clayey SAND, brown, moist, stiff to very stiff, granitic			
					41								
			115										
				115.5	42				CL	sandy CLAY, brown, moist, cohesive, stiff; trace fine GRAVEL			
					43								
			120										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

Golder Associates

REPORT OF BOREHOLE: B-105

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 7 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			120	120.0	44				SM	SILTY SAND, fine to medium grained, light brown, moist, some mica			
				121.0					SW	SAND, fine to coarse grained, light brown, angular, mica; trace fine to coarse GRAVEL, angular			
					45								
			125		46								
				126.8					SW	Heavy deposit of biotite and quartz			
				127.0					SW	SAND, fine to coarse grained, light brown, angular, moist			
					47								
				128.5					SC	clayey SAND, fine to coarse grained, medium brown			
			130	130.0	48				CL	SILTY CLAY, medium brown, cohesive; some coarse SAND			
				132.3					SC	clayey SAND, fine to coarse grained; trace fine GRAVEL			
				132.5	49				SW	SAND, fine to coarse grained, light brown, sub-angular to sub-rounded			
				134.0					ML	SILT, medium brown, moist, stiff to very stiff, mica-rich; some fine SAND			
			135	135.0	50				CH	CLAY, dark brown, moist, medium to high plasticity, stiff, mica-rich; trace SAND; trace SILT			
				137.5	51				SC	clayey SAND, fine to coarse grained, dark brown, moist, firm; trace GRAVEL			
			140										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-105

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 8 OF 8
DRILLER: Cascade Drilling
DRILL RIG: CME-85
LOGGED: C.Woods DATE: 10/14/13
CHECKED: D.Lowry DATE: 10/14/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			140		52				SC	clayey SAND, fine to coarse grained, dark brown, moist, firm; trace GRAVEL *(continued)*			
				141.3					CH	CLAY, brown, stiff			
				141.5					SW	SAND, fine to coarse grained, medium to light brown, mica-rich; some fine GRAVEL, granite and gneiss fragments			
					53								
			145	145.0	54				SC	clayey SAND, fine to coarse grained, medium brown, moist, firm; some coarse GRAVEL			
				147.5	55				SW	SAND, fine to coarse grained; some CLAY, firm; trace fine GRAVEL			
			150		56								
				152.5	57				SW	SAND, fine to coarse grained, brown, quartz clasts; some coarse GRAVEL, gneiss			
			155	155.0						Refusal			

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-106

Golder Associates

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 1 OF 5
DRILLER: Cascade Drilling
DRILL RIG: CME-95
LOGGED: C.Woods DATE: 11/20/13
CHECKED: D.Lowry DATE: 11/20/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			0							Hand Augered to 7'; No Utilities			
			5										
				7.0	1				SW SM	interbedded SILTY SAND and SAND, well-graded, brown, moist, loose to medium dense grades to fine SILTY SAND, pink and brown, dry			
				9.0					SC	SILTY SAND, dry to moist; some fine CLAYEY SAND			
			10		2								
				10.5					SW SM	interbedded SILTY SAND and SAND; some GRAVEL and fine to coarse-grained SAND, light brown, dry to moist			
					3								
			15		4								
				17.5	5				SM	SILTY SAND, brown, moist, medium dense			
				19.0					SW	coarse SAND and fine GRAVEL			
			20										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-106

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 2 OF 5
DRILLER: Cascade Drilling
DRILL RIG: CME-95
LOGGED: C.Woods DATE: 11/20/13
CHECKED: D.Lowry DATE: 11/20/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			20	20.0	6				SW SM	interbedded SILTY SAND and SAND, gray-brown, moist, medium dense; some GRAVEL; some medium-grained SAND			
					7								
			25		8								
				26.5					SW	gravelly SAND, gray-brown, moist, medium dense; fine SILTY SAND beds			
				27.0					SW	SAND, fine to coarse-grained; few coarse GRAVEL, pink/brown			
					9								
			30		10								
										becomes coarse SAND to fine GRAVEL near base, brown, moist			
					11								
				34.5					SM	SILTY SAND, brown, moist, dense (distinct contact); some GRAVEL			
			35		12								
				36.5					SW				
				37.0					SM	SILTY SAND, fine to coarse-grained; some fine GRAVEL, gneiss			
					13								
			40										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

REPORT OF BOREHOLE: B-106

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 3 OF 5
DRILLER: Cascade Drilling
DRILL RIG: CME-95
LOGGED: C.Woods DATE: 11/20/13
CHECKED: D.Lowry DATE: 11/20/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			40		14				SM	SILTY SAND, fine to coarse-grained; some fine GRAVEL, gneiss *(continued)*			
				42.0					SC	SILTY to CLAYEY SAND, fine to coarse-grained, dark brown, moist very coarse SAND at base			
					15								
				44.0					SW SM				
			45		16								
				45.5					SC	CLAYEY SAND, coarse-grained, dark brown, moist, dense; few GRAVEL			
				47.5	17				SW SM	SILTY SAND, fine to coarse, light reddish brown; trace silty GRAVEL			
										SAND, reddish pinkish brown,moist, granitic clasts; trace silty CLAY			
			50		18								
				52.5	19				SM	SILTY SAND, moist, dense; trace CLAY; trace fine GRAVEL, granitic			
			55	55.0	20				SM	SILTY SAND, fine to coarse-grained, reddish pinkish brown; some fine GRAVEL; trace CLAY			
					21								
				58.0					SW	SAND, coarse-grained, whitish grayish brown; some fine GRAVEL, gneiss, granite; trace SILT *Steel pin from drillers in sampler, probable cause of poor recovery			
			60										

Golder Associates

REPORT OF BOREHOLE: B-106

CLIENT: AG SCH/8150 Sunset Boulevard/CA
PROJECT: 8150 Sunset Boulevard/CA
LOCATION: Hollywood, CA
PROJECT NO.: 123-92034

DRIVE WEIGHT:
DROP DISTANCE:
N: E:
ELEVATION: DATUM:
INCLINATION: -90°
BOREHOLE DIAMETER: 8 inches

SHEET: 4 OF 5
DRILLER: Cascade Drilling
DRILL RIG: CME-95
LOGGED: C.Woods DATE: 11/20/13
CHECKED: D.Lowry DATE: 11/20/13

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			60	60.0	22				SW SM	SILTY SAND, pinkish reddish brown; some fine GRAVEL; trace CLAYS			
				62.5	23				SM	SILTY SAND, fine to coarse-grained, brown, moist, dense; trace CLAY, light brown to reddish brown			
			65		24					gradational			
				68.0	25				SC	SILTY to CLAYEY SAND, coarse-grained, brown, moist, dense, slightly cohesive, granite and gneiss clasts (mica in gneiss)			
			70		26								
				72.5					SC	CLAYEY SAND, fine to medium-grained, cohesive; trace coarse SAND, granite and gneiss clasts			
				73.5	27				SC	*Water introduced by drillers to abate hole expansion			
			75		28					becomes more coarse and dense			
					29								
				79.0					SC	*Water introduced by drillers to abate hole expansion			
			80										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

Golder Associates

REPORT OF BOREHOLE: B-106

CLIENT: AG SCH/8150 Sunset Boulevard/CA	DRIVE WEIGHT:	SHEET: 5 OF 5	
PROJECT: 8150 Sunset Boulevard/CA	DROP DISTANCE:	DRILLER: Cascade Drilling	
LOCATION: Hollywood, CA	N: E:	DRILL RIG: CME-95	
PROJECT NO.: 123-92034	ELEVATION: DATUM:	LOGGED: C.Woods	DATE: 11/20/13
	INCLINATION: -90°	CHECKED: D.Lowry	DATE: 11/20/13
	BOREHOLE DIAMETER: 8 inches		

Drilling					Sampling			Material Description					
METHOD	DRILL DATE/ TIME	WATER	DEPTH feet	LAYER ELEVATION	RUN	SAMPLE TYPE	BLOWS PER 6 INCHES	GRAPHIC LOG	USCS	(SYMBOL) SOIL NAME, particle size, gradation, shape, minor components; color, contamination; behaviour, moisture, density/consistency	MOISTURE	DRY DENSITY (pcf)	ADDITIONAL LAB TESTING
Hollow Stem Auger			80	80.0	30				SW SC	CLAYEY SAND and fine GRAVEL, fine to coarse-grained, reddish brown, moist, dense; trace green weathering (mica from gneiss)			
				83.5	31				SC	CLAYEY SAND to SANDY CLAY, dark brown, moist, very stiff, very dense; trace fine GRAVEL, reddish brown			
			85	85.0	32				SW SC	CLAYEY SAND and fine GRAVEL, brown, moist, dense, mica and granite green weathering			
				87.5	33				SM	SILTY SAND, brown, moist, dense to very dense, no cohesion; some fine GRAVEL; trace CLAY			
				89.0					SW SC	CLAYEY SAND, gray-brown, moist, very dense, cohesive; trace to some coarse SAND to fine GRAVEL, granitic			
			90		34					gradational			
					35					becomes SILTY SAND, coarse-grained, moist; trace to some CLAY and fine GRAVEL, granitic clasts, gneiss fragments			
			95		36								
				97.0					SW SC	CLAYEY SAND and fine GRAVEL @98.5 - Drill rig broke: Cracked 90 degree gear housing			
				98.5									
			100										

Report of borehole must be read in conjunction with accompanying notes and abbreviations

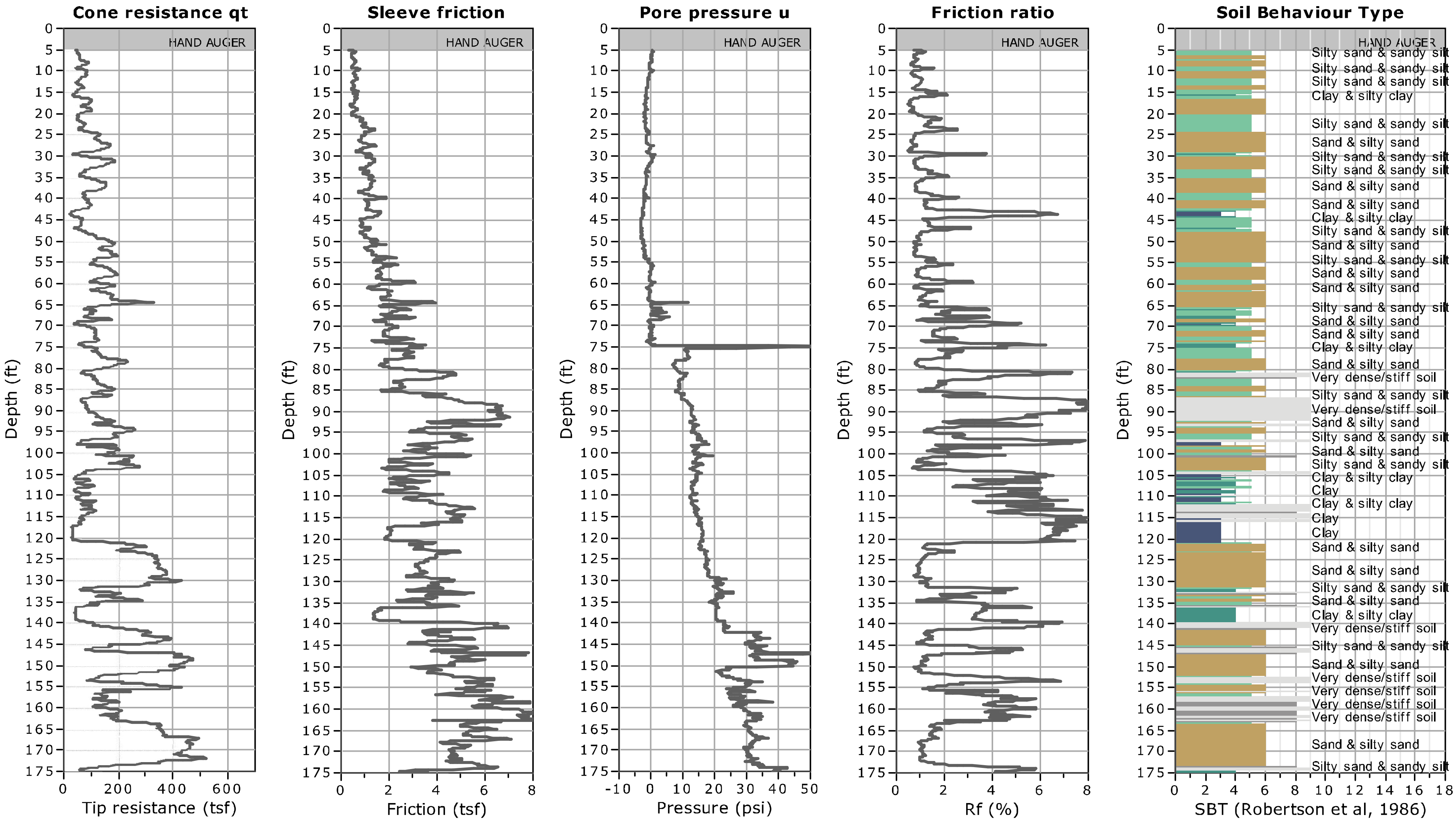
APPENDIX B
CPT DATA PREPARED BY KEHOE TESTING AND ENGINEERING INC.

Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT: CPT-1

Total depth: 175.75 ft, Date: 10/14/2013
Cone Type: Vertek

Project: **Golder Associates/8150 Hollywood**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**



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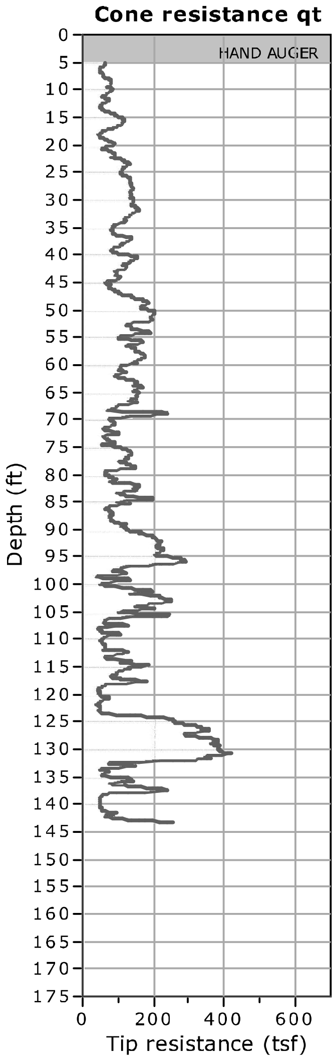
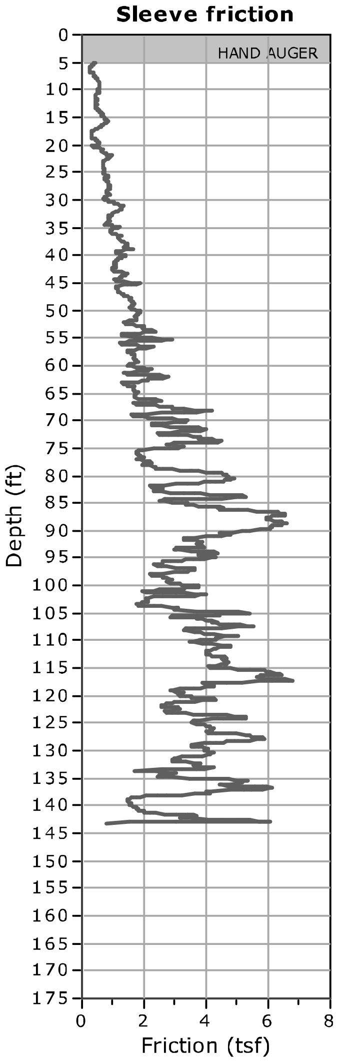
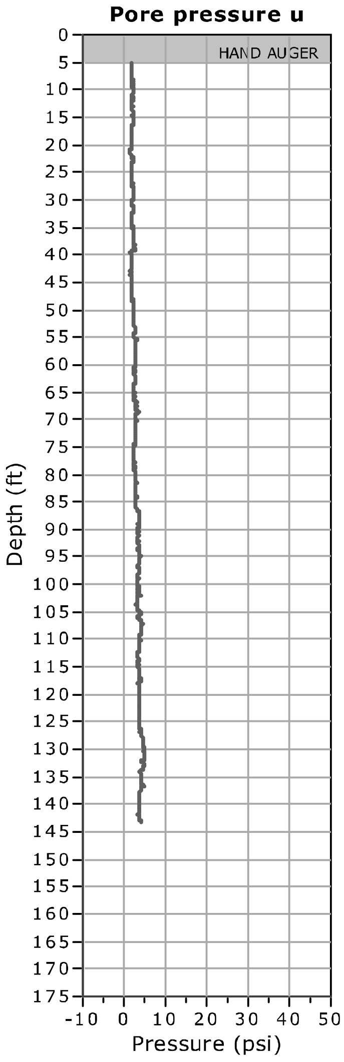
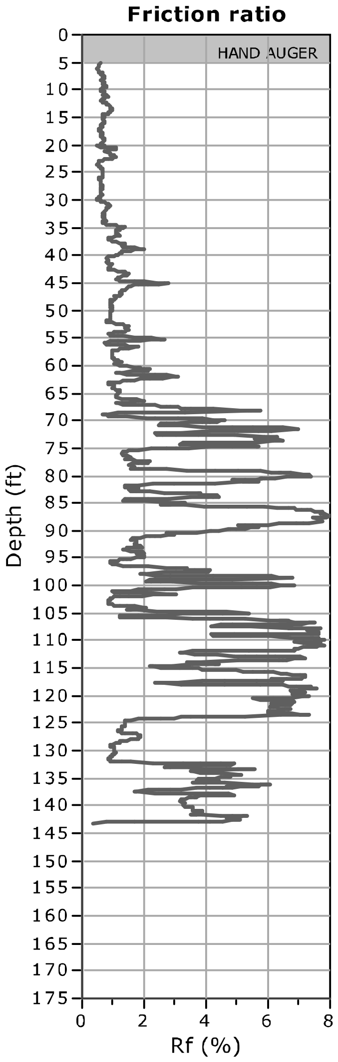
Project: **Golder Associates/8150 Hollywood**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

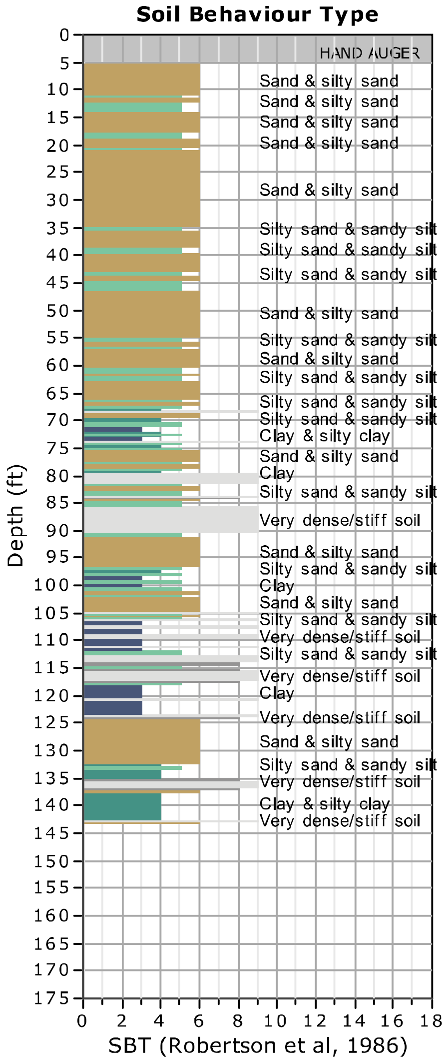
CPT: CPT-2
Total depth: 143.33 ft, Date: 10/14/2013
Cone Type: Vertek











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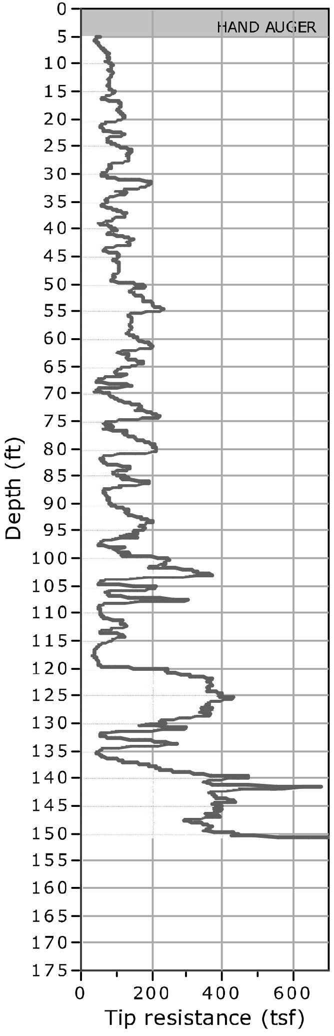
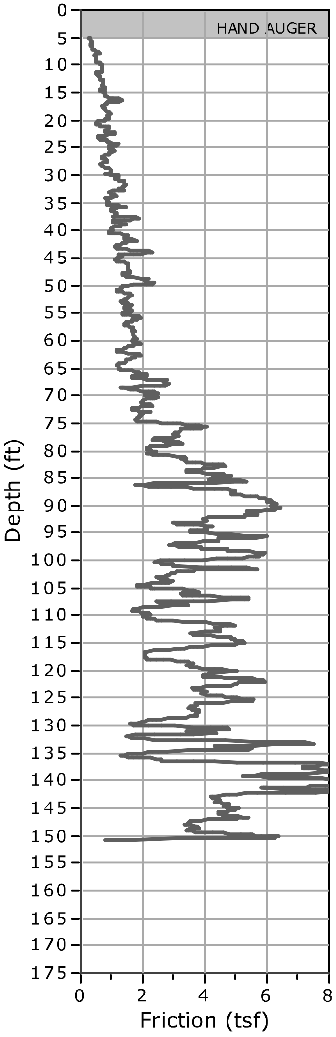
Project: **Golder Associates/8150 Hollywood**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-3
Total depth: 150.87 ft, Date: 10/14/2013
Cone Type: Vertek

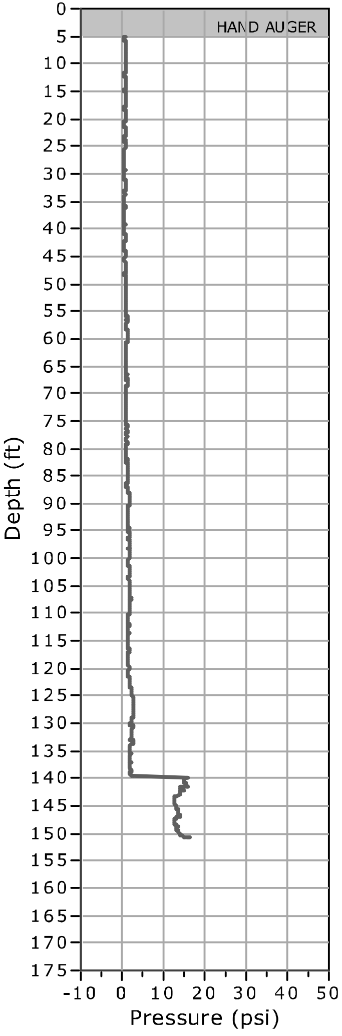
Cone resistance qt



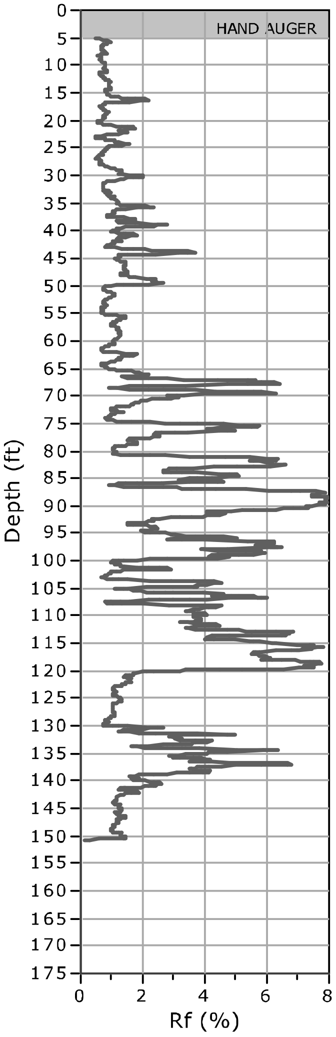
Sleeve friction



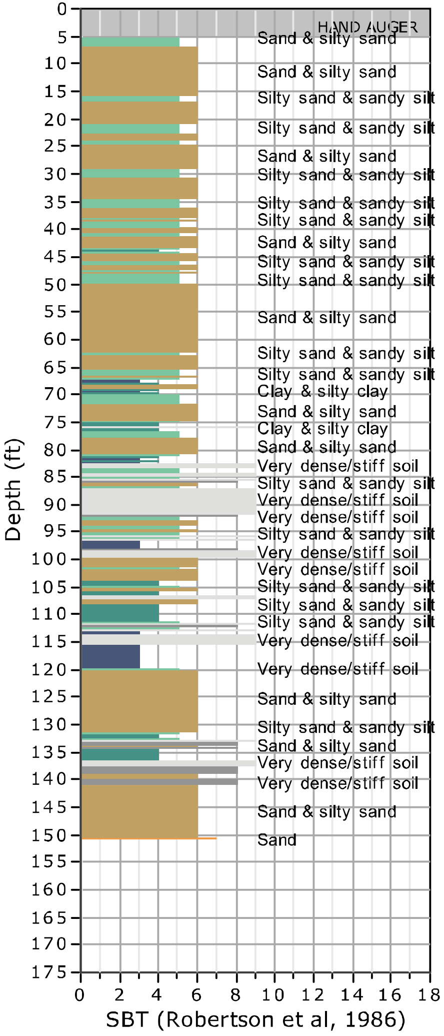
Pore pressure u



Friction ratio



Soil Behaviour Type



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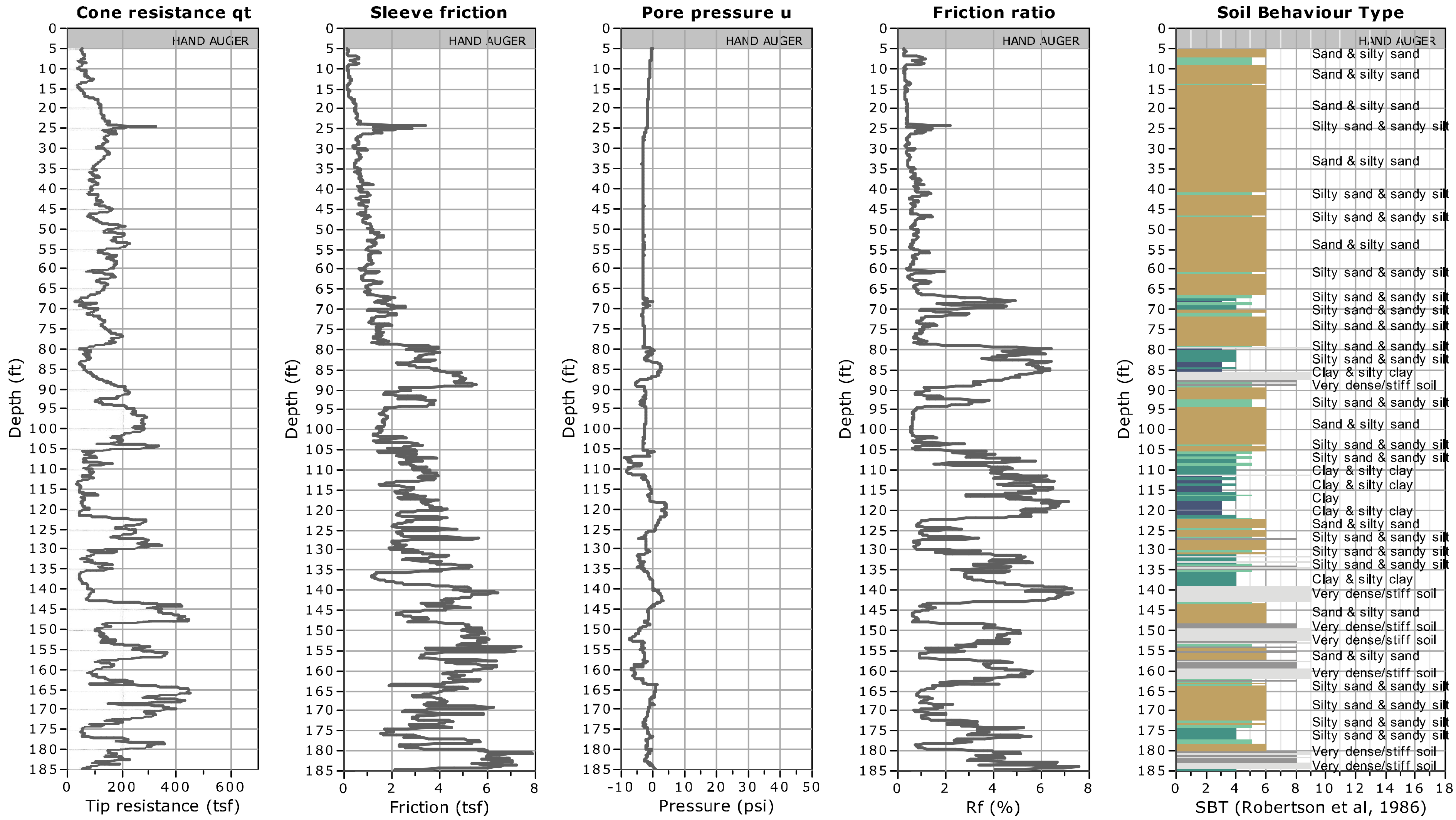
CPT: CPT-4

Total depth: 185.65 ft, Date: 11/4/2013

Cone Type: Vertek

Project: **Golder Associates**

Location: **8150 W. Sunset Blvd. Los Angeles, CA**


Cone resistance qt
Sleeve friction
Pore pressure u
Friction ratio
Soil Behaviour Type

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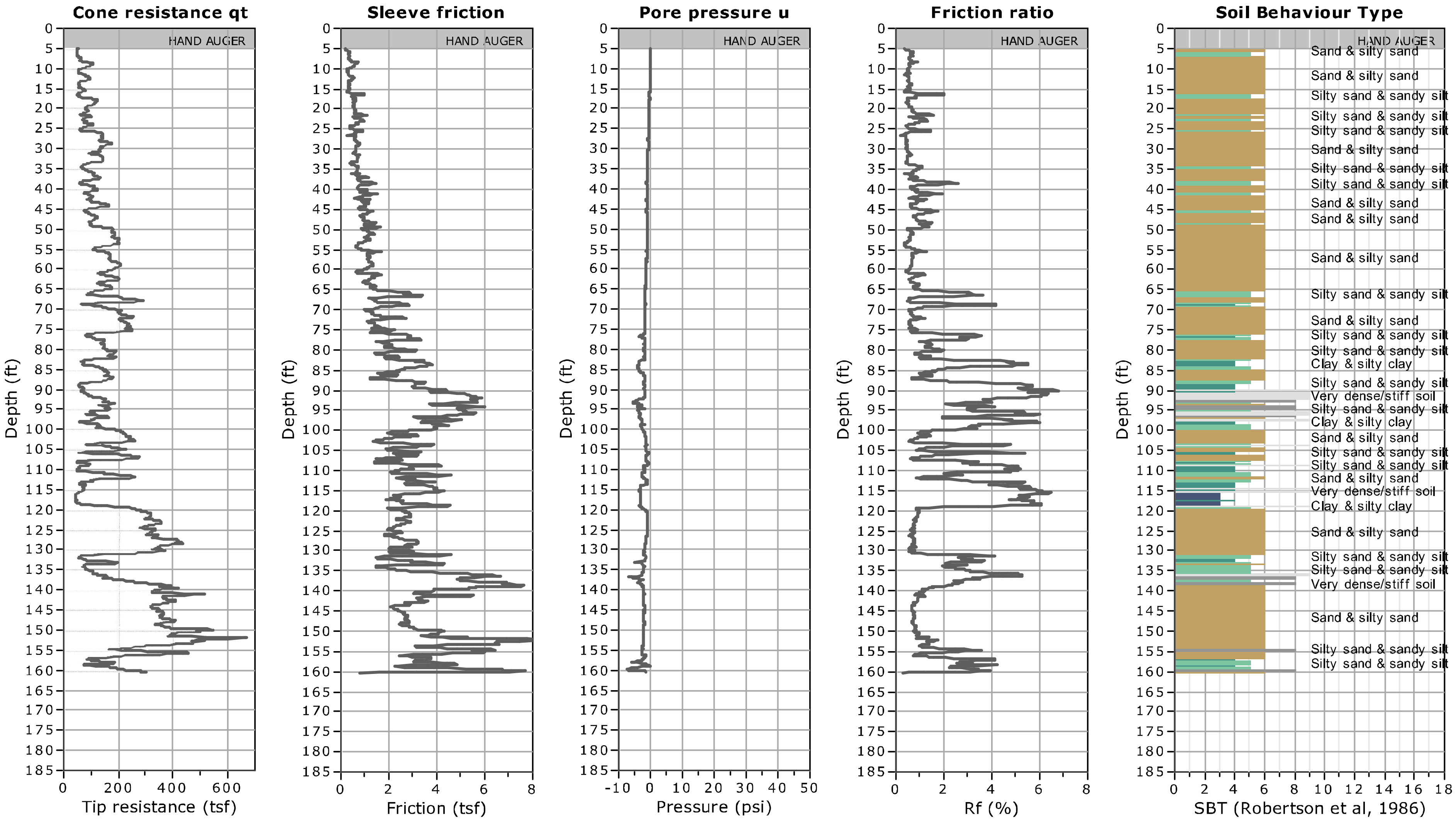
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-5
Total depth: 160.50 ft, Date: 11/4/2013
Cone Type: Vertek



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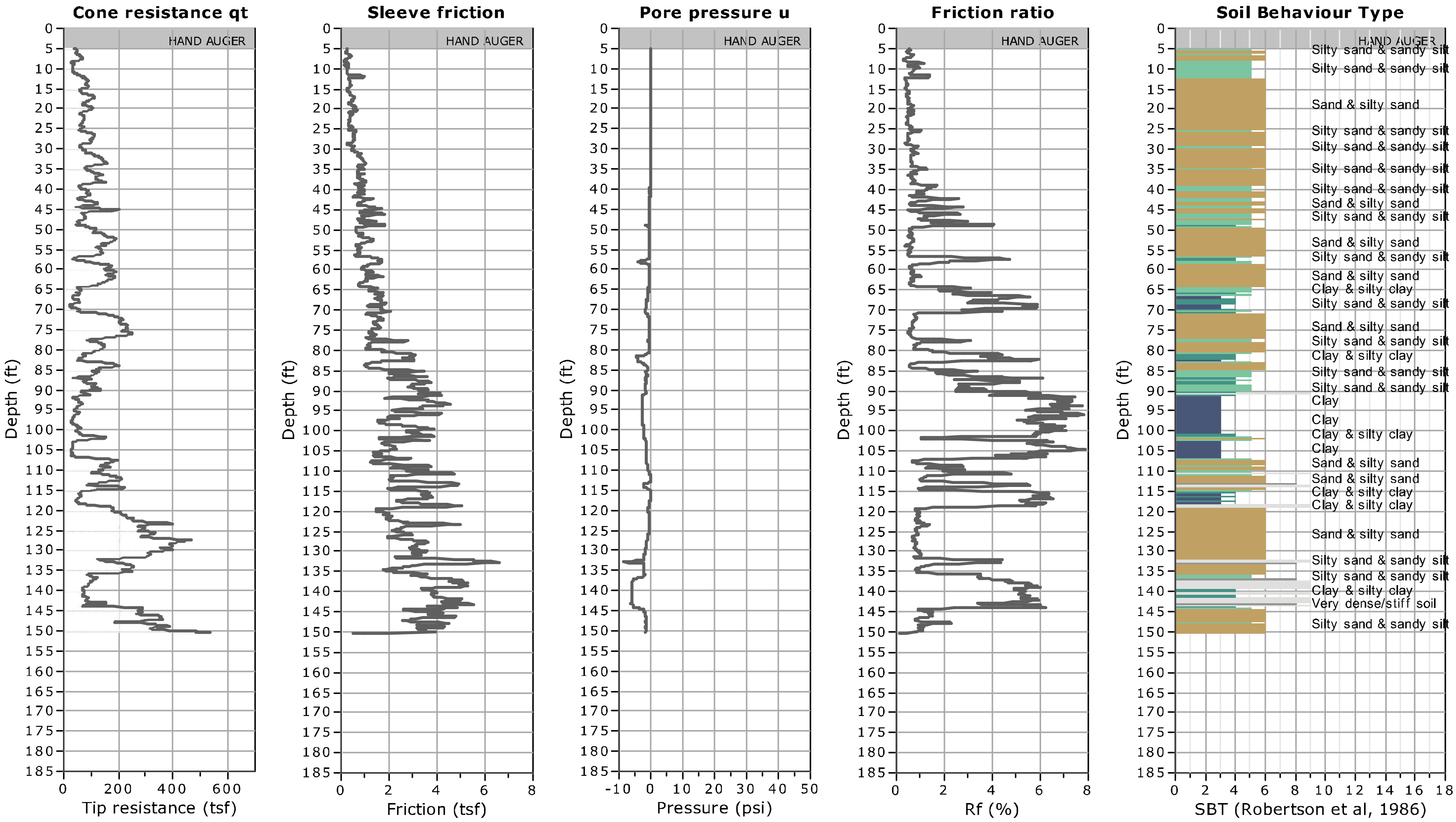
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-6
Total depth: 150.52 ft, Date: 11/4/2013
Cone Type: Vertek



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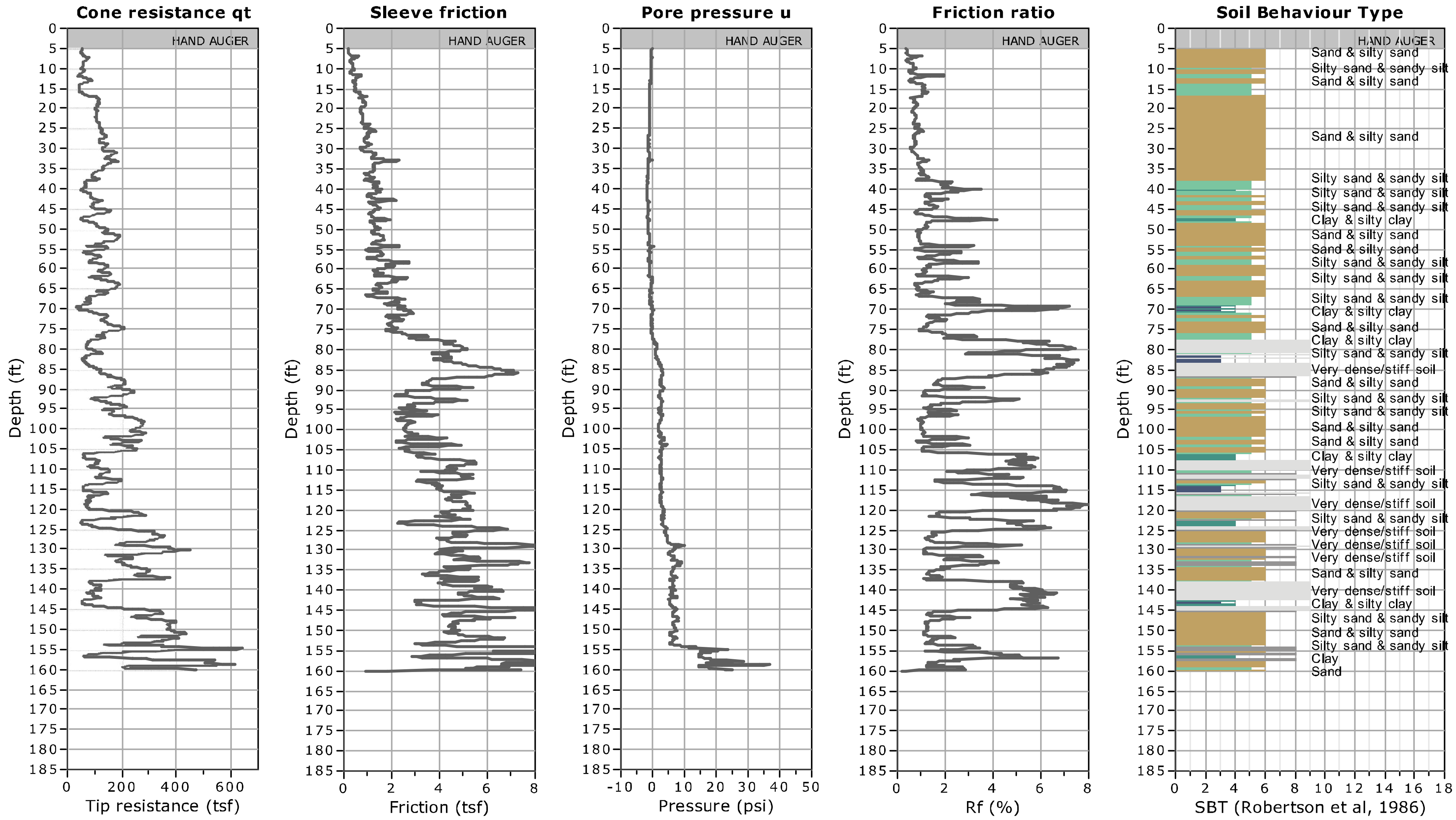
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-7
Total depth: 160.25 ft, Date: 11/14/2013
Cone Type: Vertek



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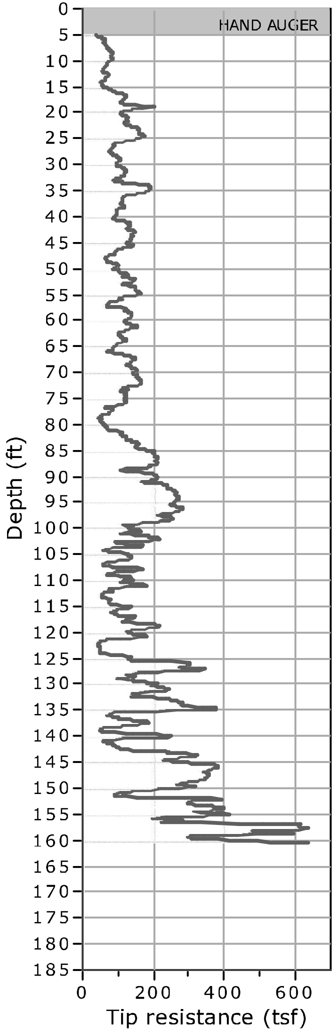
CPT: CPT-8

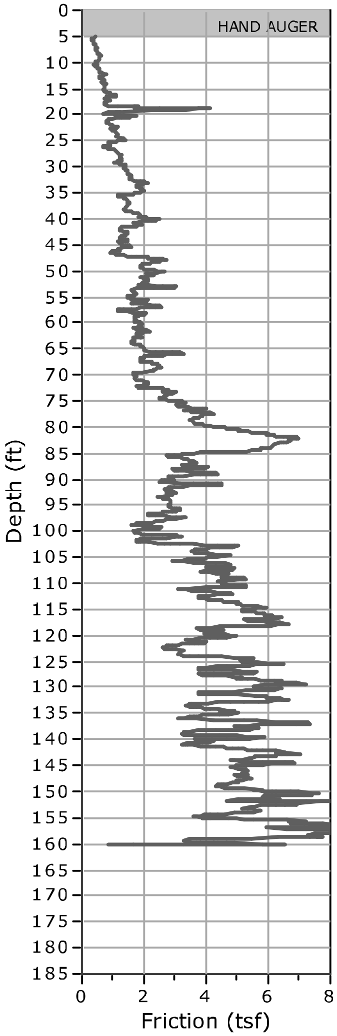
Total depth: 160.41 ft, Date: 11/14/2013
Cone Type: Vertek

Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

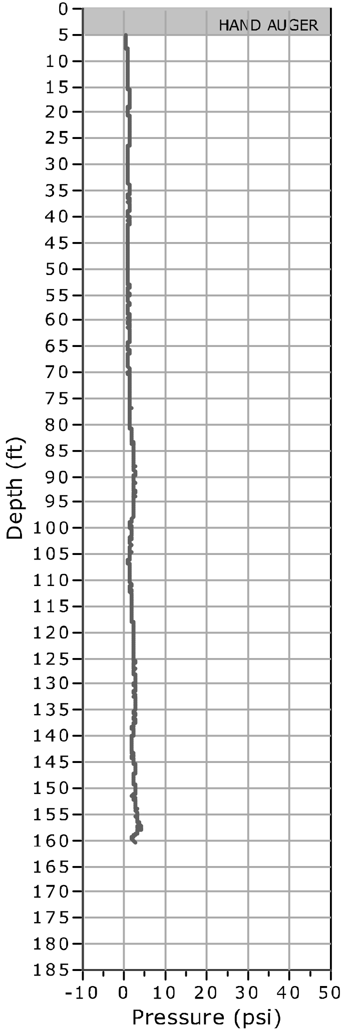
Cone resistance qt



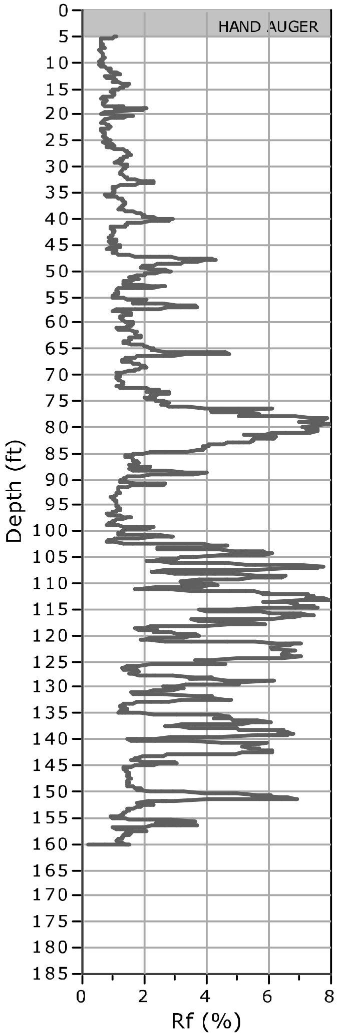
Sleeve friction



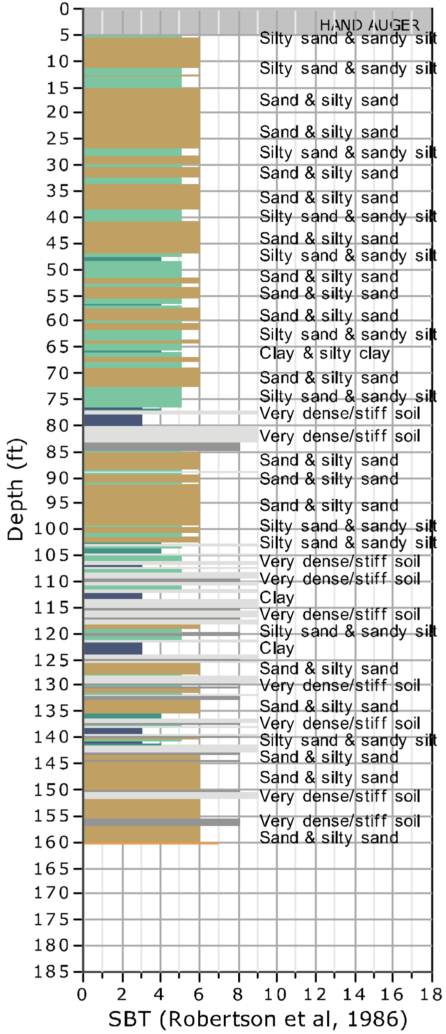
Pore pressure u



Friction ratio



Soil Behaviour Type



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Project file: C:\GolderLosAngeles11-13\CPeT Data\Plot Data\Plots w-ha.cpt

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rich@kehoetesting.com
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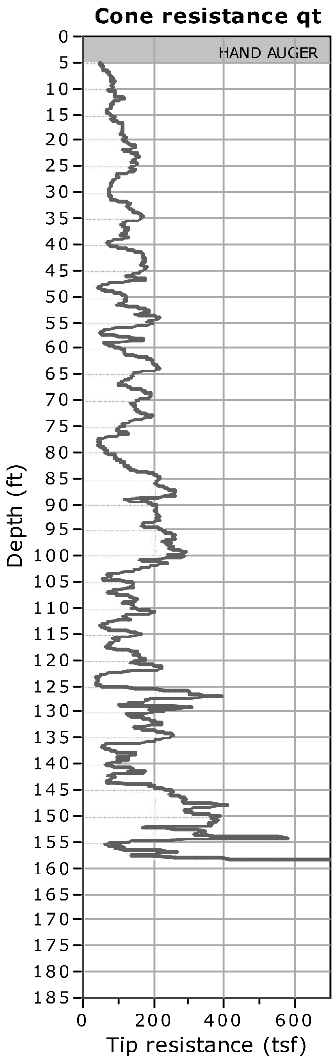
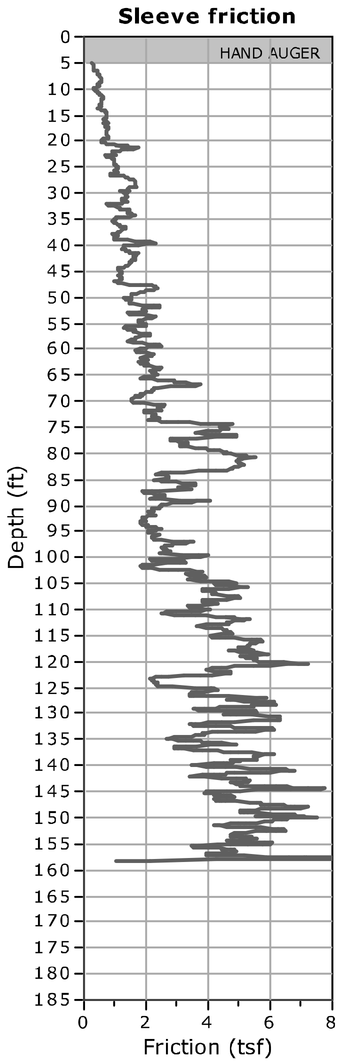
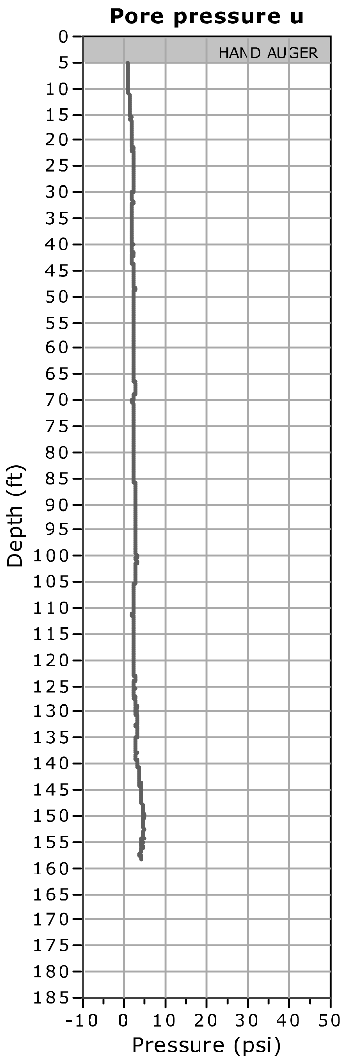
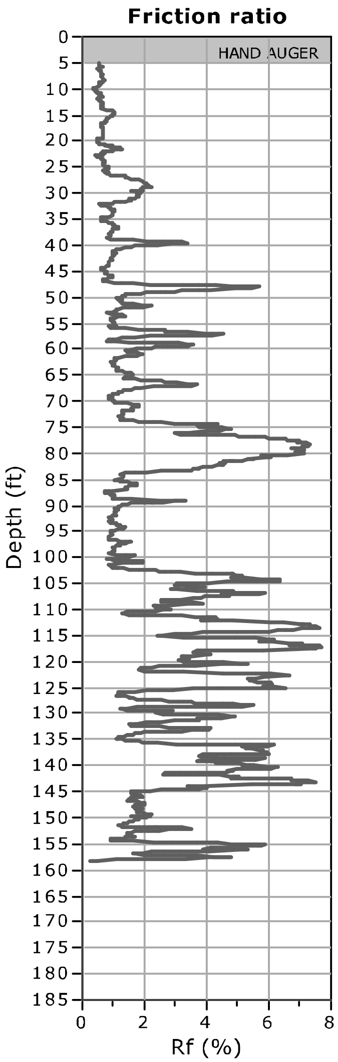
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

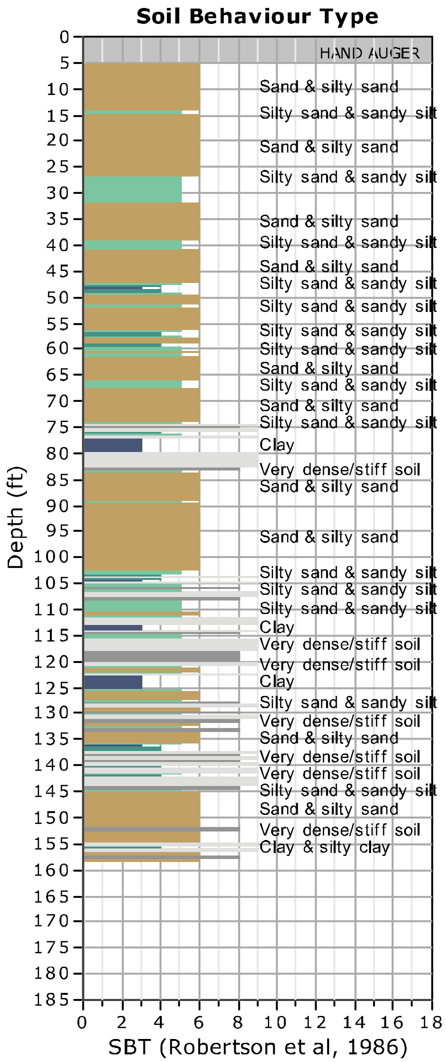
CPT: CPT-9
Total depth: 158.38 ft, Date: 11/14/2013
Cone Type: Vertek


Cone resistance qt


Sleeve friction


Pore pressure u


Friction ratio


Soil Behaviour Type

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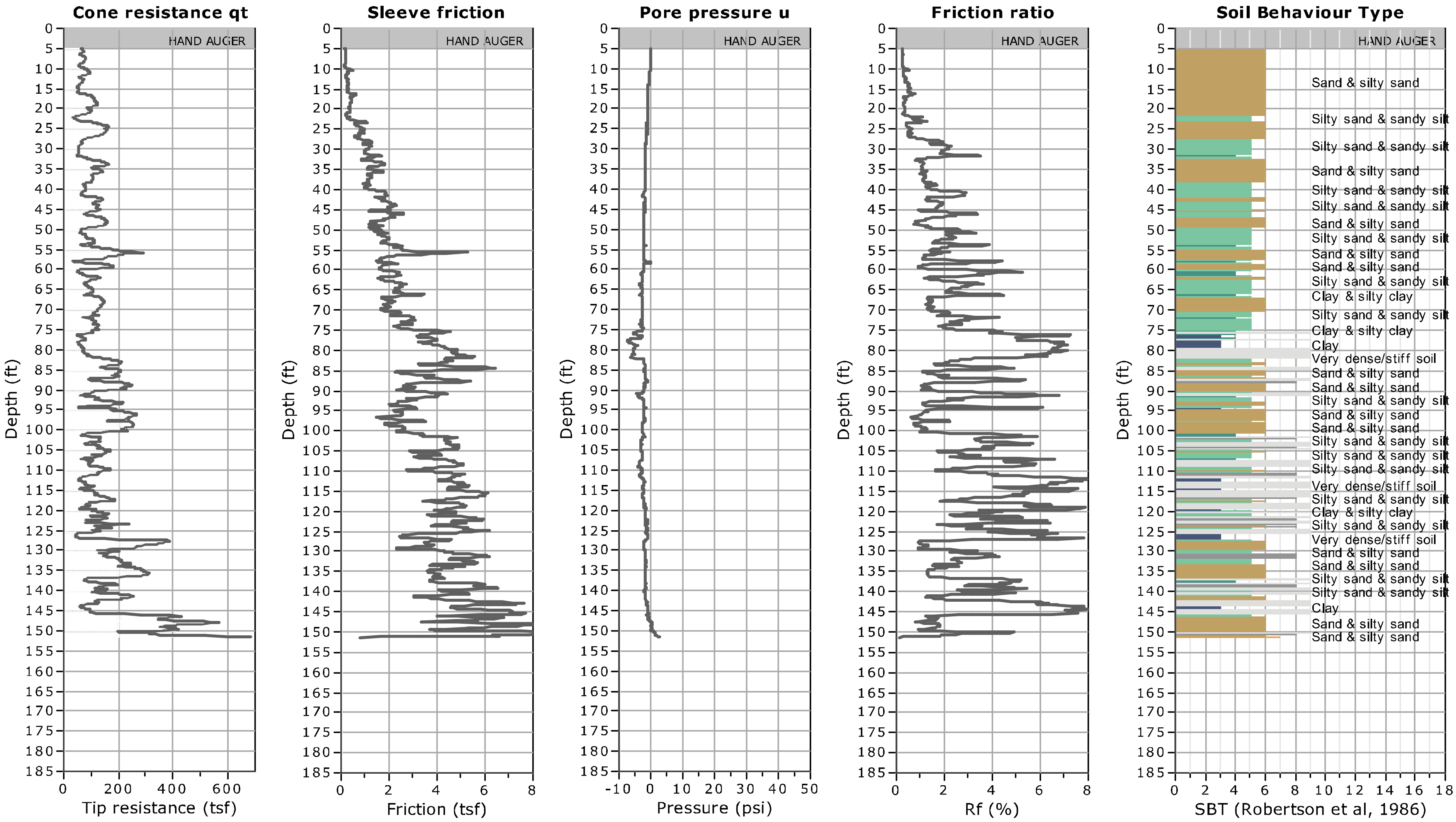
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-10
Total depth: 151.45 ft, Date: 11/15/2013
Cone Type: Vertek



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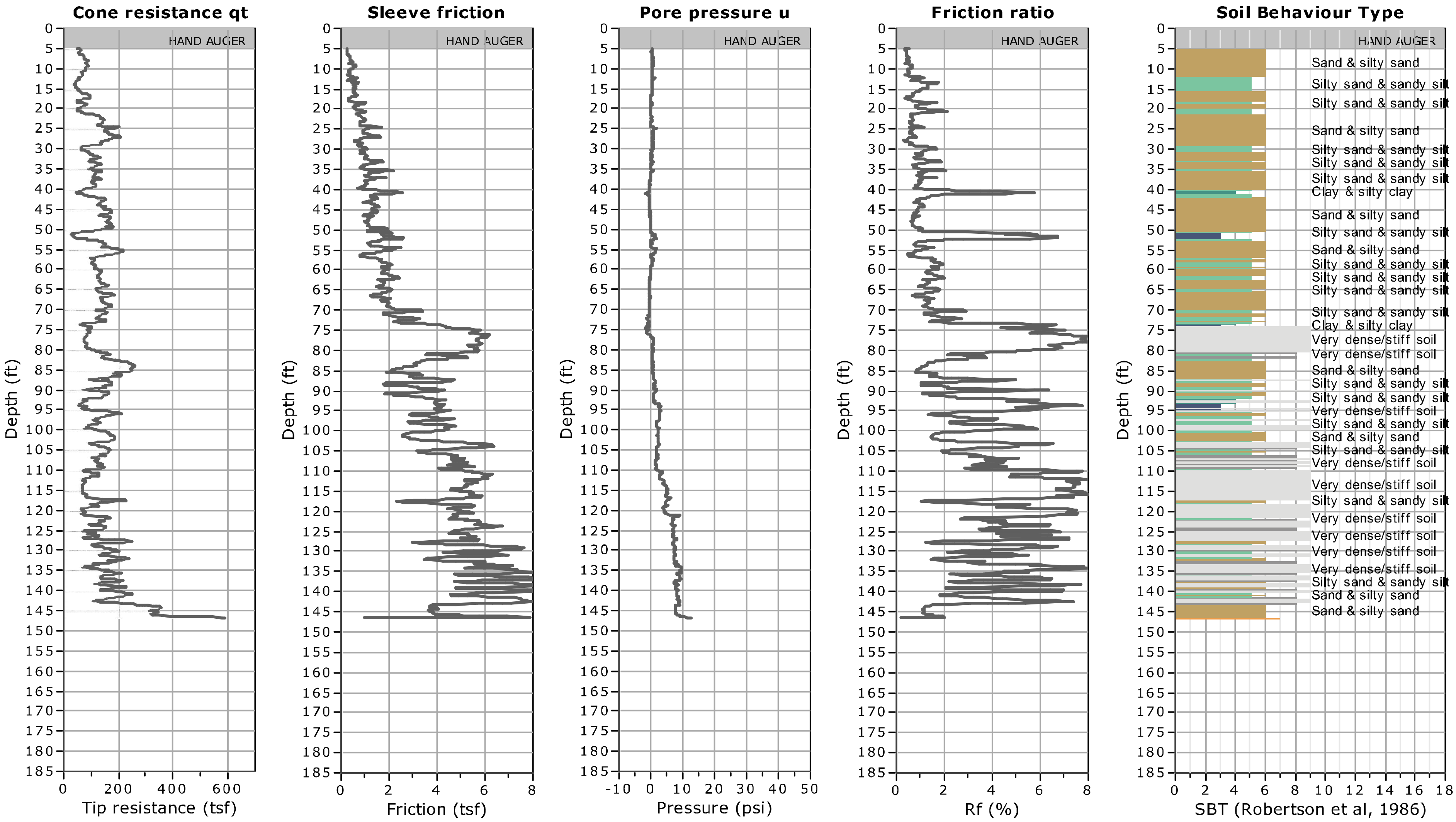
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-11
Total depth: 146.69 ft, Date: 11/18/2013
Cone Type: Vertek



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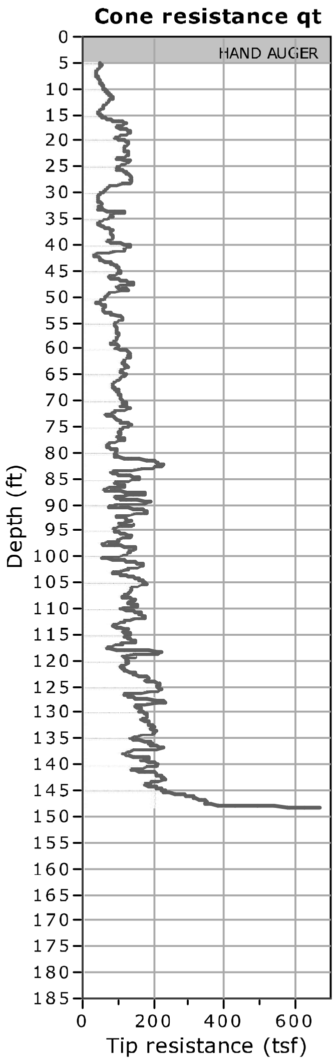
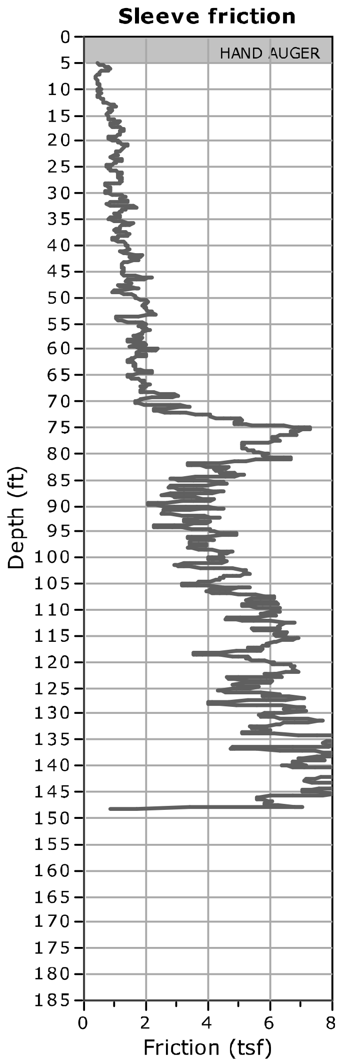
CPT: CPT-12

Total depth: 148.33 ft, Date: 11/15/2013
Cone Type: Vertek

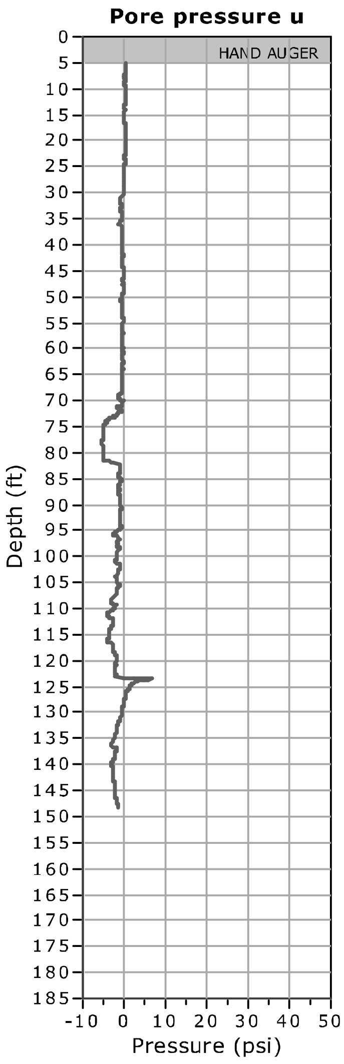
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**



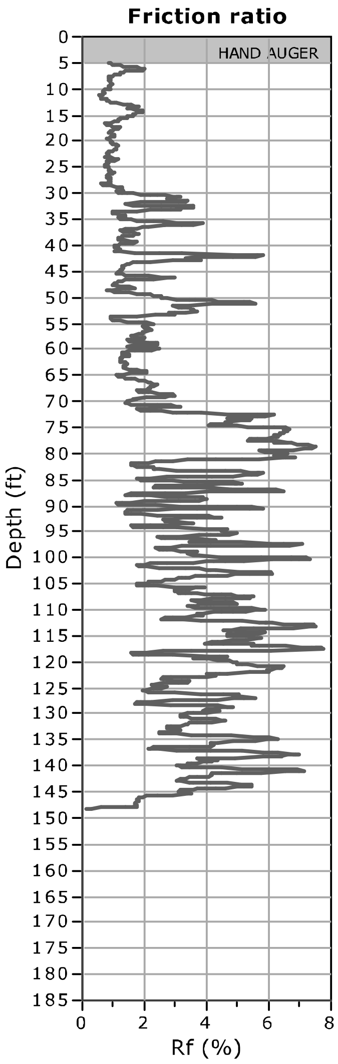
Cone resistance qt



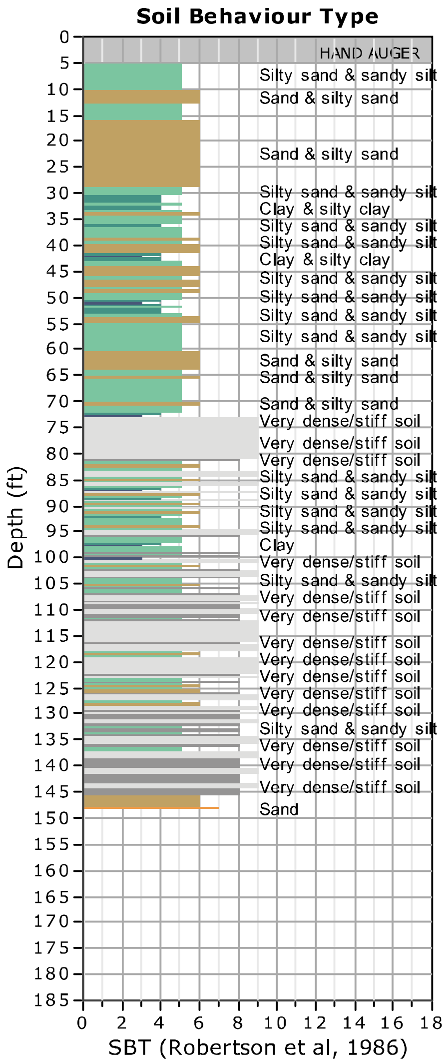
Sleeve friction



Pore pressure u



Friction ratio



Soil Behaviour Type

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rich@kehoetesting.com
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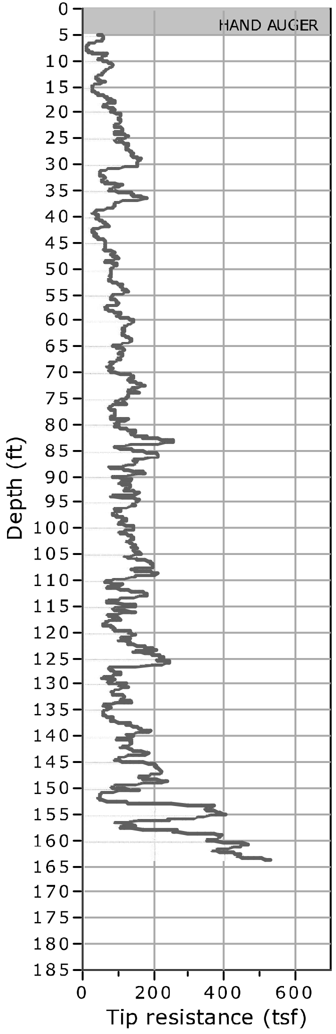
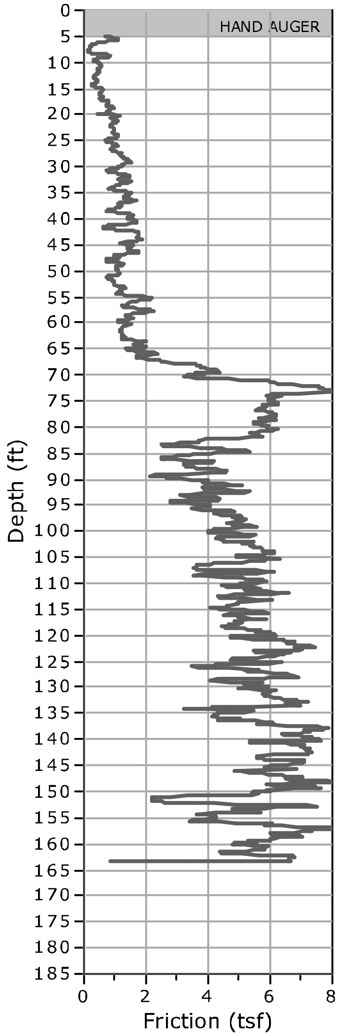
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-13
Total depth: 163.69 ft, Date: 11/15/2013
Cone Type: Vertek

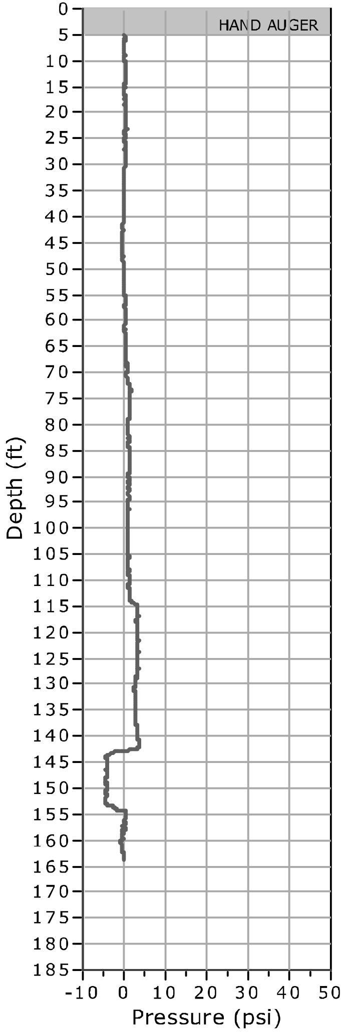
Cone resistance qt



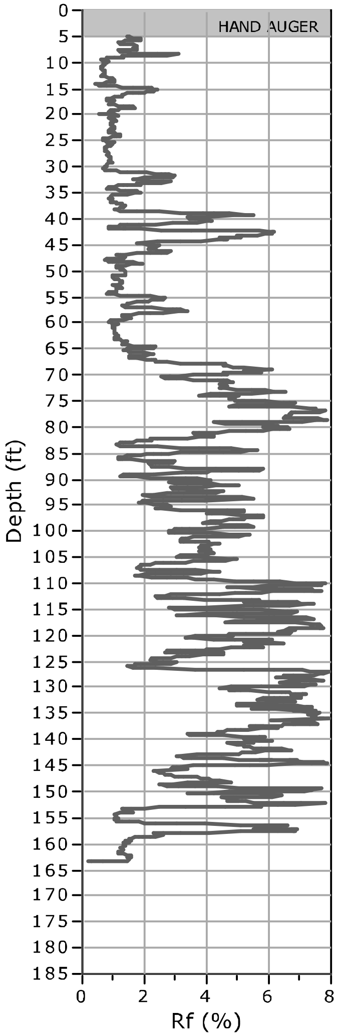
Sleeve friction



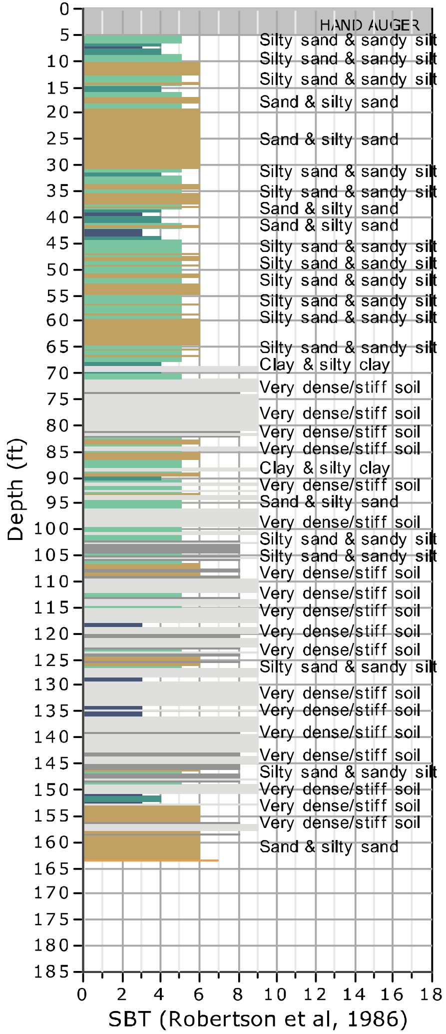
Pore pressure u



Friction ratio



Soil Behaviour Type



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rich@kehoetesting.com
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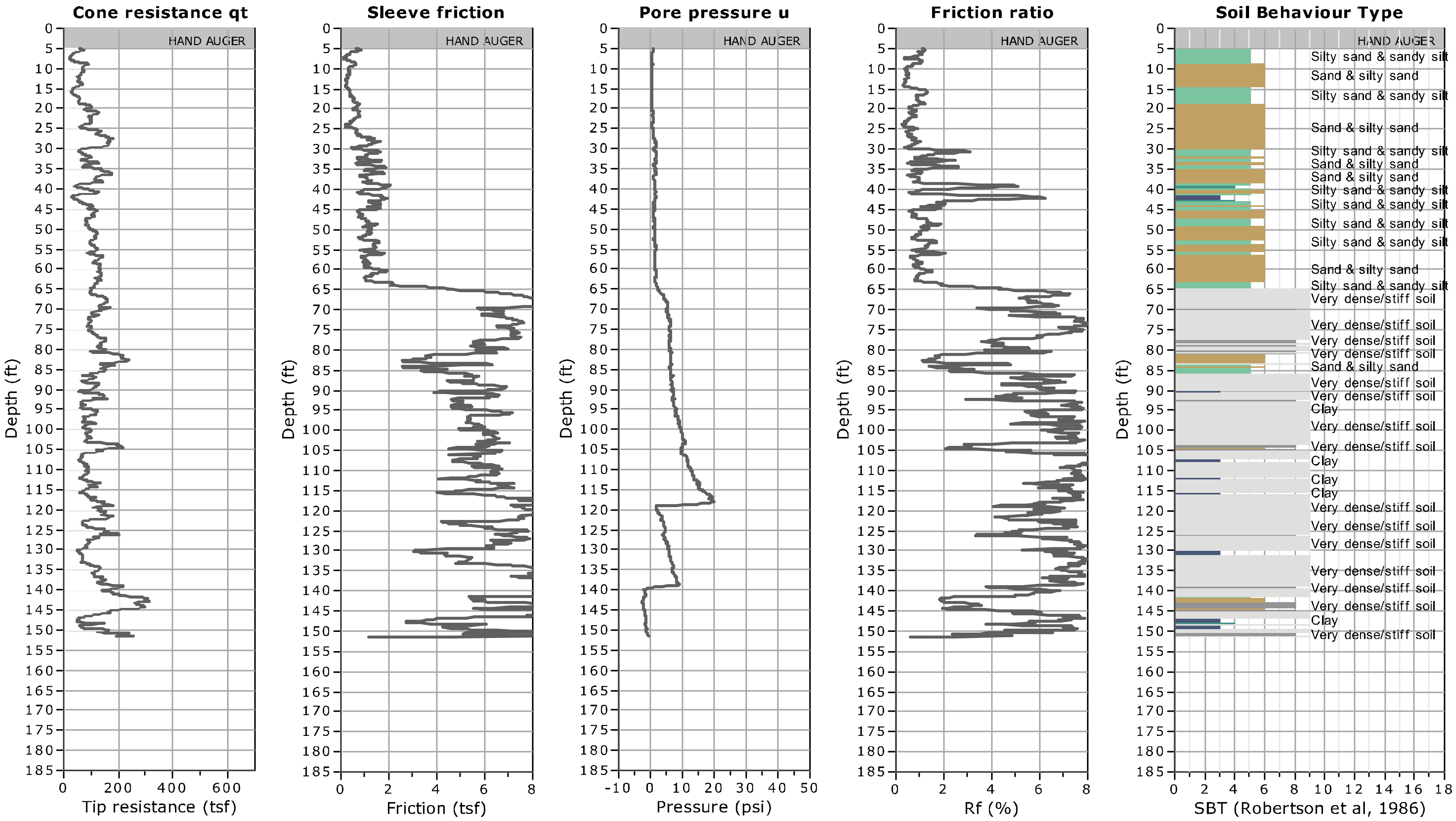
Project: **Golder Associates**
Location: **8150 W. Sunset Blvd. Los Angeles, CA**

CPT: CPT-14
Total depth: 151.63 ft, Date: 11/18/2013
Cone Type: Vertek



APPENDIX C
RADIOCARBON DATING REPORTS (BETA ANALYTIC INC.)

BETA

Consistent Accuracy . . .
. . . Delivered On-time

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305 667 5167
Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

December 16, 2013

Dr. Don Lowry
Golder Associates Inc.
230 Commerce
Suite 200
Irvine, CA 92602
USA

RE: Radiocarbon Dating Results For Samples B-105@69.7-70.0, B-106@45.5-45.7

Dear Dr. Lowry:

Enclosed are the radiocarbon dating results for two samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

The web directory containing the table of results and PDF download also contains pictures including, most importantly the portion actually analyzed. These can be saved by opening them and right clicking. Also a cvs spreadsheet download option is available and a quality assurance report is posted for each set of results. This report contains expected versus measured values for 3-5 working standards analyzed simultaneously with your samples.

All results reported are accredited to ISO-17025 standards and all analyses were performed entirely here in our laboratories. Since Beta is not a teaching laboratory, only graduates trained in accordance with the strict protocols of the ISO-17025 program participated in the analyses. When interpreting the results, please consider any communications you may have had with us regarding the samples.

If you have specific questions about the analyses, please contact us. Your inquiries are always welcome.

The cost of the analysis was charged to the MASTERCARD card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Don Lowry — Report Date: 12/16/2013

Golder Associates Inc. — Material Received: 11/22/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 365558 SAMPLE : B-105@69.7-70.0 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 7820 to 7600 (Cal BP 9770 to 9550)	8710 +/- 40 BP	-24.7 o/oo	8710 +/- 40 BP
Beta - 365559 SAMPLE : B-106@45.5-45.7 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 5320 to 5210 (Cal BP 7270 to 7160)	6260 +/- 40 BP	-23.8 o/oo	6280 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, “present” = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by “*”. The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the “Two Sigma Calibrated Result” for each sample.

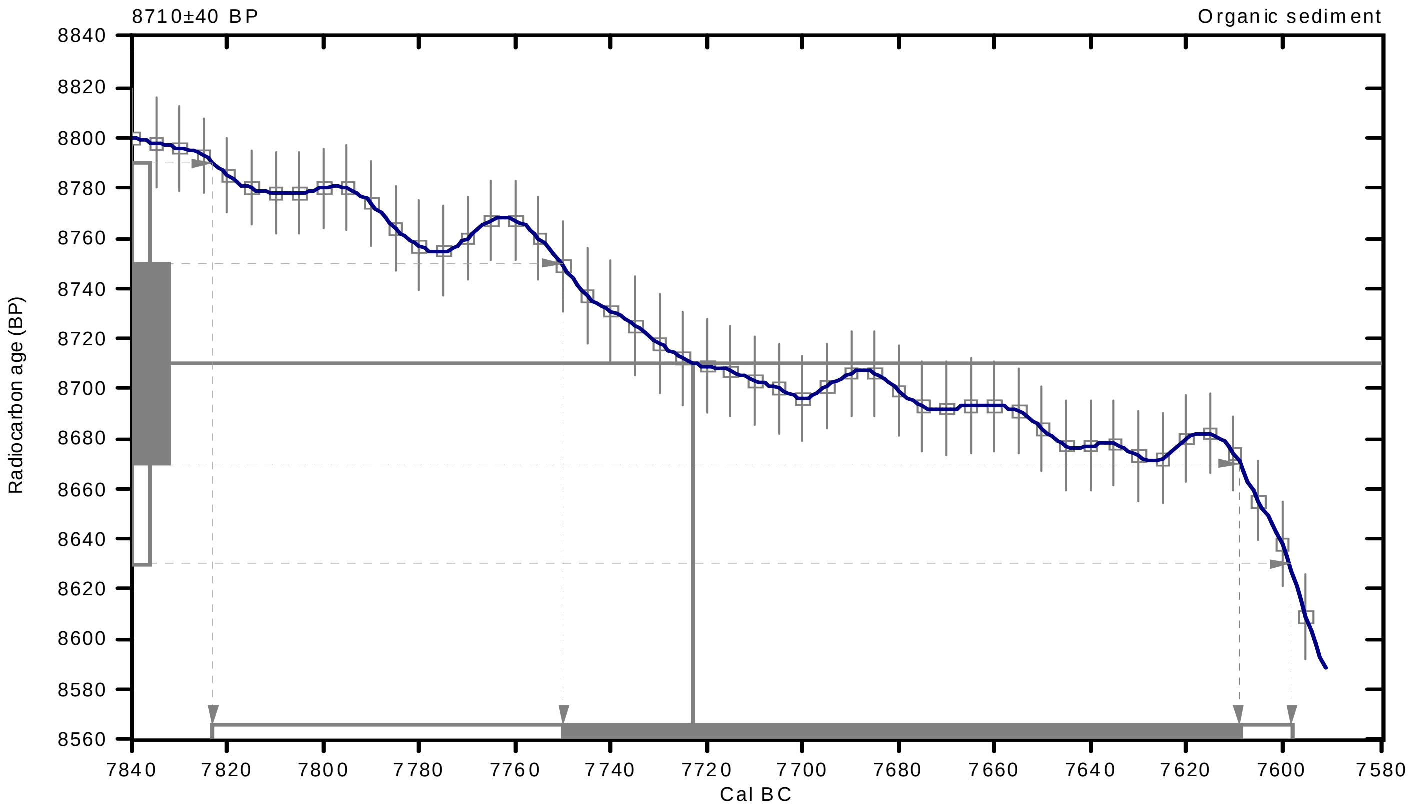
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.7:lab. mult=1)

Laboratory number:	**Beta-365558**
Conventional radiocarbon age:	**8710±40 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 7820 to 7600 (Cal BP 9770 to 9550)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 7720 (Cal BP 9670)
1 Sigma calibrated result: (68% probability)	Cal BC 7750 to 7610 (Cal BP 9700 to 9560)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

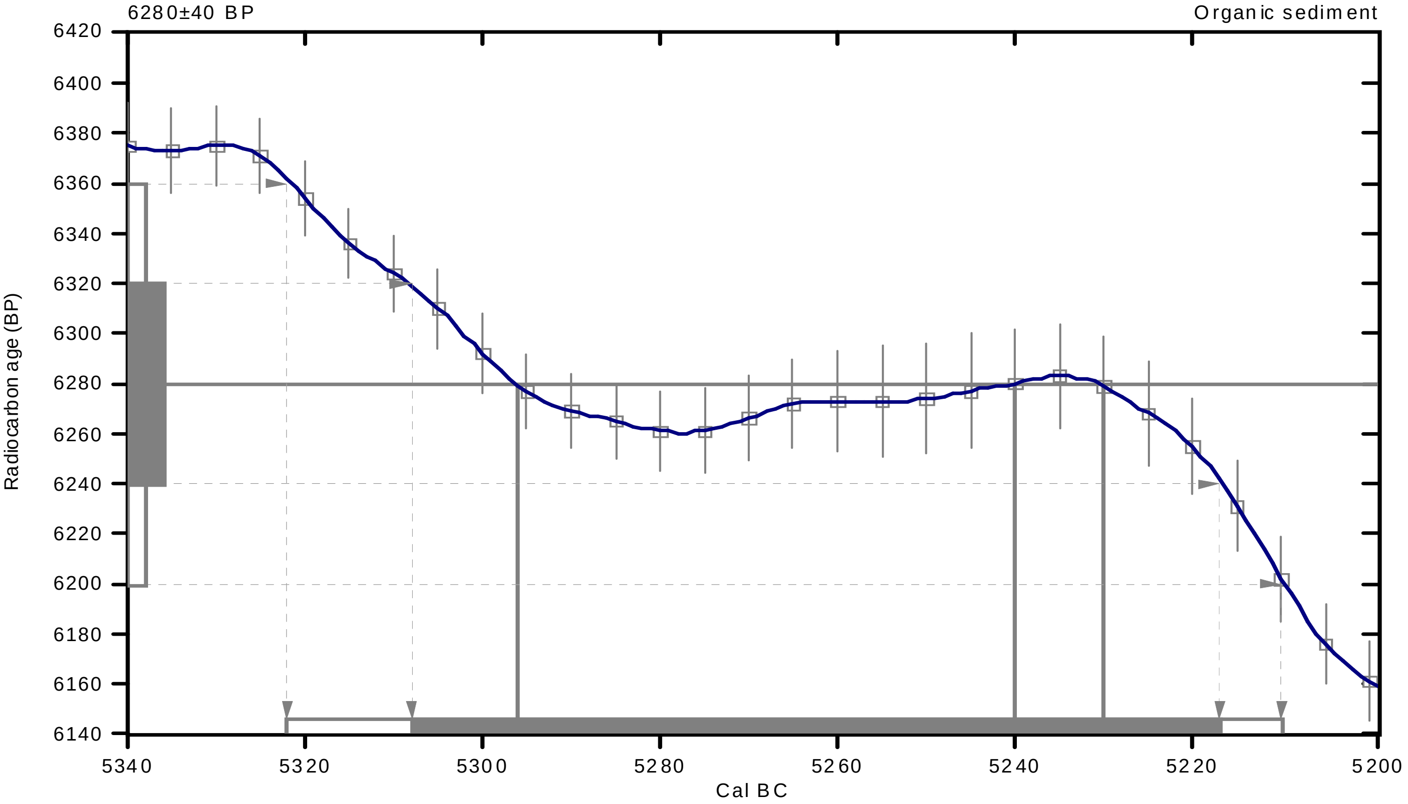
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.8:lab. mult=1)

Laboratory number:	**Beta-365559**
Conventional radiocarbon age:	**6280±40 BP**
2 Sigma calibrated result: (95% probability)	**Cal BC 5320 to 5210 (Cal BP 7270 to 7160)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 5300 (Cal BP 7250) and Cal BC 5240 (Cal BP 7190) and Cal BC 5230 (Cal BP 7180)
1 Sigma calibrated result: (68% probability)	Cal BC 5310 to 5220 (Cal BP 7260 to 7170)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

Beta Analytic Radiocarbon Dating Laboratory

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

November 18, 2013

Dr. Don Lowry
Golder Associates Inc.
230 Commerce
Suite 200
Irvine, CA 92602
USA

RE: Radiocarbon Dating Result For Sample 123-92034.02 CPT-1 @ 119 feet

Dear Dr. Lowry:

Enclosed is the radiocarbon dating result for one sample recently sent to us. It provided plenty of carbon for an accurate measurement and the analysis proceeded normally. The report sheet contains the method used, material type, and applied pretreatments and, where applicable, the two-sigma calendar calibration range.

All results (excluding some inappropriate material types) which are less than about 42,000 years BP and more than about ~250 BP include a calendar calibration page (also digitally available in Windows metafile (.wmf) format upon request). Calibration is calculated using the newest (2009) calibration database with references quoted on the bottom of the page. Multiple probability ranges may appear in some cases, due to short-term variations in the atmospheric 14C contents at certain time periods. Examining the calibration graph will help you understand this phenomenon. Don't hesitate to contact us if you have questions about calibration.

We analyzed this sample on a sole priority basis. No students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analysis. We analyzed it with the combined attention of our entire professional staff.

The cost of the analysis was charged to the MASTERCARD card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Don Lowry — Report Date: 11/18/2013

Golder Associates Inc. — Material Received: 11/12/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 364446	26080 +/- 140 BP	-23.9 o/oo	26100 +/- 140 BP

SAMPLE : 123-92034.02 CPT-1 @ 119 feet
ANALYSIS : AMS-PRIORITY delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 29110 to 28640 (Cal BP 31060 to 30590)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.9:lab. mult=1)

Laboratory number: **Beta-364446**

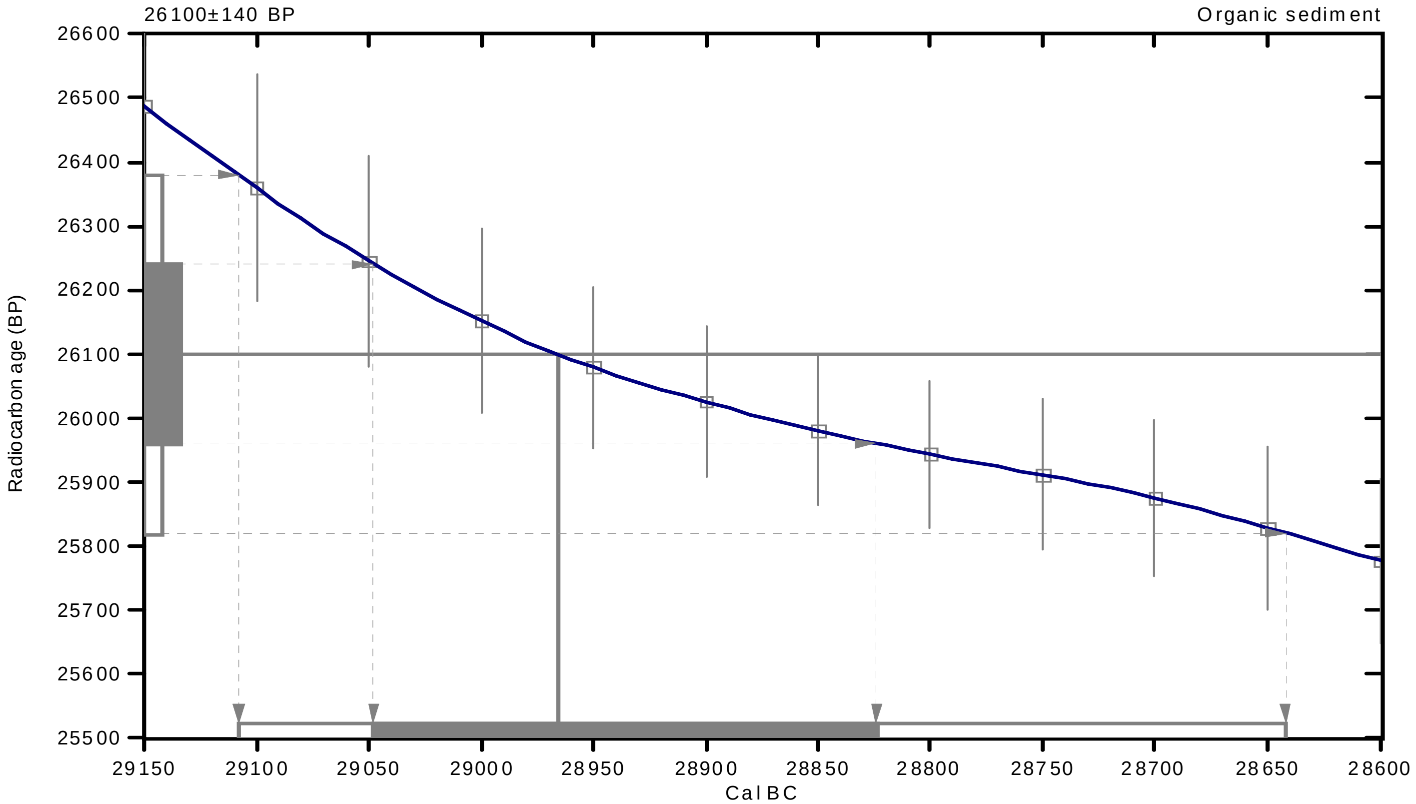
Conventional radiocarbon age: **26100±140 BP**

2 Sigma calibrated result: **Cal BC 29110 to 28640 (Cal BP 31060 to 30590)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 28970 (Cal BP 30920)

1 Sigma calibrated result: Cal BC 29050 to 28820 (Cal BP 31000 to 30770)
(68% probability)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

December 16, 2013

Dr. Don Lowry
Golder Associates Inc.
230 Commerce
Suite 200
Irvine, CA 92602
USA

RE: Radiocarbon Dating Results For Samples B-105@69.7-70.0, B-106@45.5-45.7

Dear Dr. Lowry:

Enclosed are the radiocarbon dating results for two samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

The web directory containing the table of results and PDF download also contains pictures including, most importantly the portion actually analyzed. These can be saved by opening them and right clicking. Also a cvs spreadsheet download option is available and a quality assurance report is posted for each set of results. This report contains expected versus measured values for 3-5 working standards analyzed simultaneously with your samples.

All results reported are accredited to ISO-17025 standards and all analyses were performed entirely here in our laboratories. Since Beta is not a teaching laboratory, only graduates trained in accordance with the strict protocols of the ISO-17025 program participated in the analyses. When interpreting the results, please consider any communications you may have had with us regarding the samples.

If you have specific questions about the analyses, please contact us. Your inquiries are always welcome.

The cost of the analysis was charged to the MASTERCARD card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Don Lowry

Report Date: 12/16/2013

Golder Associates Inc.

Material Received: 11/22/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 365558 SAMPLE : B-105@69.7-70.0 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 7820 to 7600 (Cal BP 9770 to 9550)	8710 +/- 40 BP	-24.7 o/oo	8710 +/- 40 BP
Beta - 365559 SAMPLE : B-106@45.5-45.7 ANALYSIS : AMS-Standard delivery MATERIAL/PRETREATMENT : (organic sediment): acid washes 2 SIGMA CALIBRATION : Cal BC 5320 to 5210 (Cal BP 7270 to 7160)	6260 +/- 40 BP	-23.8 o/oo	6280 +/- 40 BP

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

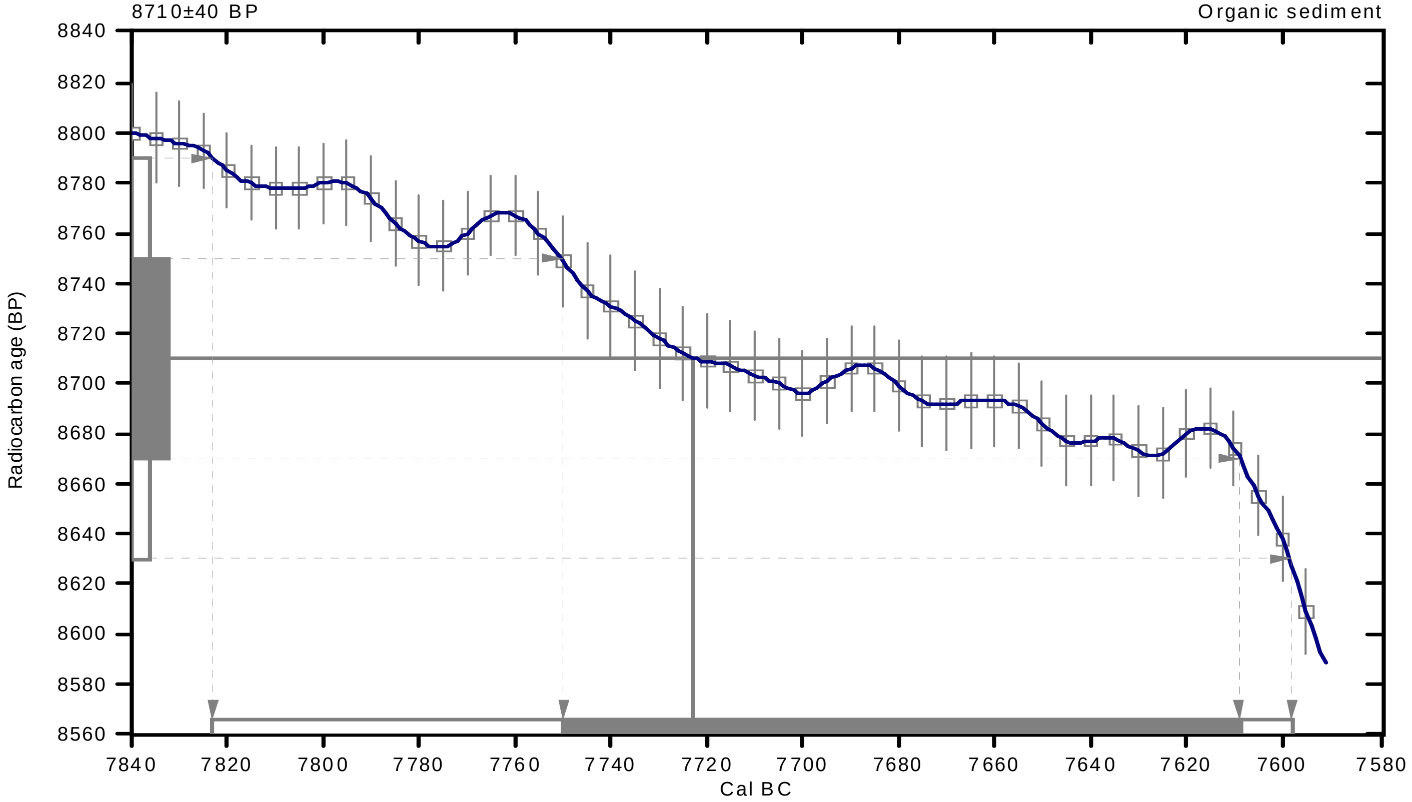
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.7:lab. mult=1)

Laboratory number:	**Beta-365558**
Conventional radiocarbon age:	**8710±40 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 7820 to 7600 (Cal BP 9770 to 9550)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 7720 (Cal BP 9670)
1 Sigma calibrated result: (68% probability)	Cal BC 7750 to 7610 (Cal BP 9700 to 9560)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

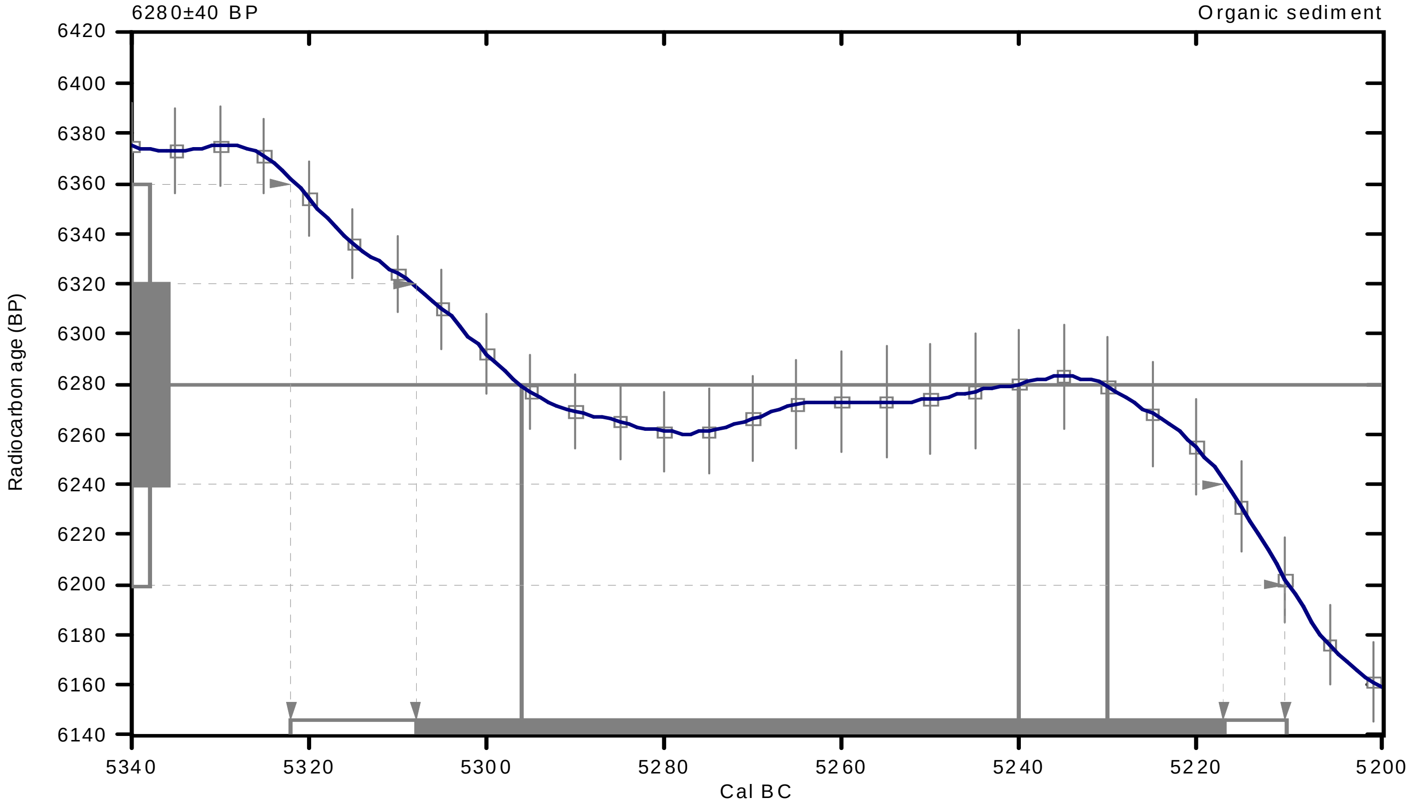
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.8:lab. mult=1)

Laboratory number:	**Beta-365559**
Conventional radiocarbon age:	**6280±40 BP**
2 Sigma calibrated result: **(95% probability)**	**Cal BC 5320 to 5210 (Cal BP 7270 to 7160)**

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal BC 5300 (Cal BP 7250) and Cal BC 5240 (Cal BP 7190) and Cal BC 5230 (Cal BP 7180)
1 Sigma calibrated result: (68% probability)	Cal BC 5310 to 5220 (Cal BP 7260 to 7170)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

December 19, 2013

Dr. Don Lowry
Golder Associates Inc.
230 Commerce
Suite 200
Irvine, CA 92602
USA

RE: Radiocarbon Dating Result For Sample B-106@65.1-65.5

Dear Dr. Lowry:

Enclosed is the radiocarbon dating result for one sample recently sent to us. The sample provided plenty of carbon for accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

The web directory containing the table of all your results and PDF download also contains pictures including, most importantly the portion actually analyzed. These can be saved by opening them and right clicking. Also a cvs spreadsheet download option is available and a quality assurance report is posted for each set of results. This report contains expected versus measured values for 3-5 working standards analyzed simultaneously with your sample.

The reported result is accredited to ISO-17025 standards and the analysis was performed entirely here in our laboratories. Since Beta is not a teaching laboratory, only graduates trained in accordance with the strict protocols of the ISO-17025 program participated in the analyses. When interpreting the result, please consider any communications you may have had with us regarding the sample.

If you have specific questions about the analyses, please contact us. Your inquiries are always welcome.

The cost of the analysis was charged to the MASTERCARD card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood

Digital signature on file

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Don Lowry | Report Date: 12/19/2013

Golder Associates Inc. | Material Received: 11/22/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 365560	11080 +/- 40 BP	-22.5 o/oo	11120 +/- 40 BP

SAMPLE : B-106@65.1-65.5
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 11160 to 10960 (Cal BP 13110 to 12920)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22.5:lab. mult=1)

Laboratory number: **Beta-365560**

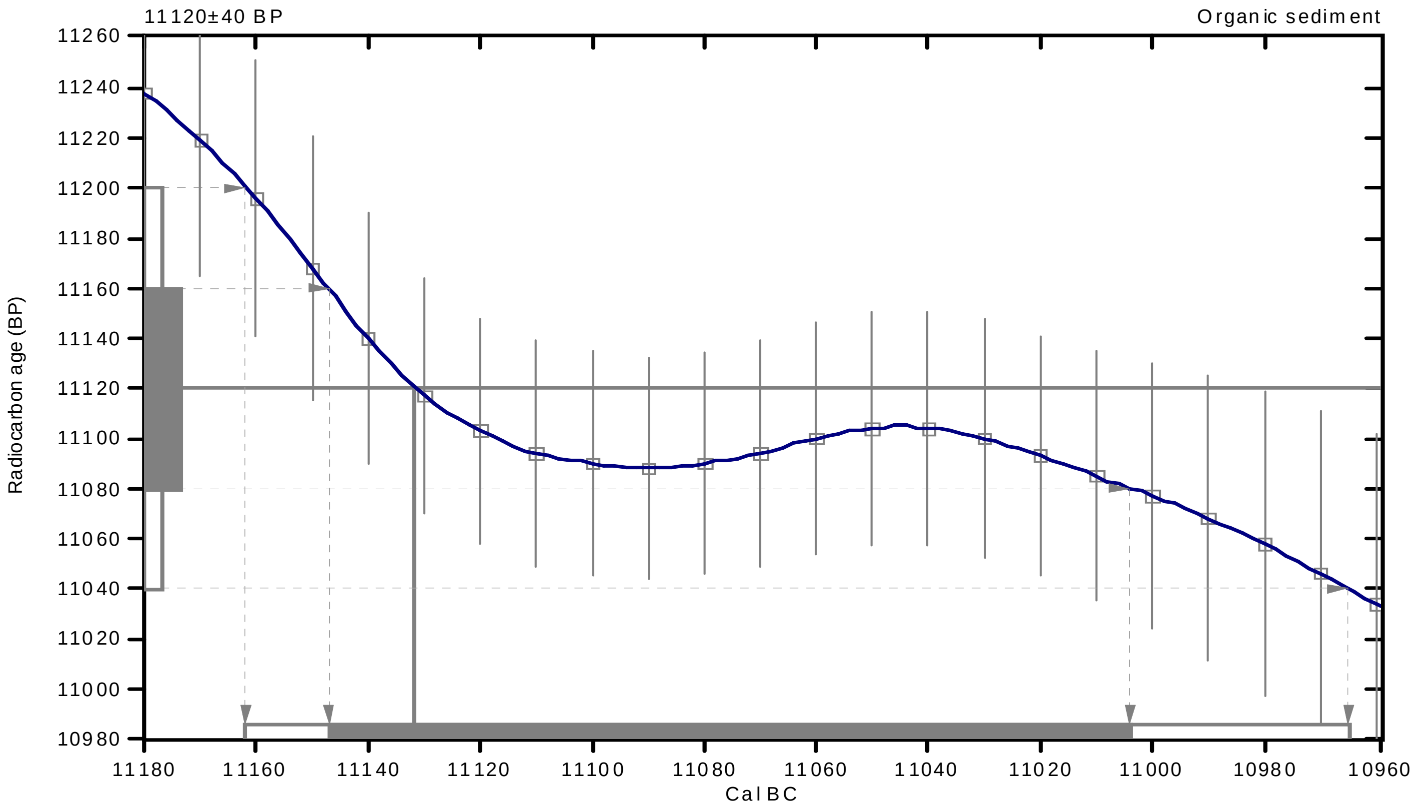
Conventional radiocarbon age: **11120±40 BP**

2 Sigma calibrated result: **Cal BC 11160 to 10960 (Cal BP 13110 to 12920)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 11130 (Cal BP 13080)

1 Sigma calibrated result: Cal BC 11150 to 11000 (Cal BP 13100 to 12950)
(68% probability)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322