Appendix E

Geology and Soils

Appendix E.1

Geotechnical Investigation

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S & R Partners

Subject: Geotechnical Engineering Evaluation
Buena Vista Project
1251 North Spring Street and 1030–1380 North Broadway
Los Angeles California

Ladies and Gentlemen:

This letter transmits the Geotechnical Engineering Evaluation for the subject site prepared by Geotechnologies, Inc. This report is intended to provide geotechnical data to assist in the preparation of an environmental impact report.

The subsurface conditions described herein have been projected from limited subsurface exploration and laboratory testing. The exploration and testing presented in this report should in no way be construed to reflect any variations which may occur between the exploration locations, or which may result from changes in subsurface conditions.

Should you have any questions please contact this office.

Respectfully submitted,
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GEOTECHNICAL ENGINEERING EVALUATION
PROPOSED MIXED-USE DEVELOPMENT
1251 NORTH SPRING STREET AND 1030-1380 NORTH BROADWAY
LOS ANGELES, CALIFORNIA

INTRODUCTION

This report presents the results of the geotechnical engineering evaluation performed on the subject site. The purpose of this evaluation was to identify the distribution and engineering properties of the geologic materials underlying the site, and to provide geotechnical data for the preparation of an environmental impact report.

This evaluation included 43 geotechnical excavations, collection of representative samples, laboratory testing, engineering analysis, review of published geologic data and the preparation of this report. The exploratory excavation locations are shown on the enclosed Plot Plan. The results of the exploration and the laboratory testing are presented in the Appendix of this report.

SITE CONDITIONS

The site is located in the vicinity of 1251 North Spring Street and 1030-1380 North Broadway, in the City of Los Angeles, California. The site is bounded by North Broadway to the northwest, Metro rail tracks to the southeast, and commercial buildings with paved parking to the west. The site can be described as a broad and narrow bowtie-shaped area. It is over 0.7 mile in length and approximately 7.87 acres in area. The site is shown relative to nearby topographic features on the attached Vicinity Map. The attached Plot Plan shows the site layout relative to property lines. Due to the range of topographic and geologic conditions, the site has been split into South Parcel and North Parcel for purposes of this report.

South Parcel

The South Parcel of the bowtie-shaped site terminates near the extension of Bishops Road. The South Parcel is widest at its southern end and narrows to the north. The ground surface descends to the southeast from elevation 330 feet along North Broadway, to 291 feet at the southern corner adjacent to the Metro easement, for a total elevation difference of 39 feet. The South Parcel is largely paved and partially developed with structures associated with transportation operations and maintenance-related facilities including 12,800 square-foot one-story metal auto repair building, as well as an approximately 2,132 square foot addition to the rear of an existing off-site restaurant and associated parking.

North Parcel

The North Parcel is widest at its northern end and narrows to the south. The ground surface descends to the south from elevation 348 feet along North Broadway, to 301 feet at the Metro easement, for a total elevation difference of 47 feet. A south to north descending, unpaved, access road connects the terrace at the North Broadway elevation to the Metro easement elevation. The terrace area is currently used for staging of construction equipment and bus parking. The North Parcel includes foundation remnants and graded areas.

PROPOSED DEVELOPMENT

It is the understanding of this office that the Project proposes a mixed-use residential and commercial development on an approximately 7.87-acre site within the Central City North Community Plan area of the City. The Project would construct up to 986 residential units including 200 affordable units, approximately 15,000 square feet of retail uses; 23,800 square feet of restaurant uses, and 116,610 square feet of overhang areas (trellis, circulation, and balconies). In total, the Project would include up to 1,245,536 square feet of floor area on a 342,678-square-foot Project Site.

The Project would include the subdivision of a curvilinear shaped Project Site that runs parallel to the Metro A Line tracks and the Los Angeles State Historic Park that are located generally to the southeast, and North Broadway that is located generally to the northwest, into two master lots as well as air space lots, herein referred to as the South Parcel and the North Parcel. The South Parcel would be developed with a 6-story podium connecting two buildings, Building 1, a 26-story building up to 343 feet 8 inches in height, and Building 2, a 22-story building up to 301 feet in height. The North Parcel would be developed with a 2-story podium connecting two buildings, the North Building, a 15-story building up to 209 feet 4 inches, and the Courtyard Building, a 6-story building up to 108 feet 8 inches in height. Additionally, the North Parcel would also include the Retail Block Building, a 3-story building up to 72 feet 4 inches in height. Further, the Project would include a 3-level partial subterranean garage on the South Parcel, and a 3-level partial subterranean parking garage on the North Parcel.

Construction of the Project would be phased, with development of the South Parcel occurring as Phase 1 and development of the North Parcel occurring as Phase 2. Phase 2 would be anticipated to begin after completion of Phase 1. Construction of each phase of the Project would commence with demolition of the existing structures to be removed, which would be followed by grading and excavation for the parking garage and footings, which would extend to a maximum depth of approximately 51 feet below ground surface for the South Parcel and 49 feet below ground surface for the North Parcel. Building foundations would then be laid, followed by building construction, paving/concrete installation, and landscape installation.

Based on the most recent plans provided to this office, the base of the lowest parking levels is expected to be at Elevation 285 for the South Parcel and Elevation 307 for the North Parcel. Due to the sloping nature of the site, maximum excavation heights on the order of 45 to 51 feet could be expected.

Any changes in the design of the project or location of any structure, as outlined in this report, should be reviewed by this office. A design-level geotechnical investigation will be required prior to submission of the project for building permit purposes.

LOCAL GEOLOGY

The site is located in the Elysian Park Hills which form the northeast border of the Los Angeles Basin. The Elysian Park Hills are composed primarily of upper Miocene and Pliocene-age sedimentary rocks. The site is underlain by the upper Puente Formation that is composed of well bedded siltstone, clayey siltstone, and sandstone. Structurally, the Elysian Park Hills are located on the southern limb of the Elysian Park Anticline. Bedding in the site vicinity dips to the south and southwest at inclinations of 40 to 55 degrees (Lamar, 1970 and Dibblee, 1989). The geology of the site vicinity is presented on the Local Geologic Map-Lamar included in this report.

The Los Angeles River is located approximately 600 feet to the east of the site. Currently the river is constrained by a concrete walled channel. Prehistorically, the Los Angeles River meandered between the Elysian Park Hills on the west and the Repetto Hills on the east. An ancient meander edge was likely defined by North Broadway. The Los Angeles River is the source for the alluvium that underlies the site.

Three small canyons drain from the Elysian Park Hills, (on the west) into the Los Angeles River (to the east). The thalweg of one canyon is defined by Solano Avenue which is located near the center of the North Parcel. Another canyon thalweg is defined by Bishops Road, located near the center of the South Parcel. The third thalweg is at the southern edge of the South Parcel aligned with Bamboo Lane. The significance of these cross-cutting, drainage channels is that a greater depth to bedrock may occur and may be the location of water seepage into the proposed excavations.

Local Unnamed Faults

Geologic mapping by Yerkes, et. al. (1977) indicates two unnamed faults cross the site. The faults are queried indicating the locations are doubtful. The geologic maps by Lamar, (1970) and Dibblee (1989) do not show these faults. Evidence of faulting was not observed during geotechnical exploration. If these faults exist, they are not considered active and therefore are not considered a seismic risk to the site. The unnamed faults are shown on the attached Local Geologic Map-Yerkes.

PREVIOUS WORK

This firm has prepared Geotechnical Engineering Investigations for the site dated November 29, 2007 (File Number 19557) and July 8, 2015 (File Number 20921). The site was explored on October 15 through 18, 2007 by drilling 24 exploratory borings with the aid of a truck-mounted drilling machine using 8-inch diameter hollowstem augers and a 24-inch diameter bucket auger. The borings varied in depth from 11 to 70 feet. The boring locations are shown on the Plot Plan and the Geologic Map. The geologic materials encountered are logged on Plates A-1 through A-24. The boring logs and laboratory results are included in the Appendix. Additional exploration was prosecuted on the site in 2015. At that time three additional borings and four test pits were excavated to depths between 8 and 70 feet below site grades. The geologic materials encountered are logged on Plates A-25 through A-28. No borings were drilled within the Metro easement either in 2007 or 2015. Some of the data generated for those reports is incorporated into this report.

Most recently this office drilled 4 additional borings. These borings were dilled between July 30 and August 2, 2024. Furthermore, 7 cone penetration soundings (CPTs) were advanced on July 30, 2024.

GEOLOGIC MATERIALS

The geologic materials underlying the site include fill soils, alluvium, and sedimentary bedrock of the Puente Formation. The areal distribution of the geologic materials is shown on the attached Geologic Map while the subsurface distribution is shown on Cross Sections A-A', B-B', and C-C'. The materials are discussed in the following paragraphs.

Fill Soils

Fill soils consist of silty sand and some brick fragments. The fill is generally dark brown, reddish brown to light gray in color, dense to moderately dense, and moist. The fill was likely generated during construction or widening of North Broadway. On the South Parcel of the site, the fill thickness is relatively consistent, varying from 2 to 8 feet. On the North Parcel, the fill varies in thickness from ½ to 30 feet. The fill on the North Parcel was deepest near the intersection of Solano Street and North Broadway, on the unpaved terrace. Two of the geotechnical excavations were terminated due to obstructions within the fill materials and the base of the fill could not be established.

Alluvium

The alluvium consists primarily of sand and gravelly sand; however, silty sand and clayey sand were also encountered. The alluvium ranges in color from dark brown to yellowish brown and grayish brown. The alluvium is also dense to very dense, and moist to wet. It is likely that the alluvium was deposited in the Holocene Epoch.

On the southern parcel the base the alluvial materials were not encountered. Two borings were drilled on the South Parcel to a depth of 70 feet (equivalent to elevation 223) and did not encounter the base of the alluvial soils. On the North Parcel, the alluvium ranged in thickness from 0 to a

maximum encountered depth of 37.5 feet. Thicker accumulations of alluvium can be expected across from the former southeast draining canyons, across from Solano Avenue which is located near the center of the North Parcel, Bishops Road, located near the center of the Southern Parcel, and at the southern edge of the South Parcel aligned with Bamboo Lane.

Bedrock (Puente Formation)

Sedimentary bedrock of the Puente Formation consists of interbedded sandstone, siltstone, and minor quantities of claystone. The bedrock is yellowish brown, yellow, olive brown and gray in color. The rock is moist and moderately hard to hard. The rock is well bedded, however near the surface, the bedding is obscured by weathering. As observed in the borings, bedding dips to the southwest from 42 to 65 degrees. This dip is consistent with the attitudes shown on the attached Local Geologic Map-Lamar. Bedding could be unsupported on cuts along North Broadway on the Northern Parcel. Fracturing and joints in the rock were not found to be common.

Groundwater

Groundwater was encountered in Borings 3, 6, 25, 28, 29, 30, and 31 (which are located in the South Parcel) at depths ranging between 23 and 31 feet. These depths correlate with elevations between of 263 and 270.5 feet. The water was identified in the coarse-grained alluvium, which will transmit water readily. Seepage of groundwater was also encountered in Boring 18 and 27 (which are located in the North Parcel) at depths of 66 and 45 feet, respectively (equivalent to elevations of 282 and 300), but water in these two borings in the North Parcel occurred as seepage from the bedrock and is not considered correlatable with the groundwater elevation in the other borings for the South Parcel.

On the South Parcel the water depths encountered vary from Elevation 263 to 270.5. These Elevations are below the proposed base elevation of the proposed structures, Elevation 285, therefore no dewatering is expected. On the North Parcel, bedrock underlies most of the site. It has been the experience of this office that finite zones of perched groundwater should be expected locally within the bedrock. Temporary dewatering during construction should be installed as necessary. Temporary dewatering should consist of gravel-filled drainage trenches leading to a sump area. The collected water should be pumped to an acceptable disposal area. The water which is anticipated is in lenses within the bedrock. Surface effects such as subsidence from this minor dewatering are not expected due to the density of the bedrock.

The historic high groundwater level was identified by review of the Seismic Hazard Report for the Los Angeles, 7.5 Minute Quadrangle (CDMG, 2006). This report indicates that the historically highest groundwater level is approximately 20 feet below grade. A copy of this map is included in the Appendix.

For purposes of design, the historic high groundwater level can be assumed to be 20 feet below the lowest site elevation. In this case, the lowest site elevation is Elevation 292. Therefore, the historic high groundwater elevation which may be assumed for the site would be Elevation 272. This elevation is below the base of the proposed buildings.

Fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time of the measurements reported herein. Fluctuations also may occur across the site. High groundwater levels can result in changed conditions.

Caving

Caving was not encountered in the borings drilled with the 24-inch diameter bucket auger. The borings drilled with the hollowstem auger in the cohesionless alluvium could not experience

caving due to the continuously-cased design of the auger. Significant caving is not expected during development based on the dense to very dense nature of the earth materials.

SEISMIC EVALUATION

REGIONAL GEOLOGIC SETTING

The subject site is located in the northern portion of the Peninsular Ranges Geomorphic Province in the Los Angeles Basin. The Peninsular Ranges are characterized by northwest-trending blocks of mountain ridges and sediment-floored valleys. The dominant geologic structural features are northwest trending fault zones that either die out to the northwest or terminate at east-trending reverse faults that form the southern margin of the Transverse Ranges.

The Los Angeles Basin is located at the northern end of the Peninsular Ranges Geomorphic Province. The basin is bounded by the east and southeast by the Santa Ana Mountains and San Joaquin Hills, to the northwest by the Santa Monica Mountains. Over 22 million years ago the Los Angeles basin was a deep marine basin formed by tectonic forces between the North American and Pacific plates. Since that time, over 5 miles of marine and non-marine sedimentary rock as well as intrusive and extrusive igneous rocks have filled the basin. During the last 2 million years, defined by the Pleistocene and Holocene epochs, the Los Angeles basin and surrounding mountain ranges have been uplifted to form the present-day landscape. Erosion of the surrounding mountains has resulted in deposition of unconsolidated sediments in low-lying areas by rivers such as the Los Angeles River. Areas that have experienced subtle uplift have been eroded with gullies.

REGIONAL FAULTING

The Project Site is not located within any special studies zone (Alquist-Priolo Act, 1972) and no known active fault crosses the Project Site. The locations of significant active and potentially active faults are shown on the Southern California Fault Map included as Attachment 10. A list of

faults located within 60 miles (100 kilometers) from the site has been provided in the Seismic Source Summary Table found in the Appendix of this report. This table is based on the USGS 2008 National Seismic Hazard Maps database. The 2010 CGS Fault Activity Map, the Southern California Earthquake Data Center, and other references. Table 1 presents a few select local faults which will be discussed in more detail below.

Table 1, Major Faults in Project Site Vicinity

Fault	Maximum Credible Earthquake	Slip Rate	Distance from Site (miles)
Hollywood Fault	6.5	0.33-0.75	3.48
Elysian Park Thrust	6.7	0.80-2.2	Under 300 feet*
Puente Hills Thrust	7.5	0.44-1.7	5.35
Newport-Inglewood Fault System	7.4	0.60	8.77
Malibu Coast-Santa Monica	7.0	0.30-0.39	4.14
Raymond Fault	7.0	0.10-0.22	3.71
Verdugo Fault	6.8	0.50	5.94
Sierra Madre Fault Zone	7.0	0.36-4.0	10.12
Northridge (Pico) Thrust	7.5	3.5-6.0	18.64
San Gabriel Fault System	7.3	1.0-5.0	17.43
Whittier (Elsinore) Fault	7.2	2.5-3.0	11.66
San Andreas Fault System	8.0	20.0-35.0	32.85

*The location of the Elysian Thrust is based on NavigateLA.

Hollywood Fault

The Hollywood Fault is part of a 200 km-long, east-west trending line of oblique, reverse and left lateral faults (Dolan, et al., 1997). The Hollywood Fault trends along the base of the Hollywood Hills to the north and is thought to connect with the Raymond Fault to the east and the Santa Monica Fault to the west.

The Hollywood Fault is a reverse, north-dipping fault located along the southern edge of the eastern Santa Monica Mountains (Dolan, J.F., Stevens, D., and Rockwell, T.K., 2000). The fault juxtaposes Miocene sedimentary rocks over Pleistocene and Holocene alluvium. Dolan et al., (1997) identified several geologic features in the Hollywood area that were believed to be fault scarps. Dolan's work includes original subsurface exploration, review of subsurface work by others, seismic trenching, storm drain excavation logging and Metro Rail excavation logs by others. Based on charcoal samples from recent trenching, Dolan concludes that the most recent rupture along the Hollywood Fault occurred between a maximum of 20,000 years ago and as recently as 4,000 years ago.

Based on recent work by several geotechnical engineering consultants and information compiled by the California Geological Survey, the Hollywood Fault has been found to be sufficiently-active and well-defined based on the criteria established by the California Geological Survey. The California Geological Survey published "Earthquake Zones of Required Investigation for the Los Angeles Quadrangle" (2017). According to the Southern California Earthquake Data Center, the Hollywood Fault is capable of producing a 6.5 magnitude earthquake. The new map shows the Hollywood Fault to be 3.48 miles north of the site based on the USGS database.

Elysian Park Thrust and Puente Hills Thrust

Blind or buried thrust faults are faults without a surface expression are a significant source of seismic activity. They are typically broadly defined based on the analysis of seismic wave recordings of hundreds of small and large earthquakes in the southern California area. Due to the buried nature of these thrust faults, their existence is sometimes not known until they produce an earthquake.

The Elysian Park Thrust has been estimated to cause an earthquake every 500 to 1,300 years in the magnitude range 6.2 to 6.7. The Elysian Park Thrust is shown on NavigateLA less than 300 feet

south of the southernmost corner of the Project Site. The Elysian Park Thrust is not within an Alquist-Priolo Earthquake Zone of required investigation.

The Puente Hills Thrust is reported to have produced at least four large earthquakes in the last 11,000 years (Dolan, 2003). The magnitude 5.9 Whittier Earthquake of 1987 has been attributed to the Puente Hills Thrust in recent studies by many researchers. The Puente Hills Thrust is located on the order of 5.35 miles northeast of the Project Site. According to the Southern California Earthquake Data Center, the Puente Hills Thrust is capable of producing a 7.5 magnitude earthquake.

The risk for surface rupture potential of these buried thrust faults is inferred to be low (Leighton, 1990). However, the seismic risk of these buried structures in terms of recurrence and maximum potential magnitude is not well established.

Newport-Inglewood Fault System

The Newport-Inglewood Fault system is located approximately 8.77 miles to the southwest of the Project Site. The Newport-Inglewood Fault Zone is a broad zone of discontinuous north to northwest en echelon faults and northwest to west trending folds. The fault zone extends southeastward from West Los Angeles, across the Los Angeles Basin, to Newport Beach and possibly offshore beyond San Diego (Barrows, 1974; Weber, 1982; Ziony, 1985).

The onshore segment of the Newport-Inglewood Fault Zone extends for about 37 miles from the Santa Ana River to the Santa Monica Mountains. Here it is overridden by, or merges with, the east-west trending Santa Monica zone of reverse faults.

The surface expression of the Newport-Inglewood Fault Zone is made up of a strikingly linear alignment of domal hills and mesas that rise on the order of 400 feet above the surrounding plains.

From the northern end to its southernmost onshore expression, the Newport-Inglewood Fault Zone is made up of: Cheviot Hills, Baldwin Hills, Rosecrans Hills, Dominguez Hills, Signal Hill-Reservoir Hill, Alamitos Heights, Landing Hill, Bolsa Chica Mesa, Huntington Beach Mesa, and Newport Mesa. Several single and multiple fault strands, arranged in a roughly left stepping en echelon arrangement, make up the fault zone and account for the uplifted mesas.

The most significant earthquake associated with the Newport-Inglewood Fault system was the Long Beach earthquake of 1933 with a magnitude of 6.3 on the Richter scale. According to the Southern California Earthquake Data Center, the Newport-Inglewood Fault Zone is capable of producing a 7.4 magnitude earthquake.

Malibu Coast-Santa Monica Fault

The Malibu Coast Fault displays both reverse and left lateral displacement and forms a major tectonic boundary between the Transverse Ranges and the Peninsular Ranges provinces. Late Quaternary movement has been documented in excavations south of Pepperdine University. The Santa Monica Fault forms the onshore concealed extension of the Malibu Coast Fault. Further to the east, the Santa Monica Fault joins the Hollywood Fault along the southern foothills of the Santa Monica Mountains. The Santa Monica Fault is on the order of 4.14 miles west of the Project Site.

As discussed above, the Hollywood Fault has been found to be sufficiently-active and well-defined based on the criteria established by the California Geological Survey. To the east, the Hollywood Fault forms a tenuous junction with the Raymond Fault. Based on offset alluvial sediments and geomorphic evidence, the Malibu Coast-Santa Monica Fault system is judged to have been active during very late Quaternary time. The California Geological Survey published "Earthquake Zones of Required Investigation for the Beverly Hills Quadrangle" (2018). According to the Southern California Earthquake Data Center, the Malibu Coast-Santa Monica Fault is capable of producing a 7.0 magnitude earthquake.

Raymond Fault

The Raymond Fault is located approximately 3.71 miles to the northeast of the Project Site. The Raymond Fault is an effective groundwater barrier which divides the San Gabriel Valley into groundwater sub-basins. Much of the geomorphic evidence for the Raymond fault has been obliterated by urbanization of the San Gabriel Valley; however, a discontinuous escarpment can be traced from Monrovia to the Arroyo Seco in South Pasadena. The very bold, "knife edge" escarpment in Monrovia parallel to Scenic Drive is believed to be a fault scarp of the Raymond Fault. Trenching of the Raymond Fault is reported to have revealed Holocene movement (Weaver and Dolan, 1997).

The recurrence interval for the Raymond Fault is probably slightly less than 3,000 years, with the most recent documented event occurring approximately 1,600 years ago (Crook, et al, 1978). However, historical accounts of an earthquake that occurred in July 1855 as reported by Toppozada and others, 1981, places the epicenter of a Richter Magnitude 6 earthquake within the Raymond Fault. According to the Southern California Earthquake Data Center, the Raymond Fault is capable of producing a 7.0 magnitude earthquake.

Verdugo Fault

The Verdugo Fault is located approximately 5.94 miles to the northeast of the site. The Verdugo Fault runs along the southwest edge of the Verdugo Mountains. The fault displays a reverse motion. According to Weber, et. al., (1980) 2- to 3-meter-high scarps were identified in alluvial fan deposits in the Burbank and Glendale areas. Further to the northeast, in Sun Valley, faults were reportedly identified at a depth of 40 feet in a sand and gravel pit. According to the Southern California Earthquake Data Center, the Verdugo Fault is capable of producing a 6.8 magnitude earthquake.

Sierra Madre Fault Zone

The Sierra Madre Fault forms the southern tectonic boundary of the San Gabriel Mountains in the northern San Fernando Valley. It consists of a system of faults approximately 75 miles in length. The individual segments of the Sierra Madre Fault system range up to 16 miles in length and display a reverse sense of displacement and dip to the north. The most recent active portions of the zone include the Mission Hills, Sylmar, and Lakeview segments, which produced an earthquake in 1971 of magnitude 6.4. Tectonic rupture along the Lakeview Segment during the San Fernando Earthquake of 1971 produced displacements of approximately 2½ to 4 feet upward and southwestward.

According to the Southern California Earthquake Data Center, the Sierra Madre Fault Zone is capable of producing an earthquake of magnitude of 7.0. The closest trace of the fault is 10.12 miles northeast of the Project Site.

Northridge (Pico) Thrust

The Mw 6.7 Northridge earthquake of 1994 was caused by the sudden rupture of a previously unknown, blind thrust fault. This fault has since been named the Northridge thrust, however it is also known in some of the literature as the Pico thrust. It has been assigned a maximum magnitude of 6.5 to 7.5 and a 1,500-to-1,800-year recurrence interval. The Northridge Thrust is the eastern extension of the Oak Ridge Fault which appears to be over thrust by the Santa Susana Fault. The Northridge Thrust is located just under 18.64 miles northwest of the Project Site. According to the Southern California Earthquake Data Center, the Northridge Thrust is capable of producing a 7.5 magnitude earthquake.

As previously discussed, the risk for surface rupture potential of buried thrust faults is inferred to be low (Leighton, 1990). However, the seismic risk of these buried structures in terms of recurrence and maximum potential magnitude is not well established. Therefore, the potential for surface rupture on these surface-verging splays at magnitudes higher than 6.0 cannot be precluded.

San Gabriel Fault System

The San Gabriel Fault system is located approximately 17.43 miles northeast of the Project Site. The San Gabriel Fault system comprises a series of subparallel, steeply north-dipping faults trending approximately north 40 degrees west with a right-lateral sense of displacement. There is also a small component of vertical dip-slip separation. The fault system exhibits a strong topographic expression and extends approximately 90 miles from San Antonio Canyon on the southeast to Frazier Mountain on the northwest. The estimated right lateral displacement on the fault varies from 34 miles (Crowell, 1982) to 40 miles (Ehlig, 1986), to 10 miles (Weber, 1982). Most scholars accept the larger displacement values and place the majority of activity between the Late Miocene and Late Pliocene Epochs of the Tertiary Era (65 to 1.8 million years before present).

Recent seismic exploration in the Valencia area (Cotton and others, 1983; Cotton, 1985) has established Holocene offset. Radiocarbon data acquired by Cotton (1985) indicate that faulting in the Valencia area occurred between 3,500 and 1,500 years before present.

It is hypothesized by Ehlig (1986) and Stitt (1986) that the Holocene offset on the San Gabriel Fault system is due to sympathetic (passive) movement as a result of north-south compression of the upper Santa Susana Thrust sheet. Seismic evidence indicates that the San Gabriel Fault system is truncated at depth by the younger, north-dipping Santa Susana-Sierra Madre Faults (Oakeshott, 1975; Namson and Davis, 1988). According to the United States Geological Survey 2008 National Seismic Hazards Maps – Source Parameters, the San Gabriel Fault system is capable of producing earthquakes of 7.3 magnitude.

Whittier (Elsinore) Fault

The Whittier Fault is located approximately 11.66 miles to the east of the Project Site. The Whittier Fault together with the Chino Fault comprises the northernmost extension of the northwest trending Elsinore Fault system. The mapped surface of the Whittier Fault extends in a west-northwest direction for a distance of 20 miles from the Santa Ana River to the terminus of the Puente Hills. The Whittier Fault is essentially a strike-slip, northeast dipping fault zone which also exhibits evidence of reverse movement along with en echelon fault segments, en echelon folds and braided fault segments. Right lateral offsets of stream drainages of up to 8800 feet (Durham and Yerkes, 1964) and vertical separation of the basement complex of 6,000 to 12,000 feet (Yerkes, 1972), have been documented. According to the Southern California Earthquake Data Center, the Whittier Fault is capable of producing a 7.2 magnitude earthquake.

The Whittier Narrows earthquakes of October 1, 1987, and October 4, 1987, occurred in the area between the westernmost terminus of the mapped trace of the Whittier Fault and the frontal fault system. The main 5.9 magnitude shock of October 1, 1987, was not caused by slip on the Whittier Fault. The earthquake ruptured a gently dipping thrust fault with an east-west strike (Haukson, Jones, Davis and others, 1988). In contrast, the earthquake of October 4, 1987, is assumed to have occurred on the Whittier Fault as focal mechanisms show mostly strike-slip movement with a small reverse component on a steeply dipping northwest striking plane (Haukson, Jones, Davis and others, 1988).

San Andreas Fault System

The San Andreas Fault system forms a major plate tectonic boundary along the western portion of North America. The system is predominantly a series of northwest trending faults characterized by a predominant right lateral sense of movement. At its closest point the San Andreas Fault system is located approximately 32.85 miles to the northeast of the Project Site.

The San Andreas Fault and associated faults have had a long history of inferred and historic earthquakes. Cumulative displacement along the system exceeds 150 miles in the past 25 million years (Jahns, 1973). Large historic earthquakes have occurred at Fort Tejon in 1857, at Point Reyes in 1906, and at Loma Prieta in 1989. Based on single-event rupture length, the maximum Richter magnitude earthquake is expected to be approximately 8.25 (Allen, 1968). The recurrence interval for large earthquakes on the southern portion of the fault system is on the order of 100 to 200 years. According to the Southern California Earthquake Data Center, the San Andreas Fault is capable of producing an 8.0 magnitude earthquake.

SEISMIC HAZARDS

The primary geologic hazard at the site is moderate to strong ground motion (acceleration) caused by an earthquake on any of the local or regional faults. The potential for other earthquake-induced hazards was also evaluated including surface rupture, liquefaction, dynamic settlement, inundation, and landsliding.

Ground Motion

The design modal magnitude was obtained from the USGS website using the Probabilistic Seismic Hazard Deaggregation program (USGS, 2008). A Site Class "D" (Stiff Soil Profile) and a published shear wave velocity of 259 meters per second were utilized for Vs30 (Tinsley and Fumal, 1985) in the USGS seismic program. A modal magnitude (M_W) of 6.9 is obtained using the USGS Probabilistic Seismic Hazard Deaggregation program (USGS, 2008).

Surface Rupture

In 1972, the Alquist-Priolo Special Studies Zones Act (now known as the Alquist-Priolo Earthquake Fault Zoning Act) was passed into law. The Act defines "active" and "potentially active" faults utilizing the same aging criteria as that used by California Geological Survey (CGS).

However, established state policy has been to zone only those faults which have direct evidence of movement within the last 11,700 years (Holocene-age), as active. It is this recency of fault movement that the CGS considers as a characteristic for faults that have a relatively high potential for ground rupture in the future.

Based on research of available literature and results of site reconnaissance, no known active faults underlie the subject site. The subject site is not located within an Alquist-Priolo Earthquake Fault Zone. The nearest such zone has been established for the Hollywood Fault, located 3.48 miles to the north. Based on these considerations, the potential for surface ground rupture at the subject site is considered low.

Liquefaction

Liquefaction is a phenomenon in which saturated silty to cohesionless soils below the groundwater table are subject to a temporary loss of strength due to the buildup of excess pore pressure during cyclic loading conditions such as those induced by an earthquake. Liquefaction-related effects include loss of bearing strength, amplified ground oscillations, lateral spreading, and flow failures.

The Seismic Hazards Maps of the State of California (CDMG, 1999), classifies the site as part of the potentially "Liquefiable" area. This determination is based on groundwater depth records, soil type and distance to a fault capable of producing a substantial earthquake.

In order to address the liquefaction potential on the site, site-specific liquefaction analyses were performed utilizing the Standard Penetration Test (SPT) data and the laboratory testing of the soil samples collected from the exploratory borings, and supplemented by the Cone Penetration Test (CPT) sounding data. The SPT and CPT liquefaction analyses are addressed individually in the following sections.

One of the primary advantages of the CPT sounding is that it provides a nearly continuous profile of penetration resistance, which is utilized to develop stratigraphic interpretation. This stratigraphic capability makes the CPT particularly advantageous for developing liquefaction-resistance profiles over the SPT data, which is collected at 5-foot intervals. In addition, the CPT results are generally more consistent, repeatable, and reliable than results from other penetration tests.

Groundwater was encountered at depths of 23 to 31 feet below the ground surface within Borings B28 through B31. According to the Seismic Hazard Zone Report of the Los Angeles 7½-Minute Quadrangle (CDMG, 1998, Revised 2006)), the historic-high groundwater level for the site was 20 feet below the ground surface. The historic highest groundwater level was conservatively utilized for the enclosed liquefaction analysis.

Section 11.8.3 of ASCE 7-16 indicates that the potential for liquefaction shall be evaluated utilizing an acceleration consistent with the MCE_G PGA. Utilizing the OSHPD seismic utility program, this corresponds to a PGA_M of 0.952g. The USGS Probabilistic Seismic Hazard Deaggregation program (USGS, 2014) indicates a mean magnitude of 6.83 for the site. The liquefaction potential evaluations were performed utilizing a magnitude 6.83 earthquake, and a peak horizontal acceleration of 0.952g (PGA_M).

Standard Penetration Test (SPT) – Liquefaction Analysis

A SPT site-specific liquefaction analysis was performed following the Recommended Procedures for Implementation of the California Geologic Survey Special Publication 117A, Guidelines for Analyzing and Mitigating Seismic Hazards in California (CGS, 2008), and the EERI Monograph (MNO-12) by Idriss and Boulanger (2008). The liquefaction analysis was performed utilizing the Standard Penetration Test data and the laboratory testing of the soil samples collected from the exploratory borings.

The enclosed "Empirical Estimation of Liquefaction Potential" is based on Borings B28 through B31. Standard Penetration Test (SPT) data were collected at 5-foot intervals. Samples of the collected materials were conveyed to the laboratory for testing and analysis. Fines content, as defined by the percent passing the #200 sieve, were utilized for the fines correction factor in computing the corrected blow count of selected soil layers. In addition, Atterberg Limit tests were performed for the underlying samples and the results are presented in the enclosed E-Plate and F-Plate.

The procedure presented in the SP117A guidelines was followed in analyzing the liquefaction potential of the subject site. The SP117A guidelines were developed based on a paper titled, "Assessment of the Liquefaction Susceptibility of Fine-Grained Soils", by Bray and Sancio (2006). According to the SP117A, soils having a Plastic Index greater than 18 exhibit clay-like behavior, and the liquefaction potential of these soils are considered to be low. Therefore, where the results of Atterberg Limits testing showed a Plastic Index greater than 18, the soils would be considered non-liquefiable, and the analysis of these soil layers was turned off in the liquefaction susceptibility column.

Based on CGS Special Publication 117A (CDMG, 2008), a factor of safety against the occurrence of liquefaction greater than about 1.3 can be considered an acceptable level of risk where high-quality, site-specific penetration resistance and geotechnical laboratory data is collected. Based on the enclosed liquefaction analysis, factors of safety against liquefaction are below 1.3 for some of the soil layers encountered in Boring B28. The potentially liquefiable layers occur between depths 21 to 22 feet below grade within Boring B28. Borings B29, B30 and B31 had no potentially liquefiable layers based on the analysis. The factor of safety against liquefaction is defined as the ratio of the cyclic stress ratio to cause liquefaction to the earthquake-induced cyclic stress ratio. Therefore, the liquefaction analyses indicate these soil layers and/or lenses may liquefy in the event of an earthquake on a local or regional fault.

Cone Penetration Test (CPT) – Liquefaction Analyses

CPT data were analyzed utilizing the liquefaction assessment software CLiq v.3.5.2.22 (Geologismiki, 2006). The analyses are based on published articles by (Robertson and Wride, 1998) and (Youd et al. 2001). The program estimates the grain characteristics directly from the CPT data and incorporates the interpreted results into an evaluation of their resistance to cyclic loading.

The liquefaction analyses of the CPTs indicate some of the soil layers and/or lenses at varying depths below the ground surface would be susceptible to liquefaction. A summary of the potentially liquefiable zones is presented in the table below:

	CPT-1	CPT-2A	CPT-3A	CPT-4B	CPT-5	CPT-6	CPT-7
Potentially Liquefiable Layers	20'-22' 28'-30' 32'-38'* 54'-54.5'* 71'-74'	20'-22' 23'-28'* 38'-42'* 45'-46' 47'-48' 56'-57'	28'-31' 35'-37' 41' 46'-49' 54'-58'* 58'-61' 67'-73'	21'-33.5' 38'-48'* 62'-64.5' 65.5'-69' 70'-75'	28.5'-29' 30'-32' 41'-43' 54'-54.5' 63.5'-65.5' 69.5'-72'* 73.5'-75.5'	23'-27'* 40'-44' 48'-49' 55.5'-56' 58.5'-59'	35'-38' 40'-44' 49'-60.5'* 64.5'-67' 69'-71' 74'-75'
Total Liquefaction Settlement	0.687 inches	0.623 inches	0.429 inches	1.224 inches	0.191 inches	0.239 inches	0.463 inches

**Multiple individual thin layers*

Based on the result of the CPT liquefaction analyses, the majority of the liquefiable zones occur between 20 to 60 feet below the existing site grade, with a few deeper thin layers.

The calculated settlements using the SPT procedure is 0.45 inches for Boring B28 and 0.0 inches for Borings B29, B30 and B31. The supplemental CPT soundings in the vicinity of Boring B28 (CPT 1), Boring B29 (CPT-2A), Boring B30 (CPT-3A), and Boring B31 (CPT-4B) yielded a higher settlement than suggested by the borings. In the opinion of this firm, the CPT liquefaction

settlement should be given greater weight consideration due to the number of soundings performed as well as the nearly continuous sampling that is permitted with the use of the CPT. It is the opinion of this firm that the differential settlement across any structure should be considered half the value of the maximum CPT settlement, which is estimated to be 1.224 inches. This settlement will be addressed by regulatory requirements during the design and plan check processes, by use of a mat foundation.

Dynamic Settlement

Liquefaction settlement analyses have been performed utilizing the results of the SPT and CPT liquefaction analyses. Based on the enclosed SPT liquefaction settlement analyses, total liquefaction settlement at the existing ground surface due to liquefaction could be expected to be 0.0 to 0.45 inches. Utilizing CPT data, liquefaction settlement between 0.191 and 1.224 inches could be anticipated.

According to SP117A, the differential seismic settlement should be up to two-thirds of the total settlement. For most critical analysis total settlements of 0.45 and 1.224 inches are considered. The total differential settlement would range between 0.3 and 0.816 inches. This will be addressed based on regulatory requirements during the design and plan check processes.

Surface Manifestation

It has been shown in recent studies by O'Rourke and Pease (1997) and Youd and Garris (1995), building upon work by Ishihara (1985), that the visible effects of liquefaction on the ground surface are only manifested if the relative and absolute thicknesses of liquefiable soils to overlying non-liquefiable surface material fall within a certain range. On the Project Site, given the relatively deep groundwater level, the relative thickness of liquefiable soils to overlying non-liquefiable surface material fall well outside the bounds within which surface effects of liquefaction have been

observed during past earthquakes. As a result, the likelihood that surface effects of liquefaction would occur on the subject site would be considered very low to non-existent. Therefore, it is the opinion of Geotechnologies, Inc. that, should liquefaction occur within the potentially liquefiable zone, there would be a negligible effect on the proposed structures.

The study by Ishihara (1985) presents data from three separate earthquakes where subsurface information was available regarding the absolute and relative thicknesses of liquefiable earth materials and overlying non-liquefiable materials. Information was obtained from sites where the surface effects of liquefaction were observed, and from sites where there were no visible surface effects. From this data, Ishihara (1985) graphs the liquefiable soil thickness vs. the overlying non-liquefiable thickness, and presents bounds identifying a zone within which surface effects of liquefaction were observed.

Youd and Garris (1995) build upon the work by Ishihara (1985), compiling data from 308 borings taken at sites shaken by 15 different earthquakes, ranging in magnitude from 5.3 to 8.0. They find that the boundaries presented by Ishihara relating the thicknesses of non-liquefiable surface layers to underlying potentially liquefiable layers remain valid for this extensive set of data, with very few exceptions. The particular site conditions which contributed to the few exceptional cases are not present on the subject site.

O'Rourke and Pease (1997) also compare the liquefiable vs. non-liquefiable thickness bounds initially proposed by Ishihara (1985) with data obtained from areas of San Francisco where the surface effects of liquefaction were observed during the 1989 Loma Prieta earthquake. They find general agreement with the previous findings of Ishihara (1985) and Youd and Garris (1995).

Lateral Spreading

Lateral spreading is the most pervasive type of liquefaction-induced ground failure. During lateral spread, blocks of mostly intact, surficial soil displace downslope or towards a free face along a shear zone that has formed within the liquefied sediment. According to the procedure provided by Bartlett, Hansen, and Youd, "Revised Multilinear Regression Equations for Prediction of Lateral Spread Displacement", ASCE, Journal of Geotechnical Engineering, Vol. 128, No. 12, December 2002, when the saturated cohesionless sediments with $(N_1)_{60} > 15$, significant displacement is not likely for M < 8 earthquakes.

The saturated cohesionless sediments underlying the subject site have corrected $(N_1)_{60}$ value greater than 15. According to the USGS Probabilistic Seismic Hazard Deaggregation Program (USGS, 2014), the modal earthquake magnitude (M_w) for the site is 6.83. In addition, the potentially liquefiable layer consists of a stratified layer, which is not expected to be continuous throughout the site. Therefore, the potential for lateral spread is considered to be remote for the Project Site.

Tsunamis, Seiches, and Flooding

Tsunamis are large ocean waves generated by sudden water displacement caused by a submarine earthquake, landslide, or volcanic eruption. Review of the City of Los Angeles General Plan Safety Element Exhibit G indicates the site does not lie within the mapped tsunami inundation boundary.

Seiches are oscillations generated in enclosed bodies of water which can be caused by ground shaking associated with an earthquake. Review of the City of Los Angeles General Plan Safety Element Exhibit G indicates the site lies just outside mapped inundation boundaries of the Devils Gate, Hanson Dam and Sepulveda Dam, Eagle Rock Dam, Elysian Park Reservoir, Garvanza Reservoir, if breached by a seiche.

These reservoirs as well as others in California, are continually monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of failure. Current design and construction practices and ongoing programs of review, modification, or total reconstruction of existing dams are intended to ensure that all dams are capable of withstanding the maximum considered earthquake for the site as well as other conditions that could undermine the integrity of the dam. Pursuant to these regulations, these reservoirs are regularly inspected and meet current safety regulations. In addition, the LADWP has emergency response plans to address any potential impacts to its dams. Therefore, the risk of flooding from a seismically-induced seiche or dam failure is considered to be remote."

Landsliding

The site is not located on or adjacent to a mapped landslide based on review of (Lamar, 1970, Yerkes, et al., 1977, Dibblee, 1999) and "Earthquake Zones of Required Investigation Los Angeles Quadrangle" by the California Geological Survey, Figure 5. In addition, no indication of slope instability was noted during the subsurface exploration of the site. As part of the proposed development, the slopes in the building areas will be removed and replaced with the proposed structures. Therefore, landsliding is not considered and issue subsequent to development.

CONCLUSIONS AND DESIGN CONSIDERATIONS

Based upon the exploration, laboratory testing, and research, it is the finding of Geotechnologies, Inc. that construction of the proposed mixed-use development is considered feasible from a geotechnical engineering standpoint provided the advice and recommendations presented herein, supplemented as necessary as the design proceeds, are followed, and implemented during construction.

This evaluation is not intended for submission to the building official for building permit purposes. Once the plans are prepared for individual buildings during the City's regulatory building permit process, it is recommended that a comprehensive geotechnical engineering investigation, suitable for submission to the building official, should be prepared. Supplemental subsurface exploration and laboratory testing, as well as the re-evaluation of the design parameters provided herein, will be required to meet the standards of a final geotechnical investigation prior to issuance of building permits. Separate investigations may be necessary pursuant to the City's regulatory building permit process to address the individual structures proposed.

The existing fill materials are not suitable for support of the proposed foundations, floor slabs or additional fill. Excavation of the proposed subterranean levels will remove most of the unsuitable materials in the building areas.

Regulatory Requirements based on Site-Specific Conditions

South Parcel

The South Parcel is underlain by fill soils that are up to 8 feet thick which are in turn, underlain by dense alluvium that extends to a depth of at least 70 feet. Bedrock may occur at a shallower depth near North Broadway however it was not encountered in any of the borings. Groundwater was identified at depths ranging between 23 and 31 feet, corresponding to elevations between of 263 and 270.5 feet.

Liquefaction analyses were performed in Borings 28, 29, 30 and 31 as well as CPTs 1 through 7 located on the South Parcel. The analyses identified soil layers and/or lenses at varying depths below the ground surface would be susceptible to liquefaction. For the South Parcel, where bedrock was not identified to the depth explored, a mat foundation should be used to accommodate the combined static and liquefaction settlement.

North Parcel

The North Parcel is underlain by fill soils, alluvium, and sedimentary bedrock of the Puente Formation. The fill soils extend to a depth of as deep as 30 feet below the ground surface and contain brick pieces and concrete fragments. Alluvium was identified below the fill in some of the geotechnical excavations. Bedrock was found to be as shallow at 1 foot in Borings 21, 22 and 24, and is exposed on the east side of the site. Seepage of groundwater was identified in Boring 18 and 27 (in the bedrock) at depths of 66 and 45 feet, respectively, which are equivalent to an elevation of 282 and 300 feet. It is the opinion of this firm that this water is due to a perched condition within bedrock fractures or permeable sandstone beds and represents a finite quantity of water which could be collected and disposed of during construction.

Conventional foundations may be used for proposed structures on the North Parcel where they will bear in the bedrock. At the subgrade elevation, siltstone bedrock, granular alluvium and fill soil will be exposed. The foundations should bear exclusively in the bedrock. Where alluvium or fill is exposed at the subgrade elevation, deepened footings or friction piles bearing in the rock would be necessary.

METHANE ZONES

The site is located in a methane zone according to the City of Los Angeles Methane and Methane Buffer Zones Map (City of Los Angeles, 2003). Appropriate measures should be considered by an experienced methane consultant. Design of the structure should proceed based on the recommendations of the methane consultant. A copy of this map is included as the Methane Zones Risk Map.

FILL SOILS

The maximum depth of fill encountered on the site was 30 feet. This material and any fill generated during demolition should be removed during the excavation of the subterranean levels and removed from the site. The fill soils contain construction debris such as brick and concrete and may be used in fill only if deleterious materials are removed.

EXPANSIVE SOILS

The onsite geologic materials are in the very low expansion index range. The Expansion Index was found to range from 8 to 18 for bulk samples of the alluvium and bedrock, remolded to 90 percent of the laboratory maximum density. Reinforcing beyond the minimums required by the City of Los Angeles Department of Building and Safety is not required.

WATER-SOLUBLE SULFATES

The Portland cement portion of concrete is subject to attack when exposed to water-soluble sulfates. Usually, the two most common sources of exposure are from soil and marine environments. The source of natural sulfate minerals in soils include the sulfates of calcium, magnesium, sodium, and potassium. When these minerals interact and dissolve in subsurface water, a sulfate concentration is created, which will react with the exposed concrete. Over time sulfate attack will destroy improperly proportioned concrete well before the end of its intended service life.

The water-soluble sulfate content of the onsite geologic materials was tested by California Test 417. The water-soluble sulfate content was determined to be less than 0.1% percentage by weight for the alluvium and greater than 0.2 % for the siltstone bedrock. Based on the Uniform Building Code, Table 19-A-4, the sulfate exposure is considered to be negligible for geologic materials with less than 0.1% and Type I cement may be utilized for concrete foundations in contact with the

alluvium, and maximum water-cementitious ratio of 0.5 and a minimum concrete compressive strength of 3,000 psi should be used.

For concrete in contact with the bedrock, the sulfate exposure is considered to be severe. The bedrock has a sulfate concentration greater than 0.2%, therefore and Type V cement should be utilized. In addition, a maximum water-cementitious ratio of 0.45 and a minimum compressive strength of 4,500 psi should be used.

SEISMIC DESIGN CONSIDERATIONS

California Building Code Seismic Parameters

North Parcel

Based on the enclosed Surface Wave report by GeoPentech, Project Number 24031A, dated August 6, 2024 the North Parcel is classified as Site Class D, based on ASCE 7-16. This information and the Project Site coordinates were input into the OSHPD seismic utility program in order to calculate ground motion parameters for the Project Site. Given the scope of the project, as design proceeds, additional seismic analyses will most likely be necessary during the design and plan check processes

CALIFORNIA BUILDING CODE SEISMIC PARAMETERS NORTH PARCEL	
California Building Code	2022
ASCE Design Standard	7-16
Risk Category	II
Site Class	D
Mapped Spectral Acceleration at Short Periods (S_S)	2.024g
Site Coefficient (F_a)	1.0
Maximum Considered Earthquake Spectral Response for Short Periods (S_{MS})	2.024g
Five-Percent Damped Design Spectral Response Acceleration at Short Periods (S_{DS})	1.349g
Mapped Spectral Acceleration at One-Second Period (S_1)	0.723g
Site Coefficient (F_v)	1.7*
Maximum Considered Earthquake Spectral Response for One-Second Period (S_{M1})	1.229g*
Five-Percent Damped Design Spectral Response Acceleration for One-Second Period (S_{D1})	0.819g*

** These values are determined based on the tabulated values shown on ASCE 7-16, Table 11.4-2 for the Long-Period Site Coefficient, F_v. It should be noted that the exception to performing a site-specific hazard analysis for structures on Site Class D for values of S_1 greater than or equal to 0.2 presented by ASCE 7-16 may be followed, provided the conditions outlined in the ASCE 7-16 Section 11.4.8 (including Supplement 3 of the ASCE 7 Standards) are implemented in the structural design and analyses. This exception recommends that, where a site-specific ground motion hazard analysis is not required, the S_{M1} determined by eq. (11.4-2) is increased by 50% for all applications of S_{M1} in this standard. The resulting value of the parameter S_{D1} determined by Eq. (11.4-4) shall be used for all applications of S_{D1} in this standard. This would require that the S_{M1} and S_{D1} values provided in the above table are increased by 50%.*

South Parcel

Based on the enclosed Surface Wave report by GeoPentech, Project Number 24031A, dated August 7, 2024 the North Parcel is classified as Site Class C, based on ASCE 7-16. This information and the Project Site coordinates were input into the OSHPD seismic utility program in order to calculate ground motion parameters for the Project Site. Given the scope of the project, as design proceeds, additional seismic analyses will most likely be necessary during the design and plan check processes

CALIFORNIA BUILDING CODE SEISMIC PARAMETERS SOUTH PARCEL	
California Building Code	2022
ASCE Design Standard	7-16
Risk Category	II
Site Class	C
Mapped Spectral Acceleration at Short Periods (S_S)	2.012g
Site Coefficient (F_a)	1.2
Maximum Considered Earthquake Spectral Response for Short Periods (S_{MS})	2.414g
Five-Percent Damped Design Spectral Response Acceleration at Short Periods (S_{DS})	1.610g
Mapped Spectral Acceleration at One-Second Period (S_1)	0.718g
Site Coefficient (F_v)	1.4
Maximum Considered Earthquake Spectral Response for One-Second Period (S_{M1})	1.006g
Five-Percent Damped Design Spectral Response Acceleration for One-Second Period (S_{D1})	0.671g

COLLAPSIBLE SOILS

The native soils and bedrock are not considered collapsible, or prone to hydroconsolidation.

GRADING GUIDELINES

Site Preparation

- A thorough search should be made for possible underground utilities and/or structures. Any existing or abandoned utilities or structures located within the footprint of the proposed grading should be removed or relocated as appropriate.

- All vegetation, existing fill, and soft or disturbed geologic materials should be removed from the areas to receive controlled fill. All existing fill materials and any disturbed geologic materials resulting from grading operations should be completely removed and properly recompacted prior to foundation excavation.

- Any vegetation or associated root system located within the footprint of the proposed structures should be removed during grading.

- Subsequent to the indicated removals, the exposed grade should be scarified to a depth of six inches, moistened to optimum moisture content, and recompacted in excess of the minimum required comparative density.

- The excavated areas should be observed by the geotechnical engineer prior to placing compacted fill.

Compaction

LADBS requires a minimum comparative compaction of 95 percent of the laboratory maximum density where the soils to be utilized in the fill have less than 15 percent finer than 0.005 millimeters. Fill materials having more than 15 percent finer than 0.005 millimeters may be compacted to a minimum of 90 percent of the maximum density. Comparative compaction is defined as the ratio of the in-place density to the maximum density as determined by applicable the American Society of Testing and Materials (ASTM) testing.

All fill should be mechanically compacted in layers not more than 8 inches thick. The materials should be moisture-conditioned to within 3 percent of the optimum moisture content of the particular material placed. All fill should be compacted to at least 90 percent (or 95 percent for cohesionless soils having less than 15 percent finer than 0.005 millimeters) of the maximum laboratory density for the materials used. The maximum density should be determined by the laboratory operated by Geotechnologies, Inc. in general accordance with the most recent revision of ASTM D 1557.

Field observation and testing should be performed by a representative of the geotechnical engineer during grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compactive effort should be made with adjustment of the moisture content, as necessary, until a minimum of 90 percent (or 95 percent for cohesionless soils having less than 15 percent finer than 0.005 millimeters) compaction is obtained.

Acceptable Materials

The excavated on-site materials are considered satisfactory for reuse in the controlled fills as long as any debris, organic matter and deleterious materials are removed. Cobbles were occasionally observed during exploration. The size of cobbles to be utilized in the controlled fill should not exceed 6 inches in dimension.

Any imported materials should be observed and tested by the representative of the geotechnical engineer prior to use in fill areas. Imported materials should contain sufficient fines (particles less than 0.075 millimeters in diameter) so as to be relatively impermeable and result in a stable subgrade when compacted. Any required import materials should consist of geologic materials with an expansion index of less than 50. The water-soluble sulfate content of the import materials should be less than 0.1% by weight.

Imported materials should be free from chemical or organic substances which could affect the proposed development. A competent professional should be retained in order to test imported materials and address environmental issues and organic substances which might affect the proposed development.

Utility Trench Backfill

Utility trenches should be backfilled with controlled fill. The utility should be bedded with clean sands at least one foot over the crown. The remainder of the backfill may be on-site soil compacted to 90 percent (or 95 percent for cohesionless soils having less than 15 percent finer than 0.005 millimeters) of the laboratory maximum density. Utility trench backfill should be tested by representatives of this firm in general accordance with the most recent revision of ASTM D 1557.

Wet Soils

At the time of exploration some of the soils which may be exposed during grading or at the bottom of the excavation were locally above optimum moisture content. It is anticipated that some of the excavated material to be placed as compacted fill, and some of the materials exposed at the bottom of excavated plane may require drying and aeration prior to recompaction.

Pumping (yielding or vertical deflection) of the high-moisture content soils at the bottom of the excavation may occur during operation of heavy equipment. Where pumping is encountered, angular minimum ¾-inch gravel and/or crushed concrete should be placed and worked into the subgrade. A gravel layer thickness of 1 to 2 feet is typical. However, the exact thickness of the gravel layer would be determined in the field, subject to standard protocol.

The gravel will help to densify the subgrade as well as function as a stabilization material upon which heavy equipment may operate. It is not recommended that rubber tire construction equipment attempt to operate directly on the pumping subgrade soils prior to placing the gravel. Direct operation of rubber tire equipment on the soft subgrade soils will likely result in excessive disturbance to the soils, which in turn will result in a delay to the construction schedule since those disturbed soils would then have to be removed and properly recompacted. Extreme care should be utilized to place gravel as the subgrade becomes exposed.

Shrinkage

Shrinkage results when a volume of soil removed at one density is compacted to a higher density. A shrinkage factor between 5 and 15 percent should be anticipated when excavating and recompacting the existing fill and underlying native geologic materials on the Project Site to an average comparative compaction of 95 percent.

Weather Related Grading Considerations

When rain is forecast during construction, all fill that has been spread and awaits compaction should be properly compacted prior to stopping work for the day or prior to stopping due to inclement weather. These fills, once compacted, should have the surface sloped to drain to an area where water can be removed.

Temporary drainage devices should be installed to collect and transfer excess water, subject to jurisdictional regulations. Drainage should not be allowed to pond anywhere on the Project Site, and especially not against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope.

Work may start again after a period of rainfall, once the Project Site has been reviewed by a representative of this office. Any soils saturated by the rain should be removed and aerated so that the moisture content will fall within three percent of the optimum moisture content.

Surface materials previously compacted before the rain should be scarified, brought to the proper moisture content and recompacted prior to placing additional fill, if considered necessary by a representative of this firm.

Abandoned Seepage Pits

No abandoned seepage pits were encountered during exploration and none are known to exist on the Project Site. However, should such a structure be encountered during grading, options to permanently abandon seepage pits include complete removal and backfill of the excavation with compacted fill, or drilling out the loose materials and backfilling to within a few feet of grade with slurry, followed by a compacted fill cap.

If the subsurface structures are to be removed by grading, the entire structure should be demolished. The resulting void may be refilled with compacted soil. Concrete and brick generated during the seepage pit removal may be reused in the fill as long as all fragments are less than 6 inches in the longest dimension and the debris comprise less than 15 percent of the fill by volume. All grading should comply with the recommendations of this report.

Where the seepage pit structure is to be left in place, the seepage pits should be cleaned of all soil and debris. This may be accomplished by drilling. The pits should be filled with a minimum 1½ sack concrete slurry to within 5 feet of the bottom of the proposed foundations. In order to provide a more uniform foundation condition, the remainder of the void should be filled with controlled fill.

Geotechnical Observations and Testing During Grading

Geotechnical observations and testing during grading are considered to be a continuation of the geotechnical investigation. It is critical that the geotechnical aspects of the Project be reviewed by representatives of Geotechnologies, Inc. during the construction process. Compliance with the design concepts, specifications or recommendations during construction requires review by this firm during the course of construction. Any fill which is placed should be observed, tested, and verified if used for engineered purposes. Please advise this office at least twenty-four hours prior to any required Project Site visit.

Proper compaction is necessary to reduce settlement of overlying improvements. Some settlement of compacted fill should be anticipated. Any utilities supported therein should be designed to accept differential settlement. Differential settlement should also be considered at the points of entry to the structure.

LEED Considerations

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System encourages adoption of sustainable green building and development practices. Credit for LEED Certification can be assigned for reuse of construction waste and diversion of materials from landfills in new construction.

In an effort to provide the design team with a viable option in this regard, demolition debris could be crushed on-site in order to use it in the ongoing grading operations. The demolition debris should be limited to concrete, asphalt, and other non-deleterious materials. All deleterious materials should be removed including, but not limited to, paper, garbage, ceramic materials, and wood.

For structural fill applications, the materials should be crushed to 2 inches in maximum dimension or smaller. The crushed materials should be thoroughly blended and mixed with on-site soils prior to placement as compacted fill. The amount of crushed material should not exceed 20 percent. The blended and mixed materials should be tested by this office prior to placement to ensure they are suitable for compaction purposes. The blended and mixed materials should be tested by Geotechnologies, Inc. during placement to ensure that they have been compacted in a suitable manner.

FOUNDATION DESIGN

Mat Foundations

It is anticipated that a mat foundation system will be required where the soils are subject to liquefaction or where a structure will be relatively heavy. Settlement due to liquefaction has been estimated elsewhere in this report and the mat should be designed to resist the indicated settlement. For the purpose of the preparation of this report, heavier structures should be considered structures which are more than 100 feet in height. Depending on the location and final depth of a proposed structure, mat foundations should bear in undisturbed native alluvial soils, or bedrock. All foundations for a structure should bear in the same material.

Conventional Foundations

A conventional foundation system will be feasible for support of the lighter structures, and areas not subject to liquefaction where the bottom of these structures will be located above the historically highest groundwater level. Conventional foundation could bear in native alluvial soils, compacted fill, or bedrock. All foundations for a structure should bear in the same material. Preliminarily, and for the purpose of the preparation of this report, these lighter structures may consist of structures which are 100 feet or less in height.

Depending on the location and final depth of a proposed structure, conventional foundations may bear in undisturbed native alluvial soils, bedrock, or a properly compacted fill pad. All foundation for a structure should bear in the same material.

RETAINING WALL DESIGN

It is anticipated that some of the proposed structures may be serviced by up to three subterranean levels. Considering the sloping nature of the site, retaining walls up to 51 feet in height may be required for the proposed development.

Where the proposed subterranean retaining walls will not extend below the historically highest groundwater level, these walls may be designed for a drained condition, provided that a subdrain system is installed at their base.

Additional active pressure should be added to the retaining wall design for any additional surcharge conditions, such as adjacent traffic and structures. For retaining walls greater than 6 feet in height, their design should consider the additional earth pressure caused by seismic ground shaking.

TEMPORARY EXCAVATIONS

The anticipated temporary excavations are expected to expose fill and dense native soils, which are suitable for vertical excavations up to 5 feet where not surcharged by adjacent traffic or structures.

Vertical excavations exceeding a height of 5 feet should be shored. One method of shoring would consist of steel soldier piles, placed in drilled holes, and backfilled with concrete. The soldier piles may be designed as cantilevers, or laterally braced utilizing drilled tie-back anchors or raker braces.

DEWATERING

Groundwater was encountered in Borings 3, 6, 25, 28, 29, 30, and 31 (which are located in the South Parcel) at depths ranging between 23 and 31 feet. These depths correlate with elevations between of 263 and 270.5 feet. The water was identified in the coarse-grained alluvium, which will transmit water readily. Seepage of groundwater was also encountered in Boring 18 and 27 (which are located in the North Parcel) at depths of 66 and 45 feet, respectively (equivalent to elevations of 282 and 300), but water in these two borings in the North Parcel occurred as seepage from the bedrock and is not considered correlatable with the groundwater elevation in the other borings for the South Parcel.

Continuous groundwater is not expected, however, it has been the experience of this office that finite zones of perched water could be encountered locally within the bedrock. Temporary dewatering during construction should be installed as necessary. Temporary dewatering should consist of gravel-filled drainage trenches leading to a sump area. The collected water should be pumped to an acceptable disposal area.

Review of the most recent plans indicate that the lowest level basements of the proposed structures are at Elevation 285 for the South Parcel and at Elevation 307 for the North Parcel. These lowest finished floor elevations correspond to a minimum of 20 feet above the groundwater level encountered during exploration. Significant dewatering is not anticipated.

The historic high groundwater level was identified by review the Seismic Hazard Report for the Los Angeles, 7.5 Minute Quadrangle (CDMG, 2006). This report indicates that the historically highest groundwater level is approximately 20 feet below grade. A copy of this map is included in the Appendix. In this case the lowest site elevation is Elevation 292. Therefore, the historic high groundwater elevation which may be assumed for the site would be Elevation 272. This elevation is below the base of the proposed buildings.

SUBSIDENCE

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. No permanent large-scale extraction of groundwater, gas, oil, or geothermal energy currently occurs or is expected to occur at the Project Site. In addition, as discussed above, the historically highest groundwater level is approximately 20 feet below grade. This elevation is below the base of the proposed buildings.

As such permanent dewatering or substantial dewatering during construction is not anticipated. Furthermore, temporary dewatering associated with perched groundwater would be limited. As discussed above, the surface effects such as subsidence from this minor dewatering are not expected due to the density of the bedrock. Thus, the potential for subsidence as a result of the Project is low.

SEDIMENTATION & EROSION

Grading, excavation, and other earth moving activities could potentially result in erosion and sedimentation. For any grading performed in November to April (generally considered the rainy season) an erosion control plan consistent with Los Angeles Department of Building and Safety requirements would need to be prepared. Compliance with minimum code requirements will render Project impacts related to sedimentation and erosion less than significant.

LANDFORM ALTERATION

There are no significant hills, canyons, ravines, outcrops or other geologic or topographic features on the Project Site. Therefore, the Project would not adversely affect any prominent geologic or topographic features.

SLABS-ON-GRADE

A conventional concrete slab-on-grade will be feasible if the bottom of the proposed structure will be located above the historically highest groundwater level, and the subgrade consists of undisturbed native alluvial soils, or properly recompacted fill materials.

A structural slab-on-grade will be required where fill materials will remain below the proposed structure and the structure will be supported on a deep pile foundation system. The structural slab should be supported on the foundation system.

SITE DRAINAGE

Proper surface drainage is critical to the future performance of the Project. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Proper Project Site drainage should be maintained at all times.

All Project Site drainage, with the exception of any required to be disposed of onsite by stormwater regulations, should be collected and transferred to the street in non-erosive drainage devices. The proposed structure should be provided with roof drainage. Discharge from downspouts, roof drains and scuppers should not be permitted on unprotected soils within five feet of the building perimeter. Drainage should not be allowed to pond anywhere on the Project Site, and especially not against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope. Planters which are located within a distance equal to the depth of a retaining wall should be sealed to prevent moisture adversely affecting the wall. Planters which are located within five feet of a foundation should be sealed to prevent moisture affecting the earth materials supporting the foundation.

STORMWATER DISPOSAL

Recently, regulatory agencies have been requiring the disposal of a certain amount of stormwater generated on a Project Site by infiltration into the site soils. Increasing the moisture content of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. This means that any overlying structure, including buildings, pavements, and concrete flatwork, could sustain damage due to saturation of the subgrade soils. Structures serviced by subterranean levels could be adversely impacted by stormwater disposal by increasing the design fluid pressures on retaining walls and causing leaks in the walls. Proper Project Site drainage is critical to the performance of any structure in the built environment.

The potential for on-site stormwater infiltration will be analyzed for each individual structure during the City's regulatory building permit process. The potential for on-site stormwater infiltration will depend on the depth of the proposed structures, the distribution of the geologic materials at the specific building site, and the depth to the current groundwater level.

DESIGN REVIEW

Engineering of the proposed Project should not begin until approval of the geotechnical report by the Building Official is obtained in writing. Significant changes in the geotechnical recommendations may result during the building department review process.

It is recommended that the geotechnical aspects of the Project be reviewed by this firm during the design process. This review provides assistance to the design team by providing specific recommendations for particular cases, as well as review of the proposed construction to evaluate whether the intent of the recommendations presented herein are satisfied.

CONSTRUCTION MONITORING

Geotechnical observations and testing during construction are considered to be a continuation of the geotechnical investigation. It is critical that this office review the geotechnical aspects of the Project during the construction process. Compliance with the design concepts, specifications or recommendations during construction requires review by this office during the course of construction. All foundations should be observed by a representative of this office prior to placing concrete or steel. Any fill which is placed should be observed, tested, and verified if used for engineered purposes. Please advise Geotechnologies, Inc. at least twenty-four hours prior to any required Project Site visit.

If conditions encountered during construction appear to differ from those disclosed herein, notify Geotechnologies, Inc. immediately so the need for modifications may be considered in a timely manner.

It is the responsibility of the contractor to ensure that all excavations and trenches are properly sloped or shored. All temporary excavations should be cut and maintained in accordance with applicable Occupational Safety and Health Administration (OSHA) rules and regulations.

EXCAVATION CHARACTERISTICS

The exploration performed for this investigation is limited to the geotechnical excavations described. Direct exploration of the entire Project Site would not be economically feasible. The owner, design team and contractor must understand that differing excavation and drilling conditions may be encountered based on boulders, gravel, oversize materials, groundwater, and many other conditions. Fill materials, especially when they were placed without benefit of modern grading codes, regularly contain materials which could impede efficient grading and drilling. Southern California sedimentary bedrock is known to contain variable layers which reflect differences in depositional environment. Such layers may include abundant gravel, cobbles, and

boulders. Similarly, bedrock can contain concretions. Concretions are typically lenticular and follow the bedding. They are formed by mineral deposits and can be very hard. Excavation and drilling in these areas may require full size equipment and coring capability. The contractor should be familiar with the Project Site and the geologic materials in the vicinity.

GEOTECHNICAL TESTING

Classification and Sampling

The soil is continuously logged by a representative of this firm and classified by visual examination in accordance with the Unified Soil Classification system. The field classification is verified in the laboratory, also in accordance with the Unified Soil Classification System. Laboratory classification may include visual examination, Atterberg Limit Tests, and grain size distribution. The final classification is shown on the excavation logs.

Samples of the geologic materials encountered in the exploratory excavations were collected and transported to the laboratory. Undisturbed samples of soil are obtained at frequent intervals. Unless noted on the excavation logs as an SPT sample, samples acquired while utilizing a hollow-stem auger drill rig are obtained by driving a thin-walled, California Modified Sampler with successive 30-inch drops of a 140-pound automatic-trip hammer. The soil is retained in brass rings of 2.50 inches outside diameter and 1.00 inch in height. The central portion of the samples are stored in close fitting, waterproof containers for transportation to the laboratory. Samples noted on the excavation logs as SPT samples are obtained in general accordance with the most recent revision of ASTM D 1586. Samples are retained for 30 days after the date of the geotechnical report.

Grain Size Distribution

These tests cover the quantitative determination of the distribution of particle sizes in soils. Sieve analysis is used to determine the grain size distribution of the soil larger than the Number 200 sieve.

General accordance with the most recent revision of ASTM D 422 is used to determine particle sizes smaller than the Number 200 sieve. A hydrometer is used to determine the distribution of particle sizes by a sedimentation process. The grain size distributions are plotted on the E-Plates presented in Exhibit 9 of this report.

Moisture and Density Relationships

The field moisture content and dry unit weight are determined for each of the undisturbed soil samples, and the moisture content is determined for SPT samples in general accordance with the most recent revision of ASTM D 4959 or ASTM D 4643. This information is useful in providing a gross picture of the soil consistency between exploration locations and any local variations. The dry unit weight is determined in pounds per cubic foot and shown on the "Excavation Logs", A-Plates (Exhibit 7). The field moisture content is determined as a percentage of the dry unit weight.

Expansion Index Testing

The expansion tests performed on the remolded samples are in accordance with the Expansion Index testing procedures, as described in the most recent revision of ASTM D 4829. The soil sample is compacted into a metal ring at a saturation degree of 50 percent. The ring sample is then placed in a consolidometer, under a vertical confining pressure of 1 lbf/square inch and inundated with distilled water. The deformation of the specimen is recorded for a period of 24 hours or until the rate of deformation becomes less than 0.0002 inches/hour, whichever occurs first. The

expansion index, EI, is determined by dividing the difference between final and initial height of the ring sample by the initial height, and multiplied by 1,000. Results are presented in Plate D, in Exhibit 8 of this report.

Laboratory Compaction Characteristics

The maximum dry unit weight and optimum moisture content of a soil are determined in general accordance with the most recent revision of ASTM D 1557. A soil at a selected moisture content is placed in five layers into a mold of given dimensions, with each layer compacted by 25 blows of a 10-pound hammer dropped from a distance of 18 inches subjecting the soil to a total compactive effort of about 56,000 pounds per cubic foot. The resulting dry unit weight is determined. The procedure is repeated for a sufficient number of moisture contents to establish a relationship between the dry unit weight and the water content of the soil. The data when plotted represent a curvilinear relationship known as the compaction curve. The values of optimum moisture content and modified maximum dry unit weight are determined from the compaction curve. Results are presented in Plate D, in Exhibit 8 of this report.

Atterberg Limits

Depending on their moisture content, cohesive soils can be solid, plastic, or liquid. The water contents corresponding to the transitions from solid to plastic or plastic to liquid are known as the Atterberg Limits. The transitions are called the plastic limit and liquid limit. The difference between the liquid and plastic limits is known as the plasticity index. ASTM D 4318 is utilized to determine the Atterberg Limits. The results are shown on the enclosed F-Plate in Exhibit 10 of this report.

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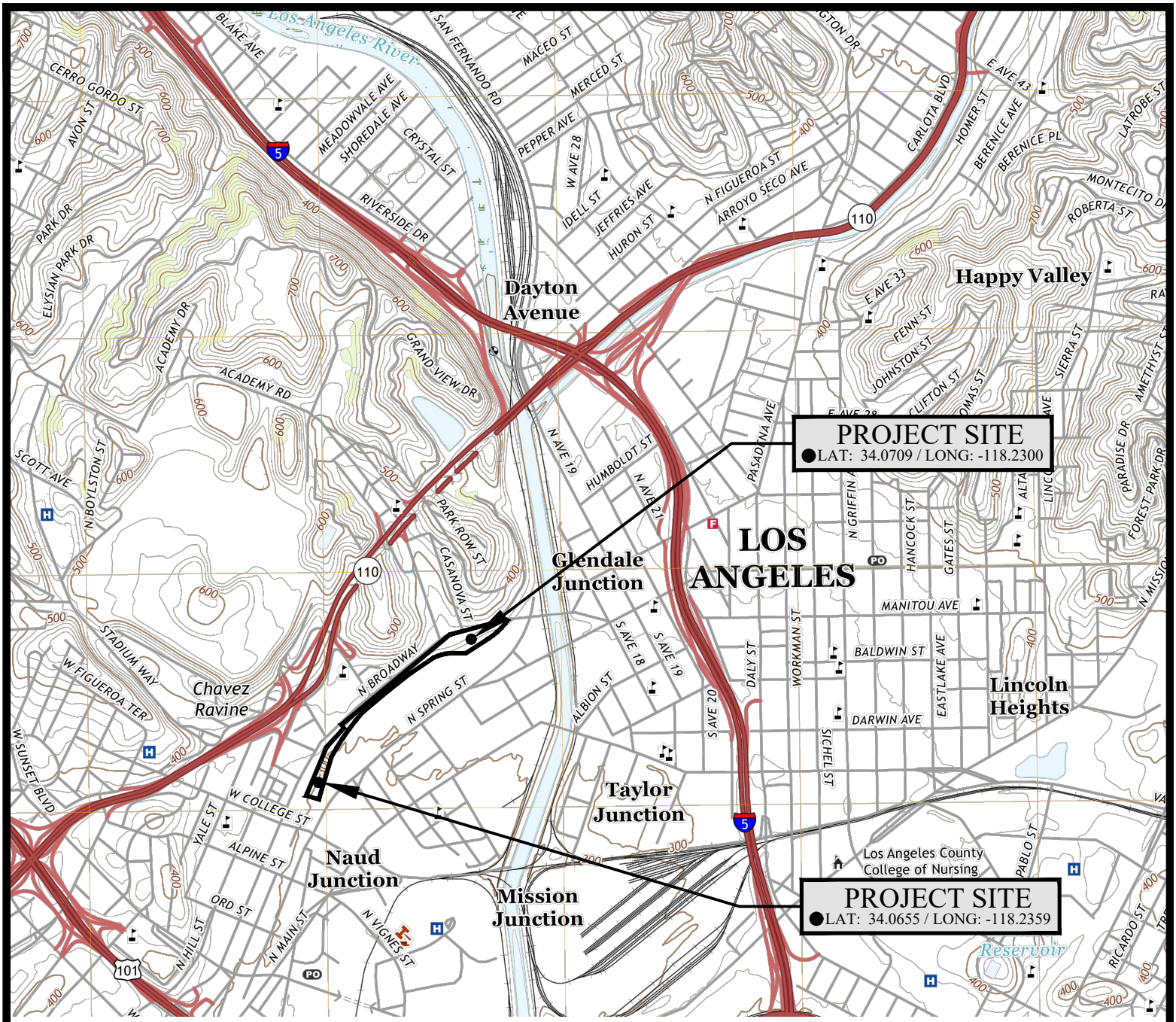


REFERENCE: U.S.G.S. TOPOGRAPHIC MAPS, 7.5 - MINUTE SERIES LOS ANGELES, CA QUADRANGLE 2022

VICINITY MAP

Geotechnologies, Inc.
Consulting Geotechnical Engineers

S & R PARTNERS, LLC

FILE NO: 20921

PROJECT SUMMARY



KEY

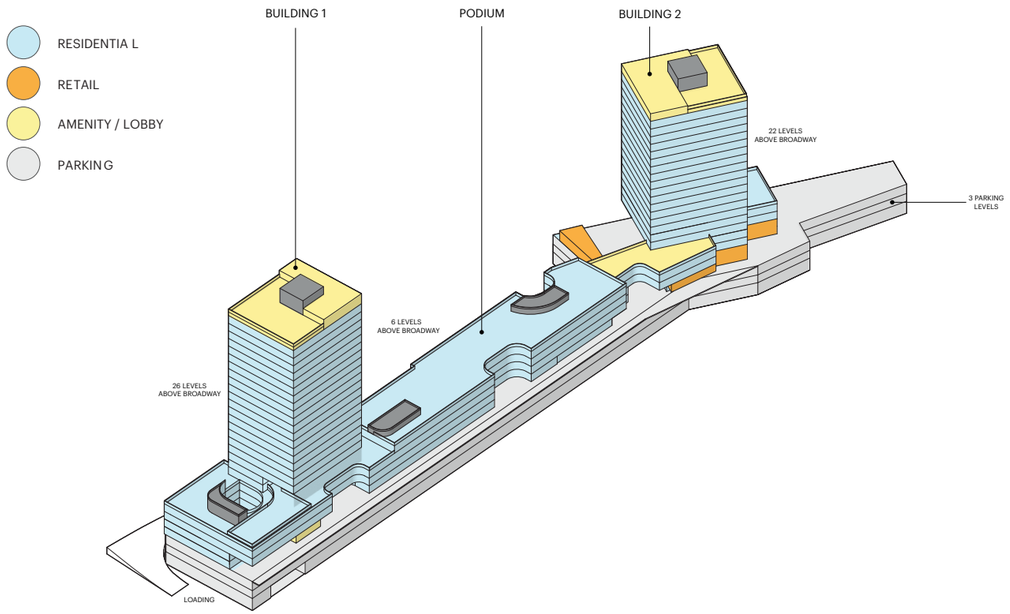
- SOUTH PARCEL
- NORTH PARCEL

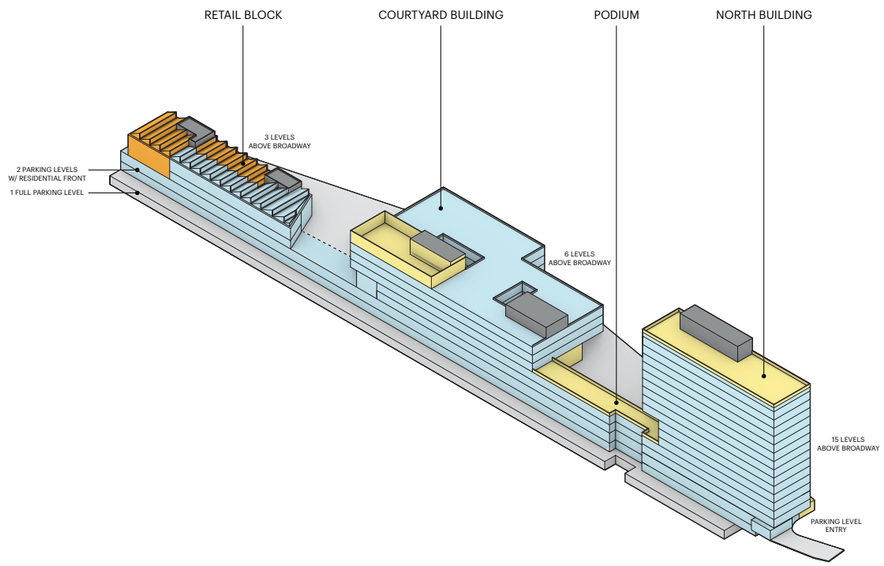
MASSING SUMMARY

BUENA VISTA
1251 NORTH SPRING STREET, 1030 – 1380 NORTH BROADWAY, LOS ANGELES, CALIFORNIA 90012

RIOS

PROJECT SUMMARY





SOUTH PARCEL

1. BUILDING 1
231 DWELLING UNITS
246,570 SF RESIDENTIAL
26 STORIES (22 LEVELS ABOVE 4-LEVEL PODIUM)

2. PODIUM
216 DWELLING UNITS
260,095 SF RESIDENTIAL
20,000 SF RESTAURANT/RETAIL
5,800 SF EXTERIOR RESTAURANT AREA
6 STORIES

3. BUILDING 2
184 DWELLING UNITS
200,189 SF RESIDENTIAL
22 STORIES (18 LEVELS ABOVE 4-LEVEL PODIUM)

SOUTH PARCEL TOTAL
631 DWELLING UNITS
RESIDENTIAL AREA: 706,854 SF
LANDSCAPE TRELLIS/OVERHANG: 51,134 SF
RESTAURANT/RETAIL AREA: 20,000 SF
EXTERIOR RESTAURANT AREA: 5,800 SF

TOTAL SOUTH PARCEL AREA: 783,788 SF

NORTH PARCEL

4. RETAIL BLOCK
18 DWELLING UNITS
13,688 SF RESIDENTIAL
10,000 SF RESTAURANT/RETAIL
3,000 SF EXTERIOR RESTAURANT AREA
3 STORIES (+ 2 RESIDENTIAL LEVELS LINING P1 + P2)

5. COURTYARD BUILDING
135 DWELLING UNITS
127,702 SF RESIDENTIAL
6 STORIES (+ 2 RESIDENTIAL LEVELS LINING P1 + P2)

6. PODIUM
58 DWELLING UNITS
85,250 SF RESIDENTIAL
2 STORIES (+ 2 RESIDENTIAL LEVELS LINING P1 + P2)

7. NORTH BUILDING
144 DWELLING UNITS
156,632 SF RESIDENTIAL
15 STORIES (+ 2 RESIDENTIAL LEVELS LINING P1 + P2)

NORTH PARCEL TOTAL
355 DWELLING UNITS
RESIDENTIAL AREA: 383,272 SF
LANDSCAPE TRELLIS/OVERHANG: 65,129 SF
RESTAURANT/RETAIL AREA: 10,000 SF
EXTERIOR RESTAURANT AREA: 3,000 SF

TOTAL NORTH PARCEL AREA: 461,401 SF

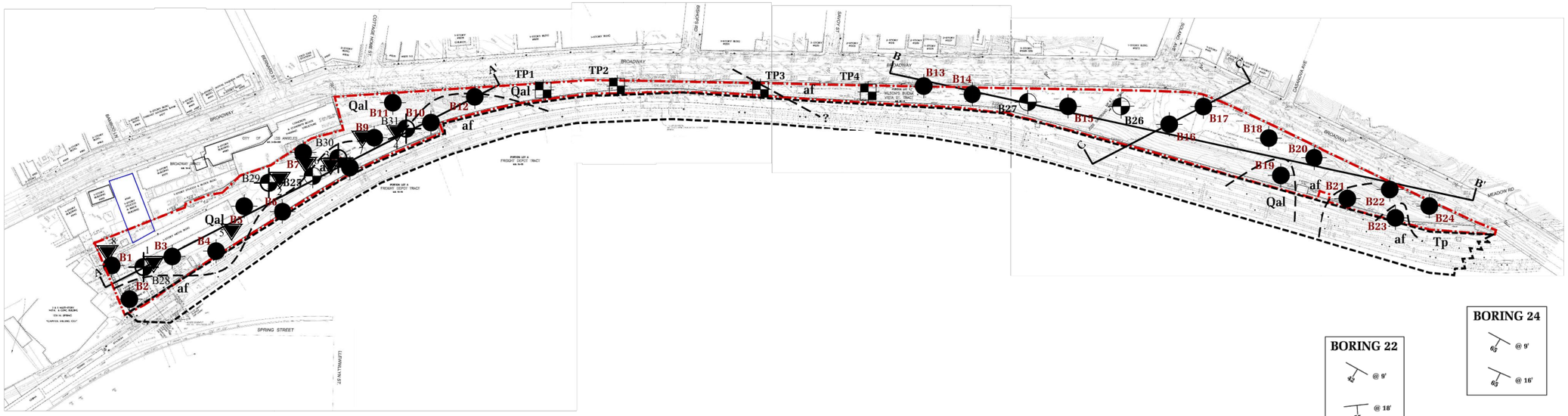
MASSING DIAGRAMS

BUENA VISTA
1251 NORTH SPRING STREET, 1030 – 1380 NORTH BROADWAY, LOS ANGELES, CALIFORNIA 90012

RIOS

Plot Date: Sep. 5, 2024
z:\shared\design cad_old\autocad\2024 projects\20921\20921 geologic map 1 - south portion.dwg

REFERENCE: ALTA/ACSM LAND TITLE SURVEY (SHEETS 2 & 3) BY THE MOLLENHAUER GROUP
JANUARY 5, 2015



LEGEND

- 8 — LOCATION & NUMBER OF CONE PENETROMETER TEST PERFORMED BY GEOTECHNOLOGIES, INC.
- B31 — **LOCATION AND NUMBER OF BORING THIS INVESTIGATION**
- TP4 — **LOCATION AND NUMBER OF TEST PIT THIS INVESTIGATION**
- B24 — **LOCATION AND NUMBER OF BORING PREVIOUS INVESTIGATION (DATED APRIL, 2015)**
- C C' — **LOCATION OF CROSS SECTION**
- af — **ARTIFICIAL FILL**
- Qal — **ALLUVIUM**
- Tp — **BEDROCK (PUENTE FORMATION) - WELL BEDDED SILTSTONE AND SANDSTONE**
- **GEOLOGIC CONTACT**
- @ 16 / 65 — **ORIENTATION OF BEDDING AND DEPTH**

NOTE: GEOLOGIC MATERIALS SHOWN WHERE THICKNESS EXCEEDS 4 FEET

GEOLOGIC MAP

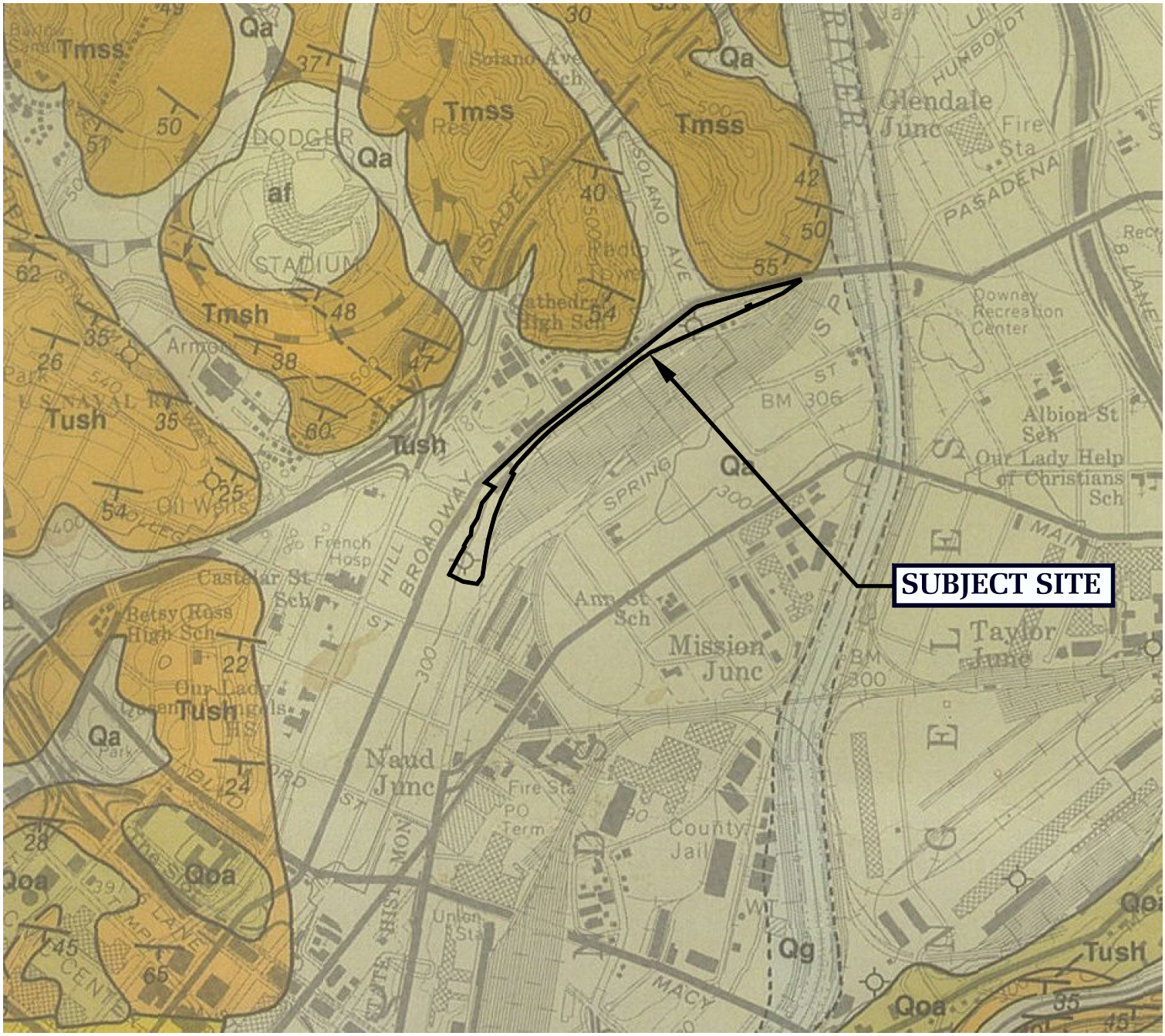
Geotechnologies, Inc.
Consulting Geotechnical Engineers

S & R PARTNERS

Drawn by: JD | File No.: 20921

Date: September 2024

REUSE OF DOCUMENTS: This document and the ideas and design incorporated herein, as an instrument of professional service, is the property of Geotechnologies, Inc. and shall not be reused in whole or part for any other project without Geotechnologies, Inc. express written authorization.



SCALE IN FEET

0 500 1000 2000

LEGEND

af:	Surficial Sediments: artificial cut & fill
Qa:	Surficial Sediments: alluvium, unconsolidated floodplain deposits of silt, sand and gravel
Qg:	Surficial Sediments: stream channel deposits of gravel, sand and silt
Qoa:	Older Dissected Surficial Sediments: remanants of older weakly consolidated alluvial deposits of gravel, sand and silt
Tmsh:	Monterey Formation: white-weathering, thin bedded, platy, siliceous shale, locally porcelaneous and silty; Mohnian Stage
Tmss:	Monterey Formation: tan to light gray semi-friable arkosic sandstone; includes some interbedded silty shale
Tush:	Unnamed Shale: gray to light brown, thin bedded, silty clay shale, locally contains scattered large calcareous nodules; in places contains thin lenses of light tan, platy, semi-siliceous or diatomaceous shale

N

Geotechnologies, Inc

REFERENCE: DIBBLEE, T.W., (1989) GEOLOGIC MAP OF THE LOS ANGELES QUADRANGLES (#DF-22)

LOCAL GEOLOGIC MAP - DIBBLEE

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Consulting Geotechnical Engineers

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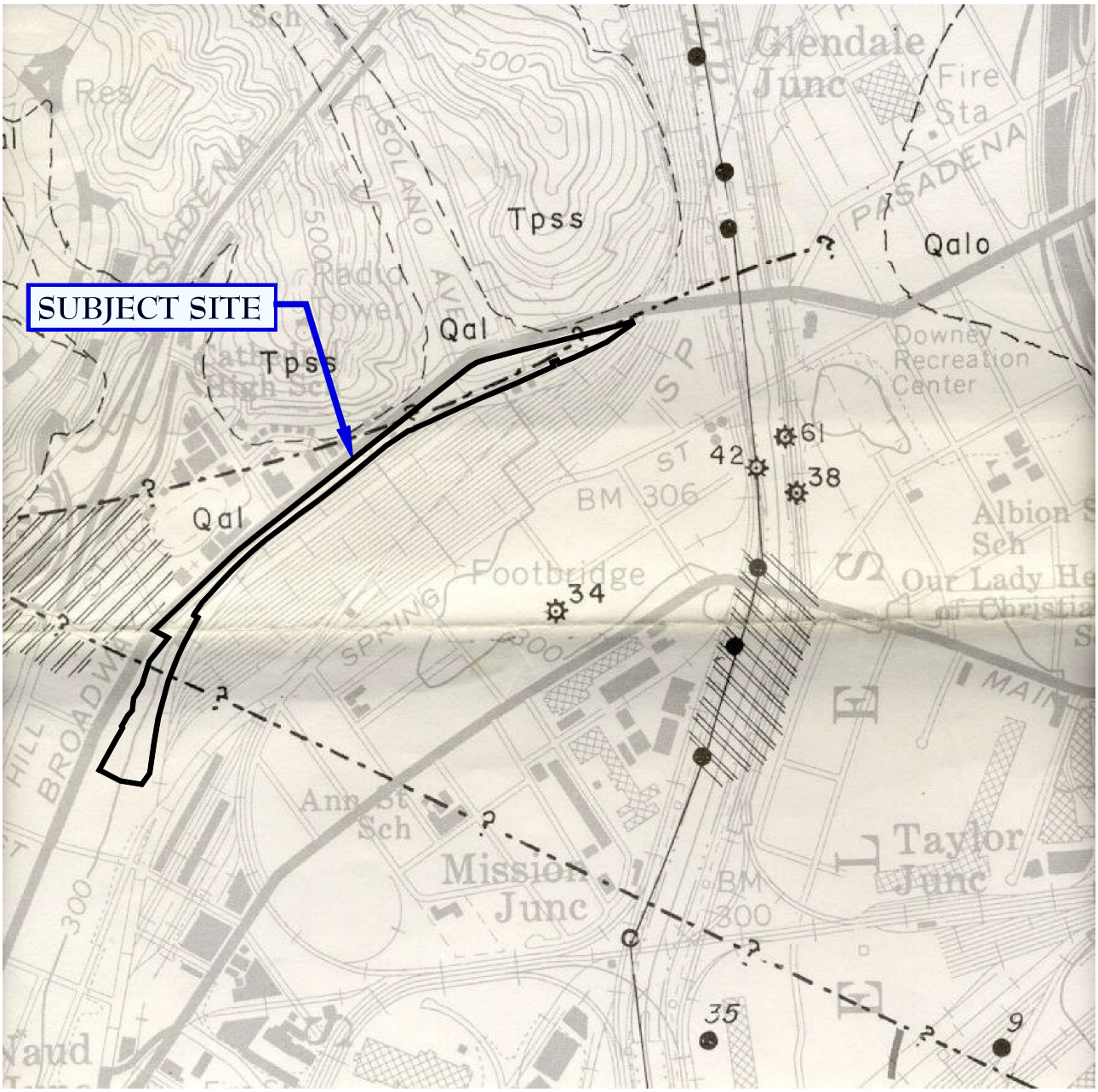
FILE NO. 20921



SCALE IN FEET

0 500 1000 2000

LEGEND

Qal: Alluvium - Silt, Sand and Gravel
Qalo: Old alluvium - terrace deposits
Tpss: Sandstone, hard and well cemented
Oil field
Unamed fault, queried where location doubtful

REFERENCE: YERKES, TINSLEY, WILLIAMS, McMANUS; ASPECTS OF TUNNELING (DEPTH OF BEDROCK), 1977 (USCG MF-866, SHEET 2 OF 5)

LOCAL GEOLOGIC MAP - YERKES

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FILE NO. 20921

SEISMIC SOURCE SUMMARY TABLE

Geotechnologies, Inc.
S & R Partners, LLC
File No.: 20921

Based on USGS 2008 National Seismic Hazard Maps

Fault Name	Distance (Miles)	Preferred Dip (degrees)	Dip Direction	Slip Sense	Activity	Reference
Elysian Park (Upper)		50	NE	reverse	-	1
Hollywood	3.48	70	N	strike slip	A (EFZ)	2
Raymond	3.71	79	N	strike slip	A (EFZ)	2
Santa Monica	4.14	44		strike slip	A(EFZ)	2
Puente Hills (LA)	5.35	27	N	thrust	-	1
Verdugo	5.94	55	NE	reverse	A	1,3
Newport Inglewood	8.77	90	V	strike slip	A (EFZ)	2
Sierra Madre	10.12	53	N	reverse	A	3
Elsinore	11.66	84	NE	strike slip	A (EFZ)	2
Sierra Madre (San Fernando)	14.93	45	N	thrust	A (EFZ)	2
Clamshell-Sawpit	15.30	50	NW	reverse	PA	3
Malibu Coast	17.08	74	N	strike slip	A (EFZ)	2
San Gabriel	17.43	61	N	strike slip	A (EFZ)	2
Palos Verdes	18.47	90	V	strike slip	A	2
Northridge	18.64	35	S	thrust	A	3
Anacapa-Dume	18.70	41	N	thrust	PA	3
San Jose	20.31	74	NW	strike slip	-	1
Santa Susana	23.25	55	N	reverse	A	3
Chino	27.97	65	SW	strike slip	-	2
Cucamonga	29.07	45	N	thrust	A (EFZ)	2
Holser	30.13	58	S	reverse	-	1
San Joaquin Hills	30.91	23	SW	thrust	-	1
Simi-Santa Rosa	31.19	60		strike slip	A (EFZ)	2
S. San Andreas	32.85	90		strike slip	A (EFZ)	2
Oak Ridge (Onshore)	36.17	65	S	reverse	-	1
San Cayetano	39.57	42	N	thrust	A (EFZ)	2
San Jacinto	41.20	90	V	strike slip	-	1
Cleghorn	47.00	90	V	strike slip	-	1
Santa Ynez (East)	52.38	70	S	strike slip	A	2
Pitas Point Connected	55.45	55		reverse	A (EFZ)	2
Ventura-Pitas Point	55.45	64	N	reverse	A (EFZ)	2
Coronado Bank	57.27	90	V	strike slip	A	2
North Frontal (West)	57.72	49	S	reverse	A	2
Channel Islands Thrust	59.27	20	N	thrust	-	1
Santa Cruz Island	59.34	90	V	strike slip	A	2

Reference:

1 = United States Geological Survey

2 = California Geological Survey

3 = County of Los Angeles, Dept. of Public Works, 1990

A = Active

PA = Potentially Active

A (EFZ) = Active (Earthquake Fault Zone)

Plot Date: Sep. 5, 2024

z:\shared\design cad_old\autocad\2024 projects\20921\20921 geologic map 1 - south portion.dwg

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LEGEND

- B31 — LOCATION & NUMBER OF BORING THIS INVESTIGATION
- TP4 — LOCATION & NUMBER OF TEST PIT THIS INVESTIGATION
- 8 — LOCATION & NUMBER OF CONE PENETROMETER TEST PERFORMED BY GEOTECHNOLOGIES, INC.
- B24 — LOCATION & NUMBER OF BORING (PREVIOUS INVESTIGATION, DATED APRIL 2015)
- af — ARTIFICIAL FILL
- Qal — ALLUVIUM
- Tp — BEDROCK (PUENTE FORMATION) - WELL BEDDED SILTSTONE AND SANDSTONE
- GEOLOGIC CONTACT
- @16 / 65 — ORIENTATION OF BEDDING AND DEPTH
- SUBJECT SITE
- C — C' — LOCATION OF CROSS SECTION

NOTE: GEOLOGIC MATERIALS SHOWN WHERE THICKNESS EXCEEDS 5 FEET

SUBJECT SITE

BERNARD ST

COTTAGE HOME ST.

BROADWAY

BAMBOO LN

BROADWAY TRACT
M.B. 16-6

CITY OF LOS ANGELES
M.R. 2-504-505

PORTION LOT A
FREIGHT DEPOT TRACT
M.B. 72-75

METRO EASEMENT

BISHOPS RD

SPRING STREET

MATCHLINE- SEE BELOW

MATCHLINE- SEE ABOVE

MATCHLINE- SEE SHHET 3

THE ZANJA MADRE:
SEE PAGES FROM ZANJA MADRE REPORT 2007 HEREON

2 & 5 MULTI-STORY
METAL & CONC. BUILDING
1231 N. SPRING
"CAPITOL MILLING CO."

SCALE IN FEET
0 25 50 100 150 200

REFERENCE: ALTA/ACSM LAND TITLE SURVEY, NORTH BROADWAY CHINATOWN BY MOLLENHAUER GROUP, SHEET 2 0F 3 DATED 01/05/2015

GEOLOGIC MAP 1 - SOUTH PORTION

Geotechnologies, Inc.
Consulting Geotechnical Engineers

S & R PARTNERS

Drawn by: JD | File No.: 20921

Date: September 2024

LEGEND

- B27 — LOCATION & NUMBER OF BORING THIS INVESTIGATION
- TP4 — LOCATION & NUMBER OF TEST PIT THIS INVESTIGATION
- B24 — LOCATION & NUMBER OF BORING (PREVIOUS INVESTIGATION, DATED APRIL 2015)
- af — ARTIFICIAL FILL
- Qal — ALLUVIUM
- Tp — BEDROCK (PUENTE FORMATION) - WELL BEDDED SILTSTONE AND SANDSTONE
- GEOLOGIC CONTACT
- @ 16 / 65 — ORIENTATION OF BEDDING AND DEPTH
- SUBJECT SITE
- C — C' — LOCATION OF CROSS SECTION

NOTE: GEOLOGIC MATERIALS SHOWN WHERE THICKNESS EXCEEDS 4 FEET

SUBJECT SITE

SOLANO AVE

CASANOVA AVE

BROADWAY

MEADOW RD

METRO EASEMENT

MATCHLINE- SEE BELOW

MATCHLINE- SEE ABOVE

MATCHLINE- SEE SHHET 2

SAVOY ST

JOSE SAVERINO TERRA TRACT

PORTION LOT A FREIGHT DEPOT TRACT M.B. 72-75

PORTION LOT 1 WILSON'S BUENA VISTA ST. TRACT

BORING 27 @ 45'

BORING 22 @ 9' @ 18' @ 33'

BORING 24 @ 9' @ 16'

SCALE IN FEET

0 30 50 100 150 200

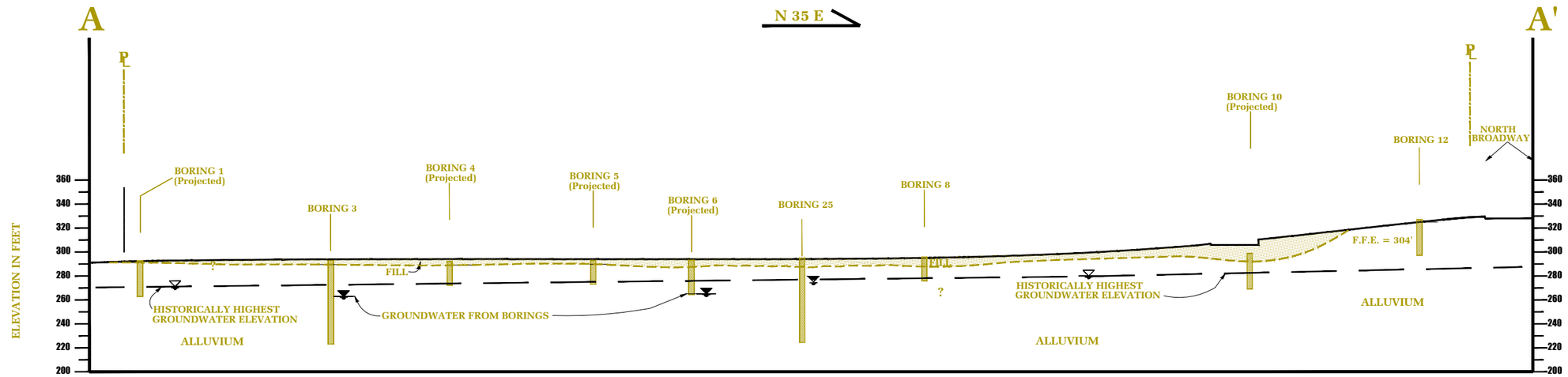
REFERENCE: ALTA/ACSM LAND TITLE SURVEY, NORTH BROADWAY CHINATOWN BY MOLLENHAUER GROUP, SHEET 3 0F 3 DATED 01/05/2015

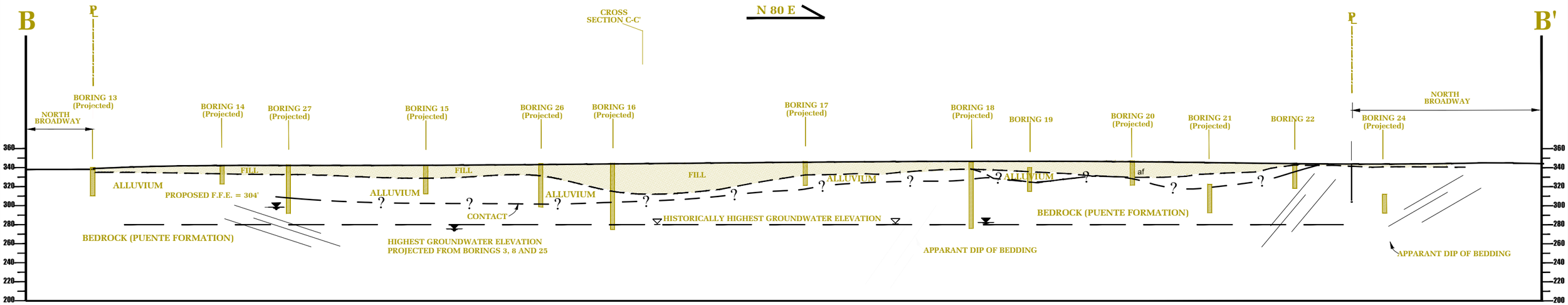
GEOLOGIC MAP 2 - NORTH PORTION

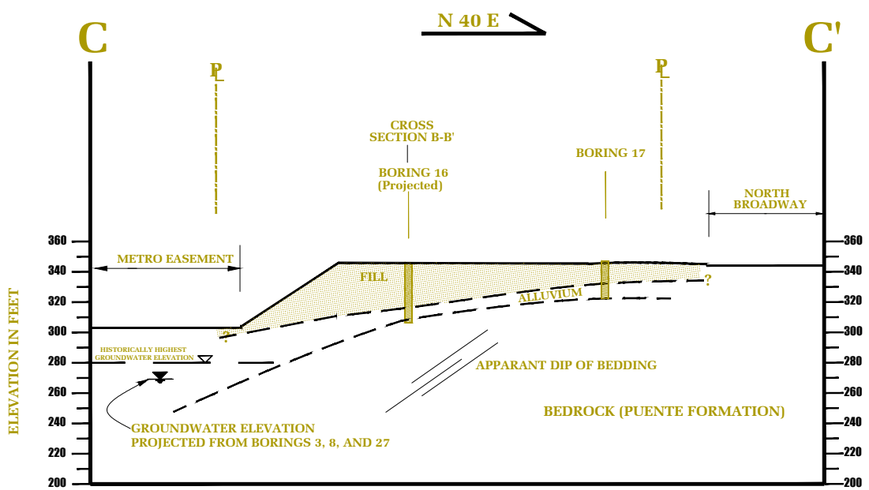
Geotechnologies, Inc.
Consulting Geotechnical Engineers

S & R PARTNERS, LLC

FILE No. 20921	DRAWN BY: SA
DATE: July '15	SHEET: 2 of 2







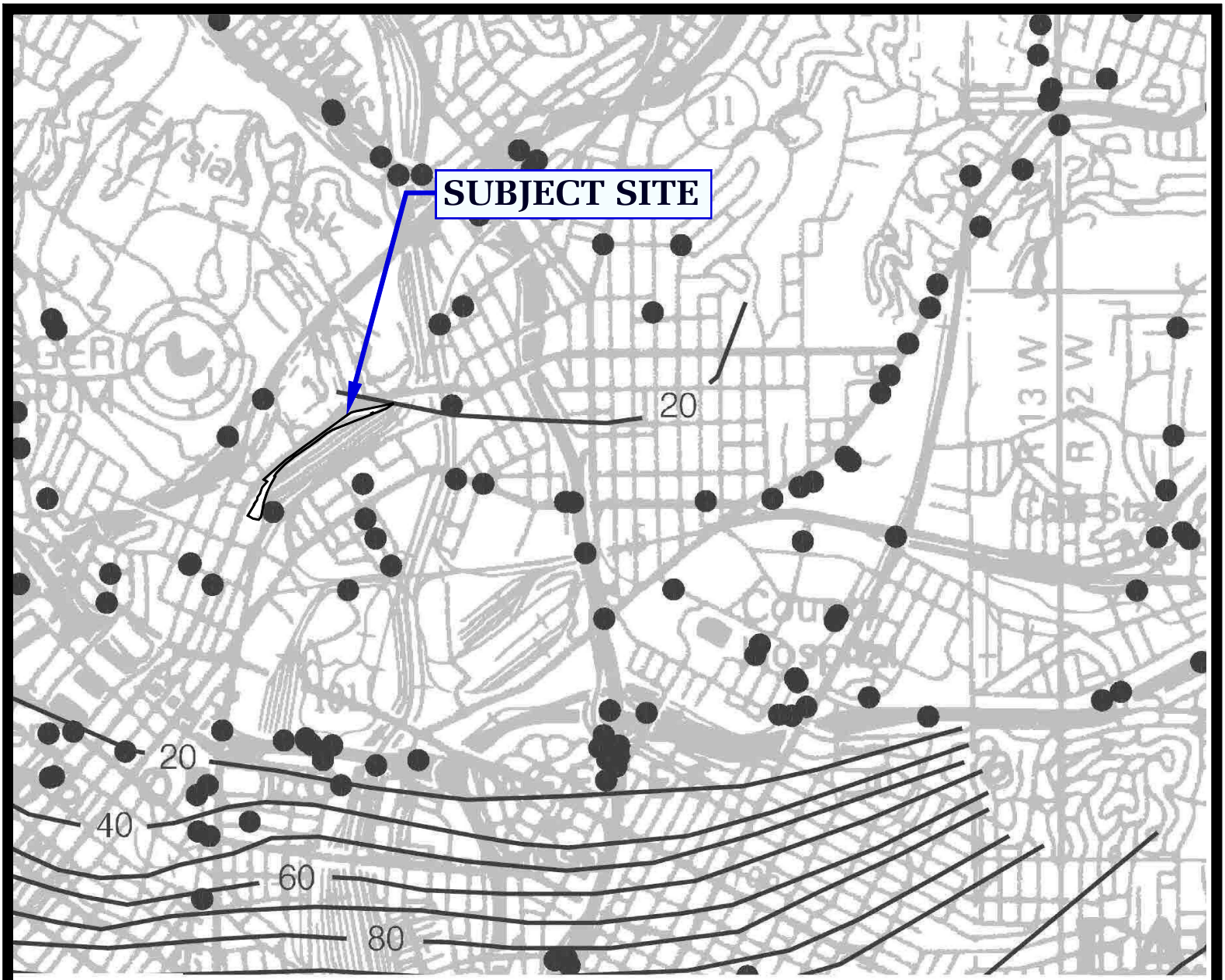
CROSS SECTIONS A-A', B-B', & C-C'

Geotechnologies, Inc.
Consulting Geotechnical Engineers

S & R PARTNERS, LLC

Drawn by: JD | File No.: 20921

Date: June 2024



REFERENCE: CDMG, SEISMIC HAZARD ZONE REPORT, 029
LOS ANGELES 7.5 - MINUTE QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA (1998, REVISED 2006)

HISTORICALLY HIGHEST GROUNDWATER LEVELS

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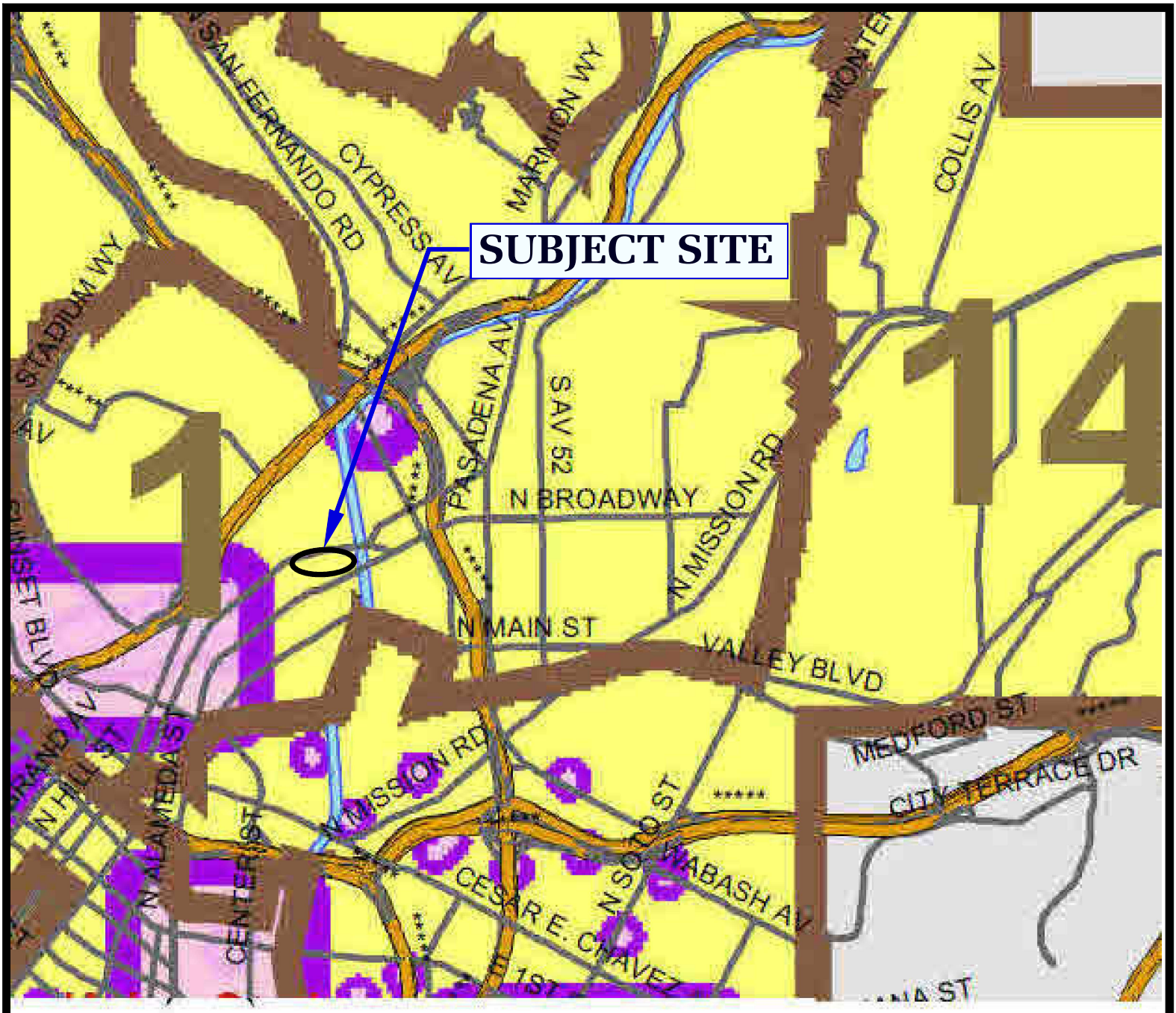
FILE NO. 20921



0 0.2 0.4 0.8 1.2 1.6 2 2.4 2.8 Miles

LEGEND

- Methane Zone
- Methane Buffer Zone
- Council District Boundary

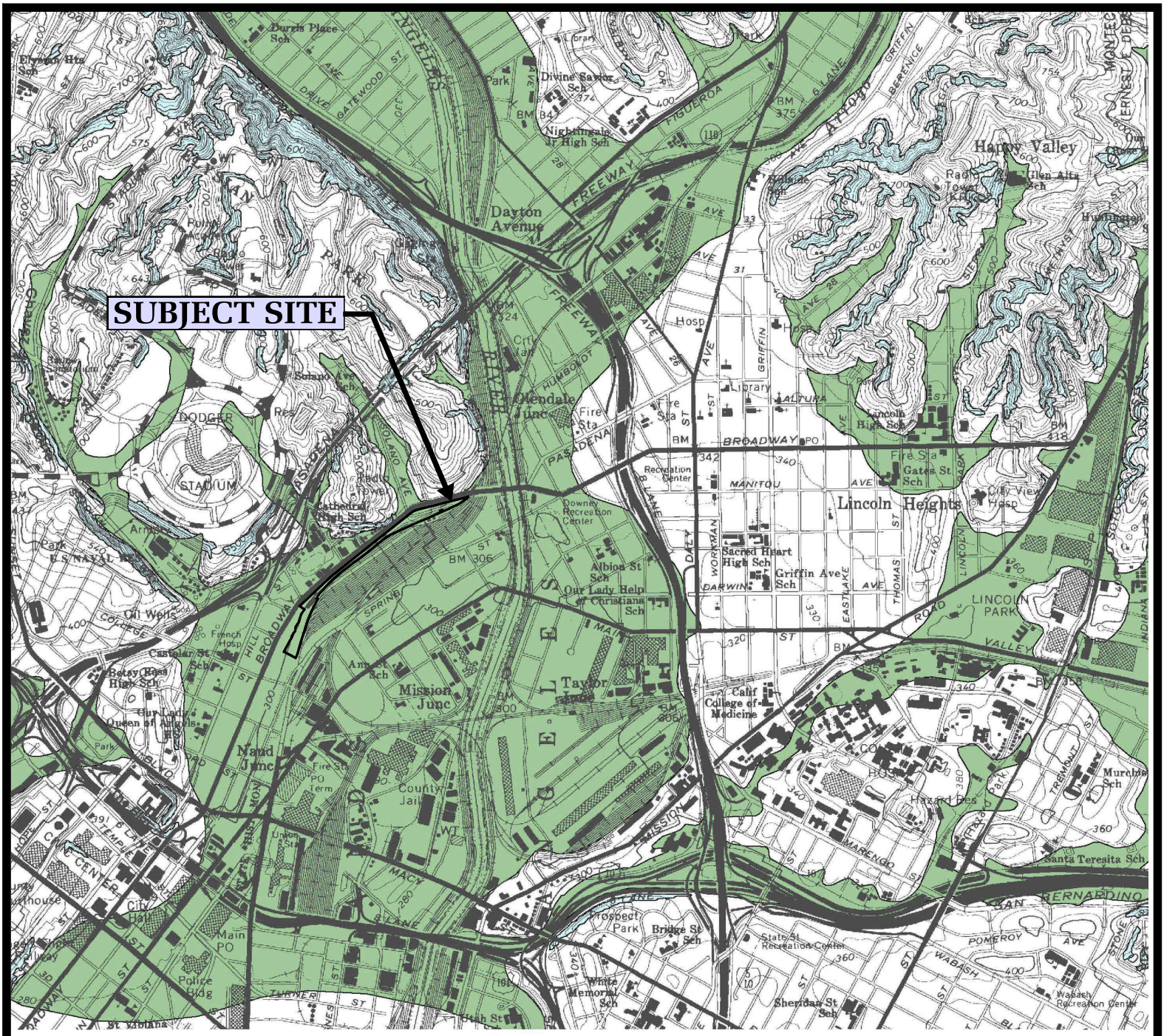
REFERENCE: GIS Mapping, Bureau of Engineering, Department fo Public Works - 09/24/03

METHANE ZONE RISK MAP

Geotechnologies, Inc.
Consulting Geotechnical Engineers

S & R PARTNERS, LLC

FILE NO. 20921



LIQUEFACTION AREA

REFERENCE: SEISMIC HAZARD ZONES, LOS ANGELES QUADRANGLE OFFICIAL MAP (CDMG, 1999)

SEISMIC HAZARD ZONE MAP

Geotechnologies, Inc.
Consulting Geotechnical Engineers

S & R PARTNERS, LLC

FILE NO. 20921

BORING LOG NUMBER 1

Drilling Date: 10/15/07 **Elevation: 293'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Flat Asphalt Parking Lot
				0 --		3-inch Asphalt, No Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained,
1	21	13.8	108.6	1 --		minor brick fragments
				-		
				2 --		
				-	SM	ALLUVIUM: Silty Sand, dark to yellowish-brown, moist, medium
3	70	2.3	123.3	3 --		dense, fine grained
				-		
				4 --	SM/SW	Silty Sand to Sand with Gravel, grayish-brown, dense, fine to coarse
				-		grained
5	80	2.6	123.2	5 --		
				-	SW	Sand to Gravelly Sand, gray, very dense, fine to coarse grained
				6 --		
				-		
7	85/9"	1.1	Disturbed	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	100/6"	4.4	107.8	10 --		
				-	SP	Sand, yellowish-brown, fine to medium grained
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	87/9"	3.9	99.5	15 --		
				-		yellowish to grayish-brown, slightly moist to moist
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	80	3.7	114.1	20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	79/8"	4.2	103.7	25 --		
				-		

BORING LOG NUMBER 1

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- -		
30	90/10"	36.4	84.9	30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -	SM/CL	Silty Sand to Silty Clay, yellow and olive-brown mottling, moist, very dense, fine grained to very stiff Total depth: 30 feet No Water Fill to 2 feet NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual Used 8-inch diameter Hollow-Stem Auger 140-lb. Slide Hammer, 30-inch drop Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 2

Drilling Date: 10/15/07 **Elevation: 291'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		Surface Conditions: Flat Parking Lot 5-inch Asphalt over 3-inch Base
				-		FILL: Silty Sand with brick fragments, dark brown, moist,
				1 --		medium dense, fine grained
				-		
2	67	13.6	116.9	2 --		
				-		dark to yellowish-brown, moist, dense, fine grained, minor cobbles
				3 --		
				-		
4	75/7"	3.0	115.2	4 --		
				-	SP/SW	ALLUVIUM: Sand with Cobbles, yellowish-brown, slightly moist,
				5 --		very dense, fine to coarse grained
				-		
				6 --		
				-		
7	80	3.1	Disturbed	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	64	3.7	111.5	10 --		
				-	SP	Sand, moist, fine to medium grained
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	70	4.9	113.3	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	83	2.2	120.6	20 --		
				-		Total depth: 20 feet
				21 --		No Water
				-		Fill to 4 feet
				22 --		
				-		
				23 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				24 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				25 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 3

Drilling Date: 10/15/07 **Elevation: 293'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Flat Parking Lot
				0 --		4-inch Asphalt over 6-inch Base
				-		FILL: Silty Sand, dark brown, moist, medium dense
				1 --		
				-		
2	37	14.6	118.5	2 --		
				-		Silty to Clayey Sand, dark brown, moist, medium dense, fine grained
				3 --		
				-		
				4 --	SM/SC	ALLUVIUM: Silty to Clayey Sand, dark brown, moist, medium dense to dense, fine grained
				-		
5	50/5"	0.5	SPT	5 --		
				-	SW	Sand with Cobbles, yellowish-brown, very dense, fine to coarse grained
				6 --		
				-		
7.5	100/5"	2.2	117.6	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	50/6"	3.0	SPT	10 --		
				-		
				11 --		
				-		
				12 --		
12.5	100/7"	6.4	118.6	-		
				13 --	SP	Sand, fine to medium grained
				-		
				14 --		
				-		
15	70	4.1	SPT	15 --		
				-		
				16 --		
				-		
				17 --		
17.5	70/7"	18.1	94.8	-		
				18 --		
				-		
				19 --		
				-		
20	50/5"	4.4	SPT	20 --		
				-		
				21 --		
				-		
				22 --		
22.5	100/6"	6.7	121.0	-		
				23 --		fine grained
				-		
				24 --		
				-		
25	50/5"	3.4	SPT	25 --		
				-		

BORING LOG NUMBER 3

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
27.5	100/6"	26.7	111.5	28 --	SP/SW	Sand, very moist, fine to coarse grained
				29 --		
30	50/6"	7.1	SPT	30 --	SW	Sand with Gravel, wet
				31 --		
				32 --		
32.5	75/7"	10.4	122.7	33 --		
				34 --		
35	50/6"	7.2	SPT	35 --	SM	Silty Sand, yellowish and olive brown mottling, moist, dense, fine grained
				36 --		
				37 --		
37.5	80	21.3	109.7	38 --	SP	Sand, grayish-brown, wet
				39 --		
40	50/6"	19.2	SPT	40 --		
				41 --		
				42 --		
42.5	90	15.4	114.5	43 --		
				44 --		
45	75	13.5	SPT	45 --		
				46 --		
				47 --		
47.5	65	17.8	108.1	48 --		
				49 --		
50	80	No Recovery		50 --		

BORING LOG NUMBER 3

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				51 --		
				52 --		
52.5	75/11"	13.1	117.3	53 --		gray to dark grayish-brown, very moist to wet
				54 --		
55	50/5"	15.4	SPT	55 --		
				56 --		
57.5	80	16.1	112.7	57 --		
				58 --		
60	50/5"	18.7	SPT	59 --		
				60 --		
				61 --		
62.5	50	16.5	Disturbed	62 --		
				63 --		
65	70	18.4	SPT	64 --		
				65 --		
				66 --		
67.5	50	14.2	118.8	67 --		
				68 --		
70	70/11"	13.2	SPT	69 --		
				70 --		Total depth: 70 feet Water at 30 feet Fill to 3.5 feet
				71 --		
				72 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual
				73 --		
				74 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Slide Hammer, 30-inch drop
				75 --		Modified California Sampler used unless otherwise noted
						SPT=Standard Penetration Test

BORING LOG NUMBER 4

Drilling Date: 10/15/07 **Elevation: 292'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Flat Parking Lot
				0 --		2-inch Asphalt, No Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				1 --		
				-		
2	20	18.1	92.1	2 --		
				-		
				3 --		
				-	SM	ALLUVIUM: Silty Sand, dark brown, moist, medium dense, fine
4	41	3.7	118.7	4 --		grained
				-		
				5 --		
				-	SP/SW	Sand with Cobbles, yellowish to light brown
				6 --		
				-		
7	80	3.4	119.9	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	75/7"	29.5	90.5	10 --		
				-	SP	Sand, yellowish and olive-brown, very dense, fine to medium
				11 --		grained
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/6"	5.9	108.3	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	80	6.2	102.6	20 --		
				-		Total depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		
				23 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				24 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				25 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 5

Drilling Date: 10/15/07 **Elevation: 293'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		7-inch Asphalt, No Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained,
1	80	9.8	112.8	1 --		minor asphalt fragments
				-		
				2 --		
				-		
3	40	2.3	113.7	3 --		
				-	SW	ALLUVIUM: Sand with Cobbles, yellowish-brown, slightly moist,
				4 --		medium dense, fine to coarse grained
				-		
5	64	2.2	112.0	5 --		
				-		
				6 --		
				-		
7	47	3.3	94.5	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	70	2.0	118.0	10 --		
				-		very dense
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/6"	6.2	111.0	15 --		
				-	SP	Sand, very dense, fine to medium grained
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	70	4.9	104.4	20 --		
				-		Total depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		
				23 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				24 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				25 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 6

Drilling Date: 10/17/07 **Elevation: 293'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Flat Parking Lot
				0 --		6-inch Asphalt, No Base
				-		FILL: Silty Sand, dark and yellowish-brown, moist, medium dense,
				1 --		fine grained
				-		
2	40	15.1	106.2	2 --		
				-		
				3 --		
				-		
4	62	16.4	107.4	4 --		
				-		Sandy to Silty Clay to Sand with Gravel, grayish to yellowish-
				5 --		brown, medium stiff to dense
				-		
				6 --	SW	ALLUVIUM: Sand with Gravel, yellowish-brown, slightly moist,
				-		medium dense to dense, fine to coarse grained
7	78	1.6	120.0	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	100/7"	5.6	117.3	10 --		
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	90/9"	3.3	111.8	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	94/10"	6.5	103.2	20 --		
				-	SP	Sand, olive to yellowish-brown, very dense, fine to medium grained
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	95/9"	4.0	102.9	25 --		
				-		

BORING LOG NUMBER 6

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- -		
30	75/7"	14.1	107.8	30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -		**Total depth: 30 feet** **Water at 29 feet** **Fill to 5.5 feet** **NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual** **Used 8-inch diameter Hollow-Stem Auger** **140-lb. Slide Hammer, 30-inch drop** **Modified California Sampler used unless otherwise noted**

BORING LOG NUMBER 7

Drilling Date: 10/17/07 **Elevation: 295'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		Surface Conditions: Flat Parking Lot 5-inch Asphalt, No Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
1	22	13.4	113.7	1 --		
				-		
				2 --		
				-	SM	ALLUVIUM: Silty Sand, dark to yellowish-brown, moist, medium
3	13	31.9	73.2	3 --		dense, fine grained
				-		
				4 --	ML	Sandy Silt, yellowish to grayish-brown mottling, medium stiff
				-		
5	13	15.0	101.5	5 --		
				-		Sandy to Clayey Silt, yellowish and reddish-brown mottling
				6 --		
				-		
7	58	1.4	Disturbed	7 --		
				-	SW	Sand with Cobbles, yellowish-brown, slightly moist, dense, fine to
				8 --		coarse grained
				-		
				9 --		
				-		
10	100/7"	2.1	123.3	10 --		
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/6"	4.4	113.2	15 --		
				-	SP	Sand, very dense, fine to medium grained
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	80/11"	4.2	97.0	20 --		
				-		Total depth: 20 feet
				21 --		No Water
				-		Fill to 2 feet
				22 --		
				-		
				23 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				24 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				25 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 8

Drilling Date: 10/17/07 **Elevation: 295'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		Surface Conditions: Flat Parking Lot 2-inch Asphalt, No Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				1 --		
				-		
2	80	6.6	109.9	2 --		
				-		minor asphalt fragments
				3 --		
				-		
4	32	11.0	102.1	4 --		
				-		
				5 --		
				-		
				6 --		
				-		
7	56	1.2	113.7	7 --		
				-		
				8 --		
				-	SP	ALLUVIUM: Sand, yellowish-brown, slightly moist, dense, fine to medium grained
				9 --		
				-		
10	80	1.3	109.5	10 --		
				-		very dense
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	70	1.6	108.5	15 --		
				-		fine grained
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	76	4.5	95.6	20 --		
				-		Total depth: 20 feet
				21 --		No Water
				-		Fill to 8 feet
				22 --		
				-		
				23 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				24 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				25 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 9

Drilling Date: 10/17/07 **Elevation: 298'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Flat Parking Lot
				0 --		3-inch Asphalt, No Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
1	46	7.8	97.9	1 --		
				-		
				2 --		
				-		
3	80	7.0	107.2	3 --		
				-	SM	ALLUVIUM: Silty Sand, dark brown, moist, very dense, fine grained, minor gravel
				4 --		
				-		
5	50	1.8	106.2	5 --		
				-	SW	Sand with Gravel, yellowish-brown, slightly moist, medium dense, fine to coarse grained
				6 --		
				-		
7	31	16.3	101.3	7 --	SM	Silty Sand, dark and reddish-brown mottling, moist, fine grained
				-		
				8 --		
				-		
				9 --		
				-		
10	77	7.0	98.0	10 --		
				-	SW/SP	Silty Sand, olive and yellowish-brown mottling, very dense
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	90/8"	No Recovery		15 --		
				-		
16	72	16.9	101.1	16 --		
				-	SM/SW	Silty Sand interbedded with Sand with Cobbles, fine to coarse grained
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	100/7"	4.6	109.6	20 --		
				-		Total depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		
				23 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual
				-		
				24 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				25 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 10

Drilling Date: 10/17/07 **Elevation: 299'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Flat Parking Lot
				0 --		3-inch Asphalt, No Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				1 --		
				-		
2	80	7.3	107.0	2 --		
				-		dark to yellowish-brown, very dense, minor gravel
				3 --		
				-		
4	75/7"	5.6	110.4	4 --		
				-		dark brown
				5 --		
				-		
				6 --		
				-		
7	75/11"	3.6	110.7	7 --		
				-	SP	ALLUVIUM: Sand, yellowish-brown, slightly moist, very dense, fine to medium grained
				8 --		
				-		
				9 --		
				-		
10	83	3.3	109.9	10 --		
				-	SP/SW	Sand with Cobbles, fine to coarse grained
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	75/7"	15.6	114.6	15 --		
				-	SM/SW	Silty Sand to Sand with Cobbles, olive to yellowish-brown, moist, fine grained
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	75/7"	6.4	108.2	20 --		
				-	SP	Sand, yellowish-brown, slightly moist, fine to medium grained
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/7"	3.7	110.8	25 --		
				-		olive-brown, moist

BORING LOG NUMBER 10

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- -		
30	95/9"	2.5	108.1	30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -		**Total depth: 30 feet** **No Water** **Fill to 7 feet** **NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual** **Used 8-inch diameter Hollow-Stem Auger** **140-lb. Slide Hammer, 30-inch drop** **Modified California Sampler used unless otherwise noted**

BORING LOG NUMBER 11

Drilling Date: 10/17/07 **Elevation: 322'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, minor gravel
1	43	10.5	105.2	1 --		
				2 --		
3	23	13.2	108.5	3 --		
				4 --	ML	ALLUVIUM: Sandy to Clayey Silt, dark to medium brown, moist, medium stiff
5	29	9.9	103.3	5 --		
				6 --	SM	Silty Sand, medium to reddish-brown, medium dense, fine grained
7	16	11.8	94.0	7 --		
				8 --	SM/ML	Silty Sand to Sandy Silt, dark brown, stiff
				9 --		
10	34	12.2	102.8	10 --		
				11 --		
				12 --		
				13 --		
				14 --		
15	50	9.6	100.3	15 --		
				16 --	SM	Silty Sand, yellowish-brown
				17 --		
				18 --		
				19 --		
20	47	8.0	101.6	20 --		
				21 --		Total depth: 20 feet No Water Fill to 3 feet
				22 --		
				23 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual
				24 --		
				25 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Slide Hammer, 30-inch drop Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 12

Drilling Date: 10/17/07 **Elevation: 327'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark to medium brown, moist, medium dense, fine grained
				-		
				1 --		
				-		
2	20	12.0	85.4	2 --		
				-	SM	ALLUVIUM: Silty Sand, dark and reddish-brown mottling, moist, medium dense, fine grained
				3 --		
				-		
4	30	9.6	93.5	4 --		
				-		
				5 --		
				-		
				6 --		
				-		
7	27	10.2	106.4	7 --		
				-		yellowish-brown, slightly porous
				8 --		
				-		
				9 --		
				-		
10	35	11.6	91.6	10 --		
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	47	10.9	106.0	15 --		
				-		dark brown
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	70/11"	6.4	101.7	20 --		
				-	SM/SP	Silty Sand to Sand, olive-brown, very dense
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/5"	1.0	Disturbed	25 --		
				-	SW	Sand with Cobbles, yellowish-brown, slightly moist, fine to coarse grained

BORING LOG NUMBER 12

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- -		
30	100/6"	1.0	121.2	30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -		**Total depth: 30 feet** **No Water** **Fill to 2 feet** **NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual** **Used 8-inch diameter Hollow-Stem Auger** **140-lb. Slide Hammer, 30-inch drop** **Modified California Sampler used unless otherwise noted**

BORING LOG NUMBER 13

Drilling Date: 10/18/07 **Elevation: 340'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		Surface Conditions: Flat Parking Lot 1-inch Asphalt over 2-inch Base
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				1 --		
				-		
2	22	7.9	85.9	2 --		
				-		
				3 --		
				-		
4	23	7.5	91.0	4 --		
				-		
				5 --		
				-	SM	ALLUVIUM: Silty Sand, dark brown, moist, medium dense, fine grained
				6 --		
				-		
7	27	7.7	95.2	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	37	7.6	100.1	10 --		
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	49	11.2	112.3	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	85/8"	11.5	101.8	20 --		
				-	SW	Sand, yellowish-brown, slightly moist, very dense, fine grained, with cobbles
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/6"	2.1	122.8	25 --		
				-		fine to coarse grained

BORING LOG NUMBER 13

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- -		
30	100/6"	1.3	123.2	30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -		**Total depth: 30 feet** **No Water** **Fill to 5 feet** **NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual** **Used 8-inch diameter Hollow-Stem Auger** **140-lb. Slide Hammer, 30-inch drop** **Modified California Sampler used unless otherwise noted**

BORING LOG NUMBER 14

Drilling Date: 10/18/07 **Elevation: 341'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				-		
				1 --		
				-		
2	71	3.8	116.5	2 --		
				-		yellowish-brown, very dense
				3 --		
				-		
4	70	5.1	114.1	4 --		
				-		medium brown, minor brick fragments
				5 --		
				-		
				6 --		
				-		
7	26	15.7	110.8	7 --		
				-		
				8 --		
				-	CL	ALLUVIUM: Sandy to Silty Clay, dark brown, moist, medium stiff
				9 --		
				-		
10	37	14.7	113.1	10 --		
				-		
				11 --		
				-	CL	Clayey Sand
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	58	13.8	112.7	15 --		
				-	SM	Silty Sand, medium dense to dense, fine grained
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	80	2.8	113.7	20 --	SW	Sand, yellowish-brown, very dense, fine to coarse grained
				-		
				21 --		Total depth: 20 feet
				-		No Water
				22 --		Fill to 8 feet
				-		
				23 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				24 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				25 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 15

Drilling Date: 10/18/07 **Elevation: 343'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, medium brown, moist, medium dense, fine grained
				-		
1	70			1 --		
				-		
				2 --		
				-		yellowish and dark brown mottling, very dense, fine grained with gravel
				3 --		
				-		
				4 --		
				-		
5	74/11"	No Recovery		5 --		
				-		
				6 --		
				-		
7	86	12.3	88.6	7 --		
				-		disturbed sample
				8 --		
				-	SC	ALLUVIUM: Clayey Sand, dark brown, moist, dense, fine grained
				9 --		
				-		
10	87	10.2	107.3	10 --		
				-	SM	Silty Sand to Clayey Sand, medium dense, fine grained
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	35	12.9	111.4	15 --		
				-	SM/SC	Silty Sand to Clayey Sand, medium dense, fine grained
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	70	13.8	105.1	20 --		
				-	SM	Silty Sand, dense
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/6"	2.6	121.8	25 --		
				-	SW	Sand with Cobbles, yellowish-brown, very dense, fine to coarse grained

BORING LOG NUMBER 15

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- -		
30	100/6"	3.0	Disturbed	30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -		**Total depth: 30 feet** **No Water** **Fill to 8 feet** **NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual** **Used 8-inch diameter Hollow-Stem Auger** **140-lb. Slide Hammer, 30-inch drop** **Modified California Sampler used unless otherwise noted**

BORING LOG NUMBER 16

Drilling Date: 10/16/07 **Elevation: 346'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, yellowish-brown, moist, medium dense, fine grained
1	67/12"	7.0	114.1	1 --		
						slight gravel
				2 --		
						Sandstone, yellowish-brown with light gray mottling, hard
3	75/7"	12.7	106.5	3 --		
				4 --		
						light gray with white mottling to medium brown, very hard
5	100/6"	8.1	117.0	5 --		
						Silty Sand, light grayish-brown, moist, very dense, fine to medium grained, slight gravel
				6 --		
7	100/6"	6.0	113.3	7 --		
				8 --		
				9 --		
10	54	4.2	115.3	10 --		
						Silty Sand to Sand, yellowish-brown, medium dense to dense, fine to coarse grained
				11 --		
				12 --		
				13 --		
				14 --		
15	64	9.4	95.7	15 --		
						Silty Sand, dark and medium brown, dense, fine grained
				16 --		
				17 --		
				18 --		
				19 --		
20	82	4.0	106.6	20 --		
				21 --		
				22 --		
22.5	66	12.9	106.2			
				23 --		Silty Sand to Sandy Silt, dark brown and dark gray mottling, stiff
				24 --		
25	90/10"	6.2	100.9	25 --		
						minor brick and asphalt fragments

BORING LOG NUMBER 16

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
27.5	74	17.6	105.9	28 --		
				29 --		
30	77/11"	4.5	113.9	30 --		
				31 --	SP	ALLUVIUM: Sand with Gravel, yellowish-brown, slightly moist, very dense, fine grained
				32 --		
				33 --		
				34 --		
35	93/11"	7.8	116.8	35 --		
				36 --	SP/SW	Sand with Gravel, dark brown, very moist
				37 --		
37.5	75	19.8	105.5	38 --		BEDROCK: (PUENTE FORMATION): Siltstone, gray to dark gray, moderately hard, well bedded
				39 --		
40	75/11"	20.1	107.1	40 --		Total depth: 40 feet No Water Fill to 30 feet
				41 --		
				42 --		
				43 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual
				44 --		
				45 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Slide Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				46 --		
				47 --		
				48 --		
				49 --		
				50 --		

BORING LOG NUMBER 17

Drilling Date: 10/16/07 **Elevation: 347'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, yellowish-brown, moist, medium dense, fine to medium grained
				-		
				1 --		
				-		
2	46	19.7	104.2	2 --		
				-		yellowish, grayish-brown with light gray mottling to brown, fine grained
				3 --		
				-		
4	38	17.6	107.2	4 --		
				-		Sandy Clay, medium brown with dark gray mottling, medium stiff
				5 --		
				-		
				6 --		
				-		
7	85/11"	19.8	103.4	7 --		
				-		Silty Sand, medium brown with gray mottling to dark gray, very dense, fine with medium grained, slight gravel
				8 --		
				-		
				9 --		
				-		
10	30	11.7	112.8	10 --		
				-		dark gray
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	85/11"	15.2	117.5	15 --		
				-	SC	ALLUVIUM: Clayey Sand, greenish-gray with dark gray mottling, moist, medium stiff
				16 --		
				-		
				17 --		
17.5	80/11"	15.8	113.4	-		
				18 --		weathered bedrock, Sandstone, yellowish-brown with light gray mottling, medium dense, fine grained
				-		
				19 --		
				-		
20	85/12"	11.7	115.4	20 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual
				-		
				21 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Slide Hammer, 30-inch drop
				22 --		Modified California Sampler used unless otherwise noted
				-		
				23 --		
				-		
				24 --		BEDROCK (PUENTE FORMATION): Sandstone, gray to greenish-gray with medium brown, moderately hard, well bedded
				-		
25	57	20.4	98.0	25 --		
				-		Total depth: 25 feet; No Water; Fill to 15 feet

BORING LOG NUMBER 18

Drilling Date: 10/16/07 **Elevation: 348'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	Description
					Surface Conditions: Gravel Road
				0 --	FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				-	
				1 --	
				-	
2	75/11"	9.7	102.1	2 --	
				-	
				3 --	
				-	
				4 --	
				-	
5	35	5.8	SPT	5 --	
				-	Silty Sand to Sand, dark and grayish-brown mottling, medium dense
				6 --	to dense
				-	
				7 --	
7.5	59	6.7	110.0	-	
				8 --	Silty Sand, dark brown, minor brick fragments
				-	
				9 --	
				-	
10	20	7.8	SPT	10 --	
				-	BEDROCK (PUENTE FORMATION): interbedded Siltstone and
				11 --	Sandstone, yellowish and light yellow mottling, moist, moderately
				-	hard, well bedded
				12 --	
12.5	52	11.7	107.4	-	
				13 --	
				-	
				14 --	
				-	
15	43	10.3	SPT	15 --	
				-	
				16 --	
				-	
				17 --	
17.5	80	21.2	116.4	-	
				18 --	Sandstone interbedded with Siltstone, yellowish and light brown
				-	mottling, less weathered
				19 --	
				-	
20	80/11"	22.2	SPT	20 --	
				-	minor caliche
				21 --	
				-	
				22 --	
22.5	83/12"	26.6	92.7	-	
				23 --	Clayey Siltstone
				-	
				24 --	
				-	
25	80/11"	25.3	SPT	25 --	
				-	

BORING LOG NUMBER 18

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	Description
				26	
				27	
27.5	75/7"	14.1	110.1		
				28	Sandstone, olive-brown
				29	
30	50/6"	16.9	SPT	30	
				31	
				32	
32.5	75/7"	37.8	85.0		
				33	Siltstone interbedded with Sandstone, yellow and olive-brown
				34	
35	50/6"	17.6	SPT	35	
					Silty Sandstone, olive-brown
				36	
				37	
37.5	100/6"	23.9	101.3		
				38	Siltstone to Sandstone, grayish-brown
				39	
40	80/12"	42.6	SPT	40	
				41	
				42	
42.5	100/6"	13.9	113.6		
				43	
				44	
45	75/7"	33.9	SPT	45	
				46	
				47	
47.5	75/7"	35.2	83.5		
				48	
				49	
50	50/6"	19.7	SPT	50	
					Sandstone, gray and dark brown

BORING LOG NUMBER 18

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	Description
				51 --	
				52 --	
52.5	75/7"	35.6	85.6	53 --	
				54 --	
55	80/11"	31.6	SPT	55 --	
				56 --	
				57 --	
57.5	100/6"	20.8	101.9	58 --	dark brown, wet
				59 --	
60	50/6'	17.5	SPT	60 --	Siltstone interbedded with Sandstone, dark brown and grayish-brown, moist
				61 --	
				62 --	
62.5	100/7"	27.8	94.8	63 --	grayish-brown
				64 --	
65	50/3"	17.0	SPT	65 --	Sandstone, dark and grayish-brown, fine grained
				66 --	
				67 --	
67.5	75/8"	30.7	89.3	68 --	
				69 --	
70	50/6"	18.2	SPT	70 --	
				71 --	Total depth: 70 feet Water at 66 feet Fill to 10 feet
				72 --	
				73 --	NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual
				74 --	
				75 --	Used 8-inch diameter Hollow-Stem Auger 140-lb. Slide Hammer, 30-inch drop Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 19

Drilling Date: 10/18/07 **Elevation: 339'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Paved and Inclined Access Road
				0 --		2-inch Asphalt, No Base
				-		FILL: Silty Sand, reddish-brown, moist, medium dense, fine
				1 --		grained
				-		
2	70/12"	8.0	103.7	2 --		
				-		very dense
				3 --		
				-	SM	ALLUVIUM: Silty Sand, reddish-brown, moist, dense, fine grained
4	42	7.2	108.8	4 --		
				-		
				5 --		
				-		
				6 --		
				-		
7	40	8.5	Disturbed	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	38	10.9	116.3	10 --		
				-	SM/ML	Silty Sand to Sandy Silt, dark and yellowish-brown, moist, medium
				11 --		dense, medium stiff
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	46	12.7	111.6	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	80	41.3	84.9	20 --		
				-		BEDROCK (PUENTE FORMATION): Clayey Siltstone, gray and
				21 --		white mottling, moderately hard, well bedded
				-		
				22 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				23 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				24 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted
25	70/11"	27.7	92.9	25 --		
				-		Total depth: 25 feet; No Water; Fill to 3 feet

BORING LOG NUMBER 20

Drilling Date: 10/18/07 **Elevation: 347'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Gravel Road
				0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				-		
				1 --		
				-		
2	75/11'	Disturbed		2 --		
				-		very dense
				3 --		
				-		
4	34	6.4	102.4	4 --		
				-		medium dense
				5 --		
				-		
				6 --		
				-		
7	15	4.9	92.4	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	30	5.9	105.3	10 --		
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	35	16.7	Disturbed	15 --		
				-		
				16 --		
				-		
				17 --		
17.5	80	15.0	129.8	-		
				18 --		BEDROCK (PUENTE FORMATION): Sandstone, yellowish and grayish-brown mottling, moderately hard, well bedded
				-		
				19 --		
				-		
20	90/9"	9.9	97.4	20 --		
				-		
				21 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual
				-		
				22 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				23 --		140-lb. Slide Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted
				24 --		
				-		
25	215/12"	20.8	103.9	25 --		
				-		Total depth: 25 feet; No Water; Fill to 17.5 feet

BORING LOG NUMBER 21

Drilling Date: 10/18/07 **Elevation: 322'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Inclined Access Road
				0 --		4-inch Asphalt over 5-inch Base
				-		FILL: Silty Sand, light gray, moist, medium dense, fine grained
1	80/11"	9.0	113.8	1 --		
				-		
				2 --		BEDROCK (PUENTE FORMATION): Sandstone, yellowish to light brown, moist, moderately hard, well bedded
				-		
3	87/11"	8.7	116.7	3 --		
				-		
				4 --		
				-		
5	85	12.0	113.2	5 --		
				-		
				6 --		
				-		
7	86	15.4	108.2	7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	89/11"	16.4	110.0	10 --		
				-		yellowish and reddish-brown
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	80/12"	24.4	99.0	15 --		
				-		gray
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	80/9"	26.9	99.5	20 --		
				-		Siltstone
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	83	21.9	100.4	25 --		
				-		Sandstone, gray and yellowish-brown mottling

BORING LOG NUMBER 21

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- -		
30	93/11"	23.2	104.5	30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -		**Total depth: 30 feet** **No Water** **Fill to 1.5 feet** **NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual** **Used 8-inch diameter Hollow-Stem Auger** **140-lb. Slide Hammer, 30-inch drop** **Modified California Sampler used unless otherwise noted**

BORING LOG NUMBER 22

Drilling Date: 10/16/07 **Elevation: 347'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, yellowish-brown, moist, medium dense, fine grained
				-		
				1 --		
				-		BEDROCK (PUENTE FORMATION): Siltstone and Sandstone,
2	8/12"	15.6	98.8	2 --		yellowish-brown with white mottling, fine grained, moderately hard, moist, well bedded
				-		
				3 --		
				-		weathered
				4 --		
				-		yellow to light brown
5	9/12"	24.9	86.8	5 --		
				-		
				6 --		
				-		
7	8/12"	29.3	81.3	7 --		
				-		reddish-orange with white mottling, less weathered
				8 --		
				-		
				9 --		@ 9' Bedding: [N60W, 42SW]
				-		
10	2/12"	23.0	109.5	10 --		
				-		yellowish-orange with white mottling
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	6/12"	17.4	104.0	15 --		
				-		yellowish-brown with reddish-brown mottling
				16 --		
				-		
				17 --		
				-		@ 18' Bedding: [N85E, 55S]
				18 --		
				-		gray
				19 --		
				-		
20	11/12"	14.9	114.4	20 --		
				-		Silty Sandstone interbedded with Silty Claystone, light gray with
				21 --		gray mottling, stiff, slight gravel
				-		
				22 --		@ 22' Bedding: [N30W, 55SW]
				-		
				23 --		
				-		
				24 --		
				-		
25	6/12"	26.3	95.6	25 --		
				-		

BORING LOG NUMBER 22

Project: File No. 19557 **S & R Partners, LLC**

ra

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 26 -- - 27 -- - 28 -- - 29 -- - 30 -- - 31 -- - 32 -- - 33 -- - 34 -- - 35 -- - 36 -- - 37 -- - 38 -- - 39 -- - 40 -- - 41 -- - 42 -- - 43 -- - 44 -- - 45 -- - 46 -- - 47 -- - 48 -- - 49 -- - 50 -- -		**Total depth: 26 feet by refusal of silicified rock** **No Water** **Fill to 6 inches** **NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual** **Used 24-inch diameter Bucket Auger with Modified California Sampler** **Kelly Weights: 1590# 0' - 27'** **Boring Downhole logged by Geologist**

BORING LOG NUMBER 23

Drilling Date: 10/18/07 **Elevation: 311'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				0 --		Surface Conditions: Inclined Paved Access Road 3-inch Asphalt over 6-inch Base
				-		FILL: Silty Sand with rock fragments, dark brown, moist, medium grained
				1 --		
				-		
				2 --		
				-		
				3 --		
				-		
				4 --		
				-	SM	Silty Sand, dark brown and olive-brown, moist, dense, fine grained
5	18/12"	10.6	110.8	5 --		
				-		
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	20/12"	10.2	110.3	10 --		
				-		Silty Sand with rock fragments, dark gray and gray mottling,
				11 --		moist, very dense, fine grained, petroleum odor
				-		
				12 --		Total depth: 11 feet by refusal
				-		No Water
				13 --		Bottom of Fill not identified
				-		
				14 --		
				-		NOTE: The stratification lines represent the approximate
				15 --		boundary between earth types; the transition may be gradual
				-		
				16 --		Used 24-inch diameter Bucket Auger
				-		with Modified California Sampler
				17 --		Kelly Weights: 1590# 0' - 27'
				-		Boring Downhole logged by Geologist
				18 --		
				-		
				19 --		
				-		
				20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
				25 --		
				-		

BORING LOG NUMBER 24

Drilling Date: 10/16/07 **Elevation: 312'***

Project: File No. 19557 **S & R Partners, LLC**

ra

*reference: Topographic Survey by Surveying and Drafting Services, dated 01/21/02

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, minor asphalt fragments
				-		
				1 --		
				-		
				2 --		
				-		
3	11/12"	6.0	107.4	3 --		
				-		
				4 --		BEDROCK (PUENTE FORMATION): Siltstone, weathered, poorly bedded, dark gray to yellowish-brown, moist, moderately hard
				-		
				5 --		
				-		
6	10/12"	20.7	97.5	6 --		Sandstone interbedded with Siltstone, light to dark gray
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		less weathered, @ 9' Bedding: [N60W, 65SW]
				-		
10	15/12"	16.1	107.9	10 --		Sandstone, gray to dark gray, moderately well bedded
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	18/12"	20.0	99.7	15 --		
				-		
				16 --		@ 16' Bedding: [N65W, 65SW]
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	8/12"	22.1	101.1	20 --		Total depth: 20 feet
				-		No Water
				21 --		Fill to 3.5 feet
				-		
				22 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual
				23 --		
				-		
				24 --		Used 24-inch diameter Bucket Auger
				-		with Modified California Sampler
				25 --		Kelly Weights: 1590# 0' - 27'
				-		Boring Downhole logged by Geologist

BORING LOG NUMBER 25

Lincoln Property Company **Date: 03/18/15** **Elevation: 295'***

File No. 20921 **Method: 8-inch diameter Hollow Stem Auger**

km *Reference: Plan by Surveying and Drafting Services

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt
				0 --		3-inch Asphalt, No Base
				-		
				1 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, some gravel
				-		
				2 --		
2.5	31	7.0	117.0	-		
				3 --		Silty Sand, dark brown, moist, medium dense, fine grained
				-		
				4 --		
				-		
5	5	8.0	SPT	5 --		
				-		Silty Sand to Sand, dark to yellowish brown, moist, medium dense, fine grained
				6 --		
				-		
				7 --		
7.5	33	2.7	103.9	-		
				8 --	SP	ALLUVIUM: Sand, yellowish brown, moist, medium dense, fine grained
				-		
				9 --		
				-		
10	7	7.0	SPT	10 --		
				-		Sand, dark and yellowish brown, moist, medium dense, fine grained
				11 --		
				-		
				12 --		
12.5	27	4.5	98.6	-		
				13 --		
				-		
				14 --		
				-		
15	32	1.7	SPT	15 --		
				-		Sand, dark and yellowish brown, moist, medium dense to dense, fine to coarse grained
				16 --		
				-		
				17 --		
17.5	75	2.3	113.1	-		
				18 --		Sand, light brown and yellow, slightly moist, very dense, fine to medium grained
				-		
				19 --		
				-		
20	32	2.9	SPT	20 --		
				-		
				21 --		
				-		
				22 --		
22.5	100/10"	4.3	114.9	-		
				23 --		Sand, yellow and olive brown, moist, very dense, fine to medium grained
				-		
				24 --		
				-		
25	68	5.0	SPT	25 --		
				-	SW	Gravelly Sand, yellow and olive brown, moist, very dense, fine grained

BORING LOG NUMBER 25

Lincoln Property Company

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
27.5	27 50/5"	3.3	108.0	28 --	SP	Sand, yellow and olive brown, moist, very dense, fine to medium grained
				29 --		
30	39	6.2	SPT	30 --		Sand, yellow and olive brown, moist to wet, medium dense, fine to medium grained
				31 --		
				32 --		
32.5	48	19.0	102.9	33 --		
				34 --		
35	21	19.2	SPT	35 --	SM/SP	Silty Sand to Sand, dark and grayish brown, moist, medium dense, fine grained
				36 --		
				37 --	SM/ML	Silty Sand to Sandy Silt, dark and grayish brown, moist, stiff, medium dense, fine grained
37.5	70	22.5	108.4	38 --		
				39 --		
40	17	19.4	SPT	40 --	SP	Sand, dark and grayish brown, moist to wet, medium dense, fine to medium grained
				41 --		
				42 --		
42.5	16	32.4	90.5	43 --	ML	Sandy Silt, gray to dark gray, moist to very moist, stiff
				44 --		
45	14	32.0	SPT	45 --	ML/SP	Sandy Silt to Sand, gray to dark gray, moist, stiff, medium dense, fine grained
				46 --		
				47 --		
47.5	24 50/5"	13.7	117.9	48 --	SP	Sand, gray to dark gray, wet, very dense, fine to medium grained, minor gravel
				49 --		
50	75	13.4	SPT	50 --		Sand, gray to dark gray, wet, very dense, fine to medium grained

BORING LOG NUMBER 25

Lincoln Property Company

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				51 --		
52.5	100/11"	9.0	129.2	52 -- 53 --		
				54 --		
55	45 50/5"	7.4	SPT	55 -- 56 --		
57.5	30 50/4"	21.6	110.8	57 -- 58 -- 59 --	SM/SP	Silty Sand to Sand, gray to dark gray, moist to wet, very dense, fine to medium grained
60	74	9.6	SPT	60 -- 61 --	SP	Sand, gray to dark gray, wet, very dense, fine to medium grained
62.5	100/8"	16.9	122.6	62 -- 63 --		Sand, gray and dark gray, wet, very dense, fine to medium grained
65	82	9.1	SPT	64 -- 65 -- 66 --		
67.5	25 50/4"	15.1	117.4	67 -- 68 -- 69 --		
70	49 50/5"	10.3	SPT	70 -- 71 -- 72 -- 73 -- 74 -- 75 --		Total Depth 70 feet Groundwater at 30 feet Fill to 7½ feet NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual. Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted SPT=Standard Penetration Test

BORING LOG NUMBER 26

S & R Partners, LLC **Date: 03/18/15** **Elevation: 344'***

File No. 20921 **Method: 8-inch diameter Hollow Stem Auger**

km *Reference: Plan by Surveying and Drafting Services

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, minor gravel
				-		
				1 --		
				-		
				2 --		
2.5	52	4.0	114.4	-		
				3 --		Silty Sand, dark brown, moist, medium dense, fine grained, minor rock fragments
				-		
				4 --		
				-		
5	36	11.3	114.9	5 --		
				-		
				6 --		
				-		
				7 --		
7.5	38	7.6	109.8	-		
				8 --		Silty Sand with rock, asphalt, brick fragments, dark brown, moist, medium dense, fine grained
				-		
				9 --		
				-		
10	14	7.1	112.6	10 --		
				-		
				11 --		
				-		
				12 --		
12.5	7	8.7	100.3	-		
				13 --	SM	ALLUVIUM: Silty Sand, dark brown, moist, medium dense, fine grained
				-		
				14 --		
				-		
15	11	10.4	103.7	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	42	6.5	132.5	20 --		
				-	SP	Sand, yellowish brown, moist, medium dense, fine grained
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	75	5.4	116.7	25 --		
				-	SW	Gravelly Sand, dark brown, moist, very dense, fine to coarse grained

BORING LOG NUMBER 26

S & R Partners, LLC

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
				28 --		
				29 --		
30	45 50/3"	4.4	118.8	30 --		
				31 --		
				32 --		
				33 --		
				34 --		
35	82	24.6	98.6	35 --		BEDROCK (PUENTE FORMATION): Siltstone, yellow and grayish brown, laminated, moist, medium hard
				36 --		
				37 --		
				38 --		
				39 --		
40	75	28.1	92.4	40 --		
				41 --		
				42 --		
				43 --		
				44 --		
						Siltstone, gray to dark gray, moist, medium hard to hard
45	52 50/5"	19.7	103.4	45 --		Total Depth 45 feet No Water Fill to 12½ feet Rock at 35 feet
				46 --		
				47 --		
				48 --		
				49 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				50 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted

BORING LOG NUMBER 27

S & R Partners, LLC **Date: 03/19/15** **Elevation: 345'***

File No. 20921 **Method: 24-inch diameter Bucket Auger**

km *Reference: Plan by Surveying and Drafting Services

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, minor brick and concrete fragments
				1 --		
				2 --		
				3 --		
				4 --		
5	4/12"	7.9	116.3	5 --		
				6 --		
				7 --		
				8 --		
				9 --		
10	7/12"	10.2	116.9	10 --		Silty Sand to Sandy Silt, dark brown, moist, medium dense to dense, fine grained, stiff
				11 --		
				12 --		
				13 --		
				14 --		
15	7/12"	12.4	111.6	15 --	SM	ALLUVIUM: Silty Sand, dark brown, moist, medium dense to dense, fine grained
				16 --		
				17 --		
				18 --		
				19 --		
20	4/12"	6.2	105.6	20 --	SM/SP	Silty Sand to Sand, dark brown, moist, medium dense, fine grained
				21 --		
				22 --		
				23 --		
				24 --		
25	30/7"	5.1	111.3	25 --	SP/SW	Sand to Cobbley Sand, dark and yellowish brown, moist, dense, fine to coarse grained

BORING LOG NUMBER 27

S & R Partners, LLC

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26		
				27		
				28		
				29		
30	20/12"	23.4	112.7	30		Sand to Cobbley Sand, gray to dark gray, moist, dense, fine to coarse grained
				31		
				32		
				33		seepage water
				34		
35	5/12"	24.5	94.8	35		BEDROCK (PUENTE FORMATION): Siltstone, yellow and grayish brown, moist, medium hard, laminated
				36		
				37		
				38		@ 40' Bedding [N85W, 57SW]
				39		
40	5/12"	24.7	95.8	40		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual. Boring Downhole logged by Geologist Kelley weights 0-24' 2400 lbs. 24-46' 1550 lbs. 46-66' 850 lbs. Modified California Sampler used unless otherwise noted
				41		
				42		
				43		
				44		
45	30/12"	25.7	98.5	45		Siltstone, gray to dark gray, moist, medium hard to hard
				46		
				47		
				48		
				49		
50	45/12"	15.2	105.7	50		Silicified Siltstone, grayish brown, moist, hard Total Depth 50 feet Water at 45 feet Fill to 15 feet

BORING LOG NUMBER 28

S & R Partners **Date: 07/30/24** **Elevation: 293'**

File No. 20921 **Method: 8-inch diameter Hollow Stem Auger**

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for Parking
				0 --		6-inch Asphalt over 2-inch Gravel
				-		
				1 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				-		
				2 --		
2.5	42 50/5"	3.8	111.6	-		
				3 --		Silty Sand to Sand, dark and yellowish brown, moist, medium dense, fine to medium grained, minor cobbles
				-		
				4 --		
				-		
5	34	2.6	SPT	5 --		
				-		Sand to Cobbley Sand, yellowish brown, moist, medium dense, fine to coarse grained
				6 --		
				-		
				7 --		
7.5	50	7.7	112.7	-		
				8 --	SM/SP	Silty Sand to Sand, yellow and grayish brown, moist, medium dense, fine to medium grained, minor cobbles
				-		
				9 --		
				-		
10	21	7.4	SPT	10 --		
				-	SP/SW	Sand, yellow and grayish brown, moist, medium dense, fine to medium grained, minor cobbles
				11 --		
				-		
				12 --		
12.5	51	10.6	97.2	-		
				13 --	SP	Sand, yellow and grayish brown, moist, medium dense, fine grained
				-		
				14 --		
				-		
15	16	9.3	SPT	15 --		
				-		Sand, gray to yellowish brown, moist, medium dense, fine to coarse grained
				16 --		
				-		
				17 --		
17.5	38	49.0	71.5	-		
				18 --	ML/CL	Clayey Silt to Silty Clay, dark and yellowish brown, moist, stiff
				-		
				19 --		
				-		
20	13	41.0	SPT	20 --		
				-	SP/CL	Sand to Silty Clay, dark and yellowish brown, moist, medium dense, stiff, fine grained
				21 --		
				-		
				22 --		
22.5	100/9"	30.5	96.8	-		
				23 --	SP/SW	Sand to Cobbley Sand, dark and yellowish brown, wet, medium dense, fine to coarse grained
				-		
				24 --		
				-		
25	36	24.7	SPT	25 --		
				-	SP/ML	Sand to Sandy Silt, dark and grayish brown, wet, medium dense, stiff, fine grained

BORING LOG NUMBER 28

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26		
				27		
27.5	32 50/5"	34.6	89.8	28	SM/ML	Silty Sand to Sandy Silt, dark and yellowish brown, moist, very dense, very stiff, fine grained
				29		
30	36	22.5	SPT	30		
				31		
				32		
32.5	72	25.4	96.0	33		
				34		
35	25	30.2	SPT	35		Silty Sand to Sandy Silt, yellowish brown to gray, moist, medium dense, stiff, fine grained
				36		
				37		
37.5	40 50/5"	25.4	101.6	38	SM/SP	Silty Sand to Sand, gray to dark gray, wet, very dense, fine grained
				39		
40	47	18.1	SPT	40	SP	Sand, gray to dark gray, wet, medium dense to dense, fine grained
				41		
				42		
42.5	89	18.5	110.2	43		Sand, gray to dark gray, wet, very dense, fine grained
				44		
45	51	18.7	SPT	45		
				46		
				47		
47.5	39 50/5"	10.8	124.8	48		
				49		
50	57	18.8	SPT	50		

BORING LOG NUMBER 28

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 51 -- - 52 --		
52.5	45 50/4"	19.2	113.1	- 53 -- - 54 -- -		
55	82	15.2	SPT	55 -- - 56 -- -		
57.5	45 50/5"	14.6	110.8	57 -- - 58 -- - 59 -- -		
60	38 50/6"	16.4	SPT	60 -- - 61 -- - 62 -- -		
62.5	45 50/4"	10.5	131.1	63 -- - 64 -- -		Sand, dark gray, wet, very dense, fine to medium grained
65	46 50/4"	13.0	SPT	65 -- - 66 -- - 67 -- -		
67.5	82	11.1	127.1	68 -- - 69 -- -		
70	50/6"	12.8	SPT	70 -- - 71 -- - 72 -- - 73 -- - 74 -- - 75 -- -		Total Depth 70 feet Water at 23 feet Fill to 7½ feet NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual. Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted SPT=Standard Penetration Test

BORING LOG NUMBER 29

S & R Partners **Date: 07/31/24** **Elevation: 295'**

File No. 20921 **Method: 8-inch diameter Hollow Stem Auger**

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for Parking
				0 --		4-inch Asphalt, No Base
				-		
				1 --		FILL: Silty Sand to Sandy Silt, dark brown, moist, medium dense, stiff, fine grained
				-		
				2 --		
2.5	27	18.5	105.6	-		
				3 --		
				-		
				4 --		
				-		
5	17	12.7	SPT	5 --		
				-		Silty Sand to Sand, dark and yellowish brown, moist, medium dense, fine grained
				6 --		
				-		
				7 --		
7.5	100/11.5"	3.4	128.2	-		
				8 --	SP/SW	Sand to Cobbley Sand, dark brown, moist, very dense, fine to coarse grained
				-		
				9 --		
				-		
10	52	5.1	SPT	10 --		
				-		
				11 --		
				-		
				12 --		
12.5	100/9"	5.1	109.1	-		
				13 --	SP	Sand, light brown, moist, very dense, fine to medium grained, minor pebbles
				-		
				14 --		
				-		
15	50/6"	4.2	SPT	15 --		
				-		
				16 --		
				-		
				17 --		
17.5	100/9"	4.2	119.0	-		
				18 --		
				-		
				19 --		
				-		
20	30 50/5"	13.3	SPT	20 --		
				-		
				21 --		
				-		
				22 --		
22.5	100/9"	25.7	105.9	-		
				23 --	ML	Sandy Silt, yellowish brown, moist, very stiff
				-		
				24 --		
				-		
25	78	15.2	SPT	25 --		
				-	SM/ML	Silty Sand to Sandy Silt, dark brown, moist, dense, stiff, fine grained

BORING LOG NUMBER 29

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
27.5	100/6"	11.6	118.9	28 --	SP	Sand, yellow and dark brown, wet, very dense, fine grained
				29 --		
30	90	11.7	SPT	30 --		
				31 --		
				32 --		
32.5	41 50/3"	11.8	123.8	33 --		Sand, dark and grayish brown, wet, very dense, fine to coarse grained, minor pebbles
				34 --		
35	74	17.7	SPT	35 --		
				36 --		
				37 --		
37.5	27 50/5"	24.4	96.8	38 --	SM	Silty Sand, dark gray, moist, very dense, fine grained
				39 --		
40	36	24.0	SPT	40 --	SP/ML	Sand to Sandy Silt, dark and grayish brown, wet, medium dense, stiff, fine grained
				41 --		
				42 --		
42.5	74	40.4	81.2	43 --	ML	Sandy Silt, dark gray, wet, stiff
				44 --		
45	39 50/5"	23.5	SPT	45 --	SM/SP	Silty Sand to Sand, gray, wet, very dense, fine grained
				46 --		
				47 --		
47.5	100/9"	16.1	108.4	48 --	SP	Sand, gray, wet, very dense, fine grained
				49 --		
50	34 50/5"	13.8	SPT	50 --		

BORING LOG NUMBER 29

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				51 --		
				52 --		
52.5	50	20.9	110.2	53 --		
				54 --		
55	50/6"	15.5	SPT	55 --		
				56 --		
				57 --		
57.5	100/7"	15.3	119.1	58 --		
				59 --		
60	100/8"	15.6	SPT	60 --		
				61 --		
				62 --		
62.5	100/8"	14.3	120.1	63 --		Sand, gray to dark gray, wet, very dense, fine to medium grained
				64 --		
65	50/6"	11.4	SPT	65 --		Sand, gray to dark gray, wet, very dense, fine to medium grained, minor pebbles
				66 --		
				67 --		
67.5	38 50/4"	10.4	123.4	68 --		
				69 --		
70	40 50/5"	16.1	SPT	70 --		Total Depth 70 feet Water at 24½ feet Fill to 7½ feet
				71 --		
				72 --		
				73 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				74 --		
				75 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
						SPT=Standard Penetration Test

BORING LOG NUMBER 30

S & R Partners **Date: 08/02/24** **Elevation: 298'**

File No. 20921 **Method: 8-inch diameter Hollow Stem Auger**

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for Parking
				0 --		2-inch Asphalt, No Base
				-		
				1 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, minor cobbles
				-		
				2 --		
2.5	36	17.5	97.9	-		
				3 --		
				-		
				4 --		
				-		
5	9	15.9	SPT	5 --		
				-	SM	Silty Sand, dark brown, moist, medium dense, fine grained
				6 --		
				-		
				7 --		
7.5	100/10"	5.8	123.1	-		
				8 --	SM/SP	Silty Sand to Sand, dark and yellowish brown, moist, very dense, fine to medium grained
				-		
				9 --		
				-		
10	32	1.6	SPT	10 --		
				-	SP	Sand, dark and yellowish brown, moist, medium dense, fine to medium grained
				11 --		
				-		
				12 --		
12.5	100/11"	6.0	Disturbed	-		
				13 --	SP/SW	Sand to Cobbley Sand, dark and yellowish brown, moist, very dense, fine to coarse grained
				-		
				14 --		
				-		
15	25 50/3"	2.0	SPT	15 --		
				-		
				16 --		
				-		
				17 --		
17.5	100/8"	4.0	119.2	-		
				18 --	SW	Cobbley Sand, dark and yellowish brown, moist, very dense, fine to coarse grained
				-		
				19 --		
				-		
20	50/5"	3.2	Disturbed	20 --		
				-		
				21 --		
				-		
				22 --		
22.5	100/10"	3.9	106.5	-		
				23 --	SP	Sand, dark and yellowish brown, moist, very dense, fine to medium grained, minor pebbles
				-		
				24 --		
				-		
25	46	18.0	SPT	25 --		
				-	SM/CL	Silty Sand to Silty Clay, dark and yellowish brown, moist, medium dense, stiff, fine to medium grained

BORING LOG NUMBER 30

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
27.5	47 50/4"	31.7	95.9	28 --	SM/ML	Silty Sand to Sandy Silt, dark and yellowish brown, moist, very dense, stiff, fine grained
				29 --		
30	74	10.6	SPT	30 --	SP	Sand, dark and yellowish brown, wet, very dense, fine to medium grained
				31 --		
				32 --		
32.5	100/9"	23.0	96.8	33 --		fine grained
				34 --		
35	70	15.3	SPT	35 --	SM/SP	Silty Sand to Sand, dark and yellowish brown, wet, very dense, fine to medium grained
				36 --		
				37 --		
37.5	100/10"	11.6	121.1	38 --		
				39 --		
40	72	16.8	SPT	40 --	SP	Sand, dark and grayish brown, wet, very dense, fine to coarse grained
				41 --		
				42 --		
42.5	100/9"	13.9	121.0	43 --	SM/SP	Silty Sand to Sand, dark and grayish brown, wet, very dense, fine to medium grained
				44 --		
45	17 50/5"	15.7	SPT	45 --		
				46 --		
				47 --		
47.5	27 50/5"	10.3	126.3	48 --	SP	Sand, gray to dark gray, wet, very dense, fine to medium grained, minor cobbles
				49 --		
50	35	22.9	SPT	50 --	SM/SP	Silty Sand to Sand, dark gray and gray, moist, medium dense, fine grained

BORING LOG NUMBER 30

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				51 --		
				52 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
52.5	87	24.8	101.0	53 --		
				54 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
55	32	2.3	SPT	55 --		SPT = Standard Penetration Test
				56 --		
				57 --		
57.5	14 50/5"	19.8	110.0	58 --	SP	Sand, gray to dark gray, wet, very dense, fine grained
				59 --		
60	50/6"	20.8	SPT	60 --		
				61 --		
				62 --		
62.5	100/9"	12.4	127.9	63 --		Sand, gray to dark gray, wet, very dense, fine to medium grained
				64 --		
65	71	15.7	SPT	65 --		
				66 --		
				67 --		
67.5	40 50/5"	14.0	113.0	68 --	SM	Silty Sand, dark gray, wet, very dense, fine grained
				69 --		
70	70	25.9	SPT	70 --	SM/ML	Silty Sand to Sandy Silt, gray to dark gray, wet, dense, fine grained
				71 --		
				72 --		
72.5	100/9"	19.6	109.4	73 --	SM	Silty Sand, gray to dark gray, moist, very dense, fine grained
				74 --	SM/SP	Silty Sand to Sand, gray to dark gray, moist, very dense, fine grained
75	50/6"	15.0	SPT	75 --		Total Depth 75 feet Water at 29 feet Fill to 5 feet

BORING LOG NUMBER 31

S & R Partners **Date: 07/31/24** **Elevation: 301'**

File No. 20921 **Method: 8-inch diameter Hollow Stem Auger**

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for Parking
				0 --		2-inch Asphalt, No Base
				-		
				1 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, minor cobbles
				-		
				2 --		
2.5	100/8"	8.3	124.2	-		
				3 --		
				-		
				4 --		
				-		
5	30	10.9	SPT	5 --		
				-		Silty Sand to Sand, dark and yellowish brown, moist, medium dense, fine to medium grained
				6 --		
				-		
				7 --		
7.5	38	6.3	110.9	-		
	50/5"			8 --		
				-	SM/SP	Silty Sand, dark and yellowish brown, moist, very dense, fine grained, minor cobbles
				9 --		
				-		
10	96	8.1	SPT	10 --		
				-		
				11 --		
				-		
				12 --		
12.5	100/5"	4.8	110.2	-		
				13 --	SW	Cobbley Sand, dark brown, moist, very dense, fine to coarse grained
				-		
				14 --		
				-		
15	15	6.2	SPT	15 --		
				-	SP	Sand, dark and yellowish brown, moist, medium dense, fine grained, minor cobbles
				16 --		
				-		
				17 --		
17.5	51	5.4	103.8	-		
				18 --		Sand, yellowish brown, moist, medium dense, fine grained
				-		
				19 --		
				-		
20	27	4.5	SPT	20 --		
				-		
				21 --		
				-		
				22 --		
22.5	59	3.9	118.2	-		
				23 --		Sand, yellowish brown, moist, dense, fine to medium grained, minor pebbles
				-		
				24 --		
				-		
25	42	3.7	SPT	25 --		
				-		Sand, dark and yellowish brown, moist, medium dense, fine grained, minor cobbles

BORING LOG NUMBER 31

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
27.5	42 50/5"	11.8	113.7	28 --	SM/SP	Silty Sand to Sand, dark and yellowish brown, moist, very dense, fine to medium grained
				29 --		
30	70/6"	9.9	SPT	30 --	SP	Sand, dark and yellowish brown, wet, fine to coarse grained
				31 --		
				32 --		
32.5	100/9"	10.6	123.4	33 --		Sand, dark and yellowish brown, wet, very dense, fine to coarse grained
				34 --		
35	40 50/3"	13.0	SPT	35 --		
				36 --		
				37 --		
37.5	43 50/2"	9.7	130.8	38 --	SM/SP	Silty Sand to Sand, dark and yellowish brown, moist to wet, very dense, fine to medium grained
				39 --		
40	36 50/5"	15.3	SPT	40 --		
				41 --		
				42 --		
42.5	100/8.5"	11.7	120.0	43 --	SP	Sand, gray to dark gray, wet, very dense, fine grained, minor pebbles
				44 --		
45	36 50/5"	10.9	SPT	45 --		
				46 --		
				47 --		
47.5	30 50/5"	9.6	125.0	48 --		
				49 --		
50	86	16.2	SPT	50 --		Sand, dark gray and yellowish brown, wet, very dense, fine to medium grained

BORING LOG NUMBER 31

S & R Partners

File No. 20921

km

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				- 51 -- - 52 --		
52.5	31 50/5"	20.2	106.0	- 53 -- - 54 --		
55	86	9.3	SPT	- 55 -- - 56 --	SP/SW	Sand to Gravelly Sand, yellow to grayish brown, moist, very dense, fine to coarse grained
57.5	42 50/4"	13.2	119.7	- 57 -- - 58 --	SP	Sand, gray to dark gray, wet, very dense, fine to medium grained
60	54	15.8	SPT	- 59 -- - 60 --	SM/ML	Sand to Clayey Silt, gray to dark gray, moist, dense, stiff, fine grained
62.5	75	22.4	106.2	- 61 -- - 62 --	SP	Sand, gray, wet, very dense, fine grained
65	81	17.5	SPT	- 63 -- - 64 --		
67.5	35 50/4"	14.4	120.9	- 65 -- - 66 --		
70	43 50/3"	17.1	SPT	- 67 -- - 68 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
72.5	100/6"	19.7	104.8	- 69 -- - 70 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
75	50/5"	12.3	SPT	- 71 -- - 72 --		SPT = Standard Penetration Test
				- 73 -- - 74 --		
				- 75 -- -		Total Depth 75 feet Water at 31 feet Fill to 7½ feet

LOG OF TEST PIT NUMBER 1

Lincoln Property Company **Drilling Date: 03/19/15** **Elevation: 331'***

File No. 20921 **Method: Hand Dug**

km *Reference: Plan by Surveying and Drafting Services

Sample Depth ft.	Moisture Content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
			0 --		FILL: Sandy Silt, dark brown, moist, stiff
1	6.3	99.0	1 --		
				ML	ALLUVIUM: Sandy Silt, dark brown, moist, stiff
			2 --		
3	7.4	107.3	3 --		
				SM/ML	Silty Sand to Sandy Silt, dark brown, moist, stiff, medium dense, fine grained
			4 --		
5	8.1	109.4	5 --		
				SM	Silty Sand, dark brown, moist, medium dense, fine grained
			6 --		
7	9.0	113.9	7 --		
					Silty Sand, dark and medium brown, moist, medium dense, fine grained
			8 --		
			9 --		
10	10.6	107.4	10 --		
			11 --		
			12 --		
			13 --		
			14 --		
15	10.4	110.8	15 --		
					Total Depth 15 feet No Water Fill to 1 foot
			16 --		
			17 --		
			18 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
			19 --		
					Used 4-inch diameter Hand-Augering Equipment; Hand Sampler
			20 --		
			21 --		
			22 --		
			23 --		
			24 --		
			25 --		

LOG OF TEST PIT NUMBER 2

Lincoln Property Company **Drilling Date: 03/19/15** **Elevation: 333'***

File No. 20921 **Method: Hand Dug**

km *Reference: Plan by Surveying and Drafting Services

Sample Depth ft.	Moisture Content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
			0 --		FILL: Sandy Silt, dark brown, moist, stiff
			-		
			1 --		
			-		
2	7.6	110.1	2 --		
			-	SM/ML	ALLUVIUM: Silty Sand to Sandy Silt
			3 --		
			-		
			4 --		
			-		
5	7.4	100.4	5 --		
			-	SM	Silty Sand, dark brown and medium brown, moist, medium dense, fine grained
			6 --		
			-		
			7 --		
			-		
			8 --		
			-		
			9 --		
			-		
10	13.4	101.8	10 --		
			-	SM/ML	Silty Sand to Sandy Silt, dark brown, moist, medium dense, fine grained, stiff
			11 --		
			-		
			12 --		
			-		
			13 --		
			-		
			14 --		
			-	SM	Silty Sand, dark brown, moist, medium dense, fine grained
15	8.4	123.0	15 --		
			-		Total Depth 15 feet
			16 --		No Water
			-		Fill to 2 feet
			17 --		
			-		
			18 --		NOTE: The stratification lines represent the approximate
			-		boundary between earth types; the transition may be gradual.
			19 --		
			-		Used 4-inch diameter Hand-Augering Equipment; Hand Sampler
			20 --		
			-		
			21 --		
			-		
			22 --		
			-		
			23 --		
			-		
			24 --		
			-		
			25 --		
			-		

LOG OF TEST PIT NUMBER 3

Lincoln Property Company **Drilling Date: 03/19/15** **Elevation: 336'***

File No. 20921 **Method: Hand Dug**

km *Reference: Plan by Surveying and Drafting Services

Sample Depth ft.	Moisture Content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
			0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
1	1.8	111.0	1 --		
			2 --		
3	19.7	76.5	3 --		
			4 --		
5	5.8	112.5	5 --		
			6 --		Silty Sand, gray and dark brown, moist, medium dense, fine grained, brick concrete and asphalt fragments
7	5.1	108.7	7 --		
			8 --		Silty Sand, dark and yellowish brown, moist, medium dense, fine grained
			9 --		Silty Sand, dark brown, moist, dense, fine grained
10	12.9	98.4	10 --		
			11 --		Silty Sand to Sand, yellow and grayish brown, moist, medium dense, fine grained, minor brick fragments
			12 --		
			13 --		
					Silty Sand to Sand, yellow and grayish brown, moist, dense, fine grained
14	No Recovery		14 --		Total Depth 14 feet by refusal No Water Bottom of Fill not encountered
			15 --		
			16 --		
			17 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
			18 --		
			19 --		Used 4-inch diameter Hand-Augering Equipment; Hand Sampler
			20 --		
			21 --		
			22 --		
			23 --		
			24 --		
			25 --		

LOG OF TEST PIT NUMBER 4

Lincoln Property Company **Drilling Date: 03/19/15** **Elevation: 338'***

File No. 20921 **Method: Hand Dug**

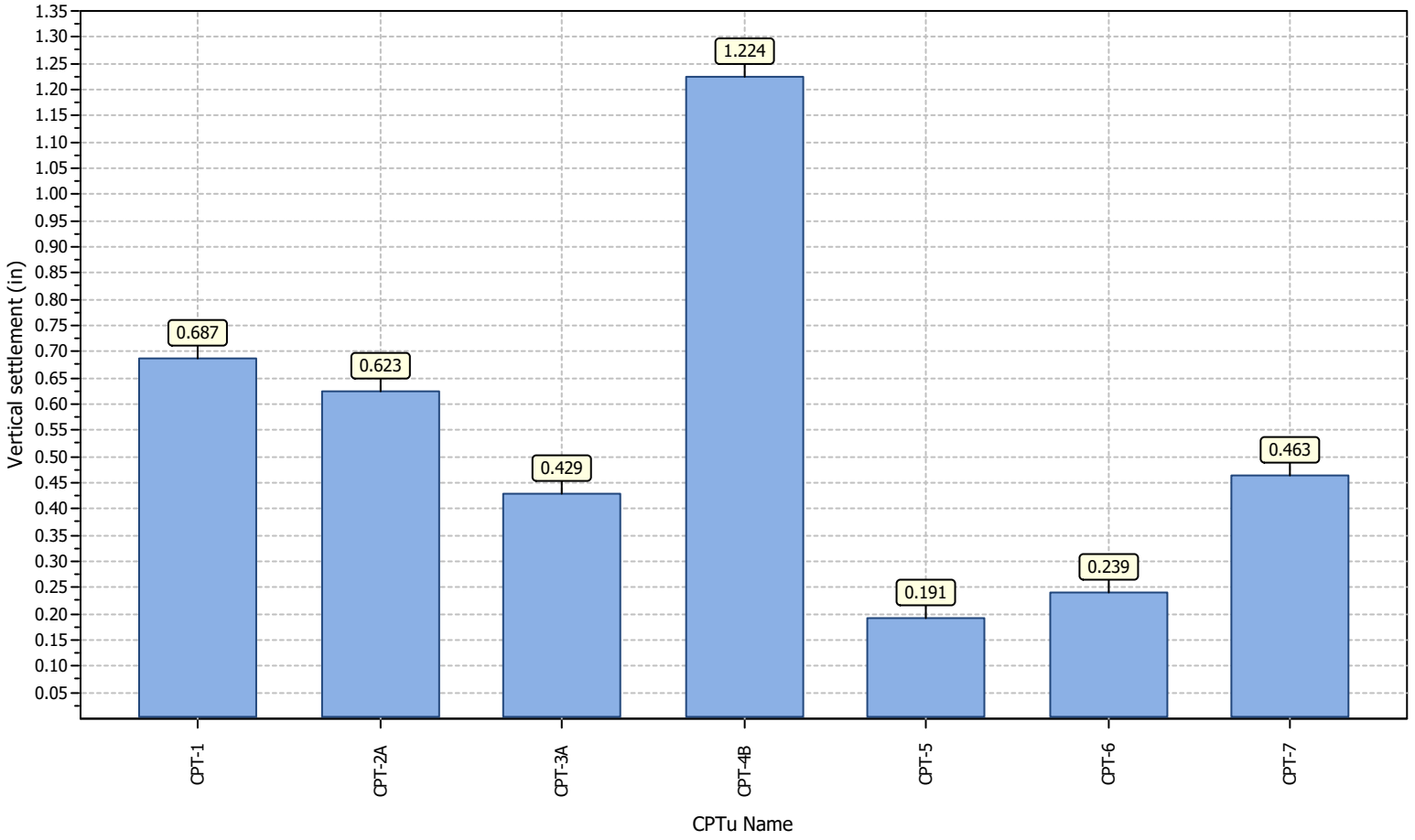
km *Reference: Plan by Surveying and Drafting Services

Sample Depth ft.	Moisture Content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
			0 --		FILL: Silty Sand, dark to yellowish brown, moist, medium dense, fine grained, minor rock fragments
1	4.9	112.9	1 --		
			2 --		
3	3.8	100.7	3 --		
			4 --		
5	4.8	135.4	5 --		
			6 --		
7	10.7	120.0	7 --		Silty Sand, dark brown, moist, medium dense, fine grained, minor brick fragments
			8 --	SM	ALLUVIUM: Silty Sand, dark brown, moist, medium dense, fine grained
			9 --		
10	11.7	114.1	10 --		
			11 --		
			12 --		
			13 --		
			14 --		
15	8.9	126.9	15 --		Total Depth 15 feet No Water Fill to 8 feet
			16 --		
			17 --		
			18 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
			19 --		
			20 --		Used 4-inch diameter Hand-Augering Equipment; Hand Sampler
			21 --		
			22 --		
			23 --		
			24 --		
			25 --		

Project title : S & R Partners (File No. 20921)

Location : 1251 N. Spring St, Los Angeles, CA

Overall vertical settlements report



Geotechnologies, Inc.

Project: S & R Partners
File No.: 20921
Description: Liquefaction Analysis
Boring Number B28

LIQUEFACTION EVALUATION (Idriss & Boulanger, EERI NO 12)

EARTHQUAKE INFORMATION:

Earthquake Magnitude (M):	6.83
Peak Ground Horizontal Acceleration, PGA_M (g):	0.952
Calculated Mag.Wtg.Factor:	1.193

GROUNDWATER INFORMATION:

Current Groundwater Level (ft):	23.0
Historically Highest Groundwater Level* (ft):	20.0
Unit Weight of Water (pcf):	62.4

* Based on California Geological Survey Seismic Hazard Evaluation Report

BOREHOLE AND SAMPLER INFORMATION:

Borehole Diameter (inches):	8
SPT Sampler with room for Liner (Y/N):	Y

LIQUEFACTION BOUNDARY:

Plastic Index Cut Off (PI):	18
Minimum Liquefaction FS:	1.3

Depth to Base Layer (feet)	Total Unit Weight (pcf)	Current Water Level (feet)	Historical Water Level (feet)	Field SPT Blowcount N	Depth of SPT Blowcount (feet)	Fines Content #200 Sieve (%)	Plastic Index (PI)	Vetical Stress σ_{vc}, (psf)	Effective Vert. Stress σ_{vc}', (psf)	Fines Corrected $(N_1)_{60\text{-}cs}$	Stress Reduction Coeff, r_d	Cyclic Shear Ratio CSR	Cyclic Resistance Ratio (CRR)	Factor of Safety CRR/CSR (F.S.)	Liquefaction Settlment ΔS_i (inches)
1	115.9	Unsaturated	Unsaturated	34	5	0.0	0	115.9	115.9	81.0	1.00	0.621	2.000	Non-Liq.	0.00
2	115.9	Unsaturated	Unsaturated	34	5	0.0	0	231.8	231.8	81.0	1.00	0.619	2.000	Non-Liq.	0.00
3	115.9	Unsaturated	Unsaturated	34	5	0.0	0	347.7	347.7	76.6	1.00	0.617	2.000	Non-Liq.	0.00
4	115.9	Unsaturated	Unsaturated	34	5	0.0	0	463.6	463.6	71.0	0.99	0.615	2.000	Non-Liq.	0.00
5	115.9	Unsaturated	Unsaturated	34	5	0.0	0	579.5	579.5	71.4	0.99	0.613	2.000	Non-Liq.	0.00
6	115.9	Unsaturated	Unsaturated	34	5	0.0	0	695.4	695.4	68.1	0.99	0.611	2.000	Non-Liq.	0.00
7	115.9	Unsaturated	Unsaturated	34	5	0.0	0	811.3	811.3	65.4	0.98	0.608	2.000	Non-Liq.	0.00
8	121.4	Unsaturated	Unsaturated	21	10	0.0	0	932.7	932.7	41.9	0.98	0.606	2.000	Non-Liq.	0.00
9	121.4	Unsaturated	Unsaturated	21	10	0.0	0	1054.1	1054.1	42.2	0.98	0.604	2.000	Non-Liq.	0.00
10	121.4	Unsaturated	Unsaturated	21	10	0.0	0	1175.5	1175.5	40.7	0.97	0.601	2.000	Non-Liq.	0.00
11	121.4	Unsaturated	Unsaturated	21	10	0.0	0	1296.9	1296.9	39.4	0.97	0.598	2.000	Non-Liq.	0.00
12	121.4	Unsaturated	Unsaturated	21	10	0.0	0	1418.3	1418.3	38.2	0.96	0.596	2.000	Non-Liq.	0.00
13	107.5	Unsaturated	Unsaturated	16	15	0.0	0	1525.8	1525.8	27.4	0.96	0.593	0.455	Non-Liq.	0.00
14	107.5	Unsaturated	Unsaturated	16	15	0.0	0	1633.3	1633.3	26.5	0.95	0.590	0.412	Non-Liq.	0.00
15	107.5	Unsaturated	Unsaturated	16	15	0.0	0	1740.8	1740.8	29.2	0.95	0.587	0.541	Non-Liq.	0.00
16	107.5	Unsaturated	Unsaturated	16	15	0.0	0	1848.3	1848.3	28.3	0.94	0.584	0.487	Non-Liq.	0.00
17	107.5	Unsaturated	Unsaturated	16	15	0.0	0	1955.8	1955.8	27.6	0.94	0.581	0.445	Non-Liq.	0.00
18	106.5	Unsaturated	Unsaturated	13	20	78.7	10	2062.3	2062.3	26.7	0.93	0.578	0.403	Non-Liq.	0.00
19	106.5	Unsaturated	Unsaturated	13	20	78.7	10	2168.8	2168.8	26.2	0.93	0.575	0.380	Non-Liq.	0.00
20	106.5	Unsaturated	Unsaturated	13	20	78.7	10	2275.3	2275.3	25.7	0.92	0.571	0.361	Non-Liq.	0.00
21	106.5	Unsaturated	Saturated	13	20	78.7	10	2381.8	2319.4	25.5	0.92	0.583	0.354	0.6	0.22
22	106.5	Unsaturated	Saturated	13	20	78.7	10	2488.3	2363.5	25.3	0.91	0.595	0.347	0.6	0.23
23	126.3	Unsaturated	Saturated	36	25	0.0	0	2614.6	2427.4	61.6	0.91	0.605	2.000	3.3	0.00
24	126.3	Saturated	Saturated	36	25	0.0	0	2740.9	2491.3	61.2	0.90	0.614	2.000	3.3	0.00
25	126.3	Saturated	Saturated	36	25	0.0	0	2867.2	2555.2	60.8	0.90	0.622	2.000	3.2	0.00
26	126.3	Saturated	Saturated	36	25	0.0	0	2993.5	2619.1	60.4	0.89	0.630	2.000	3.2	0.00
27	126.3	Saturated	Saturated	36	25	0.0	0	3119.8	2683.0	60.0	0.89	0.637	2.000	3.1	0.00
28	120.9	Saturated	Saturated	36	30	0.0	0	3240.7	2741.5	62.8	0.88	0.643	2.000	3.1	0.00
29	120.9	Saturated	Saturated	36	30	0.0	0	3361.6	2800.0	62.4	0.87	0.649	2.000	3.1	0.00
30	120.9	Saturated	Saturated	36	30	0.0	0	3482.5	2858.5	62.1	0.87	0.654	2.000	3.1	0.00
31	120.9	Saturated	Saturated	36	30	0.0	0	3603.4	2917.0	61.8	0.86	0.659	2.000	3.0	0.00
32	120.9	Saturated	Saturated	36	30	0.0	0	3724.3	2975.5	61.5	0.86	0.663	2.000	3.0	0.00
33	120.4	Saturated	Saturated	25	35	0.0	0	3844.7	3033.5	42.5	0.85	0.667	2.000	3.0	0.00
34	120.4	Saturated	Saturated	25	35	0.0	0	3965.1	3091.5	42.2	0.84	0.670	2.000	3.0	0.00
35	120.4	Saturated	Saturated	25	35	0.0	0	4085.5	3149.5	42.0	0.84	0.673	2.000	3.0	0.00
36	120.4	Saturated	Saturated	25	35	0.0	0	4205.9	3207.5	41.8	0.83	0.676	2.000	3.0	0.00
37	120.4	Saturated	Saturated	25	35	0.0	0	4326.3	3265.5	41.6	0.83	0.678	2.000	3.0	0.00
38	127.4	Saturated	Saturated	47	40	0.0	0	4453.7	3330.5	77.9	0.82	0.679	2.000	2.9	0.00
39	127.4	Saturated	Saturated	47	40	0.0	0	4581.1	3395.5	77.5	0.81	0.680	2.000	2.9	0.00
40	127.4	Saturated	Saturated	47	40	0.0	0	4708.5	3460.5	77.1	0.81	0.681	2.000	2.9	0.00
41	127.4	Saturated	Saturated	47	40	0.0	0	4835.9	3525.5	76.7	0.80	0.682	2.000	2.9	0.00
42	127.4	Saturated	Saturated	47	40	0.0	0	4963.3	3590.5	76.4	0.80	0.682	2.000	2.9	0.00
43	130.6	Saturated	Saturated	51	45	0.0	0	5093.9	3658.7	82.5	0.79	0.682	1.998	2.9	0.00
44	130.6	Saturated	Saturated	51	45	0.0	0	5224.5	3726.9	82.1	0.79	0.681	1.985	2.9	0.00
45	130.6	Saturated	Saturated	51	45	0.0	0	5355.1	3795.1	81.7	0.78	0.680	1.973	2.9	0.00
46	130.6	Saturated	Saturated	51	45	0.0	0	5485.7	3863.3	81.3	0.77	0.680	1.960	2.9	0.00
47	130.6	Saturated	Saturated	51	45	0.0	0	5616.3	3931.5	80.9	0.77	0.679	1.948	2.9	0.00
48	138.3	Saturated	Saturated	57	50	0.0	0	5754.6	4007.4	90.0	0.76	0.677	1.934	2.9	0.00
49	138.3	Saturated	Saturated	57	50	0.0	0	5892.9	4083.3	89.5	0.76	0.675	1.921	2.8	0.00
50	138.3	Saturated	Saturated	57	50	0.0	0	6031.2	4159.2	89.1	0.75	0.673	1.908	2.8	0.00
51	138.3	Saturated	Saturated	57	50	0.0	0	6169.5	4235.1	88.7	0.74	0.671	1.895	2.8	0.00
52	138.3	Saturated	Saturated	57	50	0.0	0	6307.8	4311.0	88.3	0.74	0.669	1.883	2.8	0.00
53	134.8	Saturated	Saturated	82	55	0.0	0	6442.6	4383.4	126.4	0.73	0.667	1.871	2.8	0.00
54	134.8	Saturated	Saturated	82	55	0.0	0	6577.4	4455.8	125.9	0.73	0.665	1.860	2.8	0.00
55	134.8	Saturated	Saturated	82	55	0.0	0	6712.2	4528.2	125.3	0.72	0.662	1.848	2.8	0.00
56	134.8	Saturated	Saturated	82	55	0.0	0	6847.0	4600.6	124.8	0.72	0.660	1.837	2.8	0.00
57	134.8	Saturated	Saturated	82	55	0.0	0	6981.8	4673.0	124.3	0.71	0.658	1.826	2.8	0.00
58	127.0	Saturated	Saturated	88	60	0.0	0	7108.8	4737.6	132.9	0.71	0.655	1.816	2.8	0.00
59	127.0	Saturated	Saturated	88	60	0.0	0	7235.8	4802.2	132.4	0.70	0.653	1.807	2.8	0.00
60	127.0	Saturated	Saturated	88	60	0.0	0	7362.8	4866.8	132.0	0.70	0.651	1.798	2.8	0.00
61	127.0	Saturated	Saturated	88	60	0.0	0	7489.8	4931.4	131.5	0.69	0.649	1.788	2.8	0.00
62	127.0	Saturated	Saturated	88	60	0.0	0	7616.8	4996.0	131.1	0.68	0.646	1.779	2.8	0.00
63	144.9	Saturated	Saturated	96	65	0.0	0	7761.7	5078.5	142.4	0.68	0.643	1.768	2.7	0.00
64	144.9	Saturated	Saturated	96	65	0.0	0	7906.6	5161.0	141.8	0.67	0.640	1.756	2.7	0.00
65	144.9	Saturated	Saturated	96	65	0.0	0	8051.5	5243.5	141.2	0.67	0.636	1.745	2.7	0.00
66	144.9	Saturated	Saturated	96	65	0.0	0	8196.4	5326.0	140.6	0.66	0.633	1.734	2.7	0.00
67	144.9	Saturated	Saturated	96	65	0.0	0	8341.3	5408.5	140.0	0.66	0.630	1.723	2.7	0.00
68	141.2	Saturated	Saturated	50	70	0.0	0	8482.5	5487.3	72.7	0.66	0.627	1.713	2.7	0.00
69	141.2	Saturated	Saturated	50	70	0.0	0	8623.7	5566.1	72.4	0.65	0.624	1.703	2.7	0.00
70	141.2	Saturated	Saturated	50	70	0.0	0	8764.9	5644.9	72.1	0.65	0.621	1.693	2.7	0.00
													Total Liquefaction Settlement, S =		**0.45 inches**

Geotechnologies, Inc.

Project: S & R Partners
File No.: 20921
Description: Liquefaction Analysis
Boring Number B29

LIQUEFACTION EVALUATION (Idriss & Boulanger, EERI NO 12)

EARTHQUAKE INFORMATION:

Earthquake Magnitude (M):	6.83
Peak Ground Horizontal Acceleration, PGA_M (g):	0.952
Calculated Mag.Wtg.Factor:	1.193

GROUNDWATER INFORMATION:

Current Groundwater Level (ft):	24.5
Historically Highest Groundwater Level* (ft):	20.0
Unit Weight of Water (pcf):	62.4

* Based on California Geological Survey Seismic Hazard Evaluation Report

BOREHOLE AND SAMPLER INFORMATION:

Borehole Diameter (inches):	8
SPT Sampler with room for Liner (Y/N):	Y

LIQUEFACTION BOUNDARY:

Plastic Index Cut Off (PI):	18
Minimum Liquefaction FS:	1.3

Depth to Base Layer (feet)	Total Unit Weight (pcf)	Current Water Level (feet)	Historical Water Level (feet)	Field SPT Blowcount N	Depth of SPT Blowcount (feet)	Fines Content #200 Sieve (%)	Plastic Index (PI)	Vetical Stress σ_{vc}, (psf)	Effective Vert. Stress σ_{vc}', (psf)	Fines Corrected $(N_1)_{60\text{-}cs}$	Stress Reduction Coeff, r_d	Cyclic Shear Ratio CSR	Cyclic Resistance Ratio (CRR)	Factor of Safety CRR/CSR (F.S.)	Liquefaction Settlment ΔS_i (inches)
1	125.1	Unsaturated	Unsaturated	17	5	0.0	0	125.1	125.1	40.5	1.00	0.621	2.000	Non-Liq.	0.00
2	125.1	Unsaturated	Unsaturated	17	5	0.0	0	250.2	250.2	40.5	1.00	0.619	2.000	Non-Liq.	0.00
3	125.1	Unsaturated	Unsaturated	17	5	0.0	0	375.3	375.3	40.5	1.00	0.617	2.000	Non-Liq.	0.00
4	125.1	Unsaturated	Unsaturated	17	5	0.0	0	500.4	500.4	40.5	0.99	0.615	2.000	Non-Liq.	0.00
5	125.1	Unsaturated	Unsaturated	17	5	0.0	0	625.5	625.5	41.2	0.99	0.613	2.000	Non-Liq.	0.00
6	125.1	Unsaturated	Unsaturated	17	5	0.0	0	750.6	750.6	38.3	0.99	0.611	2.000	Non-Liq.	0.00
7	125.1	Unsaturated	Unsaturated	17	5	0.0	0	875.7	875.7	35.9	0.98	0.608	1.770	Non-Liq.	0.00
8	132.5	Unsaturated	Unsaturated	52	10	0.0	0	1008.2	1008.2	94.4	0.98	0.606	2.000	Non-Liq.	0.00
9	132.5	Unsaturated	Unsaturated	52	10	0.0	0	1140.7	1140.7	97.1	0.98	0.604	2.000	Non-Liq.	0.00
10	132.5	Unsaturated	Unsaturated	52	10	0.0	0	1273.2	1273.2	94.3	0.97	0.601	2.000	Non-Liq.	0.00
11	132.5	Unsaturated	Unsaturated	52	10	0.0	0	1405.7	1405.7	91.9	0.97	0.598	2.000	Non-Liq.	0.00
12	132.5	Unsaturated	Unsaturated	52	10	0.0	0	1538.2	1538.2	89.8	0.96	0.596	2.000	Non-Liq.	0.00
13	114.6	Unsaturated	Unsaturated	50	15	0.0	0	1652.8	1652.8	84.7	0.96	0.593	2.000	Non-Liq.	0.00
14	114.6	Unsaturated	Unsaturated	50	15	0.0	0	1767.4	1767.4	83.2	0.95	0.590	2.000	Non-Liq.	0.00
15	114.6	Unsaturated	Unsaturated	50	15	0.0	0	1882.0	1882.0	91.5	0.95	0.587	2.000	Non-Liq.	0.00
16	114.6	Unsaturated	Unsaturated	50	15	0.0	0	1996.6	1996.6	90.1	0.94	0.584	2.000	Non-Liq.	0.00
17	114.6	Unsaturated	Unsaturated	50	15	0.0	0	2111.2	2111.2	88.7	0.94	0.581	2.000	Non-Liq.	0.00
18	124.0	Unsaturated	Unsaturated	80	20	0.0	0	2235.2	2235.2	139.9	0.93	0.578	2.000	Non-Liq.	0.00
19	124.0	Unsaturated	Unsaturated	80	20	0.0	0	2359.2	2359.2	137.9	0.93	0.575	2.000	Non-Liq.	0.00
20	124.0	Unsaturated	Unsaturated	80	20	0.0	0	2483.2	2483.2	136.1	0.92	0.571	2.000	Non-Liq.	0.00
21	124.0	Unsaturated	Saturated	80	20	0.0	0	2607.2	2544.8	135.2	0.92	0.582	2.000	3.4	0.00
22	124.0	Unsaturated	Saturated	80	20	0.0	0	2731.2	2606.4	134.3	0.91	0.592	2.000	3.4	0.00
23	133.1	Unsaturated	Saturated	78	25	0.0	0	2864.3	2677.1	130.1	0.91	0.601	2.000	3.3	0.00
24	133.1	Unsaturated	Saturated	78	25	0.0	0	2997.4	2747.8	129.2	0.90	0.609	2.000	3.3	0.00
25	133.1	Saturated	Saturated	78	25	0.0	0	3130.5	2818.5	128.3	0.90	0.616	2.000	3.2	0.00
26	133.1	Saturated	Saturated	78	25	0.0	0	3263.6	2889.2	127.5	0.89	0.623	2.000	3.2	0.00
27	133.1	Saturated	Saturated	78	25	0.0	0	3396.7	2959.9	126.7	0.89	0.628	2.000	3.2	0.00
28	132.7	Saturated	Saturated	90	30	0.0	0	3529.4	3030.2	152.9	0.88	0.634	2.000	3.2	0.00
29	132.7	Saturated	Saturated	90	30	0.0	0	3662.1	3100.5	152.0	0.87	0.639	2.000	3.1	0.00
30	132.7	Saturated	Saturated	90	30	0.0	0	3794.8	3170.8	151.1	0.87	0.643	2.000	3.1	0.00
31	132.7	Saturated	Saturated	90	30	0.0	0	3927.5	3241.1	150.2	0.86	0.646	2.000	3.1	0.00
32	132.7	Saturated	Saturated	90	30	0.0	0	4060.2	3311.4	149.4	0.86	0.650	2.000	3.1	0.00
33	138.4	Saturated	Saturated	74	35	0.0	0	4198.6	3387.4	122.1	0.85	0.652	2.000	3.1	0.00
34	138.4	Saturated	Saturated	74	35	0.0	0	4337.0	3463.4	121.4	0.84	0.654	2.000	3.1	0.00
35	138.4	Saturated	Saturated	74	35	0.0	0	4475.4	3539.4	120.7	0.84	0.656	2.000	3.0	0.00
36	138.4	Saturated	Saturated	74	35	0.0	0	4613.8	3615.4	120.0	0.83	0.658	2.000	3.0	0.00
37	138.4	Saturated	Saturated	74	35	0.0	0	4752.2	3691.4	119.4	0.83	0.659	1.992	3.0	0.00
38	120.4	Saturated	Saturated	36	40	0.0	0	4872.6	3749.4	57.8	0.82	0.660	1.981	3.0	0.00
39	120.4	Saturated	Saturated	36	40	0.0	0	4993.0	3807.4	57.6	0.81	0.661	1.970	3.0	0.00
40	120.4	Saturated	Saturated	36	40	0.0	0	5113.4	3865.4	57.4	0.81	0.662	1.960	3.0	0.00
41	120.4	Saturated	Saturated	36	40	0.0	0	5233.8	3923.4	57.1	0.80	0.663	1.949	2.9	0.00
42	120.4	Saturated	Saturated	36	40	0.0	0	5354.2	3981.4	56.9	0.80	0.663	1.939	2.9	0.00
43	114.0	Saturated	Saturated	89	45	0.0	0	5468.2	4033.0	140.2	0.79	0.664	1.930	2.9	0.00
44	114.0	Saturated	Saturated	89	45	0.0	0	5582.2	4084.6	139.8	0.79	0.664	1.921	2.9	0.00
45	114.0	Saturated	Saturated	89	45	0.0	0	5696.2	4136.2	139.3	0.78	0.664	1.912	2.9	0.00
46	114.0	Saturated	Saturated	89	45	0.0	0	5810.2	4187.8	138.9	0.77	0.664	1.903	2.9	0.00
47	114.0	Saturated	Saturated	89	45	0.0	0	5924.2	4239.4	138.4	0.77	0.664	1.895	2.9	0.00
48	125.8	Saturated	Saturated	84	50	0.0	0	6050.0	4302.8	130.1	0.76	0.663	1.884	2.8	0.00
49	125.8	Saturated	Saturated	84	50	0.0	0	6175.8	4366.2	129.6	0.76	0.662	1.874	2.8	0.00
50	125.8	Saturated	Saturated	84	50	0.0	0	6301.6	4429.6	129.1	0.75	0.660	1.864	2.8	0.00
51	125.8	Saturated	Saturated	84	50	0.0	0	6427.4	4493.0	128.7	0.74	0.659	1.854	2.8	0.00
52	125.8	Saturated	Saturated	84	50	0.0	0	6553.2	4556.4	128.2	0.74	0.658	1.844	2.8	0.00
53	133.3	Saturated	Saturated	50	55	0.0	0	6686.5	4627.3	76.0	0.73	0.656	1.833	2.8	0.00
54	133.3	Saturated	Saturated	50	55	0.0	0	6819.8	4698.2	75.7	0.73	0.654	1.822	2.8	0.00
55	133.3	Saturated	Saturated	50	55	0.0	0	6953.1	4769.1	75.4	0.72	0.652	1.812	2.8	0.00
56	133.3	Saturated	Saturated	50	55	0.0	0	7086.4	4840.0	75.1	0.72	0.649	1.801	2.8	0.00
57	133.3	Saturated	Saturated	50	55	0.0	0	7219.7	4910.9	74.8	0.71	0.647	1.791	2.8	0.00
58	137.3	Saturated	Saturated	100	60	0.0	0	7357.0	4985.8	149.0	0.71	0.645	1.781	2.8	0.00
59	137.3	Saturated	Saturated	100	60	0.0	0	7494.3	5060.7	148.4	0.70	0.642	1.770	2.8	0.00
60	137.3	Saturated	Saturated	100	60	0.0	0	7631.6	5135.6	147.9	0.70	0.639	1.760	2.8	0.00
61	137.3	Saturated	Saturated	100	60	0.0	0	7768.9	5210.5	147.3	0.69	0.637	1.749	2.7	0.00
62	137.3	Saturated	Saturated	100	60	0.0	0	7906.2	5285.4	146.8	0.68	0.634	1.739	2.7	0.00
63	137.2	Saturated	Saturated	50	65	0.0	0	8043.4	5360.2	73.1	0.68	0.631	1.730	2.7	0.00
64	137.2	Saturated	Saturated	50	65	0.0	0	8180.6	5435.0	72.8	0.67	0.629	1.720	2.7	0.00
65	137.2	Saturated	Saturated	50	65	0.0	0	8317.8	5509.8	72.6	0.67	0.626	1.710	2.7	0.00
66	137.2	Saturated	Saturated	50	65	0.0	0	8455.0	5584.6	72.3	0.66	0.623	1.701	2.7	0.00
67	137.2	Saturated	Saturated	50	65	0.0	0	8592.2	5659.4	72.1	0.66	0.620	1.691	2.7	0.00
68	136.2	Saturated	Saturated	90	70	0.0	0	8728.4	5733.2	129.3	0.66	0.618	1.682	2.7	0.00
69	136.2	Saturated	Saturated	90	70	0.0	0	8864.6	5807.0	128.8	0.65	0.615	1.673	2.7	0.00
70	136.2	Saturated	Saturated	90	70	0.0	0	9000.8	5880.8	128.4	0.65	0.612	1.664	2.7	0.00
													Total Liquefaction Settlement, S =		**0.00 inches**

Geotechnologies, Inc.

Project: S & R Partners
File No.: 20921
Description: Liquefaction Analysis
Boring Number B30

LIQUEFACTION EVALUATION (Idriss & Boulanger, EERI NO 12)

EARTHQUAKE INFORMATION:

Earthquake Magnitude (M):	6.83
Peak Ground Horizontal Acceleration, PGA_M (g):	0.952
Calculated Mag.Wtg.Factor:	1.193

GROUNDWATER INFORMATION:

Current Groundwater Level (ft):	29.0
Historically Highest Groundwater Level* (ft):	20.0
Unit Weight of Water (pcf):	62.4

* Based on California Geological Survey Seismic Hazard Evaluation Report

BOREHOLE AND SAMPLER INFORMATION:

Borehole Diameter (inches):	8
SPT Sampler with room for Liner (Y/N):	Y

LIQUEFACTION BOUNDARY:

Plastic Index Cut Off (PI):	18
Minimum Liquefaction FS:	1.3

Depth to Base Layer (feet)	Total Unit Weight (pcf)	Current Water Level (feet)	Historical Water Level (feet)	Field SPT Blowcount N	Depth of SPT Blowcount (feet)	Fines Content #200 Sieve (%)	Plastic Index (PI)	Vetical Stress σ_{vc}, (psf)	Effective Vert. Stress σ_{vc}', (psf)	Fines Corrected $(N_1)_{60\text{-}cs}$	Stress Reduction Coeff, r_d	Cyclic Shear Ratio CSR	Cyclic Resistance Ratio (CRR)	Factor of Safety CRR/CSR (F.S.)	Liquefaction Settlment ΔS_i (inches)
1	115.1	Unsaturated	Unsaturated	9	5	0.0	0	115.1	115.1	19.2	1.00	0.621	0.258	Non-Liq.	0.00
2	115.1	Unsaturated	Unsaturated	9	5	0.0	0	230.2	230.2	19.2	1.00	0.619	0.258	Non-Liq.	0.00
3	115.1	Unsaturated	Unsaturated	9	5	0.0	0	345.3	345.3	19.2	1.00	0.617	0.258	Non-Liq.	0.00
4	115.1	Unsaturated	Unsaturated	9	5	0.0	0	460.4	460.4	19.2	0.99	0.615	0.258	Non-Liq.	0.00
5	115.1	Unsaturated	Unsaturated	9	5	0.0	0	575.5	575.5	20.7	0.99	0.613	0.282	Non-Liq.	0.00
6	115.1	Unsaturated	Unsaturated	9	5	0.0	0	690.6	690.6	20.7	0.99	0.611	0.282	Non-Liq.	0.00
7	115.1	Unsaturated	Unsaturated	9	5	0.0	0	805.7	805.7	20.0	0.98	0.608	0.270	Non-Liq.	0.00
8	130.3	Unsaturated	Unsaturated	32	10	0.0	0	936.0	936.0	59.2	0.98	0.606	2.000	Non-Liq.	0.00
9	130.3	Unsaturated	Unsaturated	32	10	0.0	0	1066.3	1066.3	60.8	0.98	0.604	2.000	Non-Liq.	0.00
10	130.3	Unsaturated	Unsaturated	32	10	0.0	0	1196.6	1196.6	59.0	0.97	0.601	2.000	Non-Liq.	0.00
11	130.3	Unsaturated	Unsaturated	32	10	0.0	0	1326.9	1326.9	57.4	0.97	0.598	2.000	Non-Liq.	0.00
12	130.3	Unsaturated	Unsaturated	32	10	0.0	0	1457.2	1457.2	56.0	0.96	0.596	2.000	Non-Liq.	0.00
13	130.3	Unsaturated	Unsaturated	75	15	0.0	0	1587.5	1587.5	128.4	0.96	0.593	2.000	Non-Liq.	0.00
14	130.3	Unsaturated	Unsaturated	75	15	0.0	0	1717.8	1717.8	125.7	0.95	0.590	2.000	Non-Liq.	0.00
15	130.3	Unsaturated	Unsaturated	75	15	0.0	0	1848.1	1848.1	137.9	0.95	0.587	2.000	Non-Liq.	0.00
16	130.3	Unsaturated	Unsaturated	75	15	0.0	0	1978.4	1978.4	135.4	0.94	0.584	2.000	Non-Liq.	0.00
17	130.3	Unsaturated	Unsaturated	75	15	0.0	0	2108.7	2108.7	133.2	0.94	0.581	2.000	Non-Liq.	0.00
18	123.9	Unsaturated	Unsaturated	50	20	0.0	0	2232.6	2232.6	87.5	0.93	0.578	2.000	Non-Liq.	0.00
19	123.9	Unsaturated	Unsaturated	50	20	0.0	0	2356.5	2356.5	86.2	0.93	0.575	2.000	Non-Liq.	0.00
20	123.9	Unsaturated	Unsaturated	50	20	0.0	0	2480.4	2480.4	85.1	0.92	0.571	2.000	Non-Liq.	0.00
21	123.9	Unsaturated	Saturated	50	20	0.0	0	2604.3	2541.9	84.5	0.92	0.582	2.000	3.4	0.00
22	123.9	Unsaturated	Saturated	50	20	0.0	0	2728.2	2603.4	84.0	0.91	0.592	2.000	3.4	0.00
23	110.7	Unsaturated	Saturated	46	25	0.0	0	2838.9	2651.7	76.9	0.91	0.601	2.000	3.3	0.00
24	110.7	Unsaturated	Saturated	46	25	0.0	0	2949.6	2700.0	76.5	0.90	0.610	2.000	3.3	0.00
25	110.7	Unsaturated	Saturated	46	25	0.0	0	3060.3	2748.3	76.2	0.90	0.618	2.000	3.2	0.00
26	110.7	Unsaturated	Saturated	46	25	0.0	0	3171.0	2796.6	75.8	0.89	0.625	2.000	3.2	0.00
27	110.7	Unsaturated	Saturated	46	25	0.0	0	3281.7	2844.9	75.5	0.89	0.632	2.000	3.2	0.00
28	126.3	Unsaturated	Saturated	74	30	0.0	0	3408.0	2908.8	127.1	0.88	0.638	2.000	3.1	0.00
29	126.3	Unsaturated	Saturated	74	30	0.0	0	3534.3	2972.7	126.4	0.87	0.643	2.000	3.1	0.00
30	126.3	Saturated	Saturated	74	30	0.0	0	3660.6	3036.6	125.6	0.87	0.647	2.000	3.1	0.00
31	126.3	Saturated	Saturated	74	30	0.0	0	3786.9	3100.5	125.0	0.86	0.652	2.000	3.1	0.00
32	126.3	Saturated	Saturated	74	30	0.0	0	3913.2	3164.4	124.3	0.86	0.655	2.000	3.1	0.00
33	119.1	Saturated	Saturated	70	35	0.0	0	4032.3	3221.1	117.0	0.85	0.659	2.000	3.0	0.00
34	119.1	Saturated	Saturated	70	35	0.0	0	4151.4	3277.8	116.5	0.84	0.662	2.000	3.0	0.00
35	119.1	Saturated	Saturated	70	35	0.0	0	4270.5	3334.5	116.0	0.84	0.665	2.000	3.0	0.00
36	119.1	Saturated	Saturated	70	35	0.0	0	4389.6	3391.2	115.5	0.83	0.667	2.000	3.0	0.00
37	119.1	Saturated	Saturated	70	35	0.0	0	4508.7	3447.9	114.9	0.83	0.669	2.000	3.0	0.00
38	135.2	Saturated	Saturated	72	40	0.0	0	4643.9	3520.7	117.6	0.82	0.670	2.000	3.0	0.00
39	135.2	Saturated	Saturated	72	40	0.0	0	4779.1	3593.5	117.0	0.81	0.671	2.000	3.0	0.00
40	135.2	Saturated	Saturated	72	40	0.0	0	4914.3	3666.3	116.3	0.81	0.671	1.997	3.0	0.00
41	135.2	Saturated	Saturated	72	40	0.0	0	5049.5	3739.1	115.7	0.80	0.671	1.983	3.0	0.00
42	135.2	Saturated	Saturated	72	40	0.0	0	5184.7	3811.9	115.2	0.80	0.671	1.970	2.9	0.00
43	137.8	Saturated	Saturated	67	45	0.0	0	5322.5	3887.3	106.6	0.79	0.670	1.956	2.9	0.00
44	137.8	Saturated	Saturated	67	45	0.0	0	5460.3	3962.7	106.1	0.79	0.670	1.942	2.9	0.00
45	137.8	Saturated	Saturated	67	45	0.0	0	5598.1	4038.1	105.5	0.78	0.669	1.929	2.9	0.00
46	137.8	Saturated	Saturated	67	45	0.0	0	5735.9	4113.5	105.0	0.77	0.667	1.916	2.9	0.00
47	137.8	Saturated	Saturated	67	45	0.0	0	5873.7	4188.9	104.5	0.77	0.666	1.903	2.9	0.00
48	139.4	Saturated	Saturated	35	50	0.0	0	6013.1	4265.9	54.3	0.76	0.664	1.890	2.8	0.00
49	139.4	Saturated	Saturated	35	50	0.0	0	6152.5	4342.9	54.1	0.76	0.663	1.878	2.8	0.00
50	139.4	Saturated	Saturated	35	50	0.0	0	6291.9	4419.9	53.8	0.75	0.661	1.865	2.8	0.00
51	139.4	Saturated	Saturated	35	50	0.0	0	6431.3	4496.9	53.6	0.74	0.659	1.853	2.8	0.00
52	139.4	Saturated	Saturated	35	50	0.0	0	6570.7	4573.9	53.4	0.74	0.657	1.841	2.8	0.00
53	126.0	Saturated	Saturated	32	55	0.0	0	6696.7	4637.5	48.6	0.73	0.655	1.832	2.8	0.00
54	126.0	Saturated	Saturated	32	55	0.0	0	6822.7	4701.1	48.4	0.73	0.654	1.822	2.8	0.00
55	126.0	Saturated	Saturated	32	55	0.0	0	6948.7	4764.7	48.3	0.72	0.652	1.812	2.8	0.00
56	126.0	Saturated	Saturated	32	55	0.0	0	7074.7	4828.3	48.1	0.72	0.650	1.803	2.8	0.00
57	126.0	Saturated	Saturated	32	55	0.0	0	7200.7	4891.9	47.9	0.71	0.648	1.794	2.8	0.00
58	131.7	Saturated	Saturated	50	60	0.0	0	7332.4	4961.2	74.6	0.71	0.646	1.784	2.8	0.00
59	131.7	Saturated	Saturated	50	60	0.0	0	7464.1	5030.5	74.3	0.70	0.643	1.774	2.8	0.00
60	131.7	Saturated	Saturated	50	60	0.0	0	7595.8	5099.8	74.1	0.70	0.641	1.765	2.8	0.00
61	131.7	Saturated	Saturated	50	60	0.0	0	7727.5	5169.1	73.8	0.69	0.638	1.755	2.7	0.00
62	131.7	Saturated	Saturated	50	60	0.0	0	7859.2	5238.4	73.5	0.68	0.636	1.746	2.7	0.00
63	143.7	Saturated	Saturated	71	65	0.0	0	8002.9	5319.7	104.0	0.68	0.633	1.735	2.7	0.00
64	143.7	Saturated	Saturated	71	65	0.0	0	8146.6	5401.0	103.6	0.67	0.630	1.724	2.7	0.00
65	143.7	Saturated	Saturated	71	65	0.0	0	8290.3	5482.3	103.2	0.67	0.627	1.714	2.7	0.00
66	143.7	Saturated	Saturated	71	65	0.0	0	8434.0	5563.6	102.8	0.66	0.624	1.703	2.7	0.00
67	143.7	Saturated	Saturated	71	65	0.0	0	8577.7	5644.9	102.4	0.66	0.621	1.693	2.7	0.00
68	128.8	Saturated	Saturated	70	70	0.0	0	8706.5	5711.3	100.7	0.66	0.618	1.685	2.7	0.00
69	128.8	Saturated	Saturated	70	70	0.0	0	8835.3	5777.7	100.3	0.65	0.616	1.677	2.7	0.00
70	128.8	Saturated	Saturated	70	70	0.0	0	8964.1	5844.1	100.0	0.65	0.613	1.669	2.7	0.00
71	128.8	Saturated	Saturated	70	70	0.0	0	9092.9	5910.5	99.8	0.64	0.611	1.661	2.7	0.00
72	128.8	Saturated	Saturated	70	70	0.0	0	9221.7	5976.9	99.5	0.64	0.608	1.653	2.7	0.00
73	130.8	Saturated	Saturated	50	75	0.0	0	9352.5	6045.3	70.8	0.63	0.606	1.645	2.7	0.00
74	130.8	Saturated	Saturated	50	75	0.0	0	9483.3	6113.7	70.6	0.63	0.603	1.637	2.7	0.00
75	130.8	Saturated	Saturated	50	75	0.0	0	9614.1	6182.1	70.4	0.62	0.601	1.629	2.7	0.00
												Total Liquefaction Settlement, S =			**0.00 inches**

Geotechnologies, Inc.

Project: S & R Partners
File No.: 20921
Description: Liquefaction Analysis
Boring Number B31

LIQUEFACTION EVALUATION (Idriss & Boulanger, EERI NO 12)

EARTHQUAKE INFORMATION:

Earthquake Magnitude (M):	6.83
Peak Ground Horizontal Acceleration, PGA_M (g):	0.952
Calculated Mag.Wtg.Factor:	1.193

GROUNDWATER INFORMATION:

Current Groundwater Level (ft):	31.0
Historically Highest Groundwater Level* (ft):	20.0
Unit Weight of Water (pcf):	62.4

* Based on California Geological Survey Seismic Hazard Evaluation Report

BOREHOLE AND SAMPLER INFORMATION:

Borehole Diameter (inches):	8
SPT Sampler with room for Liner (Y/N):	Y

LIQUEFACTION BOUNDARY:

Plastic Index Cut Off (PI):	18
Minimum Liquefaction FS:	1.3

Depth to Base Layer (feet)	Total Unit Weight (pcf)	Current Water Level (feet)	Historical Water Level (feet)	Field SPT Blowcount N	Depth of SPT Blowcount (feet)	Fines Content #200 Sieve (%)	Plastic Index (PI)	Vetical Stress σ_{vc} (psf)	Effective Vert. Stress σ_{vc}' (psf)	Fines Corrected $(N_1)_{60\text{-}cs}$	Stress Reduction Coeff, r_d	Cyclic Shear Ratio CSR	Cyclic Resistance Ratio (CRR)	Factor of Safety CRR/CSR (F.S.)	Liquefaction Settlment ΔS_i (inches)
1	134.4	Unsaturated	Unsaturated	30	5	0.0	0	134.4	134.4	71.5	1.00	0.621	2.000	Non-Liq.	0.00
2	134.4	Unsaturated	Unsaturated	30	5	0.0	0	268.8	268.8	71.5	1.00	0.619	2.000	Non-Liq.	0.00
3	134.4	Unsaturated	Unsaturated	30	5	0.0	0	403.2	403.2	67.5	1.00	0.617	2.000	Non-Liq.	0.00
4	134.4	Unsaturated	Unsaturated	30	5	0.0	0	537.6	537.6	62.2	0.99	0.615	2.000	Non-Liq.	0.00
5	134.4	Unsaturated	Unsaturated	30	5	0.0	0	672.0	672.0	61.1	0.99	0.613	2.000	Non-Liq.	0.00
6	134.4	Unsaturated	Unsaturated	30	5	0.0	0	806.4	806.4	58.1	0.99	0.611	2.000	Non-Liq.	0.00
7	134.4	Unsaturated	Unsaturated	30	5	0.0	0	940.8	940.8	55.8	0.98	0.608	2.000	Non-Liq.	0.00
8	117.8	Unsaturated	Unsaturated	96	10	0.0	0	1058.6	1058.6	172.1	0.98	0.606	2.000	Non-Liq.	0.00
9	117.8	Unsaturated	Unsaturated	96	10	0.0	0	1176.4	1176.4	177.8	0.98	0.604	2.000	Non-Liq.	0.00
10	117.8	Unsaturated	Unsaturated	96	10	0.0	0	1294.2	1294.2	173.4	0.97	0.601	2.000	Non-Liq.	0.00
11	117.8	Unsaturated	Unsaturated	96	10	0.0	0	1412.0	1412.0	169.5	0.97	0.598	2.000	Non-Liq.	0.00
12	117.8	Unsaturated	Unsaturated	96	10	0.0	0	1529.8	1529.8	165.9	0.96	0.596	2.000	Non-Liq.	0.00
13	115.5	Unsaturated	Unsaturated	15	15	0.0	0	1645.3	1645.3	24.6	0.96	0.593	0.348	Non-Liq.	0.00
14	115.5	Unsaturated	Unsaturated	15	15	0.0	0	1760.8	1760.8	23.7	0.95	0.590	0.323	Non-Liq.	0.00
15	115.5	Unsaturated	Unsaturated	15	15	0.0	0	1876.3	1876.3	26.1	0.95	0.587	0.389	Non-Liq.	0.00
16	115.5	Unsaturated	Unsaturated	15	15	0.0	0	1991.8	1991.8	25.4	0.94	0.584	0.360	Non-Liq.	0.00
17	115.5	Unsaturated	Unsaturated	15	15	0.0	0	2107.3	2107.3	24.7	0.94	0.581	0.338	Non-Liq.	0.00
18	109.4	Unsaturated	Unsaturated	27	20	0.0	0	2216.7	2216.7	47.3	0.93	0.578	2.000	Non-Liq.	0.00
19	109.4	Unsaturated	Unsaturated	27	20	0.0	0	2326.1	2326.1	46.7	0.93	0.575	2.000	Non-Liq.	0.00
20	109.4	Unsaturated	Unsaturated	27	20	0.0	0	2435.5	2435.5	46.2	0.92	0.571	2.000	Non-Liq.	0.00
21	109.4	Unsaturated	Saturated	27	20	0.0	0	2544.9	2482.5	45.9	0.92	0.582	2.000	3.4	0.00
22	109.4	Unsaturated	Saturated	27	20	0.0	0	2654.3	2529.5	45.7	0.91	0.593	2.000	3.4	0.00
23	122.8	Unsaturated	Saturated	42	25	5.4	0	2777.1	2589.9	70.7	0.91	0.602	2.000	3.3	0.00
24	122.8	Unsaturated	Saturated	42	25	5.4	0	2899.9	2650.3	70.2	0.90	0.611	2.000	3.3	0.00
25	122.8	Unsaturated	Saturated	42	25	5.4	0	3022.7	2710.7	69.8	0.90	0.618	2.000	3.2	0.00
26	122.8	Unsaturated	Saturated	42	25	5.4	0	3145.5	2771.1	69.4	0.89	0.626	2.000	3.2	0.00
27	122.8	Unsaturated	Saturated	42	25	5.4	0	3268.3	2831.5	69.0	0.89	0.632	2.000	3.2	0.00
28	127.1	Unsaturated	Saturated	70	30	0.0	0	3395.4	2896.2	120.3	0.88	0.638	2.000	3.1	0.00
29	127.1	Unsaturated	Saturated	70	30	0.0	0	3522.5	2960.9	119.6	0.87	0.643	2.000	3.1	0.00
30	127.1	Unsaturated	Saturated	70	30	0.0	0	3649.6	3025.6	119.0	0.87	0.648	2.000	3.1	0.00
31	127.1	Unsaturated	Saturated	70	30	0.0	0	3776.7	3090.3	118.3	0.86	0.652	2.000	3.1	0.00
32	127.1	Saturated	Saturated	70	30	0.0	0	3903.8	3155.0	117.7	0.86	0.656	2.000	3.1	0.00
33	136.4	Saturated	Saturated	90	35	0.0	0	4040.2	3229.0	150.4	0.85	0.658	2.000	3.0	0.00
34	136.4	Saturated	Saturated	90	35	0.0	0	4176.6	3303.0	149.5	0.84	0.661	2.000	3.0	0.00
35	136.4	Saturated	Saturated	90	35	0.0	0	4313.0	3377.0	148.6	0.84	0.663	2.000	3.0	0.00
36	136.4	Saturated	Saturated	90	35	0.0	0	4449.4	3451.0	147.8	0.83	0.664	2.000	3.0	0.00
37	136.4	Saturated	Saturated	90	35	0.0	0	4585.8	3525.0	146.9	0.83	0.666	2.000	3.0	0.00
38	143.5	Saturated	Saturated	86	40	0.0	0	4729.3	3606.1	139.6	0.82	0.666	2.000	3.0	0.00
39	143.5	Saturated	Saturated	86	40	0.0	0	4872.8	3687.2	138.8	0.81	0.666	1.993	3.0	0.00
40	143.5	Saturated	Saturated	86	40	0.0	0	5016.3	3768.3	138.0	0.81	0.666	1.978	3.0	0.00
41	143.5	Saturated	Saturated	86	40	0.0	0	5159.8	3849.4	137.2	0.80	0.666	1.963	2.9	0.00
42	143.5	Saturated	Saturated	86	40	0.0	0	5303.3	3930.5	136.4	0.80	0.665	1.948	2.9	0.00
43	134.1	Saturated	Saturated	86	45	0.0	0	5437.4	4002.2	135.8	0.79	0.665	1.935	2.9	0.00
44	134.1	Saturated	Saturated	86	45	0.0	0	5571.5	4073.9	135.2	0.79	0.664	1.923	2.9	0.00
45	134.1	Saturated	Saturated	86	45	0.0	0	5705.6	4145.6	134.5	0.78	0.664	1.910	2.9	0.00
46	134.1	Saturated	Saturated	86	45	0.0	0	5839.7	4217.3	133.9	0.77	0.663	1.898	2.9	0.00
47	134.1	Saturated	Saturated	86	45	0.0	0	5973.8	4289.0	133.3	0.77	0.662	1.887	2.9	0.00
48	137.0	Saturated	Saturated	86	50	0.0	0	6110.8	4363.6	132.7	0.76	0.660	1.874	2.8	0.00
49	137.0	Saturated	Saturated	86	50	0.0	0	6247.8	4438.2	132.1	0.76	0.659	1.862	2.8	0.00
50	137.0	Saturated	Saturated	86	50	0.0	0	6384.8	4512.8	131.6	0.75	0.657	1.851	2.8	0.00
51	137.0	Saturated	Saturated	86	50	0.0	0	6521.8	4587.4	131.0	0.74	0.655	1.839	2.8	0.00
52	137.0	Saturated	Saturated	86	50	0.0	0	6658.8	4662.0	130.4	0.74	0.653	1.828	2.8	0.00
53	127.4	Saturated	Saturated	86	55	0.0	0	6786.2	4727.0	130.0	0.73	0.651	1.818	2.8	0.00
54	127.4	Saturated	Saturated	86	55	0.0	0	6913.6	4792.0	129.5	0.73	0.650	1.808	2.8	0.00
55	127.4	Saturated	Saturated	86	55	0.0	0	7041.0	4857.0	129.0	0.72	0.648	1.799	2.8	0.00
56	127.4	Saturated	Saturated	86	55	0.0	0	7168.4	4922.0	128.6	0.72	0.646	1.790	2.8	0.00
57	127.4	Saturated	Saturated	86	55	0.0	0	7295.8	4987.0	128.2	0.71	0.644	1.780	2.8	0.00
58	135.5	Saturated	Saturated	54	60	0.0	0	7431.3	5060.1	80.2	0.71	0.641	1.770	2.8	0.00
59	135.5	Saturated	Saturated	54	60	0.0	0	7566.8	5133.2	79.9	0.70	0.639	1.760	2.8	0.00
60	135.5	Saturated	Saturated	54	60	0.0	0	7702.3	5206.3	79.6	0.70	0.636	1.750	2.7	0.00
61	135.5	Saturated	Saturated	54	60	0.0	0	7837.8	5279.4	79.3	0.69	0.634	1.740	2.7	0.00
62	135.5	Saturated	Saturated	54	60	0.0	0	7973.3	5352.5	79.0	0.68	0.631	1.731	2.7	0.00
63	130.0	Saturated	Saturated	81	65	0.0	0	8103.3	5420.1	118.1	0.68	0.629	1.722	2.7	0.00
64	130.0	Saturated	Saturated	81	65	0.0	0	8233.3	5487.7	117.7	0.67	0.626	1.713	2.7	0.00
65	130.0	Saturated	Saturated	81	65	0.0	0	8363.3	5555.3	117.3	0.67	0.624	1.704	2.7	0.00
66	130.0	Saturated	Saturated	81	65	0.0	0	8493.3	5622.9	117.0	0.66	0.622	1.696	2.7	0.00
67	130.0	Saturated	Saturated	81	65	0.0	0	8623.3	5690.5	116.6	0.66	0.619	1.687	2.7	0.00
68	138.3	Saturated	Saturated	93	70	0.0	0	8761.6	5766.4	133.4	0.66	0.616	1.678	2.7	0.00
69	138.3	Saturated	Saturated	93	70	0.0	0	8899.9	5842.3	132.9	0.65	0.613	1.669	2.7	0.00
70	138.3	Saturated	Saturated	93	70	0.0	0	9038.2	5918.2	132.5	0.65	0.611	1.660	2.7	0.00
71	138.3	Saturated	Saturated	93	70	0.0	0	9176.5	5994.1	132.0	0.64	0.608	1.651	2.7	0.00
72	138.3	Saturated	Saturated	93	70	0.0	0	9314.8	6070.0	131.6	0.64	0.605	1.642	2.7	0.00
73	125.4	Saturated	Saturated	50	75	0.0	0	9440.2	6133.0	70.6	0.63	0.603	1.635	2.7	0.00
74	125.4	Saturated	Saturated	50	75	0.0	0	9565.6	6196.0	70.4	0.63	0.601	1.628	2.7	0.00
75	125.4	Saturated	Saturated	50	75	0.0	0	9691.0	6259.0	70.2	0.62	0.598	1.620	2.7	0.00
														Total Liquefaction Settlement, S =	**0.00 inches**

GEOTECHNOLOGIES, INC.
CONSULTING GEOTECHNICAL ENGINEERS

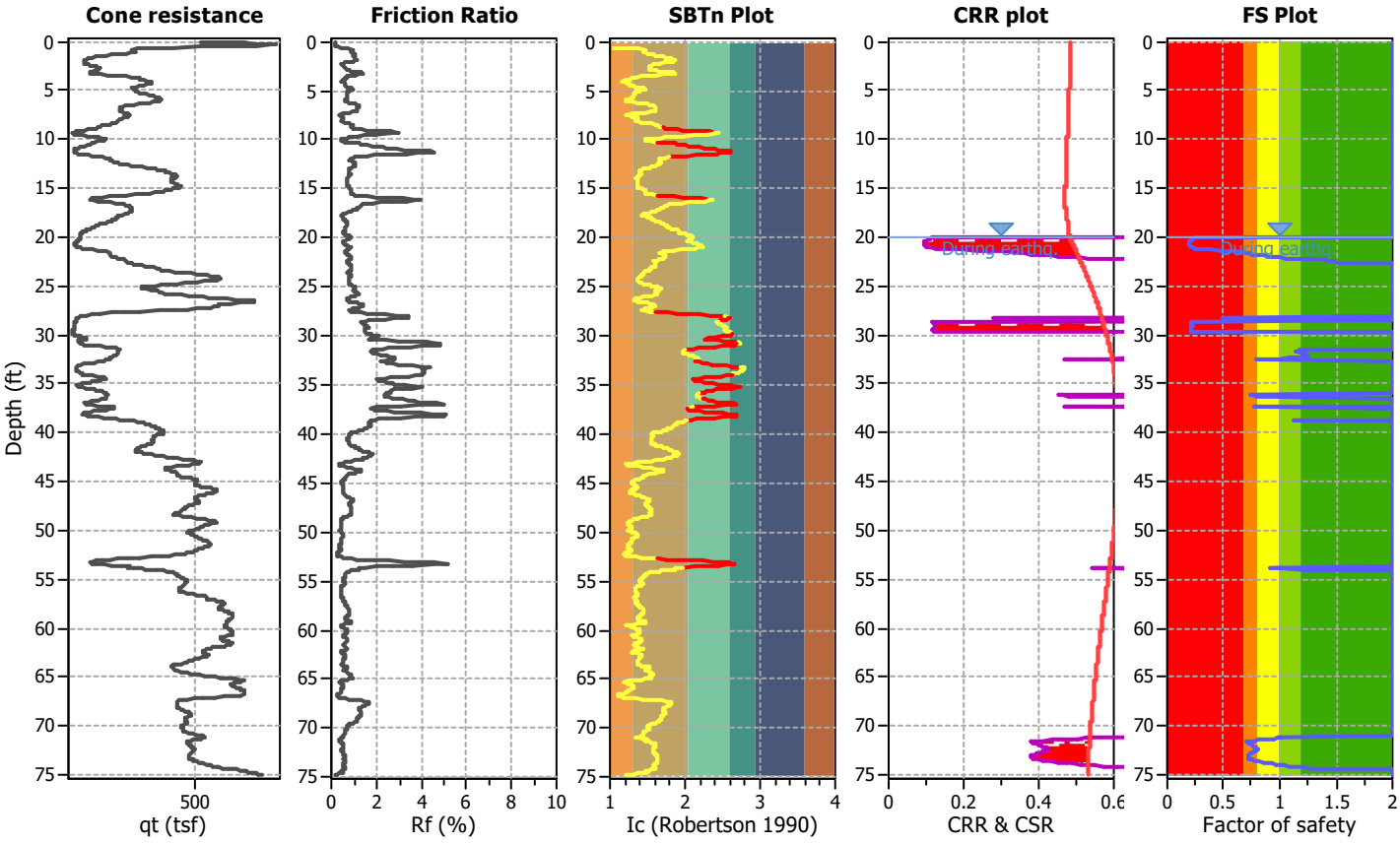
LIQUEFACTION ANALYSIS REPORT

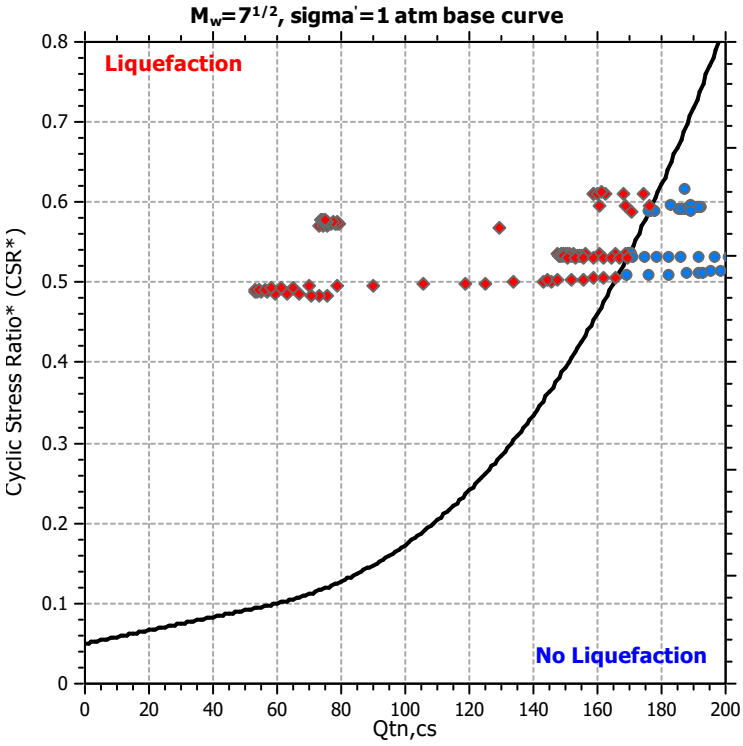
Project title : S & R Partners (File No. 20921) **Location : 1251 N. Spring St, Los Angeles, CA**

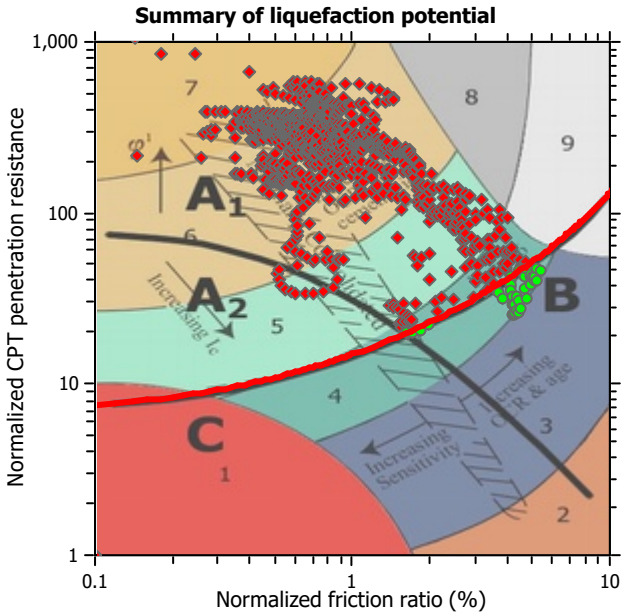
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	23.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.83	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.95	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

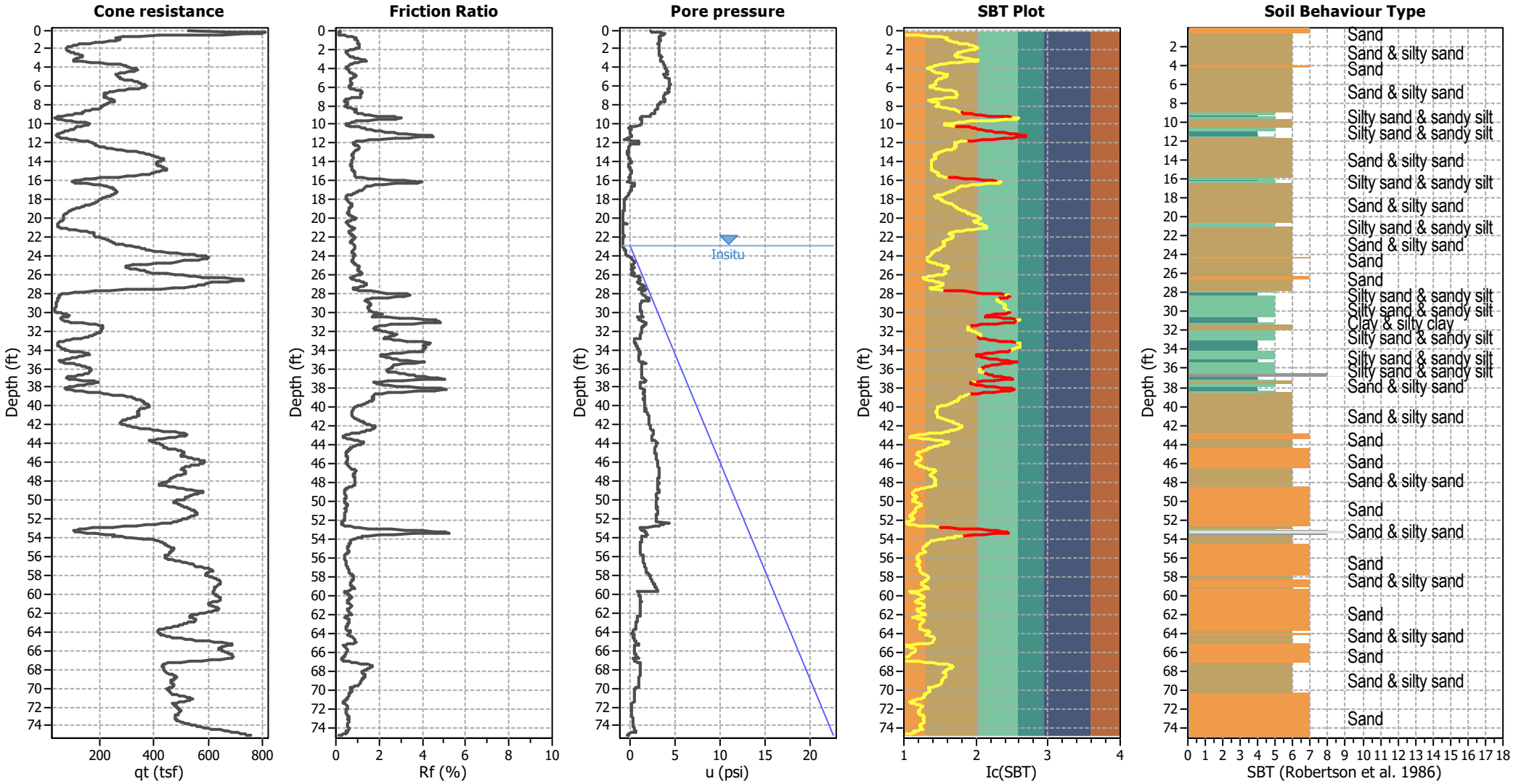






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



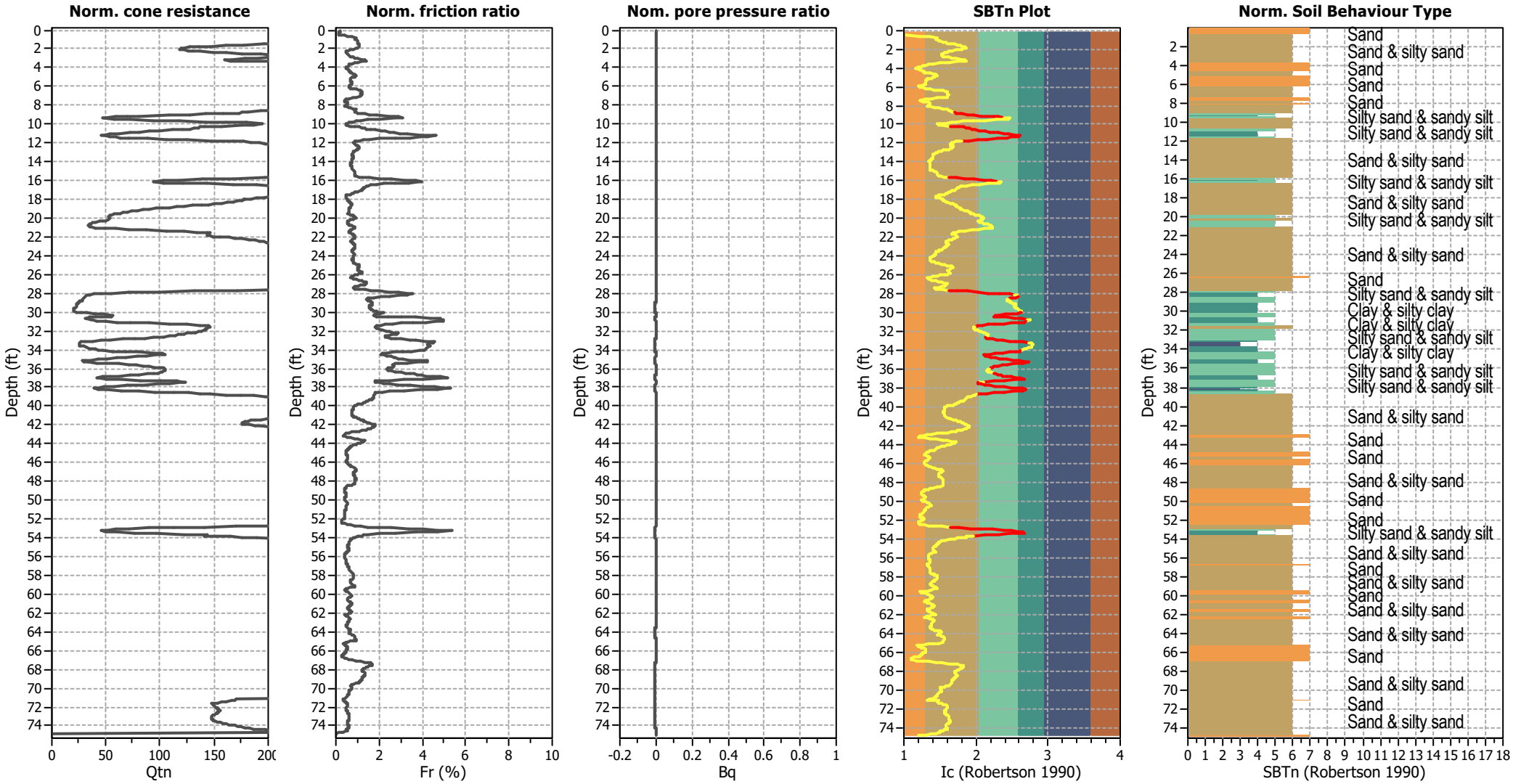
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



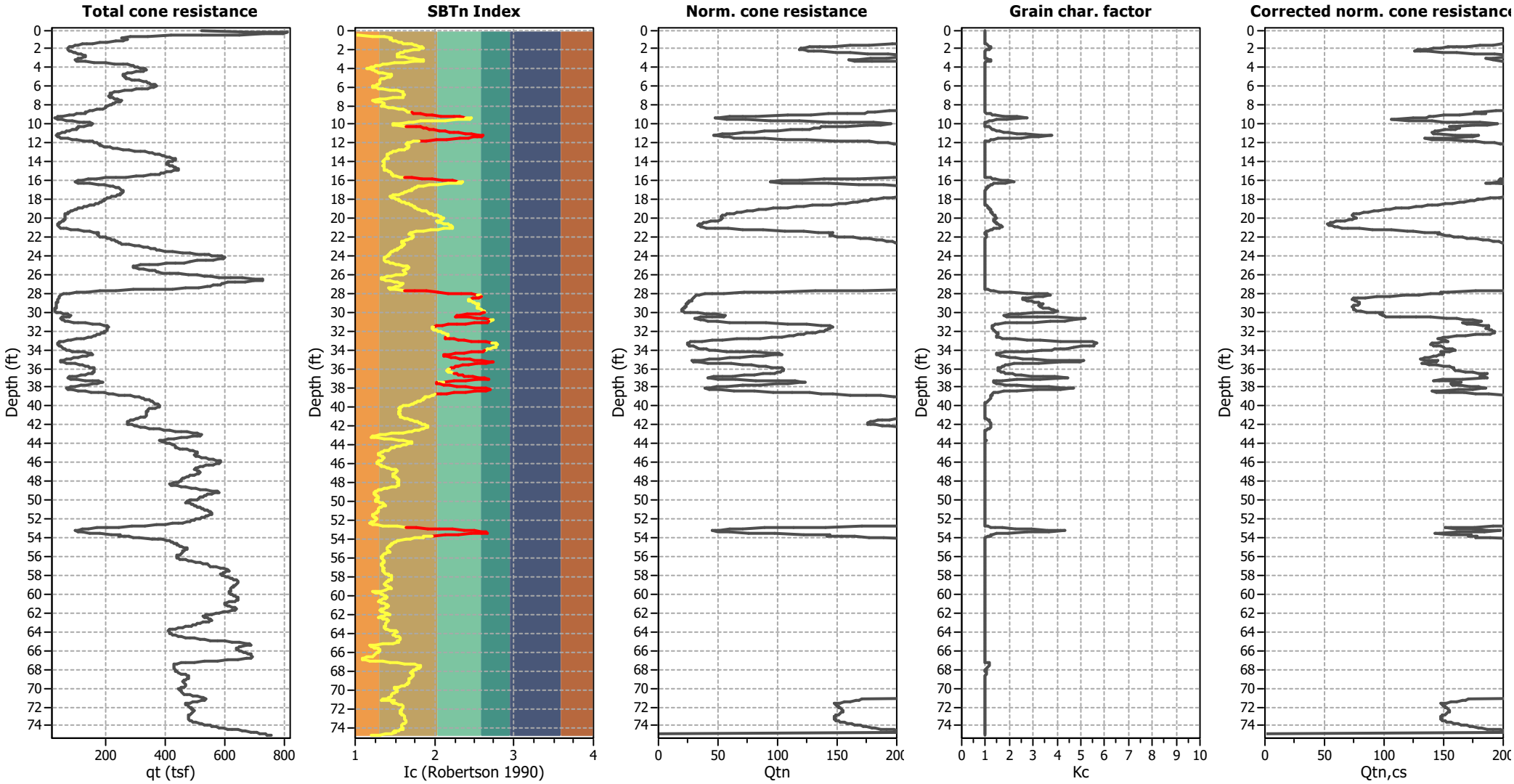
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

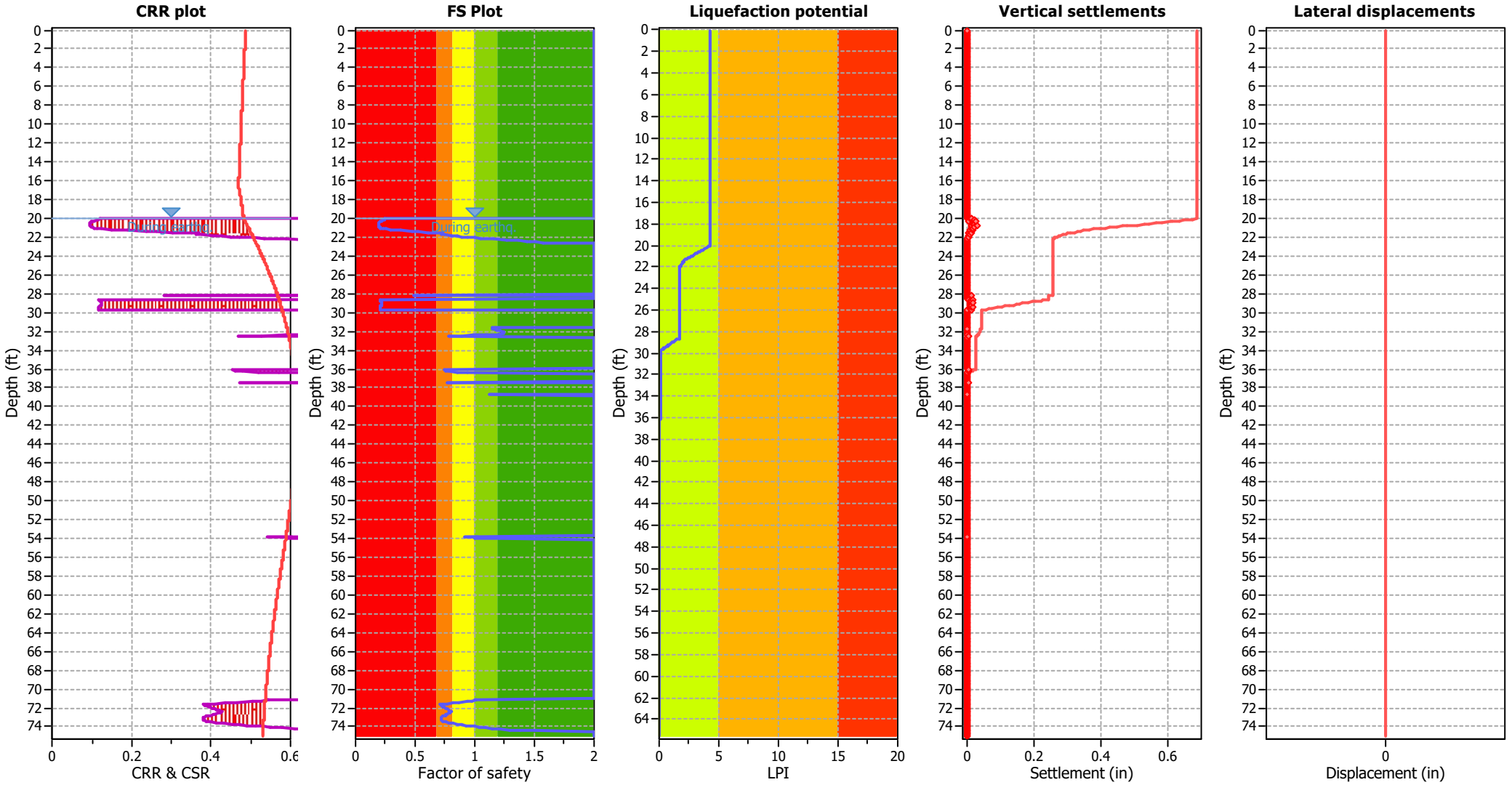
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	23.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

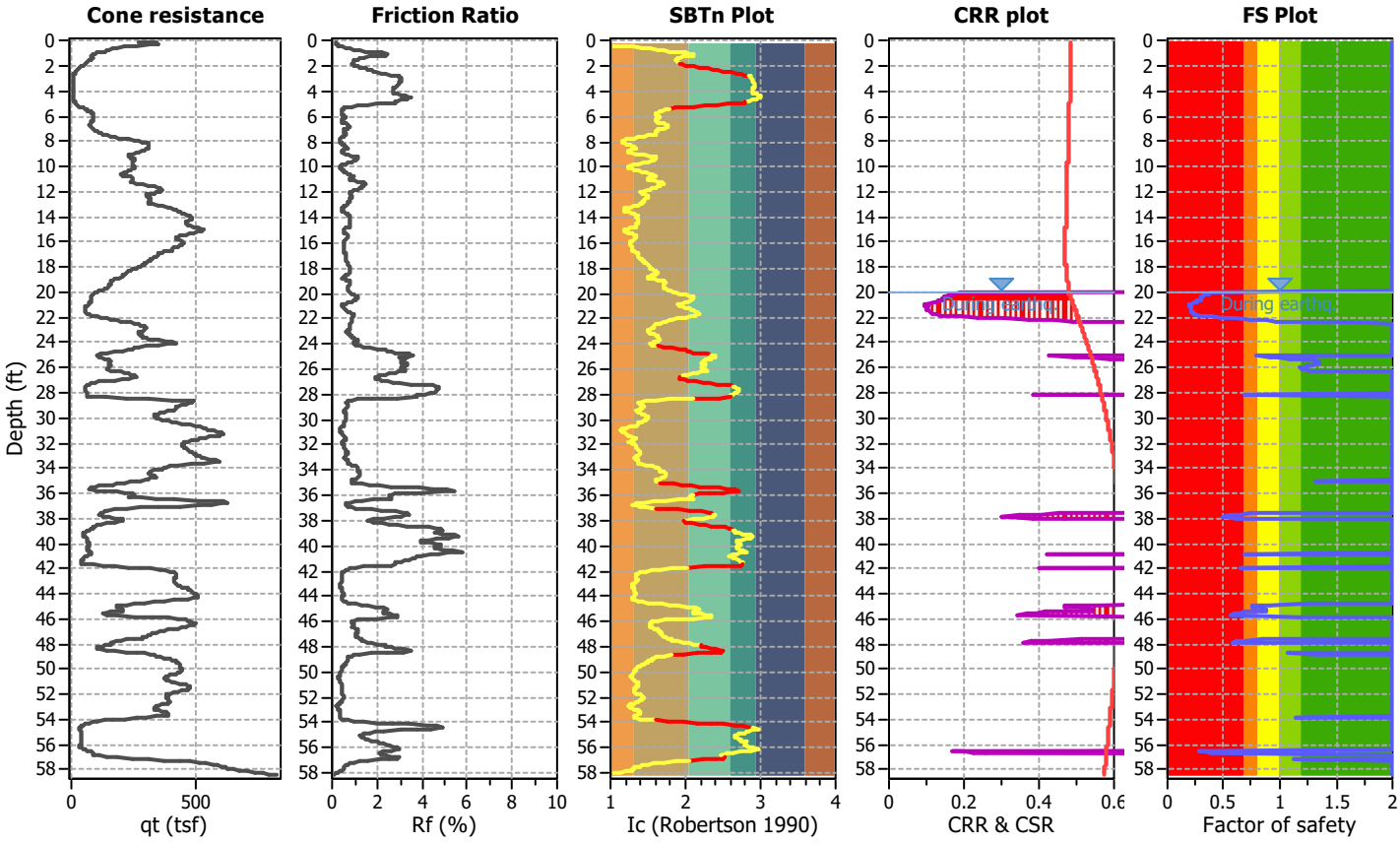
LIQUEFACTION ANALYSIS REPORT

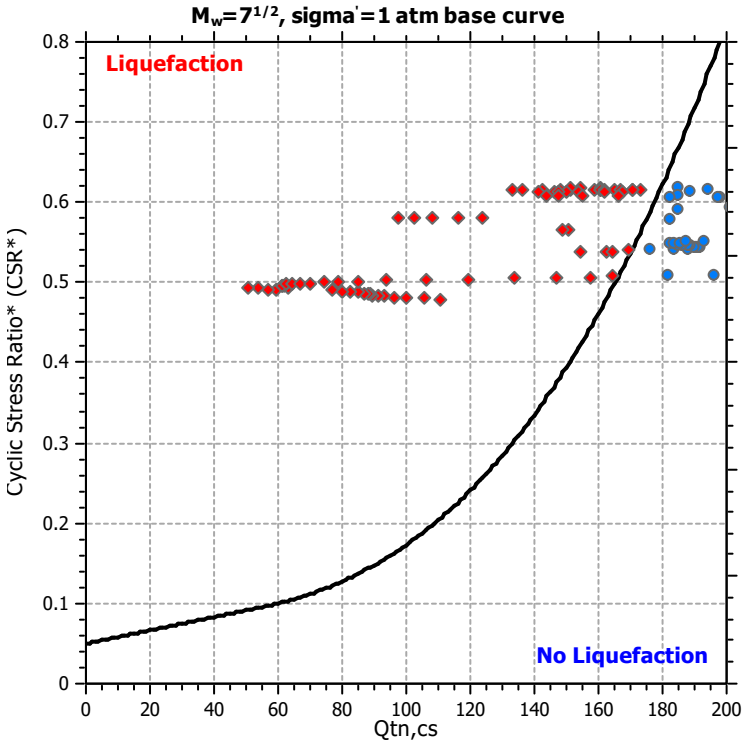
Project title : S & R Partners (File No. 20921) **Location : 1251 N. Spring St, Los Angeles, CA**

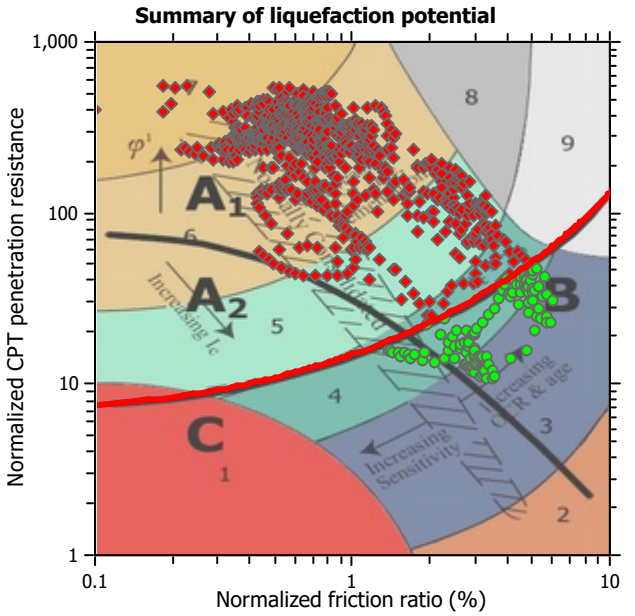
CPT file : CPT-2A

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	24.50 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.83	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.95	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

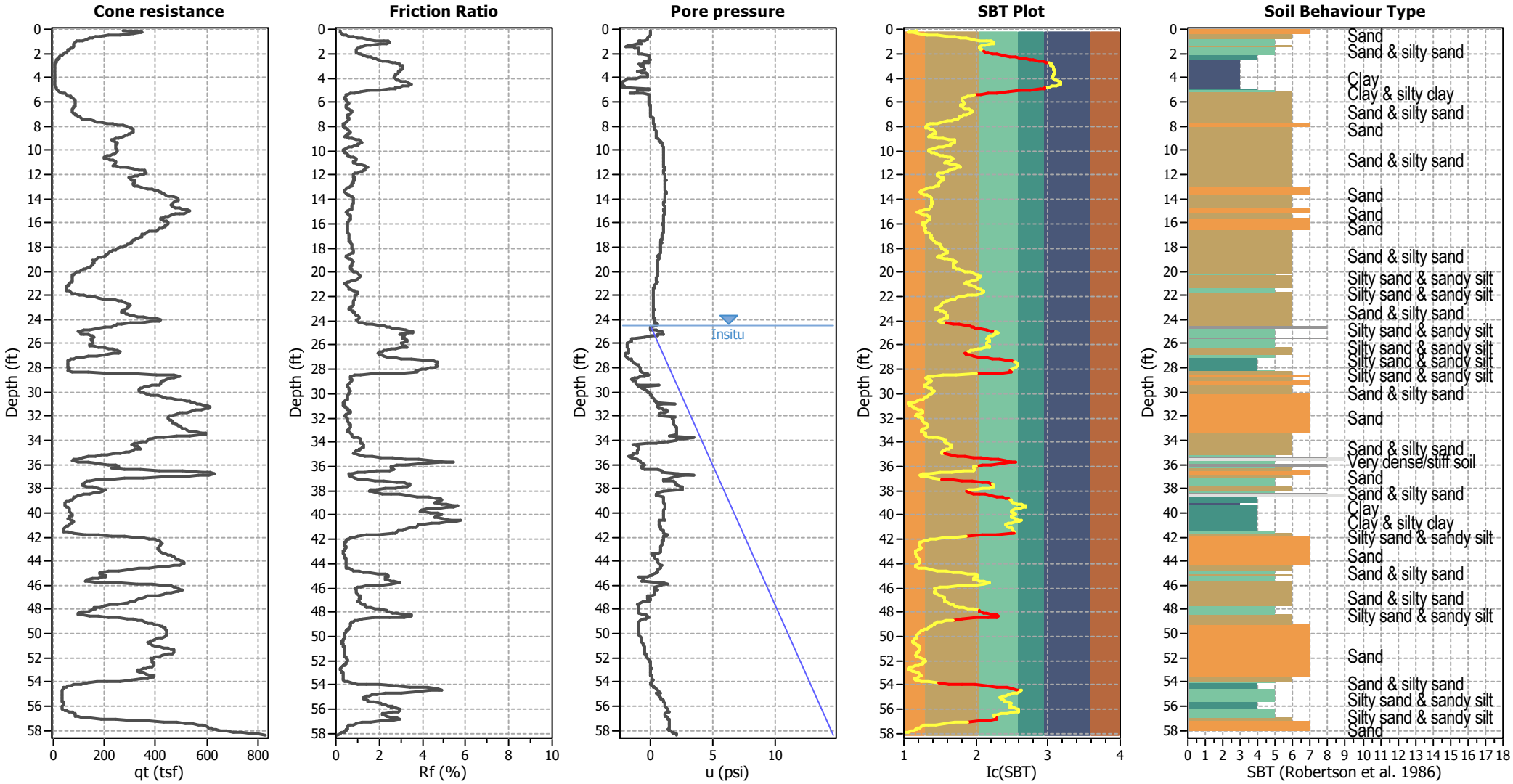






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



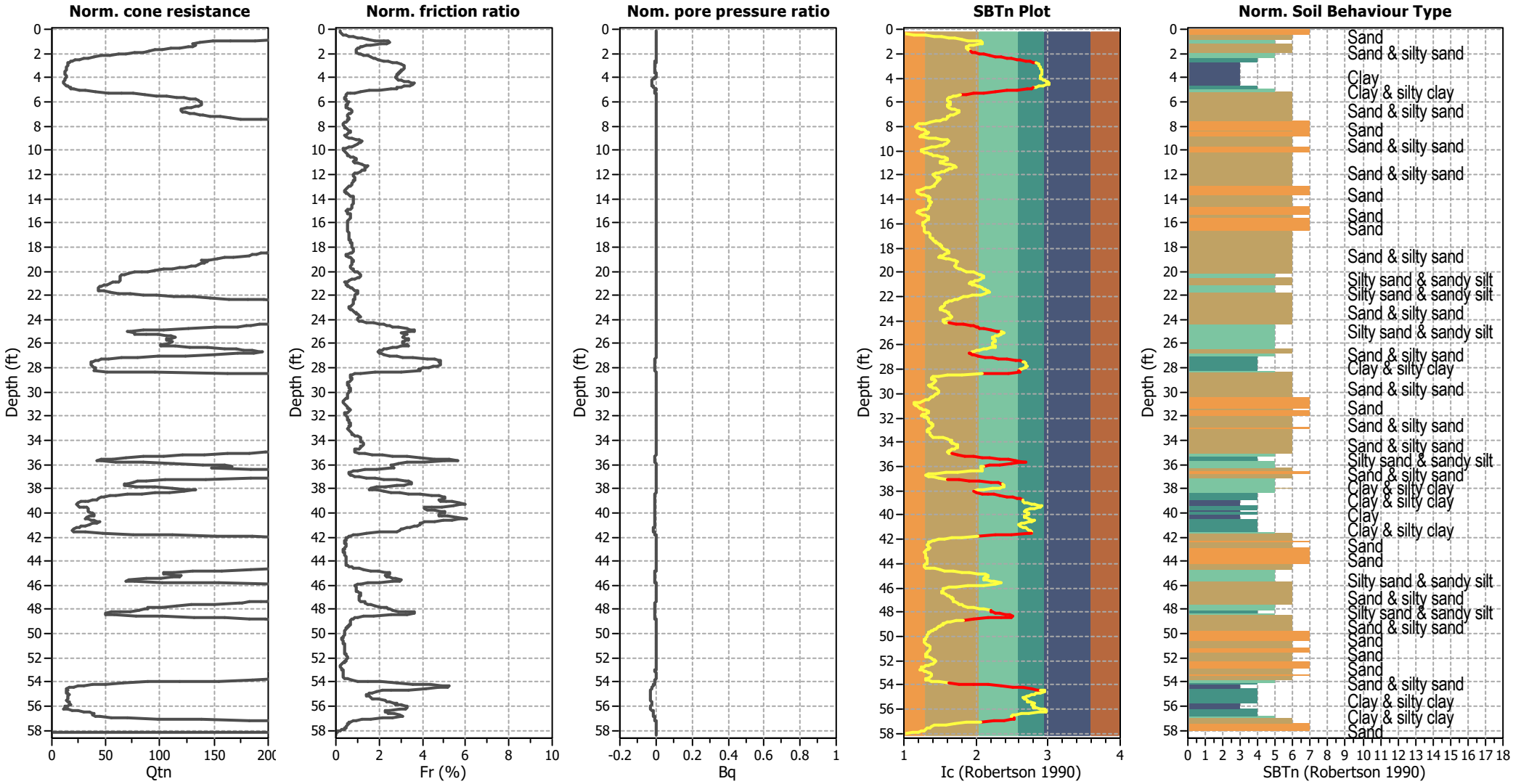
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



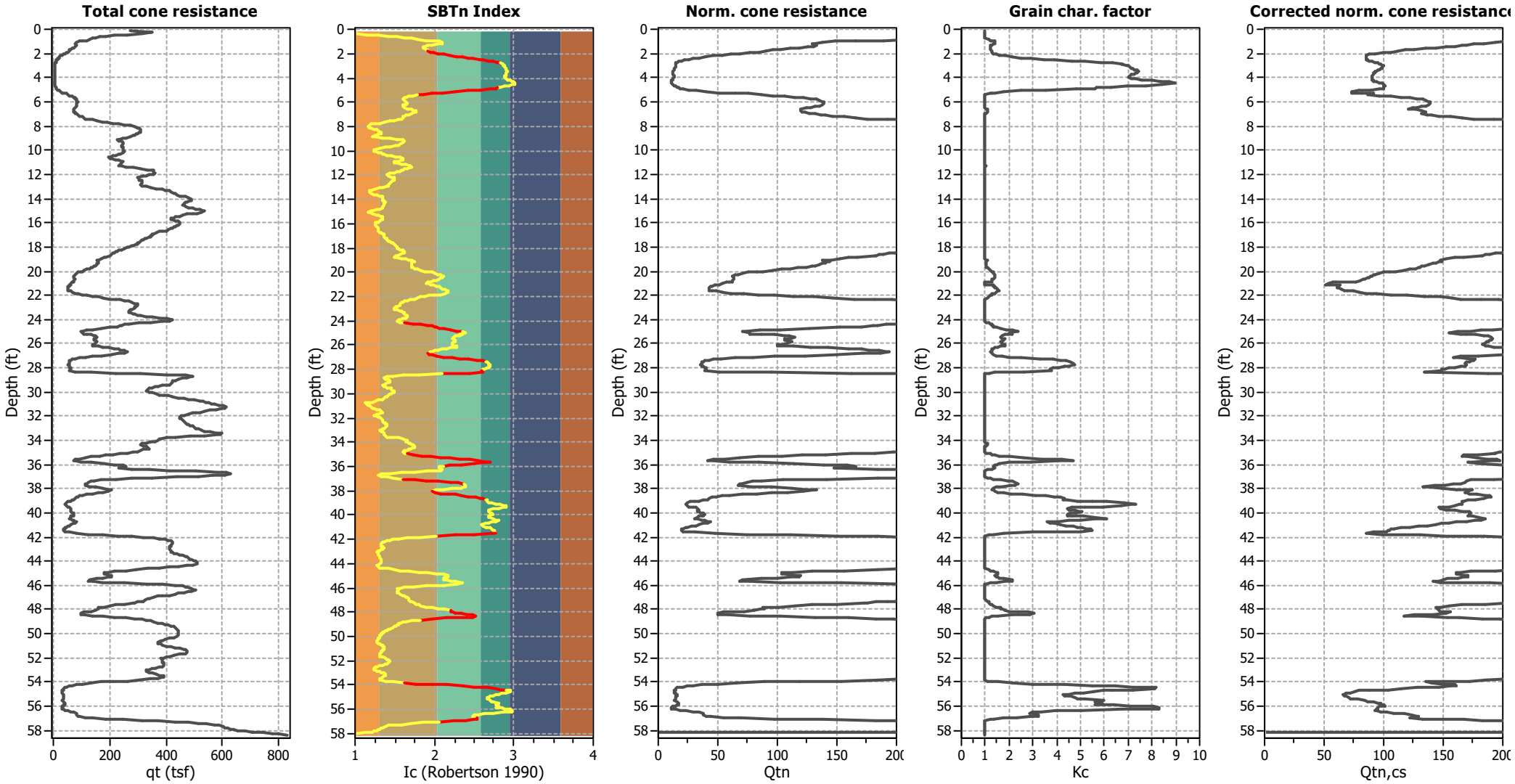
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

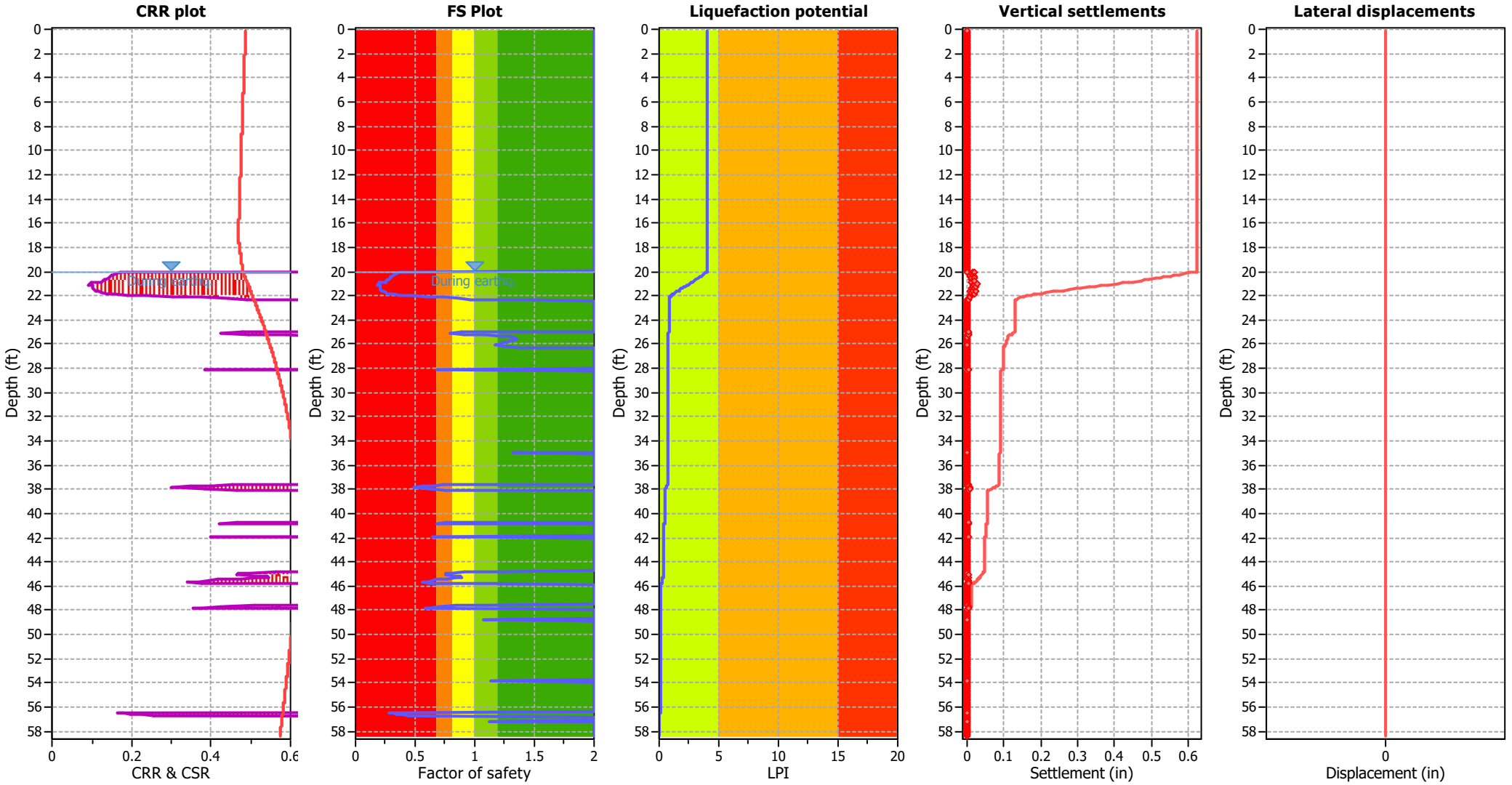
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

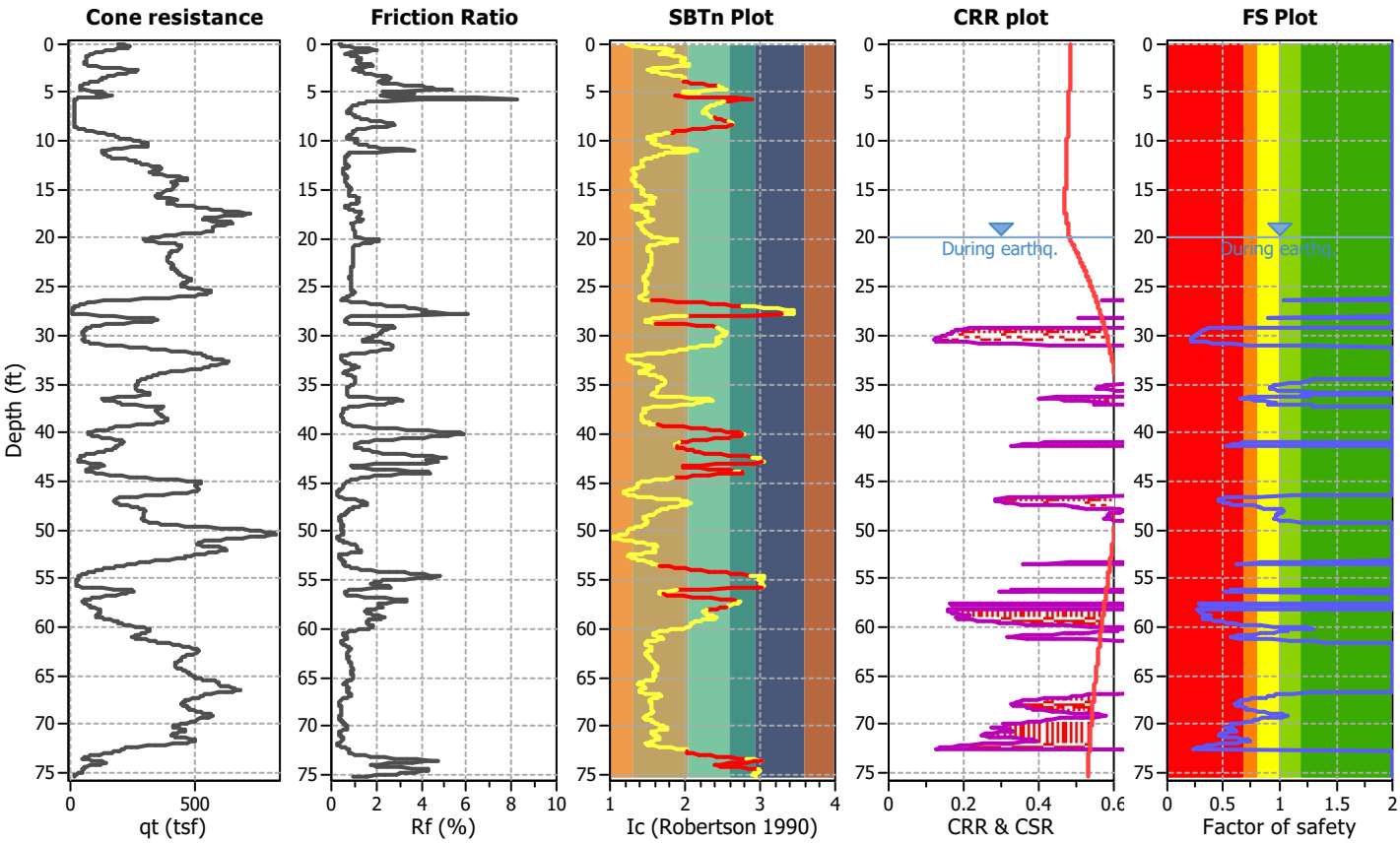
LIQUEFACTION ANALYSIS REPORT

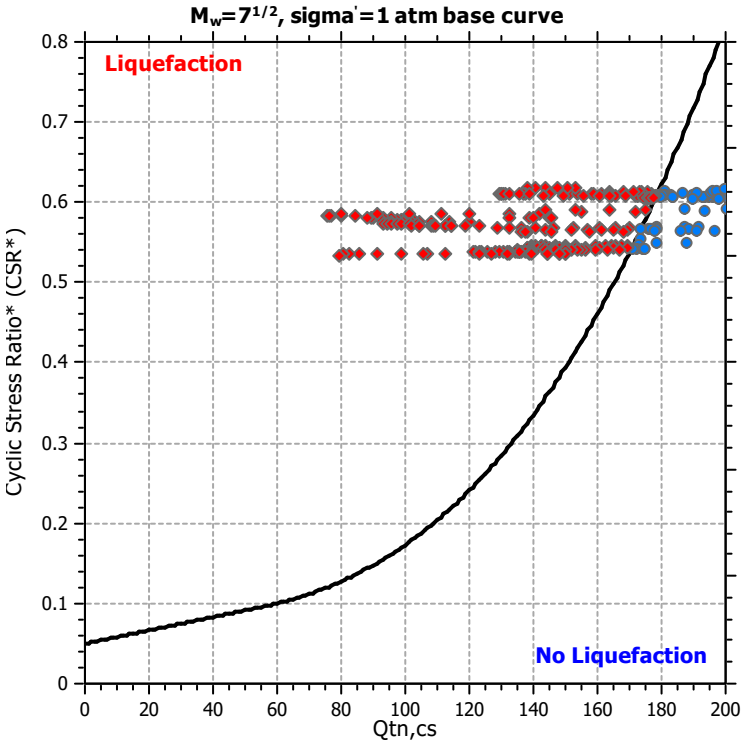
Project title : S & R Partners (File No. 20921) **Location : 1251 N. Spring St, Los Angeles, CA**

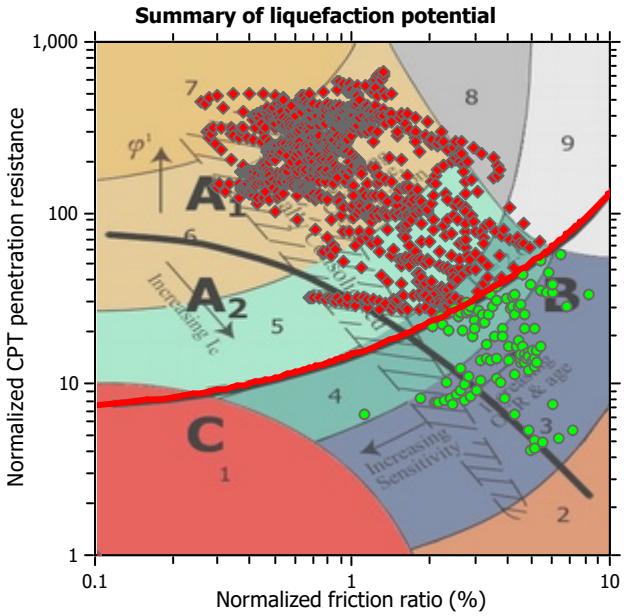
CPT file : CPT-3A

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	29.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.83	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.95	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

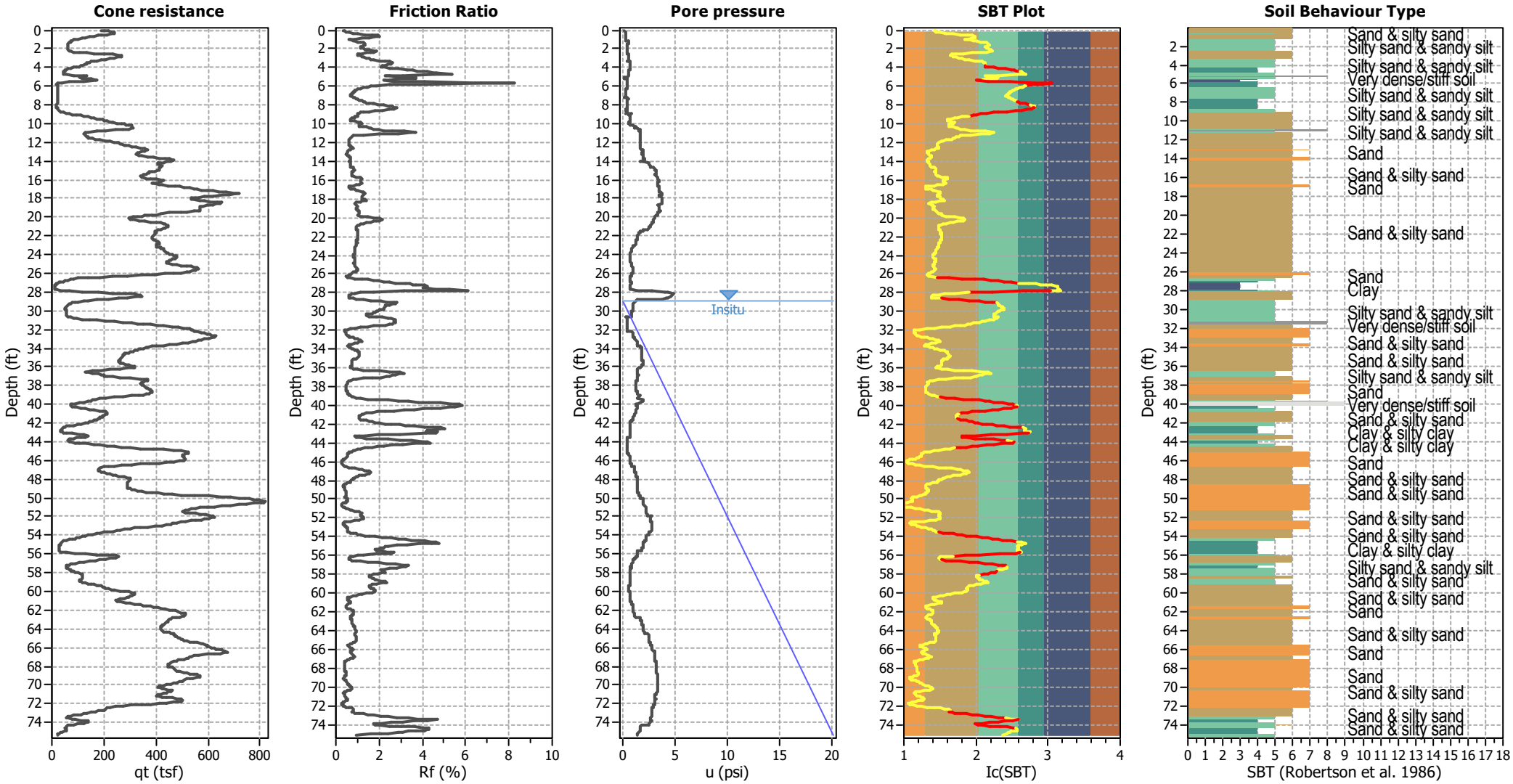






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



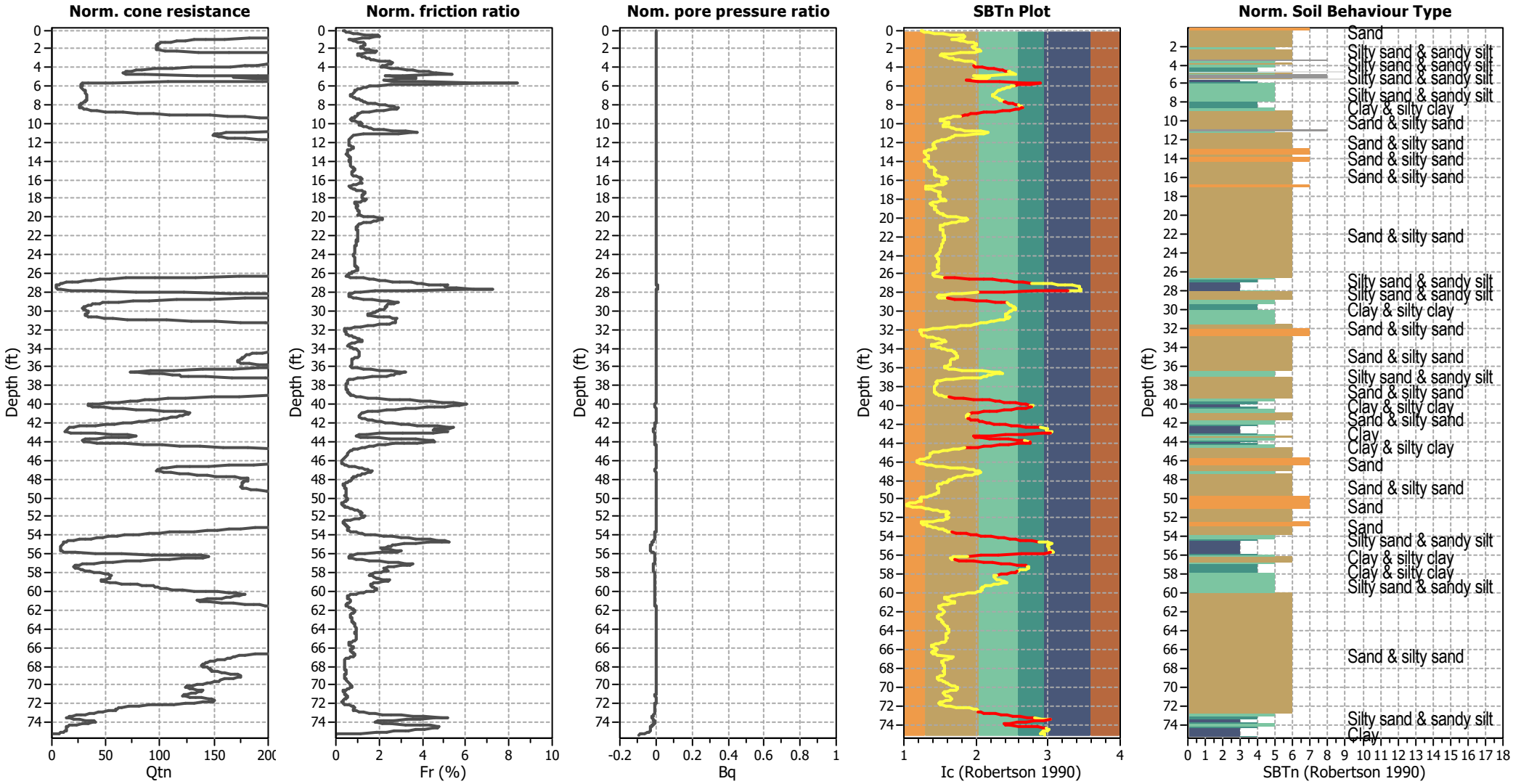
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	29.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



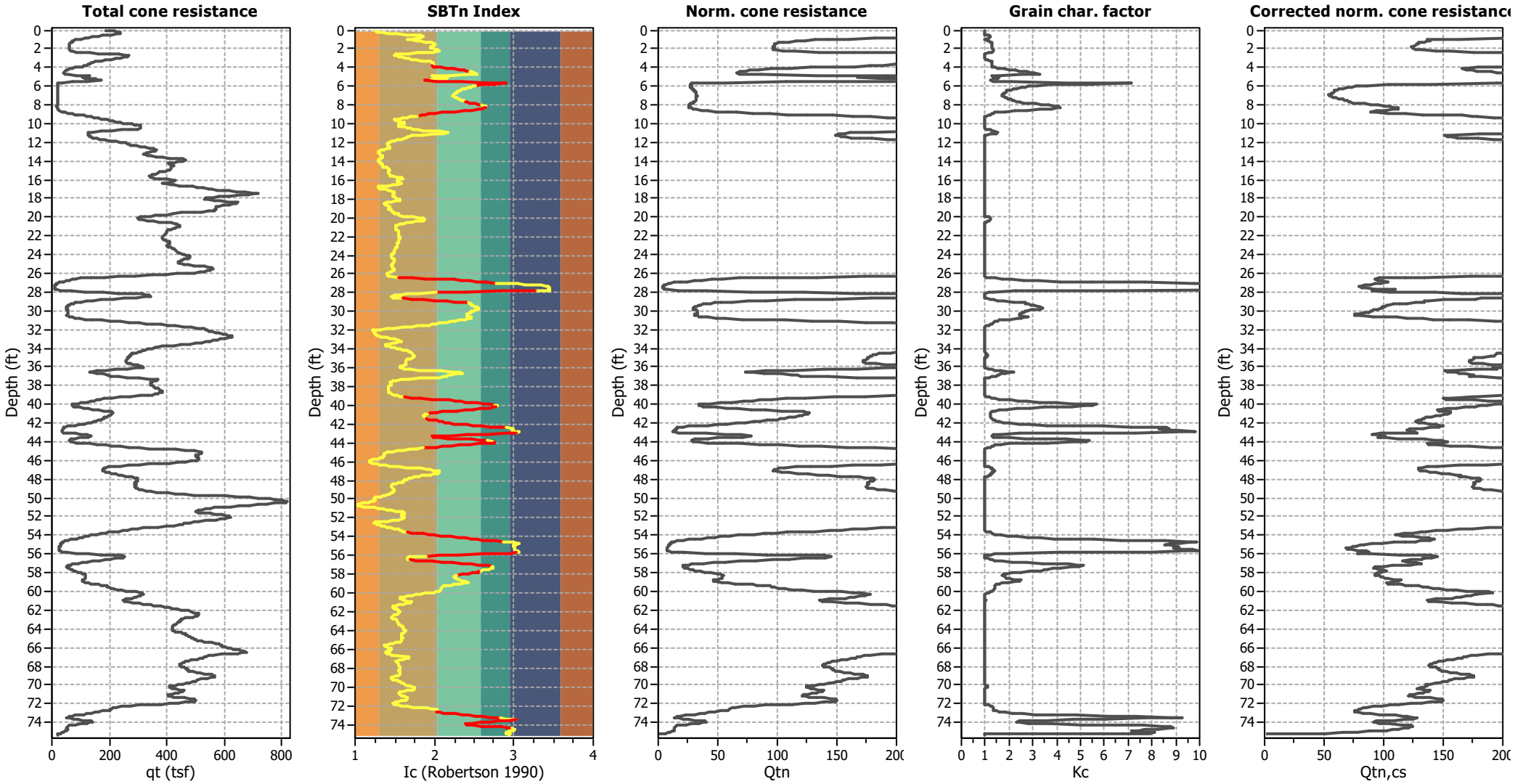
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	29.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

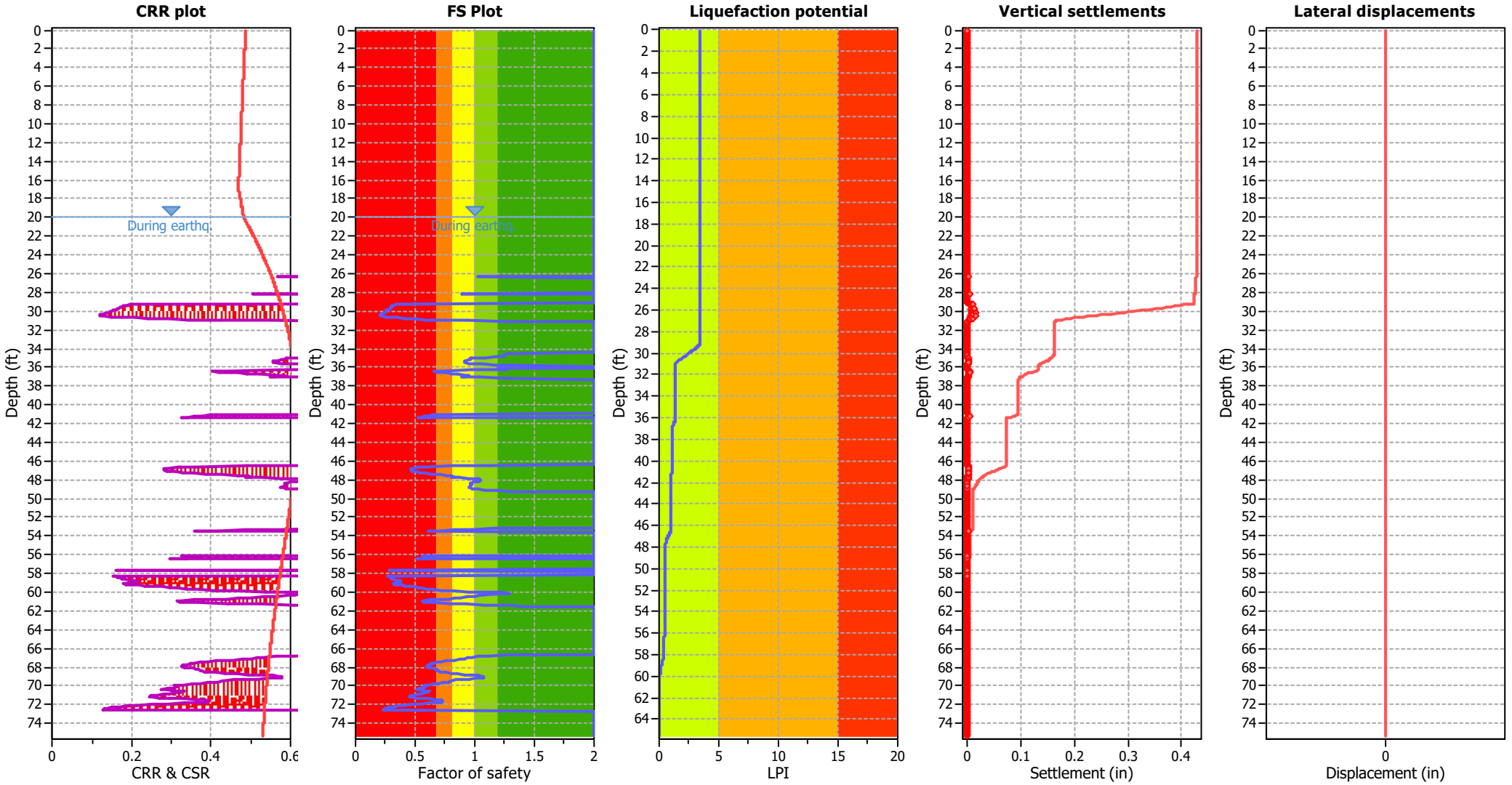
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	29.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	29.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

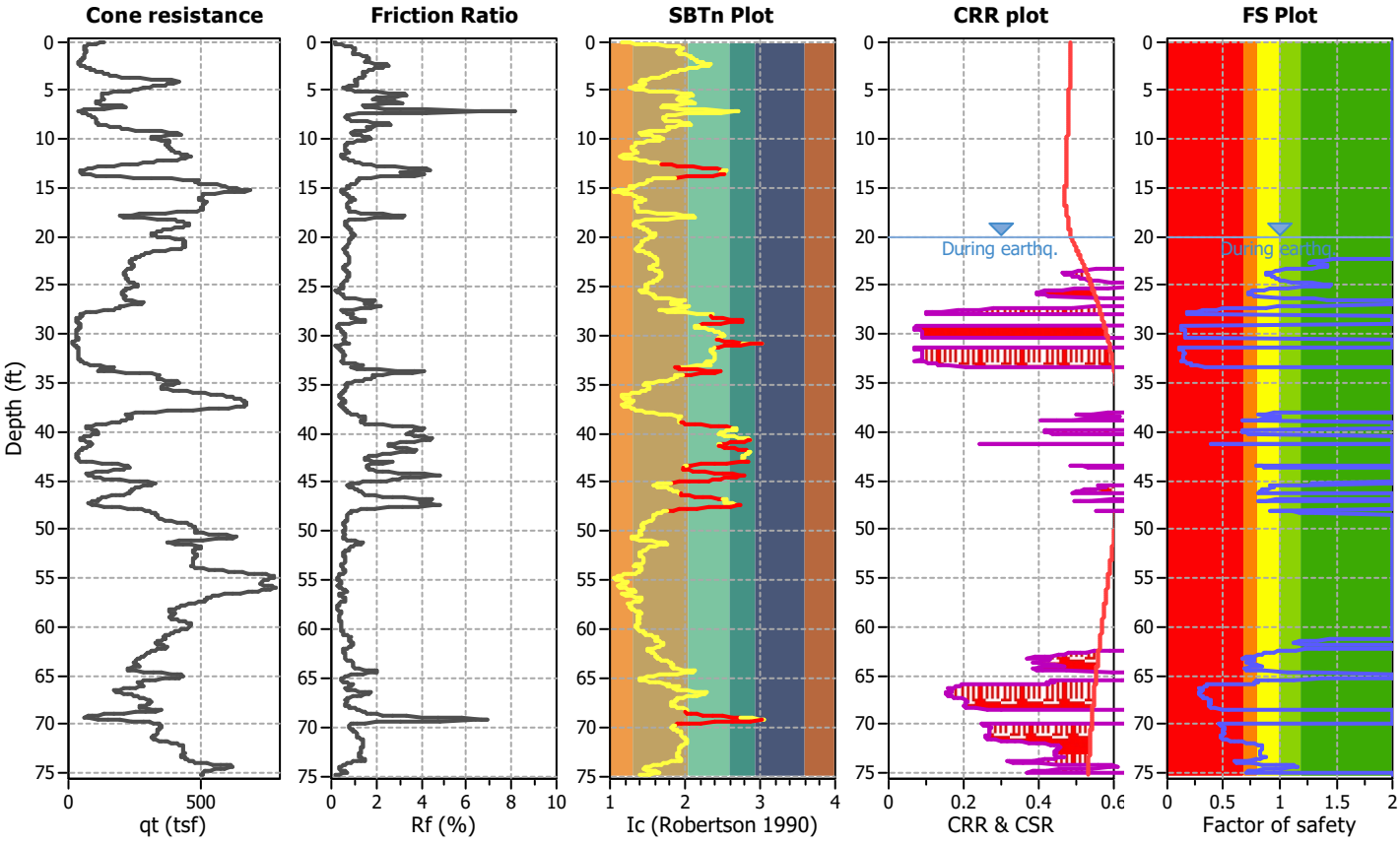
LIQUEFACTION ANALYSIS REPORT

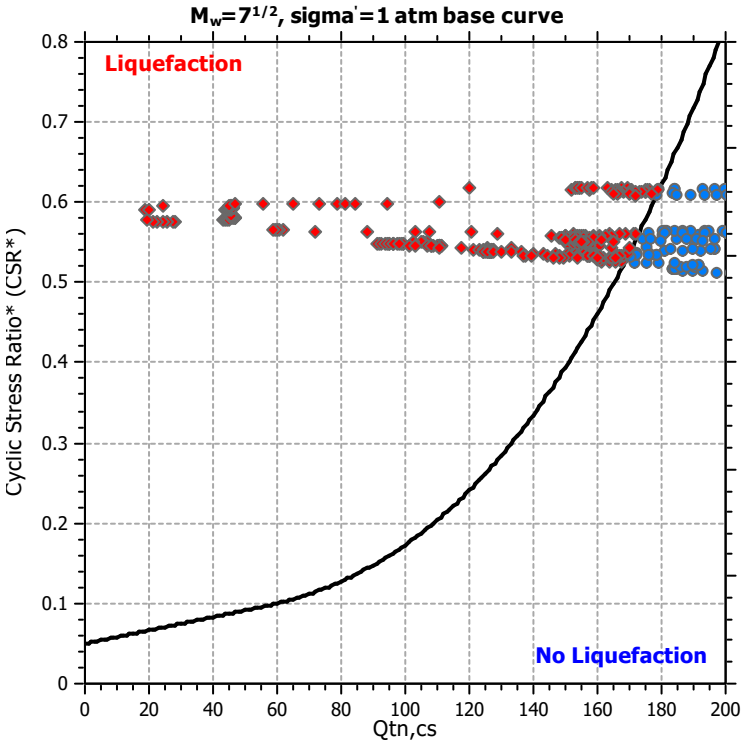
Project title : S & R Partners (File No. 20921) **Location : 1251 N. Spring St, Los Angeles, CA**

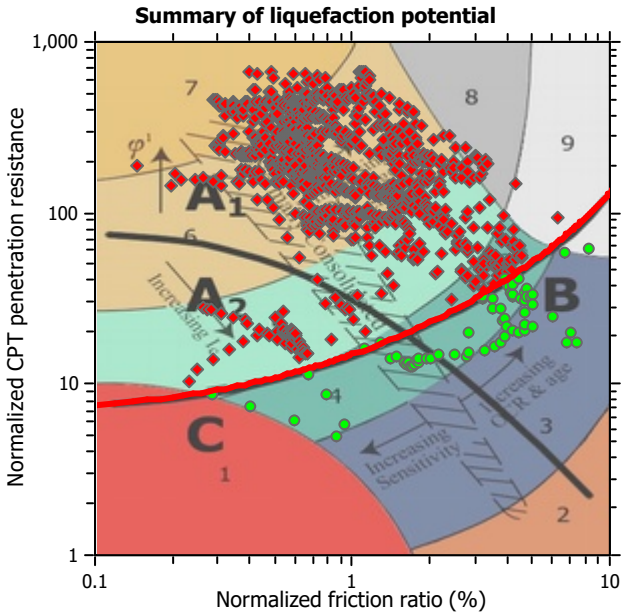
CPT file : CPT-4B

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	31.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.83	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.95	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

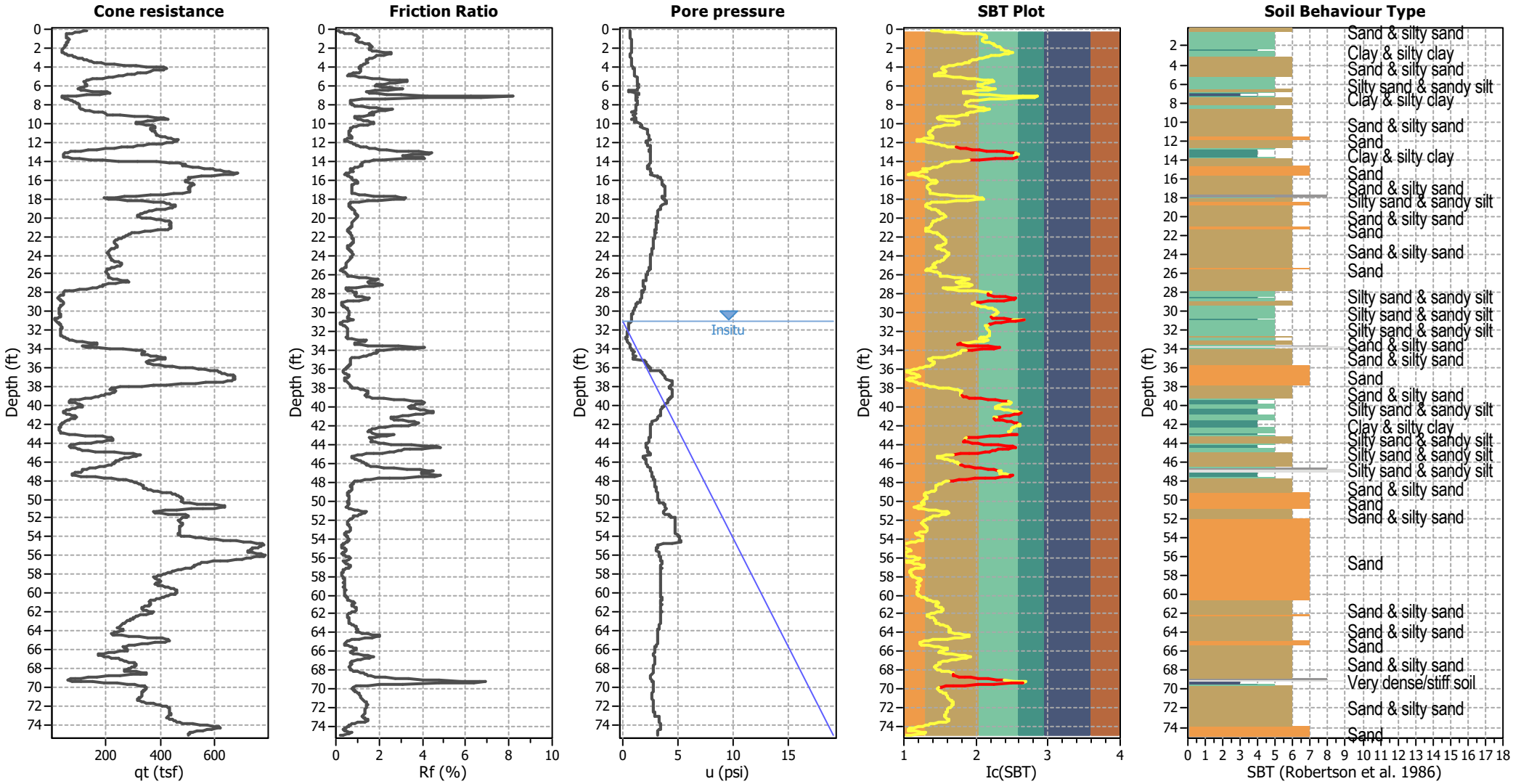






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



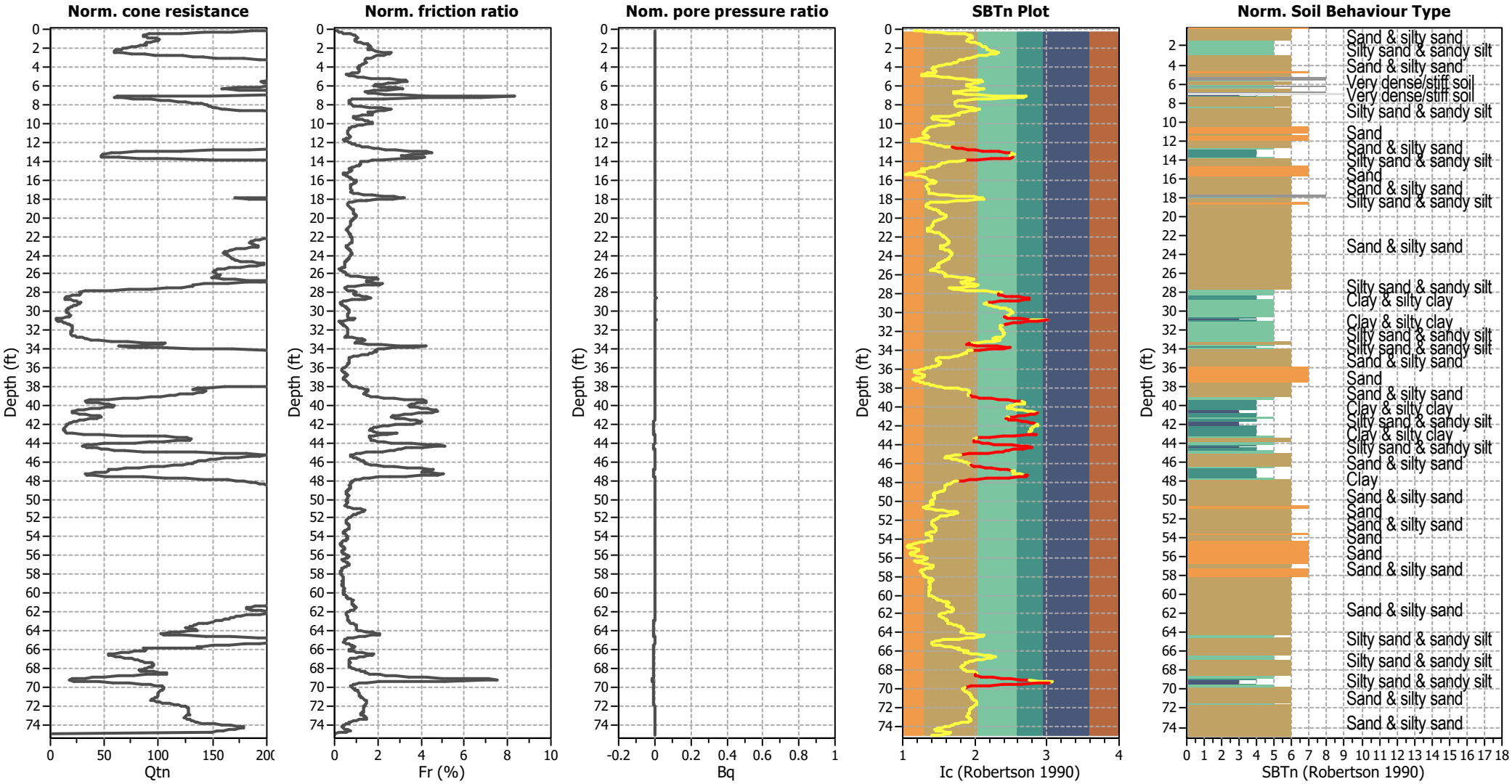
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



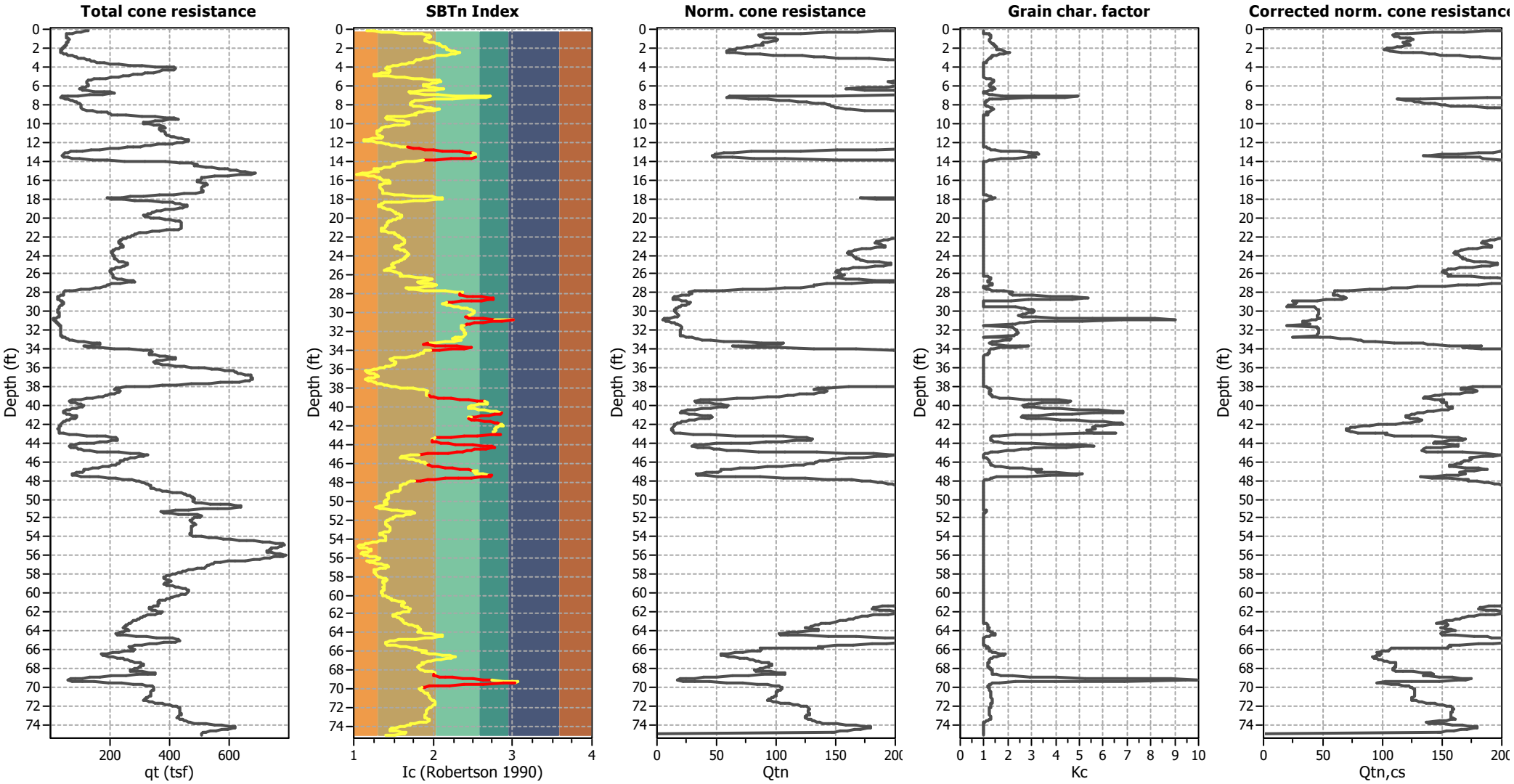
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

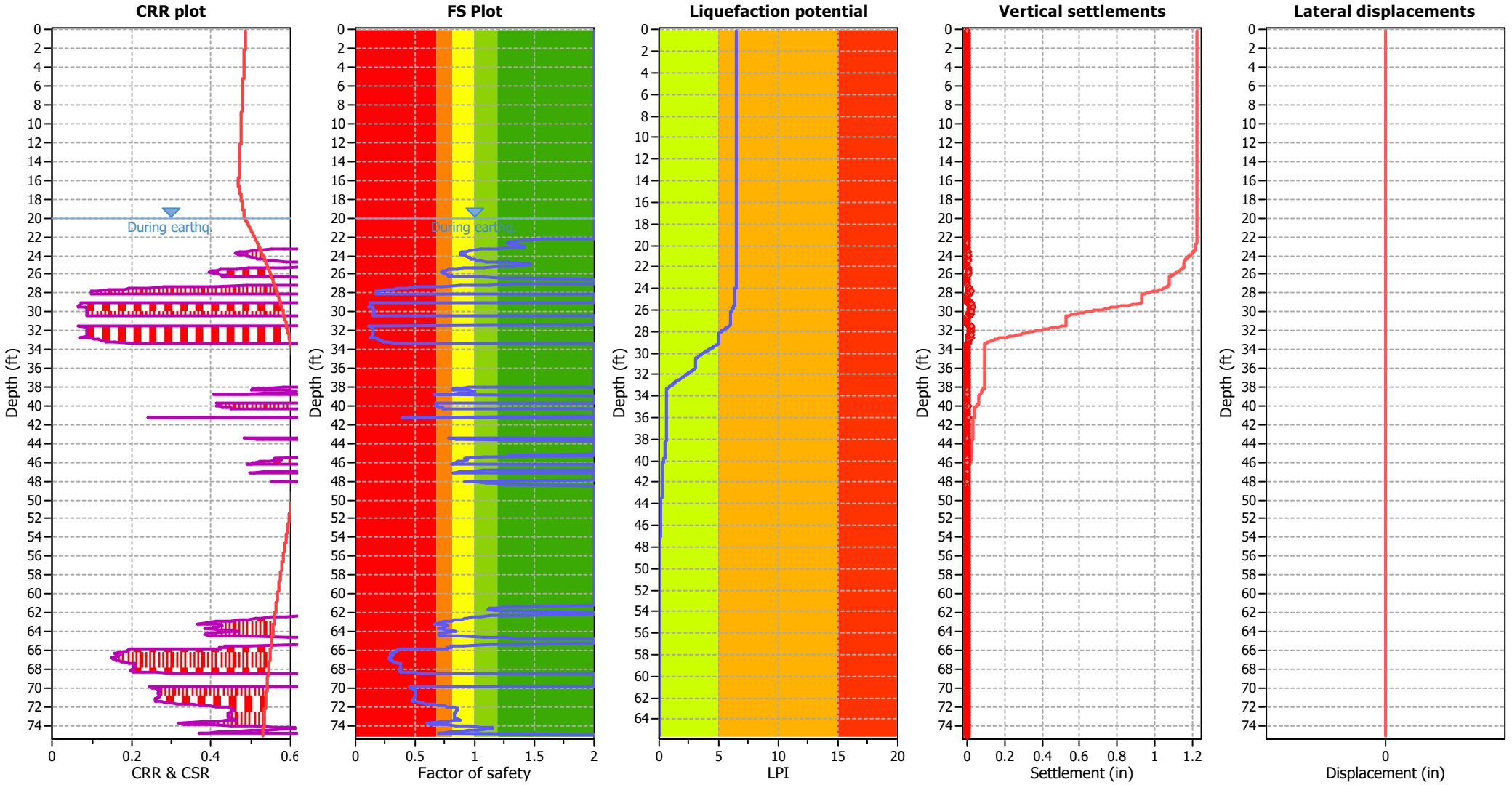
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

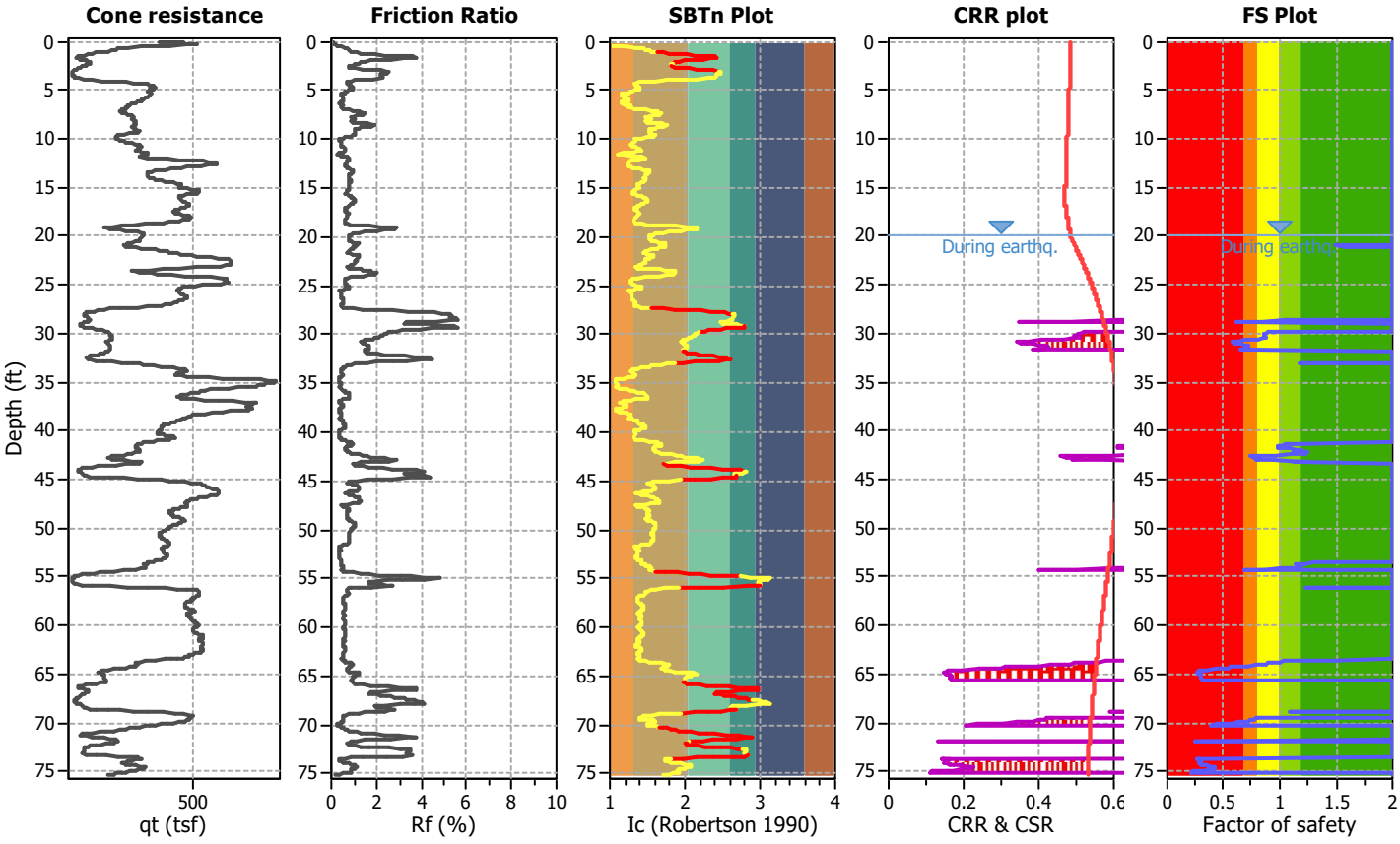
LIQUEFACTION ANALYSIS REPORT

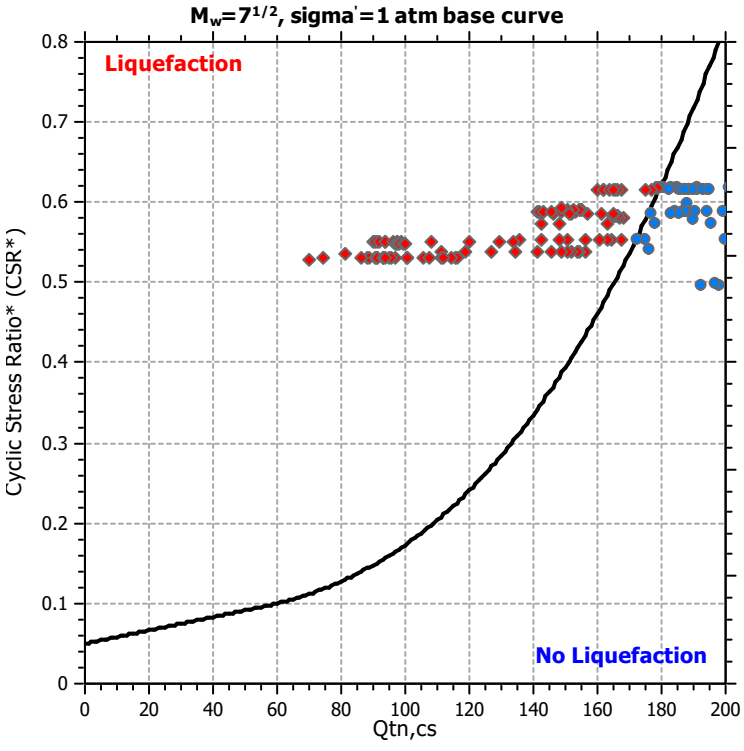
Project title : S & R Partners (File No. 20921) **Location : 1251 N. Spring St, Los Angeles, CA**

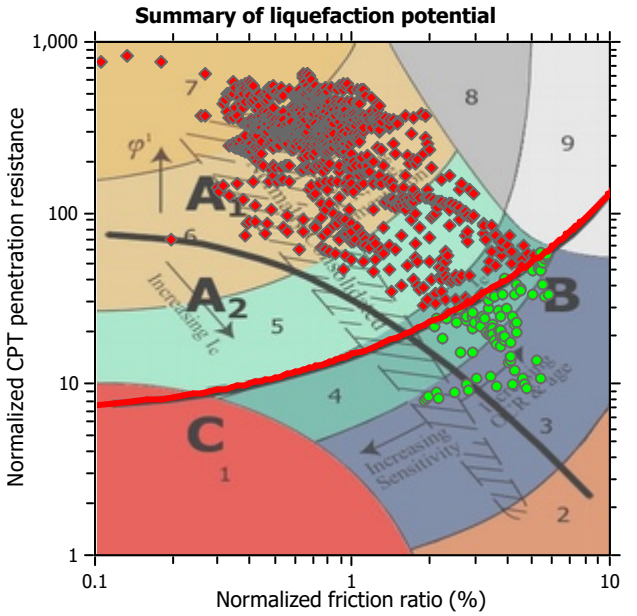
CPT file : CPT-5

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	24.50 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.83	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.95	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

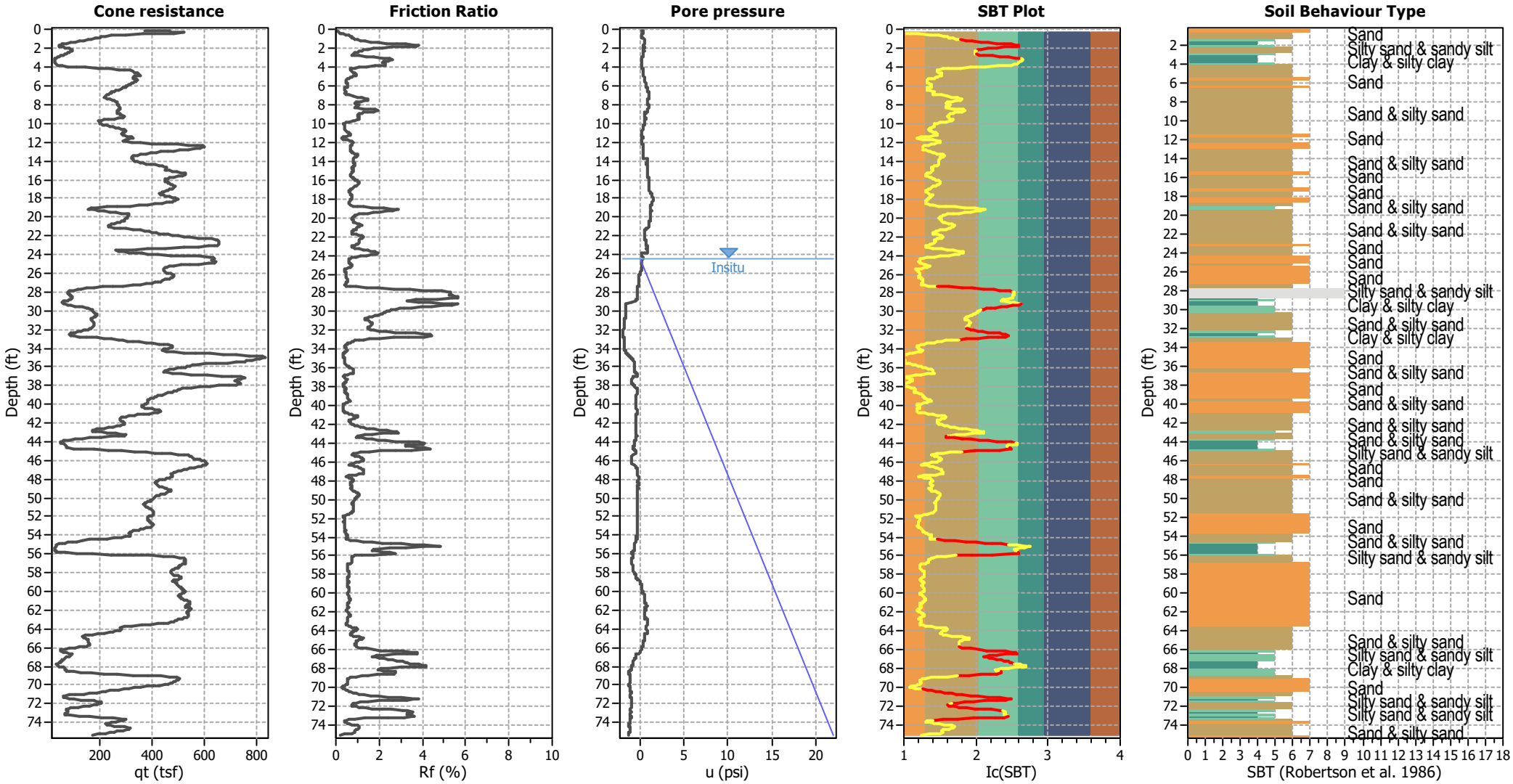






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



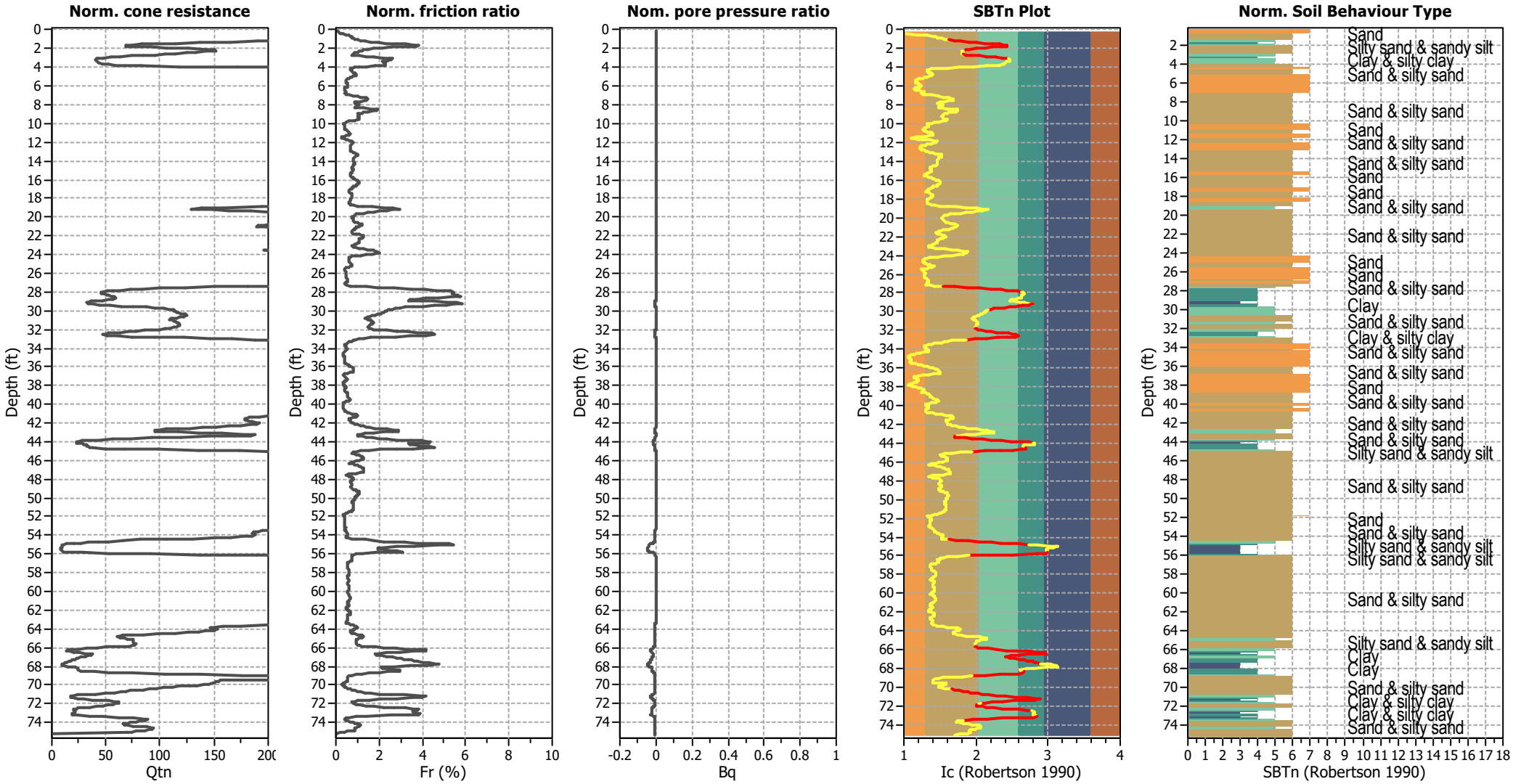
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



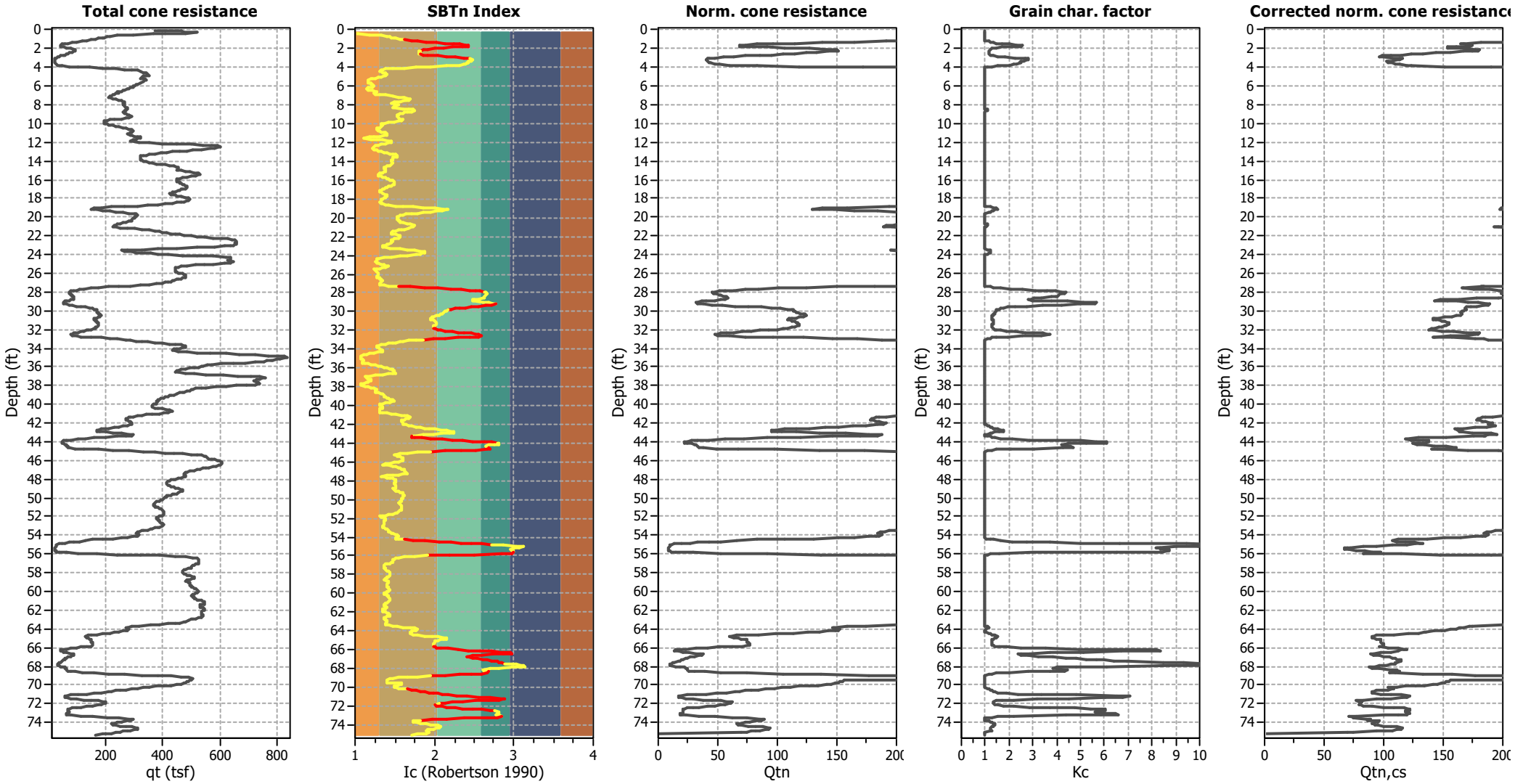
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

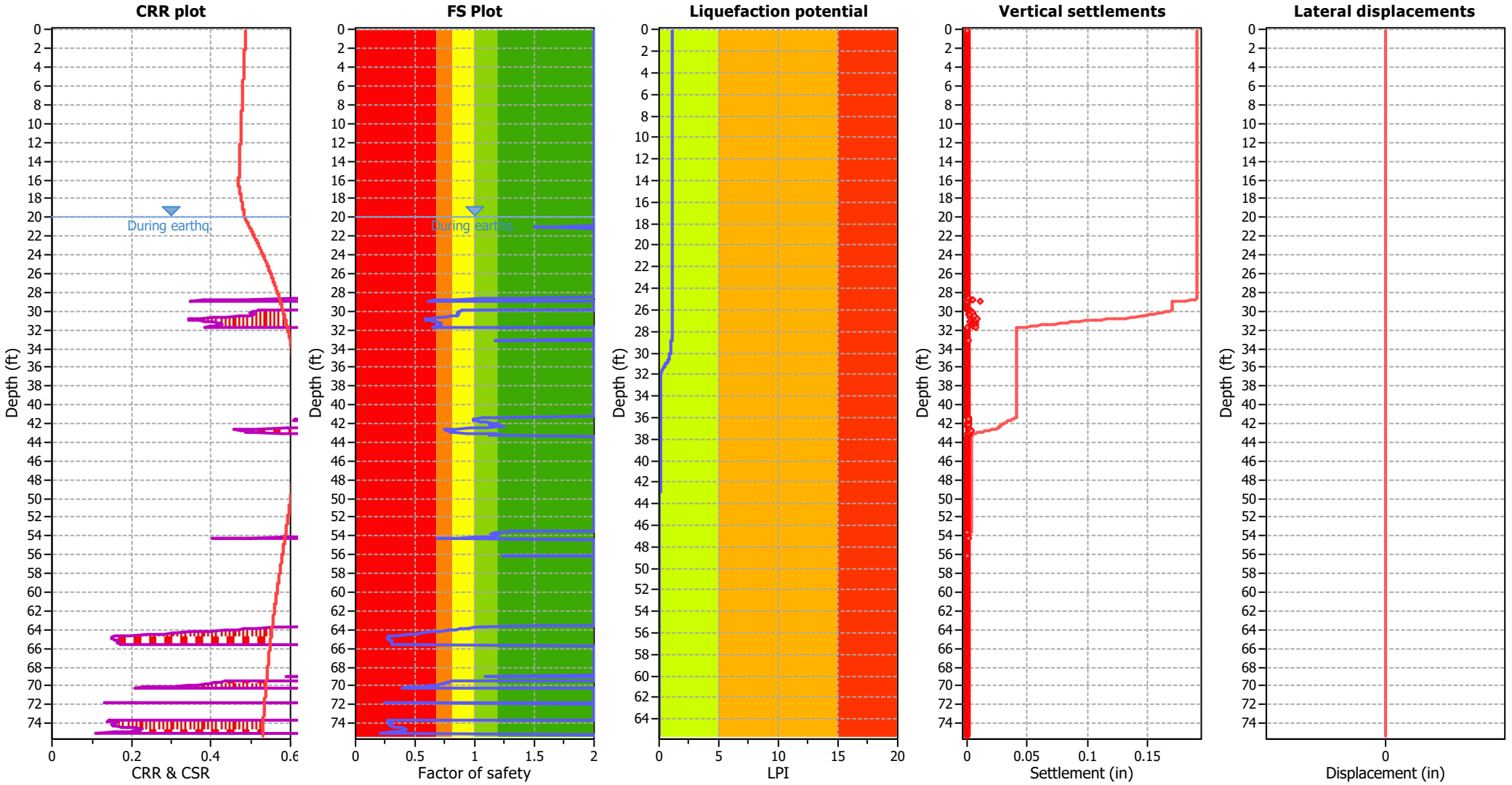
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

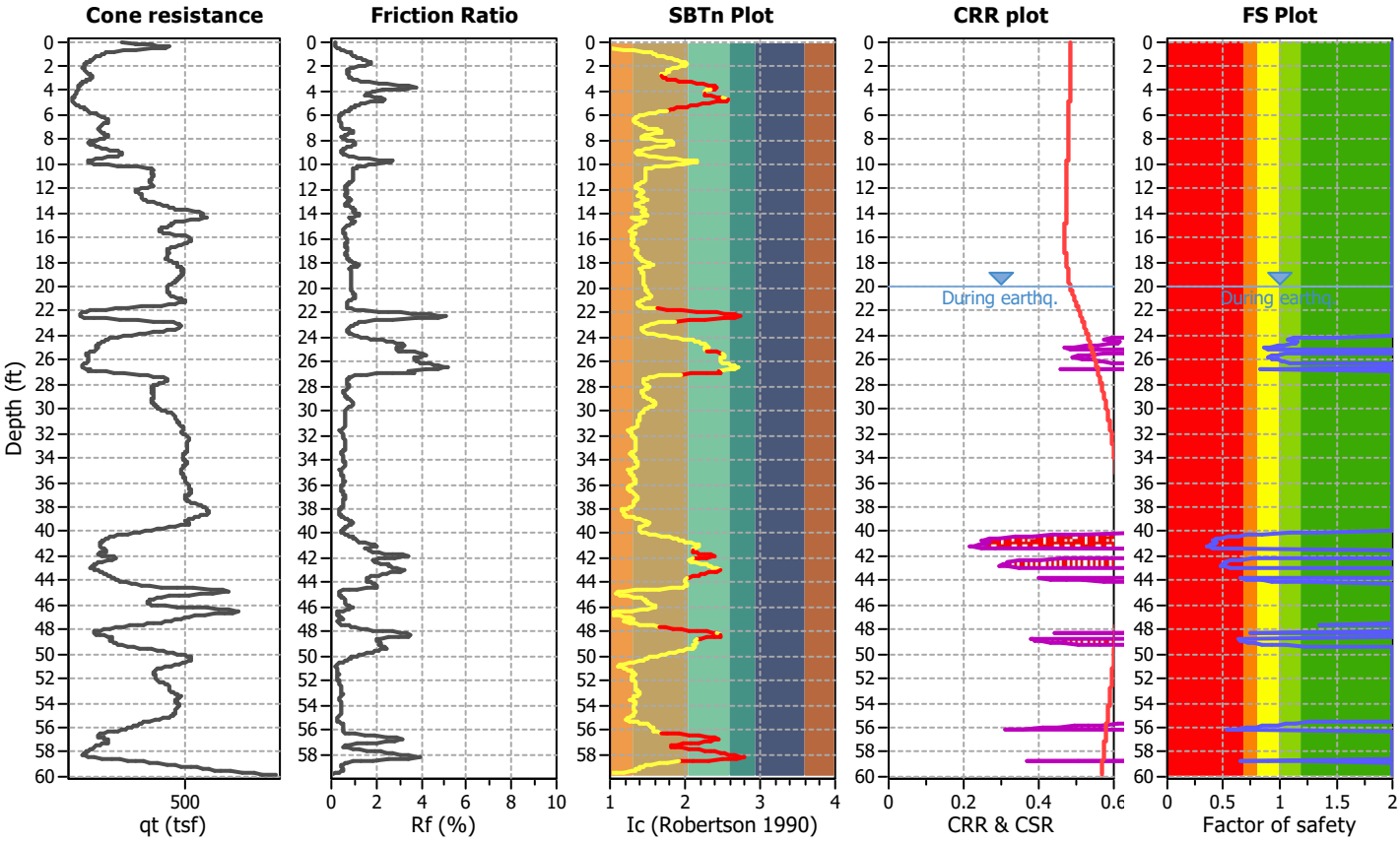
LIQUEFACTION ANALYSIS REPORT

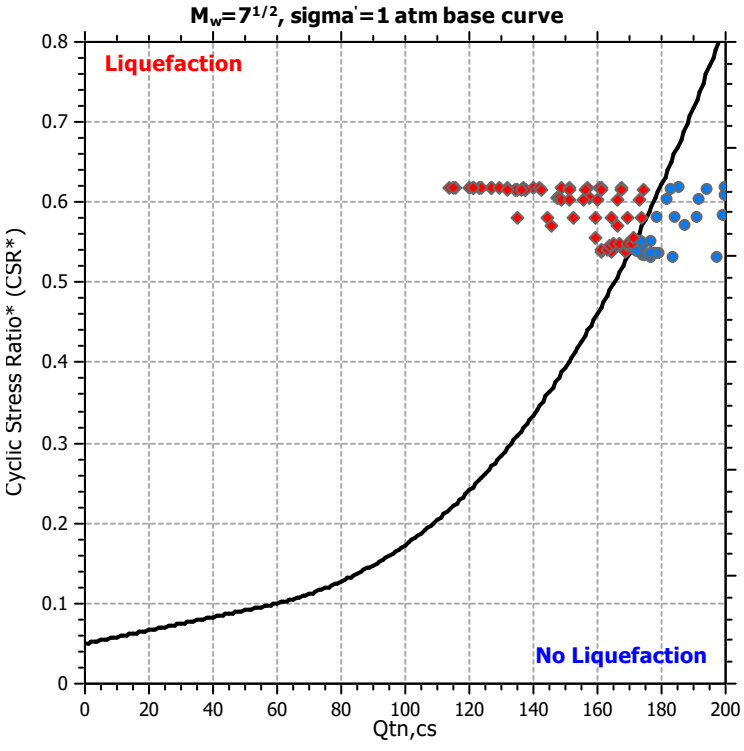
Project title : S & R Partners (File No. 20921) **Location : 1251 N. Spring St, Los Angeles, CA**

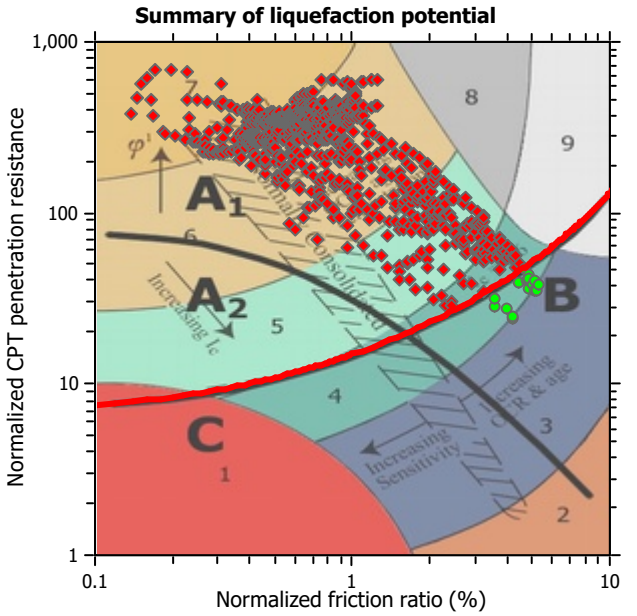
CPT file : CPT-6

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	24.50 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.83	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.95	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

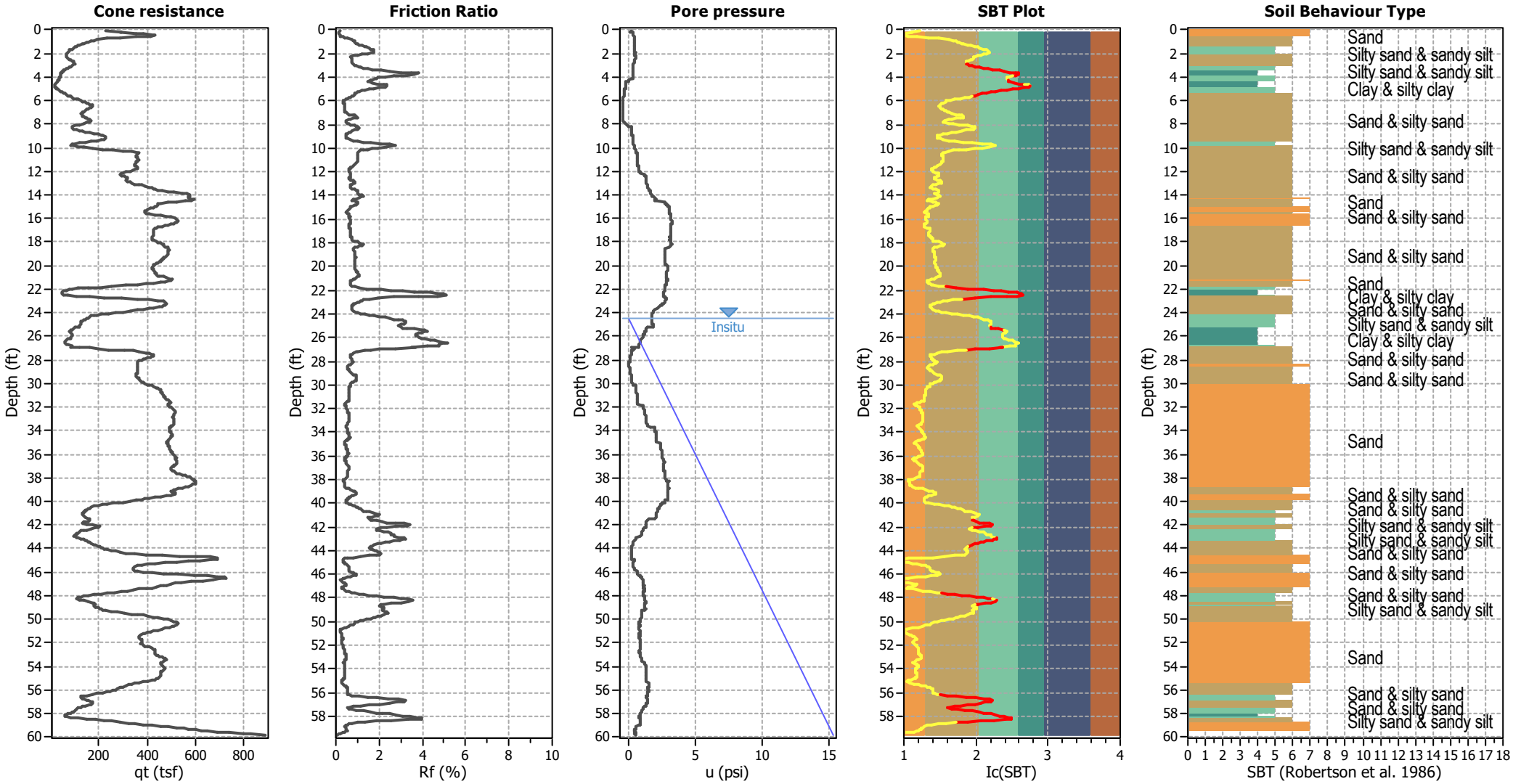






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



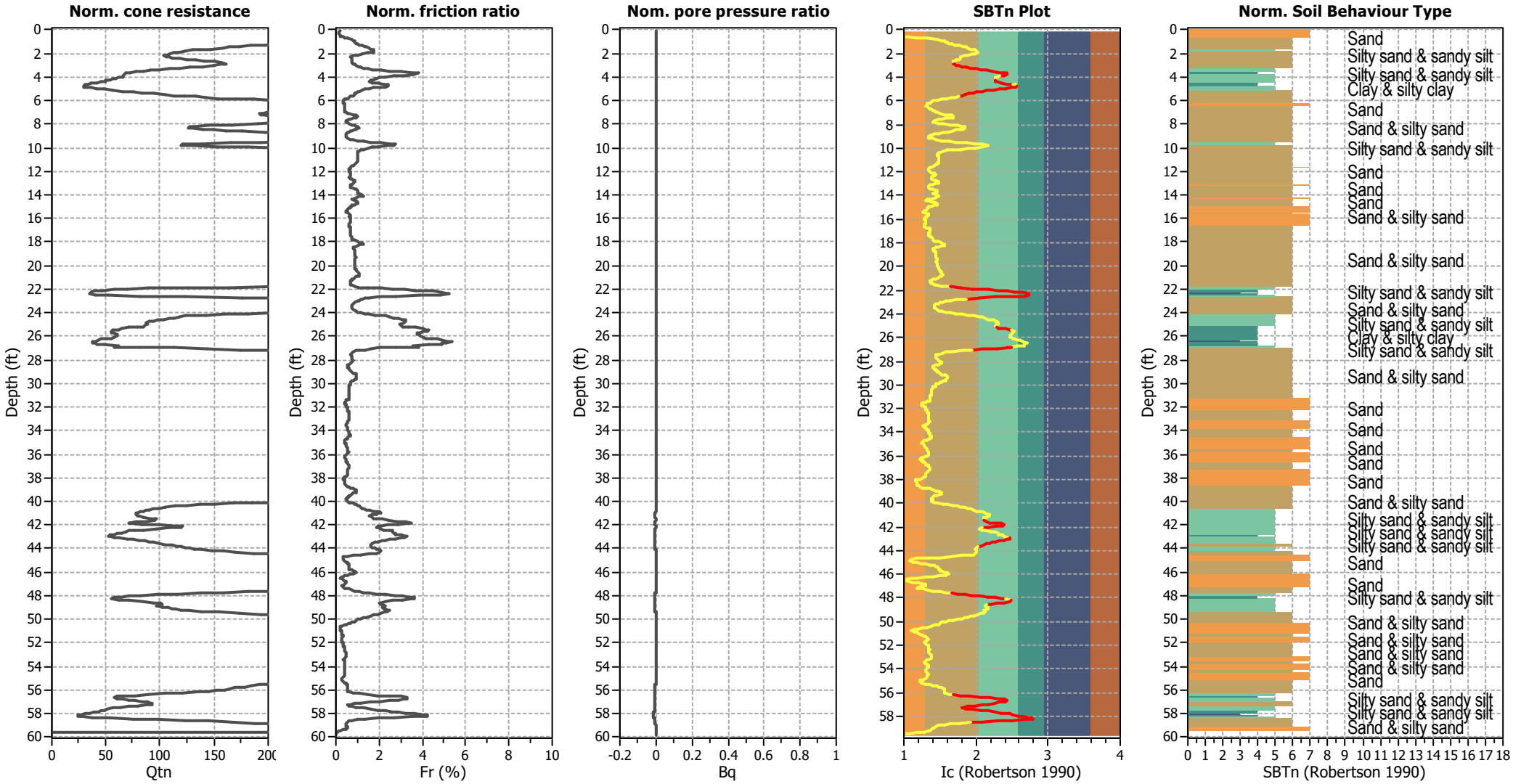
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



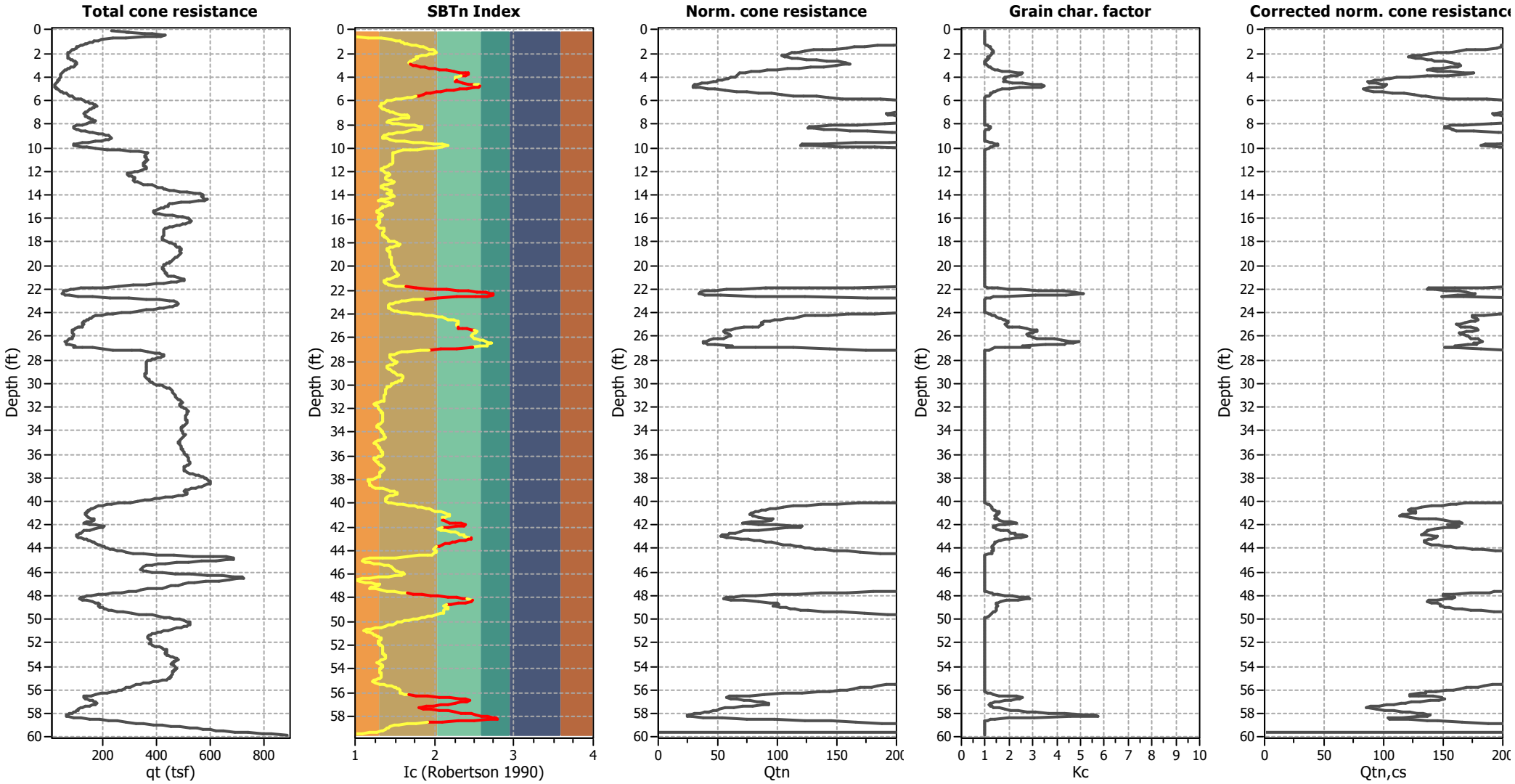
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

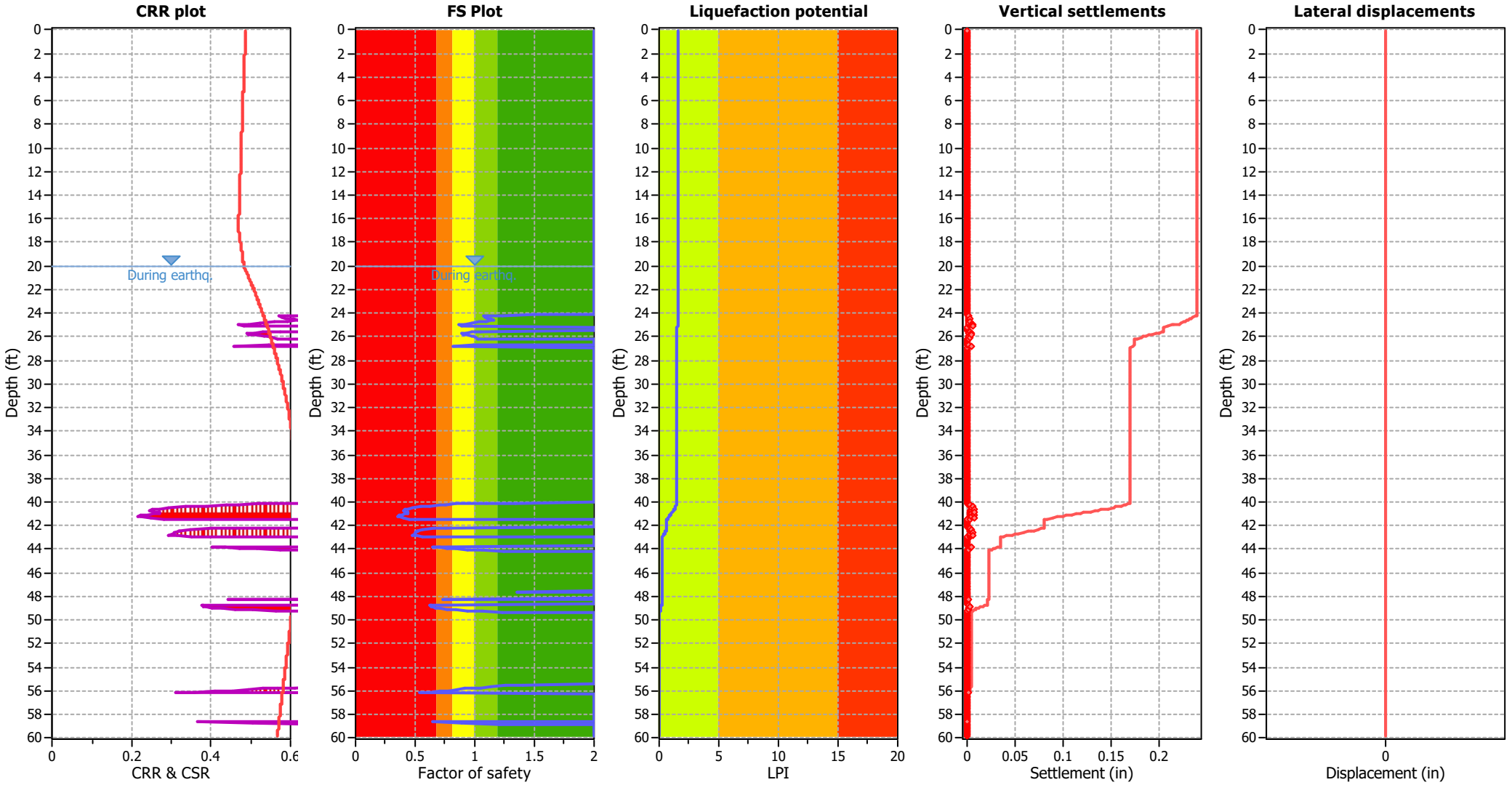
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	24.50 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

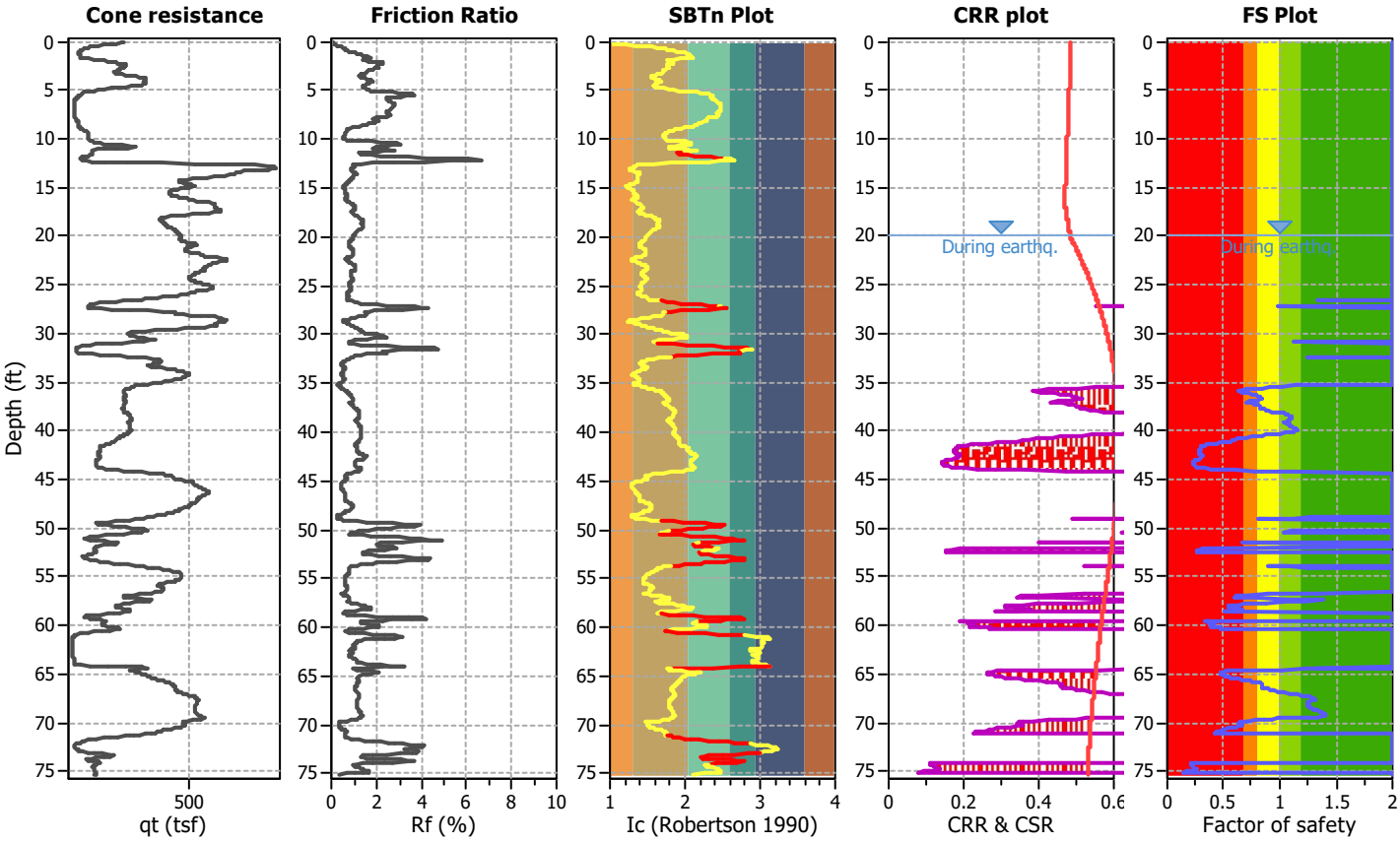
LIQUEFACTION ANALYSIS REPORT

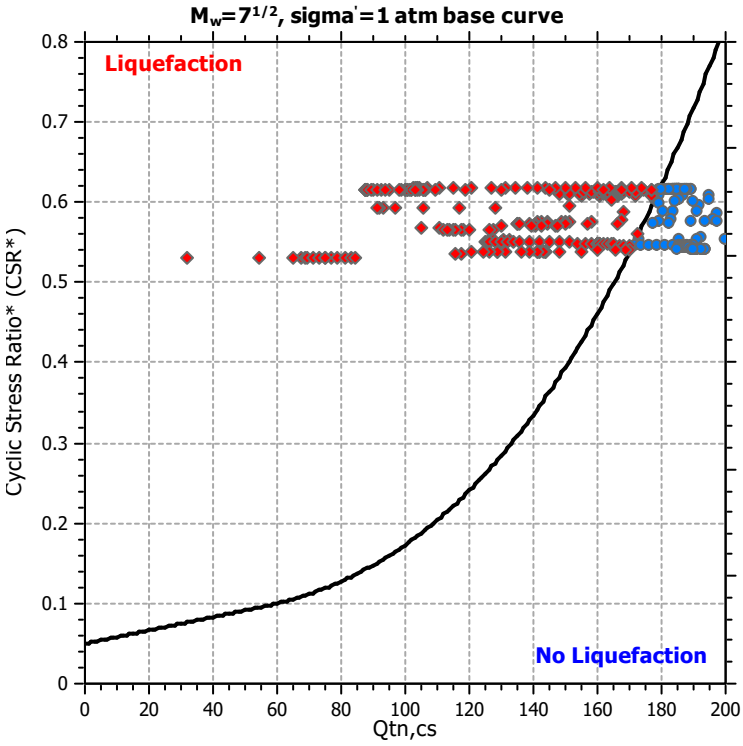
Project title : S & R Partners (File No. 20921) **Location : 1251 N. Spring St, Los Angeles, CA**

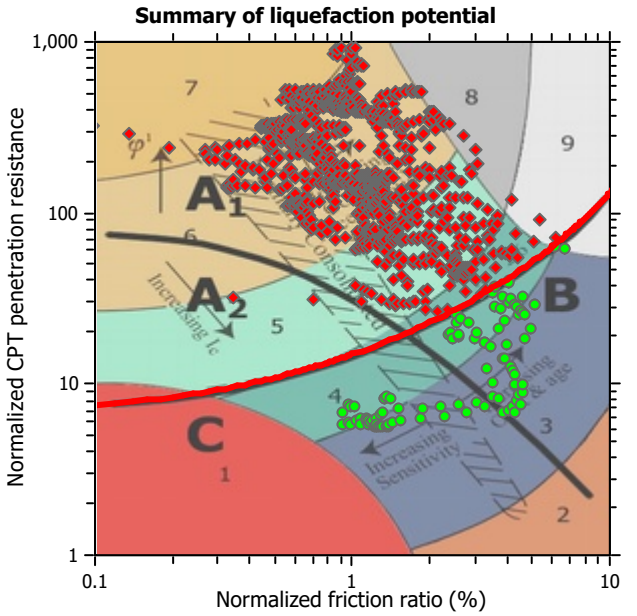
CPT file : CPT-7

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	31.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	20.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	5	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.83	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.95	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

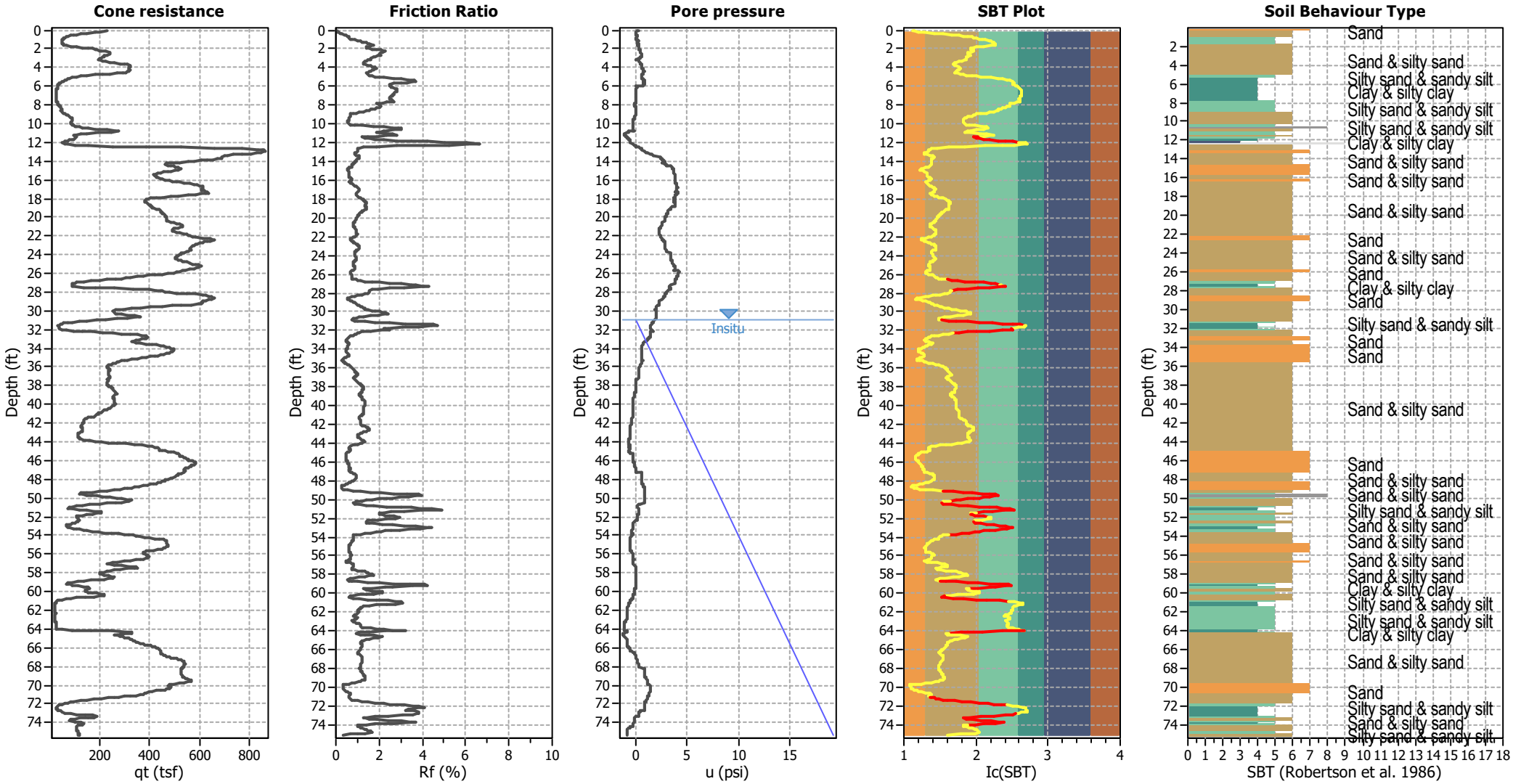






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



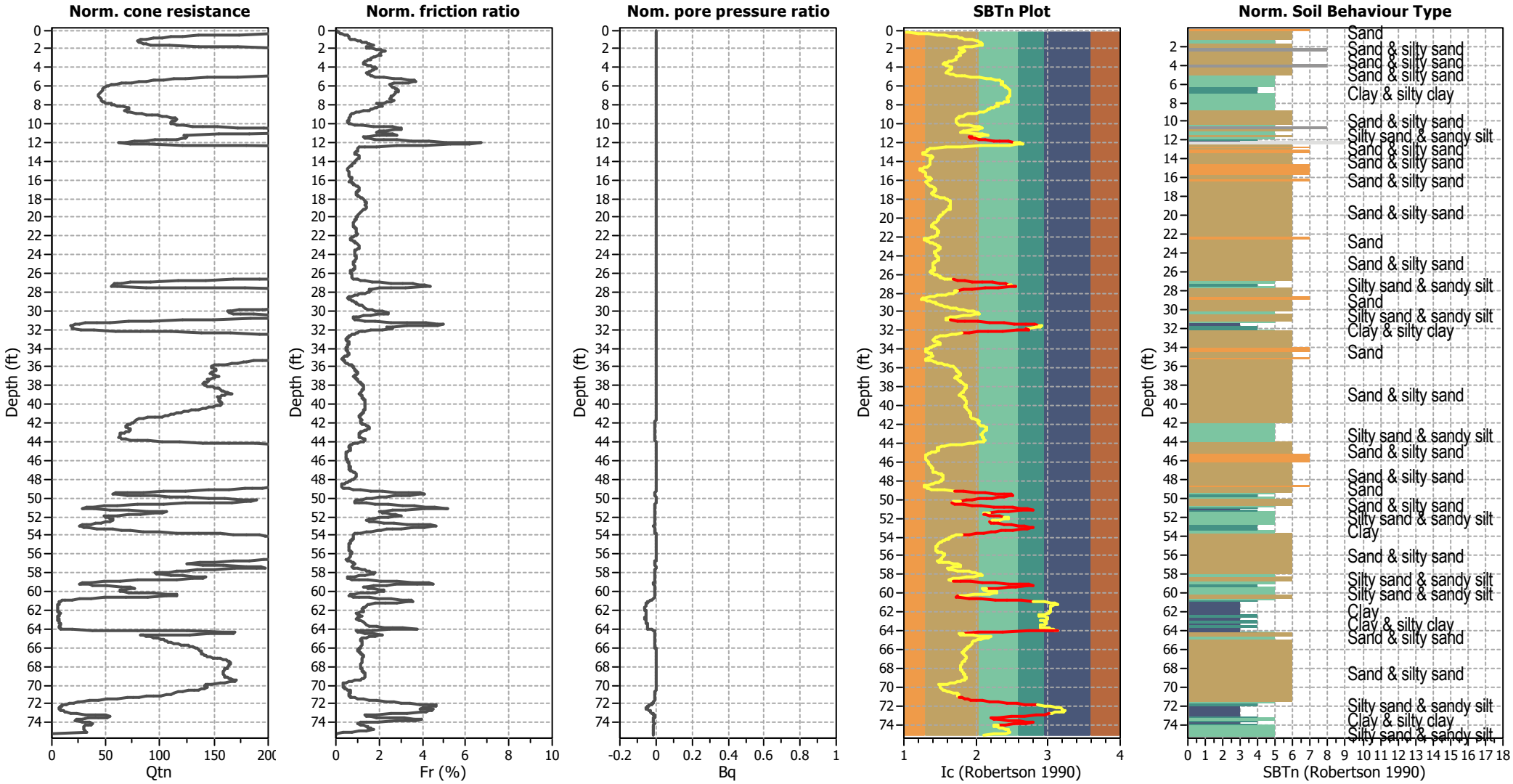
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



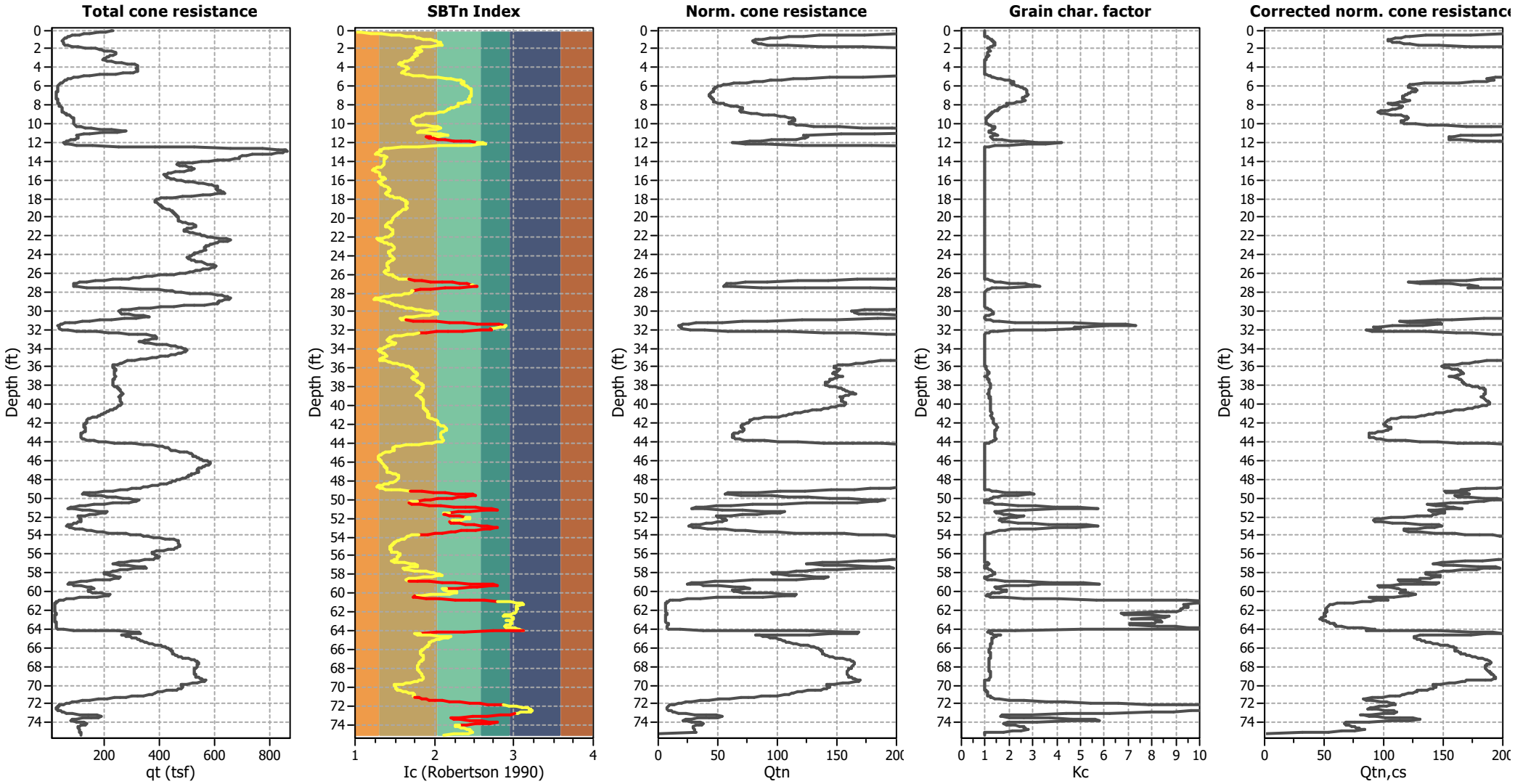
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

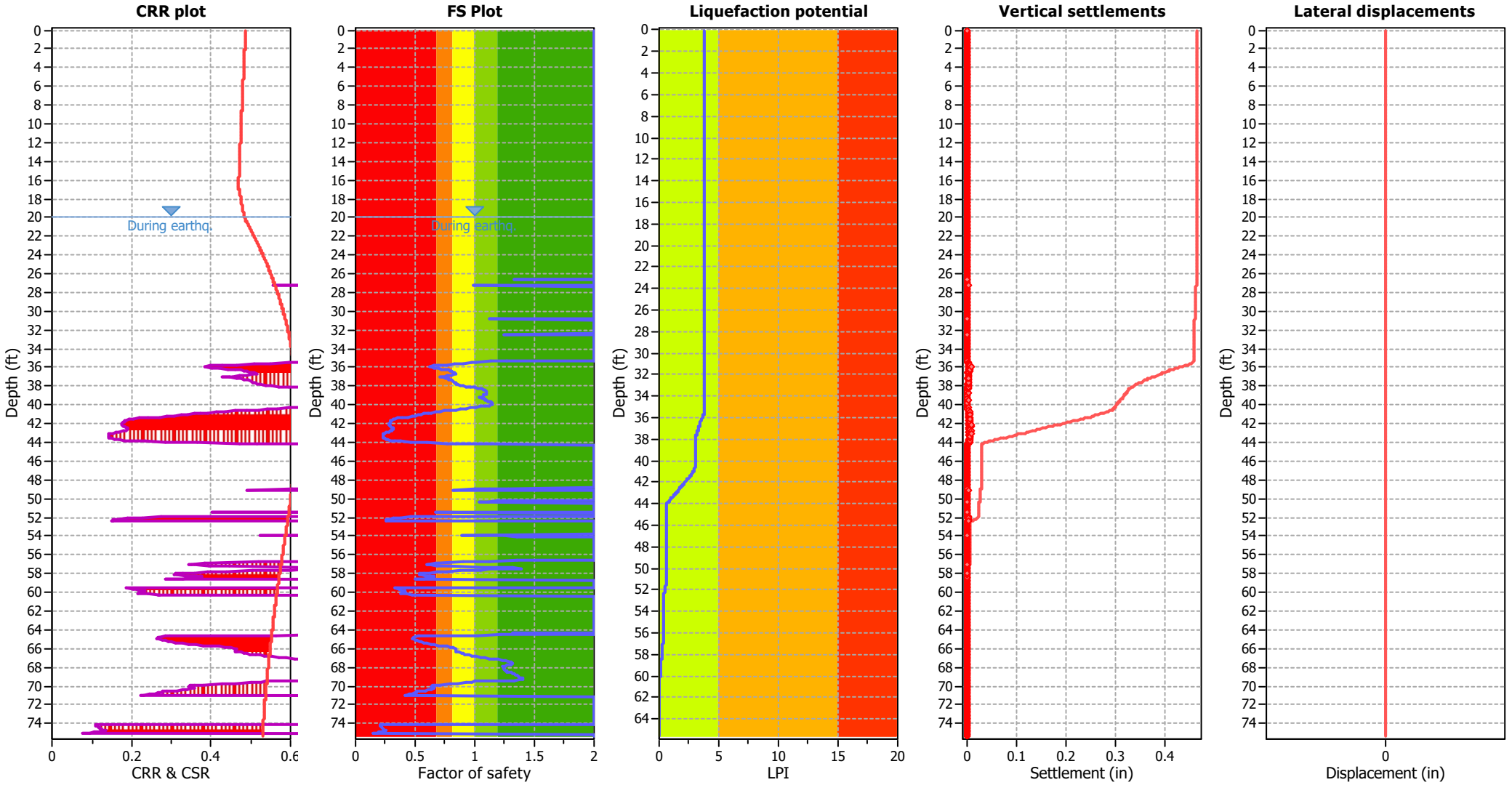
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	20.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	5	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.83	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.95	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	31.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

GeoPentech

August 6, 2024
Project No. 24031A

Mr. Ed Hill
Geotechnologies, Inc.
439 Western Avenue
Glendale, CA 91201

SUBJECT: SURFACE WAVE GEOPHYSICAL SURVEY RESULTS
BUENA VISTA DEVELOPMENT PROJECT NORTH PARCEL
LOS ANGELES, CALIFORNIA

Dear Mr. Hill,

Per your request and in accordance with the provisions of our proposal, dated June 5, 2024, and the revisions made to the proposal by Geotechnologies on July 15, 2024, GeoPentech performed surface wave geophysical measurements along three survey lines (SW24-4 through SW24-6) at the northeast portion (North Parcel) of the Buena Vista Development project at approximately 1380 North Broadway in Los Angeles, California. Additionally, seismic refraction measurements were collected from line SW24-6 to provide additional information for shear wave velocity profile modeling. The locations of the geophysical measurements are shown on Figure 1.

Project Understanding

We understand the project includes the construction a mixed-use development consisting of multiple buildings between 1030 and 1380 North Broadway and at 1251 North Spring Street. The project has been divided into two sections for the purposes of the geotechnical investigation. These sections have been designated the South Parcel (nearer to 1030 North Broadway) and the North Parcel (nearer to 1380 North Broadway and 1251 North Spring Street). The purpose of the surface-wave geophysical investigation described herein was to measure the shear-wave velocity profile at the North Parcel site to evaluate the site V_{S30}. South Parcel geophysical results are detailed in a separate report.

Surface Wave Geophysics Methods

Both active and passive surface wave surveys were performed to collect shear wave (S-wave) velocity data at the site. The active surface wave surveys were performed using MASW methods, and the passive surveys were performed using microtremor array methods. A detailed description of MASW is provided in Park et al. (1999)[1] and Foti et al. (2018)[2]. Microtremor array methods are described in Foti et al. (2018).

[1] Park, C, Miller, R., and Xia, J. (1999). Multichannel analysis of surface waves: Geophysics, v. 64, no. 3, pp. 800-808.

In general, the surface wave method records Rayleigh waves generated either with (1) an active source (e.g. sledgehammer) for the MASW method or (2) a passive (ambient) source (e.g. vehicular traffic) for microtremor array methods. In a layered medium, Rayleigh surface waves of different frequencies (or wavelengths) propagate at different velocities, referred to as phase velocity. This phase velocity primarily depends on the material stiffness properties (e.g. S-wave velocity) over a depth approximately equal to one wavelength. Consequently, lower frequency, longer wavelength surface wave energy will provide samples to greater survey depths than higher frequency, shorter wavelength energy. Because surface waves of different frequencies (wavelengths) sample different depths, they travel at different velocities (dispersion) in a layered medium. Due to the generally lower frequency nature of passive surface wave energy, passive surface wave techniques (i.e. microtremor array) have the potential to supplement active surface wave data to achieve deeper investigation depths. For this reason, it is advantageous to perform both types of measurement along the same lines as was done for this project.

Surface wave geophysical surveys measure the dispersive nature of the geologic medium and produce dispersion curves, which show the variation of Rayleigh wave phase velocity as a function of frequency (or wavelength). After the dispersion curve is generated, it is iteratively fitted to a horizontally layered, laterally continuous, homogeneous-isotropic, S-wave velocity model that would account for the measured surface wave velocity dispersion. The results provide a representative average estimate of the one-dimensional S-wave velocity profile under the array (velocity vs. depth).

Seismic Refraction Geophysics Methods

Seismic refraction surveying involves measuring the time required for a seismic compression wave (P-wave) to travel from a shot point to a series of co-linear geophones. To resolve a subsurface layer boundary using the seismic refraction method, a density or velocity change must occur at that layer boundary. P-wave arrival times are plotted on time-distance graphs and interpreted using the generalized reciprocal method or by seismic tomography. The results provide a two-dimensional picture of subsurface conditions and show the interpreted distribution of P-wave velocity as a function of depth along the profile.

The interpretation of seismic refraction data depends on several assumptions including:

- The subsurface is composed of a series of discrete homogeneous layers, which may vary laterally in seismic velocity;
- The boundaries between these layers consist of a significant seismic velocity contrast and are laterally continuous to be individually resolved;
- The thicknesses of these layers are great enough to critically refract seismic source energy to produce a detectable refracted wave arrival at the surface;

[2] Foti, S., Hollender, F., Garofalo, F., Albarello, D., Asten, M., Bard, P., Comina, C., Cornou, C., Cox, B., Di Giulio, G., Forbriger, T., Hayashi, K., Lunedei, E., Martin, A., Mercerat, D., Ohrnberger, M., Poggi, V., Renalier, F., Sicilia, D., and Socco, V. (2018). Guidelines for the good practice of surface wave analysis: a product of the InterPACIFIC project. Bull Earthquake Eng, v. 16, pp. 2367-2420.

- The seismic velocity of successive layers increases with depth.

All the assumptions above are unlikely to be completely fulfilled, and the extent to which each assumption is valid varies from site to site. Consequently, the interpreted seismic refraction profiles typically show a simplified bulk average subsurface P-wave velocity distribution. The degree of simplification depends on the extent the above assumptions are valid at the site.

Geophysical Data Collection and Processing Procedures

The surface wave and seismic refraction data were collected at the site on July 30, 2024. At the time of data collection, the site was being used for construction equipment storage and had a crushed asphalt surface. It was situated on a terrace overlooking railroad tracks and Los Angeles State Historic Park to the south. The survey lines were performed in a line generally parallel to the long axis of the property as shown on Figure 1. Drilling activities were occurring during the survey at the far southwest end of the property, so the survey lines were performed northeast of that area to avoid conflict between the activities. The survey measurements were collected using a Geometrics Geode seismograph with a linear array of 24 4.5-Hz geophones. The geophones were spaced at 10-foot intervals (230-foot line length) for lines SW24-4 and SW24-6 and at 8-foot intervals (184-foot line length) for line SW24-5.

The active seismic source for the MASW and seismic refraction measurements consisted of a sledgehammer blow to a plastic ground plate. Six shot locations were used beginning 32 to 70 feet behind the first geophone and moving towards the first geophone at 8- to 10-foot intervals. Additional shots were performed within the line and at both ends of the line at SW24-6 to collect seismic refraction data. Shot locations for each line are shown below in Table 1. The sledgehammer was hit two to three times at each shot location to create a stacked waveform for surface wave data collection and hit one to three times at each shot location for seismic refraction data collection. A 1-second-long record with 0.25 millisecond sample interval was recorded at each shot location.

TABLE 1
SURVEY LINE DIMENSIONS

Survey Line	Line Purpose	Geophone Interval / Total Line Length	Shot Locations (ft from first geophone)
SW24-4	Surface Wave	10 ft / 230 ft	-50, -40, -30, -20, -10, 0
SW24-5	Surface Wave	8 ft / 184 ft	-32, -24, -16, -8, 0, 8
SW24-6	Surface Wave / Seismic Refraction	10 ft / 230 ft	-70, -60, -50, -40, -30, -20, 0, 55, 115, 175, 230

The recorded MASW data were processed using the program SurfSeis by Kansas Geological Survey. This program uses a modified F-K filter (type of two-dimensional Fourier transform) to convert the raw seismic data from time and distance to wave frequency and velocity. The highest amplitude energies along the frequency and phase velocity plot for each shot location were then selected to create a dispersion curve.

Because of the typical lower frequency nature of passive surface wave energy, passive microtremor measurements were performed to supplement the MASW measurements at deeper investigation depths. A total of ten 32-second-long microtremor array records (2 millisecond sample interval) were collected from each survey line. The primary sources of ambient surface wave energy were vehicle traffic on the nearby streets and occasional train traffic.

The recorded microtremor data were also processed using the Kansas Geological Survey's SurfSeis program. Because microtremor records are generally created using lower-energy vibration sources, the microtremor records were stacked together to create one record with sufficient energy. Wavefield transformation was then performed on the stacked microtremor records in a similar manner to the MASW processing to create a frequency/phase velocity plot. An overall microtremor dispersion curve was then created from this plot.

For each line, the microtremor dispersion curve picks were combined with the dispersion curve picks generated from MASW to create an overall seismic dispersion curve. The degree of fit of the overlapping microtremor and MASW dispersion picks provided confidence in the results. Additionally, as noted above, the microtremor and MASW data complement each other by generally sampling different frequency ranges of surface wave data. After the data were combined, a best fit polynomial dispersion curve was calculated for modeling. The best fit dispersion curve was then iteratively fitted to a one-dimensional S-wave velocity model using the SurfSeis software. The results of the modeling provide a one-dimensional vertical profile of S-wave velocity as a function of depth averaged beneath the extent of the survey line.

Seismic refraction travel times were plotted on time-distance graphs and interpreted using seismic tomography methods with Geogiga's Seismic Pro software. The profile results were then imported into Golden Software's Grapher program to produce the two-dimensional P-wave profile along survey line SW24-6 shown in Figure 2 and to extract a representative one-dimensional P-wave profile for use in developing the S-wave models.

A representative vertical P-wave velocity profile from line SW24-6 was input into SurfSeis prior to inversion of the S-wave velocity model for line SW24-6 to provide additional information. Within the P-wave survey investigation depth, the modeling resulted in inferred Poisson ratios between 0.31 and 0.39 between ground surface and 25 feet below ground surface (bgs). At 35.7 feet bgs and below, the Poisson ratio was 0.48, consistent with saturated subsurface conditions. The seismic refraction (P-wave) measurements indicate a potential water table at approximately 35 feet bgs, which is consistent with GeoTracker reports indicating groundwater depths around 35 feet bgs in 2003 and cross sections produced by GeoTechnologies showing groundwater at around 40 feet bgs. Below the bottom of the seismic refraction investigation depth, P-wave velocities between 6,400 and 6,700 ft/s were assumed, resulting in Poisson ratios between 0.45 and 0.48. During S-wave model inversion of lines SW24-1 and SW24-3, a Poisson ratio of 0.37 was assumed between ground surface and 35 feet bgs, and a Poisson ratio of 0.47 to 0.48 was assumed beneath 35 feet bgs.

Surface Wave Geophysics Results

The results of the combined MASW and microtremor array surface wave measurements are presented in Figures 3 through 5 for lines SW24-4 through SW24-6, respectively. These figures present the MASW, passive, and best fit surface wave dispersion curves and the corresponding representative S-wave velocity models. As seen in these figures, the MASW and passive dispersion curves are generally in good agreement in the regions that overlap.

Figure 6 summarizes the surface wave measurement results for the site. This figure shows (1) the S-wave velocity models for lines SW24-4 through SW24-6 plotted as a function of depth below ground surface and (2) the site average S-wave velocity for all the measurements calculated at 1-foot increments.

Based on the results shown on Figure 6, the V_{s30} was calculated based on the procedures outlined in the National Earthquake Hazards Reduction Program (NEHRP) and UBC. The V_{s30} was calculated from the following equation from these references:

$$v_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where:

i = distinct different soil and/or rock layer between *1* and n
v_{si} = shear wave velocity in feet per second of layer i
d_i = thickness of any layer within the 100-foot interval
$\sum_{i=1}^{n} d_i$ = 100 feet

Based on this procedure, the site average V_{S30} was calculated from ground surface to 100 feet below ground surface. The V_{S30} below ground surface was calculated as **1,179 ft/s** (359 m/s), which corresponds with ASCE 7-16 Site Class D, stiff soil ($600 < V_{S30} \leq 1{,}200$ ft/s), and ASCE 7-22 Site Class CD, dense sand or very stiff clay ($1{,}000 < V_{S30} \leq 1{,}450$ ft/s). V_{S30} values for depth intervals beginning below ground surface are also shown on Figure 6 and in Table 2 below.

TABLE 2
CALCULATED SITE V_{S30}

Depth Range (ft, below planned ground surface)	V_{s30} (ft/sec)	Seismic Site Class ASCE 7-16 (2017)	Seismic Site Class ASCE 7-22 (2022)
0 to 100	1,179	D	CD
10 to 110	1,305	C	CD
20 to 120	1,410	C	CD
30 to 130	1,517	C	C
40 to 140	1,606	C	C

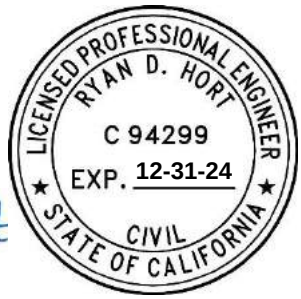
Limitations

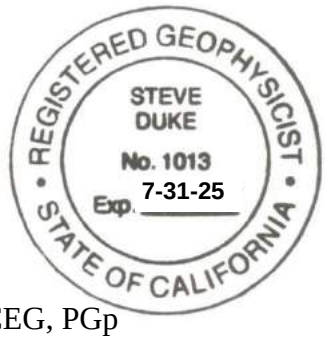
The technical results and professional judgments presented herein are based on limited observations, geophysical measurements (as described above), and our general experience in the field of geophysics. GeoPentech does not guarantee the performance of the project in any respect, only that the information provided meets the standard of care of the profession at this time under the same scope limitations imposed by the project.

We trust the contents of this letter will meet your current needs. If you have questions or require additional information, please call.

Very Truly Yours,

GeoPentech





Ryan D. Hort, PhD, PE
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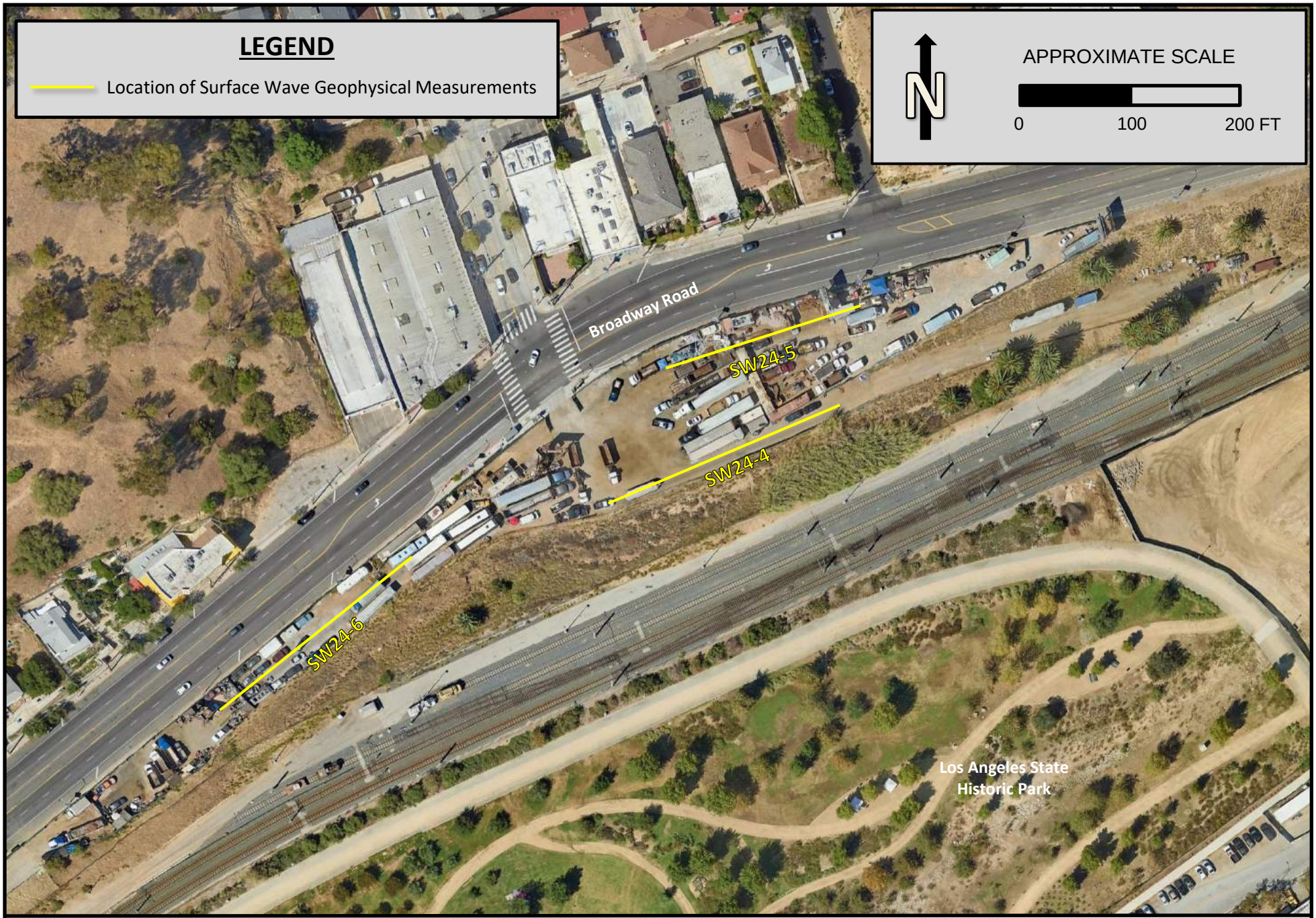
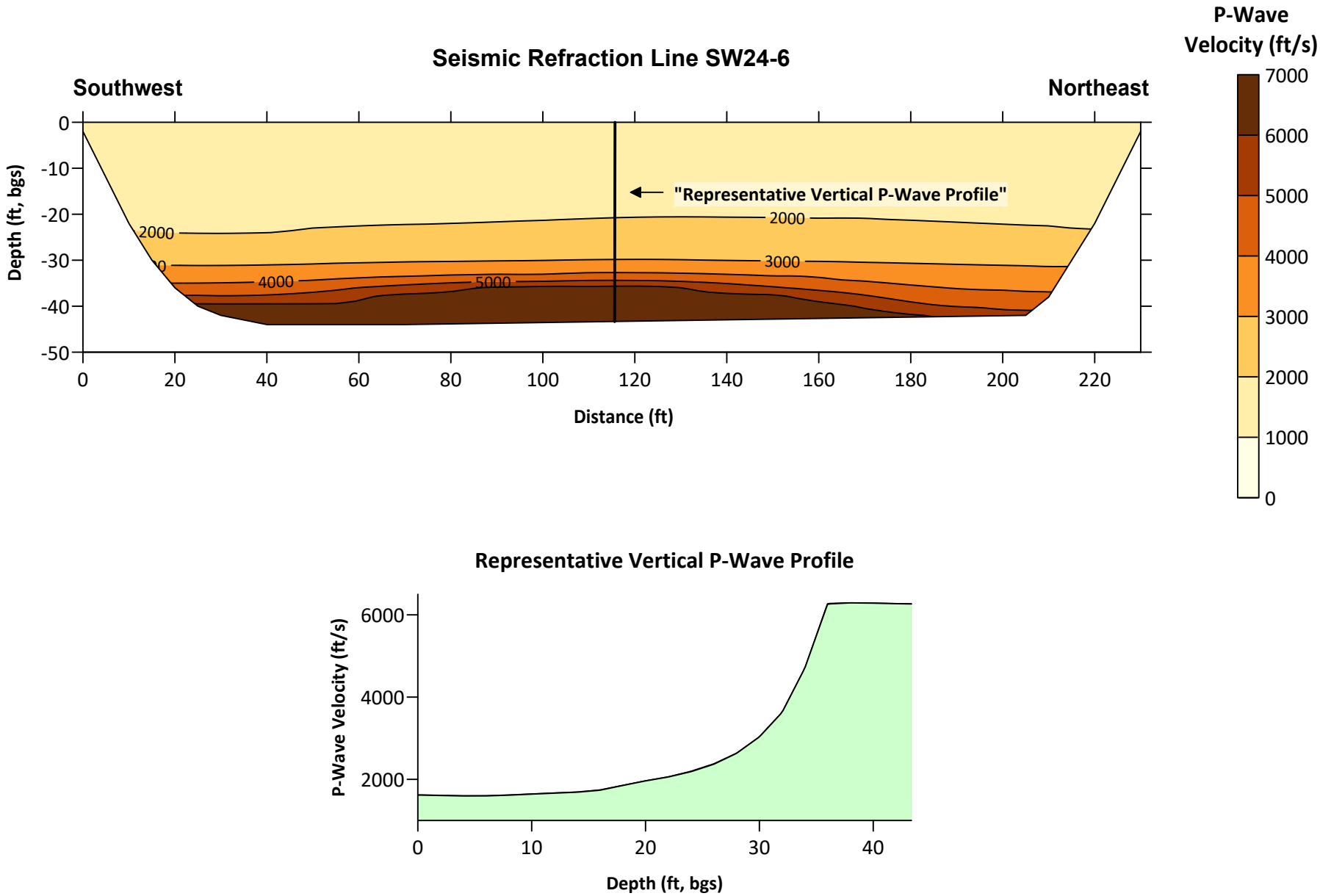


GEOPHYSICAL LINE LOCATIONS

GeoPentech	Project No.: **24031A**	Project: **Buena Vista (North Parcel)**	Date: **AUG 2024**	Figure: **1**

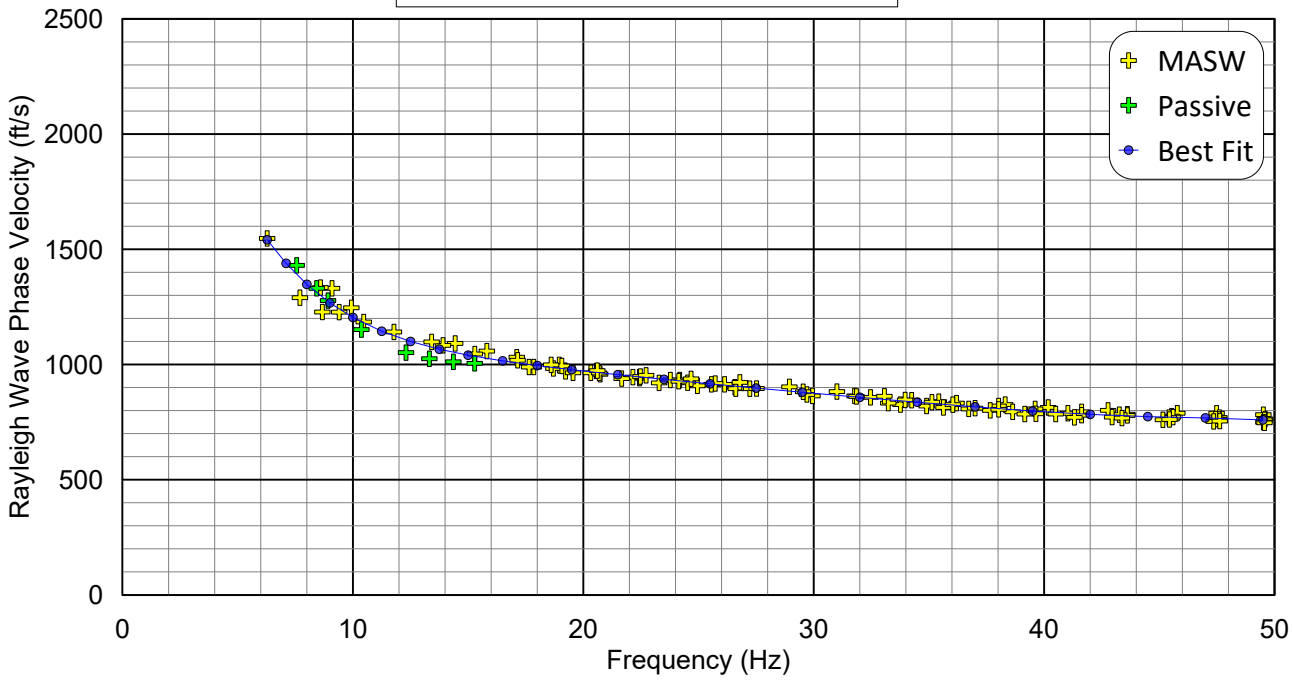


LINE SW24-6 P-WAVE VELOCITY PROFILE

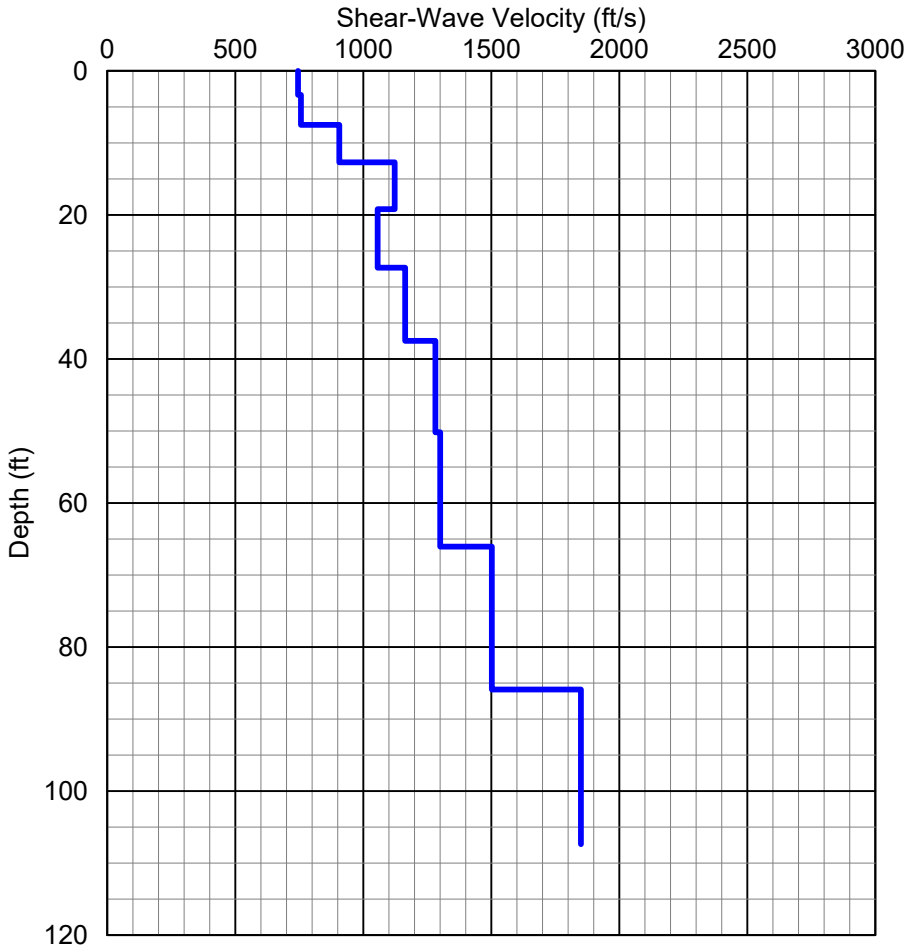
Date: AUG 2024	Project No.: 24031A	Project: Buena Vista (North Parcel)	Figure 2

GeoPentech

SURFACE WAVE DISPERSION CURVE



REPRESENTATIVE SHEAR-WAVE VELOCITY MODEL

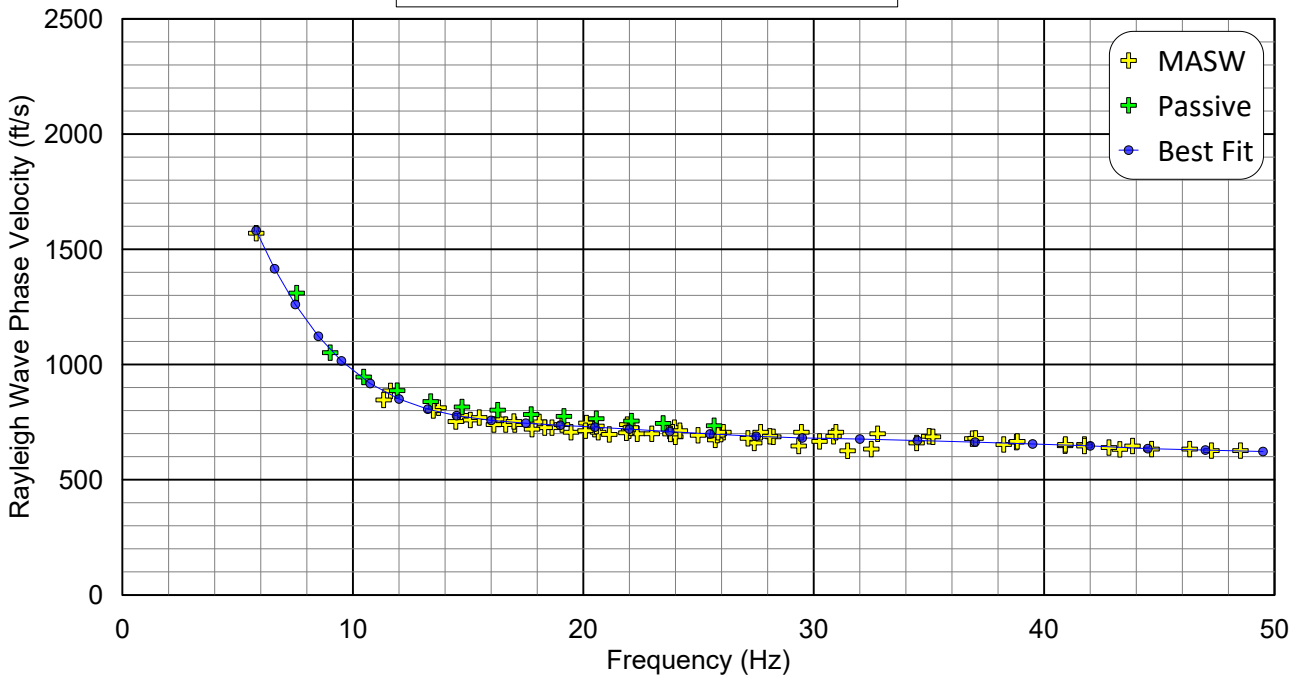


SW24-4: S-WAVE VELOCITY COMBINED SOURCE MODEL

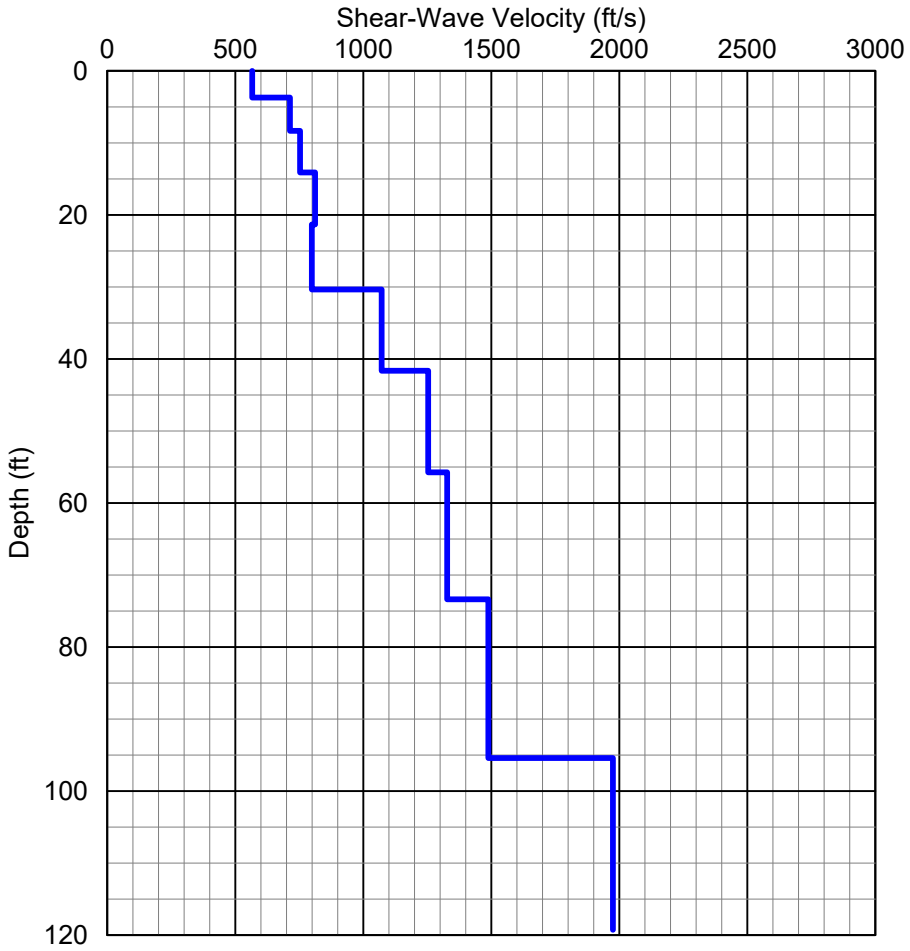
Project No.: 24031A	Project: Buena Vista (North Parcel)	Date: AUG 2024	Figure: 3

GeoPentech

SURFACE WAVE DISPERSION CURVE



REPRESENTATIVE SHEAR-WAVE VELOCITY MODEL

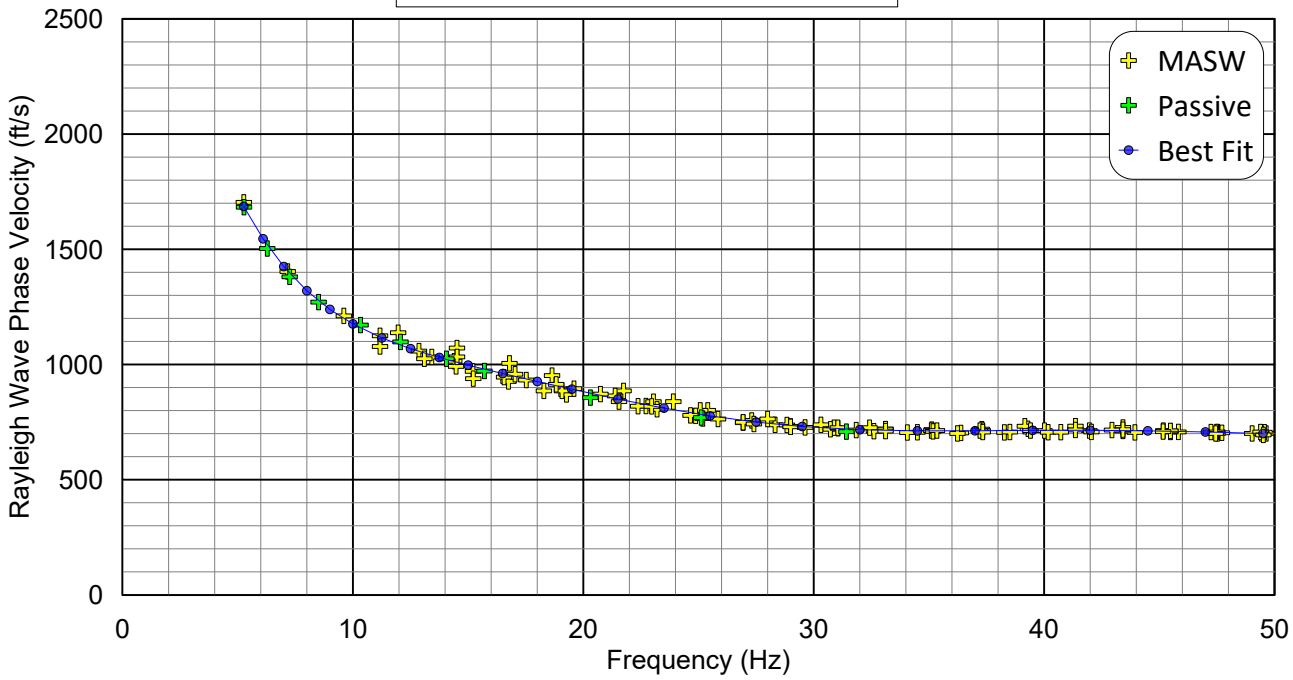


SW24-5: S-WAVE VELOCITY COMBINED SOURCE MODEL

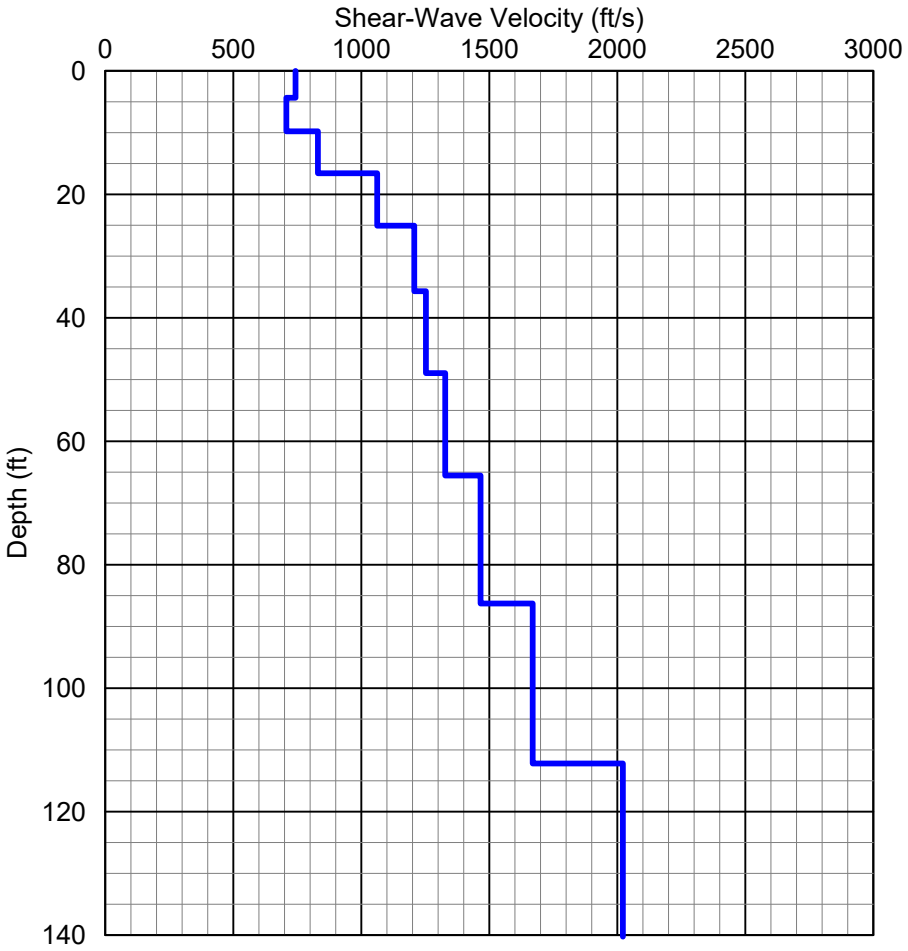
Project No.: 24031A	Project: Buena Vista (North Parcel)	Date: AUG 2024	Figure: 4

GeoPentech

SURFACE WAVE DISPERSION CURVE



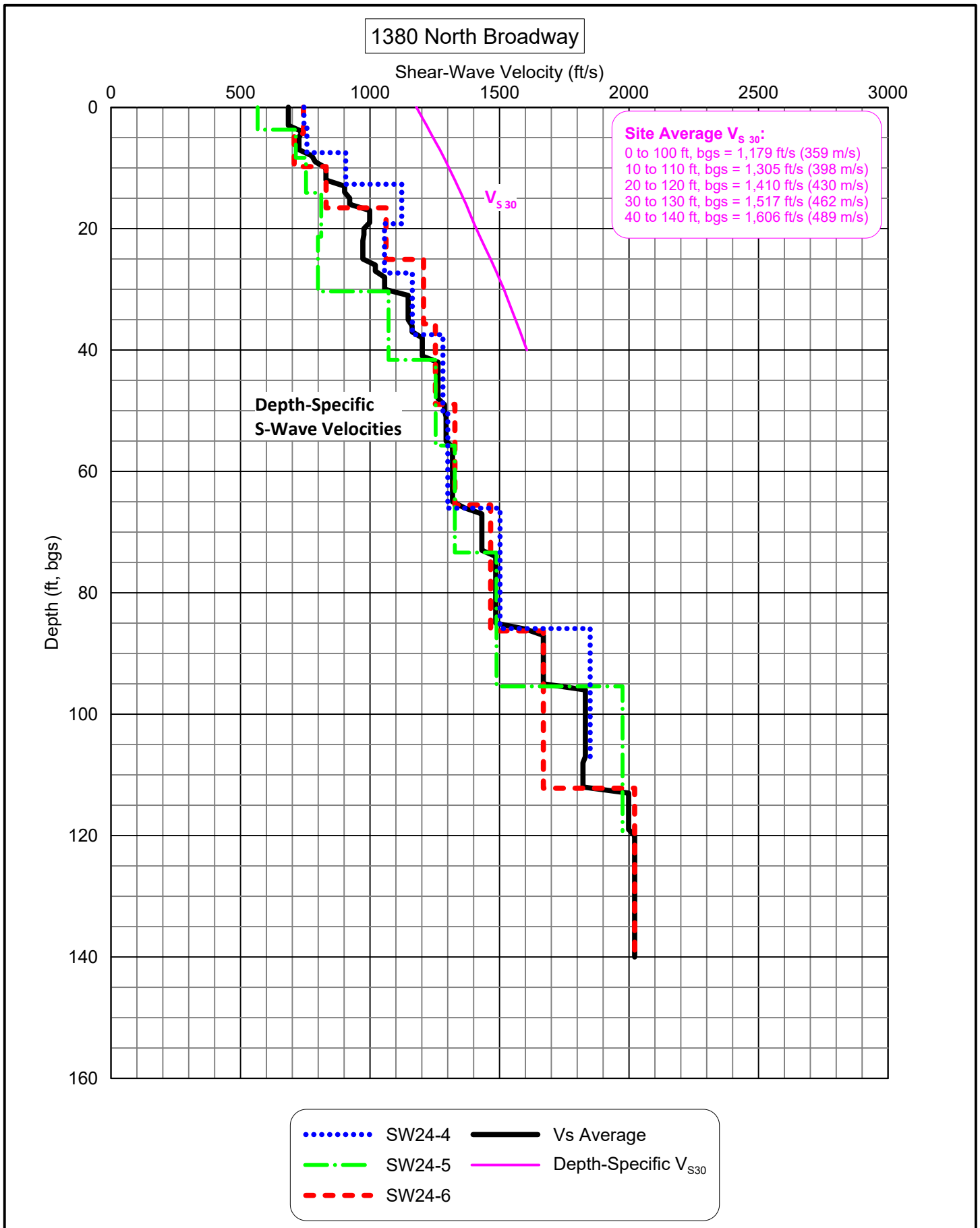
REPRESENTATIVE SHEAR-WAVE VELOCITY MODEL



SW24-6: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 24031A	Project: Buena Vista (North Parcel)	Date: AUG 2024	Figure: 5

GeoPentech



SHEAR WAVE VELOCITY PROFILE SUMMARY

Project No.: 24031A	Project: Buena Vista (North Parcel)	Date: AUG 2024	Figure 6

GeoPentech

GeoPentech

August 7, 2024
Project No. 24031A

Mr. Ed Hill
Geotechnologies, Inc.
439 Western Avenue
Glendale, CA 91201

SUBJECT: SURFACE WAVE GEOPHYSICAL SURVEY RESULTS
BUENA VISTA DEVELOPMENT PROJECT SOUTH PARCEL
LOS ANGELES, CALIFORNIA

Dear Mr. Hill,

Per your request and in accordance with the provisions of our proposal, dated June 5, 2024, and the revisions made to the proposal by Geotechnologies on July 15, 2024, GeoPentech performed surface wave geophysical measurements along three survey lines (SW24-1 through SW24-3) at the southwest portion (South Parcel) of the Buena Vista Development project at approximately 1030 North Broadway in Los Angeles, California. Additionally, seismic refraction measurements were collected from line SW24-2 to provide additional information for shear wave velocity profile modeling. The locations of the geophysical measurements are shown on Figure 1.

Project Understanding

We understand the project includes the construction a mixed-use development consisting of multiple buildings between 1030 and 1380 North Broadway and at 1251 North Spring Street. The project has been divided into two sections for the purposes of the geotechnical investigation. These sections have been designated the South Parcel (nearer to 1030 North Broadway) and the North Parcel (nearer to 1380 North Broadway and 1251 North Spring Street). The purpose of the surface-wave geophysical investigation described herein to measure the shear-wave velocity profile at the South Parcel site to evaluate the site V_{S30}. North Parcel geophysical results are detailed in a separate report.

Surface Wave Geophysics Methods

Both active and passive surface wave surveys were performed to collect shear wave (S-wave) velocity data at the site. The active surface wave surveys were performed using MASW methods, and the passive surveys were performed using microtremor array methods. A detailed description of MASW is provided in Park et al. (1999)[1] and Foti et al. (2018)[2]. Microtremor array methods are described in Foti et al. (2018).

[1] Park, C, Miller, R., and Xia, J. (1999). Multichannel analysis of surface waves: Geophysics, v. 64, no. 3, pp. 800-808.

In general, the surface wave method records Rayleigh waves generated either with (1) an active source (e.g. sledgehammer) for the MASW method or (2) a passive (ambient) source (e.g. vehicular traffic) for microtremor array methods. In a layered medium, Rayleigh surface waves of different frequencies (or wavelengths) propagate at different velocities, referred to as phase velocity. This phase velocity primarily depends on the material stiffness properties (e.g. S-wave velocity) over a depth approximately equal to one wavelength. Consequently, lower frequency, longer wavelength surface wave energy will provide samples to greater survey depths than higher frequency, shorter wavelength energy. Because surface waves of different frequencies (wavelengths) sample different depths, they travel at different velocities (dispersion) in a layered medium. Due to the generally lower frequency nature of passive surface wave energy, passive surface wave techniques (i.e. microtremor array) have the potential to supplement active surface wave data to achieve deeper investigation depths. For this reason, it is advantageous to perform both types of measurement along the same lines as was done for this project.

Surface wave geophysical surveys measure the dispersive nature of the geologic medium and produce dispersion curves, which show the variation of Rayleigh wave phase velocity as a function of frequency (or wavelength). After the dispersion curve is generated, it is iteratively fitted to a horizontally layered, laterally continuous, homogeneous-isotropic, S-wave velocity model that would account for the measured surface wave velocity dispersion. The results provide a representative average estimate of the one-dimensional S-wave velocity profile under the array (velocity vs. depth).

Seismic Refraction Geophysics Methods

Seismic refraction surveying involves measuring the time required for a seismic compression wave (P-wave) to travel from a shot point to a series of co-linear geophones. To resolve a subsurface layer boundary using the seismic refraction method, a density or velocity change must occur at that layer boundary. P-wave arrival times are plotted on time-distance graphs and interpreted using the generalized reciprocal method or by seismic tomography. The results provide a two-dimensional picture of subsurface conditions and show the interpreted distribution of P-wave velocity as a function of depth along the profile.

The interpretation of seismic refraction data depends on several assumptions including:

- The subsurface is composed of a series of discrete homogeneous layers, which may vary laterally in seismic velocity;
- The boundaries between these layers consist of a significant seismic velocity contrast and are laterally continuous to be individually resolved;
- The thicknesses of these layers are great enough to critically refract seismic source energy to produce a detectable refracted wave arrival at the surface;

[2] Foti, S., Hollender, F., Garofalo, F., Albarello, D., Asten, M., Bard, P., Comina, C., Cornou, C., Cox, B., Di Giulio, G., Forbriger, T., Hayashi, K., Lunedei, E., Martin, A., Mercerat, D., Ohrnberger, M., Poggi, V., Renalier, F., Sicilia, D., and Socco, V. (2018). Guidelines for the good practice of surface wave analysis: a product of the InterPACIFIC project. Bull Earthquake Eng, v. 16, pp. 2367-2420.

- The seismic velocity of successive layers increases with depth.

All the assumptions above are unlikely to be completely fulfilled, and the extent to which each assumption is valid varies from site to site. Consequently, the interpreted seismic refraction profiles typically show a simplified bulk average subsurface P-wave velocity distribution. The degree of simplification depends on the extent the above assumptions are valid at the site.

Geophysical Data Collection and Processing Procedures

The surface wave and seismic refraction data were collected at the site on July 30, 2024. At the time of data collection, the site was occupied by a school bus company and was covered by asphalt. The survey lines were performed in a line generally parallel to the long axis of the property as shown on Figure 1. Drilling activities were occurring during the survey at the far southwest end of the property, so the survey lines were performed northeast of that area to avoid conflict between the activities. The survey measurements were collected using a Geometrics Geode seismograph with a linear array of 24 4.5-Hz geophones. The geophones were spaced at 10-foot intervals (230-foot line length) for each line.

The active seismic source for the MASW and seismic refraction measurements consisted of a sledgehammer blow to a plastic ground plate. Six shot locations were used beginning 70 feet behind the first geophone and finishing 20 feet behind the first geophone for each line (moving in 10-foot increments). Additional shots were performed within the line and at both ends of the line at SW24-2 to collect seismic refraction data. Shot locations for each line are shown below in Table 1. The sledgehammer was hit two to three times at each shot location to create a stacked waveform for surface wave data collection and hit one to three times at each shot location for seismic refraction data collection. A 1-second-long record with 0.25 millisecond sample interval was recorded at each shot location.

TABLE 1
SURVEY LINE DIMENSIONS

Survey Line	Line Purpose	Geophone Interval / Total Line Length	Shot Locations (ft from first geophone)
SW24-1	Surface Wave	10 ft / 230 ft	-70, -60, -50, -40, -30, -20
SW24-2	Surface Wave / Seismic Refraction	10 ft / 230 ft	-70, -60, -50, -40, -30, -20, 0, 55, 115, 175, 230
SW24-3	Surface Wave	10 ft / 230 ft	-70, -60, -50, -40, -30, -20

The recorded MASW data were processed using the program SurfSeis by Kansas Geological Survey. This program uses a modified F-K filter (type of two-dimensional Fourier transform) to convert the raw seismic data from time and distance to wave frequency and velocity. The highest amplitude energies along the frequency and phase velocity plot for each shot location were then selected to create a dispersion curve.

Because of the typical lower frequency nature of passive surface wave energy, passive microtremor measurements were performed to supplement the MASW measurements at deeper investigation depths. A total of ten 32-second-long microtremor array records (2 millisecond sample interval) were collected from each survey line. The primary sources of ambient surface wave energy were traffic on the site and drilling activities.

The recorded microtremor data were also processed using the Kansas Geological Survey's SurfSeis program. Because microtremor records are generally created using lower-energy vibration sources, the microtremor records were stacked together to create one record with sufficient energy. Wavefield transformation was then performed on the stacked microtremor records in a similar manner to the MASW processing to create a frequency/phase velocity plot. An overall microtremor dispersion curve was then created from this plot.

For each line, the microtremor dispersion curve picks were combined with the dispersion curve picks generated from MASW to create an overall seismic dispersion curve. The degree of fit of the overlapping microtremor and MASW dispersion picks provided confidence in the results. Additionally, as noted above, the microtremor and MASW data complement each other by generally sampling different frequency ranges of surface wave data. After the data were combined, a best fit polynomial dispersion curve was calculated for modeling. The best fit dispersion curve was then iteratively fitted to a one-dimensional S-wave velocity model using the SurfSeis software. The results of the modeling provide a one-dimensional vertical profile of S-wave velocity as a function of depth averaged beneath the extent of the survey line.

Seismic refraction travel times were plotted on time-distance graphs and interpreted using seismic tomography methods with Geogiga's Seismic Pro software. The profile results were then imported into Golden Software's Grapher program to produce the two-dimensional P-wave profile along survey line SW24-2 shown in Figure 2 and to extract a representative one-dimensional P-wave profile for use in developing the S-wave models.

A representative vertical P-wave velocity profile from line SW24-2 was input into SurfSeis prior to inversion of the S-wave velocity model for line SW24-2 to provide additional information. Within the P-wave survey investigation depth, the modeling resulted in inferred Poisson ratios between 0.28 and 0.34 between ground surface and 21 feet below ground surface (bgs). Between 21 and 54 feet bgs the Poisson ratio gradually increased to 0.47, indicating a potential groundwater table above 54 feet bgs. The seismic refraction (P-wave) measurements indicate a potential water table between 48 and 53 feet bgs. Water levels from monitoring well MW-18 for the adjacent Union Pacific Railroad site downloaded from GeoTracker indicate depths to water of around 60 feet bgs through 2022. Well MW-18 was visually identified next to line SW24-3 during the survey. Other monitoring wells nearby to the site indicate depths to water as shallow as 27 feet bgs, indicating complex groundwater conditions near the site. Below the bottom of the seismic refraction investigation depth, P-wave velocities between 5,500 and 6,000 ft/s were assumed, consistent with saturated materials, resulting in Poisson ratios between 0.43 and 0.47. During S-wave model inversion of lines SW24-1 and SW24-3, a similar Poisson ratio distribution to SW24-2 was assumed.

Surface Wave Geophysics Results

The results of the combined MASW and microtremor array surface wave measurements are presented in Figures 3 through 5 for lines SW24-1 through SW24-3, respectively. These figures present the MASW, passive, and best fit surface wave dispersion curves and the corresponding representative S-wave velocity models. As seen in these figures, the MASW and passive dispersion curves are generally in good agreement in the regions that overlap.

Figure 6 summarizes the surface wave measurement results for the site. This figure shows (1) the S-wave velocity models for lines SW24-1 through SW24-3 plotted as a function of depth below ground surface and (2) the site average S-wave velocity for all the measurements calculated at 1-foot increments.

Based on the results shown on Figure 6, the V_{s30} was calculated based on the procedures outlined in the National Earthquake Hazards Reduction Program (NEHRP) and UBC. The V_{s30} was calculated from the following equation from these references:

$$v_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where:

i = distinct different soil and/or rock layer between *1* and n
v_{si} = shear wave velocity in feet per second of layer i
d_i = thickness of any layer within the 100-foot interval
$\sum_{i=1}^{n} d_i$ = 100 feet

Based on this procedure, the site average V_{S30} was calculated from ground surface to 100 feet below ground surface. The V_{S30} below ground surface was calculated as **1,320 ft/s** (402 m/s), which corresponds with ASCE 7-16 Site Class C, very dense soil and soft rock ($1{,}200 < V_{S30} \leq 2{,}500$ ft/s), and ASCE 7-22 Site Class CD, dense sand or very stiff clay ($1{,}000 < V_{S30} \leq 1{,}450$ ft/s). V_{S30} values for depth intervals beginning below ground surface are also shown on Figure 6 and in Table 2 below.

TABLE 2
CALCULATED SITE V_{S30}

Depth Range (ft, below planned ground surface)	V_{s30} (ft/sec)	Seismic Site Class ASCE 7-16 (2017)	Seismic Site Class ASCE 7-22 (2022)
0 to 100	1,320	C	CD
10 to 110	1,458	C	C
20 to 120	1,579	C	C
30 to 130	1,685	C	C
40 to 140	1,795	C	C

Limitations

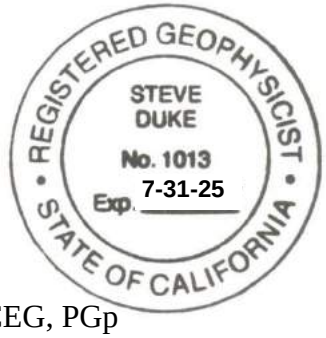
The technical results and professional judgments presented herein are based on limited observations, geophysical measurements (as described above), and our general experience in the field of geophysics. GeoPentech does not guarantee the performance of the project in any respect, only that the information provided meets the standard of care of the profession at this time under the same scope limitations imposed by the project.

We trust the contents of this letter will meet your current needs. If you have questions or require additional information, please call.

Very Truly Yours,

GeoPentech





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Project Engineer

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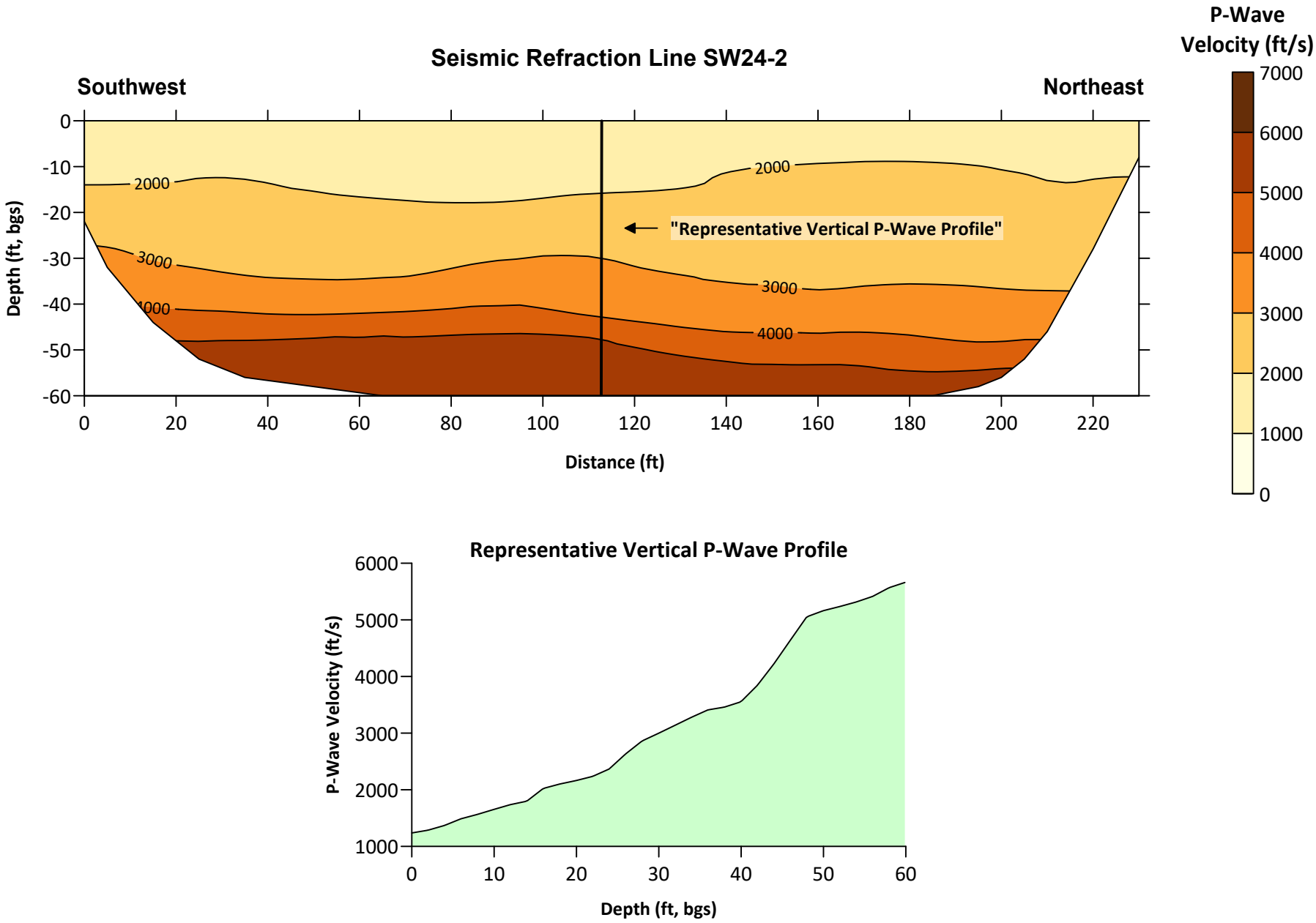
Associate Geophysicist



GEOPHYSICAL LINE LOCATIONS

GeoPentech	Project No.: **24031A**	Project: **Buena Vista (South Parcel)**	Date: **AUG 2024**	Figure: **1**

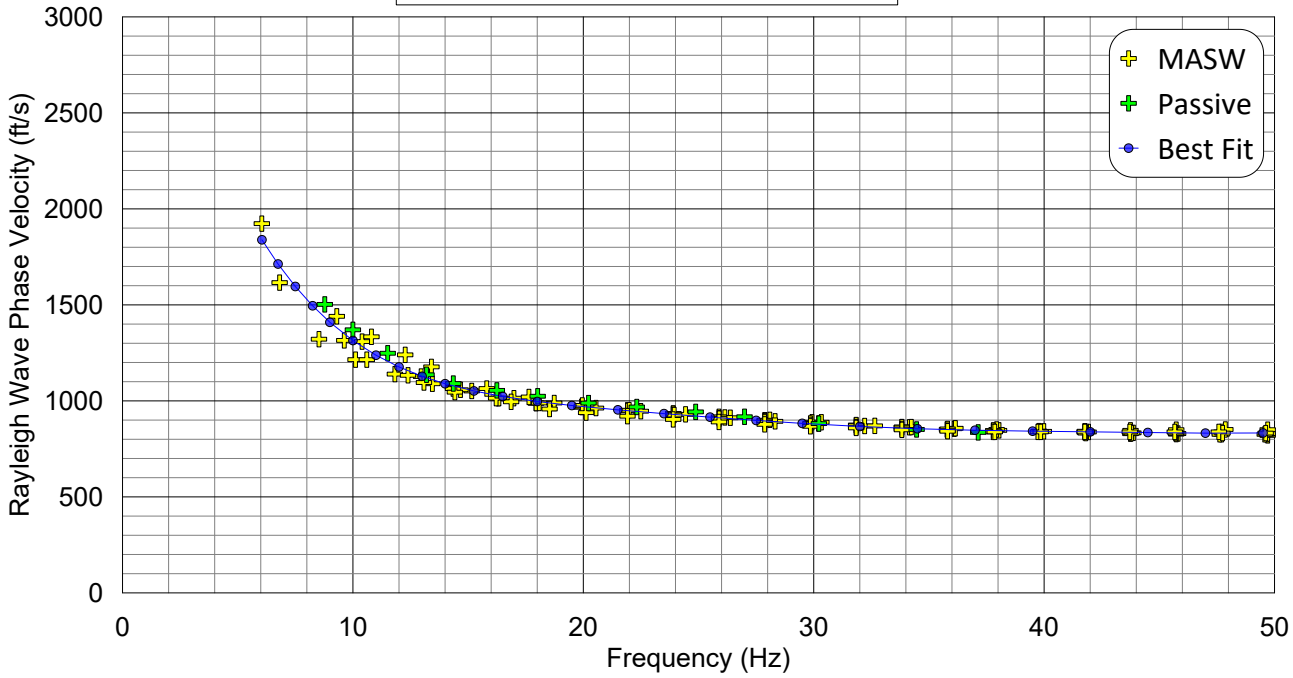


LINE SW24-2 P-WAVE VELOCITY PROFILE

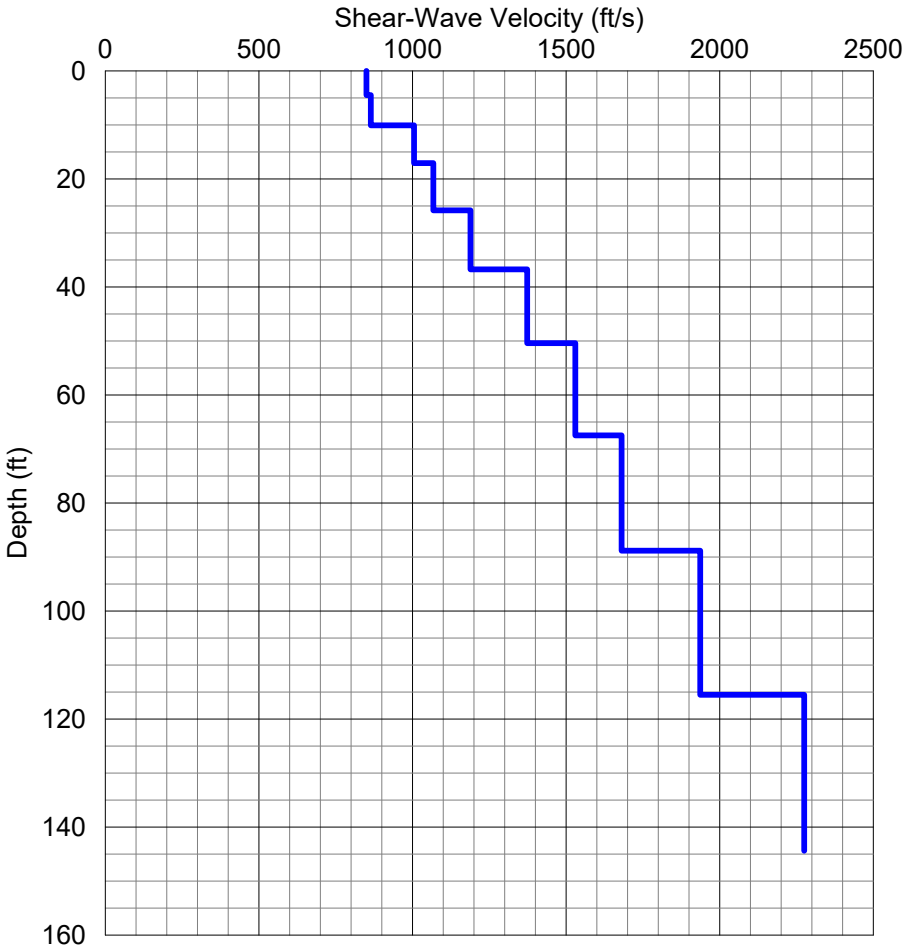
Date: AUG 2024	Project No.: 24031A	Project: Buena Vista (South Parcel)	Figure 2

GeoPentech

SURFACE WAVE DISPERSION CURVE



REPRESENTATIVE SHEAR-WAVE VELOCITY MODEL

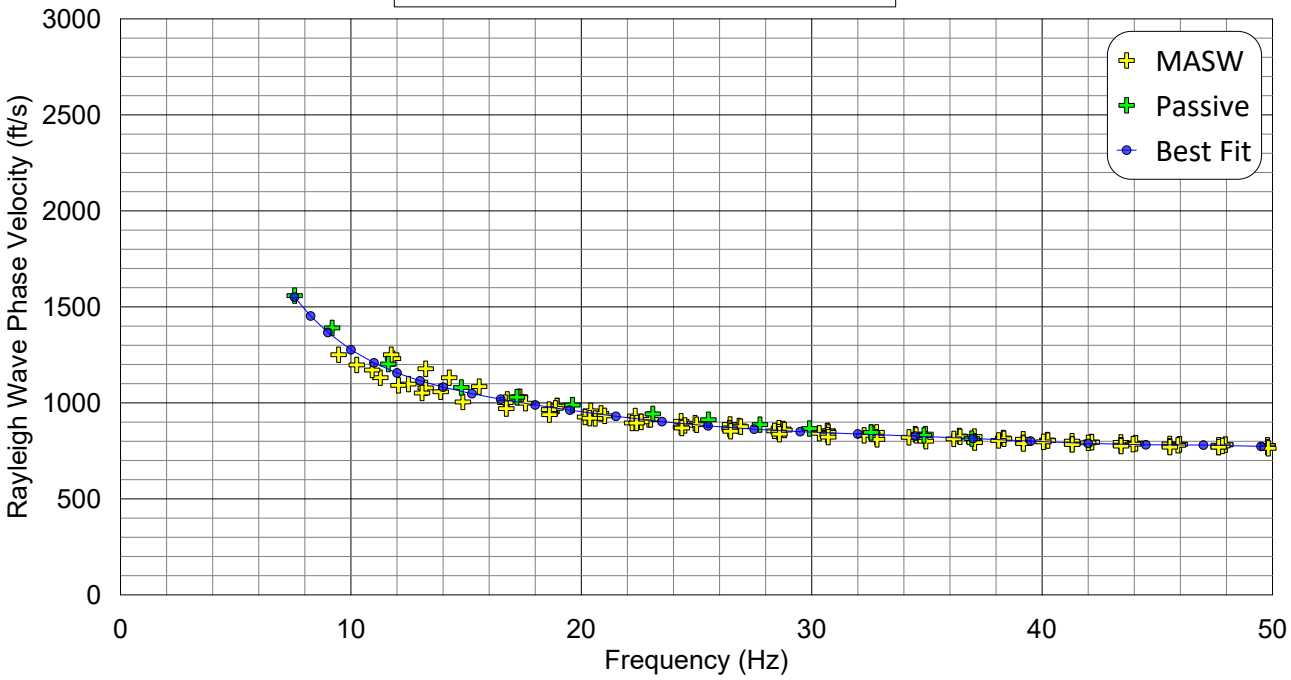


SW24-1: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 24031A	Project: Buena Vista (South Parcel)	Date: AUG 2024	Figure: 3

GeoPentech

SURFACE WAVE DISPERSION CURVE



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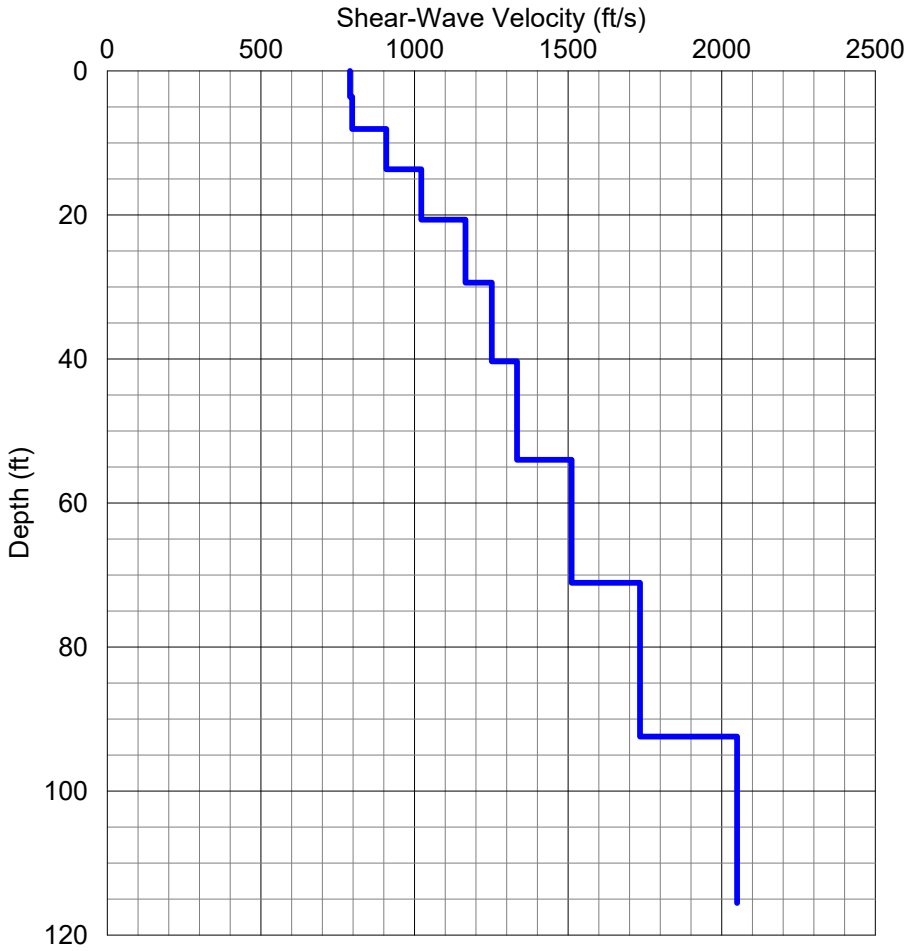
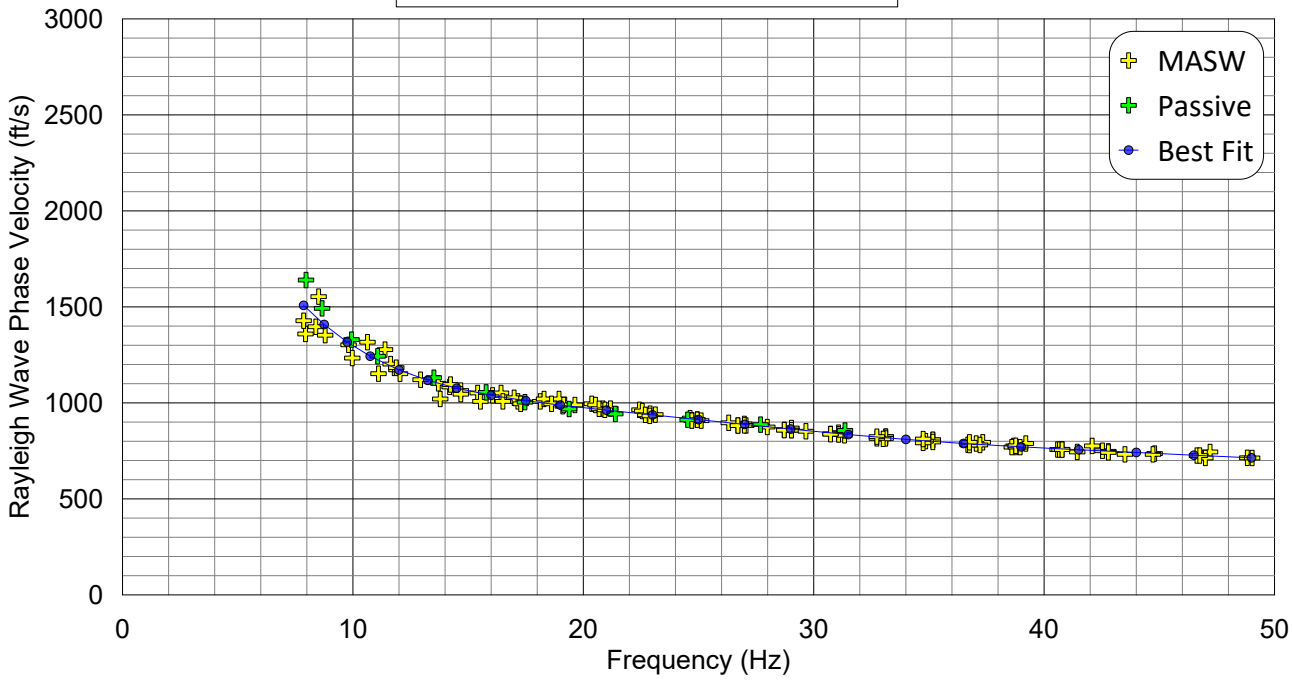


SW24-2: S-WAVE VELOCITY COMBINED SOURCE MODEL

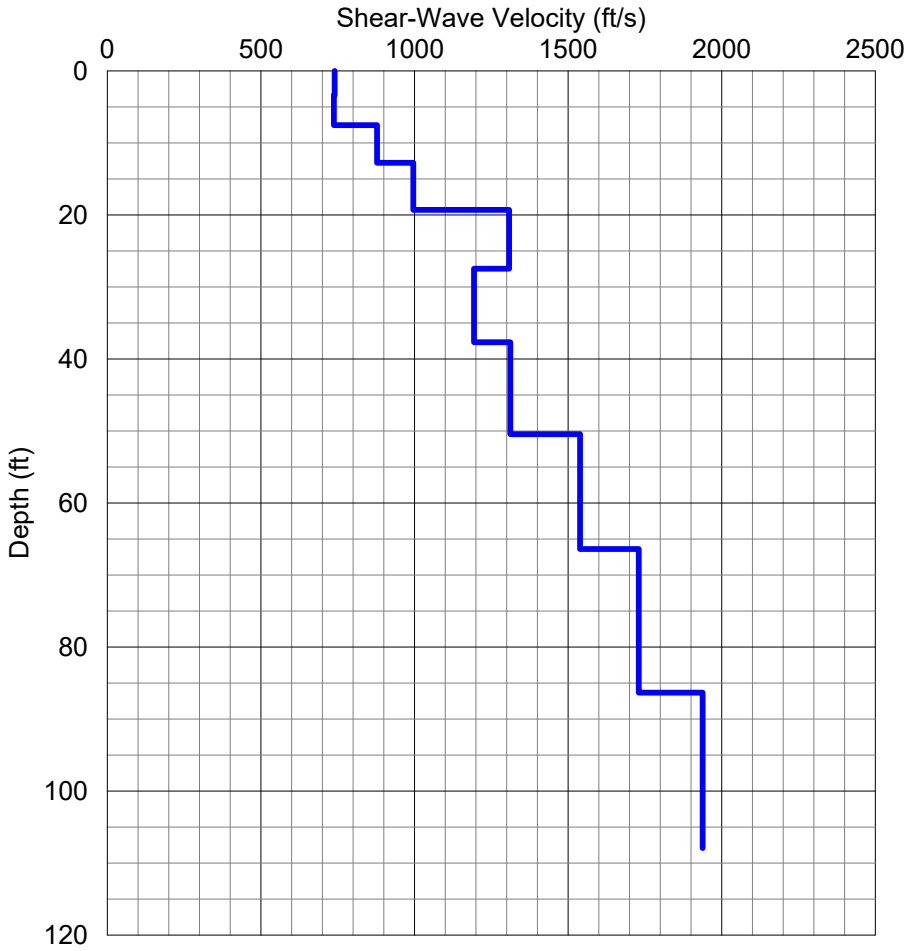
Project No.: 24031A	Project: Buena Vista (South Parcel)	Date: AUG 2024	Figure: 4

GeoPentech

SURFACE WAVE DISPERSION CURVE



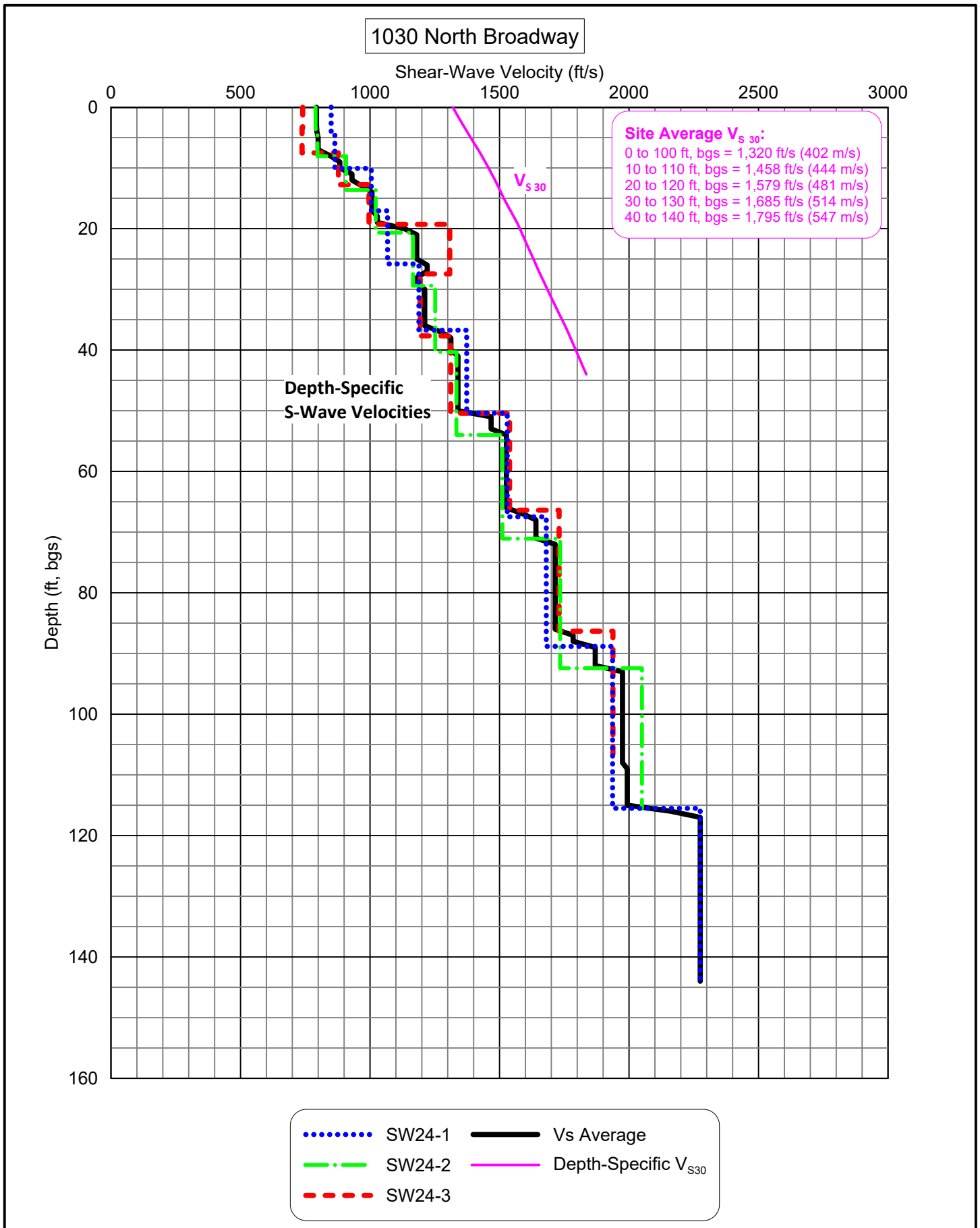
REPRESENTATIVE SHEAR-WAVE VELOCITY MODEL



SW24-3: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 24031A	Project: Buena Vista (South Parcel)	Date: AUG 2024	Figure: 5

GeoPentech



SHEAR WAVE VELOCITY PROFILE SUMMARY

Project No.: 24031A	Project: Buena Vista (South Parcel)	Date: AUG 2024	Figure 6

GeoPentech

Appendix E.2

CEQA Report Approval Letter

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BUILDING AND SAFETY
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SUPERINTENDENT OF BUILDING

JOHN WEIGHT
EXECUTIVE OFFICER

CEQA REPORT APPROVAL LETTER

March 12, 2025

LOG # 133992
SOILS/GEOLOGY FILE - 2
LIQ

Matthew Howell, Lincoln Property Company
915 Wilshire Blvd, Suite 2050
Los Angeles, CA 90017

TRACT:	WILSON'S BUENA VISTA ST. TRACT (M R 60-61) /// JOSE SAVERIANO YBARRA TRACT (M R 17-32) /// FREIGHT DEPOT TRACT (M R 72-75/76)
LOT(S):	1 /// FR 8 (Arb.2) /// FR A
LOCATION:	1251 N Spring St (aka 1030, 1040, 1050, 1310, 1322 N North Broadway), 1380 N North Broadway

CURRENT REFERENCE REPORT/LETTER(S)	REPORT No.	DATE OF DOCUMENT	PREPARED BY
Soils Report	20921	1/23/25	Geotechnologies, Inc.

The Grading Division of the Department of Building and Safety has reviewed the referenced report that provides geotechnical data for the preparation of an environmental impact report. The proposed development, which includes mixed-use residential and commercial buildings, was split into South Parcel and North Parcel due to topographic and geologic conditions. The South Parcel will be developed with a 6-story podium connection two building: a 26-story (343 feet in height) and a 22-story building (301 feet in height). The North Parcel will be developed with a 2-story podium connecting two buildings: a 15-story (209 feet in height) and a 6-story building (108 feet in height). The North Parcel will also include a 3-story building (up to 72 feet in height). Two 3-level partial subterranean garages will be built on both North and South Parcels.

The earth materials at the subsurface explorations within North Parcel consist of up to 30 feet of uncertified fill underlain by up to 37.5 feet of alluvium and Puente Formation sandstone, siltstone and claystone bedrock. Within the South Parcel, the subsurface exploration indicated the presence of fill up to 8 feet underlain by alluvium to the maximum exploration depth of 70 feet.

The consultants recommend to support the proposed heavy structures or where foundation soils are subject to liquefaction on mat-type foundations bearing on alluvial soils and/or competent bedrock.

AN EQUAL EMPLOYMENT OPPORTUNITY - AFFIRMATIVE ACTION EMPLOYER

The consultants recommend to support the proposed lighter structures or where foundation soils are not subject to liquefaction on conventional shallow foundations bearing on either native undisturbed soil, a blanket of properly placed fill or competent bedrock.

The site is located in a designated liquefaction hazard zone as shown on the Seismic Hazard Zones map issued by the State of California. The referenced report is acceptable as a preliminary assessment of CEQA guidelines, provided the following conditions are complied with during site development:

1. Prior to the issuance of any permit, secure approval from the Division of Land Unit of the Department of City Planning for the project.

2. Prior to the issuance of any building or grading permits, a soils report, in accordance with P/BC 2020-113 Information Bulletin (or latest edition), providing design level geotechnical recommendations and calculations for the proposed grading/construction shall be submitted to the Grading Division for review and approval.



DAN L. STOICA
Geotechnical Engineer I

DLS/dls
Log No. 133992
213-482-0480

cc: Kimberly Monahan, Applicant
Geotechnologies, Inc., Project Consultant
LA District Office

Appendix E.3

Paleontological Resources Assessment

Paleontological Resource Evaluation and Impact Assessment for the Buena Vista Project, City of Los Angeles, California

Joseph J. El Adli



Technical Report 22-98
Statistical Research, Inc.
Redlands, California

Paleontological Resource Evaluation and Impact Assessment for the Buena Vista Project, City of Los Angeles, California

Joseph J. El Adli



Technical Report 22-98
Statistical Research, Inc.
Redlands, California

June 2025

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Paleontological Regulatory Environment

As part of the Buena Vista Project (Project), Statistical Research, Inc. (SRI), assessed the probability of subsurface paleontological resources within the Project parcels, following the California Environmental Quality Act (CEQA; *Public Resources Code* [PRC] 21000 *et seq*.) guidelines regarding paleontological resources. This investigation can be used to prepare the relevant documents in support of any further compliance documentation. The proposed Project is considered a "project" under CEQA and is subject to compliance with CEQA and the CEQA guidelines (14 *California Code of Regulations* [CCR] 15000 *et seq.*), as amended to date. The City of Los Angeles is the CEQA lead agency. CEQA mandates that lead agencies consider whether a proposed project will have an adverse effect on the environment and whether any such effect can be feasibly eliminated by pursuing an alternative course of action or can be mitigated to less than significant levels. CEQA recognizes that historical resources are part of the environment and that "a project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment" (PRC 21084.1).

The Guidelines for Implementation of the California Environmental Quality Act (14 CCR 15000 *et seq.*) define the persons, agencies, activities, and procedures required to comply with CEQA. These guidelines include, as an issue to be addressed within the CEQA Environmental Checklist, the question "would the project. . . .directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" (CEQA Guidelines Appendixes, Appendix G, Section VII[f]).

Further regulations and guidelines may be applicable or consulted for the purpose of protecting paleontological resources. At the federal level, Paleontological Resources Preservation Act of 2009 (16 *U.S. Code* [USC] 470aaa *et seq.*) was signed into law in 2009 by President Barrack Obama under the Omnibus Public Lands Management Act (Public Law 111-11 [2009]). This act directed the Department of the Interior and Department of Agriculture to implement comprehensive paleontological resource management plans in order to protect paleontological resources on federal lands. The secretaries of both departments were instructed to use "scientific principles and expertise" in order to "develop appropriate plans for inventory, monitoring, and the scientific and educational use of paleontological resources, in accordance with applicable agency laws, regulations, and policies. These plans shall emphasize interagency coordination and collaborative efforts where possible with non-Federal partners, the scientific community, and the general public" (16 USC 470aaa-1).

At the state level, California PRC 5097.5 provides protection for paleontological resources on public lands, where Section 5097.5(a) states

> a person shall not knowingly and willfully excavate upon, or remove, destroy, injure, or deface, any historic or prehistoric ruins, burial grounds, archaeological or vertebrate paleontological site, including fossilized footprints, inscriptions made by human agency, rock art, or any other archaeological, paleontological or historical feature, situated on public lands, except with the express permission of the public agency having jurisdiction over the lands.

The City of Los Angeles General Plan Conservation Element, adopted in September 2001, recognizes paleontological resources (Section 3: Archeological and Paleontological; City of Los Angeles 2001:II-3) and identifies protection of paleontological resources as an objective (City of Los Angeles 2001:II-5). The General Plan identifies site protection as important, stating "pursuant to CEQA, if a land development project is within a potentially significant paleontological area, the developer is required to contact a bona fide paleontologist to arrange for assessment of the potential impact and mitigation of potential disruption of or damage to the site" (City of Los Angeles 2001:II-5).

Finally, Los Angeles CEQA Thresholds Guide stipulates that the determination of significance for paleontological resources shall be made, on a case-by-case basis, by considering the following factors:

- whether, or the degree to which, the Project might result in the permanent loss of, or loss of access to, a paleontological resource, and
- whether the paleontological resource is of regional or statewide significance.

Geologic Setting

The City of Los Angeles is a sprawling, 1,295–km (500-square-mile) municipality in southern California encompassing portions of the San Fernando Valley, the Los Angeles Basin, and a corridor connecting to the Port of Los Angeles in San Pedro. Several independent cities and unincorporated sections of Los Angeles County are located within the larger boundaries of the City of Los Angeles, including the Cities of Santa Monica, Culver City, and Beverly Hills. The Project site is located roughly 0.5 km (0.3 miles) southwest of Dodgers Stadium, in the Chinatown neighborhood of the City of Los Angeles.

At the regional scale, the Project is situated within the Los Angeles Basin, at the northern edge of the Peninsular Ranges geomorphic province and immediately south of the Transverse Ranges geomorphic province (Figure 1). The terrestrial (i.e., unsubmerged) portion of the Peninsular Ranges Province is characterized by a series of elongated northwest–southeast-trending mountains (Yerkes et al. 1965). These mountain ranges are composed dominantly of plutonic igneous rocks (often granites and granitoids) of Cretaceous age (approximately 120–90 million years ago [Ma]) and older metamorphic rocks of Jurassic to earliest Cretaceous age (approximately 200–140 Ma) (Gastil 1975; Krummenacher et al. 1975; Walawender 2000). In the basins and valleys beneath these mountain ranges, these igneous and metamorphic basement rocks are often overlain by sedimentary deposits of late Mesozoic to Cenozoic age (approximately 90 Ma to 10 thousand years ago [ka]) (Tweet et al. 2014).

Structurally, the Los Angeles Basin is divided into four major blocks that are bounded and divided by fault zones. The Project lies within the Central Block, which is wedge shaped and approximately 80 km (50 miles) in greatest length (northwest–southeast). The sediments of the Central Block are relatively thick, especially at the western base of the Santa Ana Mountains, where sedimentary strata have been estimated at 9,754 m (32,000 feet) in thickness. These sediments are late Cretaceous to Pleistocene in age (approximately 90 Ma to 10 ka) and are occasionally interbedded with Miocene volcanics (Yerkes et al. 1965). Strata within the Central Block were laid down in a variety of marine and terrestrial depositional contexts, which has given rise to a rich fossil record for the region.

The Project parcels are located on the Los Angeles, California, 7.5-minute topographic quadrangle (Figure 2) at an elevation of approximately 91–107 m (300–350 feet) above mean sea level. In the vicinity of the Project, the modern land surface slopes steeply toward the north. The Hollywood Fault, a major tectonic boundary between the Peninsular Ranges and Transverse Ranges Provinces, is situated 6.1 km (3.8 miles) to the north-northwest of the Project area. Immediately north of this fault lies the easternmost portion of the east–west-trending Santa Monica Mountains.

The current California Geological Survey geologic map of the region (Campbell et al. 2014) shows the Project area within two geologic units: Unit 2 of the Young alluvium (Qya2) and Unit 1 of the Young alluvial-fan deposits (Qyf1) (Figure 3). These surficial deposits were derived through erosion (often aided by water) of local topographic features and are approximately late Pleistocene in age (more than 10,000 years old) (Bedrossian et al. 2012). Sediments of these alluvial deposits consist of friable silts to gravels, which can sometimes preserve portions of the original geomorphology of the alluvial fan (Campbell et al. 2014). The Young alluvium is considered by Campbell et al. (2014) to be late Pleistocene in age, whereas the Young alluvial-fan deposits are slightly younger, with a Holocene to late Pleistocene age. The Miocene–early-Pliocene-age Puente Formation (approximately 15–3.6 Ma) (Critelli et al. 1995) is mapped to the immediate north of the northeastern portion of the Project area by Campbell et al. (2014). However, older geologic maps by Dibblee and Ehrenspeck (1989) place these Miocene deposits within the Project area. The Puente Formation was confirmed to be at the surface within the Project area by a pedestrian field survey conducted by SRI in March 2022. A geotechnical report produced by Geotechnologies, Inc. (2025) also noted the Puente Formation beneath the alluvial deposits in the northeastern portion of the Project area.

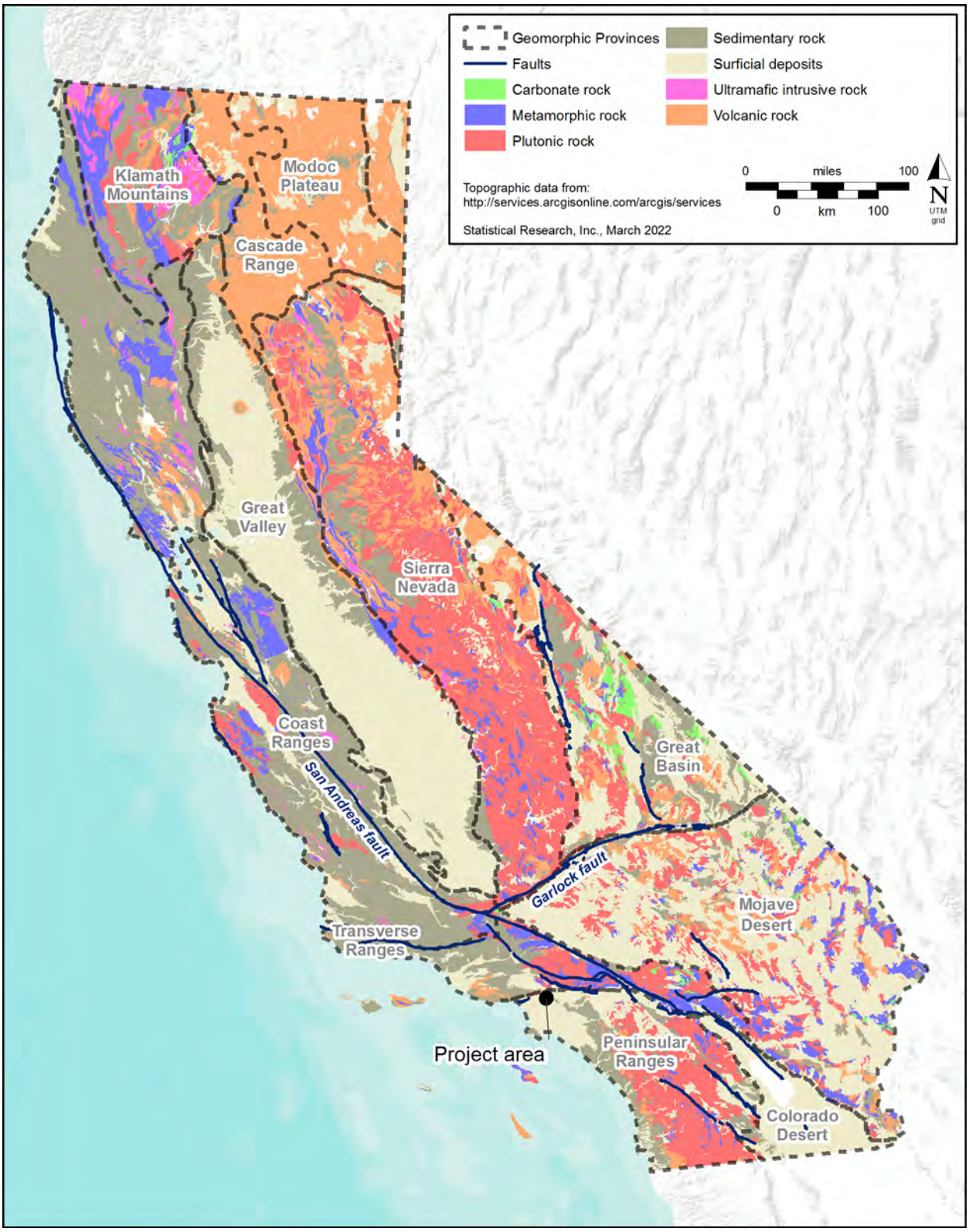

Figure 1. Geomorphic map.

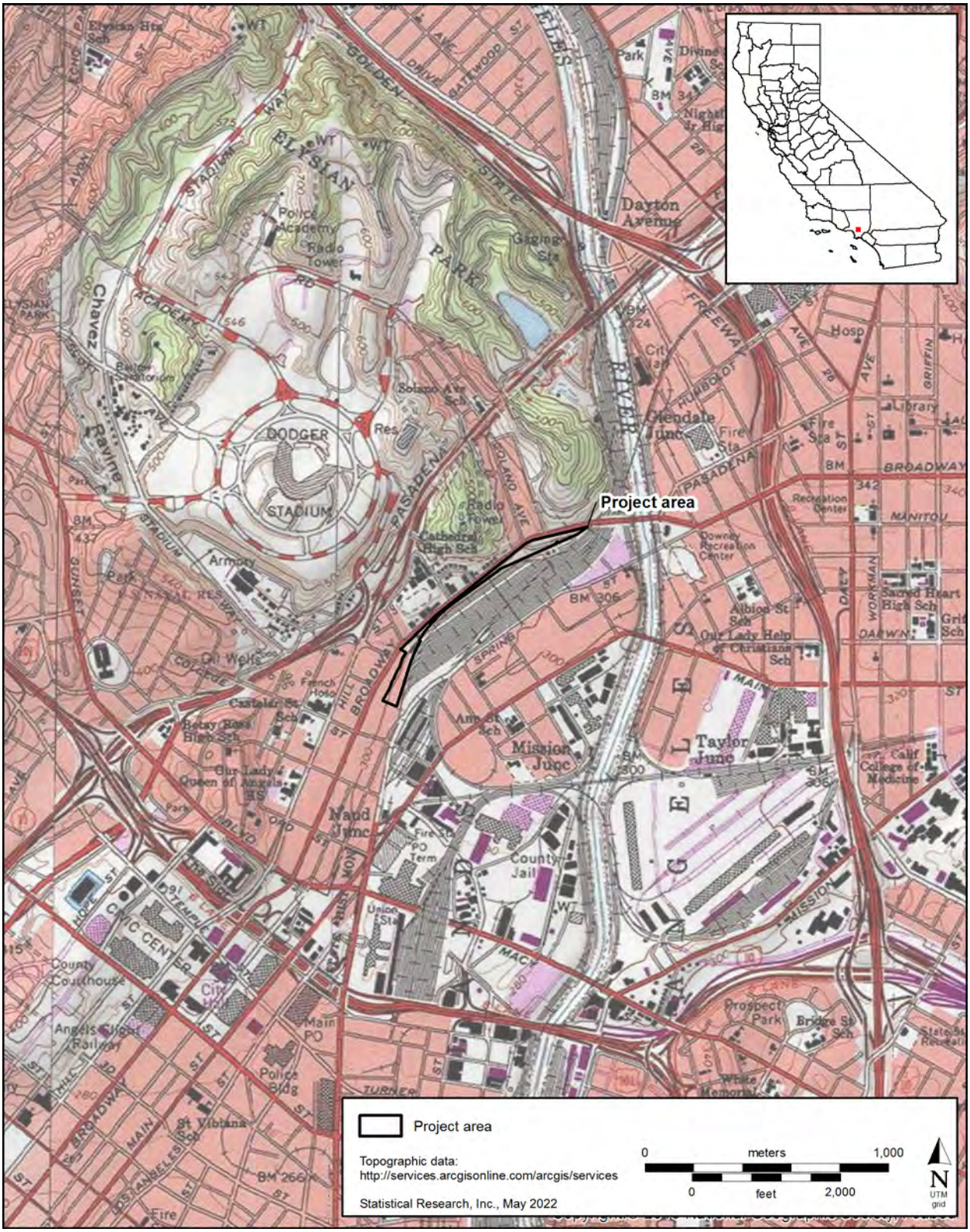

Figure 2. Location map of the Project.

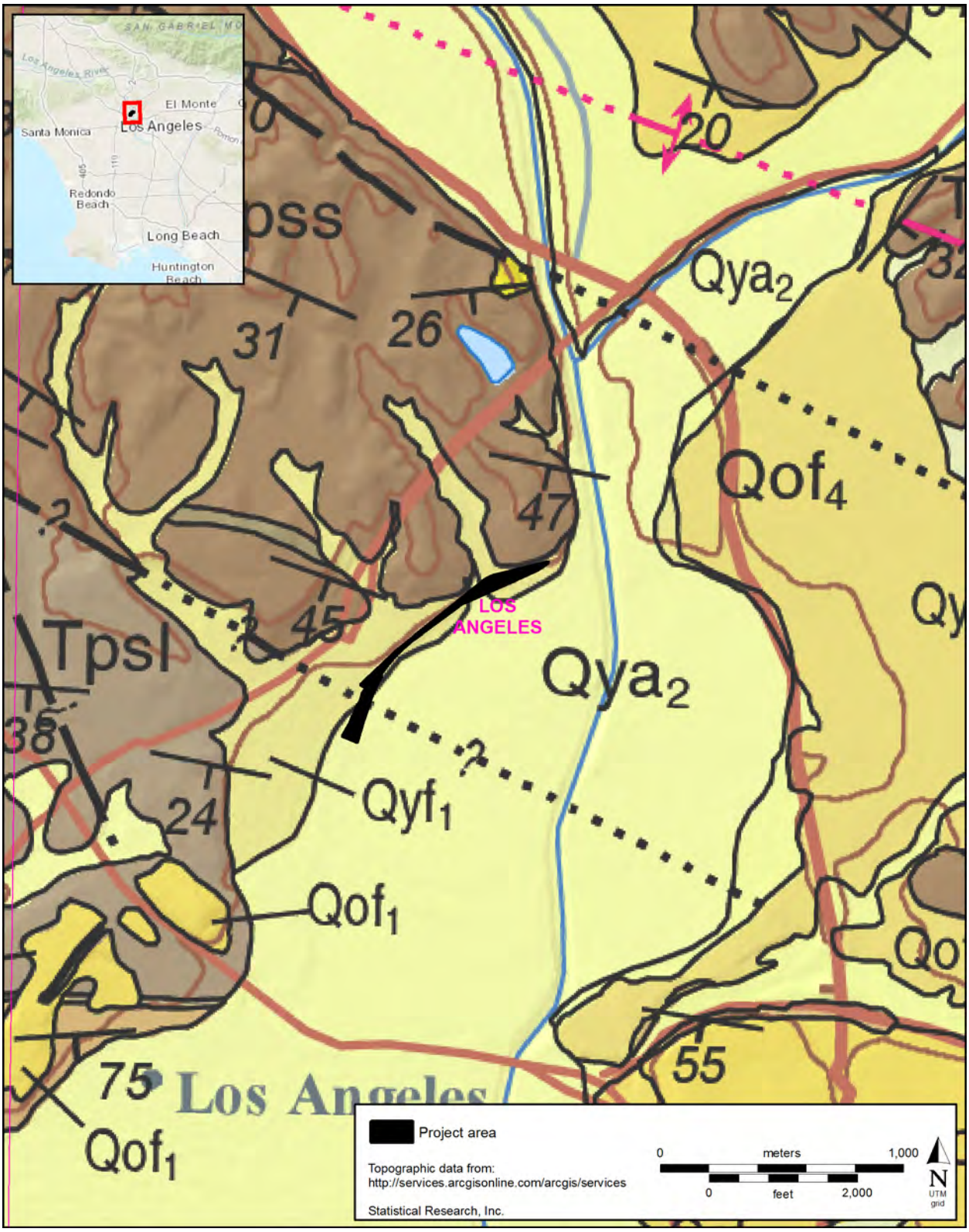

Figure 3. Geologic map.

Mapped Geologic Units

The current California Geological Survey geologic map of the region (Campbell et al. 2014; see Figure 3) shows the Project resting on sedimentary units classified as part of the Young alluvium (Qya2) and the Young alluvial-fan deposits (Qyf1). Geotechnical borings by Geotechnologies, Inc. (2025) and a pedestrian field survey by SRI noted that the Puente Formation also is present within the Project area. The following section provides a general overview of the types of geologic deposits located within the Project area (in order from oldest to youngest).

Puente Formation (Tpss)

A period of accelerated subsidence in the Los Angeles Basin starting in the late Miocene (ca. 11 Ma), coupled with a globally higher sea level, left much of the basin submerged under the Pacific Ocean (Hildenbrand et al. 2001). At this time, large volumes of terrigenous sediments (i.e., derived of material eroded from the land) were deposited in marine basins throughout the Los Angeles region, resulting in strata hundreds to thousands of meters thick. Sediments deposited in marine settings during this time include the Monterey, Modelo, and Puente Formations. Because of the similarities in time of deposition and in depositional setting, these formations have often been confused in the literature and on geologic maps. For example, the Miocene sediments exposed near the Project area were mapped by Dibblee and Ehrenspeck (1989) as sandstones and siltstones of the Monterey Formation (Tmss), and Campbell et al. (2014) mapped them as the unnamed sandstone unit of the Puente Formation (Tpss). We here use the nomenclature of the more recent Campbell et al. (2014) map for simplicity.

The Puente Formation is a late Miocene to early Pliocene (ca. 11.6 to 3.6 million years old) marine unit consisting of siltstones, sandstones, and shales. Sedimentological characteristics, as well as fossil composition, suggest that the Puente Formation represents the deposits of a submarine fan at bathyal-zone depths (Durham and Yerkes 1964). The Puente Formation has been subdivided into four formal members (from oldest to youngest: La Vida, Soquel, Yorba, and Sycamore Canyon), which represent the progradation of the submarine fan (Critelli et al. 1995; Krueger 1936). However, some exposures of the Puente Formation have not been assigned to a formal member throughout regions of the Los Angeles Basin.

Campbell et al. (2014) mapped the Puente Formation immediately to the north of the northeastern portion of the Project area but not within the Project boundary. However, bedrock corresponding to the Puente Formation was encountered at the surface during the pedestrian survey performed by SRI, as well as subsurficially during a geotechnical investigation (Geotechnologies, Inc. 2025). As mapped by Campbell et al. (2014), these sediments correspond to the late Miocene sandstone component of the Puente Formation, which have not been assigned to a formal member (Lamar 1970). Yerkes et al. (2005) described these sediments as

> well-bedded, very fine- to very coarse-grained sandstone; medium to light brown and light gray; mostly well cemented but less so in uppermost parts; local discoidal concretions; most abundant in lower part of formation [Campbell et al. 2014:34].

These sediments were documented by the geotechnical investigation as southwest-dipping, well-bedded yellowish brown, yellow, olive brown, and gray interbedded sandstones and siltstones. The pedestrian field survey performed by SRI further noted gypsum crystals and concretions within the unit. The Puente Formation was only documented (by both the pedestrian survey and geotechnical study) in the northeastern portion of the Project area.

Paleontological resources are well known form the Puente Formation and have produced remains of marine mammals, fish, sharks, birds, turtles, invertebrates, and plant material. In support of this Project, paleontologist Dr. Alyssa Bell conducted a search of the paleontological specimen and locality records held by the Vertebrate Paleontology Department of the Natural History Museum of Los Angeles County (NHMLA). On April 21, 2022, Dr. Bell provided a report of her findings. That report is summarized in the Results section below and provided in full as Appendix A.

Dr. Bell found no fossil vertebrate localities within the Puente Formation recorded in the NHMLA paleontology collection records that are directly within the Project footprint. Nonetheless, she identified several nearby localities that were found in sedimentary deposits similar to those underlying the Project area. As indicated in the records-search report (Appendix A), these deposits were identified within the Modelo and Monterey Formations. When comparing these localities to the Campbell et al. (2014) geologic map shows, it appears that they are within the same sediments as those underlying the Project area, as mapped. The fossil localities recovered during the records search included remains of fossil baleen whales (Mysticeti) and boney fish (Osteichthyes).

Alluvial Deposits (Qya2 & Qyf1)

Alluvial fans are cone- or fan-shaped deposits of sediment that form at the boundaries between areas of high and low topography. The detrital sediments of the alluvial fan are transported and deposited by gravity, wind, and (most often) water. Such features are common in mountainous regions of the world and, in tectonically active regions, alluvial fans can reach over 50 km (31 miles) in width and 60 km (37 miles) in length.

Quaternary alluvial deposits are extensively exposed throughout portions of the Los Angeles Basin and encompass most of the nonfill deposits beneath the Project area. These deposits have been subdivided into two units by relative age and geomorphology, based on geomorphic relationships and relative degree of soil formation (Campbell et al. 2014). The oldest of these deposits corresponds to Unit 2 of the Young alluvium (Qya2), which has been assigned a late Pleistocene age. The Young alluvium was mapped by Campbell et al. (2014) within a small portion of the northeastern and southwestern Project area (see Figure 3). Yerkes et al. (2005) described this unit as

> unconsolidated, generally friable, stream-deposited silt, sand and gravel on canyon floors; surfaces may show slight to moderate pedogenic soil development [Campbell et al. 2014:7].

The youngest and most extensive nonfill unit within the Project area is Unit 1 of the Young alluvial-fan deposits (Qyf1). This unit was assigned a Holocene to late Pleistocene age by Campbell et al. (2014) and Yerkes et al. (2005). As mapped, the Young alluvial-fan deposits are exposed throughout much of the northeastern, central, and southwestern portions of the Project area. Yerkes et al. (2005) described the Young alluvial-fan deposits as

> unconsolidated gravel, sand and silt, bouldery near mountain fronts; deposited chiefly from flooding streams and debris flows; surfaces can show slight to moderate pedogenic soil development [Campbell et al. 2014:7].

The general character of the alluvial deposits underlying the Project site was discussed in the geotechnical report produced by Geotechnologies, Inc. (2025). They recorded the composition and depth of sedimentological units observed under the Project area, resulting in a detailed stratigraphic cross section. The report produced by Geotechnologies, Inc. (2025) did not distinguish between the Young alluvium and Young alluvial-fan deposits, as was done by Campbell et al. (2014). Those authors instead consolidated the alluvium into a singular Quaternary alluvium unit (Qa) following the mapping of Dibblee and Ehrenspeck (1989). The alluvium encountered during the geotechnical investigation was described as dense to very dense dark brown, yellowish brown, and grayish brown sands and gravelly sands with a minor component of silty sands and clayey sands. The alluvium was determined to be thickest in the southwestern portion of the Project area where bore holes did not reach the base of the alluvium at a depth of 21 m (70 feet) below the surface. In the northeastern portion of the Project area, the alluvium ranged in thickness from 0 to 11 m (0 to 37.5 feet) and was often underlain by the Puente Formation.

Paleontologically significant finds of well-preserved, large-bodied land mammals have been found within the Pleistocene alluvial deposits throughout Los Angeles County, as well as in nearby Orange and

Riverside Counties (Jefferson 1991). These deposits have yielded remains of mammoths, mastodons, camels, bison, ground sloths, dire wolves, and American lions, among others. Plant remains, terrestrial invertebrates, and microfossils (especially micromammals) also have been found within similar deposits throughout the Los Angeles Basin (Miller 1971). However, both the Young alluvial deposits (Qya2) and the Young alluvial-fan deposits (Qyf1) may be too young to have produced significant paleontological resources near the surface, especially where these units are Holocene in age. As such, all fossil localities recovered by the NHMLA paleontological records search are within significantly older alluvial deposits, such as the late–middle Pleistocene Old alluvial-fan deposits (Qoa4).

Artificial Fill

Artificial fill materials are likely present immediately below the Project area. These sediments often range in grain size from silt to gravel and are generally poorly sorted. Such deposits are derived from prior construction activities and are thus not naturally forming. The geotechnical report for the Project documented the fill within the Project area as a dark brown, reddish brown, and light gray silty sand containing construction debris (Geotechnologies, Inc. 2025). The fill was dense to moderately dense and was moist where observed. Fill within the southern portions of the Project area range in thickness from 0.6 to 2.4 m (2 to 8 feet), whereas in the northern portions of the Project area that fill was exceptionally variable in thickness, ranging from 0.1 to 9.1 m (0.5 to 30 feet) in thickness. The thickest portions of the fill were noted near the intersection of Solano Street and North Broadway (previously Buena Vista Street) in association with an unpaved terrace. Because of the nature of the how artificial fill sediments are deposited, these units do not contain cultural or paleontological resources in their original context.

Mapped Soils Units

Soil Survey Geographic Database (SSURGO) soil-survey data reported a consociation of four soil units from three soil series and one soil order (Figure 4). Such consociations are generally composed of a multiple soil units but are often dominated by a single soil type to the extent that the less-common soils series are rarely observed. Therefore, the soil descriptions below focus primarily on the predominant soil series, because it makes up a significant majority of the mapped area underlying the Project area. A more detailed breakdown of the soil composition of mapped soil units is provided in Table 1, and a detailed description of each soil series is provided in Appendix B.

The SSURGO soil survey reported a single consociation of soils within the Project area, which was designated as “Urban land, commercial, 0 to 5 percent slopes.” This consociation is reported to be composed of approximately 90 percent Urban Land with 10 percent comprised of three other soil series. The Urban Land designation within this consociation indicates that the area has either been heavily disturbed by recent construction so no intact surficial soils are present or that the soils are currently covered by existing infrastructure. Such units should be considered as incomplete data within a soils map. The pedestrian survey of the Project area performed by SRI similarly did not encounter any intact soils within the Project area.

The remaining soils associated with the Urban Land, commercial, 0–5-percent slopes consociation were all in the soil order of Entisols. Entisols are soils that form in a generally aridic soil moisture regime that do not have a subsurface horizon (Soil Survey Staff 2014). These soils have an A horizon over pedogenically unaltered parent material (C horizon)—most commonly, stratified alluvium or aeolian sand. Entisols are generally considered to be “young” soils and are typically associated with deposits that aggraded during the latter half of the Holocene. Within the Project area, the SSURGO mapped primarily Typic Xerorthents with a much lesser concentration of the Hueneme and San Emigdio soil series. All of these soils represent weakly developed Entisols that develop on recently abandoned late Holocene and active or recently active alluvial fans and, to a lesser extent, stream terraces. These soils have developed in human-transported materials over stratified gravels and sandy alluvium derived from mixed granitic and sedimentary rock types.

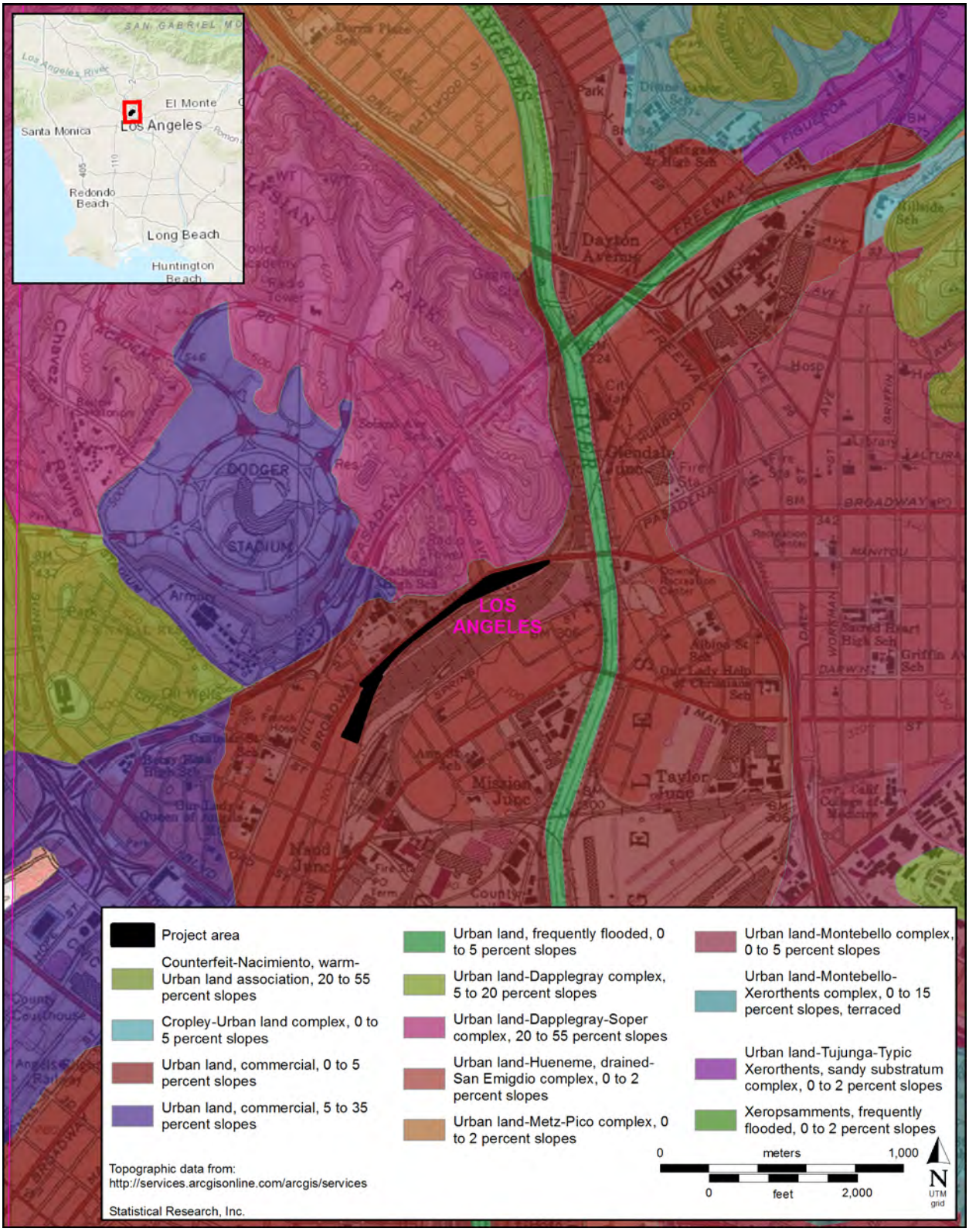

Figure 4. SSURGO soils map.

Table 1. SSURGO Map Unit Composition

Soil Series, by Soil Consociation	Percentage of Soil Consociation
Urban land, commercial, 0 to 5 percent slopes	
Urban Land[a]	90
Typic Xerorthents	8
Hueneme	1
San Emigdio	1

[a] Dominant soil series.

Methods

Project Personnel and Qualifications

The research and analysis reported in this document was conducted by SRI's Joseph J. El Adli, Ph.D., a qualified paleontologist and geologist meeting the Society of Vertebrate Paleontology's (SVP's) criteria for a Project Paleontologist/Principal Investigator and with extensive experience in southern California.

Paleontological Resource Assessment

To assess the potential for significant paleontological finds within the Project area, SRI requested a review of the paleontological specimen and locality records held by the Vertebrate Paleontology Department of the NHMLA. The search was conducted by Dr. Alyssa Bell, who provided a written report of her findings (Appendix A). The purpose of the records search was to identify all previously recorded paleontological remains and fossil localities discovered within the Project footprint and the surrounding area. Records of paleontological remains found in proximity to the Project and in the same geologic setting helped inform the paleontological potential of the Project site.

SRI conducted limited archival and background research focusing on the geologic setting and history of the Project vicinity and the identification of paleontological resources within and around the Project area, with the intent of identifying the subsurface paleontological potential of the Project parcels. Of particular importance to this effort was the review of topographic maps, geologic maps, published scientific literature, and published and unpublished technical literature. These materials were reviewed to identify the nature, extent, and potential significance of possible paleontological resources within the Project parcels and to determine the potential for Project elements to affect known or expected subsurface paleontological resources. Dr. El Adli reviewed all materials and provided an assessment of the paleontological sensitivity of the Project footprint.

Paleontological Resources and Significance Criteria

Paleontological resources (fossils) are the remains or trace remains (both physical and chemical) of prehistoric organisms (i.e., animals, plants, and microorganisms). These resources can be preserved as body fossils, such as bones, teeth, shells, and plant matter, or as trace fossils, such as burrows and footprints. Geologic deposits make up the context in which fossil remains were originally buried and provide information about the environment in which an organism lived. In the broadest sense, a fossil can be defined as any

remains documenting past life. Typically, to be considered of paleontological significance, fossils must be at least 10,000 years in age (i.e., dating from before the beginning of the modern Holocene). However, some early Holocene remains are also considered of paleontological interest, such as the specimens of the late-surviving woolly mammoths from Wrangel Island, which went extinct approximately 4,000 years before present. Alteration or replacement (e.g., permineralization or petrification) of the original organic material is not required for determination of whether or not an object is a fossil.

In general, paleontological resources are preserved in sedimentary rocks; however, they can occasionally be preserved in low-grade metamorphic rocks and can, on rare occasions, be preserved in volcanic rocks. Beyond acting as a vessel for the preservation of fossil remains, sedimentary strata record telltale information reflecting the environment in which they were deposited (e.g., sedimentary structures, maturity, and lithology). For example, fossil remains found within the fine-grained sediments of a floodplain deposit represent organisms that died and were later buried on an ancient floodplain. Because of the interwoven relationship between fossil remains and their geologic contexts, for the purpose of this report, paleontological resources can be thought of as also including fossil-collecting localities and the geological formations containing those localities.

Significant paleontological resources are defined by the SVP as identifiable vertebrate, invertebrate, plant, and trace fossils that provide taphonomic, taxonomic, phylogenetic, paleoecological, stratigraphic, or biochronological data (SVP 2010). These data are important for a multitude of scientific purposes, including examination of evolutionary relationships, understanding the development of biological communities and the interactions between organisms within them, and establishment of chronologies for geologic units (Scott and Springer 2003). Fossils are considered important scientific and educational resources because they serve as direct and indirect evidence of prehistoric life and are used to understand the history of life on Earth, the nature of past environments and climates, the membership and structure of ancient ecosystems, and the pattern and process of organic evolution and extinction. Fossils are considered to be limited, nonrenewable resources, because they typically represent organisms that are now extinct or life in a context that no longer exists. Therefore, if destroyed, a particular fossil can never be replaced, and the information associated with it is forever lost.

Paleontological-Resource Sensitivity

Currently, there are no specific agency guidelines for the assessment of paleontological-resource potential (i.e., "sensitivity"). So, any of three main sets of guidelines are used by most professional paleontologists in California for determining fossil sensitivity. The California Department of Transportation (2012) suggests a tripartite scale to characterize paleontological sensitivity that is composed of the ranks of no, low, and high, in order of increasing paleontological-resource sensitivity. The U.S. Department of the Interior Bureau of Land Management (BLM) developed a multilevel ranking system termed the Potential Fossil Yield Classification (PFYC) (BLM 2007, 2016 [update]). Under the PFYC system, geologic formations are ranked on a scale of 1–5 for paleontological sensitivity, based on the relative abundance of known vertebrate fossils and scientifically significant invertebrate or plant fossils. The final major set of guidelines was developed by the SVP. Among the three major guidelines, the SVP's (2010) Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources is the most favored by professional paleontologists, because of its detailed protocols for the assessment of paleontological-resource potential. For this assessment, SRI follows the SVP (2010) procedures for paleontological-resource assessment.

Under the SVP (2010) guidelines, geologic units are classified in one of four categories of paleontological-resource sensitivity: no, low, high, and undetermined. The criteria for each of these sensitivity categories are presented in Table 2.

In order to prevent project delays, the SVP highly recommends that the owner or developer retain a qualified professional paleontologist in the advance planning phases of a project in order to conduct an assessment and to implement paleontological mitigation during construction, as necessary.

Table 2. Society of Vertebrate Paleontology Paleontological Resource Sensitivity

Paleontological Potential	Criteria	Recommendations
High	Geologic formations that are known to yield vertebrate or significant invertebrate, plant, or tracefossils. Highly sensitive formations also may be those that are likely to produce new vertebrate materials, traces, or trackways.	A field survey as well as onsite construction monitoring is required. Any significant specimens discovered will require preparation, identification, and curation, as well as eventual accession into an appropriate museum collection. A final report documenting the significance of any finds is required.
Low	Geologic formations that have yielded few fossils in the past, based upon review of available literature and museum collections records. Low potential also may include formations that yield fossils only under unusual circumstances. This also includes formations that, based on their relative youthful age or high-energy depositional history, are unlikely to produce important fossil remains.	Mitigation is not typically required.
No	Geologic formations that are formed under or exposed to immense heat and pressure, such as high-grade metamorphic rocks and plutonic igneous rocks. Artificial fill materials also are assigned as having no potential because of the loss of stratigraphic context of any contained organic remains.	No mitigation is required.
Undetermined	Geologic formations for which available literature on paleontological resources is scarce, making it difficult to determine whether or not it is potentially fossiliferous. Under these circumstances, further study is needed to determine the unit's paleontological resource potential (i.e., field survey).	A field survey is required to further assess the unit's paleontological potential.

Note: Modified from Society of Vertebrate Paleontology (2010).

Paleontological resources are potentially disturbed during construction activities, specifically ground-disturbing activities such as mass grading of geologic units where fossils are potentially buried. If a project area is determined to have high or undetermined potential for paleontological resources, then a paleontological-resource mitigation plan must be developed prior to construction activities and implemented during the construction phase of a project. This mitigation plan describes when and where paleontological monitoring will take place and establishes the protocols that will be followed in the event an unanticipated fossil discovery is made during project development (e.g., preconstruction discoveries or discoveries from geologic units where monitoring was not required). The mitigation plan is prepared by a qualified professional paleontologist, based on the results of the initial paleontological assessment and survey.

Paleontological Resource Assessment

Paleontological Records Search

A records search at the NHMLA was conducted on April 2, 2022, by staff of the Vertebrate Paleontology Collection. Their report is provided in full in Appendix A. The records search found no previously recorded vertebrate fossil locality directly underlying the Project site. However, multiple Los Angeles County Museum of Natural History (LACM) vertebrate fossil localities (LACM VP 1023, 1880, 2032, 3882, 6934, and 7507) were found within a 3-mile radius of the Project footprint. These localities are reported from

multiple geologic units, such as the Monterey and Modelo Formations, as well as an unnamed Pleistocene deposit. These geologic units are not explicitly mapped within the Project area on modern geologic maps. However, when the location of these localities are compared to geologic maps by Campbell et al. (2014) and Yerkes et al. (2005), they fall into areas mapped similarly to geologic units within the Project area. LACM VP 6934 and 7507 were noted to be within in the Monterey Formation, a Miocene marine deposit known for producing fossil marine vertebrates. These localities contained the remains of a baleen whale (Mysticeti) and bony fish (*Thyrsocles kriegeri*). Both localities were mapped by Campbell et al. (2014) within the sandstone unit of the Puente Formation. Localities LACM VP 1880 and 3882 were noted to be within the Modelo Formation, a fossiliferous Miocene marine deposit. Fossils discovered from these localities included the holotype specimen of the baleen whale *Mixocetus elysius* and remains of bony fish (cf. Osteichthyes). As with the specimens identified as from the Monterey Formation, these specimens have been mapped within the sandstone unit of the Puente Formation by Campbell et al. (2014). Finally, LACM VP 1023 and 2032 were discovered in an unnamed Pleistocene deposit (likely alluvial) and contained remains of sabertooth cat (*Smilodon*), horse (*Equus*), deer (*Odocoileus*), and turkey (*Meleagris*). The geologic map by Campbell et al. (2014) placed these Pleistocene localities within Unit 4 of the Old Alluvial-fan deposits, which were not mapped as outcropping within the Project area.

Field Survey

A pedestrian field survey was conducted on March 14, 2022, by two SRI paleontologists: Dr. Joseph El Adli and a paleontological technician. All portions of the Project area were surveyed, but special attention was paid to portions of the Project area where deeper excavations were expected during Project construction (i.e., the northeastern and southwestern portions of the Project area) and where exposures of the Puente Formation may be present within the Project area (i.e., the northeastern portion of the Project area). Where possible, exposed native sediments were documented by the field crew.

Much of the southwestern portion of the Project area has been previously developed and is covered by asphalt and existing structures. Exposed sediments within this area are composed entirely of artificial fill deposits (presumably) overlying native alluvial deposits. Historical-period cultural materials were noted buried within the artificial-fill deposits in the southwestern portion of the Project area, including a portion of the Zanja Madre. The depth of this artificial fill could not be assessed during the pedestrian survey, but the geotechnical reported produced by Geotechnologies, Inc. (2025) suggested that native alluvium may be buried beneath the fill at depths of 0.9–2.4 m (3–8 feet) below the surface. However, no vestiges of the underlying alluvium were noted within this portion of the Project area during the survey.

The central portion of the Project area is composed of a narrow strip of land that steeply slopes up toward the northwest. This area was heavily covered in vegetation, making observation of the underlying sediments difficult. Where visible, sediments were composed of artificial-fill materials redeposited downslope as a loose talus. As with the southwestern portion of the Project area, the artificial-fill materials likely overlie intact native alluvium at depth. However, such alluvium was not observed during the pedestrian survey. The geotechnical report produced by Geotechnologies, Inc. (2025) suggested that the contact between the alluvium and artificial fill is highly variable and ranges from 0.6 m (2 feet) to greater than 4.3 m (14 feet) below the surface.

Portions of the northeastern part of the Project area previously have been graded, although this area is not covered by extant structures or asphalt. Aside from the graded portions (where it is horizontally flattened), the terrain of the northeastern portion of the Project area steeply slopes up to the north toward Buena Vista Hill. This was the only portion of the Project area where intact native sediments were observed by the field crew. The sandstones and siltstones of the Puente Formation were noted across several outcrops in the northeasternmost portion of the Project area, where the steep hillslopes give rise to vertical exposures. The sediments of the Puente Formation are tilted to the southwest and overlain by artificial-fill deposits across an angular unconformity. It was unclear from field observation whether these fill deposits simply cover the Puente Formation as a veneer across the landscape or if they are thickly overlying the unit. The geotechnical report produced by Geotechnologies, Inc. (2025) documented the fill as less than 0.9 m (3 feet) thick in the area but also noted that the Puente Formation may also be encountered beneath native alluvial deposits at greater depths (>6 m [>20 feet]) beneath

the northeastern portion of the Project area. Regardless, the Puente Formation is present within the northeastern portion of the Project area at surface or near-surface depths. No intact soils were noted within any portion of the Project area. No paleontological resources were observed within the Puente Formation. Furthermore, no redeposited fossils were noted within the artificial-fill deposits across the site.

Site-Specific Paleontological Sensitivity

The Project area is underlain by geologic units that are known to contain paleontological resources. Within sensitive geologic units, paleontological resources may be encountered at the surface to below the base of proposed Project construction. Using the SVP (2010) system of paleontological sensitivity classification, each geologic unit was assigned a sensitivity of high, low, or none, based on age, lithology, depositional environment, regionally known fossil localities from similar geologic units, and the results of the NHMLA records search. These results are summarized in Table 3 and Figure 5.

Two geologic units within the Project area were assigned a high paleontological sensitivity: the Miocene Puente Formation (Tpss) and Unit 2 of the Young alluvium (Qya2). Although no localities have been identified within the Project footprint, the known significant fossil finds from the Puente Formation and the richness of nearby localities with similar depositional regimes and geologic ages is indicative of the high fossil sensitivity for this unit. Alluvial deposits are known to produce remains of significant paleontological resources across the Los Angeles Basin (Miller 1971). Given the assignment by Campbell et al. (2014) of a late Pleistocene age for the Young alluvium, this unit combines both the potential to contain buried fossil remains and the requisite age to contain fossil materials. Given these factors, both the Puente Formation and Unit 2 of the Young alluvium were assigned a high paleontological potential. Therefore, any excavation into the Puente Formation or Young alluvium has the potential to encounter significant vertebrate fossil remains. Both of these units only outcrop within the northeastern portion of the Project area in association with construction on the North Parcel. These units outcrop at or near the surface within this area. Neither the Puente Formation nor the Young alluvium were discovered at proposed construction depths associated with the South Parcel, according to the geotechnical report prepared for the Project (Geotechnologies, Inc. 2025). However, if excavations in the South Parcel extend below the proposed depths, the Young alluvium may be encountered during construction.

Unit 1 of the Young alluvial-fan deposits (Qyf1) was assigned a low paleontological-resource potential despite the potential for alluvial deposits, regionally, to produce significant paleontological resources (Miller 1971). This assignment of low was based on the Holocene age of the unit, which is too young to produce fossil remains. Generally, any paleontological resources contained within such young deposits would have been redeposited from older geologic units and would therefore not be in their original context. However, it is possible that the Young alluvial-fan deposits could contain in situ paleontological resources at depth. Should paleontological resources be discovered during construction, a qualified paleontologist should examine the material and, if determined to be in situ, the Young alluvium should be treated as high paleontological potential for the remainder of the Project. The Young alluvium is primarily present within the southwestern and central portions of the Project area and would primarily be impacted during construction within the South Parcel.

Table 3. Geologic Units within the Project Area and Their Paleontological Potential

Unit	Map Abbreviation	Age	Paleontological Potential
Artificial fill	af	recent	no
Young alluvial-fan deposits, Unit 1	Qyf1	Holocene to late Pleistocene	low
Young alluvium, Unit 2	Qya2	late Pleistocene	high
Puente Formation	Tpss	late Miocene to early Pliocene	high

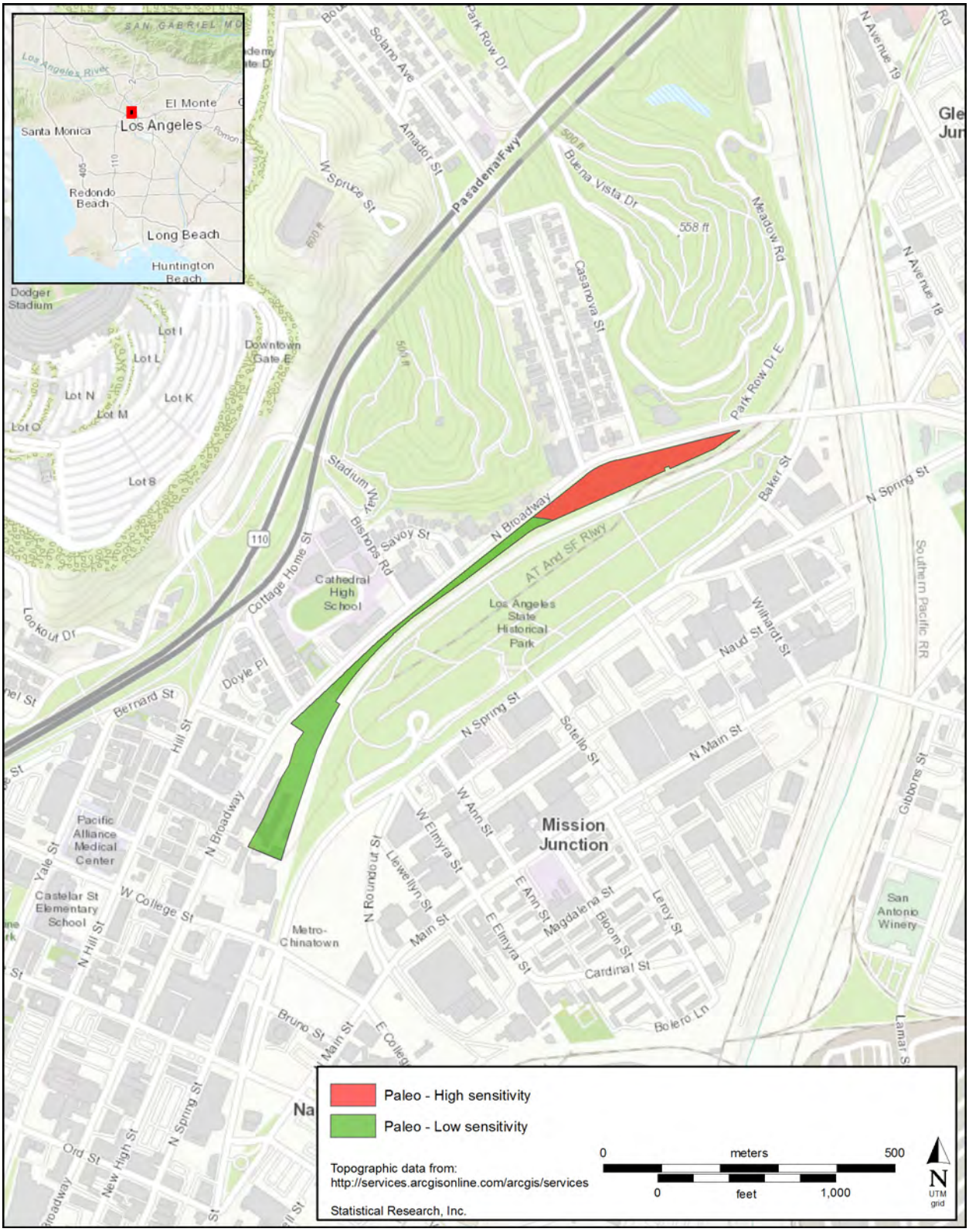

Figure 5. Paleontological-sensitivity map.

The artificial-fill deposits were assigned no paleontological-resource potential within the Project area. These disturbed fill sediments could potentially contain fossil materials that were unintentionally introduced during earlier excavations. However, such fossil materials would be removed from their original geologic and stratigraphic contexts and thus would not be of paleontological interest or significance. Artificial-fill materials are thus assigned as having no paleontological-resource sensitivity, and monitoring of such deposits is not required.

Paleontological Resources

Field survey; the locality records search; and background research, including analysis of geologic and topographic maps, aerial photographs, and recent published and unpublished literature, has resulted in an understanding of the Project site and the areas within it where subsurface paleontological resources might remain undisturbed. The Project site (at the depths associated with proposed construction) is underlain by four primary geologic units: the Miocene Puente Formation (Tpss; high paleontological potential), Unit 2 of the Young alluvium (Qya2; high paleontological potential), Unit 1 of the Young alluvial-fan deposits (Qyf1; low paleontological potential), and artificial fill deposits (af; no paleontological potential). The artificial fill is present at the surface across most of the Project area (except in the northeastern portion of the Project area where the Puente Formation is exposed at the surface) and is variable in thickness.

In the South Parcel, the artificial fill overlies the Young alluvium (Qya2) and Young alluvial-fan deposits (Qyf1) to depths between 0.6 and 2.4 m (2 and 8 feet) below the surface. Proposed construction depths for the Project would only impact these intact alluvial deposits during excavations for the three parking levels associated with Building 2 of the South Parcel. However, these excavations would occur in the Young alluvial-fan deposits, which are assigned a low paleontological-resource sensitivity. Therefore, construction on the South Parcel is not likely to impact significant paleontological resources.

In the North Parcel, the artificial fill is variable in thickness and overlies the Puente Formation, Young alluvium, and Young alluvial-fan deposits to depths between 0.1 and 9.1 m (0.5 and 30 feet) below the surface. Proposed construction depths in this area would penetrate the artificial fill across the area and extend into the underlying Young alluvium and Puente Formation; both are assigned a high paleontological-resource potential. Proposed excavations would especially impact the Puente Formation during excavations associated with the North Building, where the Puente Formation was observed to outcrop at the surface. Such excavations would extend into paleontologically sensitive geologic units and could displace paleontologically significant fossil resources. Therefore construction, as proposed, on the entirety of the North Parcel is likely to impact geologic units that may contain buried paleontological resources.

Recommendations

The results of our research indicate that the North Parcel within the Project area has a high sensitivity for the presence of buried paleontological resources immediately below the ground surface and to a depth of at least 70 feet. Sediments associated with Puente Formation and Unit 2 of the Young alluvium are known to produce important fossil discoveries, and thus proposed construction activities associated with the Project have a great potential to negatively affect paleontological resources. Fossil remains found within the Project area could provide important information about the prehistory of the region.

The Project area is underlain by alluvial and marine deposits that are sensitive for buried paleontological remains dating to the late Pleistocene and Miocene (see Figure 4). The geotechnical report (Geotechnologies, Inc. 2025) and the NHMLA records search (see Appendix A) conducted for the Project suggest that artificial-fill deposits are likely to be found at shallow depths below the existing grade and structures and that they overlay undisturbed geologic units of high paleontological-resource potential (i.e., the Puente Formation and Young alluvium) at construction depths associated with the North Parcel. Therefore, proposed Project excavations in the North Parcel may disturb late Pleistocene alluvial deposits and Miocene marine deposits and the paleontological resources that they may contain. This includes the entirety of the

North Parcel below the artificial fill (of varied thickness) and where the Puente Formation outcrops at the surface. No geologic units assigned a high paleontological sensitivity are expected to be encountered within the South Parcel at proposed construction depths.

The collected data indicate that there is a potential to encounter paleontologically significant remains during Project construction of the North Parcel, particularly at depths greater than a few feet below grade where Young alluvium and the Puente Formation may be encountered or where the Puente Formation outcrops at the surface. SRI recommends that a comprehensive paleontological resource monitoring and treatment plan be prepared and implemented prior to any Project ground disturbance as a mitigation measure in the event that paleontological discoveries are made during construction. The following recommendations regarding paleontological resources, developed in accordance with SVP (2010) guidelines, satisfy the requirements for mitigating damage to paleontological remains under CEQA.

Recommended Mitigation Measures

Expected construction will likely involve excavation below previously excavated depths in the North Parcel, which could destroy any paleontological resources present below the depth of such prior excavation. The following mitigation measures would reduce the potential impact to such resources to a less than significant level as required under CEQA.

Mitigation Measure 1

The services of a Qualified Professional Paleontologist who meets Society of Vertebrate Paleontology ([SVP] 2010) standards, shall be retained prior to ground disturbance activities associated with Project construction in order to develop a site-specific Paleontological Resource Mitigation and Treatment Plan. As defined by SVP (2010), a Qualified Professional Paleontologist, also Principal Investigator, or Project Paleontologist, is described as:

> "a practicing scientist who is recognized in the paleontological community as a professional and can demonstrate familiarity and proficiency with paleontology in a stratigraphic context. A paleontological Principal Investigator shall have the equivalent of the following qualifications:
>
> 1. A graduate degree in paleontology or geology, and/or a publication record in peer reviewed journals; and demonstrated competence in field techniques, preparation, identification, curation, and reporting in the state or geologic province in which the project occurs. An advanced degree is less important than demonstrated competence and regional experience.
> 2. At least two full years of professional experience as assistant to a Project Paleontologist with administration and project management experience; supported by a list of projects and referral contacts.
> 3. Proficiency in recognizing fossils in the field and determining their significance.
> 4. Expertise in local geology, stratigraphy, and biostratigraphy.
> 5. Experience collecting vertebrate fossils in the field."

The Paleontological Resource Mitigation and Treatment Plan shall specify the levels and types of mitigation efforts based on the types and depths of ground disturbance activities and the geologic and paleontological sensitivity of the Project Site. The Paleontological Resource Mitigation and Treatment Plan shall also include a description of the professional qualifications required of key staff, communication protocols during construction, fossil recovery protocols, sampling protocols for microfossils, laboratory procedures, reporting requirements, and curation provisions for any collected fossil specimens. A Worker Environmental Awareness Program (WEAP) shall be conducted at the preconstruction meeting for the Project.

The Qualified Professional Paleontologist shall supervise a Qualified Paleontological Resource Monitor who shall monitor all ground disturbance activities within high sensitivity deposits (i.e., Puente Formation and Unit 2 of the Young alluvium) in order to identify potential paleontological remains. As defined

by the SVP (2010), a Qualified Paleontological Resource Monitor has the following qualifications (or their equivalent):

1. BS or BA degree in geology or paleontology and one year experience monitoring in the state or geologic province of the specific project. An associate degree and/or demonstrated experience showing ability to recognize fossils in a biostratigraphic context and recover vertebrate fossils in the field may be substituted for a degree. An undergraduate degree in geology or paleontology is preferable, but is less important than documented experience performing paleontological monitoring, or
2. AS or AA in geology, paleontology, or biology and demonstrated two years of experience collecting and salvaging fossil materials in the state or geologic province of the specific project, or
3. Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in the state or geologic province of the specific project.
4. Monitors must demonstrate proficiency in recognizing various types of fossils, in collection methods, and in other paleontological field techniques.

In the event of the discovery a paleontological resource, the paleontological monitor has the authority to divert and/or re-direct ground-disturbing activities in the area of the find and rope off a protective barrier of at least 50 feet to evaluate the unanticipated find.

If significantly disturbed deposits or younger deposits too recent to contain paleontological resources are encountered during construction, the Qualified Professional Paleontologist may reduce or curtail monitoring in those affected areas, after consultation with the Applicant and the Los Angeles Department of City Planning's Office of Historic Resources.

Post-construction, a report shall be prepared detailing paleontological resources discovered during construction. The paleontological resources must be prepared, identified, curated, and donated to a repository, such as the Natural History Museum of Los Angeles County or the La Brea Tar Pits and Museum. All discovered fossils shall be handled and deposited consistent with the Paleontological Resource Mitigation and Treatment Plan.

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Paleontological Records Search

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NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Research & Collections

e-mail: paleorecords@nhm.org

April 2, 2022

Statistical Research, Inc.

Attn: Joseph J. El Adli

re: Paleontological resources for the Buena Vista Project

Dear Joseph:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for proposed development at the Buena Vista project area as outlined on the portion of the Los Angeles USGS topographic quadrangle map that you sent via e-mail on March 17, 2022. We do not have any fossil localities that lie directly within the proposed project area, but we do have fossil localities nearby from the same sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

The following table shows the closest known localities in the collection of the Natural History Museum of Los Angeles County (NHMLA).

Locality Number	Location	Formation	Taxa	Depth
LACM VP 7507	Near intersection of San Fernando Rd. & Humbolt St.	Monterey Formation	Fish (*Thyrsocles kriegeri*)	31-32 m bgs (collected during excavations of the Humboldt Street Sewer Shaft)
LACM VP 1880	3320 Seymour St., W of Mt. Washington	Modelo Formation (orange shale)	Fish (Osteichthyes)	surface
LACM VP 3882	Steep hill near 527 Lincoln Park Avenue	Modelo Formation	Baleen whale (*Mixocetus elysius* holotype)*	Unknown
LACM VP 1023	Workman & Alhambra Sts	Unknown Formation (Pleistocene)	sabertooth cat (*Smilodon*), horse (*Equus*), deer (*Odocoileus*), Turkey (*Meleagris*)	Unknown (excavations for storm drains)
LACM VP 2032	Los Angeles Brickyard Mission Rd. & Daly St.	Unknown formation (Pleistocene, silt & clay)	Mastodon (*Mammut*)	20-35 feet bgs
LACM VP	Along the slope	Monterey Formation	Baleen whale *(Mysticeti*)	found in hillslope

6934	between Quail Drive & Pheasant Drive; E of Mt Washington Elementary School	(yellowish tan siltstone)	rubble

VP, Vertebrate Paleontology; IP, Invertebrate Paleontology; bgs, below ground surface

This records search covers only the records of the NHMLA. It is not intended as a paleontological assessment of the project area for the purposes of CEQA or NEPA. Potentially fossil-bearing units are present in the project area, either at the surface or in the subsurface. As such, NHMLA recommends that a full paleontological assessment of the project area be conducted by a paleontologist meeting Bureau of Land Management or Society of Vertebrate Paleontology standards.

Sincerely,



Alyssa Bell, Ph.D.
Natural History Museum of Los Angeles County

enclosure: invoice

Soil Series Descriptions

Hueneme Series

The Hueneme soils have grayish brown, loamy fine sand and light sandy loam, moderately alkaline A horizons and stratified, grayish brown, light brownish gray and light gray, calcareous C horizons of sandy loams through sands with thin silt layers, mottled, and containing segregated gypsum.

TAXONOMIC CLASS: Coarse-loamy, mixed, superactive, calcareous, thermic Oxyaquic Xerofluvents

TYPICAL PEDON: Hueneme sandy loam - lemon grove (Colors are for dry soil unless otherwise noted.)

Ap1--0 to 2 inches; Grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, nonsticky, nonplastic; few very fine roots; many very fine interstitial and very few fine tubular pores; moderately alkaline (pH 8.0); abrupt smooth boundary. (1 to 3 inches thick)

Ap2--2 to 9 inches; Grayish brown (10YR 5/2) light sandy loam, very dark grayish brown (10YR 3/2) moist; massive (compacted by tillage); hard, friable, nonsticky, nonplastic; few fine and very fine roots; many very fine interstitial pores; slightly effervescent, lime disseminated; moderately alkaline (pH 8.0); clear smooth boundary. (4 to 8 inches thick)

A13--9 to 17 inches; Grayish brown (2.5Y 5/2) light sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, nonsticky, slightly plastic; few fine and very fine roots; many very fine interstitial and few fine tubular pores; strongly effervescent, lime disseminated; moderately alkaline (pH 8.2); gradual smooth boundary. (6 to 15 inches thick)

C1--17 to 23 inches; Grayish brown (2.5Y 5/2) light sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, nonsticky, slightly plastic; few fine and very fine roots; many very fine interstitial and common very fine and few fine tubular pores; many gypsum segregations; violently effervescent, lime disseminated and segregated into soft masses; moderately alkaline (pH 8.2); gradual wavy boundary. (4 to 12 inches thick)

C2--23 to 37 inches; Grayish brown (2.5Y 5/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; common fine distinct mottles of light gray (2.5Y 7/2), pale yellow (2.5Y 7/3) moist; massive; soft, very friable, nonsticky, nonplastic; few fine and very fine roots; many very fine interstitial and common very fine and fine tubular pores; very few gypsum segregations; violently effervescent, lime disseminated, and segregated into soft masses; moderately alkaline (pH 8.2); abrupt smooth boundary. (10 to 20 inches thick)

C3--37 to 41 inches; Light gray (2.5Y 7/2) sandy loam, grayish brown (2.5Y 5/2) moist; many fine faint mottles of light gray (2.5Y 7/2), pale yellow (2.5Y 7/3) moist; massive; hard, friable, slightly sticky, slightly plastic; many very fine interstitial and common fine and very fine tubular pores; many gypsum segregations; violently effervescent, lime disseminated and segregated into soft masses; moderately alkaline (pH 8.2); clear smooth boundary. (0 to 6 inches thick)

C4--41 to 65 inches; Light gray (2.5Y 7/2) sand, grayish brown (2.5Y 5/2) moist; many fine faint mottles of light gray (2.5Y 7/2), pale yellow (2.5Y 7/3) moist; single grained; loose dry and moist; nonsticky, nonplastic; many very fine interstitial pores; strongly effervescent, lime disseminated; moderately alkaline (pH 8.2); clear smooth boundary. (18 to 30 inches thick)

C5--65 to 70 inches; Light brownish gray (2.5Y 6/2) stratified silt and sand, dark grayish brown (2.5Y 4/2) moist; many large prominent mottles of reddish yellow (7.5YR 6/6), strong brown (7.5YR 4/6) moist; weak thin platy structure (layered); soft, friable, slightly sticky, slightly plastic; many very fine interstitial and few very fine tubular pores; strongly effervescent, lime disseminated and segregated into soft masses; moderately alkaline (pH 8.4).

TYPE LOCATION: Ventura County, California; approximately 1,300 feet south and 1,000 feet east of the intersection of Hueneme Road and Nauman Road.

RANGE IN CHARACTERISTICS: These soils have A horizons that are darkened by organic matter, but they are stratified and the organic matter decreases irregularly with depth. There are few rock fragments, generally less than 10 percent gravel. The soils are saturated, unless drained, to within 20 to 40 inches of the surface during part of the winter and spring or longer. Some mottling is present above a depth of 40 inches. Gypsum segregations and a few small brown concretions may or may not be present. The soils are usually moist all the time in some or all parts between depths of 8 and 24 inches from early December until about mid May. The same section is dry all the time, unless irrigated, from about June until November. The mean summer soil temperature is about 67 degrees F., the mean winter soil temperature is about 56 degrees F., and the mean annual soil temperature about 64 degrees F. The A horizon is grayish brown or light brownish gray in hue of 10YR or 2.5Y. It is mildly to moderately alkaline and the immediate surface may be calcareous or noncalcareous. All parts of the 10 to 20 inch zone and below are calcareous. Some or all parts of the A horizon are hard and massive when dry. The C horizon is light gray, light brownish gray, or light olive gray in 10YR or 2.5Y hue. It is stratified sandy loam or loamy sand and averages sandy loam in the 10 to 40 inch section with about 10 to 15 percent clay. Thin silty or sandy strata are commonly present.

COMPETING SERIES: These are the Bishop, Camarillo, Dello, Grangeville, Hilmar, Lang, Laugenour, Maria, Piper, and Tyndall series. Bishop soils have mollic epipedons and a mean soil temperature of less than 59 degrees F. Camarillo soils have more than 18 percent clay. Grangeville soils have mollic epipedons. Dello and Lang soils are sand or loamy sand through the 10 to 40 inch section. Hilmar soils are loamy sand in the upper part of the 10 to 40 inch section and loam in the lower part. Maria soils are high in silt and have more than 18 percent clay. Piper, Laugenour, and Tyndall soils have mottles and other evidence of poor drainage above a depth of 20 inches.

SETTING: Hueneme soils are in nearly level alluvial plains and basins in stratified alluvium derived from alkaline sedimentary sources. These soils are at elevations from near sea level to approximately 1,000 feet in a dry subhumid, mesothermal climate having a mean annual rainfall of about 15 inches with cool, rainless, foggy summers and cool, moist winters; an average January temperature of about 53 degrees F., an average July temperature of about 67 degrees F., a mean annual temperature of 60 degrees F.; and a frost-free season of about 275 to 365 days.

PRINCIPAL ASSOCIATED SOILS: These are the Anacapa, Cropley, Mocho, and Sorrento soils and the competing Camarillo soils. Anacapa, Mocho, and Sorrento soils all lack mottles above a depth of 40 inches and are in slightly higher positions. Cropley soils are fine textured.

DRAINAGE AND PERMEABILITY: Natural drainage is poor although many areas have been artificially drained. Undrained areas may have seasonal water table as high as 20 to 40 inches in wet years. Runoff is slow or very slow. Permeability is moderately rapid. Unless protected, these soils are subject to periodic flooding. Original amounts of salt were variable due to flooding and flushing.

USE AND VEGETATION: The principal uses are for vegetables and lemons. Originally, vegetation consisted of salt-tolerant grasses and forbs in most areas.

DISTRIBUTION AND EXTENT: Coastal plains and valleys in southern California. The soils are of moderate extent in MLRA 19.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Ventura County, California, 1971.

REMARKS: The Hueneme series was formerly classified in the Alluvial soils.

San Emigdio Series

The San Emigdio series consists of very deep, well drained soils that formed in dominantly sedimentary alluvium. San Emigdio soils are on fans and floodplains and have slopes of 0 to 15 percent. The mean annual precipitation is about 15 inches and the mean annual air temperature is about 62 degrees F.

TAXONOMIC CLASS: Coarse-loamy, mixed, superactive, calcareous, thermic Typic Xerofluvents

TYPICAL PEDON: San Emigdio fine sandy loam, grassland, formerly cultivated. (Colors are for dry soil unless otherwise noted).

Ap--0 to 8 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium and fine granular structure; hard, very friable, nonsticky and nonplastic; many very fine roots; many fine tubular pores; slightly effervescent, disseminated lime; moderately alkaline (pH 8.2); abrupt smooth boundary. (0 to 10 inches thick)

C1--8 to 22 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, very friable, nonsticky and nonplastic; common fine roots; many fine tubular pores; strongly effervescent, lime disseminated and in filaments; moderately alkaline (pH 8.2); clear smooth boundary. (10 to 16 inches thick)

C2--22 to 42 inches; light gray (2.5Y 7/2) fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many fine tubular pores; strongly effervescent, lime disseminated and in filaments; moderately alkaline (pH 8.2); clear smooth boundary. (15 to 24 inches thick)

C3--42 to 60 inches; light gray (2.5Y 7/2) fine sandy loam, light olive brown (2.5Y 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many fine tubular pores; strongly effervescent, lime disseminated and in filaments; moderately alkaline (pH 8.2).

TYPE LOCATION: Riverside County, California; approximately 800 feet east, 400 feet south of NW corner section 16. T.3 S., R.2 W.

RANGE IN CHARACTERISTICS: The mean annual soil temperature at a depth of 20 inches is 60 to 65 degrees F and the soil temperature usually is not below 47 degrees F at any time. Soil between the depths of about 8 and 15 inches is dry all of the time from April or May until late October to early December and is moist in some or all parts all the rest of the year. The soil is coarse sandy loam, sandy loam, fine sandy loam, silt loam, or loam to a depth of 40 inches or more. Rock fragments, mostly fine pebbles, range to 15 percent, the amount tends to be greater in the lower part of the profile. The 10 to 40 inch control section averages less than 18 percent clay. There is weak to strong stratification and the organic matter decreases irregularly with depth.

The A horizon has dry color of 10YR 5/3, 5/4, 6/2, 6/3 or 6/4; 2.5Y 6/2 or 7/2. Moist colors are 10YR 3/3, 3/4, 4/3, 4/4; 2.5Y 4/2, 3/2. The organic matter is 0.5 to 1.5 percent. It is mildly to moderately alkaline.

The C horizon has dry color of 10YR 6/3, 6/4, 6/6 or 7/6; 2.5Y 6/2, 7/2, 7/3, 7/4; moist colors are 10YR 4/3, 4/4, 4/6, 5/3, 5/4 or 5/6. When moist values are 3, dry values are 6 or more. Lime is disseminated throughout and many pedons have small amounts of fine segregated lime.

COMPETING SERIES: San Emigdio is the only series in this family. Similar soils are in the Anthony, Docas, Gila, Hanford, Honcut, Ireteba, Maywood, Pico, Ramada, and Reiff series. Anthony, Gila, and Ireteba soils have an aridic moisture regime. Docas soils have a fine-silty control section. Hanford and Honcut soils are noncalcareous and have a regular decrease in organic matter. Maywood, Ramada, and Reiff soils are noncalcareous in the upper part or in all parts of the profile. Pico soils have a mollic epipedon.

GEOGRAPHIC SETTING: San Emigdio soils are on alluvial fans, floodplains, and in narrow valleys at elevations of 100 to 2,000 feet. Slopes are 0 to 15 percent. The soils formed in moderately coarse textured alluvium dominantly from sedimentary formations. The climate is dry subhumid mesothermal with hot dry

summers and cool moist winters. Mean annual precipitation, all in the form of rain, is 10 to 20 inches. Average January temperature is about 50 to 52 degrees F, average July temperature is about 70 to 74 degrees F, and the mean annual temperature is about 60 to 65 degrees F. The frost-free season is about 200 to 280 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Hanford, Metz, and San Timoteo soils. Metz soils have an average texture of loamy sand in the 10 to 40 inch control section. San Timoteo soils have a paralithic contact at depths of 20 to 40 inches.

DRAINAGE AND PERMEABILITY: Well drained; negligible to low runoff; moderately rapid permeability.

USE AND VEGETATION: Used for growing citrus fruit, alfalfa, truck crops, dryland grain, and some areas are in homesites. Uncultivated areas are annual grasses and forbs.

DISTRIBUTION AND EXTENT: Intermountain valleys in the western part of southern California, MLRA 14, 17, and 19. The soil is of moderate extent. (See Remarks).

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Davis, California

SERIES ESTABLISHED: Bakersfield Area, California, 1940.

REMARKS: The San Emigdio series was initially mapped extensively in an area now recognized as having an aridic moisture regime and later was mapped in a xeric moisture regime. In future mapping, the Anthony series will probably replace soils placed in the San Emigdio series in the aridic regime.