Appendix H
Geotechnical Report

Preliminary Geotechnical Report

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

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Abbreviations

Abbreviations used in this report are as follows:

ACI	American Concrete Institute
AECOM	AECOM Technology Corporation, Inc.
aka	Also Known AS
APGD	Auger Pressure Grouted Displacement (Piles)
ASTM	American Society of Testing and Materials
bgs	Below Existing Ground Surface
bpf	Blows Per Foot
CAB	Crushed Aggregate Base
CBC	California Building Code
CDMG	California Division of Mines and Geology
CGS	California Geological Survey
CIDH	Cast-in-Drilled-Hole (Pile)
DOGGR	California Division of Oil, Gas and Geothermal Resources
FEMA	Federal Emergency Management Agency
IN/HR	Inch per hour
MRC	Minimum Relative Compaction per ASTM D-1557
MSL	Mean Sea Level
OSHA	Occupational Safety and Health Administration
NBA	National Basketball Association
PPC	Precast Pre-stressed Concrete (Pile)
PCC	Portland Cement Concrete
PCF	Pounds per Cubic Foot
PSF	Pounds per Square Foot
PROJECT	Project CONDOR
PSF	Pounds per Square Foot
PSHA	Probabilistic Seismic Hazard Analysis
SF	Square feet
SPT	Standard Penetration Test
TI	Traffic Index
USA	Underground Services Alert
WRCB	State of California Water Resources Control Board
WRD	Water Replenishment District of Southern California

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August 23, 2018

Murphy's Bowl, LLC c/o
Mr. John Cheung, PE
Wilson Meany
6701 Center Drive, Suite. 950
Los Angeles, CA 90045

Re: REPORT
PRELIMINARY GEOTECHNICAL INVESTIGATION
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE + W. CENTURY BOULEVARD
INGLEWOOD, CALIFORNIA

Dear Mr. Cheung:

1. INTRODUCTION

AECOM Technical Services, Inc. (AECOM) is pleased to submit this report summarizing the results of a preliminary geotechnical investigation for Project Condor (Project) in Inglewood, California. The Project is located within an area bounded by West Century Boulevard and 104th Street, a westerly boundary approximately 500 feet west of Prairie Avenue, and an easterly boundary approximately 450 west of Yukon Avenue. The approximate location of the Project study area relative to existing major streets and freeways is shown in Figure 1 – Vicinity Map.

1.1 PROJECT UNDERSTANDING

The Project involves construction of an NBA basketball arena and various other ancillary and supporting structures. The approximate proposed locations of the main Project components are shown in Figure 2, Plot Plan. Key components would include the following:

- A multi-purpose arena of 18,000 seats that will host a variety of events from NBA games to concerts, family shows, convocations and sports exhibitions.
- Training facility and offices;
- A sports medicine clinic;
- Structured parking, office and retail;
- Other ancillary uses that would include community and youth-oriented space;
- Outdoor event plaza;

- Infrastructure (pedestrian bridges, roadways, utilities) typically associated with the above development.

1.1.1 Preliminary Project Layout

The Arena will comprise about 915,000 sf (excluding the team and office spaces) located over multiple levels, with a seating-bowl footprint of approximately 365' x 420'. The Event Level, which will serve as the location for the event floor for basketball games, concerts, etc. will be established at approximately 30 feet bgs (about Elevation +60 feet MSL). The overall building height from event level to the main roof will be approximately 135' to 150', with the net height in the range of 100' to 115' as seen from street level.

The training facility and offices will be approximately 148,000 sf with 5 levels; the lower 2 levels will be below grade to connect to the event level of the arena. Included in the training center is a sports rehabilitation clinic of approximately 25,000 sf to be potentially shared by the team and external medical partner.

The two structured parking garages are on-grade and above. A garage south of the Arena (South Parking Structure) will include 3 levels and a garage west of Prairie Avenue (West Parking Structure) will have 6 levels. A community space of about 15,000 sf will also be included on the plaza level.

A bridge is planned to provide pedestrian crossing over Prairie Avenue and connect the west parking garage facilities with the Event plaza. A second bridge is also in development and is planned to span across Century Boulevard to facilitate pedestrian access between the Event plaza and the neighboring LA Rams Stadium / Hollywood Park developments.

1.1.2 Preliminary Loading Conditions and Limitations

We understand that structural building concepts are still in development and the building loads are not yet available. Based on loading information from other similar-sized structures, it is anticipated that maximum column loads could vary widely, from about 200 kips to 3,000 kips at different Project locations.

The current field exploration program involves widely spaced borings, and some of the borings fall outside of possible final building footprints. Additional confirmation borings and CPT's will be required to fill the data gaps, confirm the preliminary recommendations contained in this report and/or develop revised recommendations.

The subsurface conditions described in this preliminary report have been projected from limited subsurface explorations and testing. Conditions may vary between exploration locations. Our recommendations should not be extrapolated to other areas, or used for design of other structures without prior review.

1.2 PURPOSE AND SCOPE OF SERVICES

The purpose of the current geotechnical investigation was to obtain a general understanding of the site subsurface conditions and develop preliminary design recommendations for the project. Our scope for the current investigation phase generally included performing the following key tasks:

- Site reconnaissance to observe the project site and to lay out the locations of proposed field explorations;
- Drilling and sampling of sixteen (16) preliminary borings at strategic and immediately accessible locations;
- Drilling of five (5) shallow borings to facilitate borehole infiltration testing;
- Preparation of this preliminary geotechnical investigation report that includes:
  - Geologic and seismic hazard evaluation;
  - Assessment of feasibility for using spread footings and pile foundations;
  - Retaining wall design data;
  - Pavement and hardscape recommendations for various applications (TI = 4 to 7).
  - Expansive soils remediation/recommendations;
  - Corrosion recommendations for protection of concrete footings, slab-on-grade concrete and underground piping;
  - Recommendations for shoring; and
  - Preliminary evaluation of feasibility BMP design at the site.

2. FIELD AND LABORATORY TESTING PROGRAMS

2.1 FIELD EXPLORATIONS

A field exploration program was performed and completed at the site during the period from May 8 through May 25, 2018. The borings were drilled under the technical supervision of a representative from our Los Angeles office. Exploratory borings were drilled by our subcontractor, ABC Liovin of Signal Hill, California, using a CME85 rig equipped with 8-inch diameter hollow stem augers.

The borings were advanced typically to depths of about 75 to 100 feet bgs. Relatively undisturbed soil samples were obtained using a California Sampler. Standard Penetration Tests (per ASTM D-1586) were performed typically at alternating depths with the California sampler. Bulk samples of representative near-surface soils were also obtained at selected boring locations. The locations of the borings are shown in Figure 2. A detailed description of the field exploration program, including boring logs, key to the logs of borings and other pertinent information, is presented in Appendix A.

2.2 LABORATORY TESTING

Soil samples obtained from the borings were packaged and sealed in the field to prevent moisture loss and minimize disturbance. They were then transported to our Los Angeles laboratory where they were further examined and classified. Index, strength and compressibility tests were performed on selected soil samples in accordance with ASTM standards. A detailed description of the laboratory testing program is presented in Appendix B.

EGLAB of Arcadia, California provided assistance with some direct shear and R-value testing of selected soils. All corrosivity testing was subcontracted to Project X Corrosion Engineering of Murrieta, California.

3. GENERAL SITE CONDITIONS

3.1 SURFACE

The Project site currently consists of vacant lots with a few areas still occupied by 1 to 3 story commercial units. A significant portion of the existing 102nd Street, between Prairie Avenue and Doty Avenue, will be permanently closed and demolished to make room for the Project.

In general, the ground surface gently slopes down from east to west and north to south with existing elevations ranging from +95 feet MSL and +86 feet MSL at the West Parking Structure and Event Area and from +100 feet MSL to +105 feet MSL along the east surface parking areas.

3.2 SUBSURFACE

Overall, the Project site is blanketed by artificial fill overlying native alluvial and older alluvial deposits. Some of the fill could have been placed with or without control following demolition of pre-existing structures that occupied most of the parcels. There are no known records of fill placement available.

Dibblee (2007) describes the underlying alluvial sediments as fine to medium-grained silty sand and sand with trace fine gravels interbedded with discontinuous flood plain fine-grained sediments consisting of clayey silt, lean clay, and sandy clay. This is confirmed in the borings drilled during the current investigation.

A Geologic Map of the Project vicinity is shown in Figure 3. Subsurface cross sections depicting the distribution of the subsurface units at the site relative to the proposed Project components are shown in Figures 8 through 11.

3.2.1 Artificial Fill

During the current investigation, the artificial fill was encountered generally to depths of about 5 to 10 feet bgs. Given the current spacing of the preliminary borings and the fact that most of the

site had been previously developed, the possibility of encountering fills at deeper depths between the current borings should not be ruled out. In general, the artificial fill was observed to be variable, consisting primarily of brown to dark brown silty sand, mixed with clayey sand and sandy silt. Occasional concrete debris, presumably from previous demolition of existing structures, was observed in some of the preliminary borings.

3.2.2 Alluvium

The soils underlying artificial fill consist of variable alluvium with alternating layers of sandy clay, silty clay, clayey and silty sands, and thin lenses of poorly graded sands. This relatively younger alluvium is characterized as generally having medium dense to dense and medium stiff to stiff consistencies, extending to depths of about 30 to 40 feet bgs.

3.2.3 Older Alluvium

Older alluvium was encountered at average depths of about 30 to 40 feet bgs, extending to the maximum depth explored, 100 feet bgs. The older alluvium consists of dense to very dense silty sands and stiff to very hard sandy clays.

3.3 GROUNDWATER

Based on the current borings, near-saturated soils were encountered typically below 75 feet bgs (about Elevation + 0 feet MSL) in the Event Area borings. No saturated soils or groundwater was encountered in the borings drilled along the easterly Project limits (Borings B-12 to B-16).

According to the Seismic Hazard Zone Report 027 for the Inglewood 7.5-Minute Quadrangle, the historically highest groundwater in the area has been inferred to be greater than 50 feet below existing grade (see Figure 4 – Historical Groundwater Levels).

4. GEOLOGY AND SEISMICITY

4.1 GEOLOGIC SETTING

Regionally, the Project site is located within a broad sediment-filled trough generally referred to as the Los Angeles Basin. The Los Angeles Basin forms an alluvial plain of low relief that was created by tectonic subsidence and subsequent deposition of sediments derived from ancestral streams from erosion along the flanks of the local mountains since the Pliocene time. Within this portion of the basin, thick accumulations of Quaternary age, non-marine to shallow marine deposits overlie marine Tertiary age sediments.

Locally, the Project site is located within the southwest block of the Los Angeles Basin and is part of the Torrance Plain which is a southward-dipping gently-sloping alluvial plain developed by continued uplift and subsequent filling of sediments derived from headward erosion along the flanks of the Santa Monica Mountains and local uplands. The southwestern block of the Los

Angeles Basin is interrupted by a series of left-stepping en echelon pattern of domal hills. These hills (the Baldwin, Dominguez, and Signal Hills) which were formed due to folding and deformation produced by the Newport-Inglewood Fault Zone, extend southeasterly from the Santa Monica Mountains on the north to the San Joaquin Hills in the Newport Beach area to the south.

4.2 GEOLOGIC AND SEISMIC HAZARDS

Geologic and seismic hazards are those hazards that could impact a site due to the surrounding geologic and seismic conditions. Geologic hazards include expansive and compressible soils, oil wells, methane gas, subsidence, landsliding and erosion. Seismic hazards include phenomena that occur during an earthquake such as surface fault rupture, ground shaking, liquefaction, seismic-induced landsliding, earthquake induced flooding, and tsunamis/seiches. Other hazards include flooding. The potential impact of those hazards to the Project site has been assessed and is summarized in the following sections. Our assessment of these hazards was based on current guidelines provided in Note 48, prepared by the CGS (formerly CDMG) and it is intended to meet the standards of the California Code of Regulations, as outlined in its Special Publication 117A (2008).

4.3 GEOLOGIC HAZARDS

4.3.1 Landsliding, Erosion and Subsidence

Hazards associated with seismic-induced slope instability include landslides and mudflows. According to the Seismic Hazard Zones Map for the Inglewood Quadrangle as shown in Figure 5, the project site is not located within areas designated by the state geologist where previous occurrence of landslide movement or local topographic, geological, geotechnical and subsurface conditions indicating a potential for permanent ground displacement to the event that mitigation would be required. The Project site is located in a relatively flat, low-lying sediment-filled plain. The potential for slope stability hazards at the Project site is negligible.

Most of the Project site will be either landscaped or covered with asphalt or concrete and therefore will not be readily susceptible to erosion.

There is no historic evidence of subsidence in the City of Inglewood (City of Inglewood, 1995) and no major extraction of water or petroleum is planned in the future in the vicinity of the site.

4.3.2 Expansive Soils and Collapsible Soils

Expansive soils are fine-grained soils that can undergo a significant increase in volume with an increase in water content and a significant decrease in volume with a decrease in water content. Changes in the water content of an expansive soil can result in severe distress to structures constructed upon the soil. In general, the Project site includes areas that are underlain by clayey soils that could exhibit moderate expansion potential when not properly mitigated.

Collapsible soils undergo settlement upon wetting, even without the application of additional load. Water weakens or destroys the bonds between soil particles and severely reduces the bearing capacity of the soil. Typical collapsible soils are lightly colored, with low plasticity and relatively low densities. Since the site fill soils are expected to be predominately clayey, potential impacts due to collapsible soils are expected to be low.

4.3.3 Volcanic Eruption

The southern California area has no active volcanoes and no known dormant volcanoes that could reactivate to cause eruptions. The closest Quaternary volcanic hazard zone consisting of basalt flows and tephra deposits is the Amboy-Lavic Lake area is approximately 140 miles to the northeast. The potential for volcanic hazards affecting the Project sites is remote.

4.3.4 Oil / Gas Wells

According to the California Division of Oil, Gas and Geothermal Resources (DOGGR) Map 1 District 119, there are no known active or abandoned oil/gas wells within the footprint of the Project Site.

4.3.5 Methane

Methane (CH_4) is a naturally occurring colorless gas associated with the decomposition of organic materials. In high-enough concentrations, methane can be considered an explosion hazard. According to the Los Angeles County Department of Public Works Solid Waste Information Management System, the Project sites are not within 300 feet of an oil or gas well or 1,000 feet of a methane producing site. As such, the potential for explosive methane gases impacting the Project sites appears to be low.

4.3.6 Flooding

The site is designated by the Federal Emergency Management Agency (FEMA) as outside the 500-year floodplain (Zone X) as shown on the Flood Insurance Rate Map. According to FEMA, the site is not located within a 100-year or 500-year flood area. The potential for significant flooding is low.

4.4 SEISMIC HAZARDS

4.4.1 Strong Ground Shaking

The Project site is located within a seismically active region that will be subjected to future seismic shaking during earthquakes generated by any of several surrounding active faults. The locations of the known active and potentially active faults and epicenters of earthquakes with magnitudes of 3.5 or greater with respect to the proposed project are shown on the Regional Fault and Epicenter Map, Figure 6. This map includes the location of active and potentially active faults, within the general vicinity of the site. Most of the larger earthquakes have been associated with larger faults that have been mapped at the ground surface. A number of moderate to large earthquakes in the region have also occurred on deep-seated buried thrust faults in this geological complex region of Southern California.

The Newport-Inglewood fault is the closest and most significant active fault to the Project sites. At its closest, the Newport-Inglewood fault zone is about 1.13 miles to the northwest. The Newport-Inglewood fault is considered to connect with fault zones south of Newport Beach (The "offshore zone of deformation", and the Rose Canyon fault) forming a system of faults that extends from Santa Monica to Baja California. The Newport-Inglewood fault was the source for the 1933 M6.4 Long Beach earthquake. It caused major damage and the loss of 115 lives in Long Beach and surrounding communities of Los Angeles. Other significant historic earthquakes that have occurred near the project site include:

- The 1971 San Fernando Earthquake (M6.6) on the San Fernando fault
- The 1987 Whittier Earthquake (M6.0), and
- The 1994 Northridge Earthquake (M6.7).

4.4.2 Seismic Sources

Both distant and nearby faults contribute to the seismic exposure of the site. Based on their proximity to the site, and rate of activity, Newport-Inglewood Fault Zone, the Compton Thrust, and the Puente Hills Thrust are considered capable of producing the most significant shaking at the Project site. The most significant seismic sources to the site are summarized in the following table.

Table 1 – List of Most Significant Seismic Sources

Fault	Approximate Distance[1] (kilometers)	Approximate Distance[1] (miles)	Type of Fault[2]	Maximum Earthquake Magnitude[3] (Mw)
Newport-Inglewood Fault Zone (NIFZ)	1.89	1.13	Strike Slip	7.4
Puente Hills (LA)	11.1	6.9	Blind Thrust	6.9
Palos Verdes	13.7	8.5	Strike Slip	7.1
Compton Fault	22.2	13.8	Blind Thrust	7.3
Hollywood Fault	26.4	16.4	Strike Slip	6.6
Elysian Park (Upper)	27.2	16.9	Blind Thrust	6.7

Fault	Approximate Distance[1] (kilometers)	Approximate Distance[1] (miles)	Type of Fault[2]	Maximum Earthquake Magnitude[3] (Mw)

Notes:
1. Distance to fault, R_x, which is defined as the perpendicular distance from the site to the surface projection of the top of fault.
2. Fault characterization based on Field et al., 2013.
3. The maximum earthquake magnitude is estimated using the Leonard 2010 magnitude-area scaling relations.
4. Fault data based on Uniform California Earthquake Rupture Forecast, Version 3 (Field et al., 2013).

The Los Angeles Basin, as well as most of Southern California, is located within a complex zone of faults and folds resulting from compressional forces occurring along a bend within the boundary between the Pacific and North American tectonic plates. Numerous generally east-west to northwest trending faults have formed as a result of these north-south compressional forces acting within this area.

The major faults within the vicinity of the Los Angeles Basin are characterized by a combination of blind thrusting, right-lateral strike-slip, and reverse faulting and are described in the following subsections.

4.4.2.1 Hollywood Fault

The Project site is located near several active or potentially active faults that comprise parts of the Transverse Ranges Southern Boundary fault system, an east-west-trending system of reverse, oblique-slip, and strike slip faults that extends for more than 124 miles (200 kilometers) along the southern edge of the Transverse Ranges (Dolan et al., 2000). The 15-kilometer-long Hollywood fault is located just south of the faceted ridges and bedrock outcrops of the south margin of the eastern Santa Monica Mountains along Sunset Boulevard. Studies by several investigators have indicated that the fault is active, based on geomorphic evidence, stratigraphic correlation between exploratory borings, and fault trenching studies. Although it is considered to be a Holocene fault (indicating displacement within the past 10,000 years) the Hollywood fault has not produced any moderate or large earthquakes in the historical record.

4.4.2.2 Puente Hills Blind Thrust

The Puente Hills Blind Thrust fault is defined based on seismic reflection profiles and petroleum well logs. The blind thrust system extends eastward from downtown Los Angeles to Brea and is composed of three north-dipping segments, the Coyote Hills segment, the Santa Fe Springs segment, and the Los Angeles segment. The Los Angeles segment of this system is located closest to the site. The surface expression is characterized by the Coyote Hills, Santa Fe Springs anticline, and the Montebello Hills. The Santa Fe Springs segment is believed to be the causative fault of the October 1, 1987 Whittier Narrows Earthquake (Shaw, 2002). The Puente Hills Blind Thrust fault is considered an active fault capable of generating future earthquakes beneath the Los Angeles Basin.

4.4.2.3 Palos Verdes Fault

The Palo Verdes fault is reported to be approximately 107.1 kilometers (km) in length. The fault is predominantly a 'right lateral strike-slip' with a small (approximately 10 to 15 percent) component of vertical slip. Slip rates for the Palos Verdes fault are based primarily on geological and geophysical studies for onshore and offshore portions of the length and estimated at a long-term slip rate between 2.0 to 3.5 millimeters per year (mm/yr) with a range of approximately 2.3 to 3.0 mm/yr for the middle to late Holocene period (McNeil et al., 1996). These slip rates make the Palos Verdes fault one of the most active faults in the Los Angeles region.

4.4.2.4 Santa Monica Fault

The onshore extension of the Malibu Coast Fault has been designated as the Santa Monica Fault. The Santa Monica Fault is an oblique/left-lateral fault which exhibits pronounced near-surface strain which has caused development of a series of near-vertical, left-lateral strike slip faults and a near-surface blind thrust. Its lateral extent and rupture history are not well known due largely to limited knowledge of the fault location, geometry, and relationship to other faults. The Santa Monica fault has been obscured at the surface by alluvium and urbanization. Dolan et al. (1995) could find only one 200-meter long stretch of the Santa Monica fault that was not covered by either streets or buildings. Of the 19-km length onshore section of the Santa Monica fault, its apparent location has been delineated largely on the basis of geomorphic features and oil-well drilling. Dolan et al. (1995) suggest that the Santa Monica fault is capable of generating Mw 7.0 earthquake and presents a sizable earthquake hazard to the Los Angeles metropolitan area.

4.4.2.5 Elysian Park Blind Thrust

The Elysian Park Blind Thrust consists of a series of shallowly north and northeast-dipping blind thrusts that extend from Orange County through downtown Los Angeles and westward beneath the Santa Monica Mountains. The thrust system is not exposed at the surface but is buried under the unconsolidated alluvial sediments of the Los Angeles Basin. These subsurface thrust faults are capped and structurally reflected at the surface known as the Elysian Park anticline. Recent studies suggest that the fault experiences an average slip rate of 1.5mm/year and is capable of producing a Magnitude 6.7 earthquake.

4.4.2.6 Compton Blind Thrust

The Compton Thrust System Fault is an active thrust fault that has generated several large magnitude earthquakes extending back to about 14,000 years with magnitudes ranging Mw 7.0 to 7.4. This concealed fault underlies the Los Angeles coastal plain area. Petroleum borehole data and seismic reflection methods were used to map the fault and link seismological data to near surface faulting and folding (Shaw and Suppe, 1996) and show that the Compton Thrust is associated at depth with the Newport-Inglewood Fault causing uplift during the 1933 Long Beach earthquake (Barrows, 1974). Deformed Holocene stratigraphic records show recent

activity along buried fold scarps. Minimum uplift from the buried scarp events ranged from 0.6 to 1.9 meters. These displacements are consistent with large magnitude earthquakes (Mw 7). Relations among magnitude, co-seismic displacement, and slip rate yield an average recurrence interval of 380 years for single segment earthquakes and a range of 400 to 1300 years for multiple segmented earthquakes. Shaw and Suppe (1996) calculated a slip rate of 1.4 mm/yr based on modeling of deep seismic data.

4.4.2.7 Newport-Inglewood Fault Zone

The Newport-Inglewood fault zone (NIFZ) is about 75 km and consists of a series of right lateral strike-slip faults that trends northwest-southeast forming an alignment of hills from Newport Mesa to Cheviot Hills along the western side of the Los Angeles Basin. The NIFZ is characterized at the surface by a belt of domal hills and mesas formed by the folding and faulting of thick sequences of Pleistocene age sediments and Tertiary age sedimentary rocks (Barrows, 1974). The fault was the source of the 1933 Long Beach earthquake (M 6.4). The recurrence interval is estimated on the order of a thousand years or more (Schell, 1991; Freeman et al., 1992; Shlemon et al., 1995; Grant et al., 1997). The slip rate on the Newport-Inglewood fault is not fully constrained but appears to be approximately 0.5 to 1 mm/yr in the north, and increasing to 0.5 to 1.5 mm/yr in the south (USGS, 2015). The Newport-Inglewood fault zone produced the 1933 Long Beach event that had a moment magnitude (Mw) of about 6.4.

4.4.1 Primary Ground Rupture

The "Alquist-Priolo Earthquake Fault Zoning Act" is a state law that regulates development projects near active faults to mitigate the hazard of surface fault rupture. The act requires that development permits for projects within "Earthquake Fault Zones" be withheld until geologic investigations demonstrate that the sites are not threatened by surface displacement from future fault rupture.

To be zoned under the Alquist-Priolo Fault Zoning Act, a fault must be considered active or both sufficiently active and well-defined (CDMG, 1997b). The CGS defines an active fault as one that has had surface displacement within Holocene time (about the last 11,000 years), and a sufficiently active fault as one that has evidence of Holocene surface displacement along one or more of its segments or branches (CDMG, 1997b). The CGS considers a fault to be well defined if its trace is clearly detectable as a physical feature at or just below the ground surface.

No known active, sufficiently active, or well-defined faults traces have been recognized as crossing the Project site, and the CGS does not delineate any part of the site as being within an Earthquake Fault Zone. As shown in Figure 5, the closest Earthquake Fault Zones to the proposed site are the Potrero Fault, approximately 0.18 miles (0.3 kilometers) to the northeast and the Inglewood Fault located approximately 1.13 miles (1.84 kilometers) to the northwest. Because there are no known active faults on or adjacent to the site, the potential for surface fault rupture at the site is considered low.

4.4.2 Ground Lurching

Ground lurching is permanent displacement or shift of the ground in response to seismic shaking. Ground lurching occurs in areas with high topographic relief, and usually occurs near the source of an earthquake, where shaking and permanent ground displacements are highest. These displacements can result in permanent cracks in the ground surface, which are sometimes confused with surface fault ruptures. Cracks from lurching do not extend to great depths, usually only several feet to tens of feet below the ground surface, depending on specific site conditions. The project site has relatively flat topography, therefore, ground lurching does not represent a potential hazard to the proposed Project structures.

4.4.3 Liquefaction

Liquefaction is a phenomenon whereby saturated, granular soils lose their inherent shear strength due to excess pore water pressure build-up, such as that generated during repeated cyclic loading from an earthquake. A low relative density and loose consistency of the granular materials, shallow ground-water table, long duration and high acceleration of seismic shaking are some of the factors favorable to cause liquefaction.

According to the Seismic Hazard Zones Map, Figure 5, the project site is not located within the liquefaction zone area. According to the Seismic Hazard Zones Report No. 027 for the Inglewood Quadrangle published by the California Geological Survey, the historic high groundwater level is greater than 50 feet below existing ground surface.

Due to presence of dense to very dense and very stiff to hard soils, and the depth to groundwater greater than 50 feet, the potential for liquefaction is considered remote at the Project site.

4.4.4 Lateral Spread Displacement

According to publications by Bartlett and Youd (1995), conditions such as free-face, sloping ground surfaces and liquefiable layers are factors contributing to lateral spread displacement of the ground during strong motion events. The project site does not have free-face, sloping surface that is unsupported. Furthermore the site has very low susceptibility of liquefaction. Therefore, the risk of lateral spread displacement is remote.

4.4.5 Seismically Induced Settlements

Differential seismic settlement occurs when seismic shaking causes one type of soil to settle more than another type. It may also occur within a soil deposit with relatively homogeneous properties if the seismic shaking is uneven, which could occur due to variable geometry, for example, and variable depth of the soil deposit. Differential seismic settlement is most likely to occur in areas that transition between rock formations and more recently deposited alluvial soils or artificial fill. The project site is situated entirely on alluvium and most existing artificial fills will

be removed or placed back as engineered fill. in general, we consider the potential for differential seismic settlement to be low throughout most of the Project site.

4.4.6 Earthquake Induced Flooding

Earthquake-induced flooding occurs when nearby water retaining structures, such as dams or storage tanks, are breached or damaged during an earthquake. The site is not currently located within a flood or inundation hazard zone according to the Los Angeles County Safety Element (1990). Based on this information, there appears to be minimal risk of earthquake-induced flooding within the vicinity of the site.

4.4.7 Tsunamis, Seiches and Earthquake Induced Landslides

Other seismic hazards include tsunamis, seiches, and earthquake-induced landslides.

Tsunamis are great sea waves (commonly called a tidal wave) produced by a significant undersea disturbance. The Project site is located approximately 5.5 miles from the Pacific Ocean shoreline at an average elevation of about +90 feet MSL. According to City of Los Angeles Safety Element Department of City Planning Los Angeles, 1996, (Inundation & Tsunami Hazard Areas, Exhibit G), the project site is not located within a tsunami hazard area. As a result, tsunamis are not considered a hazard to the Project Site.

A seiche is an oscillation of a body of water in an enclosed or semi-enclosed basin, such as a reservoir, harbor, lake, or storage tank, resulting from earthquakes or other large environmental disturbances. Given its distance to the nearest reservoir, there appears to be little risk of a seiche impacting the Project site.

The potential for landslides induced by seismic shaking is not anticipated to pose a significant seismic hazard to the Project site due to the relatively flat topography. The Seismic Hazards Zones Map for the Inglewood Quadrangle (Figure 5) indicates that Project site does not lie within areas designated as having the potential for seismically induced landslides.

5. DISCUSSION AND RECOMMENDATIONS

Based on the results of our preliminary investigation, it is our opinion that the site can be developed for the proposed Project. In general, conventional shallow foundations may be considered for support of most of the structures provided footing settlements are kept within acceptable limits.

Since the structural building concepts are still in development, some iteration could be expected to identify the most suitable building foundation systems. In addition, future explorations will be required to confirm the subsurface conditions where there are gaps in the data and to obtain other as-needed design parameters. However, based on the preliminary soil data, key geotechnical findings that would influence the final site preparation and foundation selection are discussed below.

1. Based on the preliminary data, up to 10 feet of overexcavation and soil recompaction under building footprints of near-grade structures could be required due to presence of uncertified fills and other variable native soils. Additional overexcavation will be required if deeper fills are encountered within the building footprint.

2. Proposed structures that would be established in either young or older alluvium (between 15 and 30 feet bgs) would likely encounter predominately clayey soils at the foundation subgrade level. Due to the potentially expansive nature of the clayey soils, some removals and replacement of these soils with granular soils would be required to improve bearing capacity, reduce settlement and protect slabs-on-grade against swell.

3. Based on the consolidation test data, the older alluvium in spite of the stiff to hard consistencies, have not experienced loading beyond the current overburden pressures and exhibits moderate compressibility under saturated conditions. This condition needs to be taken into account during design of the highly-loaded Arena foundations. There should be adequate provisions in place to mitigate any potential for saturation of the foundation soils.

4. The deep excavations would require temporary shoring if setback is not available for adequate sloping of the excavations. Conventional soldier piles and lagging, tied-back or internally braced should be feasible.

5. The excavation for the Arena will generate considerable volumes of variable soils. Within the Event Area, majority of the upper 10 feet generally comprise predominately granular soils with low expansion potential and suitable for re-use as structural fill. Between 10 to 30 feet bgs, the native soils consist of predominately clayey soils that might not be immediately suitable for use as primary structural fill and might need to be hauled away.

6. If pile foundations are required for support of the Arena column loads, driven, end-bearing, pre-stressed pre-cast concrete (PCC) piles may be considered. Large-diameter cast-in-drilled-hole (CIDH) piles, which would rely primarily in friction for capacity, may also be feasible.

Preliminary recommendations are provided in the following sections.

5.1 SITE PREPARATION

Prior to general site grading, any debris, existing buildings, pavements, rubble, existing undocumented fill, or vegetation should be removed and disposed of outside the construction limits. All active or inactive utilities within the construction limits should be identified for relocation, abandonment, or protection prior to grading. Any pipes greater than 2 inches in diameter to be abandoned in-place should be filled with a sand/cement slurry.

For planning purposes, it should be assumed that any uncertified fill encountered during grading activity will require removal and re-compaction. It should also be anticipated that the remnants of previous construction could be encountered anywhere within the Project study area, including buried foundations (footings and possible pilings), concrete, brick, septic tanks, slabs, utilities and other construction materials. These materials should be removed and disposed of outside the construction limits. Soil excavation should be feasible using conventional heavy duty grading equipment such as scrapers, loaders, dozers, and excavators.

Following site stripping and any required overexcavation, we recommend that all areas to receive fill or to be used for the future support of structural loads, be proof-rolled with a rubber-tired loader or other heavy equipment to locate any soft or loose zones. All loose/soft or otherwise unsuitable areas should be removed or compacted in-place. No fill should be placed over loose, pumping or unstable subgrade. If the disturbed zone is greater than about 12 inches in depth, in-place compaction will be difficult, and additional over-excavation and compaction will be needed.

Prior to placing fill the subgrade shall be unyielding and compacted to at least 90% minimum relative compaction per ASTM D-1557 (MRC). Upon completion of proofrolling and any required overexcavation, fills and backfills may be placed in accordance with the recommendations presented in the following sections.

Minimum soil improvement criteria under the different Project components are provided in the following sections.

5.1.1 Arena

Based on the current configuration shown in Figure 2, it is proposed to establish the arena event level at approximately 30 feet bgs (+60 feet MSL). The following constraints have been identified when establishing the event level at the proposed elevation.

- The excavation will expose predominantly uniform, clayey soils. Although the obtained SPT blowcounts at this depth (> 30 bpf) suggest very stiff to hard soil consistencies, the soils do not appear to have experienced saturation and generally exhibit a moderate compressibility when saturated and when loaded beyond the current overburden.

- Based on the consolidation tests and independent swell tests, the swell potential of the clayey soils at the slab level is moderate to high. In order to mitigate this swell potential, the arena slab should be underlain by at least 2 feet of granular fill (preferably crushed miscellaneous base) compacted to 95% MRC.

- All fills should extend a minimum 5 feet beyond the structure footprint.

5.1.2 Practice Facility and South Parking Structure

It is proposed to establish the Practice Facility and adjoining South Parking Structure at an average depth of 20 feet bgs, with some portions lowered to about 30 feet bgs to connect with the Arena event level. The following constraints have been identified when establishing the Practice Facility and South Parking Structure at the average intermediate depth of about 20 feet bgs.

- The excavation could expose variable soils at the foundation subgrade level, consisting of medium dense and medium stiff sandy silts, silty sands and silty clays. The clayey soils do not appear to have experienced saturation and generally exhibit moderate compressibility and swell potential.
- In order to provide uniform foundation support, mitigate the swell potential and minimize foundation settlement, a minimum 3 feet of engineered fill compacted to 95% MRC is recommended under the building foundations. Predominately granular fill (preferably crushed miscellaneous base) should be used. The engineered fill should extend up to the bottom of slab-on-grade.
- All fills should extend a minimum 10 feet beyond the structure footprint.

For those building levels established at 30 feet bgs, similar provisions as discussed in Section 5.2.1 should be accounted for.

5.1.3 Retail Buildings and Other Near-Grade Structures

The Retail Buildings and other similar, isolated structures would be established near existing grade. The following site preparation constraints have been identified for these types of structures.

- The upper 5 to 10 feet of soils within the foundation footprints consist of fill soils that will require complete overexcavation and recompaction as appropriate. Due to the predominately sandy nature of the upper fill soils, the resulting excavated fill should be reusable as engineered fill under the footings and slab-on-grade.
- Due to potential fill variability, some mixing / blending should be anticipated.
- The engineered fill should extend a minimum 10 feet beyond the building footprint. The fill should be compacted to at least 95% MRC.

5.1.4 West Parking Structure

The West Parking Structure will be located at the southwest corner of Century Boulevard and Prairie Avenue and could be established at grade or about 20 feet bgs. In either case, near surface fill soils and/or variable young alluvium should be anticipated at the foundation level.

On a preliminary basis, similar provisions provided in the preceding sections may be assumed for estimating purposes.

Borings and CPTs are planned under the footprints of the West Parking Structure during a supplemental phase investigation program in order to confirm the subsurface conditions and to develop foundation settlement estimates.

5.1.5 East Parking Lot, Roadways and Pavements

An approximately 0.25-acre lot east of the Event area will be designated as surface parking for the Project. Most of the other new roadways and paved areas will be located near the main Event plaza area.

We anticipate that the Project site finished grade would be consistent with existing adjacent major roads such as Prairie Avenue and Century Boulevard. At this time, no significant site re-grading is expected to raise the site grades to final elevations.

Most roadways, parking lots and pavements (including flatwork), would be established around Elevation +90 feet MSL and would expose artificial fill subgrade consisting of a mix of sandy, silty and clayey soils. In general, in order to achieve uniform support, a minimum 2 feet of engineered fill should be provided under roadway and pavement structural sections and other heavily trafficked areas. If the existing soils are confirmed to be predominately granular, this may be achieved through overexcavation of the existing soils and compacting the soils to 95% MRC.

5.1.6 Pedestrian Bridges

A bridge is planned to provide pedestrian crossing over Prairie Avenue and connect the west parking garage facilities with the Event plaza. A second bridge is also in development and is planned to span across Century Boulevard to facilitate pedestrian access between the Event plaza and the neighboring LA Rams Stadium / Hollywood Park developments.

The bridge foundations are anticipated to comprise either spread footings or CIDH piles. As with the preceding recommendations, site preparation will involve overexcavation and recompaction of all uncertified fills under the footing footprints. If CIDH piles are used, pile capacities will need to ignore any contributions from the fill soils.

5.2 EARTHWORK

As previously discussed, up to 10 feet of near-surface fill soils should be anticipated and this fill will need to be completely removed and replaced as compacted (engineered) fill in order to provide adequate support for near-grade building foundations. However, given the previous site development, the possibility of encountering fills at deeper depths should be ruled out. A supplemental investigation targeting areas where near-surface structures are planned will be performed to obtain a better estimate of the thickness of fills under these buildings.

In areas to be overlain by flatwork, pavements and roadways, some removal and recompaction will be required to establish competent subgrades as well as to buffer areas that might expose potentially expansive soils.

Excavations up to 35 feet bgs may be required to establish building foundation subgrades and temporary shoring will be required if sloped setback is not feasible. The excavations could generate significant quantities of clayey soils, most of which would not be suitable as structural fill under footings and slabs-on-grade due to their potentially expansive and compressible nature.

5.2.1 Reusability of On-Site Sources

The upper near-surface fill soils were found to be generally granular in nature, exhibit low expansion potential and are suitable for direct re-placement as engineered fill under footings and floor slabs. However, in some cases, the recent grading activities have caused mixing of these upper sandy soils with the underlying younger alluvium resulting in varying blends that could contain a wide variety of soils including sandy silt, sandy clay, clayey and silty sands, and poorly graded sands. However, if properly blended together into a homogenous mix and tested, the on-site soils have a potential to be reused for structural purpose.

Below 10 feet bgs, native soils with higher moisture contents, particularly the more clayey soils, could be encountered during excavations. As these soils would have little use in engineered fills, we recommend that they be hauled away from the site.

Demolition of existing streets, pavements and concrete foundations could produce materials that can be recycled. From a geotechnical standpoint, recycled base and asphalt may be reused as engineered fill (or mixed with the on-site soils to enhance the fill) provided they conform to the specifications of the Standard Specifications for Public Works Construction, the latest Edition ("The Green Book").

Reuse of recycled asphalt and base, should also be reviewed and approved by the project environmental consultant prior to use.

5.2.2 Bulking and Shrinkage

Based on the index properties of the near surface soils, some volume loss should be anticipated during re-use and recompaction of the on-site soils during grading. A shrinkage factor in the range of 0 to 6 percent may be assumed.

For estimating soil export volumes, a bulking factor of 10 to 15 percent may be assumed for the clay soils to be excavated from 10 feet bgs.

5.2.3 Import Materials Criteria

All imported fill and backfill soils for structural use should be clean, predominantly granular, non-expansive, less than 3 inches in any dimension, free of any contamination, organic and inorganic debris and containing non-plastic fines not exceeding 35 percent passing the No. 200 sieve. All fill and backfill materials should be observed and tested by the geotechnical engineer prior to their use in order to evaluate their suitability. Such geotechnical testing may include grain size, shear strength, compressibility, expansion, compaction and corrosivity characteristics.

All potential fills should also be reviewed, tested and approved by the project environmental consultant prior to their import/delivery to the site.

5.2.4 Controlled Low Strength Material

In lieu of engineered fill, Controlled Low-Strength Material (CLSM) per 2016 California Building Code 1803.5.9 may be used in areas with difficult access, for utility trench excavations and other minor backfills. For backfill providing indirect support for foundations, the CLSM shall have an unconfined compressive strength of at least 100 pounds per square inch (psi). Any use of CLSM directly under foundations shall first be reviewed and approved by the geotechnical engineer.

For minor, non-structural fills and utility trench backfills, CLSM having not less than 2-sack sand/cement mix and an unconfined compressive strength of 50 psi may be used.

5.2.5 Compaction Criteria

The compaction criteria will depend on the specific loading conditions anticipated. In general, all fills and backfills should be compacted to the minimum requirements of the California Building Code unless specified otherwise. The following industry standard compaction criteria should be followed:

- Fills and backfills should be placed in loose lifts not exceeding 6 to 8 inches in loose thickness and moisture conditioned as required to achieve near-optimum moisture content.
- All fills and backfills should be compacted using mechanical compaction equipment.
- Unless specifically recommended, all granular fills and backfills shall be compacted to at least 95 percent of the maximum dry density per ASTM D-1557. Granular fills are defined as generally sandy materials having appreciably larger percentage of materials passing the No. 4 sieve and retained in the No. 200 sieve.
- Due to compressibility and expansion potential, on-site materials containing appreciable amounts of clay should not be used under foundations and slabs-on-grade. Under

certain non-structural applications, approved fine-grained or predominately clayey on-site soils may be compacted to 90 percent of the maximum dry density per ASTM D-1557. These soils should be compacted about 2 percent over the optimum moisture content.

- Fills required in landscaped areas may be compacted as specified by the landscape architect.

5.3 TEMPORARY EXCAVATIONS

5.3.1 Sloped Excavations

All excavations will be required to comply with the current California and Federal OSHA requirements, as applicable. All cuts greater than 4 feet in depth should be sloped and/or shored. Typical temporary excavations should not be steeper than 1(h):1(v), up to a maximum depth of 20 feet below surrounding grade. For excavations up to 40 feet bgs, the slope setback should not be steeper than 2(h):1(v).

During wet weather, runoff water should be prevented from entering the excavation, and collected and disposed of outside the construction limits. To prevent runoff from adjacent areas from entering the excavation, a perimeter berm should be constructed at the top of the slope. Heavy construction equipment, building materials, excavated soil stockpiles and vehicle traffic should not be allowed near the top of the slope within a horizontal distance equal to the depth of the excavation.

Where there is insufficient room to excavate slopes, or where an existing structure, street, or other improvement requires protection, the customary approach would be to use temporary shoring consisting of soldier piles; either cantilevered, tied-back or internally braced.

5.3.2 Shoring

Temporary shoring systems consisting of cantilevered, tied-back or internally braced soldier piles and steel plates or treated-timber lagging may be considered where conventional sloping of excavations is not feasible. Typical soldier piles consist of steel H-sections installed in pre-drilled holes and backfilled with either minimum 2,000 psi concrete or specified acceptable material below the planned bottom of the excavation. Alternatively, soldier piles could be installed using vibration (soil displacement) techniques.

Shoring should be designed to support the lateral earth pressure given below, such that lateral wall deflections at any excavation stage are limited to a maximum of 1 inch.

Lateral Earth Pressure for Shoring Design

Cantilevered shoring can be used for support of excavation depths of 15 feet or less. A triangular load distribution should be used, equivalent to the pressure exerted by a fluid weighing 36 pcf.

Temporary tied-back or braced excavations should be designed to resist a horizontal earth pressure (trapezoidal distribution for dense / stiff soils) of 25H psf, where H is the wall height in feet. Areal surcharge placed within a distance of H feet of a cantilevered, braced or restrained shoring should be accounted for.

The above pressures do not include any hydrostatic pressures; it is assumed that drainage will be provided by weep-holes or cracks in the lagging. It is important to install lagging immediately upon excavation to minimize sloughing or movement of the soils behind the shoring.

Passive Resistance for Shoring

Soldier piles must extend below the excavation bottom to provide lateral resistance by passive earth pressure. Allowable passive pressures for the native soils in the upper 100 feet bgs may be taken as equivalent to the pressure exerted by a fluid weighing 300 pcf up to a maximum of 3,000 psf. In order to develop the full lateral value, provisions should be taken to ensure there is firm contact between the soldier piles and the undisturbed soils.

To account for three-dimensional effects, the lateral pressure may be assumed to act on over a width of 2.4 [0.08 times a friction angle of 31 degrees] times the drilled-hole diameter for soldier piles backfilled with minimum 2,000 psi concrete. For compacted sand or gravel backfill, the effective width is considered to be 2.4 times the flange-width of the beam. The latter may be applied to steel sections installed using vibration techniques. Prior to employing vibration methods, the shoring contractor should assess the site conditions to prevent damage or impacts to existing structures and/or subsurface utilities damage to existing utilities.

Where used, all gravel backfills should be grouted with high-mobility grout upon removal of all temporary shoring elements.

Frictional Resistance

Where the portion of the soldier piles below the excavated level is backfilled with a minimum 2,000 psi concrete, the embedded portion may be used to resist downward loads. For this purpose, the frictional resistance between the concrete cylinder and the soil may be taken as 400 psf.

Timber Lagging

We recommend that continuous lagging will be provided between the soldier piles. The soldier piles and anchors should be designed for the full anticipated lateral pressures.

Tiebacks

Tieback friction anchors may be used to resist lateral loads. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn at about 30 degrees with the vertical through the bottom of the excavation. The anchors should extend at least 15 feet beyond the potential active wedge and to a greater length as necessary to develop the desired capacities. The anchors will need to be located so they are not in conflict with existing utilities, foundations and/or other subsurface structures. Tieback construction procedures should take every precaution to minimize ground loss.

Anchor capacity is most realistically evaluated from anchor load tests in the field, as the actual capacity depends on various site-specific and equipment- and method-related factors. A common practice is to utilize a skin friction in the range of 1,500 to 3,500 psf for post-grouted anchors in the types of soils expected at the site. Skin friction depends upon the depth of the anchors below existing grade, as well as the techniques utilized, and the experience of the contractor performing the installation. Post-grouted anchors should be spaced a minimum of 6 feet on-center.

Detailed recommendations as well as testing criteria can be provided when proposed excavation dimensions and other design constrains become available.

Raker Bracing

As an alternative to tiebacks, raker bracing may be used to internally brace the soldier piles. If used, raker bracing could be supported laterally with a temporary concrete footing (aka deadman) or using conveniently located permanent interior footings.

For design of temporary footings poured with the bearing surface normal to rakers with inclinations from 45 to 60 degrees with the vertical, a bearing value of 4,000 psf may be used for footings on the dense or stiff native soils. The footings should embedded is at least 1 foot below the lowest adjacent grade.

5.4 PRELIMINARY BEARING VALUES AND SETTLEMENT ESTIMATES

Using the data obtained from the consolidation testing program, preliminary bearing capacity and settlement analyses corresponding to the nominal site preparation cases were performed and the results are presented in this section. Because the project design loads are still in development, parametric settlement analyses were conducted for a practical range of allowable bearing pressures and minimum footing widths and the corresponding soil compressibility profiles for different locations.

In general, all footings should be a minimum of 2 feet wide and established at a depth of at least 2 feet below the lowest adjacent finished grade. The allowable bearing pressure is a net value;

therefore, the weight of the footing and the backfill over the foundation may be neglected when computing dead loads. The bearing pressure applies to dead and live load and includes a factor of safety of at least 3 against bearing failure. The allowable pressure may be increased by 33 percent for short-term loading due to wind or seismic forces.

Table 2 - Estimated Footing Settlements for Arena Structure

Assumes footings at about 30 feet bgs or +60 feet MSL

Qall	Settlement under Arena Structure				
	10'	15'	20'	25'	30'
5000	1.55	2.16	2.60	2.94	3.32
6000	1.76	2.50	3.14	3.68	4.28
8000	2.16	3.45	4.50	5.40	6.37

Note: For any load combination, larger foundation size and lower bearing pressure result in smaller settlement due to the pre-consolidation effects.

Table 3 – Estimated Footing Settlements for Practice Facility & Parking Structures

Assumes footings at about 20 feet bgs or +70 feet MSL

Qall	Settlement under Practice Facility & Parking Structures				
	4'	8'	12'	16'	20'
3000	0.41	0.88	1.27	1.59	1.95
4000	0.50	1.09	1.74	2.32	2.93
5000	0.59	1.31	2.27	3.12	3.97

Table 4 – Estimated Footing Settlements for Retail & Shop + Near-Grade Structures

Assumes footings at about 5 feet bgs or +85 feet MSL

Qall	Settlement under Retail & Shop + Near-Grade Structures				
	4'	6'	8'	10'	12'
2000	0.25	0.41	0.57	0.70	0.91
4000	0.38	0.72	1.25	1.79	2.39

NOTES:

1. Settlement estimates are based on the subsurface profile, anticipated foundation sizes and maximum soil pressures (Qall).
2. Approximately 50% of the total anticipated settlement is expected to occur immediately following foundation construction due to recompression.

3. The remaining settlement is expected to occur within several weeks after application of the building loads.
4. Defer settlement sensitive connections until after majority of the load has been applied.
5. Subject to confirmation with additional borings and CPTs, differential settlement may be assumed to be one-third of the total settlement for similarly loaded footings.
6. Differential settlements assume all design loads have been applied.

The allowable bearing pressure (Qall) is a net value. Therefore, the weight of the foundation and the backfill over the footing may be neglected when computing dead loads. The bearing pressure applies to dead plus live loads and includes a calculated factor of safety of at least 3. The allowable bearing pressure value may be increased to the maximum values provided in Table 2 for short-term loading due to wind or seismic forces.

5.5 LATERAL RESISTANCE

Resistance to lateral loads may be provided by frictional resistance between the bottom of concrete footings and the underlying soils and by passive soil pressure against the sides of the footings. The coefficient of friction between poured-in-place concrete footings and the underlying native soil or compacted granular soils may be taken as 0.4. Passive pressure available in native soil or compacted fill may be taken as equivalent to the pressure exerted by a fluid weighing 250 pounds per cubic foot (pcf). The passive earth pressure should be limited to 2,500 psf. The above-recommended values include a factor of safety of at least 1.5; therefore, frictional and passive pressure resistance may be used in combination without reduction.

5.6 LATERAL EARTH PRESSURES

5.6.1 Static Lateral Pressure

The at-rest earth pressure against walls that are restrained at the top may be taken as equivalent to the pressure exerted by a fluid weighing 56 pounds per cubic foot (pcf). Fifty percent of any uniform areal surcharges placed at the top of a restrained wall will act as a uniform horizontal pressure over the entire height of the wall. For a 2(h):1(v) sloping backfill condition, the wall should be designed for a triangular load distribution, equivalent to the pressure exerted by a fluid weighing 80 pcf. Restrained conditions may be taken as a lateral wall movement of less than 0.001 H, where H is the unbalanced wall height.

Walls that are not restrained at the top should be designed for an active earth pressure developed by an equivalent fluid weighing 36 pcf for level backfill conditions. Thirty percent of any uniform areal surcharges placed at the top of an unrestrained wall will act as a uniform horizontal pressure over the entire height of the wall.

For retaining walls with sloping backfill condition of 2(h):1(v) slope, the wall should be designed for a triangular load distribution equivalent to the pressure exerted by a fluid weighing 53 pcf. The active earth pressure shall be applied as parallel to the sloping backfill condition.

Light equipment will be used during backfill compaction immediately behind the wall to minimize possible overstressing of the wall.

5.6.2 Seismic Lateral Pressure

Retaining walls higher than 12 feet, as measured from the top of the foundation, should be designed to resist the additional earth pressure caused by seismic ground shaking.

For vertical retaining walls with a level backfill, the corresponding seismic lateral pressure based on the design earthquake may be taken as an inverted triangular pressure distribution with a maximum pressure at the top equal to 37H (with H being the height of the wall in feet). The seismic lateral force may be assumed to act at 2/3H above the wall base. The seismic pressure should be superimposed on the static design load.

5.7 SLAB-ON-GRADE

The slab on grade shall be supported on a minimum 2 feet of properly compacted, granular subgrade as recommended in the preceding sections. For design of slabs and rigid pavements and for estimating their deflections, a modulus of subgrade reaction (k) of 200 pounds per square inch per inch deflection (pci) may be used.

To further reduce the potential for moisture transmission through slabs where moisture sensitive covering will be installed, we recommend that a vapor retarder be used. A 4-inch thick base of ¾ - inch or larger clean aggregate shall be provided for the proposed slab on grade construction in accordance with the City Green Building Code. The material type and installation procedures should comply with appropriate ACI and ASTM specifications.

5.8 PRELIMINARY PILE FOUNDATION OPTIONS FOR ARENA

If settlement constraints preclude the economical use of shallow foundations for the Arena, pile foundations may be considered. Ideally, pile foundations should achieve design axial capacities through being driven / installed to adequate depths.

For initial planning purposes, driven, pre-cast, pre-stressed 16-inch or 18-inch square concrete (PPC) piles may be considered. These piles will derive their capacities primarily in end bearing and skin friction. Potential vibrations and noise from pile driving operations and their effects on adjacent neighboring facilities and residences may need to be evaluated. In order to avoid pre-mature refusal in the stiff, dry clays, the pile locations may require pre-drilling.

For comparison, large-diameter CIDH piles, which would develop axial capacity primarily and some end-bearing, could also be considered. On a preliminary basis, we have estimated that a 10-foot diameter CIDH pile, drilled to a depth of 70 feet below the Arena event level, could develop an allowable bearing (axial) capacity of about 2,000 kips.

Depending upon the project constraints, other types of deep foundations may be considered and can be evaluated on a case-by-case basis. Such piles could include auger pressure-grouted (APG), Tubex / Fundex, and drill displacement pile (DDP), to name a few.

5.8.1 PPC Axial Pile Capacities

For initial comparison purposes, analysis was conducted for PPC piles installed to a nominal depth of 50 feet below the Arena event level. Additional feet of penetration would result in additional pile capacity, if needed. Preliminary axial pile capacities for the two PPC pile sizes with a nominal length of about 50 feet bgs are provided below.

Table 5 – Preliminary Pile Axial Capacities

Pile Type	Pile Width (inches)	Minimum Downward Capacity (kips)	Minimum Upward Capacity (kips)	Increase per each Additional Foot of Penetration (kips)	
				Downward	Upward
PPC	16	200	100	3.0	2.5
	18	260	140	4.0	3.5

The above estimates of axial capacities are based on conventional analyses performed using the methods outlined in Chapter 5 of the Design Manual 7.02 prepared by Naval Facilities Engineering Command (NavFac) for displacement piles. The allowable downward and upward capacities include a factor of safety of at least 2.0.

The allowable downward and upward capacities may be increased by 33 percent to account for temporary loads such as those from wind or earthquakes.

To avoid interference with adjacent piles, and to minimize group effects, piles should be spaced a minimum of 3 pile widths, center-to-center. For this minimum spacing, it will not be necessary to reduce axial capacities for group action.

Settlements of the piles are expected to be less than one inch, including elastic compression of the piles under the design loads.

5.8.2 PPC Lateral Pile Capacities

Resistance to lateral loads will be provided by the resistance of the soil against the pile, pile caps, grade beams, and by the bending strength of the pile itself. Estimated lateral capacity and maximum induced bending moments for the PPC piles with the top in a fixed-head condition are presented in the table below.

Table 6 – Preliminary Pile Lateral Capacities

Pile Type	Pile Width (inches)	Lateral Load (kips)	Deflection (inches)	Bending Moment (ft-kips)	Depth to Zero Moment (feet)
PPC	16	45	½	203	5
		58	1	226	6
	18	55	½	266	5
		70	1	306	6

The preliminary lateral pile capacities and maximum induced bending moments correspond to pile head deflections of 0.5 to 1 inch. At full fixity, the maximum induced bending moment occurs at the pile cap connection. The group reduction in lateral capacity is about 50 percent for center-to-center spacing of at least 3 pile widths.

5.9 DRAINAGE

5.9.1 Surface Drainage and Erosion Control

Management of surface water is critical to the long-term performance of shallow foundations. The ground surface of the site should be sloped at least 2% to direct water away from the foundations, retaining walls, and other structures. Areas where water could pond adjacent to the structures should be eliminated by the use of area drains. Area drains should not be placed next to, or in contact with, the structures.

5.9.2 Drainage Behind Retaining Walls

Retaining walls which are not designed for hydrostatic pressures should be provided with adequate drainage to prevent hydrostatic build-up behind the walls. Backfill behind the walls should be free draining and should satisfy the material requirements of Section 300-3.5.2 of the latest version of “Standard Specification for Public Works Construction”. Lateral drainage should be provided by installing a perforated drainage pipe behind the base of the walls, or weepholes at 8 feet on-center maximum spacing. If a perforated pipe is used, the pipe should be a schedule 40 PVC with a minimum diameter of 4 inches, surrounded with at least 1 square foot per linear foot of wall (1 cubic foot) of free-draining ¾-inch crushed rock or gravel. A non-woven geofabric (Mirafi 140NC or better) should be used to prevent fines loss into the drainage material.

Pre-fabricated drainage composites such as Miradrain 5000, or similar products, should be placed behind subterranean walls cast in front of any shoring to provide adequate drainage.

Drainage water should be controlled and directed to proper drainage devices in an acceptable manner, away from foundations.

5.10 SEISMIC DESIGN PARAMETERS PER CBC 2016

For preliminary determination of the site seismic design parameters, the coordinates North 33.944513 and West 118.342484 were assumed, representing the center of the Event Area. Based on SPT blowcount data from the current borings, a Site Class D was assumed to represent the upper 100 feet of subsurface conditions. Preliminary seismic design parameters per Section 1613A of CBC 2016 are presented in Table 4 below.

Table 7 - Seismic Design Parameters – CBC 2016

Column heading	
Site Class	D
S_s - mapped spectral acceleration at short periods (g)	1.703
S_1 - mapped spectral acceleration at 1-second period (g)	0.626
F_a - site coefficient	1.0
F_v - site coefficient	1.5
S_{MS} - risk-targeted maximum considered earthquake (MCE_R) spectral acceleration at short periods (g)	1.703
S_{M1} - MCE_R spectral acceleration at 1-second period (g)	0.939
S_{DS} - design spectral acceleration at short periods (g)	1.135
S_{D1} - design spectral acceleration at 1-second period (g)	0.626
PGA – mapped maximum considered earthquake geometric mean (MCE_G) peak ground acceleration (g)	0.619
Note: ASCE 7-10 mapped values for 2 percent probability exceedance in 50 years.	

5.11 CORROSIVITY

Corrosivity tests were performed on several representative soils, including near-surface soils as well as several samples from the arena event level. The tests were conducted by Corrosion X Engineers of Murrieta, California. The minimum resistivity test results generally characterize the subsurface soils as being moderately corrosive to corrosive to ferrous metals. The results and recommendations are presented in Appendix C.

5.12 SURFACE PAVEMENT AREAS

These areas include pavements, roadways, parking lots and flatwork as described in the preceding Section 5.1.5.

To provide uniform and adequate support, all surface pavement areas should be typically underlain by at least 24 inches of granular fill compacted to 95 percent MRC. The fill shall be placed on an unyielding subgrade prepared in accordance with the preceding recommendations. Flexible and PCC sections may be designed per the following subsections.

5.12.1 Flexible Pavement Thicknesses

The following flexible pavement thicknesses for Traffic Index (TI) values of 5, 6 and 7 may be used:

Table 8 – Minimum Flexible (AC) Pavement Thicknesses

	Pavement Section (feet)	
Traffic Index (TI)	Asphaltic Concrete	Aggregate Base
4 to 5	0.3	0.55
6 to 7	0.4	0.65
7 to 8	0.5	0.75

5.12.2 Concrete Flatwork / Hardscape and Sidewalks

For typical PCC pavements in pedestrian areas, a pavement section of 4 inches PCC over 6 inches of aggregate base is typical for the kinds of soils to be expected at the site.

Loading docks, trash enclosures and other areas where heavy truck-turning is anticipated should be paved with PCC pavement. We recommend that the section consist of a minimum of 6 inches of reinforced Portland cement concrete over 4 inches of Caltrans Class 2 Base with a minimum R-value of 78. The aggregate base should be compacted to at least 95 percent of the maximum dry density per ASTM D-1557 over unyielding subgrade.

5.13 INFILTRATION FEASIBILITY

Preliminary percolation tests were conducted at five (5) selected locations at the site (P-1 through P-5). The results of percolation testing are summarized in Appendix D.

Based on the results, infiltration rates for the soils in the upper 10 feet ranged from 0.32 to 3.52 in/hr. The test results represent a sampling of the upper materials which consist of variable and predominately clayey and silty sands. The upper value may be due to localized presence of more granular soils at the particular test location (P-2).

However, as discussed in this report, the subsurface native soils at the site consist predominately of clayey soils with estimated infiltration rates lower than 0.3 in/hr and with few or no connectivity to permeable soil horizons of adequate thickness. Moreover, the underlying, predominately clayey soils have never experienced saturation and have been found to exhibit more compressibility when inundated; therefore any infiltration of water into the subsurface soils, particularly within the areas to be occupied by permanent structures, is highly discouraged from a foundation performance stand-point. Given these constraints, infiltration practices at the site might be very limited.

6. DESIGN REVIEW AND SUPPLEMENTAL INVESTIGATIONS

We recommend that the design aspects of the project be reviewed with the geotechnical engineer as the process advances.

The scope of services may include conducting additional subsurface explorations and testing, developing specific recommendations for special cases, reviewing the foundation design and evaluating the overall applicability of the recommendations presented in this report, reviewing the geotechnical portions of the project for possible cost savings through alternative approaches and reviewing the proposed construction techniques to evaluate if they satisfy the intent of the recommendations presented in this report.

7. LIMITATIONS

AECOM warrants that our services have been performed within the limits prescribed by our clients, with the usual thoroughness and competence of the geotechnical engineering profession in Southern California at this time. No other warranty or representation, express or implied, is included or intended in this report. This report has not been prepared for other parties and may not contain sufficient information for other purposes or other users.

- o0o -

We appreciate the opportunity to be a part of this iconic Project. Should you have any questions regarding our preliminary findings, please contact us.

Very truly yours,

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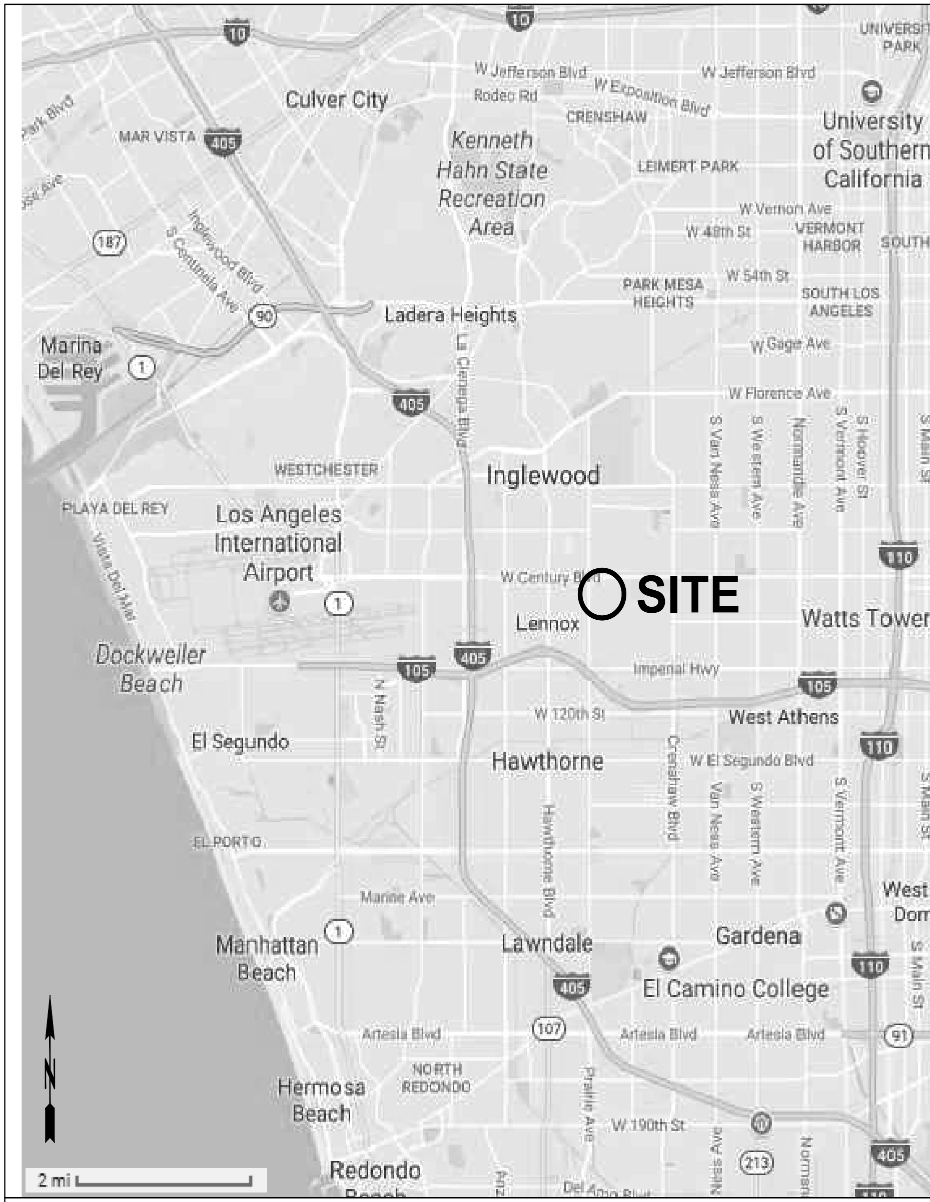


LEGEND

Project Site Location

*Source: Google Maps

VICINITY MAP

PROJECT CONDOR

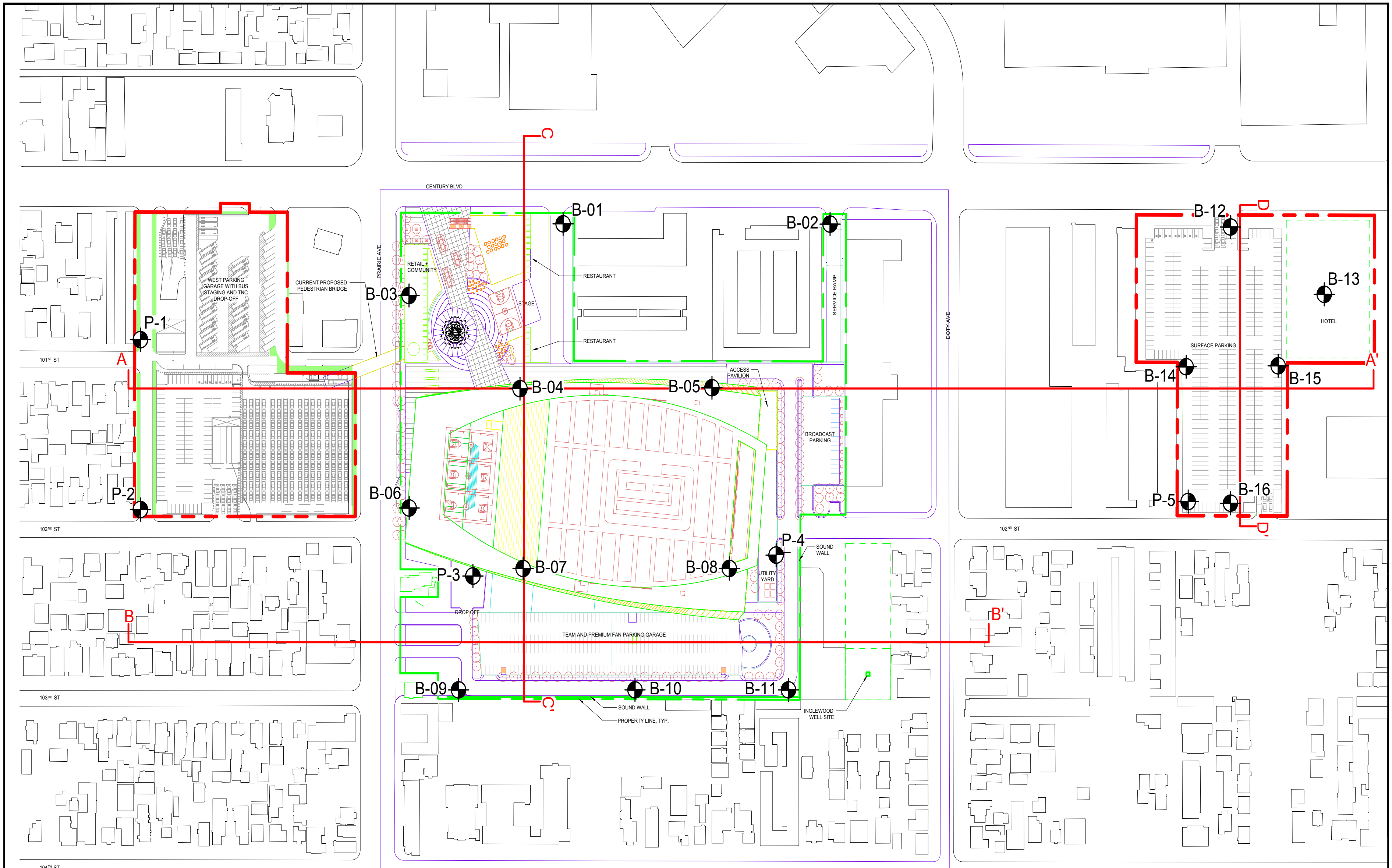
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD

INGLEWOOD, CALIFORNIA

FOR: MURPHY'S BOWL, LLC

AECOM

FIGURE 1



LEGEND

B-16 Approx. Location of Exploratory Boring

P-6 Approx. Location of Borehole Percolation Test

D D' Cross Section

PLOT PLAN

PROJECT CONDOR

SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD

INGLEWOOD, CALIFORNIA

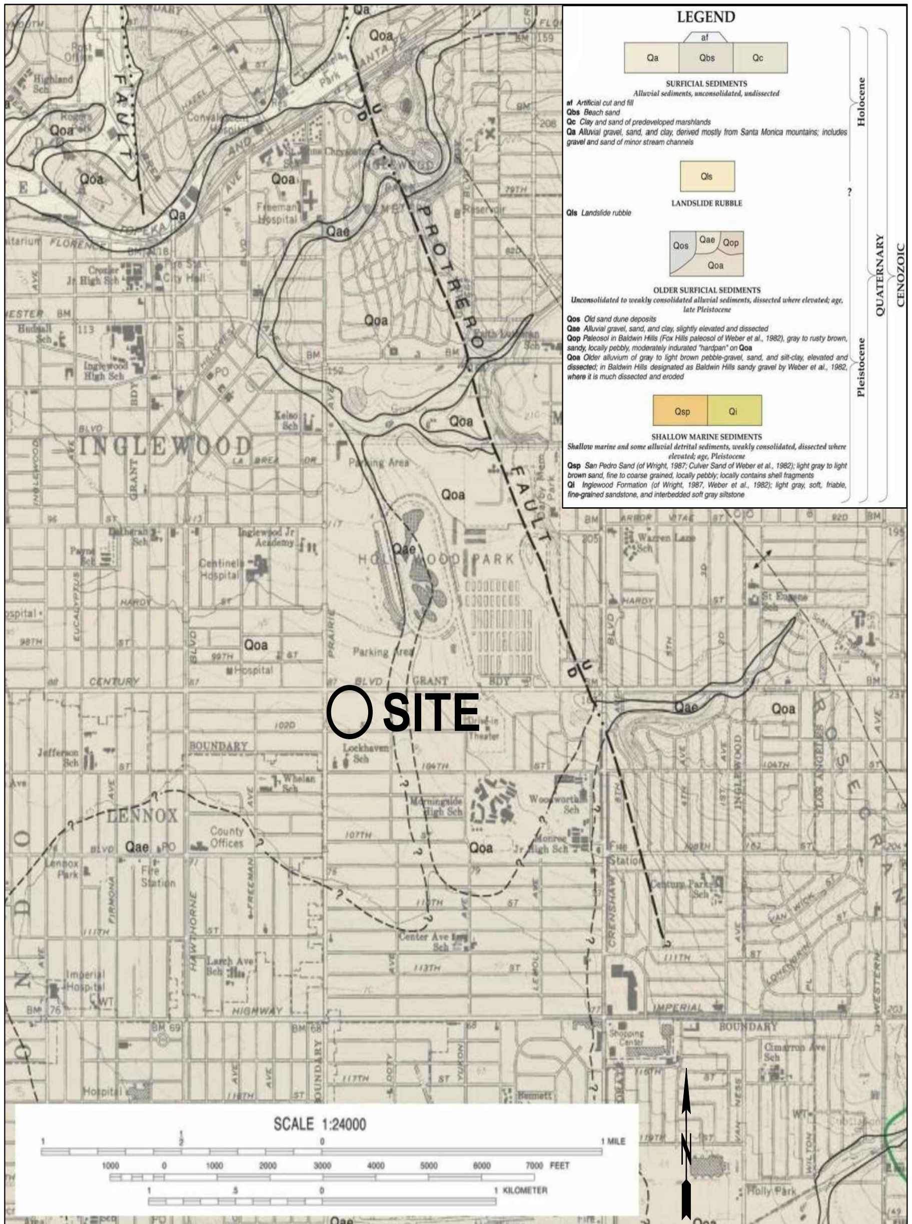
FOR: MURPHY'S BOWL, LLC

N

100' 0' 200'

SCALE: 1"= 200'

FIGURE 2



LEGEND

Project Site Location

*Source: Dibblee (2007), Geologic map of the Venice and Inglewood Quadrangles, Los Angeles County, California

GEOLOGIC MAP

PROJECT CONDOR

SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD

INGLEWOOD, CALIFORNIA

FOR: MURPHY'S BOWL, LLC

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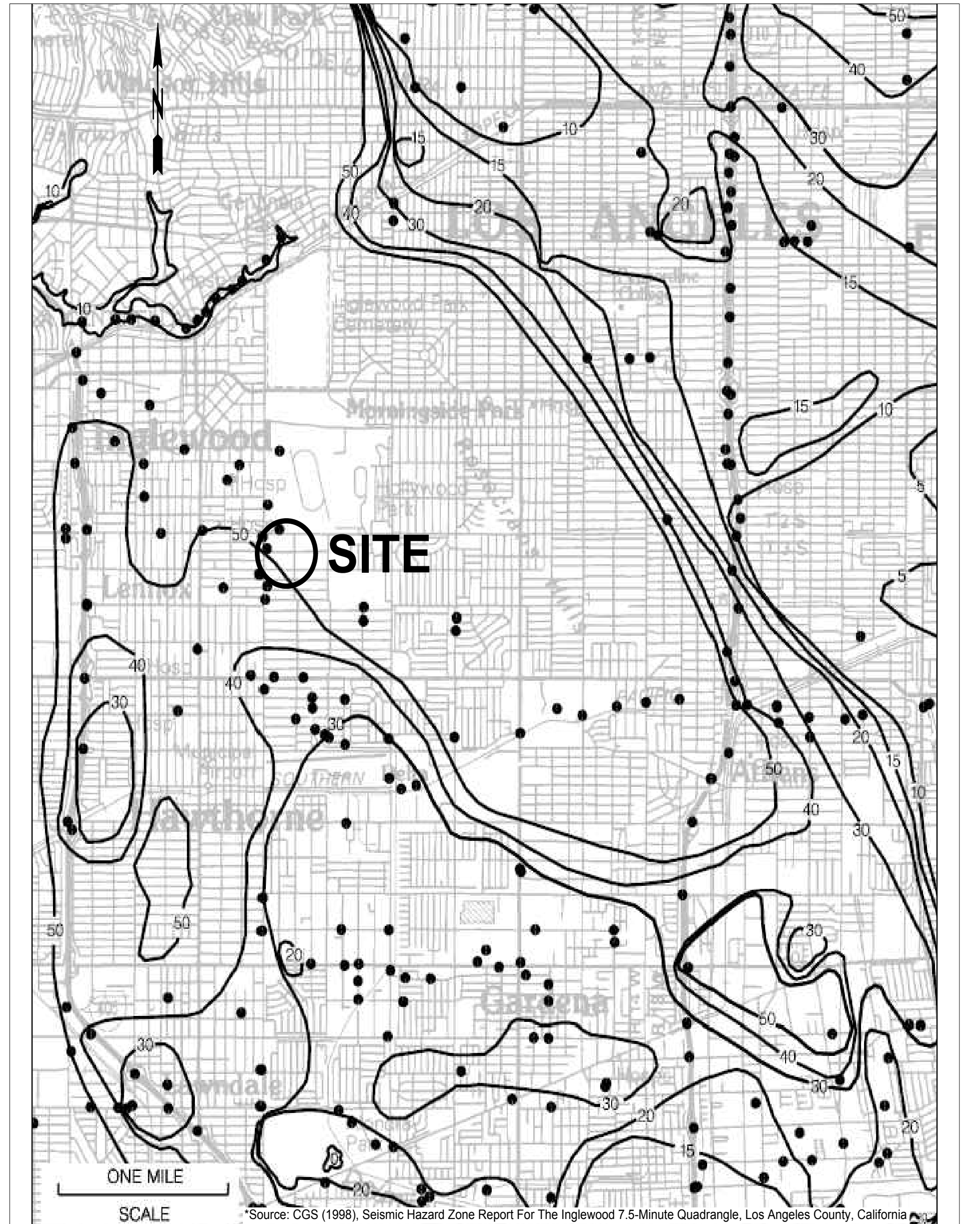
FIGURE 3



LEGEND

Project Site Location

—30— Depth To Groundwater (Feet)

Borehole Site

HISTORICAL GROUNDWATER LEVELS

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INGLEWOOD, CALIFORNIA

FOR: MURPHY'S BOWL, LLC

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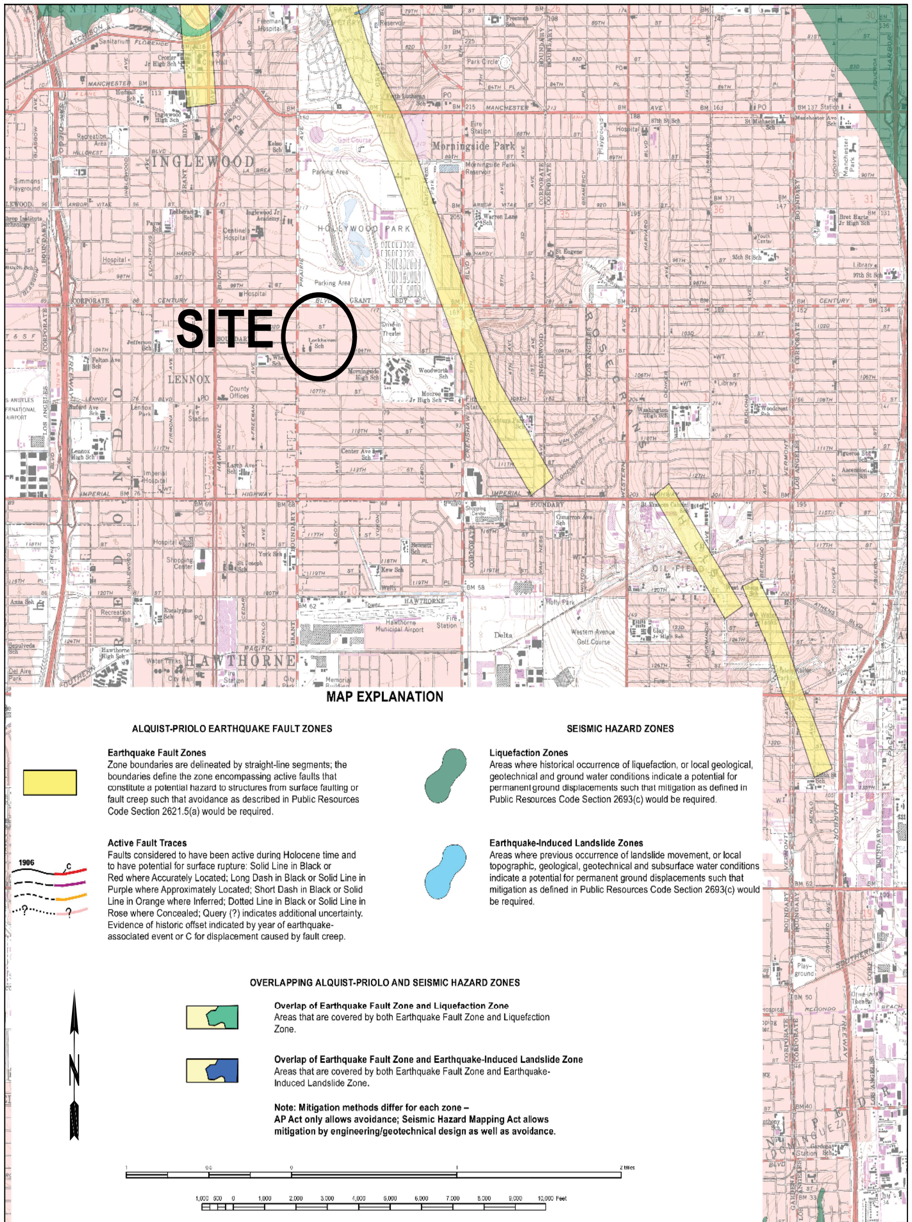
FIGURE 4



LEGEND

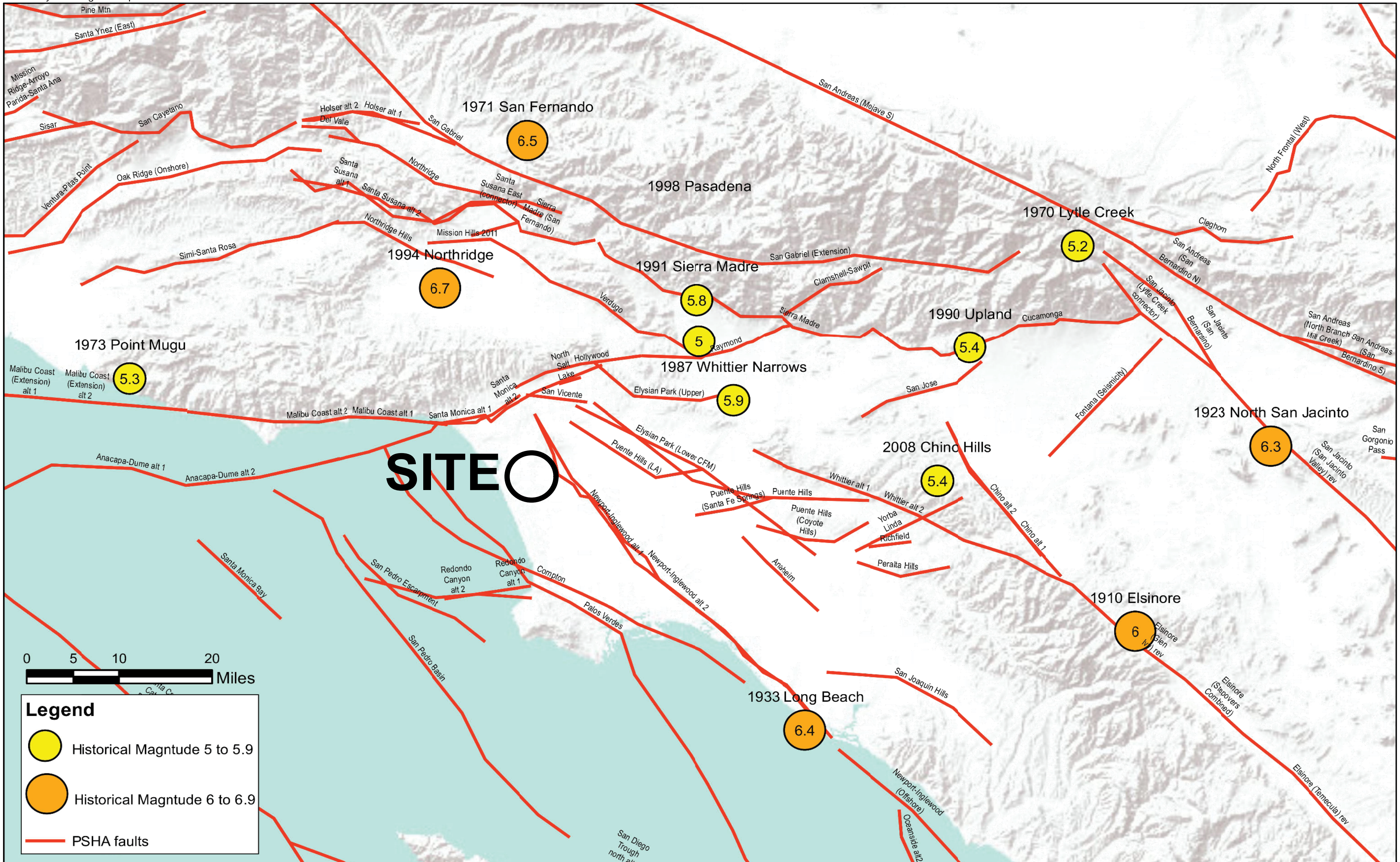
Project Site Location

*Source: CGS, Earthquake Zones of Required Investigaton, Inglewood Quadrangle

SEISMIC HAZARD ZONE MAP

PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD
INGLEWOOD, CALIFORNIA
FOR: MURPHY'S BOWL, LLC

AECOM
FIGURE 5



LEGEND

Project Site Location

*Sources: Esri, USGS, NOAA

N

REGIONAL FAULT MAP

PROJECT CONDOR

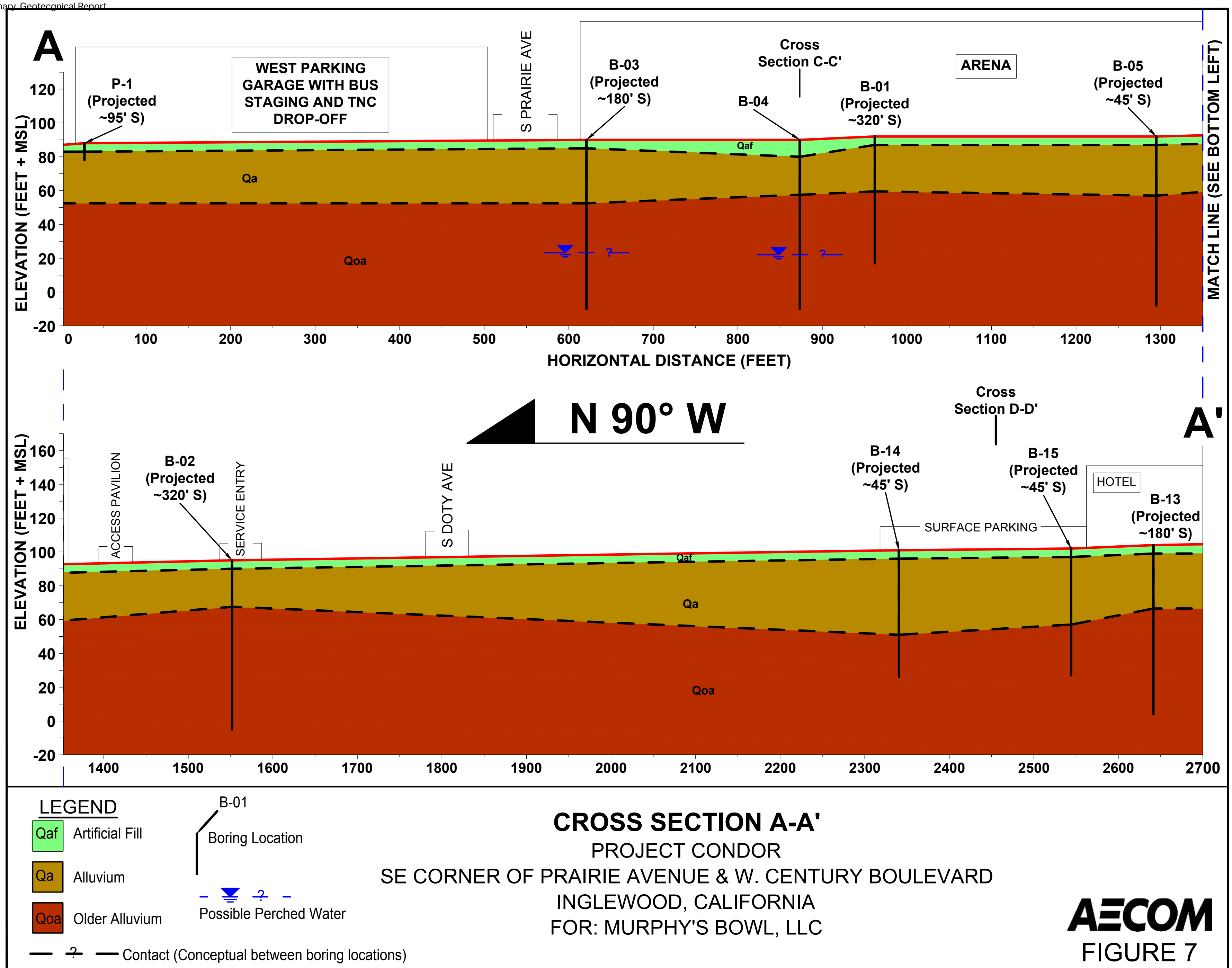
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD

INGLEWOOD, CALIFORNIA

FOR: MURPHY'S BOWL, LLC

AECOM

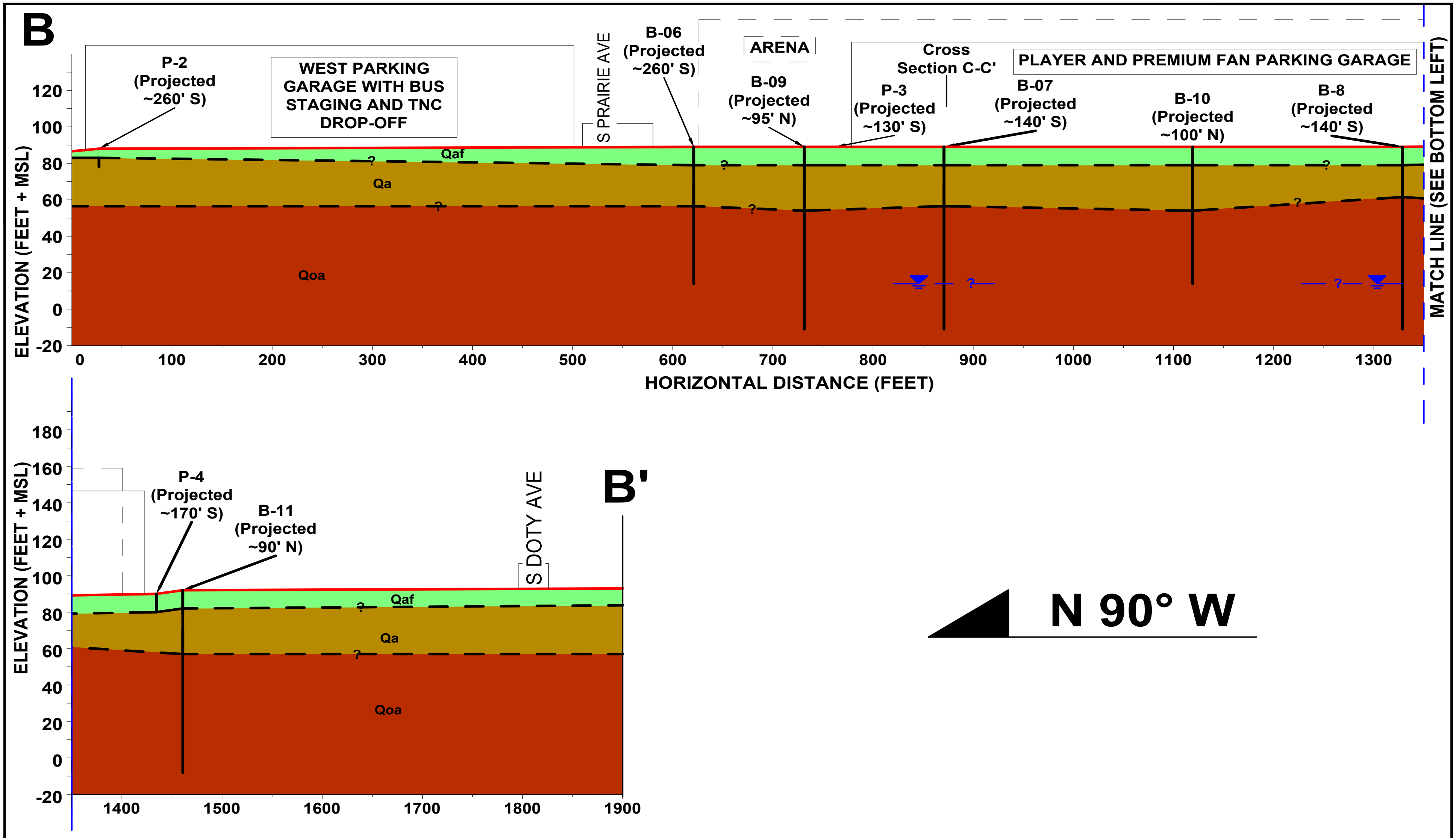
FIGURE 6



CROSS SECTION A-A'

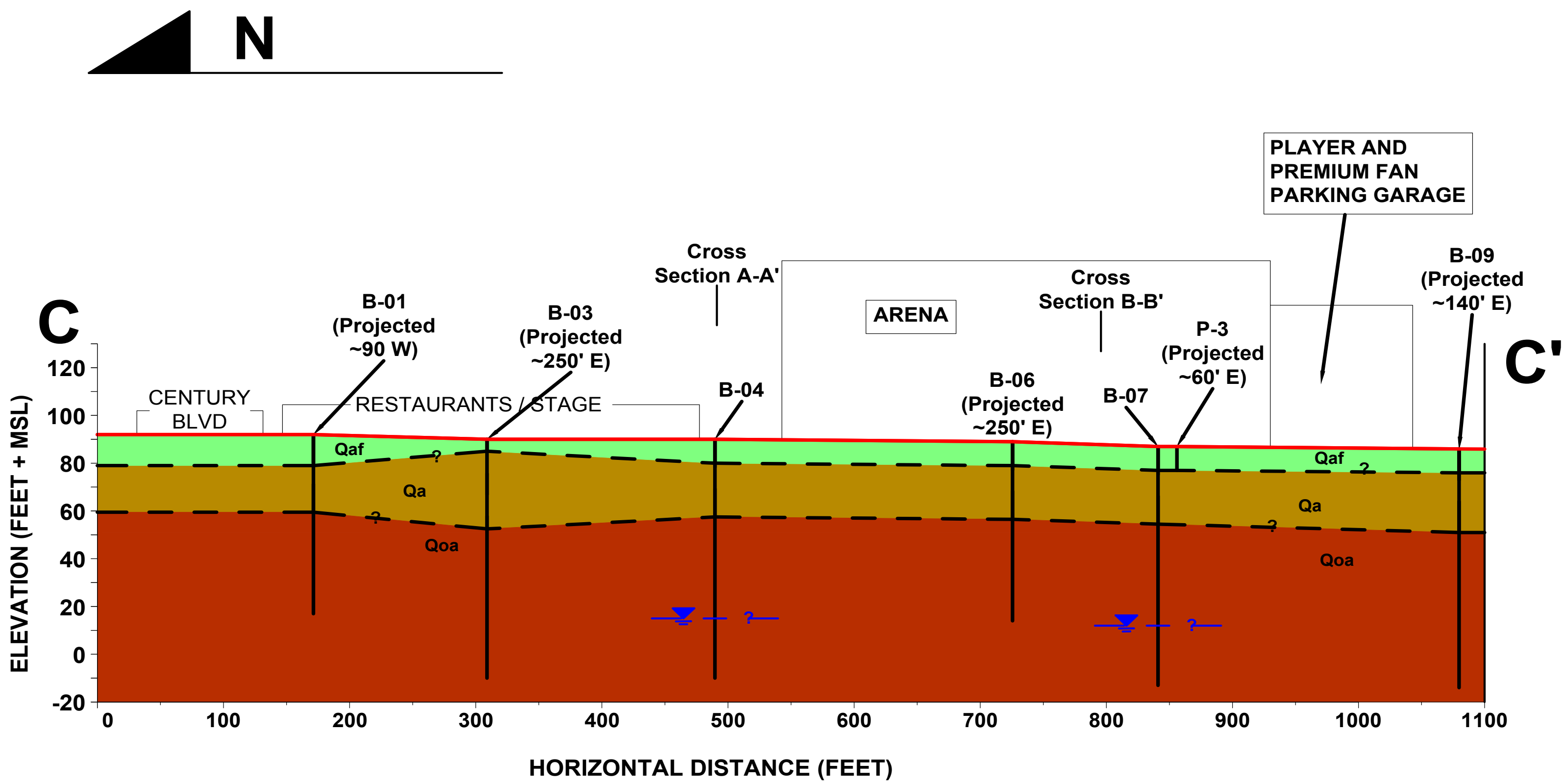
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD
INGLEWOOD, CALIFORNIA
FOR: MURPHY'S BOWL, LLC

AECOM
FIGURE 7



CROSS SECTION B-B'
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD
INGLEWOOD, CALIFORNIA
FOR: MURPHY'S BOWL, LLC

AECOM
FIGURE 8



LEGEND

Qaf Artificial Fill

Qa Alluvium

Qoa Older Alluvium

B-01 Boring Location

Possible Perched Water

Contact (Conceptual between boring locations)

CROSS SECTION C-C'

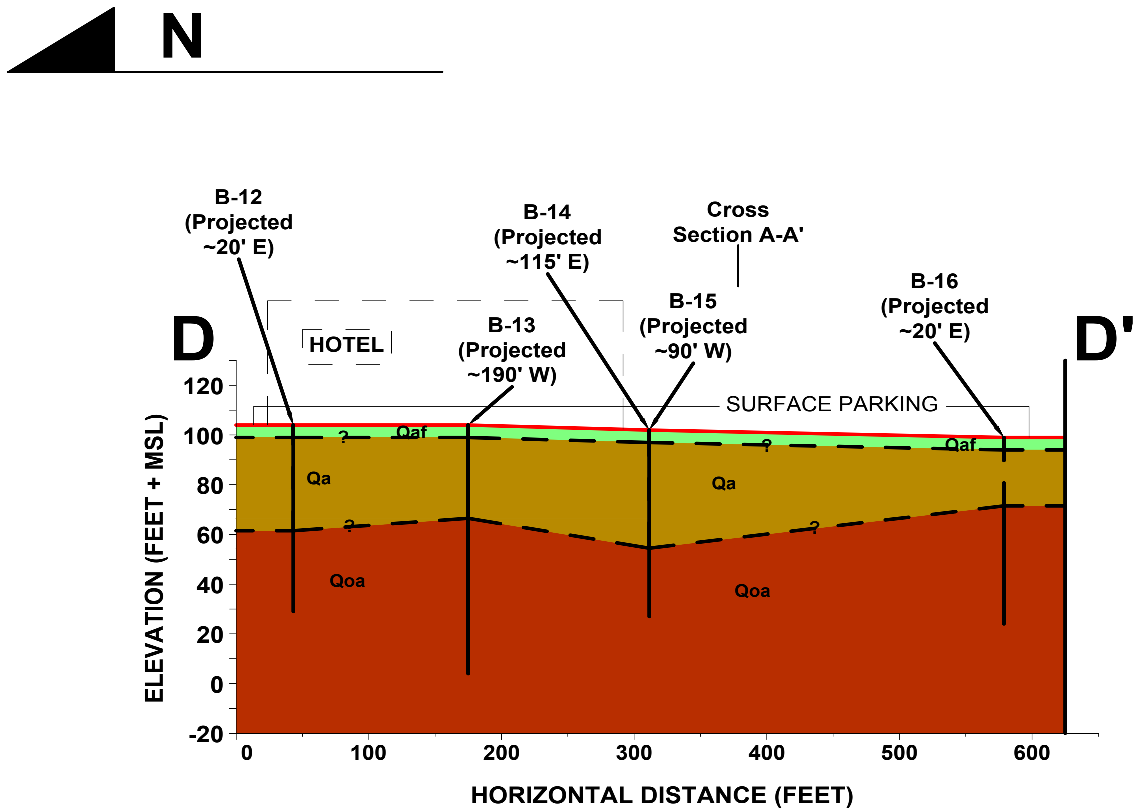
PROJECT CONDOR

SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD

INGLEWOOD, CALIFORNIA

FOR: MURPHY'S BOWL, LLC

FIGURE 9



LEGEND

Qaf Artificial Fill

Qa Alluvium

Qoa Older Alluvium

— ? — Contact (Conceptual between boring locations)

Boring Location

B-01

CROSS SECTION D-D'

PROJECT CONDOR

SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD

INGLEWOOD, CALIFORNIA

FOR: MURPHY'S BOWL, LLC

AECOM

FIGURE 10

Appendix A – Field Exploration Program

List of Figures

Figure A-1	USCS
Figures A-2 through A-22	Logs of Borings

This appendix describes the field exploration program conducted by AECOM for a preliminary geotechnical investigation for Project CONDOR. The site is located at the southeast corner of Prairie Avenue and West Century Boulevard. The exploratory locations for soil borings were first marked in the field, and then checked through DigAlert and finally using ground penetration radar (GPR) techniques for clearance of potential conflicts with underground utilities.

The GPR work was performed by our subconsultant, Southwest Geophysics of San Diego, California. No underground obstructions were encountered in any of the borings drilled during the current investigation.

The subsurface exploration program was conducted from May 8, 2018 through May 25, 2018 and included drilling and sampling 16 borings (B-01 through B16) to approximate depths ranging between 75 feet and 100 feet bgs using a CME85 drilling rig operated by ABC Liovin Drilling of Signal Hill, California. The approximate locations of the borings are shown on the Plot Plan, Figure 2.

AECOM representatives from our Los Angeles office maintained a log for each boring in the field, recording sampler blow counts, soil characteristics, observations, sample locations, and other pertinent drilling and sampling information. The subsurface materials were characterized by visual inspection of the samples and soil cuttings returned to the surface during the drilling operation. The behavior of the drill rig, such as variations penetration rate, was also considered in material characterization. Soils were classified according to the Unified Soil Classification System (ASTM D 2488). The boring logs were modified to reflect the results of laboratory observations and testing of the samples. A key to notations on the boring logs (Figure A-1) and the boring logs (Figures A-2 through A-22) are presented in this Appendix.

Relatively undisturbed samples were obtained using a California sampler (2.42-inches I.D.) driven 18-inches using a 140-pound hammer with a 30-inch drop. The number of blows required to drive the sampler was recorded for each 6-inch interval of penetration. The first 6-inch increment of penetration is considered to be a “seating interval” in potentially highly disturbed soils at the base of the borehole, and is therefore not included in the final log notation unless refusal was met within the seating interval. The total number of blows for the 12 inches of penetration beyond the seating interval, or the distance driven before refusal, is normally recorded on the log.

Relatively undisturbed and disturbed samples from the sampling activities were placed in plastic bags to preserve the water content of the soil and transported to our geotechnical laboratory in Los Angeles for testing.

Standard penetration tests (SPT) were also performed at selected depths per ASTM D-1586. The blow count for the final 12 inches of sampler penetration is commonly referred to as the "N-value". This value generally reflects the resistance to penetration of the soil at the sample depth.

Project: Project Condor
Project Location: Inglewood, California
Project No.: 60545923

Key to Log of Boring

Sheet 1 of 1

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

CL	Collapse Potential (ASTM D 5333)
CONS	Consolidation (ASTM D 2435)
COMP	Lab Compaction (ASTM D 1557)
CORR	Corrosion: Resistivity, pH (CTM 532, 643), Sulfates (CTM 417), Chlorides (CTM 422)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
MC	Moisture Content (ASTM D 2216)
OC	Organic Content (ASTM D 2974)
PERM	Permeability (CTM 220)
PA	Particle Size Analysis (-200 result in parentheses) (ASTM D 6913)
PI	Liquid Limit (LL=test result), Plastic Limit, Plasticity Index (PI=test result) (ASTM D 4318)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
PP	Pocket Penetrometer
RV	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (ASTM D 854)
SL	Shrinkage Limit (ASTM D 427)
SW	Swell Potential (ASTM D 4546)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166) Unconfined Compression - Rock (ASTM D 2938)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 4767)
WA	Minus #200 (test result in parentheses) (ASTM D 1140)

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Split Spoon Sampler (2 in. outside diameter)
- California Sampler (3 in. outside diameter)
- Modified California Sampler (2-1/2 in. outside diameter)
- Shelby Tube (3 in. outside diameter)
- Piston Sampler
- Bulk, Bag, or Grab Sample
- Sonic Core
- HQ Rock Core

GENERAL NOTES

Soil classifications are based on ASTM D2488 version of the Unified Soil Classification System. Descriptions and stratum lines are interpretive; actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of laboratory tests per ASTM D2487. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (short-term)
- Static Water Level Reading (long-term)

AECOM

Figure A-1

Boring B-01

Sheet 1 of 2

Date(s) Drilled	05-09-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.945290°, E -118.342582°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Job Number	60545923
Total Depth Drilled (ft)	75.0
Approximate Ground Surface Elevation (ft)	92.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	**FILL** **Silty SAND**: dark brown, moist, medium dense, mostly fine SAND, trace coarse SAND, trace small concrete debris			
90										
			S-1	7 11 12		SC	**ALLUVIUM** **Clayey SAND**: dark brown, moist, medium dense, mostly fine SAND	6	118	DS
	10		S-2	3 8 12			Grades brown	15		
80										
			S-3	7 7 9			Grades light brown	12	118	CONSOL
	20		S-4	10 14 16		SP	**Poorly-Graded SAND**: light brown, dry, dense, mostly fine SAND	2		WA (2.8)
70										
			S-5	6 9 14			Grades moist, medium dense	4		
	30		S-6	22 27 22			Grades dark brown, very dense, trace CLAY	9		
60						CL	**Lean CLAY with SAND**: brown, moist, very stiff, little fine SAND			
			S-7	8 12 10				29	93	
	40		S-8	8 14 16			Grades hard, lenses of fine SAND	23		
50						SC	**Clayey SAND**: brown, moist, dense, mostly fine SAND			
			S-9	17 29 34				13	111	
	50									

This log is part of the report prepared by AECOM for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

LOG OF BORING

PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-2

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PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-01
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Sample Type	Sample Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	50		S-10	13 20 21		**ALLUVIUM** (*continued*) **Clayey SAND**: brown, moist, very dense, mostly fine SAND (*continued*)	8		WA (44.2)
40			S-11	14 29 39	ML	**Sandy SILT with CLAY**: olive brown, moist, very dense, some fine SAND, little CLAY	18	106	
30	60		S-12	12 19 22		Grades with few CLAY	11		WA (50.2)
			S-13	12 29 36	CL	**Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND, few SILT	19	113	
20	70		S-14	8 13 23			22		
			S-15	22 39 39			23	103	
10	80					1. Boring completed to planned depth of 75 feet bgs. 2. No groundwater encountered. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
0	90								
-10	100								
-20	110								

AECOM

FIGURE A-2 continued

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Boring B-02
Sheet 1 of 2

Date(s) Drilled	05-25-2018	Logged By	A. Bicol
Drilling Method	Hollow-Stem Auger	Checked By	S. Nesarajah
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater encountered at 90' bgs	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.945288°, E -118.340656°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Job Number	60545923
Total Depth Drilled (ft)	100.0
Approximate Ground Surface Elevation (ft)	95.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Sample Type	Sample Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0				SM	**FILL** **Silty SAND**: brown, moist, medium dense, mostly fine SAND			
90			S-1	10 10 14	SC	**ALLUVIUM** **Clayey SAND**: brown, moist, medium dense, mostly fine SAND	10	118	
	10		S-2	5 10 11					
80			S-3	7 10 16	CL	**Sandy Lean CLAY**: brown, moist, very stiff, some fine SAND. Grades with few SILT	26	100	
	20		S-4	7 7 10					
					SC	**Clayey SAND**: light brown, moist, medium dense, mostly fine SAND			
70			S-5	9 16 18			11	114	
					CL	**Sandy Lean CLAY**: light brown, moist, very stiff, little fine SAND			
	30		S-6	4 9 13					
60			S-7	9 12 17		Grades with reddish staining, lenses of Silty fine SAND	15	102	
	40		S-8	10 24 24		Grades hard, some fine SAND			
50			S-9	16 24 32		Grades olive brown	12	120	
	50								

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-3

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Date(s) Drilled	05-15-2018 to 05-16-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	Bulk, SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater encountered 75' bgs	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.944902°, E -118.343699°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Boring B-03
Sheet 1 of 2

Job Number	60545923
Total Depth Drilled (ft)	100.0
Approximate Ground Surface Elevation (ft)	90.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
90	0		BK-1		SM	**FILL** **Silty SAND**: brown, moist, dense, mostly fine SAND, some small concrete debris			
			S-1	5 18 25	CL	**ALLUVIUM** **Sandy Lean CLAY**: yellowish-brown, moist, very stiff, some fine SAND			
80	10		S-2	7 6 8			14		
			S-3	12 18 20		Grades hard			
					SM	**Silty SAND**: dark grayish-brown, moist, dense, mostly fine SAND			
70	20		S-4	14 16 21			5		
			S-5	10 21 23		Grades dark gray			
60	30		S-6	7 8 11	ML	**Sandy SILT with CLAY**: olive brown, moist, medium dense, some fine SAND, little CLAY	9		WA (53.6)
			S-7	5 10 19					
					CL	**Sandy Lean CLAY**: olive brown, moist, hard, little fine SAND, iron oxide staining			
50	40		S-8	7 13 12			24		
			S-9	18 22 30		Grades with some fine SAND			
40	50								

This log is part of the report prepared by AECOM for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-4

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-03
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
40	50		S-10	8 14 18		**ALLUVIUM** *(continued)* **Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND, iron oxide staining *(continued)*	12		WA (59.8)
			S-11	11 23 26		Grades dark olive brown			
30	60		S-12	7 11 16	CL	**Lean CLAY with SAND**: dark olive brown, moist, hard, little fine SAND	21		WA (79.2)
			S-13	22 50/6"					
20	70		S-14	8 12 20			19		
			S-15	25 29 29	ML	**Sandy SILT with CLAY**: dark olive brown, wet, dense, some fine SAND, few CLAY			Possible perched water at 75' bgs
10	80		S-16	5 7 14		Grades olive brown, medium dense	21		
			S-17	12 28 42		Grades dark olive brown, very dense			
0	90		S-18	7 13 21	SC	**Clayey SAND**: dark olive brown, wet, dense, mostly fine SAND	20		WA (11.6)
			S-19	21 50/6"		Grades olive brown			
					SM	**Silty SAND**: dark grayish-brown, wet, very dense, mostly fine SAND			
-10	100		S-20	7 30 30			21		
						1. Boring completed to planned depth of 100 feet bgs. 2. Possible perched water at 75 feet bgs. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
-20	110								

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FIGURE A-4 continued

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Date(s) Drilled	05-08-2018	Logged By	T. Hanson	**Boring B-04** Sheet 1 of 2	
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol		
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin		
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger	Job Number	60545923
Groundwater Level(s)	Groundwater encountered 75' bgs	Hammer Data	140lbs, 30-inch auto drop	Total Depth Drilled (ft)	100.0
Borehole Location	N 33.944416°, E -118.342888°	Borehole Completion	Backfilled with compacted mix of soil cuttings	Approximate Ground Surface Elevation (ft)	90.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Samples: Number	Samples: Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
90	0			SM	**FILL** **Silty SAND**: brown, moist, medium dense, mostly fine SAND, trace CLAY, some small concrete debris			
		S-1	2 10 10			8		
				SM	**ALLUVIUM** **Silty SAND**: light brown, moist, medium dense, mostly fine SAND			
80	10	S-2	11 9 26			9	124	CORR
		S-3	3 7 9			6		
70	20	S-4	4 13 34		Grades mottled gray and light brown, dense	7	111	
		S-5	6 11 15		Grades with reddish brown staining	5		WA (17.5)
60	30	S-6	8 15 22		Grades dark brown, olive and red staining, medium dense	8	116	DS; CORR
				CL	**Sandy Lean CLAY**: brown, moist, very stiff, some fine SAND			
		S-7	6 10 13			32		PA (66.6)
50	40	S-8	5 13 37		Grades hard	23	95	
				SC	**Clayey SAND**: grayish brown, moist, dense, mostly fine SAND			
		S-9	10 16 19			5		WA (20.3)
					Grades with lenses of lean CLAY			
40	50							

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-5

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-04
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Samples: Number	Samples: Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
40	50	S-10	14 22 23		**ALLUVIUM** *(continued)* **Clayey SAND**: grayish brown, moist, dense, mostly fine SAND, lenses of lean CLAY *(continued)*	15	114	
		S-11	10 21 26		Grades dark brown, very dense	13		
30	60	S-12	5 11 18	CL	**Sandy Lean CLAY**: dark olive brown, moist, very stiff, some fine SAND	20	101	
		S-13	4 6 8		Grades dark brown	22		
20	70	S-14	11 18 32		Grades brown, hard	26	99	
				SC	**Clayey SAND**: dark brown, wet, very dense, mostly fine SAND			
		S-15	9 18 24			22		Possible perched water at 75' bgs
10	80	S-16	8 14 24		Grades dense	24	102	
		S-17	4 7 14	ML	**Sandy SILT with CLAY**: light brown, wet, medium dense, some fine SAND, few CLAY	22		
0	90	S-18	15 45 50/3"		Grades dark brown, very dense	23	105	
		S-19	7 13 17		Grades grayish-brown, dense	35		
-10	100	S-20	24 50/6"			17	112	
					1. Boring completed to planned depth of 100 feet bgs. 2. Possible perched water encountered at about 75 feet bgs. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
-20	110							

AECOM

FIGURE A-5 continued

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-05
Sheet 2 of 2

Elevation (ft)	Depth (ft)	SAMPLES Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
40	50	S-10	13 35 46		**ALLUVIUM** *(continued)* **Clayey SAND:** dark olive brown, moist, very dense, mostly fine SAND, some CLAY *(continued)*	16	113	CONSOL
		S-11	8 21 22		Grades dark olive brown			
30	60	S-12	18 28 50/5"		Grades grayish-brown, less CLAY			
		S-13	6 16 25		Grades olive brown, some CLAY			
20	70	S-14	9 24 30		Grades dark olive brown, dense			
		S-15	5 5 9		Grades medium dense, lenses of lean CLAY			
10	80	S-16	5 21 36		Grades dense, trace CLAY			
		S-17	2 5 9	CL	**Sandy Lean CLAY**: dark olive brown, moist, very stiff, some fine SAND			
0	90	S-18	7 28 50/5"		Grades hard			
		S-19	4 11 16					
-10	100	S-20	14 24 40		1. Boring completed to planned depth of 100 feet bgs. 2. No groundwater encountered. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
-20	110							

AECOM

FIGURE A-6 continued

Boring B-06
Sheet 1 of 2

Date(s) Drilled	05-08-2018 to 5-09-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater encountered 75' bgs	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.943775°, E -118.343702°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Job Number	60545923
Total Depth Drilled (ft)	75.0
Approximate Ground Surface Elevation (ft)	89.0

MATERIAL DESCRIPTION

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	SAMPLES Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0			SM	**FILL** **Silty SAND**: dark brown, moist, medium dense, few CLAY, some small concrete debris			
		S-1	9 13 15			7	125	
80				SC	**ALLUVIUM** **Clayey SAND**: brown, moist, medium dense, mostly fine SAND			
	10	S-2	3 8 8			8		PA (36.0)
		S-3	5 11 20	SP	**Poorly-Graded SAND**: yellowish-brown, dry, medium dense, mostly fine to medium SAND	4	102	DS
70	20	S-4	6 14 19		Grades light brown, dense, trace coarse SAND	3		WA (4.1)
		S-5	5 15 27		Grades moist, mostly fine SAND	6	107	
60	30	S-6	4 8 9		Grades grayish-brown, medium dense, mostly medium to coarse SAND, lenses of lean CLAY	14		
				CL	**Lean CLAY**: dark brown, moist, stiff, trace fine SAND			
		S-7	3 8 9			27	108	CONSOL
50	40	S-8	4 7 14		Grades very stiff	32		WA (92.0);
		S-9	14 23 37	SC	**Clayey SAND**: grayish-brown, moist, dense, mostly fine SAND	5	98	
					Grades with lenses of lean CLAY			
40	50							

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-7

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-06
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	50		S-10	7 14 20			**ALLUVIUM** *(continued)* **Clayey SAND**: brown, moist, dense, mostly fine SAND, lenses of lean CLAY *(continued)*	15		
			S-11	10 25 26			Grades light brown, trace CLAY	6	112	
30	60		S-12	11 27 17			Grades grayish brown, very dense, some CLAY	11		
							Grades brown			
			S-13	8 22 27		CL	**Lean CLAY with SAND**: olive brown, moist, hard, little fine SAND	17	116	
20	70		S-14	5 7 12			Grades very stiff, few fine SAND	24		
			S-15	5 7 12				24	99	Possible perched water at 75' bgs
10	80						1. Boring completed to planned depth of 75 feet bgs. 2. Possible perched water at 75 feet bgs. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
0	90									
-10	100									
-20	110									

AECOM

FIGURE A-7 continued

Date(s) Drilled	05-09-2018 to 05-10-2018	Logged By	T. Hanson	Job Number	60545923
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol	Total Depth Drilled (ft)	100.0
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin	Approximate Ground Surface Elevation (ft)	87.0
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger		
Groundwater Level(s)	Groundwater encountered 75' bgs	Hammer Data	140lbs, 30-inch auto drop		
Borehole Location	N 33.943462°, E -118.342887°	Borehole Completion	Backfilled with compacted mix of soil cuttings		

Boring B-07
Sheet 1 of 2

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0					SM	**FILL** **Silty SAND**: dark brown, moist, medium dense, mostly fine SAND, some small concrete debris			
			S-1	6 10 14				10		
80						ML	**ALLUVIUM** **Sandy SILT with CLAY**: light brown, moist, medium dense, some fine SAND, few CLAY			
	10		S-2	7 10 15				16	110	
							Grades with less CLAY			
70			S-3	3 6 8				17		
						SP	**Poorly-Graded SAND**: light brown, moist, medium dense, mostly fine SAND			
	20		S-4	5 14 19				5	99	WA (6.3)
			S-5	7 9 12		SC	**Clayey SAND**: light brown, moist, medium dense, mostly fine SAND	10		WA (38.7)
60	30		S-6	9 16 21				10	114	CONSOL
						CL	**Lean CLAY**: mottled light brown, moist, very stiff, trace fine SAND			
50			S-7	5 7 14				26		LL=46; PI=21
	40		S-8	5 15 15				29	94	DS
			S-9	9 20 23		SC	**Clayey SAND**: brown, moist, very dense, mostly fine SAND, few CLAY	15		
40	50									

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

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FIGURE A-8

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-07
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	50		S-10	5 14 21		**ALLUVIUM** *(continued)* **Clayey SAND**: brown, moist, medium dense, mostly fine SAND, few CLAY *(continued)*	12	110	
30			S-11	13 19 21		Grades dense	12		
	60		S-12	14 21 29		Grades with little CLAY	15	111	CONSOL
20			S-13	10 17 20			16		
	70		S-14	11 20 31	CL	**Lean CLAY with SAND**: brown, moist, hard, few fine SAND	30	93	
10			S-15	12 26 50/5"		Grades with little fine SAND	26		Possible perched water at 75' bgs
	80		S-16	9 12 22			26		
0			S-17	5 10 19			26		
	90		S-18	7 11 16		Grades lenses of fine SAND	21		
					SM	**Silty SAND**: gray, wet, very dense, mostly fine SAND			
-10			S-19	14 24 34			19		WA (9.5)
	100		S-20	8 14 16		Grades dense	18		
-20	110								

1. Boring completed to planned depth of 100 feet bgs.
2. Possible perched water at 75 feet bgs.
3. Boring backfilled with compacted mix of soil cuttings upon completion.

AECOM

FIGURE A-8 continued

Boring B-08
Sheet 1 of 2

Date(s) Drilled	05-14-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater encountered 75' bgs	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.943387°, E -118.341381°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Job Number	60545923
Total Depth Drilled (ft)	100.0
Approximate Ground Surface Elevation (ft)	89.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0				SM	**FILL** **Silty SAND**: brown, dense, mostly fine SAND			
			S-1	21 30 40			8	126	
80	10				ML	**ALLUVIUM** **Sandy SILT with CLAY**: brown, moist, medium dense, some fine SAND, few CLAY			
			S-2	8 9 7			11		
			S-3	14 14 19		Grades dark brown	11	118	
70	20		S-4	5 10 13		Grades with lenses of lean CLAY	24		
					SP	**Poorly-Graded SAND**: yellowish-brown, moist, dense, mostly fine SAND, little medium to coarse SAND, trace fine GRAVEL			
			S-5	5 18 38			2	100	DS
60					CL	**Sandy Lean CLAY**: dark brown, moist, hard, some fine SAND, red staining			
	30		S-6	10 16 19			12		WA (56.5)
			S-7	10 14 20		Grades light olive brown, very stiff, little fine SAND	30	91	PA (78.8); CORR; CONSOL
50	40		S-8	13 11 16		Grades dark brown, hard	33		
					SC	**Clayey SAND**: grayish-brown, moist, dense, mostly fine SAND, little CLAY			
			S-9	12 26 37			16	95	CONSOL
40	50								

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-9

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-08
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	50		S-10	10 16 18		**ALLUVIUM** *(continued)* **Clayey SAND**: grayish-brown, moist, dense, mostly fine SAND, little CLAY *(continued)*	10		
			S-11	12 21 40		Grades dark brown, some CLAY	15	114	
30	60		S-12	8 9 13	CL	**Sandy Lean CLAY**: dark brown, moist, very stiff, little fine SAND	21		LL=47; PI=23
			S-13	9 18 34		Grades light olive brown, hard, red staining	20	111	
20	70		S-14	4 5 7		Grades dark olive brown, stiff	25		
					SM	**Silty SAND**: dark brown, wet, very dense, mostly fine SAND, few CLAY			
			S-15	38 50/6"			22	106	Possible perched water at 75' bgs
10	80		S-16	7 10 16	ML	**Sandy SILT with CLAY**: olive brown, wet, dense, some fine SAND, few CLAY, red staining	27		
			S-17	8 24 44		Grades dark olive brown, very dense	24	102	
0	90		S-18	7 11 15		Grades dense	21		
			S-19	15 33 40	SM	**Silty SAND**: olive brown, wet, very dense, mostly fine SAND	23	105	
-10	100		S-20	14 50/6"			22		
-20	110					1. Boring completed to planned depth of 100 feet bgs. 2. Possible perched water at 75 feet bgs. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			

AECOM

FIGURE A-9 continued

Date(s) Drilled	05-10-2018	Logged By	T. Hanson	Job Number	60545923
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol	Total Depth Drilled (ft)	100.0
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin	Approximate Ground Surface Elevation (ft)	86.0
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger		
Groundwater Level(s)	Groundwater encountered 70' bgs	Hammer Data	140lbs, 30-inch auto drop		
Borehole Location	N 33.942800°, E -118.343336°	Borehole Completion	Backfilled with compacted mix of soil cuttings		

Boring B-09
Sheet 1 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0				SM	**FILL** **Silty SAND**: brown, moist, dense, mostly fine SAND, some small concrete debris			
80			S-1	11 17 22			15	115	
					ML	**ALLUVIUM** **Sandy SILT with CLAY**: grayish-brown, moist, medium dense, some fine SAND, little CLAY			
	10		S-2	5 7 8			11		
70			S-3	5 8 14		Grades brown, some CLAY	20	105	
	20		S-4	7 12 13		Grades dense, less CLAY	8		
					SC	**Clayey SAND**: grayish-brown, moist, dense, mostly fine SAND			
60			S-5	9 21 22			15	94	CONSOL
	30		S-6	5 9 11		Grades brown, medium dense	12		
50			S-7	9 14 23	CL	**Lean CLAY**: olive brown, moist, very stiff, trace fine SAND, trace CLAYSTONE clasts	27	98	
	40		S-8	5 7 9			30		LL=45; PI=20
40			S-9	17 28 36	ML	**Sandy SILT with CLAY**: brown, moist, very dense, some fine SAND, little CLAY Grades dense, trace coarse SAND	14	120	
	50								

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-10

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PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-09
Sheet 2 of 2

Elevation (ft)	Depth (ft)	SAMPLES Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	50	S-10	9 13 16		**ALLUVIUM** *(continued)* **Sandy SILT with CLAY**: brown, moist, dense, some fine SAND, little CLAY, trace coarse SAND *(continued)*	16		LL=31; PI=6
30		S-11	12 22 38			16	117	
	60	S-12	19 21 19	CL	**Sandy Lean CLAY**: grayish-brown, moist, hard, some fine SAND	23		
					Grades brown			
20		S-13	20 32 38			19	113	
					Grades olive brown			
	70	S-14	5 11 14	ML	**Sandy SILT with CLAY**: grayish-brown, wet, dense, some fine SAND, few CLAY	22		Possible perched water at 70' bgs
					Grades very dense			
10		S-15	23 34 50/5"			20	109	
	80	S-16	6 10 14		Grades olive brown, medium dense	25		
0		S-17	14 16 34	SM	**Silty SAND**: grayish-brown, wet, dense, mostly fine SAND	24	100	
	90	S-18	7 16 21			24		
				CL	**Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND, trace coarse SAND, trace CLAYSTONE clasts			
-10		S-19	19 30 50/4"			32	95	
				SC	**Clayey SAND**: olive brown, moist, very dense, mostly fine SAND			
	100	S-20	22 30 50/5"			18		
-20					1. Boring completed to planned depth of 100 feet bgs. 2. Possible perched water at 70 feet bgs. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
	110							

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FIGURE A-10 continued

Date(s) Drilled	05-11-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater encountered 70' bgs	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.942749°, E -118.342071°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Boring B-10
Sheet 1 of 2

Job Number	60545923
Total Depth Drilled (ft)	75.0
Approximate Ground Surface Elevation (ft)	88.0

MATERIAL DESCRIPTION

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	SAMPLES Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0			SM	**FILL** **Silty SAND**: dark brown, moist, dense, mostly fine SAND, some small concrete debris			
		S-1	6 10 15		Grades with more SILT	12		WA (53.6)
80				ML	**ALLUVIUM** **Sandy SILT with CLAY**: dark brown, moist, medium dense, some fine SAND, few CLAY			
	10	S-2	4 7 11			15	112	
		S-3	3 4 4		Grades loose, lenses of lean CLAY	21		WA (69.8)
70				SC	**Clayey SAND**: brown, moist, medium dense, mostly fine SAND			
	20	S-4	11 13 23			7	116	
		S-5	12 16 18		Grades grayish-brown, dense, less CLAY	4		
60								
	30	S-6	10 14 14		Grades brown, medium dense, some CLAY	8	114	
		S-7	5 7 8	CL	**Lean CLAY**: olive brown, moist, very stiff, trace fine SAND	31		
50								
	40	S-8	11 15 18			34	89	
				ML	**Sandy SILT with CLAY**: olive brown, moist, dense, some fine SAND, few CLAY			
		S-9	11 15 19			9		WA (59.8)
40								
	50							

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

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FIGURE A-11

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-10
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	50		S-10	16 22 28		**ALLUVIUM** (*continued*) **Sandy SILT with CLAY**: olive brown, moist, dense, some fine SAND, few CLAY (*continued*)	13	112	
30			S-11	8 13 13			14		
	60		S-12	17 24 31	CL	**Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND, trace CLAYSTONE clasts	24	100	
			S-13	9 14 12		Grades dark olive brown	20		
20	70		S-14	18 33 36	SC	**Clayey SAND**: dark grayish-brown, wet, very dense, mostly fine SAND	20	111	Possible perched water at 70' bgs
			S-15	20 31 50/5"			31		
10	80					1. Boring completed to planned depth of 75 feet bgs. 2. Possible perched water at 70 feet bgs. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
0	90								
-10	100								
-20	110								

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FIGURE A-11 continued

Boring B-11
Sheet 1 of 2

Date(s) Drilled	05-14-2018 to 05-15-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater encountered 75' bgs	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.942784°, E -118.340903°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Job Number	60545923
Total Depth Drilled (ft)	100.0
Approximate Ground Surface Elevation (ft)	92.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0				SM	**FILL** **Silty SAND**: dark brown, moist, medium dense, mostly fine SAND, some small concrete debris			
90			S-1	5 5 10	ML	**ALLUVIUM** **Sandy SILT with CLAY**: dark brown, moist, medium dense, some fine SAND			
80	10		S-2	9 14 18			10	118	CORR
			S-3	8 17 18		Grades dense			
					SC	**Clayey SAND**: dark brown, moist, medium dense, mostly fine to medium SAND			
70	20		S-4	8 14 22					
			S-5	11 20 23		Grades light grayish-brown, very dense, lenses of fine to medium poorly-graded SAND			
60	30		S-6	14 25 25		Grades dark brown, dense, mostly fine SAND			
			S-7	6 8 14	CL	**Sandy Lean CLAY**: olive brown, moist, very stiff, some fine SAND			
50	40		S-8	5 13 20		Grades light olive brown			
			S-9	7 10 14	SC	**Clayey SAND**: light olive brown, moist, medium dense, mostly fine SAND; Grades olive brown, very dense			
	50								

LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

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FIGURE A-12

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-11
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
40	50		S-10	13 28 36			**ALLUVIUM** *(continued)* **Clayey SAND**: olive brown, moist, very dense, mostly fine SAND *(continued)*			
			S-11	12 23 25			Grades dark olive brown			
30	60		S-12	23 50/6"			Grades grayish-brown			
			S-13	6 10 16			Grades dark olive brown, dense			
20	70		S-14	12 16 28		CL	**Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND			
			S-15	4 6 10			Grades dark olive brown, wet, very stiff, red staining			Possible perched water at 75' bgs
10	80		S-16	19 20 20			Grades olive brown, hard			
			S-17	6 12 14			Grades dark olive brown			
						SC	**Clayey SAND**: dark olive brown, wet, very dense, mostly fine SAND			
0	90		S-18	13 50/6"						
			S-19	13 21 25		SM	**Silty SAND**: olive brown, moist, very dense, mostly fine SAND, trace CLAY			
-10	100		S-20	14 50/6"			Grades grayish-brown			
							1. Boring completed to planned depth of 100 feet bgs. 2. Possible perched water at 75 feet bgs. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
-20	110									

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FIGURE A-12 continued

Date(s) Drilled	05-17-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.945257°, E -118.337702°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Boring B-12
Sheet 1 of 2

Job Number	60545923
Total Depth Drilled (ft)	75.0
Approximate Ground Surface Elevation (ft)	104.0

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0					SM	**FILL** **Silty SAND**: dark brown, moist, dense, mostly fine SAND			
100			S-1	12 14 24		SM	**ALLUVIUM** **Silty SAND**: light olive brown, moist, dense, mostly fine SAND	8	122	CORR
	10		S-2	9 14 17						
90			S-3	5 7 9			Grades grayish-brown, medium dense	10	101	DS
	20		S-4	5 10 13						
80			S-5	13 18 23			Grades dense, trace SILT	3	98	CONSOL
	30		S-6	8 10 10			Grades dark olive brown, medium dense			
70			S-7	9 21 27			Grades light olive brown, dense	6	109	
	40		S-8	10 16 24			Grades dark olive brown			
						CL	**Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND			
60			S-9	6 15 24				17	107	
	50									

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

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FIGURE A-13

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-12
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	50		S-10	11 12 16		**ALLUVIUM** *(continued)* **Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND *(continued)*			
50			S-11	10 24 30		Grades with trace CLAYSTONE clasts	18	94	
	60		S-12	7 16 20		Grades dark olive brown			
40			S-13	11 23 30		Grades with red staining	17	111	
					SM	**Silty SAND**: dark olive brown, moist, very dense, mostly fine SAND			
	70		S-14	10 24 27					
30			S-15	8 25 35		Grades light grayish-brown, dense, mostly fine to coarse SAND	5	100	
						1. Boring completed to planned depth of 75 feet bgs. 2. No groundwater encountered. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
20	80								
10	90								
0	100								
	110								

AECOM

FIGURE A-13 continued

Boring B-13
Sheet 1 of 2

Date(s) Drilled	05-16-2018	Logged By	T. Hanson	Job Number	60545923
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol	Total Depth Drilled (ft)	75.0
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin	Approximate Ground Surface Elevation (ft)	104.0
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger		
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop		
Borehole Location	N 33.944919°, E -118.336948°	Borehole Completion	Backfilled with compacted mix of soil cuttings		

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0				SM	**FILL** **Silty SAND**: dark brown, moist, dense, mostly fine SAND			
100			S-1	10 17 23	SM	**ALLUVIUM** **Silty SAND**: yellowish-brown, moist, medium dense, mostly fine SAND	10	123	
	10		S-2	7 10 11			10		
90			S-3	8 10 14			13	108	
	20		S-4	6 10 12		Grades grayish-brown	11		WA (37.3)
80			S-5	14 24 24		Grades light grayish-brown, dense	11	94	
	30		S-6	8 9 12		Grades dark olive brown, medium dense	8		
70			S-7	11 32 33		Grades very dense	8	119	
					CL	**Sandy Lean CLAY**: olive brown, moist, hard, little fine SAND			
	40		S-8	4 12 16			22		
						Grades with some fine SAND			
60			S-9	6 13 25			12	108	
	50								

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

AECOM

FIGURE A-14

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-13
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Sample Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	50	S-10	10 19 18		**ALLUVIUM** *(continued)* **Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND *(continued)*	17		
50		S-11	7 23 27	SC	**Clayey SAND**: dark olive brown, moist, dense, mostly fine SAND	9	102	
	60	S-12	5 11 18		Grades olive brown, red staining	15		
40		S-13	7 19 32	ML	**Sandy SILT with CLAY**: olive brown, moist, dense, some fine SAND, little CLAY	19	104	
	70	S-14	10 18 24	SM	**Silty SAND**: olive brown, moist, very dense, mostly fine SAND	16		
30		S-15	13 27 24	SP	**Poorly-Graded SAND**: light gray, moist, dense, mostly fine SAND	2	98	
	80	S-16	10 16 23		Grades with trace CLAYSTONE clasts	13		WA (23.0)
20		S-17	18 50/6"		Grades gray, very dense	3	94	
	90	S-18	24 27 40	SM	**Silty SAND**: light grayish-brown, dry, very dense, mostly fine to coarse SAND, fine GRAVEL	3		
10		S-19	19 50/6"		Grades yellowish-brown	4	99	
	100	S-20	13 20 25		Grades dark grayish-brown, moist, little CLAY	15		
0					1. Boring completed to planned depth of 100 feet bgs. 2. No groundwater encountered. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
	110							

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FIGURE A-14 continued

Boring B-14
Sheet 1 of 2

Date(s) Drilled	05-18-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.944528°, E -118.338075°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Job Number	60545923
Total Depth Drilled (ft)	75.0
Approximate Ground Surface Elevation (ft)	101.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Sample Number	Blows per 6-inches	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
100	0			SM	**FILL** **Silty SAND**: dark brown, moist, medium dense, mostly fine SAND, little small concrete debris			
		S-1	5 11 10	SM	**ALLUVIUM** **Silty SAND**: brown, moist, medium dense, mostly fine SAND	8		
90	10	S-2	9 13 24			11	21	
		S-3	10 10 11		Grades with lenses of lean CLAY			
80	20	S-4	8 10 16			15	27	
		S-5	3 14 14		Grades grayish-brown, dense			
70	30	S-6	9 12 20		Grades olive brown, medium dense	18	31	
		S-7	7 7 12		Grades with trace CLAY			
60	40	S-8	16 30 50/5"		Grades very dense	7	14	
		S-9	8 13 16		Grades dark olive brown, dense			
	50							

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

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FIGURE A-15

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-14
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
50	50		S-10	16 29 35		CL	**ALLUVIUM** *(continued)* **Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND	18	32	
			S-11	12 12 12			Grades very stiff	18		
40	60		S-12	9 17 28			Grades hard			
						SC	**Clayey SAND**: dark olive brown, moist, very dense, mostly fine SAND			
			S-13	18 22 24				15		
30	70		S-14	10 30 50/5"						
			S-15	13 20 22						
20	80						1. Boring completed to planned depth of 75 feet bgs. 2. No groundwater encountered. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
10	90									
0	100									
-10	110									

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FIGURE A-15 continued

Boring B-15
Sheet 1 of 2

Date(s) Drilled	05-17-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.944528°, E -118.337373°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Job Number	60545923
Total Depth Drilled (ft)	75.0
Approximate Ground Surface Elevation (ft)	102.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
100	0					SM	**FILL** **Silty SAND**: dark brown, moist, dense, mostly fine SAND			
			S-1	10 13 16		ML	**ALLUVIUM** **Sandy SILT with CLAY**: light brown, moist, dense, some fine SAND, few CLAY	9		
90	10		S-2	9 19 24				10	20	
			S-3	4 5 5			Grades medium dense			
80	20		S-4	7 14 16			Grades light olive brown, little CLAY	15	27	
			S-5	4 7 9		SM	**Silty SAND**: light grayish-brown, moist, medium dense, mostly fine SAND			
70	30		S-6	8 18 25			Grades olive brown, dense	5	107	
			S-7	7 10 13			Grades medium dense			
60	40		S-8	13 25 26			Grades dense			
			S-9	7 13 18		CL	**Sandy Lean CLAY**: dark olive brown, moist, hard, some fine SAND; Grades olive brown, trace CLAYSTONE clasts	18		
	50									

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FOR: Murphy's Bowl LLC

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FIGURE A-16

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-15
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	50		S-10	10 11 30			**ALLUVIUM** *(continued)* **Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND, trace CLAYSTONE clasts *(continued)*			
50			S-11	7 11 16				22		
						SM	**Silty SAND**: olive brown, moist, dense, mostly fine SAND			
40	60		S-12	18 22 25				9	105	
			S-13	5 10 15		CL	**Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND	15		
30	70		S-14	8 18 24		SM	**Silty SAND**: olive brown, moist, dense, mostly fine SAND, little CLAY			
			S-15	6 14 20			Grades dark olive brown, red staining			
20	80						1. Boring completed to planned depth of 75 feet bgs. 2. No groundwater encountered. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
10	90									
0	100									
-10	110									

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FIGURE A-16 continued

Date(s) Drilled	05-18-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	SPT, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.943801°, E -118.337706°	Borehole Completion	Backfilled with compacted mix of soil cuttings

Boring B-16
Sheet 1 of 2

Job Number	60545923
Total Depth Drilled (ft)	75.0
Approximate Ground Surface Elevation (ft)	99.0

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0					SM	**FILL** **Silty SAND**: dark brown, moist, medium dense, mostly fine SAND, few CLAY			
			S-1	8 7 17		SC	**ALLUVIUM** **Clayey SAND**: olive brown, moist, medium dense, mostly fine SAND	17	111	
90	10		S-2	3 6 8				12		PA (42.1); CORR
			S-3	4 10 16				17	108	DS
80	20		S-4	2 5 6						
			S-5	4 11 18			Grades dark olive brown, lenses of lean CLAY	25	96	CONSOL
						CL	**Sandy Lean CLAY**: olive brown, moist, hard, some fine SAND			
70	30		S-6	3 9 16						
			S-7	7 13 16			Grades dark olive brown, very stiff	19	94	
60	40		S-8	7 11 12						
			S-9	13 22 30		SC	**Clayey SAND**: dark olive brown, moist, dense, mostly fine SAND, trace CLAYSTONE clasts	8	111	
50	50									

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PROJECT CONDOR
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FOR: Murphy's Bowl LLC

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FIGURE A-17

PROJECT: PROJECT CONDOR
FOR: Murphy's Bowl LLC

Boring B-16
Sheet 2 of 2

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	50		S-10	8 14 14			**ALLUVIUM** (*continued*) **Clayey SAND**: dark olive brown, moist, dense, mostly fine SAND, trace CLAYSTONE clasts (*continued*)			
			S-11	12 25 37			Grades with more CLAYSTONE clasts	14	117	
40	60		S-12	7 21 30			Grades very dense			
			S-13	12 50/6"		SM	**Silty SAND**: dark olive brown, moist, dense, mostly fine to medium SAND	6	103	
30	70		S-14	14 25 6			Grades with mostly fine SAND			
			S-15	9 22 36			Grades with little CLAY	20	107	
20	80						1. Boring completed to planned depth of 75 feet bgs. 2. No groundwater encountered. 3. Boring backfilled with compacted mix of soil cuttings upon completion.			
10	90									
0	100									
-10	110									

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FIGURE A-17 continued

Date(s) Drilled	05-21-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	Bulk, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.944661°, E -118.345651°	Borehole Completion	Piezometer installed

Boring P-1
Sheet 1 of 1

Job Number	60545923
Total Depth Drilled (ft)	10.0
Approximate Ground Surface Elevation (ft)	88.0

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
							Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus			
	0		Bk-1			SM	**FILL** **Silty SAND**: light brown, moist, mostly fine SAND			Bulk Sample 0-5 ft
						SM	**ALLUVIUM** **Silty SAND**: brown, moist, medium dense, mostly fine SAND			
80			S-1	11 17 18				11	117	
	10						1. Boring completed to planned depth of 10 feet bgs. 2. No groundwater encountered. 3. Piezometer installed (see diagram for details)			
70	20									
60	30									
50	40									
40	50									

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LOG OF BORING
PROJECT CONDOR
SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA
FOR: Murphy's Bowl LLC

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FIGURE A-18

Date(s) Drilled	05-21-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	Bulk, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.943762°, E -118.345651°	Borehole Completion	Piezometer installed

Boring P-2

Sheet 1 of 1

Job Number	60545923
Total Depth Drilled (ft)	10.0
Approximate Ground Surface Elevation (ft)	88.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Samples: Type	Samples: Number	Samples: Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0	Bulk	Bk-1			SM	**FILL** **Silty SAND**: light brown, moist, mostly fine SAND			EI (12.4)
80		Modified California	S-1	14 18 30		SM	**ALLUVIUM** **Silty SAND**: brown, moist, dense, mostly fine SAND	4	126	
	10						1. Boring completed to planned depth of 10 feet bgs. 2. No groundwater encountered. 3. Piezometer installed (see diagram for details)			
70	20									
60	30									
50	40									
40	50									

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LOG OF BORING

PROJECT CONDOR

SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA

FOR: Murphy's Bowl LLC

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FIGURE A-19

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Date(s) Drilled	05-18-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	Bulk, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.943425°, E -118.343234°	Borehole Completion	Piezometer installed

Boring P-3

Sheet 1 of 1

Job Number	60545923
Total Depth Drilled (ft)	10.0
Approximate Ground Surface Elevation (ft)	87.0

Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Samples: Type	Samples: Number	Samples: Blows per 6-inches	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density(pcf)	OTHER TESTS and REMARKS
	0	Bulk	Bk-1			SM	**FILL** **Silty SAND**: dark brown, moist, mostly fine SAND			
80		Modified California	S-1	11 12 20		SM	**ALLUVIUM** **Silty SAND**: olive brown, moist, medium dense, mostly fine SAND	10	118	
	10						1. Boring completed to planned depth of 10 feet bgs. 2. No groundwater encountered. 3. Piezometer installed (see diagram for details)			
70	20									
60	30									
50	40									
40	50									

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LOG OF BORING

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SE CORNER OF PRAIRIE AVENUE & W. CENTURY BOULEVARD, INGLEWOOD, CALIFORNIA

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FIGURE A-20

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Boring P-4
Sheet 1 of 1

Date(s) Drilled	05-21-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	Bulk, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.943539°, E -118.341039°	Borehole Completion	Piezometer installed

Job Number	60545923
Total Depth Drilled (ft)	10.0
Approximate Ground Surface Elevation (ft)	90.0

MATERIAL DESCRIPTION: Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	Material Description	Moisture Content (%)	Dry Density(pcf)	Other Tests and Remarks
90	0	Bulk	Bk-1		SM	**FILL** **Silty SAND**: dark brown, moist, mostly fine SAND, some small concrete debris			R-VALUE; EI (5.2)
		Mod. Cal.	S-1	7 13 23	SM	**ALLUVIUM** **Silty SAND**: olive brown, moist, medium dense, mostly fine SAND	8	122	
80	10					1. Boring completed to planned depth of 10 feet bgs. 2. No groundwater encountered. 3. Piezometer installed (see diagram for details)			
70	20								
60	30								
50	40								
40	50								

This log is part of the report prepared by AECOM for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

LOG OF BORING
PROJECT CONDOR
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FOR: Murphy's Bowl LLC

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FIGURE A-21

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Boring P-5
Sheet 1 of 1

Date(s) Drilled	05-17-2018	Logged By	T. Hanson
Drilling Method	Hollow-Stem Auger	Checked By	A. Bicol
Drill Rig Type	CME 85	Drilling Contractor	ABC Liovin
Sampling Method(s)	Bulk, Modified California	Drill Bit Size/Type	8" Auger
Groundwater Level(s)	Groundwater not encountered	Hammer Data	140lbs, 30-inch auto drop
Borehole Location	N 33.943810°, E -118.338063°	Borehole Completion	Piezometer installed

Job Number	60545923
Total Depth Drilled (ft)	10.0
Approximate Ground Surface Elevation (ft)	98.0

MATERIAL DESCRIPTION: Relative density and consistency assessments are based on corrected SPT blow counts calculated using assumed ERi=82% and assuming equivalent SPT blow counts of 65% of those recorded with the Modified California apparatus

Elevation (ft)	Depth (ft)	Type	Number	Blows per 6-inches	USCS	Material Description	Moisture Content (%)	Dry Density(pcf)	Other Tests and Remarks
	0	Bulk	Bk-1		SM	**FILL** **Silty SAND**: dark brown, moist, mostly fine SAND			R-VALUE
90		Mod. Cal.	S-1	6 12 18	SM	**ALLUVIUM** **Silty SAND**: brown, moist, medium dense, mostly fine SAND	12	123	
	10					1. Boring completed to planned depth of 10 feet bgs. 2. No groundwater encountered. 3. Piezometer installed (see diagram for details)			
80	20								
70	30								
60	40								
50	50								

This log is part of the report prepared by AECOM for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

LOG OF BORING
PROJECT CONDOR
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FOR: Murphy's Bowl LLC

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FIGURE A-22

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Appendix B – Laboratory Testing Program

List of Figures

Figures B-1 through B-4	Particle-Size Distribution Test Results
Figures B-5 through B-8	Atterberg Limits Test Results
Figures B-9 through B-16	Direct Shear Test Results
Figures B-17 through B-24	Consolidation Test Results
Figures B-25 through B-28	R-Value Test Results

Soil samples obtained from the borings were packaged and sealed in the field to prevent moisture loss and minimize disturbance. They were then transported to our Los Angeles laboratory where they were further examined and classified. Laboratory tests were performed on selected representative samples as an aid in classifying the soils and to evaluate the physical properties of the soils affecting foundation design and construction procedures. Index, strength and compressibility tests were performed on selected soil samples in accordance with ASTM standards.

EG Labs of Arcadia, California provided assistance with some direct shear and R-value testing of selected soils. All corrosivity testing was subcontracted to Project X Corrosion Engineering of Murrieta, California. Corrosivity test results are presented separately in Appendix C.

The types of tests performed, together with some of the results, are indicated on the Logs of Borings, Appendix A. Other test results are presented in separate figures in this Appendix. Descriptions of the laboratory tests performed are presented below.

B.1 Moisture and Density Tests

Moisture content and density tests were performed on a number of samples recovered from the borings. The results of these tests were used to compute existing soil overburden pressures, to correlate strength and compressibility data from tested samples with those not tested, and to aid in evaluating soil properties. The tests were performed in accordance with ASTM Test Methods D-2216 and D-2937, respectively. The results of these tests are presented on the Logs of Borings.

B.2 Amount of Material in Soils Finer than # 200 Sieve

The tests were performed to determine the amount of material in soils finer than # 200 sieve to aid in the classification of the soils. The tests were performed in accordance with ASTM Test Method D1140. The results of the tests are presented on the Logs of Borings.

B.3 Particle-Size Distribution

The tests were performed to determine the grain size distribution of selected soils and to aid in soil classification. The tests were performed in general accordance with ASTM Test Method D422. The results of the tests are presented in Figures B-1 through B-4.

B.3 Atterberg Limits Tests

Atterberg Limits tests were performed to aid in classification and to evaluate the plasticity characteristics of fine-grained materials encountered in the borings. The tests were performed in accordance with ASTM Test Method D-4318. The results of these tests are presented on the Logs of Borings and in B-5 through B-8.

B.4 Direct Shear Tests

Consolidated-drained (saturated) direct shear tests were performed on selected undisturbed samples to evaluate shear strength parameters of the site soils. The direct shear tests were performed in accordance with ASTM Test Method D-3080. The results are presented in Figures B-9 through B-16.

B.5 Consolidation Tests

One-dimensional consolidation tests were performed on selected undisturbed samples to evaluate compressibility characteristics of the on-site soils. These tests were performed in accordance with ASTM Test Method D-2435. The results are presented in Figures B-17 through B-24.

B.6 Expansion Index Tests

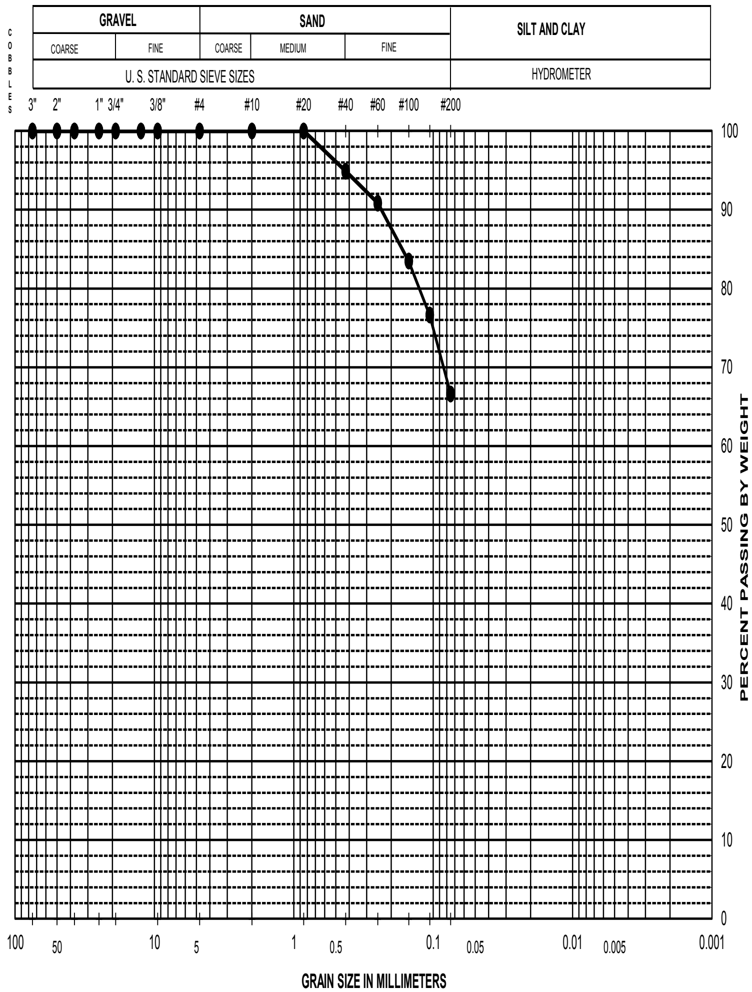
Expansion Index (EI) tests were performed on 2 representative bulk samples from borings P-2 and P-4 to evaluate the expansion potential of the near-surface sandy soils. The tests were performed in accordance with ASTM Test Method D-4829. The results of the tests are presented on the Logs of Boring.

B.7 R Value Tests

Resistance (R-Value) tests were performed on 2 representative bulk samples of soils obtained from the borings. The tests were performed in accordance with California Test Method 301. The R-Value test results were compared and correlated with existing data and used in developing appropriate pavement sections thicknesses for different load applications. The results of the tests are presented in Figures B-25 through B-28.

AECOM

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	100.0
#20	0.850	100.0
#40	0.425	94.9
#60	0.250	90.8
#100	0.150	83.5
#140	0.106	76.6
#200	0.075	66.6
Hydrometer Analysis		

% Cobbles	---
% Gravel	0.0
% Sand	33.4
% Fines	66.6
D_{85}	---
D_{60}	---
D_{50}	---
D_{30}	---
D_{15}	---
D_{10}	---
C_u	---
C_c	---

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-4	7	35.0	●	21.9	---	---	---	(CL) Olive brown Sandy CLAY

PROJECT NAME: Project Condor

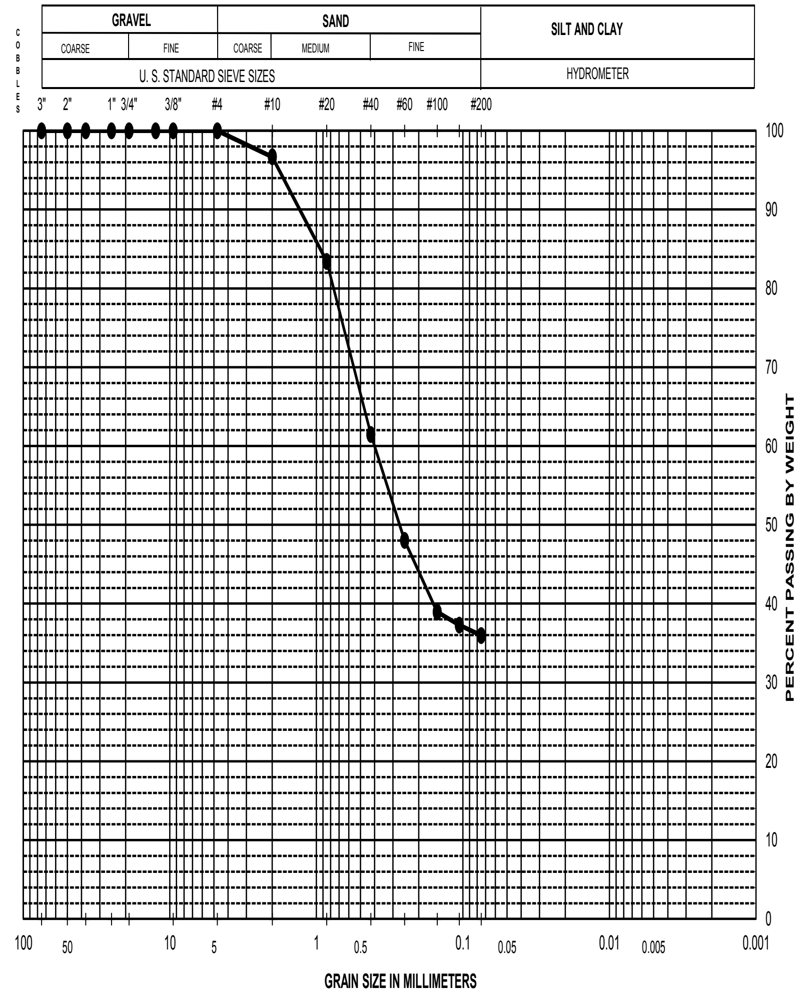
PROJECT NUMBER: 60545923

PARTICLE-SIZE DISTRIBUTION CURVE

B-1

AECOM

UNIFIED SOIL CLASSIFICATION



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	96.7
#20	0.850	83.4
#40	0.425	61.5
#60	0.250	48.0
#100	0.150	38.9
#140	0.106	37.3
#200	0.075	36.0
Hydrometer Analysis		

% Cobbles	---
% Gravel	0.0
% Sand	64.0
% Fines	36.0
D_{85}	---
D_{60}	---
D_{50}	---
D_{30}	---
D_{15}	---
D_{10}	---
C_u	---
C_c	---

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 μm	Description and Classification
B-6	2	10.0	●	8.5	---	---	---	(SC) Brown clayey SAND

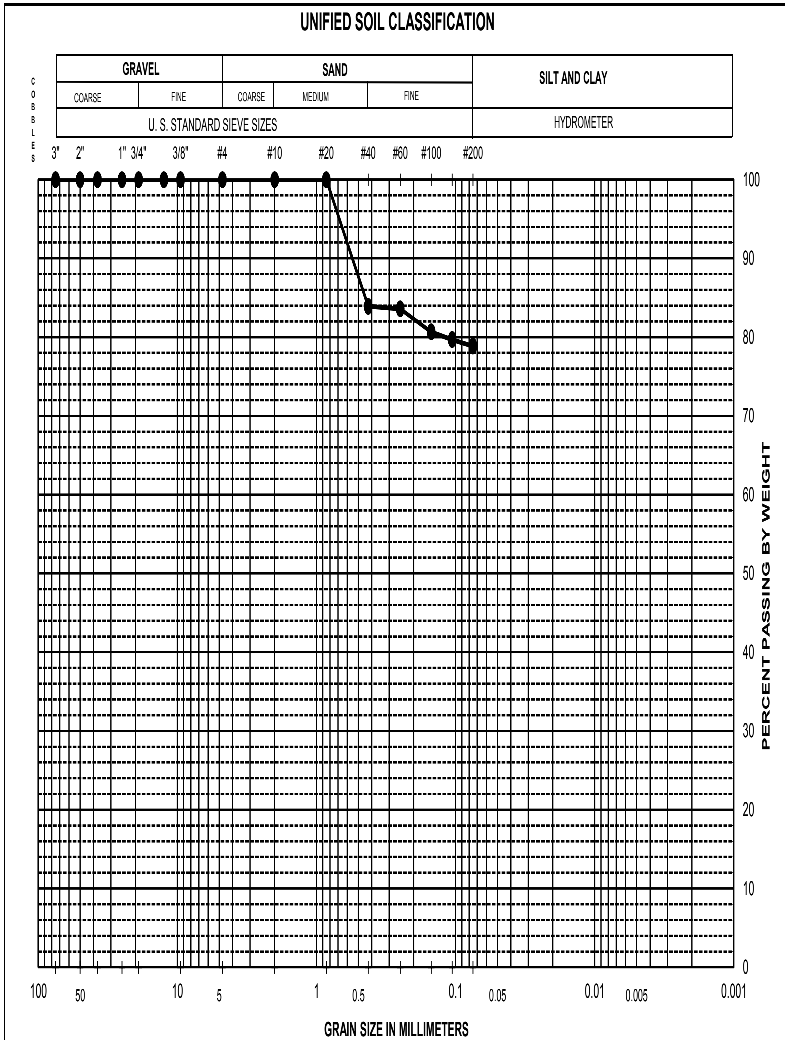
PROJECT NAME: Project Condor

PROJECT NUMBER: 60545923

PARTICLE-SIZE DISTRIBUTION CURVE

B-2

AECOM



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	100.0
#20	0.850	100.0
#40	0.425	83.9
#60	0.250	83.6
#100	0.150	80.7
#140	0.106	79.7
#200	0.075	78.8
Hydrometer Analysis		

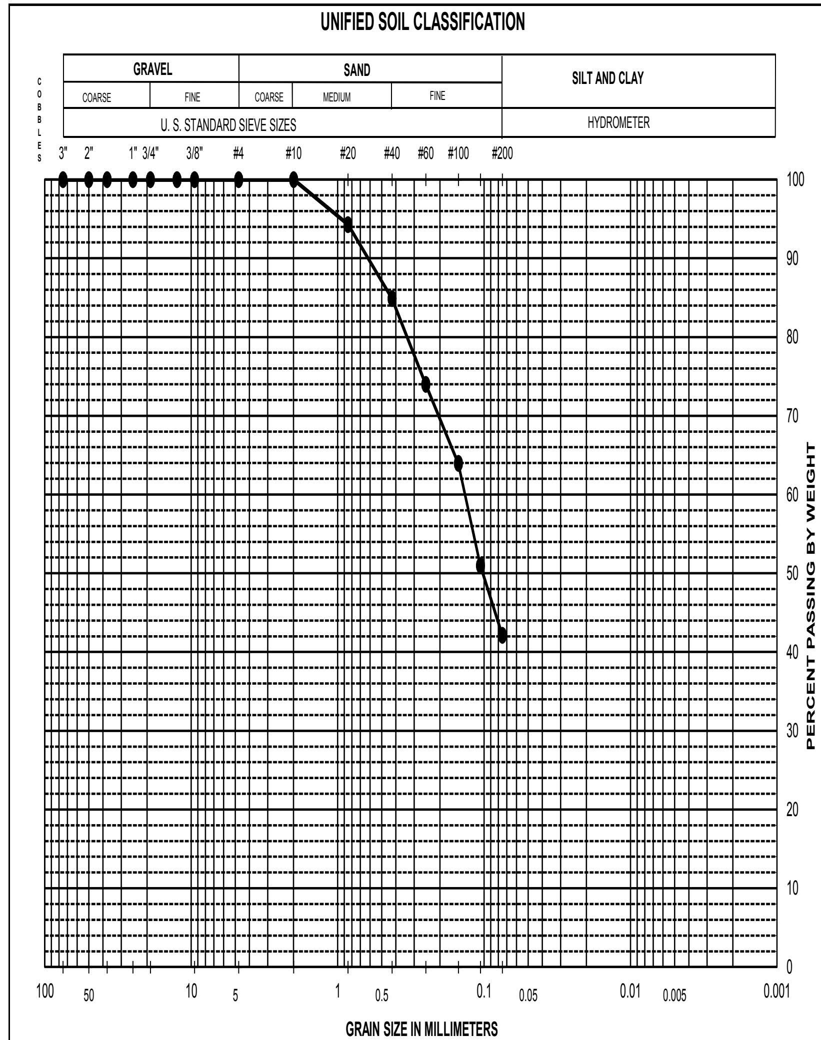
% Cobbles	---
% Gravel	0.0
% Sand	21.2
% Fines	78.8
D_{85}	---
D_{60}	---
D_{50}	---
D_{30}	---
D_{15}	---
D_{10}	---
C_u	---
C_c	---

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 µm	Description and Classification
B-8	7	35.0	●	29.9	---	---	---	(CL) Light olive brown CLAY with fine sand

PROJECT NAME: Project Condor
PROJECT NUMBER: 60545923

PARTICLE-SIZE DISTRIBUTION CURVE

AECOM



Sieve No.	Dia. mm	% Finer
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	100.0
#10	2.00	100.0
#20	0.850	94.3
#40	0.425	84.9
#60	0.250	74.0
#100	0.150	63.9
#140	0.106	51.0
#200	0.075	42.1
Hydrometer Analysis		

% Cobbles	---
% Gravel	0.0
% Sand	57.9
% Fines	42.1
D_{85}	---
D_{60}	---
D_{50}	---
D_{30}	---
D_{15}	---
D_{10}	---
C_u	---
C_c	---

Boring No.	Sample No.	Depth (ft)	SYMBOL	Wn (%)	LL	PI	% 2 µm	Description and Classification
B-16	2	10.0	●	13.4	---	---	---	(SC) Olive brown clayey SAND

PROJECT NAME: Project Condor
PROJECT NUMBER: 60545923

PARTICLE-SIZE DISTRIBUTION CURVE

ATTERBERG LIMITS
ASTM D4318-10

Project Name	Project Condor	**Tested By**	FP	**Date**	
Project No.	60545923	**Input By**	TH	**Date**	
Boring No.	B-7	**Checked By**		**Date**	
Sample No.	7	**Depth (ft.)**	35		

Visual Sample Description Olive brown CLAY with Fine Sand

	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	**1**	**2**	**1**	**2**	**3**	**4**
Number of Blows [N]			34	28	25	
Container No.	C-2	C-29	47A	5A	34A	
Wet Wt. of Soil + Cont. (gm.)	11.73	12.08	34.11	26.35	27.25	
Dry Wt. of Soil + Cont. (gm.)	10.45	10.29	26.82	21.52	21.99	
Wt. of Container (gm.)	4.41	4.47	10.80	10.96	10.53	
Moisture Content (%) [Wn]	***21.2***	***30.8***	***45.5***	***45.7***	***45.9***	

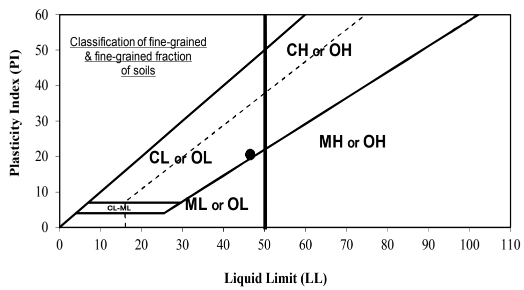
Groove Tool #: ______

Liquid Limit Machine #: ______

LIQUID LIMIT	**46**
PLASTIC LIMIT	**26**
PLASTICITY INDEX	**21**

PI at "A" Line = 0.73(LL-20) = **19**

One-Point LL = $W_n(N/25)^{0.121}$

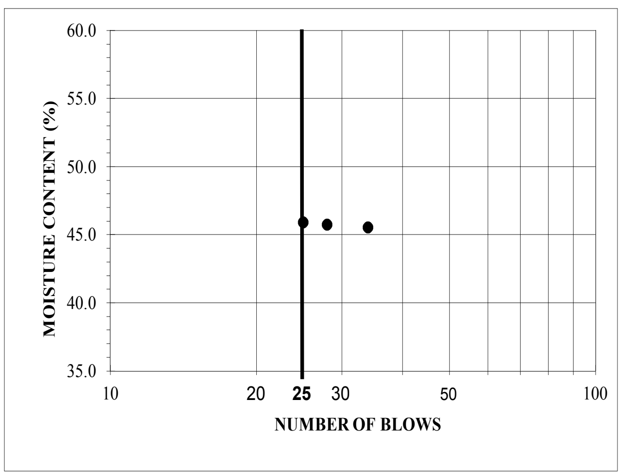


Preparation Used

- [ ] Dry Method
- [X] Pushed Mechanically thru No. 40
- [ ] Washed thru No. 40

Procedure Used

- [X] A - Multipoint
  - Pt. 1: 25-35 blows
  - Pt. 2: 20-30 blows
  - Pt. 3: 15-25 blows
- [ ] B - Single point
  - 20-30 blows



ATTERBERG LIMITS
ASTM D4318-10

Project Name	Project Condor	**Tested By**	FP	**Date**	
Project No.	60545923	**Input By**	TH	**Date**	
Boring No.	B-8	**Checked By**		**Date**	
Sample No.	12	**Depth (ft.)**	60		

Visual Sample Description Dark brown CLAY with fine sand

	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	**1**	**2**	**1**	**2**	**3**	**4**
Number of Blows [N]			33	30	22	
Container No.	H2	MN	33A	7A	39A	
Wet Wt. of Soil + Cont. (gm.)	28.24	27.16	30.84	28.06	26.41	
Dry Wt. of Soil + Cont. (gm.)	26.58	25.77	24.65	22.58	21.35	
Wt. of Container (gm.)	20.23	19.79	11.17	10.93	10.73	
Moisture Content (%) [Wn]	***26.1***	***23.2***	***45.9***	***47.0***	***47.6***	

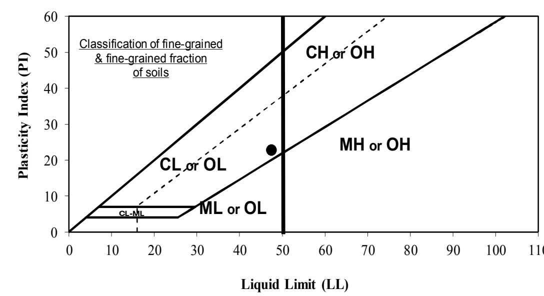
Groove Tool #: ______

Liquid Limit Machine #: ______

LIQUID LIMIT	**47**
PLASTIC LIMIT	**25**
PLASTICITY INDEX	**23**

PI at "A" Line = 0.73(LL-20) = **20**

One-Point LL = $W_n(N/25)^{0.121}$

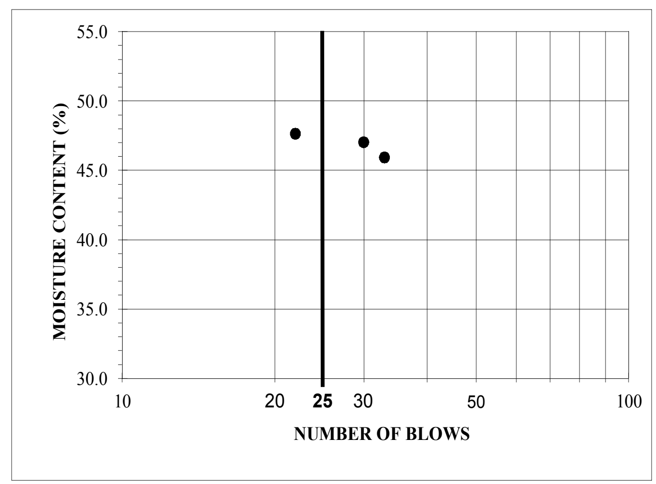


Preparation Used

- [ ] Dry Method
- [X] Pushed Mechanically thru No. 40
- [ ] Washed thru No. 40

Procedure Used

- [X] A - Multipoint
  - Pt. 1: 25-35 blows
  - Pt. 2: 20-30 blows
  - Pt. 3: 15-25 blows
- [ ] B - Single point
  - 20-30 blows



AECOM

ATTERBERG LIMITS

ASTM D4318-10

Project Name	Project Condor	**Tested By**	FP	**Date**	
Project No.	60545923	**Input By**	TH	**Date**	
Boring No.	B-9	**Checked By**		**Date**	
Sample No.	8	**Depth (ft.)**	40		

Visual Sample Description Olive brown CLAY with fine sand

	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	4
Number of Blows [N]			29	24	19	
Container No.	20A	27A	48A	88A	23A	
Wet Wt. of Soil + Cont. (gm.)	15.48	15.95	23.16	21.48	21.74	
Dry Wt. of Soil + Cont. (gm.)	14.52	14.99	19.25	18.22	18.47	
Wt. of Container (gm.)	10.76	10.91	10.61	10.89	11.20	
Moisture Content (%) [Wn]	***25.5***	***23.5***	***45.3***	***44.5***	***45.0***	

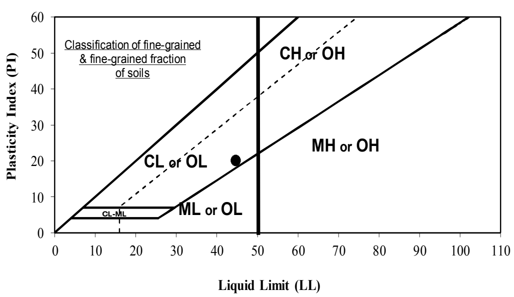
Groove Tool #: ____

Liquid Limit Machine #: ____

LIQUID LIMIT	**45**
PLASTIC LIMIT	**25**
PLASTICITY INDEX	**20**

PI at "A" Line = 0.73(LL-20) = **18**

One-Point LL = Wn(N/25)$^{0.121}$



Preparation Used

[ ] Dry Method

[X] Pushed Mechanically thru No. 40

[ ] Washed thru No. 40

Procedure Used

[X] A - Multipoint
Pt. 1: 25-35 blows
Pt. 2: 20-30 blows
Pt. 3: 15-25 blows

[ ] B - Single point
20-30 blows

AECOM

ATTERBERG LIMITS

ASTM D4318-10

Project Name	Project Condor	**Tested By**	FP	**Date**	
Project No.	60545923	**Input By**	TH	**Date**	
Boring No.	B-9	**Checked By**		**Date**	
Sample No.	10	**Depth (ft.)**	50		

Visual Sample Description Brown SILT with fine sand and clay

	PLASTIC LIMIT		LIQUID LIMIT			
TEST NO.	1	2	1	2	3	4
Number of Blows [N]			33	30	22	
Container No.	C23	C21	30A	42A	35A	
Wet Wt. of Soil + Cont. (gm.)	16.56	13.19	34.06	28.72	30.42	
Dry Wt. of Soil + Cont. (gm.)	14.09	11.37	28.62	24.50	25.81	
Wt. of Container (gm.)	4.33	4.32	10.78	10.80	10.96	
Moisture Content (%) [Wn]	***25.3***	***25.8***	***30.5***	***30.8***	***31.0***	

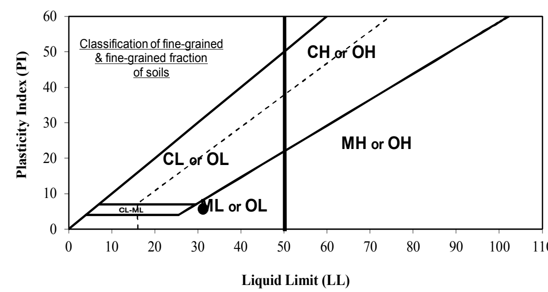
Groove Tool #: ____

Liquid Limit Machine #: ____

LIQUID LIMIT	**31**
PLASTIC LIMIT	**26**
PLASTICITY INDEX	**6**

PI at "A" Line = 0.73(LL-20) = **8**

One-Point LL = Wn(N/25)$^{0.121}$



Preparation Used

[ ] Dry Method

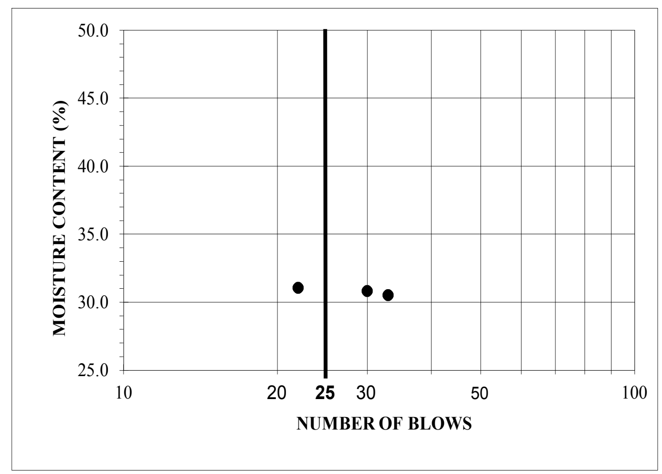
[X] Pushed Mechanically thru No. 40

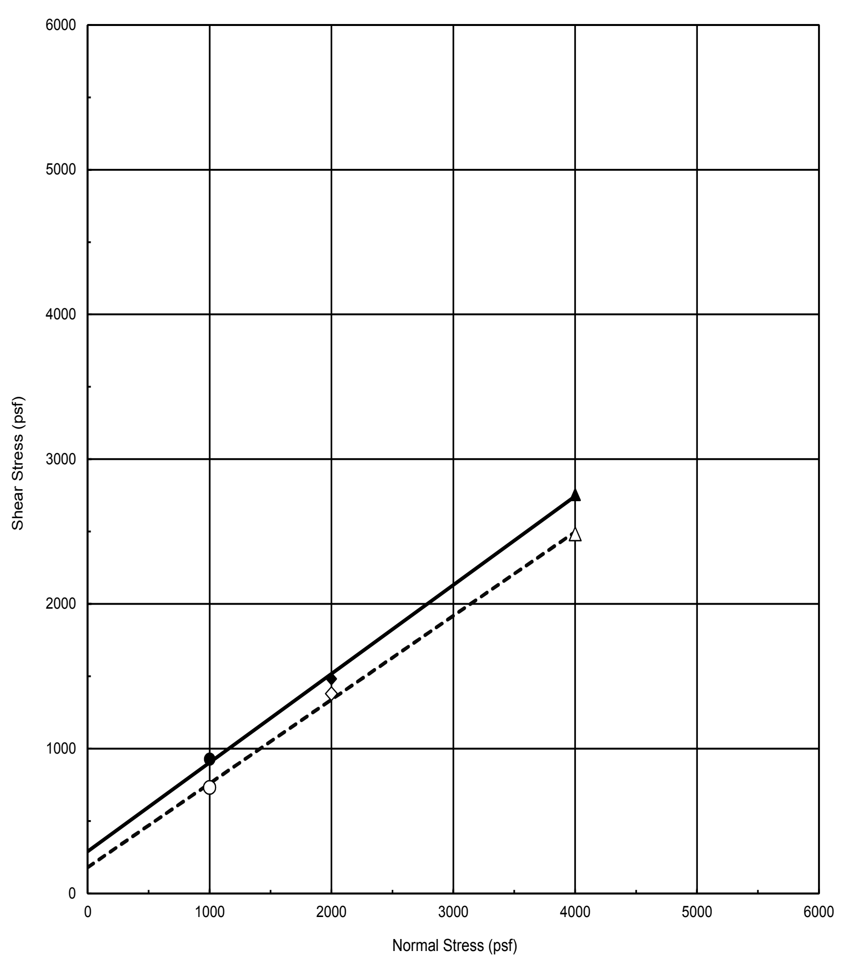
[ ] Washed thru No. 40

Procedure Used

[X] A - Multipoint
Pt. 1: 25-35 blows
Pt. 2: 20-30 blows
Pt. 3: 15-25 blows

[ ] B - Single point
20-30 blows

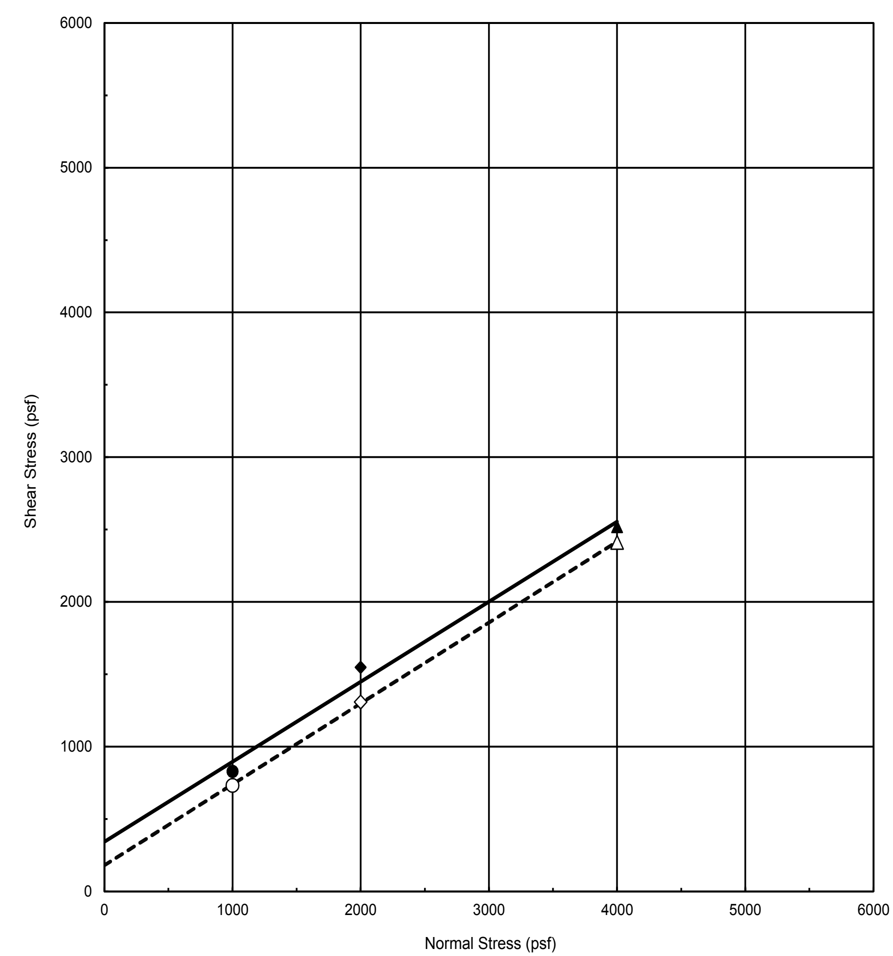




Peak Values are : ● ,solid trend line							Ultimate Values are: ❍ ,dashed trend line					
Boring No.:	B-1	**Strength Intercept (C) :**		291.0	psf	**Peak**	180.0	psf	**Ultimate**			
Sample No.:	1			13.9	kPa		8.6	kPa				
Depth (ft.):	5.0	**Friction Angle (ϕ) :**		32	degree		30	degree				
Description:	***Dark Brown Silty Fine SAND***				Shear rate :	0.0050	(in/min) ,	0.0127	(cm/min)			
SYMBOL	**% Water Content**	**Total Unit Weight (pcf)**	**Total Unit Weight (kN/m^3)**	**Dry Unit Weight (pcf)**	**Dry Unit Weight (kN/m^3)**	**Normal Stress (psf)**	**Normal Stress (kPa)**	**Peak Stress (psf)**	**Peak Stress (kPa)**	**Ultimate Stress (psf)**	**Ultimate Stress (kPa)**	
Initial / Set up	7.0	125.0	19.6	116.8	18.4	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
● spec. 1	7.5	125.9	19.8	117.1	18.4	1000	48	928	44	732	35	
◆ spec. 2	8.2	126.8	19.9	117.2	18.4	2000	96	1482	71	1380	66	
▲ spec. 3	9.6	128.9	20.3	117.6	18.5	4000	192	2756	132	2484	119	

AECOM	**Project Condor**	**DIRECT SHEAR TEST**
	Project Number 60545923	**ASTM D3080**

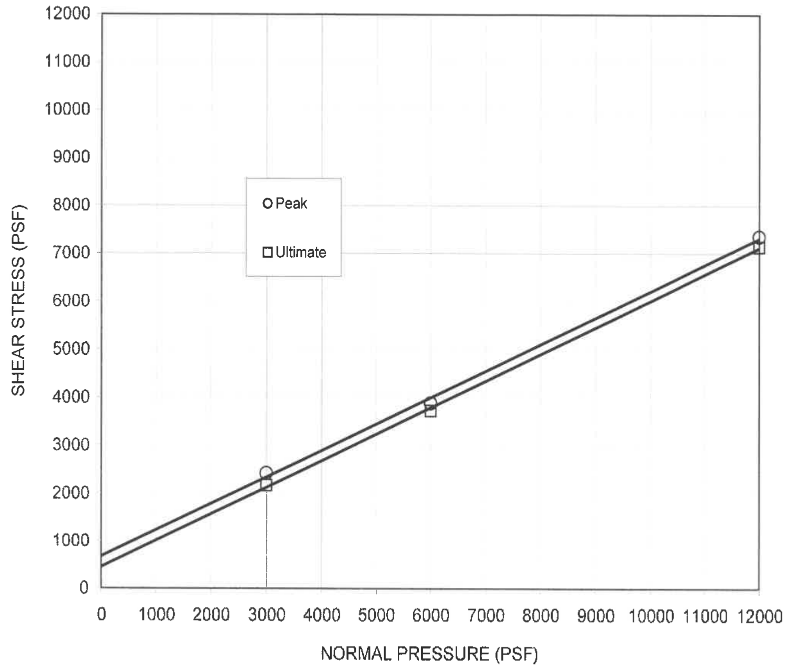
B-9



Peak Values are : ● ,solid trend line							Ultimate Values are: ❍ ,dashed trend line					
Boring No.:	B-4	**Strength Intercept (C) :**		342.0	psf	**Peak**	180.0	psf	**Ultimate**			
Sample No.:	6			16.4	kPa		8.6	kPa				
Depth (ft.):	30.0	**Friction Angle (ϕ) :**		29	degree		29	degree				
Description:	***Dark olive brown silty fine SAND***				Shear rate :	0.0050	(in/min) ,	0.0127	(cm/min)			
SYMBOL	**% Water Content**	**Total Unit Weight (pcf)**	**Total Unit Weight (kN/m^3)**	**Dry Unit Weight (pcf)**	**Dry Unit Weight (kN/m^3)**	**Normal Stress (psf)**	**Normal Stress (kPa)**	**Peak Stress (psf)**	**Peak Stress (kPa)**	**Ultimate Stress (psf)**	**Ultimate Stress (kPa)**	
Initial / Set up	8.4	125.7	19.8	116.0	18.2	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	
● spec. 1	10.2	131.8	20.7	119.6	18.8	1000	48	828	40	732	35	
◆ spec. 2	11.8	133.9	21.0	119.7	18.8	2000	96	1548	74	1308	63	
▲ spec. 3	12.7	139.4	21.9	123.7	19.4	4000	192	2520	121	2412	115	

AECOM	**Project Condor**	**DIRECT SHEAR TEST**
	Project Number 60545923	**ASTM D3080**

B-10



Boring No.:	Sample No.	Depth (ft)	Sample Type	Soil Type	Symbol	Cohesion (PSF)	Friction Angle
B-5	8	40.0	Ring	SM	○	672	29
					□	450	29

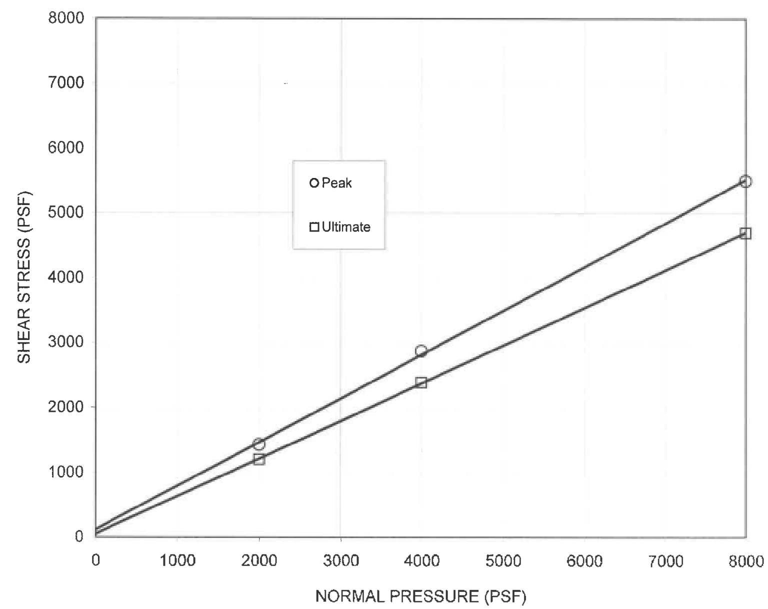
Normal Stress (psf)	Initial Moisture (%)	Final Moisture (%)	γ_d (pcf)	S (%)
3000	6.8	23.4	107.3	100
6000	6.8	22.6	107.5	100
12000	6.8	22.2	107.6	100

EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Project No.: 18-008-010

DIRECT SHEAR
(ASTM D3080)
06/18

B-11



Boring No.:	Sample No.	Depth (ft)	Sample Type	Soil Type	Symbol	Cohesion (PSF)	Friction Angle
B-6	3	15.0	Ring	SP	○	114	34
					□	48	30

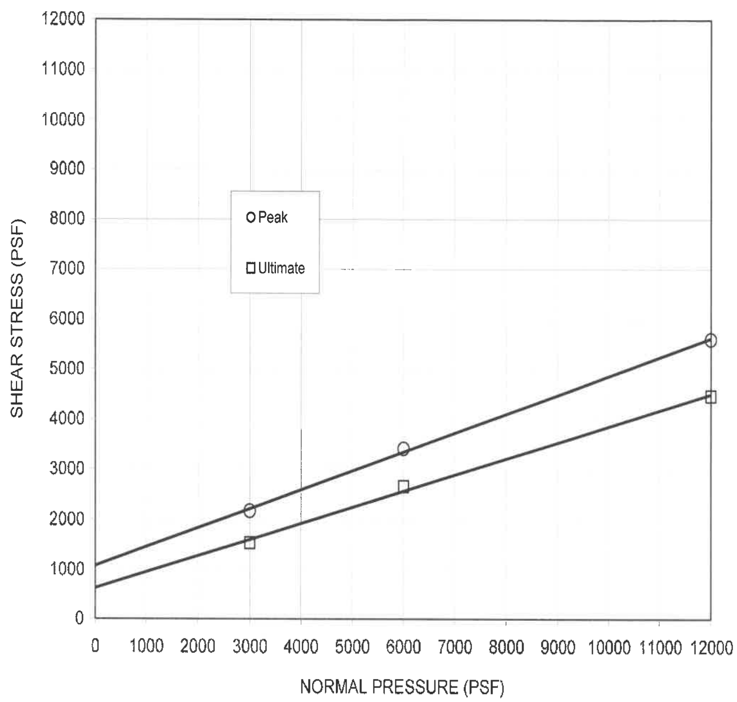
Normal Stress (psf)	Initial Moisture (%)	Final Moisture (%)	γ_d (pcf)	S (%)
2000	3.5	23.2	101.1	94
4000	3.5	22.4	102.4	94
8000	3.5	20.9	104.8	93

EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Project No.: 18-008-010

DIRECT SHEAR
(ASTM D3080)
06/18

B-12



Boring No.:	Sample No.	Depth (ft)	Sample Type	Soil Type	Symbol	Cohesion (PSF)	Friction Angle
B-7	8	40.0	Ring	CL	○	1068	21
					□	618	18

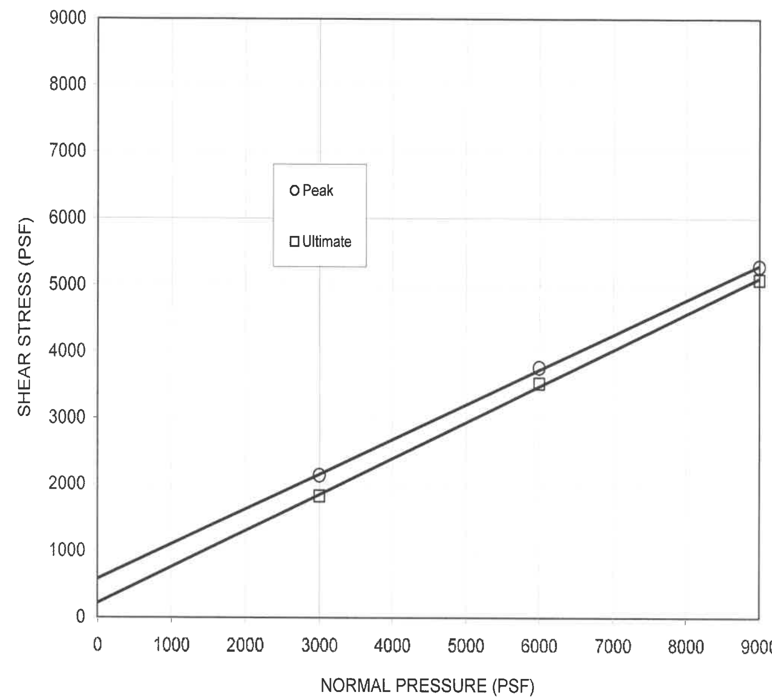
Normal Stress (psf)	Initial Moisture (%)	Final Moisture (%)	γ_d (pcf)	S (%)
3000	29.0	33.0	93.3	100
6000	29.0	31.8	94.0	100
12000	29.0	30.5	95.2	100

EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Project No.: 18-008-010

DIRECT SHEAR
(ASTM D3080)
06/18

B-13



Boring No.:	Sample No.	Depth (ft)	Sample Type	Soil Type	Symbol	Cohesion (PSF)	Friction Angle
B-8	5	25.0	Ring	SM	○	580	28
					□	219	28

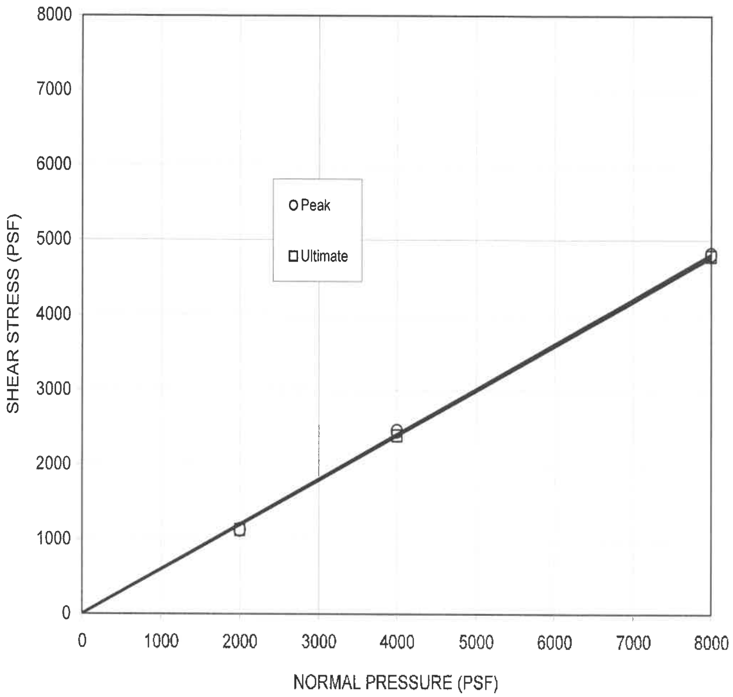
Normal Stress (psf)	Initial Moisture (%)	Final Moisture (%)	γ_d (pcf)	S (%)
3000	2.7	23.8	100.4	95
6000	2.7	22.1	105.5	100
9000	2.7	21.3	105.5	96

EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Project No.: 18-008-010

DIRECT SHEAR
(ASTM D3080)
06/18

B-14



Boring No.:	Sample No.	Depth (ft)	Sample Type	Soil Type	Symbol	Cohesion (PSF)	Friction Angle
B-12	3	15.0	Ring	SC	○	0	30
					□	0	30

Normal Stress (psf)	Initial Moisture (%)	Final Moisture (%)	γ_d (pcf)	S (%)
2000	10.4	23.6	100.8	95
4000	10.4	23.4	100.9	94
8000	10.4	21.2	103.7	92

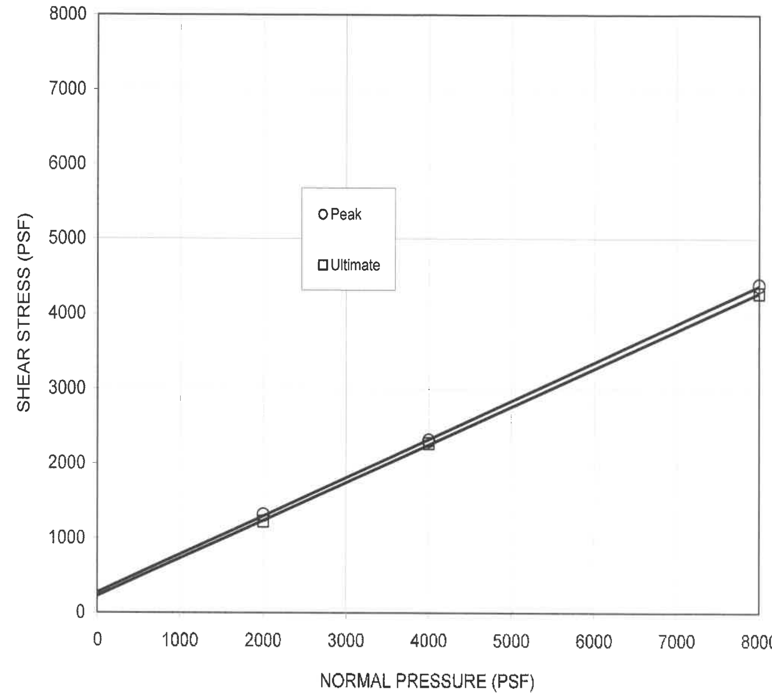
EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Project No.: 18-008-010

DIRECT SHEAR

06/18 (ASTM D3080)

B-15



Boring No.:	Sample No.	Depth (ft)	Sample Type	Soil Type	Symbol	Cohesion (PSF)	Friction Angle
B-16	3	15.0	Ring	CL	○	270	27
					□	222	27

Normal Stress (psf)	Initial Moisture (%)	Final Moisture (%)	γ_d (pcf)	S (%)
2000	16.8	21.1	107.8	100
4000	16.8	20.4	108.4	99
8000	16.8	19.0	109.4	95

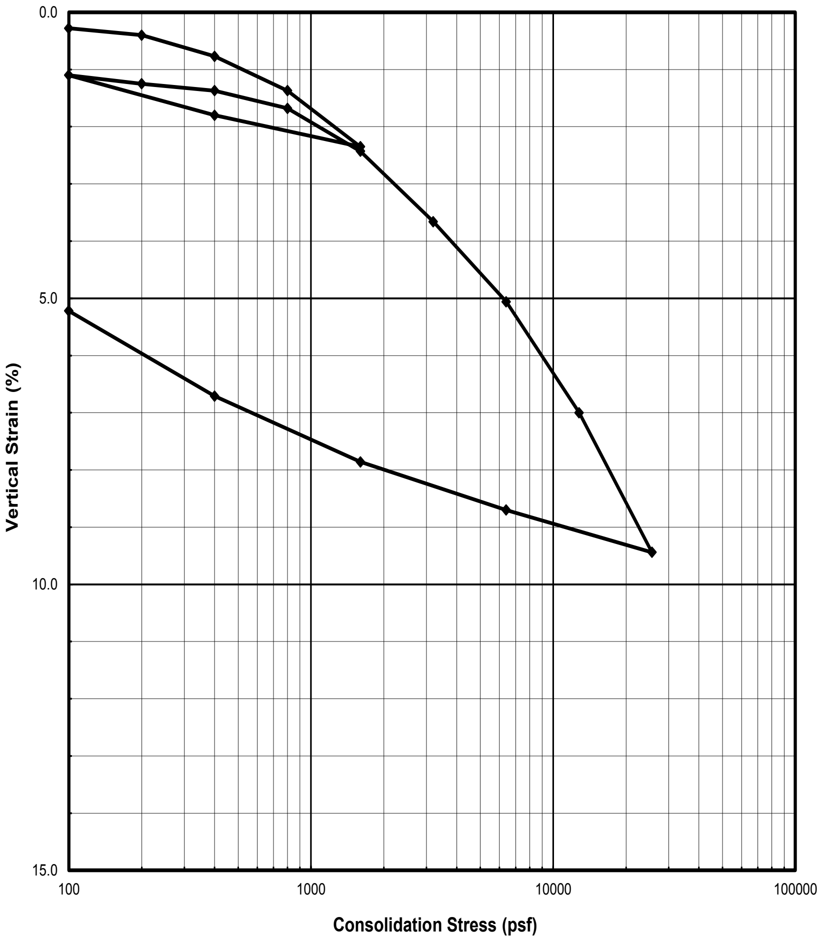
EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Project No.: 18-008-010

DIRECT SHEAR

06/18 (ASTM D3080)

B-16



Description	Dark Brown Silty Fine SAND with Clay							
Boring No.	B-1	**Liquid Limit**	XXXXX	%	**Specific Gravity**	2.70	assumed	
Sample No.	3	**Plasticity Index**	XXXXX	%	**Strain for Saturation**	2.80	%	
Depth (ft)	15.0	**Fines Content**	XXXXX	%	**Water added at**	100.0	psf	

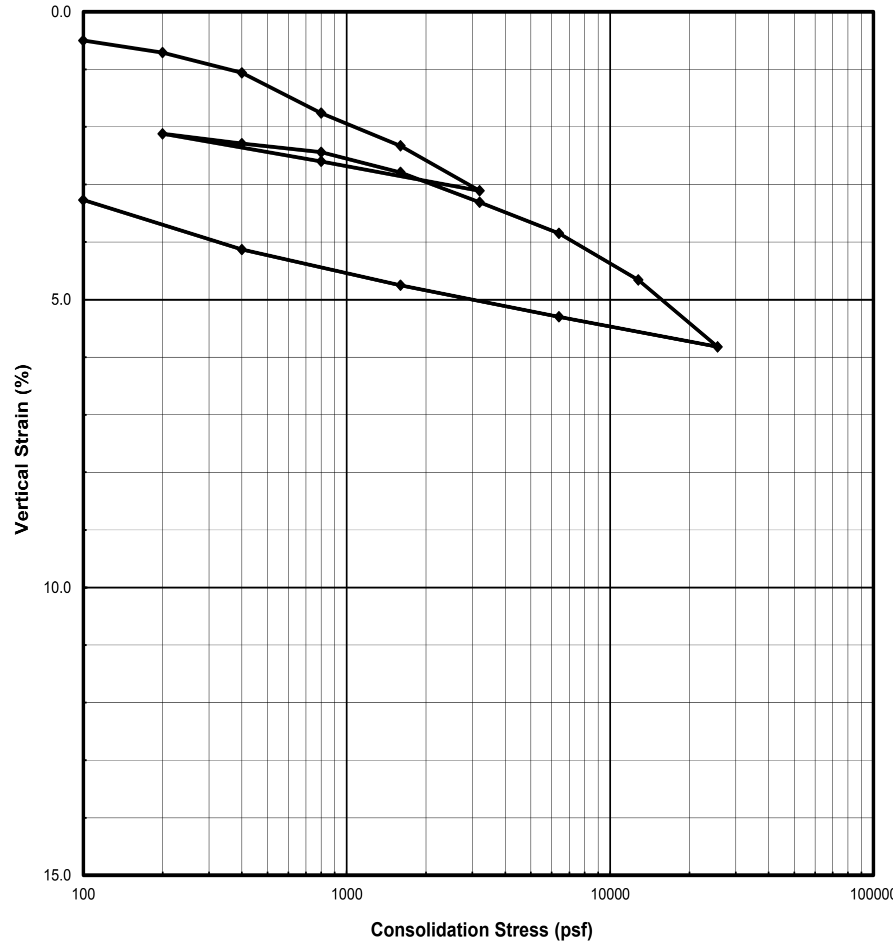
	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	12.12	131.0	116.8	74.4	0.440	1.000	2.416
Final	14.14	140.7	123.3	104.7	0.365	0.948	

AECOM

Project Condor

Project Number	60545923

CONSOLIDATION TEST
ASTM D2435



Description	Dark olive brown silty fine SAND with Clay							
Boring No.	B-5	**Liquid Limit**	XXXXX	%	**Specific Gravity**	2.70	assumed	
Sample No.	6	**Plasticity Index**	XXXXX	%	**Strain for Saturation**	2.80	%	
Depth (ft)	30.0	**Fines Content**	XXXXX	%	**Water added at**	100.0	psf	

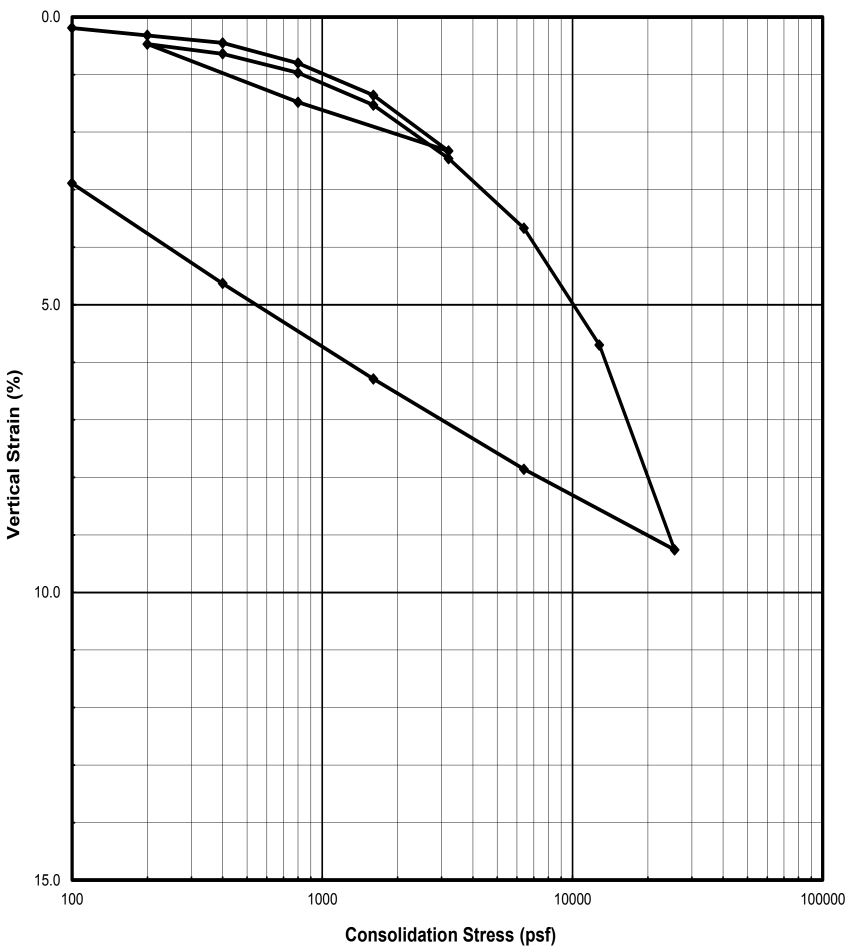
	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	10.54	136.7	123.6	78.9	0.361	1.000	2.416
Final	13.06	144.5	127.8	100.0	0.316	0.967	

AECOM

Project Condor

Project Number	60545923

CONSOLIDATION TEST
ASTM D2435

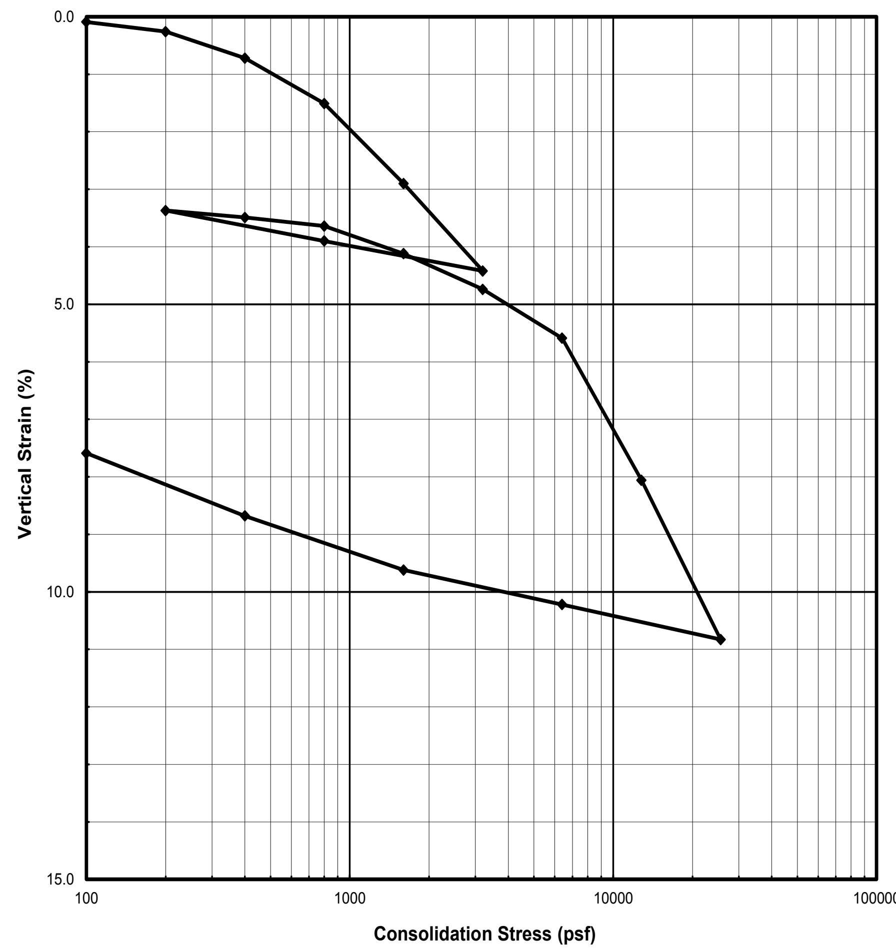


Description	Olive brown SC to sandy CL					
Boring No.	B-6	Liquid Limit	XXXXX %	Specific Gravity	2.70	assumed
Sample No.	7	Plasticity Index	XXXXX %	Strain for Saturation	2.80	%
Depth (ft)	35.0	Fines Content	XXXXX %	Water added at	100.0	psf

	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	27.98	120.6	94.2	96.1	0.786	1.000	2.416
Final	33.20	129.2	97.0	100.0	0.735	0.971	

AECOM	Project Condor	CONSOLIDATION TEST ASTM D2435
	Project Number 60545923	

B-19

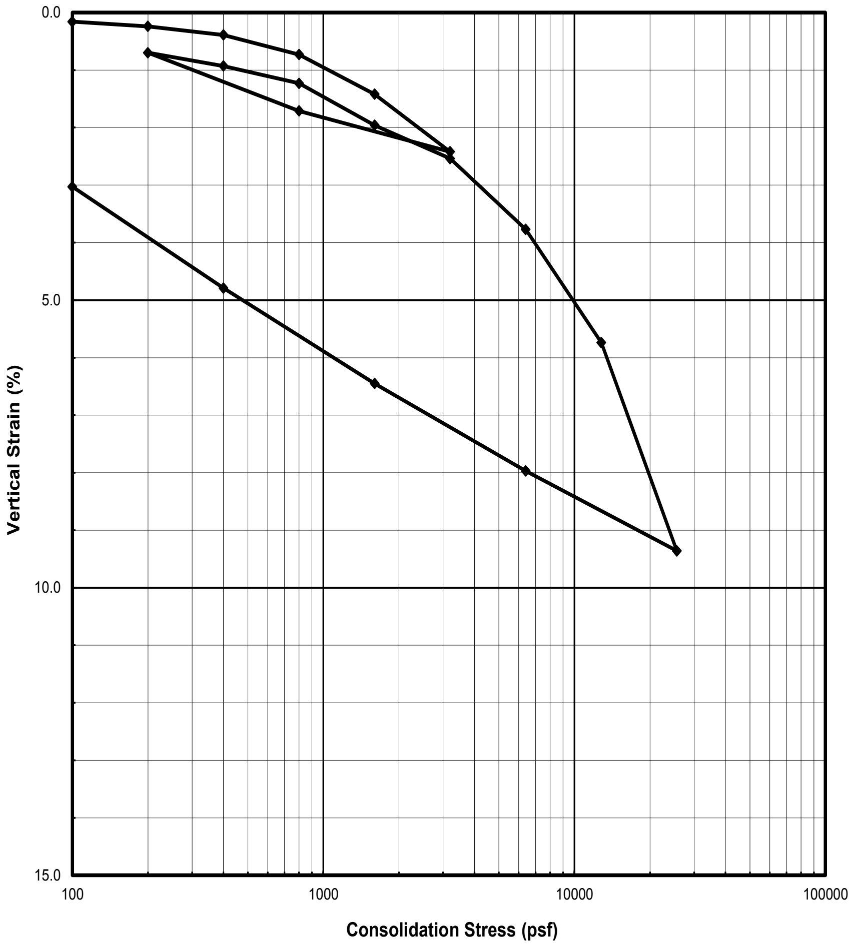


Description	Olive brown silty fine SAND with Clay					
Boring No.	B-7	Liquid Limit	XXXXX %	Specific Gravity	2.70	assumed
Sample No.	6	Plasticity Index	XXXXX %	Strain for Saturation	2.80	%
Depth (ft)	30.0	Fines Content	XXXXX %	Water added at	100.0	psf

	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	9.63	122.9	112.1	51.9	0.501	1.000	2.416
Final	14.90	139.3	121.3	100.0	0.387	0.924	

AECOM	Project Condor	CONSOLIDATION TEST ASTM D2435
	Project Number 60545923	

B-20



Description	Olive light brown fine sandy SILT with clay							
Boring No.	B-8	Liquid Limit	XXXXX	%	Specific Gravity	2.70	assumed	
Sample No.	7	Plasticity Index	XXXXX	%	Strain for Saturation	2.80	%	
Depth (ft)	35.0	Fines Content	XXXXX	%	Water added at	100.0	psf	

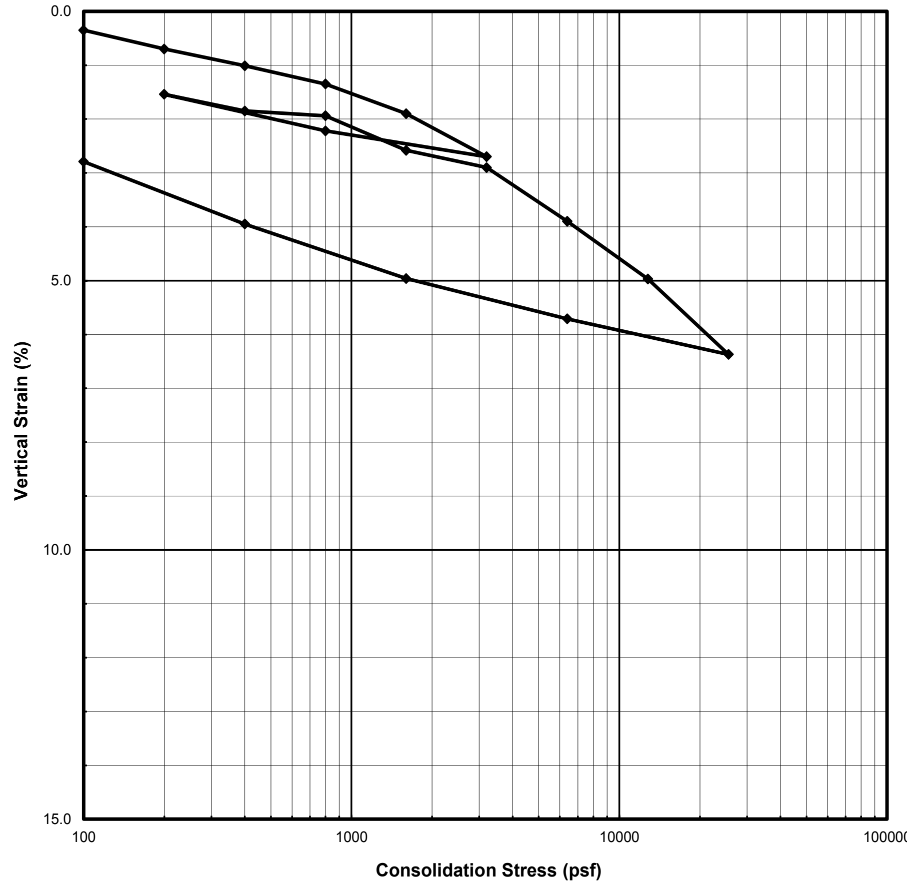
	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	29.29	118.9	91.9	95.3	0.830	1.000	2.416
Final	31.28	124.5	94.8	100.0	0.775	0.970	

AECOM

Project Condor

Project Number 60545923

CONSOLIDATION TEST
ASTM D2435



Description	Olive brown fine sandy SILT with Clay							
Boring No.	B-9	Liquid Limit	XXXXX	%	Specific Gravity	2.70	assumed	
Sample No.	5	Plasticity Index	XXXXX	%	Strain for Saturation	2.80	%	
Depth (ft)	25.0	Fines Content	XXXXX	%	Water added at	100.0	psf	

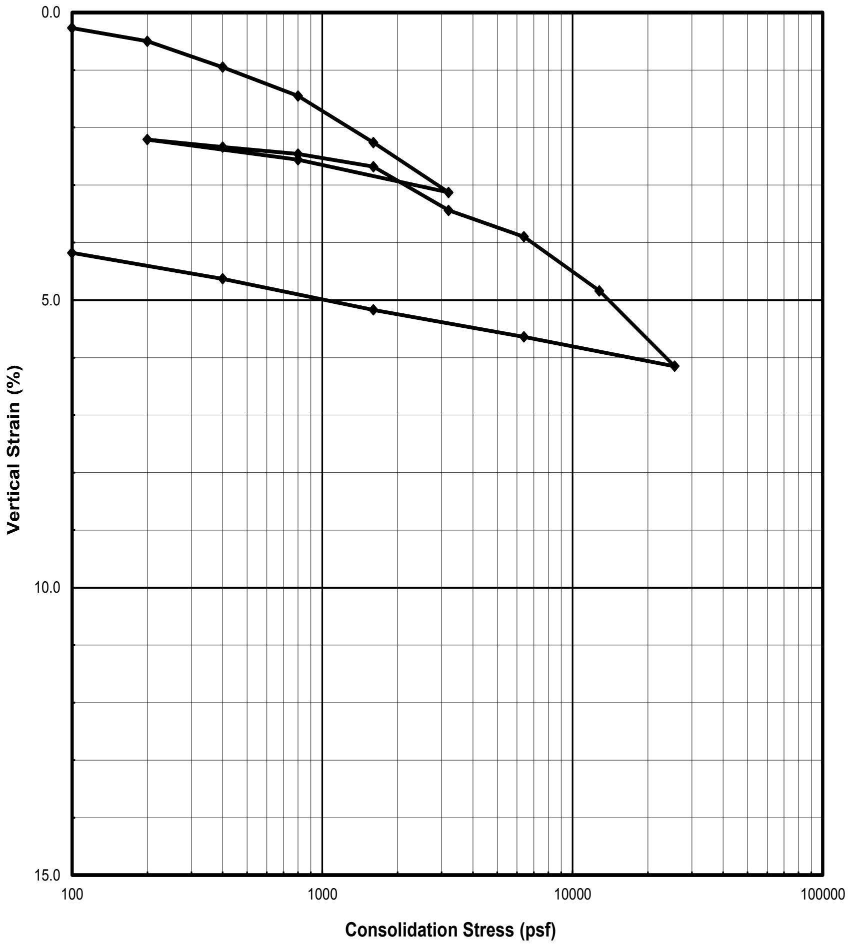
	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	15.43	113.2	98.0	58.2	0.716	1.000	2.416
Final	28.58	129.7	100.8	100.0	0.668	0.972	

AECOM

Project Condor

Project Number 60545923

CONSOLIDATION TEST
ASTM D2435



Description	Olive brown silty fine SAND (very sandy)							
Boring No.	B-12	Liquid Limit	XXXXX	%	Specific Gravity	2.70	assumed
Sample No.	5	Plasticity Index	XXXXX	%	Strain for Saturation	2.80	%
Depth (ft)	25.0	Fines Content	XXXXX	%	Water added at	100.0	psf

	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	9.72	100.3	91.4	31.2	0.841	1.000	2.416
Final	23.70	127.6	103.1	100.0	0.631	0.958	

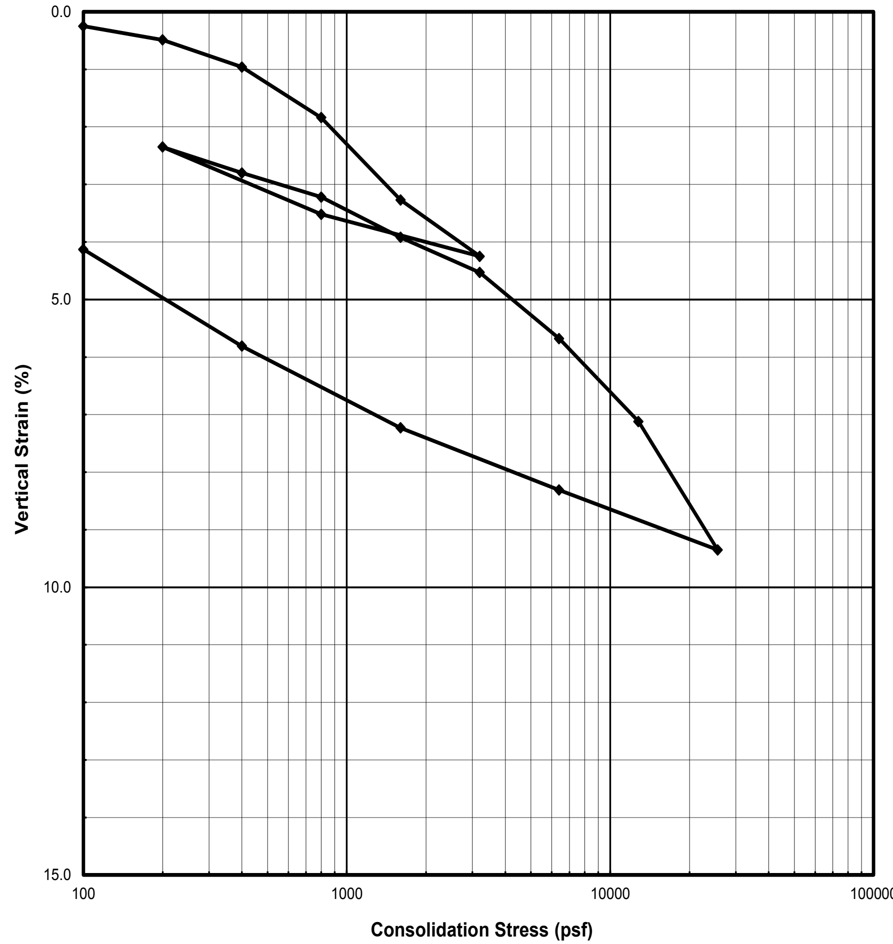
AECOM

Project Condor

Project Number 60545923

CONSOLIDATION TEST
ASTM D2435

B-23



Description	Olive brown ML-CL with sand						
Boring No.	B-16	Liquid Limit	XXXXX	%	Specific Gravity	2.70	assumed
Sample No.	5	Plasticity Index	XXXXX	%	Strain for Saturation	2.80	%
Depth (ft)	25.0	Fines Content	XXXXX	%	Water added at	100.0	psf

	Water Content (%)	Total Unit Weight (pcf)	Dry Unit Weight (pcf)	Saturation (%)	Void Ratio	Height (inches)	Diameter (inches)
Initial	24.04	118.7	95.7	85.7	0.758	1.000	2.416
Final	28.67	128.5	99.9	100.0	0.685	0.959	

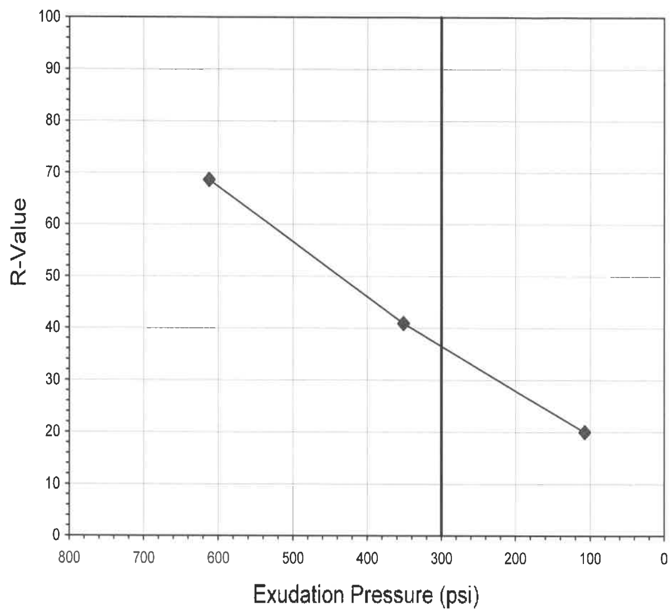
AECOM

Project Condor

Project Number 60545923

CONSOLIDATION TEST
ASTM D2435

B-24



Test No.	Compaction Pressure (psi)	Density (pcf)	Moisture (%)	Expansion Pressure (psi)	Horizontal Pressure (psi) @ 160 psi	Sample Height (in)	Exudation Pressure (psi)	R-Value	R-Value Correction
1	150	123.4	11.6	0.00	112	2.45	107	20	20
2	250	125.5	10.2	0.00	78	2.45	352	41	41
3	350	127.8	8.9	0.27	41	2.48	612	69	69

Boring No.: P-4
Sample No.: P4 @ 0-5'
Sample Type: Bulk
Sample Description: SC
Test Date: 6/12/2018

Test Name and Method:
Resistance R-Value and Expansion Pressure - Cal Test 301

EGLAB, INC.

Project Name:
PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Job No.: 18-008-010

Test Results: R-Value at 300 psi
Exudation Pressure: 38

R-VALUE TEST REPORT

06/14/18

FIGURE 1

Resistance R - Value Testing Results

(Cal Test 301)

Project Name:	PROJECT CONDOR
Job No.:	60545923
Client:	AECOM
EGLAB Project No.:	18-008-010
Test Date:	6/12/2018
Boring No.:	P-4
Sample No.:	P4 @ 0-5'
Sample Type:	Bulk
Sample Description:	Clayey sand (SC), dark brown, few gravel, trace of vegetation
Tested by:	JT
Checked by:	RJ

Test Specimen Number	1	2	3
Compaction Pressure (psi)	150	250	350
Wet Weight (gms)	1255	1240	1225
Dry Weight (gms)	1125	1125	1125
Tare Weight (gms)	0	0	0
Exudation Load (lbs.)	1350	4415	7688
Total Weight (gms)	2896	3037	3011
Mold Weight (gms)	1782	1919	1871
Sample Weight (gms)	1113	1119	1139
Sample Height (in)	2.45	2.45	2.48
Initial Expansion (x 10,000)	0.0000	0.0000	0.0000
Final Expansion (x 10,000)	0.0000	0.0000	0.0009
Expansion Pressure (psi)	0.0000	0.0000	0.2727
Ph @ 2000 lbs	112	78	41
D turns	4.28	3.8	3.32
R-Value from Exudation	20	41	69
Density (pcf)	123.4	125.5	127.8
Moisture (%)	11.6	10.2	8.9
Exudation Pressure (psi)	107	352	612
Corrected R-Value from Exudation:	20	41	69
Exudation Pressure (psi)	107	352	612

R-Value at 300 psi exudation pressure = 38

Note:
1.66% Retained on 3/4-inch Sieve

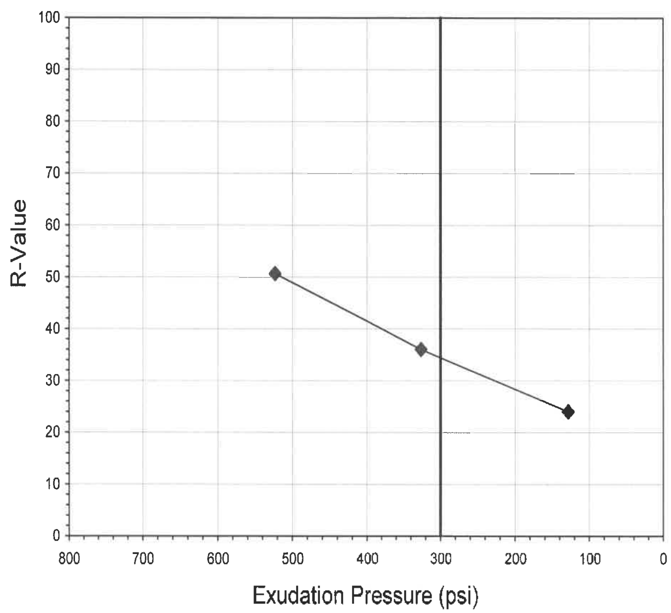
EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Job No.: 18-008-010

R-VALUE TEST RESULTS

06/14/18

FIGURE 2



Test No.	Compaction Pressure (psi)	Density (pcf)	Moisture (%)	Expansion Pressure (psi)	Horizontal Pressure (psi) @ 160 psi	Sample Height (in)	Exudation Pressure (psi)	R-Value	R-Value Correction
1	350	128.2	8.4	0.00	63	2.50	523	51	51
2	250	126.2	9.3	0.00	84	2.51	326	36	36
3	150	124.4	10.1	0.00	104	2.52	129	24	24

Boring No.: P-5
Sample No.: P5 @ 0-5'
Sample Type: Bulk
Sample Description: SC
Test Date: 6/12/2018

Test Name and Method:
Resistance R-Value and Expansion Pressure - Cal Test 301

EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Job No.: 18-008-010

Test Results: R-Value at 300 psi Exudation Pressure: 35

R-VALUE TEST REPORT

06/14/18 FIGURE 1

B-27

Resistance R - Value Testing Results

(Cal Test 301)

Project Name:	PROJECT CONDOR
Job No.:	60545923
Client:	AECOM
EGLAB Project No.:	18-008-010
Test Date:	6/12/2018
Boring No.:	P-5
Sample No.:	P5 @ 0-5'
Sample Type:	Bulk
Sample Description:	Clayey sand (SC), very dark brown, little gravel, trace of vegetation
Tested by:	JT
Checked by:	RJ

Test Specimen Number	1	2	3
Compaction Pressure (psi)	350	250	150
Wet Weight (gms)	1230	1240	1250
Dry Weight (gms)	1135	1135	1135
Tare Weight (gms)	0	0	0
Exudation Load (lbs.)	6568	4100	1620
Total Weight (gms)	2996	3096	3116
Mold Weight (gms)	1850	1954	1976
Sample Weight (gms)	1146	1142	1140
Sample Height (in)	2.50	2.51	2.52
Initial Expansion (x 10,000)	0.0000	0.0000	0.0000
Final Expansion (x 10,000)	0.0000	0.0000	0.0000
Expansion Pressure (psi)	0.0000	0.0000	0.0000
Ph @ 2000 lbs	63	84	104
D turns	3.75	4.02	4.25
R-Value from Exudation	51	36	24
Density (pcf)	128.2	126.2	124.4
Moisture (%)	8.4	9.3	10.1
Exudation Pressure (psi)	523	326	129
Corrected R-Value from Exudation:	51	36	24
Exudation Pressure (psi)	523	326	129

R-Value at 300 psi exudation pressure = 35

Note:
0.65% Retained on 3/4-inch Sieve

EGLAB, INC.

Project Name: PROJECT CONDOR
Client: AECOM
Project No.: 60545923
EGLAB Job No.: 18-008-010

R-VALUE TEST RESULTS

06/14/18 FIGURE 2

B-28

AECOM

Appendix C – Corrosivity Testing

Attachment

Corrosion Evaluation Report for Project Condor, dated June 7, 2018

This Appendix C presents the results of corrosivity testing conducted for Project CONDOR as part of the current preliminary geotechnical investigation program. The testing was subcontracted to Project X Corrosion Engineers of Murrieta, California. The tests were conducted on six (6) selected soil samples taken from different locations and representative foundation depths across the site.

The report by Project X, titled "Corrosion Evaluation Report for Project Condor", dated June 7, 2018 is attached to this Appendix.

Corrosion Evaluation Report for Project Condor

June 7, 2018

Prepared for:
Arnel Bicol
AECOM
300 S. Grand Avenue, 8th Floor
Los Angeles, California 90071
arnel.bicol@aecom.com

Project X Job #: S180530A
Client Job or PO #: 60545923

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5.4.6 Landscapers and Irrigation Sprinkler Systems 24
5.4.7 Roof Drainage splash zones 24
5.4.8 Stray Current Sources 24

1 Executive Summary

A corrosion evaluation of the soils at Project Condor was performed to provide corrosion control recommendations for general construction materials. The site is located at 3700 W Century Blvd Inglewood, CA 90303. Six (6) samples were tested to a depth of 35.0 ft. Site ground water and topography information was provided via AECOM and determined to be 70 feet below finished grade.

The recommendations outlined herein are not a substitute for any design documents previously prepared for the purpose of construction and apply only to the depth of samples collected.

Soil samples were tested for minimum resistivity, pH, chlorides, sulfates, ammonia, nitrates, sulfides and redox.

As-Received soil resistivities ranged between 1,273 ohm-cm and 4,556 ohm-cm. This data would be similar to a Wenner 4 pin test in the field and used in the design of a cathodic protection or grounding bed system. This resistivity can change seasonally depending on the weather and moisture in the ground. This reading alone can be misleading because condensation or minor water leaks will occur underground along pipe surfaces creating a saturated soil environment in the trench along infrastructure surfaces which is why minimum or saturated soil resistivity measurements are more important than as-received resistivities.

Saturated soil resistivities ranged between 1,139 ohm-cm to 2,479 ohm-cm. The worst of these values is considered to be corrosive to general metals.

PH levels ranged between 7.4 to 9.0 pH. The average pH of these samples is alkaline and can cause accelerated corrosion of copper and aluminum alloys.

Chlorides ranged between 27 mg/kg to 195 mg/kg. Chloride levels in these samples are low and may cause insignificant corrosion of metals.

Sulfates ranged between 36 mg/kg to 300 mg/kg. Sulfate levels in these samples are negligible for corrosion of metals and cement. Any type of cement can be used that does not contain encased metal.

Ammonia ranged between 1.0 mg/kg to 67.5 mg/kg. Nitrates ranged between 6.0 mg/kg to 480.0 mg/kg. Concentrations of these elements were high enough to cause accelerated corrosion of copper and copper alloys such as brass.

Sulfides presence was determined to be trace. REDOX ranged between + 132 mV to + 181 mV. Though sulfides were detected, the probability of corrosive bacteria was determined to be low due to very positive REDOX levels determined in these samples.

2 Corrosion Control Recommendations

The following recommendations are based upon the results of soil testing.

2.1 Cement

The highest reading for sulfates was 300 mg/kg or 0.0300 percent by weight.

Per ACI 318-14, Table 19.3.1.1, sulfate levels in these samples categorized as S0 and are negligible for corrosion of metals and cement. Per ACI 318-14 Table 19.3.2.1 any type of cement not containing steel or other metal can be used.

2.2 Steel Reinforced Cement/ Cement Mortar Lined & Coated (CML&C)

Chlorides in soil can overcome the corrosion inhibiting property of cement for steel, as it can also break through passivated surfaces of aluminum and stainless steels.[1,2] The highest concentration of chlorides was 195 mg/kg.

Chloride levels in these samples are not significantly corrosive to metals not in tension. Standard cement cover may be used in these soils.

2.3 Stainless Steel Pipe/Conduit/Fittings

Stainless steels derive their corrosion resistance from their chromium content and oxide layer which needs oxygen to regenerate if damaged. Thus stainless steel is not good for deep soil applications where oxygen levels are extremely low. Stainless steels should not be installed deeper than a plant root zone. Stainless steels typically have the same nobility as copper on the galvanic series and can be connected to copper. If steel must be used, it must be backfilled with soil having greater than 10,000 ohm-cm resistivity and excellent drainage. Steel will also corrode if in contact with carbon materials. Stainless steel welds should be pickled.

The soil at this site has low probability for anaerobic corrosive bacteria and low chloride levels. Per Nickel Institute guidelines, 304 or 316 Stainless steels can be used in these soils.

2.4 Steel Post Tensioning Systems

The proper sealing of stressing holes is of utmost importance in PT Systems. Cut off excess strand 1/2" to 3/4" back in the hole. Coat or paint exposed anchorage, grippers, and stub of strands with "Rust-o-leum" or equal. After tendons have been coated, the cement contractor shall dry pack blockouts within ten (10) days. A non-shrink, non-metallic, non-porous moisture-insensitive grout (Master EMACO S 488 or equivalent), or epoxy grout shall be used for this purpose. If an encapsulated post-tension system is used, regular non-shrink grout can be used.

Due to the low chloride concentrations measured on samples obtained from this site, post-tensioned slabs should be protected in accordance with soil considered normal (non-corrosive).[3,4]

[1] Design Manual 303: Cement Cylinder Pipe. Ameron. p.65
[2] *Chapter 19, Table 1904.2.2(1), 2012 International Building Code*
[3] *Post-Tensioning Manual, sixth edition. Post-Tensioning Institute (PTI), Phoenix, AZ, 2006.*
[4] *Specification for Unbonded Single Strand Tendons. Post-tensioning Institute (PTI), Phoenix, AZ, 2000.*

2.5 Steel Piles

Steel piles are most susceptible to corrosion in disturbed soil where oxygen is available. Further, a dissimilar environment corrosion cell would exist between the steel embedded in cement, such as pile caps and the steel in the soil. In the cell, the steel in the soil is the anode (corroding metal), and the steel in cement is the cathode (protected metal). This cell can be minimized by coating the part of the steel piles that will be embedded in cement to prevent contact with cement and reinforcing steel.

Piles driven into soils without disturbing soils will avoid oxygen introduction and low corrosion rates unless there is a probability for corrosive anaerobic bacteria. Galvanized steel's zinc coating can provide significant protection for driven piles. In corrosive soils in which normal zinc coatings are not enough, the life of piles can be extended by increasing zinc coating thickness, using sacrificial metal, or providing a combination of epoxy coatings and cathodic protection. Corrosion has been observed to be extremely localized even at and below underground water tables. Pit depths of this magnitude do not have an appreciable effect on the strength or useful life of piling structures because the reduction in pile cross section is not significant.[5] Pitting is of more importance to pipes transporting liquids or gases which should not be leaked into the ground.

The following recommendations are recommended to achieve desired life. We defer to structural engineers to use our estimated corrosion rates and to choose from the corrosion control options listed below.

1) Sacrificial metal by use of thicker piles per non-disturbed soil corrosion rates, or
2) Galvanized steel piles per non-disturbed soil corrosion rates, or
3) Combination of galvanized and sacrificial metal per non-disturbed soil corrosion rates, or
4) For no loss of metal, coat entire pile with abrasion resistant epoxy coating such as 3M Scotchkote 323, or PowercreteDD, or equivalent, or
5) Use high yield steel which will corrode at the same rate as mild steel but have greater yield strength and thus be able to suffer more material loss than mild steel.

2.5.1 Expected Corrosion Rate of Steel and Zinc in disturbed soil

In general, the corrosion rate of metals in soil depends on the electrical resistivity, the elemental composition, and the oxygen content of the soil. Soils can vary greatly from one acre to the next, especially at earthquake faults. The better a soil is for farming; the easier it will be for corrosion to take place. Expansive soils will also be considered disturbed simply because of their nature from dry to wet seasons.

In Melvin Romanoff's NBS Circular 579, the corrosion rates of carbon steels and various metals was studied over long term periods. Various metals were placed in various soil types to gather corrosion rate data of all metals in all soil types. Samples were collected and material loss measured over the course of 20 years in some sites. The following corrosion rates were estimated by comparing the worst results of soils tested with similar soils in Romanoff's studies

[5] Melvin Romanoff, Corrosion of Steel Pilings in Soils, National Bureau of Standards Monograph 58, pg 20.

and Highway Research Board's publications.[6] The corrosion rate of zinc in disturbed soils is determined per Romanoff studies and King Nomograph.[7]

Expected Corrosion Rate for Steel = 1.97 mils/year for one sided attack

Expected Corrosion Rate for Zinc = 0.756 mils/year for one sided attack.

Note: 1 mil = 0.001 inch

In undisturbed soils, a corrosion rate of 1 mil/year for steel is expected with little change in the corrosion rate of zinc due to it's low nobility in the galvanic series.

Per CTM 643: Years to perforation of corrugated galvanized steel culverts

- 26.3 Years to Perforation for a 18 gage metal culvert
- 34.2 Years to Perforation for a 16 gage metal culvert
- 42.1 Years to Perforation for a 14 gage metal culvert
- 57.9 Years to Perforation for a 12 gage metal culvert
- 73.7 Years to Perforation for a 10 gage metal culvert
- 89.5 Years to Perforation for a 8 gage metal culvert

2.5.2 Expected Corrosion Rate of Steel and Zinc in Undisturbed soil

Expected Corrosion Rate for Steel = 1 mils/year for one sided attack

Expected Corrosion Rate for Zinc = 0.756 mils/year for one sided attack.

Note: 1 mil = 0.001 inch

2.6 Steel Storage tanks

Underground fuel tanks must be constructed and protected in accordance with California Underground Storage Tank Regulations, CCR, Title 23, Division 3, Chapter 16. Metals should be protected with cathodic protection or isolated from backfill material with an epoxy coating.

2.7 Steel Pipelines

Though a site may not be corrosive in nature at the time of construction, **installation of corrosion test stations and electrical continuity joint bonding should be performed during construction** so that future corrosion inspections can be performed. If steel pipes with gasket joints or other possibly non-conductive type joints are installed, their joints should be bonded across by welding or pin brazing a #8 AWG copper strand bond cable. Electrical continuity is necessary for corrosion inspections and for cathodic protection.

Corrosion test stations should be installed every 1,000 feet of pipeline.

Test stations shall have two #8 HMWPE copper strand wire test leads welded or pin brazed to the underground pipe, brought up into the test station hand hole and marked CTS. Wires should be brought into test station hand hole at finished grade with 12 inches of wire coiled within test station.

[6] Field test for Estimating Service Life of Corrugated Metal Culverts, J.L. Beaton, Proc. Highway Research Board, Vol 41, P. 255, 1962

[7] King, R.A. 1977, Corrosion Nomograph, TRRC Supplementary Report, British Corrosion Journal

At isolation joints and pipe casings, 4 wire test stations shall be installed using #8 HMWPE copper strand wire test leads. Use different color wires to distinguish which wires are bonded to one side of isolation joint or to casing. Wires should be brought into test station hand hole at finished grade with 12 inches of wire coiled within test station.

Prevent dissimilar metal corrosion cells per NACE SP0286:

1) Electrically isolate dissimilar metal connections
2) Electrically isolate dissimilar coatings (Epoxy vs CML&C) segments connections
3) Electrically isolate river crossing segments
4) Electrically isolate freeway crossing segments
5) Electrically isolate old existing pipelines from new pipelines
6) Electrically isolate aboveground and underground pipe segments with flange isolation joint kits. **These are especially important for fire risers.**

The corrosivity at this site is corrosive to steel. Any piping that must be jack-bored should use abrasion resistant epoxy coating such as 3M Scotchkote 323, or PowercreteDD, or equivalent. The corrosion control options for this site are as follows:

1) Apply impermeable dielectric coating such as minimum 8 mil thick polyethylene, and install cathodic protection system per NACE SP0169, or
2) Wax tape, or
3) Coal tar enamel, or
4) Fusion bonded epoxy, or
5) Apply 3 inch coating of Type II cement or high pH slurry that will maintain pH higher than 12. Cement is both a corrosion inhibitor and a coating for ferrous metals. Cement naturally holds a pH of 12 or higher for many years if not exposed to high levels of carbon dioxide.

It is critical for the life of the pipe that the protective wrap contains no openings or holes. Prevent damage to the protective sleeve during backfilling of the pipe trench. Penetrations of any kind within these or other protective materials generally leads to accelerated corrosion failure due to the fact that the corrosion attack is concentrated at the location of these penetrations. Cathodic protection will protect these defects. The better the coating, the less expensive a cathodic protection system will be in anode material and power requirement if needed.

2.8 Steel Fittings

The corrosivity at this site is corrosive to steel. The corrosion control options for this site are as follows:

1) Apply impermeable dielectric coating such as minimum 8 mil thick polyethylene, and install cathodic protection system per NACE SP0169, or
2) Tape coating system, or
3) Wax tape, or

4) Coal tar enamel, or
5) Fusion bonded epoxy, or
6) Apply 3 inch coating of Type II cement or high pH slurry that will maintain pH higher than 12. Cement is both a corrosion inhibitor and a coating for ferrous metals. Cement naturally holds a pH of 12 or higher for many years if not exposed to high levels of carbon dioxide.

It is critical for the life of the metal that the protective wrap contains no openings or holes. Prevent damage to the protective sleeve during backfilling of the pipe trench. Penetrations of any kind within these or other protective materials generally leads to accelerated corrosion failure due to the fact that the corrosion attack is concentrated at the location of these penetrations. Cathodic protection will protect these defects. The better the coating, the less expensive a cathodic protection system will be in anode material and power requirement if needed.

2.9 Ductile Iron (DI) Fittings

AWWA C105 developed a 10 point system to classify sites as corrosive or non-corrosive to ductile iron materials. The criterion is based upon soil resistivities, soil drainage, pH, sulfide presence, and reduction-oxidation (REDOX) potential. The soil samples tested for this site resulted in a score of 11 out of 25.5. A score greater or equal to 10 points classifies soils as aggressive to iron materials.

The corrosivity at this site is corrosive to iron. The corrosion control options for this site are as follows:

1) Apply impermeable dielectric coating such as minimum 8 mil thick polyethylene, and install cathodic protection system per NACE SP0169, or
2) Wax tape, or
3) Coal tar enamel, or
4) Fusion bonded epoxy, or
5) Apply 3 inch coating of Type II cement or high pH slurry that will maintain pH higher than 12. Cement is both a corrosion inhibitor and a coating for ferrous metals. Cement naturally holds a pH of 12 or higher for many years if not exposed to high levels of carbon dioxide.

It is critical for the life of the metal that the protective wrap contains no openings or holes. Prevent damage to the protective sleeve during backfilling of the pipe trench. Penetrations of any kind within these or other protective materials generally leads to accelerated corrosion failure due to the fact that the corrosion attack is concentrated at the location of these penetrations. Cathodic protection will protect these defects. The better the coating, the less expensive a cathodic protection system will be in anode material and power requirement if needed.

2.10 Ductile Iron Pipe

AWWA C105 developed a 10 point system to classify sites as corrosive or non-corrosive to ductile iron materials. The criterion is based upon soil resistivities, soil drainage, pH, sulfide presence, and reduction-oxidation (REDOX) potential. The soil samples tested for this site resulted in a score of 11 out of 25.5. A score greater or equal to 10 points classifies soils as aggressive to iron materials.

Though a site may not be corrosive in nature at the time of construction, **installation of corrosion test stations and electrical continuity joint bonding should be performed during construction** so that future corrosion inspections can be performed. If steel pipes with gasket joints or other possibly non-conductive type joints are installed, their joints should be bonded across by welding or pin brazing a #8 AWG copper strand bond cable. Electrical continuity is necessary for corrosion inspections and for cathodic protection.

Pea gravel is used by plumbers to lay pipes and establish slopes. If the gravel has more than 200 ppm chlorides or is not tested, a 25 mil plastic should be placed between the gravel and pipe to avoid corrosion.

Corrosion test stations should be installed every 1,000 feet of pipeline.

Test stations shall have two #8 HMWPE copper strand wire test leads welded or pin brazed to the underground pipe, brought up into the test station hand hole and marked CTS. Wires should be brought into test station hand hole at finished grade with 12 inches of wire coiled within test station.

At isolation joints and pipe casings, 4 wire test stations shall be installed using #8 HMWPE copper strand wire test leads. Use different color wires to distinguish which wires are bonded to one side of isolation joint or to casing. Wires should be brought into test station hand hole at finished grade with 12 inches of wire coiled within test station.

Prevent dissimilar metal corrosion cells per NACE SP0286:

1) Electrically isolate dissimilar metal connections
2) Electrically isolate dissimilar coatings (Epoxy vs CML&C) segments connections
3) Electrically isolate river crossing segments
4) Electrically isolate freeway crossing segments
5) Electrically isolate old existing pipelines from new pipelines
6) Electrically isolate aboveground and underground pipe segments with flange isolation joint kits**. These are especially important for fire risers.**

The corrosivity at this site is corrosive to iron. Any piping that must be jack-bored should use abrasion resistant epoxy coating such as 3M Scotchkote 323, or PowercreteDD, or equivalent. The corrosion control options for this site are as follows:

1) Apply impermeable dielectric coating such as minimum 8 mil thick polyethylene, and install cathodic protection system per NACE SP0169, or
2) Wax tape, or
3) Coal tar enamel, or

4) Fusion bonded epoxy, or
5) Apply 3 inch coating of Type II cement or high pH slurry that will maintain pH higher than 12. Cement is both a corrosion inhibitor and a coating for ferrous metals. Cement naturally holds a pH of 12 or higher for many years if not exposed to high levels of carbon dioxide.

It is critical for the life of the metal that the protective wrap contains no openings or holes. Prevent damage to the protective sleeve during backfilling of the pipe trench. Penetrations of any kind within these or other protective materials generally leads to accelerated corrosion failure due to the fact that the corrosion attack is concentrated at the location of these penetrations. Cathodic protection will protect these defects. The better the coating, the less expensive a cathodic protection system will be in anode material and power requirement if needed.

2.11 Copper Materials

Copper is an amphoteric material which is susceptible to corrosion at very high and very low pH. It is one of the most noble metals used in construction thus typically making it a cathode when connected to dissimilar metals. Copper's nobility can change with temperature, similar to the phenomenon in zinc. When zinc is at room temperature, it is less noble than steel and can provide cathodic protection to steel. But when zinc is at a temperature above 140F such as in a water heater, it becomes nobler than the steel and the steel becomes the sacrificial anode. This is why zinc is not used in steel water heaters or boilers. Copper when cold has one native potential, but when heated develops a more electronegative electro-potential. Thus hot and cold copper pipes should be electrically isolated from each other to avoid creation of a thermo-galvanic corrosion cell.

2.11.1 __Copper Pipes__

The lowest pH for this area was measured to be 7.4. Soil with a pH less than 5.5 is considered aggressive to copper. Copper is also greatly affected by ammonia and nitrate concentrations[8]. The highest nitrate concentration was 480.0 mg/kg and the highest ammonia concentration was 67.5 mg/kg at this site.

These soils were determined to be corrosive to copper and copper alloys such as brass.

Aboveground, underground, cold water and hot water pipes should be electrically isolated from each other by use of dielectric unions and plastic in-wall pipe supports. The following are corrosion control options for underground copper water pipes.

1) Run copper pipes within PVC pipes to prevent soil contact, or
2) Cover piping with a 20 mil epoxy coating free of scratches and defects, or
3) Cover copper pipes with minimum 10 mil polyethylene sleeve over a suitable primer and apply cathodic protection per NACE SP0169

It is critical for the life of the metal that the protective wrap contains no openings or holes. Prevent damage to the protective sleeve during backfilling of the pipe trench. Penetrations of

[8] Corrosion Data Handbook, Table 6, Corrosion Resistance of copper alloys to various environments, 1995

any kind within these or other protective materials generally leads to accelerated corrosion failure due to the fact that the corrosion attack is concentrated at the location of these penetrations. Cathodic protection will protect these defects. The better the coating, the less expensive a cathodic protection system will be in anode material and power requirement if needed.

2.11.2 __Brass Fittings__

Brass fittings should be electrically isolated from dissimilar metals by use of dielectric unions or isolation joint kits.

These soils were determined to be corrosive to copper and copper alloys such as brass.

The following are corrosion control options for underground brass.

1) Prevent soil contact by use of impermeable coating system such as wax tape, or
2) Prevent soil contact by use of a 20 mil epoxy coating free of scratches and defects, or
3) Cover brass with minimum 10 mil polyethylene sleeve over a suitable primer and apply cathodic protection per NACE SP0169

It is critical for the life of the metal that the protective wrap contains no openings or holes. Prevent damage to the protective sleeve during backfilling of the pipe trench. Penetrations of any kind within these or other protective materials generally leads to accelerated corrosion failure due to the fact that the corrosion attack is concentrated at the location of these penetrations. Cathodic protection will protect these defects. The better the coating, the less expensive a cathodic protection system will be in anode material and power requirement if needed.

2.11.3 __Bare Copper Grounding Wire__

It is assumed that corrosion will occur at all sides of the bare wire, thus the corrosion rate is calculated as a two sided attack determining the time it takes for the corrosion from two sides to meet at the center of the wire. The estimated life of bare copper wire for this site is the following:[9]

Size (AWG)	**Diameter (mils)**	**Est. Time to penetration (Yrs)**
14	64.1	5.5
13	72	6.2
12	80.8	7.0
11	90.7	7.8
10	101.9	8.8
9	114.4	9.9
8	128.5	11.1
7	144.3	12.4
6	162	14.0
5	181.9	15.7

[9] Soil-Corrosion studies 1946 and 1948: Copper Alloys, Lead, and Zinc, Melvin Romanoff, National Bureau of Standards, Research Paper RP2077, 1950

Size (AWG)	**Diameter (mils)**	**Est. Time to penetration (Yrs)**
4	204.3	17.6
3	229.4	19.8
2	257.6	22.2
1	289.3	24.9

If the bare copper wire is being used as a grounding wire connected to less noble metals such as galvanized steel or carbon steel, the less noble metals will provide additional cathodic protection to the copper reducing the corrosion rate of the copper.

It is recommended that a corrosion inhibiting and water-repelling coating such as Corrosion X Part No. 90102 by Corrosion Technologies (no affiliation to Project X) be applied to aboveground and belowground copper-to-dissimilar metal connections to reduce risk of dissimilar corrosion.

2.12 Aluminum Pipe/Conduit/Fittings

Aluminum is an amphoteric material prone to pitting corrosion in environments that are very acidic or very alkaline or high in chlorides.

Conditions at this site are unsafe for aluminum. Soils at this site were determined to be too alkaline for aluminum. Soil contact with aluminum alloys should be avoided at this site. This can be achieved with:

1) Impermeable minimum 20 mil polyethylene coatings, or
2) Epoxy coatings with minimum 20 mil thickness free of scratches and defects, or
3) Wax tape

Aluminum derives its corrosion resistance from its oxide layer which needs oxygen to regenerate if damaged, similar to stainless steels. Thus aluminum is not good for deep soil applications. Since aluminum corrodes at very alkaline environments, it cannot be encased or placed against cement or mortar such as brick wall mortar up against an aluminum window frame.

Aluminum is also very low on the galvanic series scale making it most likely to become a sacrificial anode when in contact with dissimilar metals in moist environments. Avoid electrical continuity with dissimilar metals by use of insulators, dielectric unions, or isolation joints. Pooling of water at post bottoms or surfaces should be avoided by integrating good drainage.

2.13 Carbon Fiber or Graphite Materials

Carbon fiber or other graphite materials are extremely noble on the galvanic series and should always be electrically isolated from dissimilar metals. They can conduct electricity and will create corrosion cells if placed in contact within a moist environment with any metal.

2.14 Plastic and Vitrified Clay Pipe

No special precautions are required for plastic and vitrified clay piping from a corrosion viewpoint.

Protect all metallic fittings and pipe restraining joints with wax tape per AWWA C217, cement if previously recommended, or epoxy.

3 CLOSURE

In addition to soils chemistry and resistivity, another contributing influence to the corrosion of buried metallic structures is stray electrical currents. These electrical currents flowing through the earth originate from buried electrical systems, grounding of electrical systems in residences, commercial buildings, and from high voltage overhead power grids. Therefore, it is imperative that the application of protective wraps and/or coatings and electrical isolation joints be properly applied and inspected.

It is the responsibility of the builder and/or contractor to closely monitor the installation of such materials requiring protection in order to assure that the protective wraps or coatings are not damaged.

The recommendations outlined herein are in conformance with current accepted standards of practice that meet or exceed the provisions of the Uniform Building Code (UBC), the International Building Code (IBC), California Building Code (CBC), the American Cement Institute (ACI), Nickel Institute, National Association of Corrosion Engineers (NACE International), Post-Tensioning Institute Guide Specifications and State of California Department of Transportation, Standard Specifications, American Water Works Association (AWWA) and the Ductile Iron Pipe Research Association (DIPRA).

Our services have been performed with the usual thoroughness and competence of the engineering profession. No other warranty or representation, either expressed or implied, is included or intended.

Please call if you have any questions.

Respectfully Submitted,

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Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
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Client Job Number: 60545923
Project X Job Number: S180530A
June 7, 2018

ethod	ASTM G187		ASTM D516		ASTM D512B		SM 4500-NO3-E	SM 4500-NH3-C	SM 4500-S2-D	AS G
Dept h	Resistivity		Sulfates		Chlorides		Nitrate	Ammonia	Sulfide	Re
	As Rec'd	Minimum								
(ft)	(Ohm-cm)	(Ohm-cm)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(mg/kg)	(mg/kg)	(mg/kg)	(r
10.0	4,087	2,479	300	0.0300	195	0.0195	480	67.5	5.55	1
30.0	3,216	2,278	120	0.0120	84	0.0084	168	27.0	2.52	1
35.0	1,273	1,139	36	0.0036	48	0.0048	66	21.0	0.90	1
10.0	4,556	2,144	90	0.0090	27	0.0027	6	4.0	0.39	1
5.0	4,288	1,407	90	0.0090	36	0.0036	12	1.0	0.12	1
10.0	2,479	2,211	150	0.0150	105	0.0105	60	15.0	2.85	1

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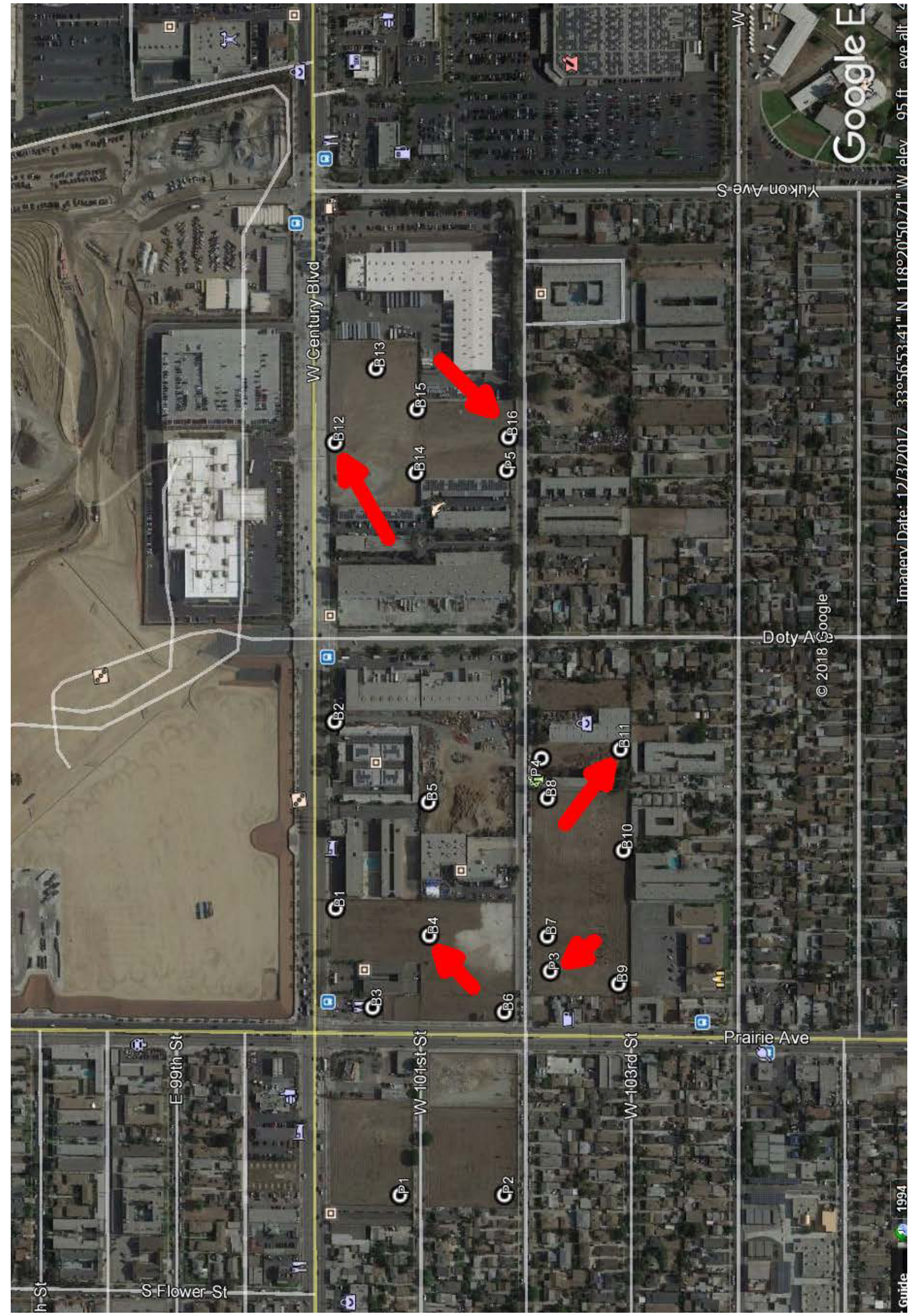


3700 West
Century Boulevard
Inglewood
Westmont
Los Angeles
Southwest
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Lennox
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S Hoover St
S Vermont Ave
S Western Ave
S Van Ness Ave
Crenshaw Blvd
Prairie Ave
South La Brea Ave
S Inglewood Ave
La Cienega Blvd
W Manchester Ave
W Manchester Blvd
W 92nd St
W Arbor Vitae St
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Pincay Dr
W Century Blvd
W 108th St
Imperial Hwy
Glenn Anderson Fwy
Century Fwy
W 120th St
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405

5 Corrosion Basics

In general, the corrosion rate of metals in soil depends on the electrical resistivity, the elemental composition, and the oxygen content of the soil. Soils can vary greatly from one acre to the next, especially at earthquake faults. The better a soil is for farming; the easier it will be for corrosion to take place. Oxygen content in soil can be increased during construction. These soils are considered disturbed soils. When construction equipment at a site is simply driving piles into soil without digging into the soil, the activity can still disturb soil down to 3 feet. Expansive soils will also be considered disturbed simply because of their nature from dry to wet seasons.

5.1 Galvanic Series

All metals have a natural electrical potential in soil. This electrical potential is measured using a high impedance voltmeter connected to the metal being tested and with the common lead connected to a copper copper-sulfate reference electrode (CSE). There are many types of reference electrodes. In laboratory measurements, a Standard Hydrogen Electrode (SHE) is commonly used. When different metal alloys are tested they can be ranked into an order from most noble (less corrosion), to least noble (more active corrosion). When a more noble metal is connected to a less noble metal, the less noble metal will become an anode and sacrifice itself through corrosion providing corrosion protection to the more noble metal. This hierarchy is known as the galvanic series named after Luigi Galvani whose experiments with electricity and muscles led Alessandro Volta to discover the reactions between dissimilar metals leading to the early battery. The greater the voltage difference between two metals, the faster the corrosion rate will be.

Table 1- Dissimilar Metal Corrosion Risk

	Zinc	Galvanized Steel	Aluminum	Cast Iron	Lead	Mild Steel	Tin	Copper	Stainless Steel
Zinc	None	Low	Medium	High	High	High	High	High	High
Galvanized Steel	Low	None	Medium	Medium	Medium	High	High	High	High
Aluminum	Medium	Medium	None	Medium	Medium	Medium	Medium	High	High
Cast Iron	High	Medium	Medium	None	Low	Low	Low	Medium	Medium
Lead	High	Medium	Medium	Low	None	Low	Low	Medium	Medium
Mild Steel	High	High	Medium	Low	Low	None	Low	Medium	Medium
Tin	High	High	Medium	Low	Low	Low	None	Medium	Medium
Copper	High	High	High	Medium	Medium	Medium	Medium	None	Low
Stainless Steel	High	High	High	Medium	Medium	Medium	Medium	Low	None

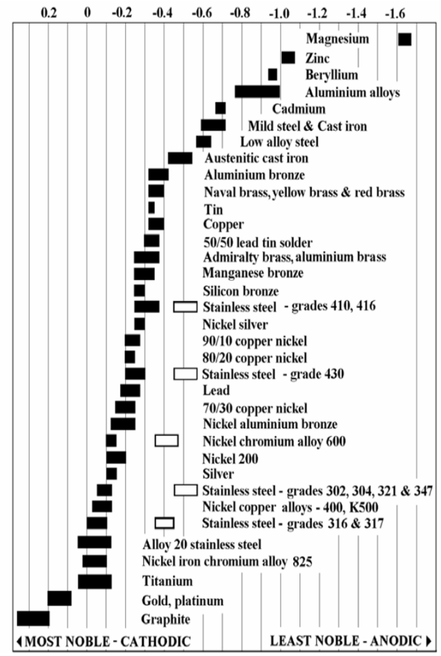


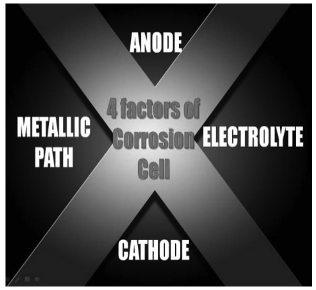
Figure 3 - Galvanic series of metals relative to CSE half cell.

5.2 Pourbaix Diagram

Every metal reacts differently in different environments. In the mid 1900's, Marcel Pourbaix developed the Pourbaix diagram which describes a metal's reaction to an environment dependant on pH and voltage conditions. It describes when a metal remains passive (non-corroding) and in which conditions metals become soluble (corrode). Steels are passive in pH over 12 such as the condition when it is encased in cement. If the cement were to carbonate and its pH reduce to below 12, the cement would no longer be able to act as a corrosion inhibitor and the steel will begin to corrode when moist.

Some metals such as aluminum are amphoteric, meaning that they react with acids and bases. They can corrode in low pH and in high pH conditions. Aluminum alloys are generally passive within a pH of 4 and 8.5 but will corrode outside of those ranges. This is why aluminum cannot be embedded in cement and why brick mortar should not be laid against an aluminum window frame.

5.3 Corrosion Cell



In order for corrosion to occur, four factors must be present. (1) The anode (2) the cathode (3) the electrolyte and (4) the metallic or conductive path joining the anode and the cathode. If any one of these is removed, corrosion activity will stop. This is how a simple battery produces electricity. An example of a non-metallic yet conductive material is graphite. Graphite is similar in nobility to gold. Do not connect graphite to anything in moist environments.

The anode is where the corrosion occurs, and the cathode is the corrosion free material. Sometimes the anode and cathode are different materials connected by a wire or union. Sometimes the anode and cathode are on the same pipe with one area of the pipe in a low oxygen zone while the other part of the pipe is in a high oxygen zone. A good example of this is a post in the ocean that is repeatedly splashed. Deep underwater, corrosion is minimal, but at the splash zone, the corrosion rate is greatest. Low oxygen zones and crevices can also harbor corrosive bacteria which in moist environments will lead to corrosion. This is why pipes are laid on backfill instead of directly on native cut soil in a trench. Filling a trench slightly with backfill before installing pipe then finishing the backfill creates a uniform environment around the entire surface of the pipe.

The electrolyte is generally water, seawater, or moist soil which allows for the transfer of ions and electrical current. Pure water itself is not very conductive. It is when salts and minerals dissolve into pure water that it becomes a good conductor of electricity and chemical reactions. Metal ores are turned into metal alloys which we use in construction. They naturally want to return to their natural metal ore state but it requires energy to return to it. The corrosion cell, creates the energy needed to return a metal to its natural ore state.

The metallic or conductive path can be a wire or coupling. Examples are steel threaded into a copper joint, or an electrician grounding equipment to steel pipes inadvertently connecting electrical grid copper grounding systems to steel or iron underground pipes.

The ratio of surface area between the anode and the cathode is very important. If the anode is very large, and the cathode is very small, then the corrosion rate will be very small and the anode may live a long life. An example of this is when short copper laterals were connected to a large and long steel pipeline. The steel had plenty of surface area to spread the copper's attack, thus corrosion was not noticeable. But if the copper was the large pipe and the steel the short laterals, the steel would corrode at an amazing rate.

5.4 Design Considerations to Avoid Corrosion

The following recommendations are based upon typical observations and conclusions made by forensic engineers in construction defect lawsuits and NACE International (Corrosion Society) recommendations.

5.4.1 Testing Soil Factors (Resistivity, pH, REDOX, SO, CL, NO3, NH3)

As previously mentioned, different factors can cause corrosion. The most useful and common test for categorizing a soil's corrosivity has been the measure of soil resistivity which is typically measured in units of (ohm-cm) by corrosion engineers and geologists. Soil resistivity is the ability of soil to conduct or resist electrical currents and ion transfer. The lower the soil resistivity, the more conductive and corrosive it is. The following are generally accepted descriptions.

Table 2 - Corrosion Basics- An Introduction, NACE, 1984, pg 191

(Ohm-cm)	Corrosivity Description
0-500	Very Corrosive
500-1,000	Corrosive
1,000-2,000	Moderately Corrosive
2,000-10,000	Mildly Corrosive
Above 10,000	Progressively less corrosive

Testing a soil's pH provides information to reference the Pourbaix diagram of specific metals. Some elements such as ammonia and nitrates can create localized alkaline conditions which will greatly affect amphoteric materials such as aluminum and copper alloys.

Excess sulfates can break-down the structural integrity of cement and high concentrations of chlorides can overcome cement's corrosion inhibiting effect on encased ferrous metals and break down protective passivated surface layers on stainless steels and aluminum.

Corrosive bacteria are everywhere but can multiply significantly in anaerobic conditions with plentiful sulfates. The bacteria themselves do not eat the metal but their by-products can form corrosive sulfuric acids. The probability of corrosive bacteria is tested by measuring a soil's oxidation-reduction (REDOX) electro-potential and by testing for the presence of sulfides.

5.4.2 Proper Drainage

It cannot be emphasized enough that pooled stagnant water on metals will eventually lead to corrosion. This stands for internal corrosion and external corrosion situations. In soils, providing good drainage will lower soil moisture content reducing corrosion rates. Attention to properly sealing polyethylene wraps around valves and piping will avoid water intrusion which would allow water to pool against metals. Above ground structures should not have cupped or flat surfaces that will pond water after rain or irrigation events.

Buildings typically have swales when constructed to drain water away from buildings directing it towards an acceptable exit point such as a driveway where it continues draining to a local storm drain. Many homeowners, landscapers and flatwork contractors appear to not be aware of this and destroy swales during remodeling. The majority of garage floor and finished grade elevations are governed by drainage during design.

5.4.3 Avoiding Crevices

Crevices are excellent locations for oxygen differential induced corrosion cells to begin. Crevices can also harbor corrosive bacteria even in the most chemically treated waters. If water's total alkalinity is low, its ability to maintain a stable pH can also become more difficult within a crevice allowing the pH to drop to acidic levels continuing a pitting process.

5.4.4 Coatings and Cathodic Protection

When faced with a corrosive environment, the best defense against corrosion is removing the electrolyte from the corrosion cell by applying coatings to separate the metal from the soil. During construction and installation, there is always some scratch or damage made to a coating. NACE training recommends that coatings be used as a first line of defense and that sacrificial or impressed current cathodic protection is used as a 2nd line of defense to protect the scratched areas. Use of a good coating dramatically reduces the amount of anodes a CP system would need. If CP is not installed as a 2nd line of defense in an extremely corrosive environment, the small scratched zones will suffer accelerated corrosion. CP details such as anode installation instructions must be designed by corrosion engineers on a per project basis because it depends on soil resistivity, surface area of infrastructure to be protected, and system geometry.

There are two types of cathodic protection systems, a Galvanic Anode Cathodic Protection (GACP) system and an Impressed Current Cathodic Protection (ICCP) system. A Galvanic Anode Cathodic Protection (GACP) system is simpler to install and maintain than an Impressed Current Cathodic Protection (ICCP) system. To protect the metals, they must all be electrically continuous to each other. In a GACP system, sacrificial zinc or magnesium anodes are then buried at locations per the CP design and connected by wire to a structure at various points in system. At the connection points, a wire connecting to the structure and the wire from the anode are joined in a Cathodic Protection Test Station hand hole which looks similar in size and shape to an irrigation valve pull box. By coating the underground structures, one can reduce the number of anodes needed to provide cathodic protection by 80% in many instances.

An ICCP system requires a power source, a rectifier, significantly more trenching, and more expensive type anodes. These systems are typically specified when bare metal is requiring protection in severely corrosive environments in which galvanic anodes do not provide enough power to polarize infrastructure to -850 mV structure-to-soil potential or be able to create a 100 mV potential shift as required by NACE SP169 to control corrosion. In severely corrosive environments, a GACP system simply may not last a required lifetime due to the high rate of consumption of the sacrificial anodes. ICCP system rectifiers must be inspected and adjusted quarterly or at a minimum bi-annually per NACE recommendations. Different anode installations may be possible but for large sites, anodes are placed evenly throughout the site and all anode wires must be trenched to the rectifier. For a large site, it may be beneficial to use two or more rectifiers to reduce wire lengths or trenching.

To simplify, a GACP system can be installed and practically forgotten with minor trenching because the anodes can be installed very close to the structures. An ICCP system must be inspected annually and anode wires run back to the rectifier which itself connects to the pile system. If any type of trenching or development is expected to occur at the site during the life of the site, it is a good idea to inspect the anode connections once a year to make sure wires are not cut and that the infrastructure is still being provided adequate protection. A common situation that occurs with ICCP systems is that a contractor accidently cuts the wires during construction then reconnects them incorrectly, turning the once cathode, into a sacrificing anode.

Design of a cathodic protection system requires that Wenner Four Pin ground resistance measurements per ASTM G57 be performed by corrosion engineers at various locations of the site to determine the best depths and locations for anode installations. Ideally, a sample pile is installed and experiments determining current requirement are conducted. Using this data, the decision is made whether a GACP system is feasible or if an ICCP must be used.

Project X Corrosion Engineers can provide a proposal for cathodic protection design and field work if needed.

5.4.4.1 Good Electrical Continuity

In order for cathodic protection to protect a long pipeline or system of pipes, they must all be electrically continuous to each other so that the electric current from the anode can travel along the pipes, then return through the earth to the anode. Electrical continuity is achieved by welding or pin brazing #8 AWG copper strand bond cable to the end of pipe sticks which have rubber gaskets at bell and spigots. If steel pipes are joined by full weld, bonding wires are not needed.

Electrical continuity between dissimilar metals is not desirable. Isolation joints or di-electric unions should be installed between dissimilar metals, such as steel pipes connecting to a brass valve. Bonding wires should then be welded onto the steel pipes by-passing the brass valve so that the cathodic protection system's current can continue to travel. Another option would be to provide a separate cathodic protection system for steel pipes on both sides of the brass valve.

Typically, gas meters and water meters have dielectric unions installed in them to separate utility property from homeowner property. This also protects them in the case that a home owner somehow electrically connects water pipes or gas pipes to a neighborhood electrical grounding system which can potentially have less noble steel in soil now connected to much more noble copper in soil which will then create a corrosion cell. This is exactly how a lemon powered clock works when a galvanized zinc nail and a steel nail are inserted into a lemon then connected to a clock. The clock is powered by the corrosion cell created.

5.4.4.2 Bad Electrical Continuity

Bad electrical continuity is when two different materials or systems are made electrically continuous (aka shorted) when they were not designed to be electrically continuous. Examples of this would be when gas lines are shorted to water lines or to electrical grounding beds. Very often, fire risers are shorted to electrical grounding systems, and water pipes at business parks. Since fire risers usually have a very short ductile iron pipe in the ground which connects to PVC pipe systems, they tend to experience leaks after 7 to 10 years of being attacked by underground copper systems.

It is absolutely imperative that any copper water piping or other metal conduits penetrating cement slab or footings, not come in contact with the reinforcing steel or post-tensioning tendons to avoid creation of galvanic corrosion cells.

5.4.4.3 Corrosion Test Stations

Corrosion test stations should be installed every 1,000 feet along pipelines in order to measure corrosion activity in the future. For a simple pipeline, two #8 AWG copper strand bond cable welded or pin brazed onto the pipeline are run up to finished grade and left in a hand hole. Corrosion test stations are used to measure pipe-to-soil electro potential relative to a copper

copper-sulfate reference electrode to determine if the pipe is experiencing significant corrosion activity. By measuring test stations along a pipeline, hot spots can be determined, if any. The wires also allow for electrical continuity testing, condition assessment, and a multitude of other types of tests.

At isolation joints and pipe casings, two wires should be welded to either side of the isolation joint for a total of 4 wires to be brought up to the hand hole. This allows for future tests of the isolation joint, casing separation confirmation, and pipe-to-soil potential readings during corrosion surveys.

5.4.5 Excess Flux in Plumbing

Investigations of internal corrosion of domestic water plumbing systems almost always finds excess flux to be the cause of internal pitting of copper pipes. Some people believe that there is no such thing as too much flux. Flux runs have been observed to travel up to 20 feet with pitting occurring along the flux run. Flushing a soldered plumbing system with hot water for 15 minutes can remove significant amounts of excess flux left in the pipes. If a plumbing system is expected to be stagnant for some time, it should be drained to avoid stagnant water conditions that can lead to pitting and dezincification of yellow brasses.

5.4.6 Landscapers and Irrigation Sprinkler Systems

A significant amount of corrosion of fences is due to landscaper tools scratching fence coatings and irrigation sprinklers spraying these damaged fences. Recycled water typically has a higher salt content than potable drinking water, meaning that it is more corrosive than regular tap water. The same risk from damage and water spray exists for above ground pipe valves and backflow preventers. Fiber glass covers, cages, and cement footings have worked well to keep tools at an arm's length.

5.4.7 Roof Drainage splash zones

Unbelievably, even the location where your roof drain splashes down can matter. We have seen drainage from a home's roof valley fall directly down onto a gas meter causing it's piping to corrode at an accelerated rate reaching 50% wall thickness within 4 years. It is the same effect as a splash zone in the ocean or in a pool which has a lot of oxygen and agitation that can remove material as it corrodes.

5.4.8 Stray Current Sources

Stray currents which cause material loss when jumping off of metals may originate from direct-current distribution lines, substations, or street railway systems, etc., and flow into a pipe system or other steel structure. Alternating currents may occasionally cause corrosion. The corrosion resulting from stray currents (external sources) is similar to that from galvanic cells (which generate their own current) but different remedial measures may be indicated. In the electrolyte and at the metal-electrolyte interfaces, chemical and electrical reactions occur and are the same as those in the galvanic cell; specifically, the corroding metal is again considered to be the anode from which current leaves to flow to the cathode. Soil and water characteristics affect the corrosion rate in the same manner as with galvanic-type corrosion.

However, stray current strengths may be much higher than those produced by galvanic cells and, as a consequence, corrosion may be much more rapid. Another difference between galvanic-type currents and stray currents is that the latter are more likely to operate over long distances since the anode and cathode are more likely to be remotely separated from one another. Seeking the path of least resistance, the stray current from a foreign installation may travel along a pipeline causing severe corrosion where it leaves the line. Knowing when stray currents are present becomes highly important when remedial measures are undertaken since a simple sacrificial anode system is likely to be ineffectual in preventing corrosion under such circumstances.[10] Stray currents can be avoided by installing proper electrical shielding, installation of isolation joints, or installation of sacrificial jump off anodes at crossings near protected structures such as metal gas pipelines or electrical feeders

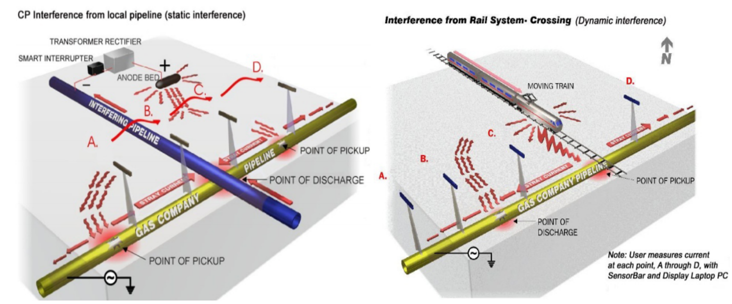


Figure 4 Examples of Stray Current[11]

[10] http://corrosion-doctors.org/StrayCurrent/Introduction.htm

[11] http://www.eastcomassoc.com/

Project X
Corrosion Engineering
Corrosion Control - Soil, Water, and Metallurgy Lab

Lab Request Sheet Chain of Custody
Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com
Ship Samples To: 29970 Technology Dr, Suite 105F, Murrieta, CA 92563

Project X Job Number: S180530A AECOM-PRJ Condor-60545923 6Full

IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.

Company Name:	AECOM	Contact Name:	ARNEL BICOL — Phone No.: 213-440-1310
Mailing Address:		Contact Email:	ARNEL.BICOL@AECOM.COM
Accounting Contact:		Invoice Email:	
Project Name:	PROJECT CONDOR	Client Project No:	60545923

P.O. #:	5 Day Normal	3 Day RUSH 75% mark-up	2 Day RUSH 100% mark-up
Turn Around Time:	☐	☐	☐

Results By: ☐ Phone ☐ Fax ☐ Email ☐ Mail ☐ Overnight Mail (charges apply)

Date & Received by :

Default Method

SPECIAL INSTRUCTIONS:

ANALYSIS REQUESTED (Please circle)

#	SAMPLE ID - BORE #	DESCRIPTION	DEPTH (ft)	DATE COLLECTED	CORROSION SERIES	Soil Resistivity	pH	Sulfate	Chloride	Redox Potential	BiCarbonate	Alkalinity	Acidity	Nitrate	Ammonia	Sulfide	Moisture Content	Soil Corrosivity Evaluation Report	Metallurgical Analysis	NOTES
				Default Method	Min. Resistivity, Sulfate, Chloride, Sulfide, Redox, pH, Ammonia, Nitrate.	Caltrans CTM64 / AASHTO T2888 / ASTM G187	Caltrans CTM64 / AASHTO T 289 / ASTM G 51	Caltrans CTM41 / AASHTO T 290 / ASTM D516	Caltrans CTM42 / AASHTO T 291 / ASTM D512B	SM 2580B	SM 2320B	SM 2520B	SM 2510B	SM 4500-NO3 / Hach 835	SM 4500-NH3 / Hach 830	SM 4500-S2 / SM 4500-S2	ASTM D2216			
1	B-4		10'	5-8-18	X															
2	B-4		30'	5-8-18	X															
3	B-8		35'	5-14-18	X															
4	B-11		10'	5-14-18	X															
5	B-12		5'	5-17-18	X															
6	B-16		10'	5-18-18	X															
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				

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Appendix D – Borehole Percolation Testing

List of Figures

Figure D-1 through D-5 Percolation Test Logs

This Appendix D presents the results of borehole percolation testing conducted by AECOM at Project CONDOR as part of the current preliminary geotechnical investigation program. The purpose of the percolation testing was to provide preliminary evaluate percolation rates within the upper 10 feet of materials at the site and to assess infiltration feasibility at the Project site.

Infiltration wells were installed in five (5) soil borings (P-1 through P-5) drilled using an 8-inch diameter hollow stem auger. The wells consisted of close-ended, 3-inch diameter perforated PVC pipes surrounded by a pea-gravel filter pack, and topped with a bentonite cap. The bottom of the PVC pipe was positioned at the base of the targeted infiltration layer and the bentonite cap at the top of the infiltration layer.

Field Infiltration Tests

Field infiltration tests, based on the boring percolation testing method, were performed following the "Guideline for Design, Investigation, and Reporting, Low Impact Development Stormwater Infiltration (GS200.1)" by LACDPW: Geotechnical and Materials Engineering Division (GMED).

Prior to conducting the tests, each test hole was pre-soaked by filling with clear water. Following a minimum 4-hour pre-soaking period, the test boring was then refilled with water to 12 inches above the top of the bentonite seal. The time interval between readings was determined within a time period (set-time intervals) of 30 minutes after presoaking. The time interval between readings for each well is stated in the field logs. From a fixed reference point, the drop in water level was then measured at approximately set-time intervals, refilling the hole with clean water after every reading to the fixed reference point. The test was performed until a stabilized rate was achieved or at least 8 measurements were made. The measured percolation rates are summarized in. The measured boring percolation test data and calculation sheets are presented in Figures D-1 through D-5.

pth (feet)	Soil Type	Readings (minutes)	Rate (in/hr)	Factor (R_f)
10	SM	30	7.38	15.08
10	SM	30	23.13	13.11
10	SM	30	6.25	15.61
10	SM	30	6.00	15.63
10	SM	30	5.00	15.69

te = (Pre-adjusted Percolation Rate) / (R_f)

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Boring/Excavation Percolation Testing Field Log **Date** ____________

Project Location		**Boring/Test Number**	
Earth Description		**Diameter of Boring**	**Diameter of Casing**
Tested by		**Depth of Boring**	
Liquid Description		**Depth to Invert of BMP**	
Measurement Method		**Depth to Initial Water Depth (d_1)**	
		Depth to Water Table	

Time Interval Standard

Start Time for Pre-Soak		**Water Remaining In Boring (Y/N)**	
Start Time for Standard		**Standard Time Interval Between Readings**	

Reading Number	Time Start / End (hh:mm)	Elasped Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/Notes/Comments

d_1 = Initial water depth (in.)
Δd = Water drop of final period (in.)
DIA = Diameter of boring (in.)

R_f =

Measure Percolation Rate

$$R_f = \left(\frac{2d_1 - \Delta d}{DIA}\right) + 1$$

AECOM

Boring/Excavation Percolation Testing Field Log

Date ____________

Project Location ____________ Boring/Test Number ____________
Earth Description ____________ Diameter of Boring ____________ Diameter of Casing ____________
Tested by ____________ Depth of Boring ____________
Liquid Description ____________ Depth to Invert of BMP ____________
Measurement Method ____________ Depth to Initial Water Depth (d_1) ____________
Depth to Water Table ____________

Time Interval Standard
Start Time for Pre-Soak ____________ Water Remaining In Boring (Y/N) ____________
Start Time for Standard ____________ Standard Time Interval Between Readings ____________

Reading Number	Time Start / End (hh:mm)	Elasped Time Δtime (mins)	Water Drop During Standard Time Interval Δd (inches)	Percolation Rate for Reading (in/hr)	Soil Description/Notes/Comments

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AECOM

Boring/Excavation Percolation Testing Field Log

Date ____________

Project Location ____________ Boring/Test Number ____________
Earth Description ____________ Diameter of Boring ____________ Diameter of Casing ____________
Tested by ____________ Depth of Boring ____________
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Depth to Water Table ____________

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AECOM

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Date ______

Project Location ______ Boring/Test Number ______
Earth Description ______ Diameter of Boring ______ Diameter of Casing ______
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