GEOTECHNICAL SITING STUDY

SAN DIEGO GAS & ELECTRIC
PROPOSED OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK – PARCELS 7, 16 AND 17
OCEANSIDE, CALIFORNIA

June 26, 2012

KLEINFELDER
Bright People. Right Solutions.

June 26, 2012
Project No. 124202

Mr. Richard Miller
San Diego Gas & Electric
8316 Century Park Court
Suite CP 52G
San Diego, California 92123-1582

Subject: Geotechnical Siting Study
San Diego Gas & Electric
Proposed Ocean Ranch Substation
Pacific Coast Business Park - Parcels 7, 16 and 17
Oceanside, California

Dear Mr. Miller:

This report presents the results of our geotechnical siting study of three potential sites for the proposed San Diego Gas & Electric Ocean Ranch Substation to be located in the Pacific Coast Business Park in Oceanside, California. The three potential sites included Parcels 7, 16 and 17.

We appreciate this opportunity to be of continued service and look forward to future endeavors. If you have any questions about our report, please contact us at (858) 320-2000.

Very truly yours,

KLEINFELDER, INC.

Kevin Crennan

Trampus L. Grindstaff
Project Engineer

Kevin M. Crennan, GE 2511
Senior Geotechnical Engineer

REGISTERED PROFESSIONAL ENGINEER
KEVIN M. CRENNAN
No. 2511
EXP. 12/31/13
GEOTECHNICAL
STATE OF CALIFORNIA

Dale M. Hamelehle, PG, CEG 1760
Project Engineering Geologist

REGISTERED GEOLOGIST
DALE M. HAMELEHLE
NO. 1760
CERTIFIED ENGINEERING GEOLOGIST
EXP. 12/31/12
STATE OF CALIFORNIA

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

Section

PLATES

APPENDICES

1 INTRODUCTION

1.1 PURPOSE AND SCOPE OF SERVICES

San Diego Gas & Electric (SDG&E) is evaluating the suitability of three potential sites for siting a new substation within the Pacific Coast Business Park located in the Oceanside area of San Diego County. Kleinfelder has performed a siting study of Parcels 7, 16 and 17 located in the southern portion of Pacific Coast Business Park. The purpose of our siting study was to present preliminary geologic and geotechnical considerations pertaining to development of the potential substation sites in order to assist SDG&E with selecting and potentially acquiring one of the sites. Supplemental subsurface exploration, laboratory testing, analysis and design would be required during the future design-level phase.

For this current study, we performed a site reconnaissance and reviewed regional geologic literature and readily available consultant reports for the business park. In addition, we performed a limited field and laboratory investigation to further evaluate the subsurface conditions within each of the three potential sites. Using data obtained from the above activities, we evaluated geologic hazards and developed geotechnical considerations for use in evaluating the candidate sites. Specifically, we performed the following tasks:

- Review of readily available geotechnical and geologic literature including previously completed geotechnical studies, project site grading report, topographic maps, geologic maps, and stereoscopic aerial photographs.
- Perform a geologic reconnaissance of the three parcels.
- Perform a limited geotechnical subsurface field investigation and laboratory testing.
- Compilation and synthesis of the data obtained.
- Evaluation of potential geologic hazards including surface fault rupture, seismicity and ground shaking, liquefaction and seismic induced settlement, landsliding, expansive soils, unconsolidated soils, tsunamis and seiches, and flooding.

- Preparation of this report presenting our preliminary findings and conclusions, specifically those related to potential geologic and soils constraints that may impact site development and performance.

2 SITE DESCRIPTION AND HISTORY

2.1 PROJECT AND SITE DESCRIPTION

The project area for all three potential substation locations (Parcels 7, 16 and 17) is located off of Avenida del Oro in the Pacific Coast Business Park in Oceanside, California, as shown on Plate 1, Site Vicinity Map. Our understanding of the proposed development is based on our review of Concept Layout Plan for Ocean Ranch Substation, prepared by San Diego Gas & Electric. The plan for Parcel 7 was dated January 27, 2012 and the plans for Parcels 16 and 17 were dated March 1, 2012. In general, the plans include a layout of a new substation with a perimeter access road, battery storage areas and water quality areas.

Parcel 7 is located along the west side of Avenida del Oro at the south end of Blacks Beach Street. Parcels 16 and 17 share a property boundary and are located east of Parcel 7 and Avenida del Oro, at the south end of Rocky Point Drive. The three parcels are shown on Plate 1, Site Vicinity Map and on Plate 2, Field Exploration Map.

Parcel 7 is semi-rectangular in shape and sits north of an existing US Postal Office. Site elevations range from about 387 feet Mean Sea Level (MSL) in the southwest corner to about 382 feet MSL in the northeast corner. An approximate 50-foot high slope descends from the south end of the site to the post office. The site is sparsely vegetated with native grasses and small bushes. A roughly graded access road for the existing SDG&E transmission corridor is located along the western side of the parcel. Existing slopes on the south, west and east sides of the site appear to have inclinations of about 2 horizontal to 1 vertical (2H:1V). An approximate 4-foot high soil berm is located on the north end of the site. Preliminary plans provided by SDG&E indicate the substation may be located along the southwest portion of the parcel with an access road from the cul-de-sac off of Blacks Beach Street. Existing SDG&E transmission easements are located on the west and south sides of the parcel.

Parcels 16 and 17 are triangular in shape and have a common property boundary directly south of Rocky Point Drive. These parcels are moderately to densely vegetated with native grasses and bushes. Avenida del Oro borders the western property line of Parcel 16 and an existing commercial development is located to the north, south and east of Parcel 17. An approximately 4-foot high soil berm with small trees traverses through the central portion of the parcels along the property boundary, roughly in a southwest to northeast direction. Existing slopes located on the southern portion of Parcel 16 appear to have inclinations of about 2H:1V. The sites have gentle to moderately sloping topography with gradients that slope to the southwest. The total differential elevation across each parcel is approximately 4 feet, with Parcel 17 being about 4-foot higher in elevation overall. A large soil berm surrounds the cul-de-sac on the north end of each site; however, an access road for Parcel 16 is located on the west side of Rocky Point Drive. Relatively large (40 to 50 feet in diameter) stormwater desilting basins are located within the northern portion of Parcel 7 and the southwestern portion of Parcels 16 and 17. These desilting basins have a corrugated steel stand pipe within the deepest portion of the basin. The sides of the basins on Parcels 16 and 17 have several erosion gullies that are about 1 to 3 feet in depth. It is anticipated that loose soil sediments have accumulated within each of these desilting basins. Preliminary plans indicate the proposed substation for either site may be located at the northern portion of the parcels and the access road located from cul-de-sac at the south end of Rocky Point Drive.

2.2 SITE HISTORY

Our understanding of the proposed substation sites is based on our discussions with SDG&E and our review of the following documents:

- Preliminary Geotechnical Investigation, Pacific Coast Industrial Park, SW Corner of College Boulevard and Old Grove Road, Oceanside, California, prepared by Medall, Aragon Geotechnical, Inc. (MAG), dated June 14, 2004.

- Supplemental Geotechnical Investigation, Pacific Coast Business Park, Oceanside, California, by Davis Earth & Materials, Inc., dated December 9, 2005 (included as Appendix C of Christian Wheeler 2006 report).

- Report of Supplemental Geotechnical Investigation, Pacific Coast Business Park, Old Grove Road and Avenida del Oro, Oceanside, California, prepared by Christian Wheeler Engineering, dated June 14, 2006.

- Report of Mass Grading Observations and Testing, Pacific Coast Business Park, Old Grove Road and Avenida del Oro, Oceanside, California, prepared by Christian Wheeler Engineering, dated May 2, 2007.

- Rough Grading Plans for Pacific Coast Business Park, Parcels 1 through 30, City of Oceanside, California, Sheets 1 through 19, prepared by BHA Inc., As-built dated March 6, 2008.

- Concept Layout Plan for Ocean Ranch Substation, prepared by San Diego Gas & Electric Company, San Diego California, dated January 27, 2012.

- Concept Layout Plan for Ocean Ranch Substation, Parcels 16 and 17, prepared by San Diego Gas & Electric Company, San Diego California, dated March 1, 2012.

Based on our review of the referenced documents, soils placed during grading operations in the early 1980's for the alignment of Avenida del Oro and the commercial development along the southern site boundary of the business park were identified as "offsite fills". The referenced 2004 geotechnical study by Medall, Aragon Geotechnical (MAG) indicates the fill soils were placed under controlled conditions, however, the competency of the fill needed to be further evaluated. Reports for the compaction testing during grading operations were not available for our review for these areas located along the west and southern portions of Parcels 16 and 17, respectively. The 2006 Christian Wheeler (CW) report states the fill was placed in the early 1980's and placement of this fill was observed, tested and documented by Prater Associates in 1982. Based on this information, CW considered the fill suitable in its current condition to support new fill and/or settlement-sensitive improvements. However, the 2006 report did recommend that all residual soils, and all loose alluvial / colluvial soils be removed and replaced as properly compacted fill. Undocumented fill soil was also noted within the alignment of the 20-foot-wide easement for a 27-inch water line that bisects Parcels 16 and 17. As discussed in a following section, this undocumented fill was reportedly removed in a later phase of grading and replaced with compacted fill.

A bedding plane shear zone was identified by MAG (2004) near the base of the existing 30-foot high cut slope along the southern property boundary of Parcel 7. The bedding shear zone was characterized as a soft clayey gouge varying in thickness up to about one inch. The bedding shear is referred to as a low-angle bedding parallel shear zone. Such shear zones typically have significantly reduced strength relative to adjacent intact materials and occur in association with landslides. The MAG (2004) report recommended that a buttress, or stability fill, be placed along the existing cut slope with the key of the excavation at least 5 feet below the bedding plane shear to improve the new fill slope's stability. The 2006 report by CW concurred with the stability fill recommendation by MAG for Parcel 7.

Previous grading within the business park in the 1980s consisted of rough grading of Avenida del Oro from the southern site boundary to its intersection with Old Grove Road, between Parcel 7 and Parcel 16. Fills over 60 feet in thickness exist where Avenida del Oro bisects the parcels and crosses the previously filled canyon, or finger drainage feature, at the southern portion of the business park. Cut slopes up to about 40 feet in height were located along the southern and western property line of Parcel 7. Pre-grading elevations on the parcels varied from about 302 feet MSL within the drainage feature on Parcel 16, up to approximately 400 feet at northwest corner of Parcel 7.

The Christian Wheeler (2007) grading report documents that the mass grading operations for the business park development were performed in accordance with the geotechnical recommendations presented in the referenced reports (MAG, 2004 and Christian Wheeler, 2006). Specifically, the grading report documents the stability fill on Parcel 7 was constructed as recommended and the key excavation extended 5 feet below the base of a bedding plane shear zone. Recommended subdrains at the base of the deep canyon fills within Parcels 16 and 17 were documented as being located and tied into existing drainage systems. The deep canyon drain was also completed within a finger canyon of Parcel 7 and a heel drain was installed along the south side of Parcel 7 within the stability fill slope. Sheets 15 through 17 of the as-built grading plans by BHA, Inc. are included in Appendix C for reference

Undocumented fill soils associated with the 27-inch water line traversing Parcels 16 and 17 were addressed during the removal and relocation of the water line. However, in some areas of the parcels, the alluvial / colluvial soils were evaluated and deemed competent by Christian Wheeler (2007) by utilizing in-place density testing during grading. This slightly contradicts the recommendations provided in the referenced geotechnical reports that all of the alluvium / colluvium should be removed prior to fill placement, but was based on direct observation and testing during grading. Due to the deep canyon fills (nearly 80 feet) in some areas of Parcel 16 and 17, settlement monuments were installed. Results of the settlement monitoring were not included in the Christian Wheeler (2007) grading report and supplemental monitoring results have not been provided for our review. Based on the final graded surface elevations, a cut / fill transition was documented traversing Parcel 7 and possibly the extreme northern corner of Parcel 16. Undercutting within the cut portion of these parcels was not completed at the time of grading, as the location of proposed improvements was not known at that time. Undercuts are typically performed with the cut portion of cut / fill transitions in order to limit potential differential settlement within structures by having all foundation elements or slab-on-grade within compacted fill.

3 INVESTIGATION METHODS

3.1 GEOLOGIC EVALUATION

Our geologic evaluation consisted of reviewing aerial photographs, geologic reports and maps reasonably available to our office, previous geotechnical and as-graded reports provided by SDG&E, and observation of the geotechnical conditions in the field at the time of our field reconnaissance and subsurface investigation. The geology of the site area is shown Regional Geologic Map, Plate 3.

Based on the results of our initial desktop review, we focused our investigation on the primary geotechnical issues including the stability fill slope on the south end of Parcel 7, the existing condition of the fill material, the alluvium / colluvium within the canyon drainages below engineered fill, potential settlement of deep fills placed within the drainage features within Parcels 16 and 17, and the cut / fill transitions within the graded pads.

3.2 FIELD RECONNAISSANCE

A certified engineering geologist from Kleinfelder conducted a site reconnaissance of the three parcels to assess and document current surface conditions. The graded pads are undeveloped and topography is relatively gently sloping. Vegetation varies from sparse to locally dense. Surficial soils show signs of desiccation or shrinkage and some surface cracking, which are indicative of near-surface clayey soil which has dried. Desilting basins are present in Parcels 7, 16 and 17. Several deeply eroded channels leading to and within the desilting basins have developed. All three parcels have semi-circle gravel bags placed on the surface at intervals across the sites for reducing surface runoff velocity and associated erosion. Relatively soft and moist soil conditions were observed at the ground surface in some areas during the site reconnaissance.

3.3 LIMITED SUBSURFACE INVESTIGATION

Kleinfelder conducted a limited subsurface investigation of the three parcels that included six borings and seven test pits. The borings were excavated between the dates of April 24 and April 26, 2012 to depths between 50 and 80 feet. The 8-inch diameter borings were excavated with a truck-mounted drill rig equipped with hollow stem augers and operated by Scott’s Drill Company of Oceanside, California.

Seven backhoe test pits were excavated on April 25, 2012. The depth of the excavations ranged from about 5 to 10 feet. The test pit excavations were performed by Cut'N Core Inc., of San Diego, California. The test pit excavations were backfilled with compactive effort applied by the backhoe with a sheeps foot wheel attachment. The approximate location of each boring and test pit excavation is shown on Plate 2, Field Exploration Map, and logs of borings and test pit excavations are included in Appendix A, along with additional details of the field investigation.

3.4 LABORATORY TESTING

A limited laboratory testing program was conducted to evaluate physical characteristics of select soils encountered. The limited testing primarily consisted of moisture content and unit weight to evaluate the fill, consolidation testing of the alluvium that remained in place below the fill, and expansion index tests. The testing was performed in general accordance with the applicable ASTM test methods. Details of the laboratory testing program are presented in Appendix B.

4 SITE CONDITIONS

4.1 REGIONAL GEOLOGIC SETTING

The project site is situated in the western San Diego County section of the Peninsular Ranges geomorphic province of California. This province is characterized by mountainous terrain on the east composed mostly of Mesozoic igneous and metamorphic rocks, and relatively low-lying coastal terraces to the west underlain by late Cretaceous-, Tertiary-, and Quaternary-age sedimentary rocks. The portion of the province in San Diego County that includes the project sites generally consists of Tertiary-age sedimentary rocks and Quaternary-age alluvial materials deposited in the inland valleys. The proposed sites are underlain by the Eocene-age Santiago Formation consisting of interbedded sandstone, siltstone and claystone, according to Tan and Kennedy (2005).

4.2 REGIONAL FAULTING AND SEISMICITY

The Peninsular Ranges are traversed by several major active faults. The Whittier-Elsinore, San Jacinto, and the San Andreas faults are major active fault systems located northeast of the site and the Rose Canyon, Newport-Inglewood (offshore), Coronado Bank, and San Diego Trough are active faults located to the west-southwest. Tectonic activity associated with these and other faults is predominantly right-lateral strike-slip movement. These faults, as well as other faults in the region, have the potential for generating earthquakes and associated strong ground motions at the proposed sites. The nearest of these fault systems, the Rose Canyon fault, lies approximately 8 miles to the west and is the most significant fault to the site with respect to the potential for seismic activity. Lindvall and Rockwell (1995) have described the Rose Canyon fault system in terms of several segments that each has distinctive earthquake potential. The closest segment is the Delmar segment located about 8 miles to the west, which extends from La Jolla on the south to Oceanside on the north where it apparently merges with the Newport-Inglewood fault zone.

4.3 SITE GEOLOGY

The site is underlain by the Eocene-age Santiago Formation and surficial units consisting of fill and undifferentiated alluvium / colluvium. Detailed descriptions of these units are provided in Appendix A (Boring Logs and Test Pit Excavations), and generalized descriptions are provided in the subsequent sections below as described in the cited literature and as observed on the sites.

4.3.1 Fill

Fill materials are present throughout each of the three parcels and are associated with the mass grading operations for the Pacific Coast Business Park in 2007 and construction of Avenida del Oro in the 1980s. Our review of previous topographic maps and our limited field investigation indicates that the fill depth is up to about 50, 80 and 85 feet within Parcels 7, 16 and 17, respectively. Compaction of this fill was observed and tested by Christian Wheeler (2007) and was reported to be a minimum 90 percent relative compaction based on the ASTM D1557 modified proctor maximum dry density. For fills deeper than 50 feet, as noted for Parcels 16 and 17, the fill was reported to have been compacted to a minimum of 95 percent relative compaction per ASTM D1557. Standard Penetration Test (SPT) and California Sampler blow counts for fill soils encountered at the three parcels ranged from 24 to 92 blows per foot, which are generally consistent with the reported levels of compaction. The fills were likely derived from the on-site materials and generally consist of clayey sand, sandy clay and silty sand. The specified Expansion Index for grading was for a maximum EI of 90 within the upper 5 feet. The majority of fills throughout each parcel are documented and considered engineered fill, with the exception of older fills associated with construction of Avenida del Oro and the neighboring commercial development along the southern portion of Parcel 17.

Limited laboratory test results for moisture content of fill soils collected during our field investigation ranged between 5.5 and 31.9 percent with an average of about 12 percent. Reported optimum moisture contents for soils used as fill material during the 2006 and 2007 grading operations ranged between 9.7 and 21.7 percent (Christian Wheeler, 2007). The high moisture content of 31.9 percent is likely attributed to the depth of the sample tested being just above the fill / formation contact where perched water may accumulate. The in-situ dry density test results of the soil samples tested from our study were between 115 and 125 pounds per cubic foot (pcf), with an average of about 121 pcf. The Christian Wheeler grading report documented the maximum dry density of the fill soils tested and placed during the earthwork operations at the three parcels between 110 and 123 pcf.

4.3.2 Alluvium / Colluvium

Alluvium / Colluvium accumulates on and near the bottom of the natural slopes and drainages on the site through a combination of stream deposition and gravitational processes. These materials were identified in the referenced geotechnical reports to be located in drainage features and consist primarily of sandy clays and clays. Complete removal and recompaction was recommended. However, as previously discussed in this report, in-situ relative density testing and observation was performed during grading by Christian Wheeler (2007) in some areas where the material was encountered and determined by Christian Wheeler that they were of suitable density and depth so that complete removal was not required. The thickness of these soils was about 10 feet at three of the exploratory boring locations (B-4, B-5 and B-6) in Parcels 16 and 17. SPT and California Sampler blow counts for these soils ranged from 55 to 87 blows per foot.

4.3.3 Santiago Formation

The Cretaceous-age Santiago Formation has been mapped underlying the subject site (Kennedy and Tan, 2005), and was encountered in the previous consultant investigations and all of our explorations performed during our subsurface evaluation. Data from the exploratory borings and trenches and examination of the numerous cut slopes on and near the site indicate the Santiago Formation consists primarily of interbedded fine to coarse, light gray to light brown, massively bedded sandstone, clayey siltstone, and claystone. The sandstones vary from very highly cemented with thin concretionary beds to moderately cemented and friable. Siltstones are massive to locally thinly bedded, and moderately well-cemented. Recorded SPT and California Sampler blow counts for the Santiago Formation were relatively high, having a range of penetration of 2 to 5 inches for 50 blows.

4.4 GROUNDWATER

Groundwater was not encountered in any of our borings or test pit excavations. We anticipate that groundwater is located well below the proposed construction elevations. The depth to the regional groundwater table is anticipated to be significantly deeper than anticipated grading depths. The groundwater table may fluctuate with seasonal variations and irrigation. Groundwater is not expected to be a constraint to development at any of the sites.

5 DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 POTENTIAL GEOLOGIC HAZARDS

Potential geologic hazards considered in our study include, fault surface rupture, seismic shaking, landslides, liquefaction, seismically induced settlement, tsunamis, seiches, flooding, and expansive soils. The following sections discuss these hazards and their potential at this site in more detail.

5.1.1 Seismic Shaking

The project area is considered to be seismically active, as is most of southern California. Based on our review of the referenced geologic maps, stereoscopic aerial photographs, and geologic reconnaissance, the subject sites are not underlain by known active or potentially active faults (i.e., faults that exhibit evidence of ground displacement in the last 11,000 years and 1,600,000 years, respectively), nor do the sites lie within an Alquist-Priolo Earthquake Fault Zone.

The Rose Canyon, Newport Inglewood Fault (offshore segment) is the closest active fault with an approximate distance of about 8 miles to the west of the site. The maximum moment magnitude associated with the offshore segment of the Rose Canyon, Newport Inglewood Fault is 7.1 (Cao et. al., 2003). The seismic shaking hazard is essentially the same for all three parcels.

5.1.2 Fault Surface Rupture

As previously discussed, the subject sites are not underlain by known active or potentially active faults. Therefore, the potential for ground rupture due to faulting at the sites is considered low for all three parcels.

5.1.3 Landslides and Slope Stability

Landslides are deep-seated ground failures (several tens to hundreds of feet deep) in which a large arcuate shaped section of a slope detaches and slides downhill. Landslides should not be confused with minor slope failures (slumps), which are usually limited to the topsoil zone and can occur on slopes composed of almost any geologic material. Landslides can cause damage to structures both above and below the slide mass. Structures above the slide area are typically damaged by undermining of foundations. Areas below a slide mass can be damaged by being overridden and crushed by the failed slope material.

Several formations within the San Diego region are particularly prone to landsliding. These formations generally have high clay content and are more prone to mobilize when they become saturated with water. Other factors, such as steeply dipping bedding that project out of the face of the slope and/or the presence of fracture planes, will also increase the potential for landsliding.

No surficial indications of deep-seated landsliding were noted at the three sites during our field reconnaissance or in topographic maps we reviewed. There were no mapped landslides in the geologic literature we reviewed. As discussed earlier, prior to mass grading at the site a bedding plane shear zone was identified by MAG (2004) near the base of the currently existing 30-foot high cut slope along the southern property boundary of Parcel 7. The bedding shear zone was characterized as a low-angle bedding plane composed of soft clayey gouge varying in thickness up to about one inch. Such shear zones typically have significantly reduced strength relative to adjacent intact materials and can occur in association with landslides. To address the presence of the shear zone and its potential effect on slope stability, a buttress fill was placed along the southern side of Parcel 7. Slope stability analyses performed by MAG (2004) concluded that the buttressed fill slope achieved a factor of safety in excess of 1.5.

Kleinfelder performed a cursory review of the static and seismic slope stability analyses in the report for the stability fill slope north of the existing US Post Office complex. Soil strength parameters used in the initial analyses by MAG for the slope stability check were confirmed from the results of our field investigation, direct shear testing, and engineering judgment.

The external static and seismic factors of safety calculated from the slope stability analyses were above the generally accepted minimum factors of safety of 1.5 and 1.1, respectively. Based on the results of our review, field investigation and limited engineering evaluations indicating the calculated factors of safety exceed the industry minimum, it is our opinion that the potential for significant large-scale slope instability is considered low for all three parcels.

5.1.4 Liquefaction and Seismic Settlement

The term liquefaction describes a phenomenon in which saturated, cohesionless soils temporarily lose shear strength (liquefy) due to increased pore water pressures induced by strong, cyclic ground motions during an earthquake. Structures founded on or above potentially liquefiable soils may experience bearing capacity failures due to the temporary loss of foundation support, vertical settlements (both total and differential), and undergo lateral spreading. The factors known to influence liquefaction potential include soil type, relative density, grain size, confining pressure, depth to groundwater, and the intensity and duration of the seismic ground shaking. The cohesionless soils most susceptible to liquefaction are loose, saturated sands and some silts.

Seismic settlement can occur either as a result of post-liquefaction reconsolidation as porewater pressure dissipates, or in unsaturated, predominantly granular and loose soils that tend to densify during seismic shaking.

The majority of the subject site is underlain at depth by weakly to moderately cemented formational sandstone and claystone at depth, or by well-compacted engineered fill. Based on the dense/firm and clayey/plastic nature of the on-site formational deposits and compacted fill as well as the absence of a shallow groundwater in those areas, it is our opinion that the potential for liquefaction and seismic settlement is very low for all three parcels.

5.1.5 Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures or concrete slabs supported on grade.

Based on the results of our review, limited investigation, and experience with similar materials, the fill soils used for all three sites are expected to have a low to medium potential for expansive soils. A sample of the fill material from Boring B-1 at Parcel 7 was tested for expansion index (ASTM D4829). This test result indicates an expansion index (EI) of 54. Based on this result, our visual evaluation of samples from our borings and our review of previous reports, these materials may be classified in the medium expansion range (between 50 and 90 EI). However, it is possible that there is a potential for some highly expansive soils in some lifts of fill or areas of the sites. The granular materials of the Santiago Formation were tested from test pits TP1 and TP3 in the cut portion of Parcel 7 and indicated expansion indices of 5 and 29, respectively. The test results indicate the formational soils at this near-surface elevation of Parcel 7 have a very low to low expansion potential. However, more expansive soils should be expected at other elevations of the formation.

Based on the recommendations provided by Christian Wheeler (2006), selective grading was to be performed for soils placed within the upper 5 feet of each parcel. The selective grading was recommended to provide a cap of fill material with an expansion index of less than 90. The Christian Wheeler (2007) grading report references an expansion index test result on one sample of fill collected from each of the three parcels. The test results of the samples collected range between 50 and 61, which correspond to low to medium expansion potential. However, the sample number and soil type number documented in the report do not correlate with the in-place density tests data recorded for each of the parcels, so the location of these samples is not clear. Based on the test data recorded for expansion potential and soil type in the grading report, the actual expansion potential of soils used as fill in each of the three parcels is not clear. As stated above, we anticipate soils used as fill within the parcels to have a medium expansion range, but highly expansive soils may be encountered in localized areas or lifts of fill. We were not able to differentiate the lots with respect to expansion potential of the near-surface soils. Therefore, the hazard for expansive soil is essentially the same for all three parcels. The maximum expansion index of 90 specified during the previous grading exceeds the typically specified value of 50 in San Diego County, due to characteristics of the on-site Santiago Formation. Depending on the actual near–surface soils present, possible measures to mitigate the potential impacts of expansion and shrinkage may include compacting near-surface soils in excess of optimum moisture content, providing surface drainage to minimize infiltration and fluctuations in moisture content near settlement sensitive improvements, deepening foundations, and providing additional reinforcement within concrete.

5.1.6 Tsunamis and Seiches

Tsunamis are long wavelength seismic sea waves (long compared to the ocean depth) generated by sudden movements of the ocean bottom during submarine earthquakes, landslides, or volcanic activity. A seiche is an oscillation (wave) of a body of water in an enclosed or semi-enclosed basin that varies in period, depending on the physical dimensions of the basin, from a few minutes to several hours, and in height from several inches to several feet. A seiche is caused chiefly by local changes in atmospheric pressure, aided by winds, tidal currents, and occasionally earthquakes. Based on the inland location and elevation of the three parcels, the potential for damage due to either a tsunami or seiche is considered nil.

5.1.7 Flood Hazard

According to a Federal Emergency Management Agency (FEMA) flood insurance rate maps (FEMA map panels numbers 0758F), the sites are considered to be outside of 100-year and 500-year floodplains. Based on review of topographic maps, the three parcels are not located downstream of a dam or within a dam inundation area. Based on this review and our site reconnaissance, the potential for flooding of the three parcels is considered low.

5.2 SETTLEMENT OF DEEP FILLS

Settlement of deep fills occurs from self-weight of the fill. This occurs slowly, even when subsurface and surface drainage is provided, and is a function of a number of variables including depth, soil type, age of fill, degree of initial compaction, and degree of wetting. Experience has shown that this consolidation may approach from 0.2 percent (for granular soils) to 0.5 percent (for clayey soils) of the fill thickness. The settlement may be larger if the fine grained soil from underlying alluvium/colluvium is considered along with the fill thickness. This settlement is in addition to the static settlements due to loading from structures or new fill loading. Specific settlement estimates can be provided once the site is selected and locations of the proposed substation improvements are known. Although the actual magnitude and rate of settlement is dependent on several variables, experience has shown this can take about 10 to 20 years to occur with about half the settlement occurring in the first 5 years.

Based on the estimated maximum fill depths of 80 to 85 feet on Parcels 16 and 17, we estimate maximum total settlement that would occur to be on the order of 3 to 5 inches. It is difficult to speculate on how much settlement has occurred and how much more may occur. As previously discussed in this report, settlement monitoring points were recommended and reportedly installed within Parcels 16 and 17. Kleinfelder recommends that SDG&E make additional attempts to obtain and review the settlement monitoring results for the parcels if these are considered in selection and acquisition process. It should also be noted that SDG&E typically utilizes decomposed granite or aggregate base rather than pavement over much of their substations, and the higher infiltration rate of these materials can lead to potentially larger settlements occurring over a shorter time period than sites covered with pavements and buildings.

Differential settlement between equipment pads within the substation will be dependent on the depth of fill below the proposed substation layout in each parcel. Based on our review of the referenced concept layout plans and as-built grading sheets, the range of fill depth in the general area below each of the proposed substations are approximately 0 to 34 feet at Parcel 7, 8 to 66 feet at Parcel 16, and 20 to 61 feet at Parcel 17.

5.3 GEOTECHNICAL CONSIDERATIONS FOR SITE SELECTION AND DEVELOPMENT

Based on the results of our review, geologic reconnaissance and limited field and laboratory investigation, it is our opinion that substation construction is feasible at any of the three proposed sites from a geotechnical perspective. Although there are geotechnical differences between the sites, it is our opinion that they are not significant enough to establish a clear ranking of sites. The similarities and differences of the sites are discussed below along with the associated implications to site development.

- The three sites are located adjacent to each other within the Pacific Coast Business Park. Mass grading occurred at about the same time in 2006 and 2007 with the same design team and contractor. The three sites are located in an area with similar geotechnical conditions with variable depths of compacted fill placed over very dense/firm Santiago Formation.

- The maximum depth of fill varies from 55, 80 and 85 on Parcels 7, 16 and 17, respectively. Based on a potential total settlement of about 0.4 to 0.5 percent of the fill depth for clayey fill soil, we estimate maximum settlements may be on the order of 3 to 5 inches. However it is difficult to estimate how much may have occurred since the completion of grading in 2006 and how much more may occur in the future. Settlement can be a function of the variation of fill depth and the inclination of natural slope the fill was placed on. Based on our review of the grading plans, both Parcels 16 and 17 appear to have underlying natural slope inclinations of approximately 3H:1V to the south. Parcel 7 appears to have a natural slope inclination that is typically flatter than 5:1, however slope geometry is more irregular in shape and orientation. Although settlement monitoring data was not available for our review, considering the generally good level of compaction of the engineered fill and the time it will have been in place prior to development, it is unlikely that total or differential settlement would be beyond tolerable limits by SDG&E and impact structures. Potential settlement can be further evaluated if and when the post-grading settlement monitoring data is provided.

- Alluvial / colluvial soils were left in-place within the drainage features below the fill on Parcels 16 and 17 but were either not present or completely removed on Parcel 7. These types of materials are typically removed and recompacted since they may be more susceptible to settlement or consolidation due to their younger geologic age and method of deposition. The initial geotechnical reports recommended removal and recompaction, however, the lower portion was left in place since observation and in-situ testing during grading indicated they were of adequate density. Up to approximately 10 feet of this clayey material was encountered in three of our borings and uncorrected SPT and California sampler blow counts were 55 to 87 blows per foot. Due to their depth, thickness, and observed density, the potential for settlement of the alluvial / colluvial soils impacting the proposed substation is low.

- With respect to topography, Parcel 7 is bordered by three descending slopes, Parcel 16 is bordered by one descending slope and Parcel 17 is bordered by one ascending slope. Due to the presence of a bedding plane shear zone observed in a large diameter boring by MAG (2004), a large buttress or stability fill slope on the order of 30-feet in height was designed and constructed along the south side of Parcel 7. The slope was designed to have a minimum factor of safety of 1.5 for static conditions. The as-graded report states that the buttress fill was constructed as designed.

- Based on the previous grading performed at the sites, remedial grading should be anticipated in the proposed substation areas of all three parcels. The recommended extent of this grading should be established as part of the design-level geotechnical investigation. However, we expect that the cut portions would be overexcavated and recompacted so that proposed improvements do not traverse cut / fill transitions. The fill areas would be overexcavated and recompacted due to the age of fill and observed loose surficial soils during our field studies. For preliminary planning purposes, the depth of remedial grading may be up to about 3 feet in depth. Based on our prior experience with SDG&E substations traversing cut / fill transitions, the cut portion of the substation is typically overexcavated and recompacted to a depth of 3 feet. The cut area needing remedial grading is largest for Parcel 7 with a small area potentially located on Parcel 16.

- All three of the parcels have similar existing vegetation and would require a similar level of preparation prior to grading. Prior to grading at any of the proposed sites, existing trees and shrubs will require removal.

- Excavation into the on-site materials can likely be achieved with moderate to heavy effort with conventional heavy-duty excavation equipment. The formational materials of the Santiago Formation will generally break down fairly well under compactive effort, but some oversize cemented sandstone / claystone may remain. Oversize material greater than 6 inches in diameter should be placed a minimum of 8 feet below finish grade in areas outside the substation pad, a minimum of 8 feet from the face of fill slopes, and not in areas where underground construction is planned such as drilled pier foundations or trenches for utility ducts.

- Expansive soils are present on all three sites. The specification during mass grading was for an expansion index less than 90 in the upper 5 feet. Although some clay layers within the undisturbed Santiago Formation had expansion indices over 120, blending of clays, sands and silts during mass grading appears to have generally reduced the expansion index of the fill and complied with the specification. Results of 37 expansion index tests during grading of the business park (Christian Wheeler, 2007) indicate typical EIs between about 50 and 80 (low to medium expansion potential). Our limited observations and laboratory testing are consistent with this. As part of the design-level geotechnical studies of the selected site, additional laboratory testing to evaluate expansive soil potential should be performed.

- Due to the similarity in site conditions, we do not anticipate a significant difference in foundation type or size for the three parcels. We anticipate that the foundations for structures and equipment pads will be supported on shallow spread and continuous footings founded on engineered fill. Remedial grading would be required on portions of Parcel 7 so that foundations for each individual structure are supported entirely on engineered fill.
- Spread and continuous footings for proposed substation structures that will be founded on engineered fill soils can be designed using a preliminary allowable soil bearing pressure of 2,500 psf, for dead loads plus long-term live loads. These preliminary values are based on a minimum width of 12 inches and may be increased by 500 psf for each additional foot of depth up to a maximum of 4,000 psf for fill. These values are subject to confirmation during the design-level geotechnical investigation.
- Although existing slopes along the proposed sites are considered to be grossly stable, the surficial soils may be somewhat erodible due to their sandy nature. Of the three sites, Parcel 7 has the largest surface area of slopes requiring vegetation and maintenance and Parcel 17 has the least.

5.4 RECOMMENDATIONS FOR ADDITIONAL STUDY

We recommend that a design-level geotechnical investigation be performed for the selected site to support project design. The investigation should include development-specific subsurface exploration and laboratory testing. The purpose of the study would be to further evaluate the subsurface conditions at the proposed structure locations, along with the samples collected during this study, and to provide information pertaining to the engineering characteristics of earth materials at the selected project site. We also recommend that corrosion testing be performed on on-site soil types and imported soils (if any) used in the project. Based on this siting study and the results of the recommended additional geotechnical evaluation and laboratory testing for the selected site, recommendations for grading/earthwork, surface and subsurface drainage, foundations, pavement structural sections, and other pertinent geotechnical design considerations may be formulated.

6 LIMITATIONS

Recommendations contained in this siting study are based on our review of reports by others, field observations and subsurface explorations, laboratory tests, and our present knowledge of the proposed project. It is possible that soil conditions could vary between or beyond the points explored. If soil conditions are encountered during design-level geotechnical investigations or construction that differ from those described herein, we should be notified immediately in order that a review may be made and any supplemental recommendations provided. If the scope of the proposed project, including the proposed foundation systems or structural locations, changes from that described in this report, our recommendations should also be reviewed and a response issued. We have not reviewed the grading plans or foundation plans for the project. References to elevations and locations provided within this report were based upon general information provided for our use. Kleinfelder, Inc. did not provide surveying services.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference", as the latter term is used relative to contracts or other matters of law.

We have strived to prepare the findings, conclusions, and recommendations in this report in a manner consistent with the standards of care and skill ordinarily exercised by members of this profession practicing under similar conditions in the geographic vicinity and at the time the services were performed. No warranty or guarantee, express or implied, is made. The recommendations provided in this report are preliminary and not suitable for final design, and are based on the assumption that Kleinfelder will be retained to perform a design level investigation of the selected site, provide a program of tests and observations during the construction phase in order to evaluate compliance with our recommendations and to evaluate the site conditions exposed. Information and recommendations presented in this report should not be extrapolated to other areas or be used for other projects without our prior review and response.

This report may be used only by San Diego Gas & Electric and only for the purposes stated, within a reasonable time from its issuance. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. Any party other than San Diego Gas & Electric who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

7 REFERENCES

BHA Inc. 2008, Rough Grading Plans for Pacific Coast Business Park, Parcels 1 through 30, City of Oceanside, California, Sheets 1 through 19, As-built dated March 6, 2008.

California Division of Mines and Geology (CDMG), 1999, Seismic Shaking Hazard Maps of California: Map Sheet 48.

California Division of Mines and Geology (CDMG), 1998, Maps of Known Active Fault Near-Source Zones in California and Adjacent Portions of Nevada: International Conference of Building Officials.

California Division of Mines and Geology (CDMG), 1995, Landslide Hazards in the Northern Part of the San Diego Metropolitan Area, San Diego County, California, Landslide Hazard Identification Map No. 35

California Division of Mines and Geology (CDMG), 1996, Plate 1: Geologic Maps of the Oceanside, San Luis Rey, and San Marcos 7.5’ Quadrangles. DMG Open-file Report 96-02.

Christian Wheeler Engineering, 2006, Report of Supplemental Geotechnical Investigation, Pacific Coast Business Park, Old Grove Road and Avenida del Oro, Oceanside, California, dated June 14, 2006.

Christian Wheeler Engineering, 2007, Report of Mass Grading Observations and Testing, Pacific Coast Business Park, Old Grove Road and Avenida del Oro, Oceanside, California, dated May 2, 2007.

Davis Earth & Materials, Inc., 2005, Supplemental Geotechnical Investigation, Pacific Coast Business Park, Oceanside, California, dated December 9, 2005 (included as Appendix C of Christian Wheeler 2006 report).

Kennedy, M.P., and Tan, S.S., 2005, Geologic Map of the Oceanside 30’x60’ Quadrangle, California, Regional Geologic Maps Series, 1:100,000 Scale, Map No. 2, Sheets 1 and 2, California Division of Mines and Geology (CDMG).

Lindvall, S.C and Rockwell, T.K., 1995, Holocene activity of the Rose Canyon fault zone in San Diego, California, Journal of Geophysical research, Vol. 100, No. B12, pp. 24, 121-24, 132, doi:10.1029/95JB02627

Federal Emergency Management Agency (FEMA), June 19, 1997, Flood Insurance Rate Map, Map No. 06073C0758F.

Jennings, C.W., 1994, Fault Activity Map of California and Adjacent Areas: California Division of Mines and Geology, California Geologic Map Series, Map No. 6.

Medall, Aragon Geotechnical, Inc., 2004, Preliminary Geotechnical Investigation, Pacific Coast Industrial Park, SW Corner of College Boulevard and Old Grove Road, Oceanside, California, dated June 14, 2004.

Norris, R.M., and Webb, R.W., 1990, Geology of California, Second Edition: John Wiley & Sons, Inc.

Peterson, M. and others, 1996, Probabilistic Seismic Hazard Assessment for the State of California, California Division of Mines and Geology, DMG Open-File Report 96-08, http://www.consrv.ca.gov/dmg/shezp/shaking/sndiego.htm.

San Diego Gas & Electric Company, Concept Layout Plan for Ocean Ranch Substation, dated January 27, 2012.

San Diego Gas & Electric Company, Concept Layout Plan for Ocean Ranch Substation, Parcels 16 and 17, dated March 1, 2012.

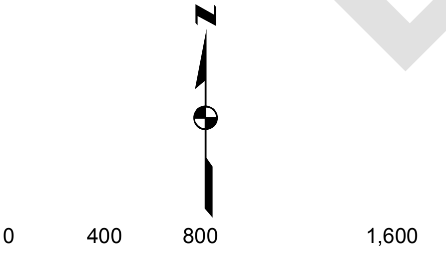
Treiman, J.A., 1993, The Rose Canyon Fault Zone, Southern California: California Division of Mines and Geology, Open File Report 93-02.

United States Geological Survey, 1997, National Seismic Hazard Mapping Project, World Wide Web, http://geohazards.cr.usgs.gov/eq/

United States Department of Agriculture, 1953, Aerial Photographs, Flight AXN-4M, Numbers 83 and 84, scale approximately 1:20,000, dated March 31.

PLATES

SOURCE: Esri WORLD IMAGERY



KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	124202
DRAWN:	05/31/12
DRAWN BY:	PD
CHECKED BY:	TG
FILE NAME:	124202_Vicinity.mxd

SITE VICINITY MAP

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
1

LEGEND

B-1 ⊕ APPROXIMATE BORING LOCATION

TP-1 ▭ APPROXIMATE TEST PIT LOCATION

SOURCE: Esri WORLD IMAGERY

0 150 300 600 Feet

N

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	124202
DRAWN:	05/15/12
DRAWN BY:	PD
CHECKED BY:	TG
FILE NAME:	124202_PBH.mxd

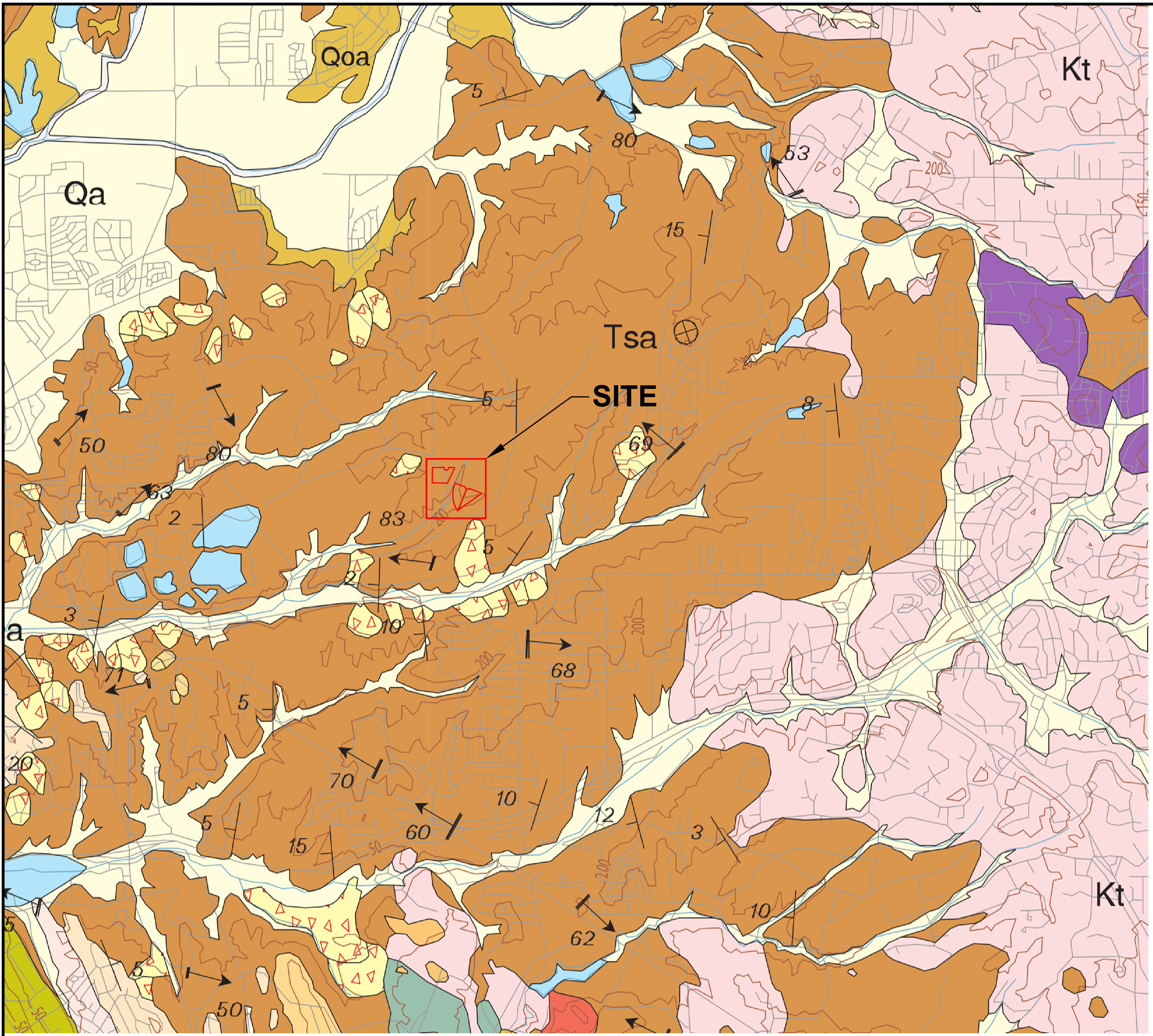
FIELD EXPLORATION MAP

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

2

ATTACHED IMAGES: Images: MAP SYMBOLS.JPG Images: QA.JPG
ATTACHED XREFS:
ALBUQUERQUE, NM
CAD FILE: U:\PDan\San Diego Projects\124202_Pacific Coast Business Park\ LAYOUT: Layout1 PLOTTED: 16 May 2012, 1:04pm, PDan



SOURCE: GEOLOGIC MAP OF THE OCEANSIDE 30'X60' QUADRANGLE, CALIFORNIA
1) CALIFORNIA DIVISION OF MINES AND GEOLOGY, LOS ANGELES, CALIFORNIA
2) U. S. GEOLOGICAL SURVEY, RIVERSIDE, CALIFORNIA

LEGEND

Qa **Alluvial flood plain deposits (late Holocene)**—Active and recently active alluvial deposits along canyon floors. Consists of unconsolidated sandy, silty, or clay-bearing alluvium. Does not include alluvial fan deposits at distal ends of channels

Qls **Landslide deposits undivided (Holocene and Pleistocene)**—Highly fragmented to largely coherent landslide deposits. Unconsolidated to moderately well consolidated. Most mapped landslides contain scarp area as well as slide deposit. In some areas scarp is shown separately. Many Pleistocene-age landslides were reactivated in part or entirely during late Holocene. Most of the landslides in the quadrangle have occurred within the Capistrano Formation, however, there are many within the Monterey and Santiago formations as well

Qoa **Old alluvial flood plain deposits undivided (late to middle Pleistocene)**—Fluvial sediments deposited on canyon floors. Consists of moderately well consolidated, poorly sorted, permeable, commonly slightly dissected gravel, sand, silt, and clay-bearing alluvium. Where more than one number is shown (e.g., Qoa_{2-6}) those deposits are undivided (Fig. 3). Includes:

Qop_7 **Old paralic deposits, Unit 7 (late to middle Pleistocene)**—Mostly poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach, estuarine and colluvial deposits composed of siltstone, sandstone and conglomerate. These deposits rest on the 9-11 m Bird Rock terrace (Fig. 3)

Qop_6 **Old paralic deposits, Unit 6 (late to middle Pleistocene)**—Mostly poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach, estuarine and colluvial deposits composed of siltstone, sandstone and conglomerate. These deposits rest on the 22-23 m Nestor terrace (Fig. 3)

Qop_3 **Old paralic deposits, Unit 3 (late to middle Pleistocene)**—Mostly poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach, estuarine and colluvial deposits composed of siltstone, sandstone and conglomerate. These deposits rest on the 45-46 m Guy Fleming terrace (Fig. 3)

Tsa **Santiago Formation (middle Eocene)**—Named by Woodring and Popenoe (1945) for Eocene deposits of northwestern Santa Ana Mountains. There are three distinctive parts. A basal member that consists of buff and brownish-gray, massive, coarse-grained, poorly sorted arkosic sandstone and conglomerate (sandstone generally predominating). In some areas the basal member is overlain by gray and brownish-gray (salt and pepper) central member that consists of soft, medium-grained, moderately well-sorted arkosic sandstone. An upper member consists of gray, coarse-grained arkosic sandstone and grit. Throughout the formation, both vertically and laterally, there exists greenish-brown, massive claystone interbeds, tongues and lenses of often fossiliferous, lagoonal claystone and siltstone. The lower part of the Santiago Formation interfingers with the Delmar Formation and Torrey Sandstone in the Encinitas quadrangle

Kt **Tonalite undivided (mid-Cretaceous)**—Mostly massive, coarse-grained, light-gray hornblende-biotite tonalite

Kgb **Gabbro undivided (mid-Cretaceous)**—Mostly massive, coarse-grained, dark-gray and black biotite-hornblende-hypersthene gabbro

Contact—Contact between geologic units; dotted where concealed.

70 U D **Fault**—Solid where accurately located; dashed where approximately located; dotted where concealed. U = upthrown block, D = downthrown block. Arrow and number indicate direction and angle of dip of fault plane.

Anticline—Solid where accurately located; dotted where concealed.

Syncline—Solid where accurately located; dotted where concealed.

Kgd—granite pegmatite dike

Closed depression—Closed depression in Elsinore fault zone.

Qls? **Landslide**—Arrows indicate principal direction of movement. Queried where existence is questionable.

Strike and dip of beds
70 **Inclined**
70 **Overturned**
Vertical
⊕ **Horizontal**

Strike and dip of igneous foliation
45 **Inclined**
Vertical

Strike and dip of igneous joints
60 **Inclined**

Vertical

Strike and dip of metamorphic foliation
55 **Inclined**

Strike and dip of sedimentary joints
■ **Vertical**

3500 0 1750 3500 ft
APPROXIMATE SCALE: 1 inch = 3500 ft

N

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	124202
DRAWN:	05/16/12
DRAWN BY:	PD
CHECKED BY:	DH
FILE NAME:	124202_Geo.dwg

REGIONAL GEOLOGIC MAP

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
3

APPENDIX A

FIELD EXPLORATION AND BORING LOGS

APPENDIX A
FIELD EXPLORATION AND BORING LOGS

Prior to any subsurface exploration, Kleinfelder notified Underground Service Alert (USA) to clear proposed boring locations of conflicts with utilities. In addition, Kleinfelder subcontracted a private utility locating company to sweep the proposed boring locations for underground utilities at the site. As required by the County of San Diego department of Environmental Health (DEH), explorations deeper than 20 feet were permitted. In addition, the field activities were monitored by a paleontologist.

The subsurface investigation included six borings and seven test pits. The borings were excavated to depths between 50 and 80 feet. The 8-inch diameter borings were excavated with a truck-mounted drill rig equipped with hollow stem augers and operated by Scott's Drill Company of Oceanside, California. An engineer from our office supervised the field operations and logged the borings. Selected bulk, disturbed, and intact samples were retrieved from the borings, sealed, and transported to our laboratory for further evaluation. Our typical vertical sampling interval was five feet; however, due to the extent of the deep canyon fills and knowledge of the previous grading operations, our sampling interval was increased to 10 feet in some of the deeper fill soils. The borings were backfilled using bentonite chips and soil cuttings.

In-place soil samples were obtained at the test boring locations using a California penetration sampler driven a total of 18-inches (or until practical refusal), into the undisturbed soil at the bottom of the boring. The soil sampled by the California sampler (3-inch O.D., 2.4 inches I.D.) was retained in 6-inch long brass tubes for laboratory testing. The samplers were driven using a 140 pound automatic hammer falling 30 inches. The total number of hammer blows required to drive the sampler the final 12 inches is termed the blow count and is recorded on the Logs of Borings. The blow counts presented on the Logs have not been adjusted for the effects of overburden pressure, input driving energy, rod length, sampler correction, or boring diameter correction.

Seven backhoe test pits were excavated to depths ranging from about 5 to 10 feet. An engineer from our office supervised the field operations and logged the pits. Selected bulk samples were retrieved from the excavations and transported to our laboratory for further evaluation. The test pit excavations were backfilled with compactive effort applied by the backhoe with a sheeps foot wheel attachment. The approximate location of each boring and test pit excavation is shown on Plate 2, Field Exploration Map.

Soil was classified in the field according to the Unified Soil Classification System (USCS) using the visual-manual procedure in accordance with ASTM D 2488. Field descriptions and classifications were reviewed against the laboratory descriptions (ASTM D2487) and adjusted where laboratory data was available.

A Unified Soil Classification System (USCS) chart and a Boring Log legend are presented as Plates A1a and A1b, respectively. The Logs of Borings and test pits are presented as Plates A1 through A23. The Logs of Borings and test pit excavations describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the general location, boring number, drilling date, and the names of the logger and drilling subcontractor. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual.

SAMPLER GRAPHICS

HYDRO-EXCAVATION
HAND AUGER
BULK / BAG SAMPLE
CALIFORNIA SAMPLER (3 inch outside diameter)
MODIFIED CALIFORNIA SAMPLER (2 OR 2-1/2 inch outside diameter)
STANDARD PENETRATION SPLIT SPOON SAMPLER (2 inch outside and 1.4 inch diameter)
SHELBY TUBE SAMPLER OR PUSH TUBE SAMPLER
TEXAS CONE PENETRATION
DYNAMIC CONE PENETRATION
VANE SHEAR
GEO-PROBE / MACROCORE SAMPLER
SONIC SAMPLER
CONTINUOUS CORE SAMPLE
HQ CORE SAMPLE (2.500 inch (63.5 mm) core diameter)
NQ CORE SAMPLE (1.874 inch (47.6 mm) core diameter)
NX CORE SAMPLE (2.154 inch (54.7 mm) core diameter)

▽ WATER LEVEL
(level where first observed)

▼ WATER LEVEL
(level after exploration completion)

▼ WATER LEVEL
(additional levels after exploration)

≈ OBSERVED SEEPAGE

1. The report and log key are an integral part of these logs. All data and interpretations in this log are subject to the stated explanations and limitations stated in the report.

2. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.

3. No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.

4. Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.

5. In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate by visual classifications in the office and/or laboratory gradation and index property testing.

6. Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

7. 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pounds hammer falling 30 inches.

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	**GRAVELS** (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥4 and 1≤Cc≤3	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc >3	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤Cc≤3	GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc >3	GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				SW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤Cc≤3	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc >3	SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤Cc≤3	SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc >3	SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		SANDS WITH > 12% FINES		SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-CLAY MIXTURES

FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid Limit less than 50)	ML	INORGANIC SILTS AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY

KLEINFELDER
Bright People. Right Solutions.

5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: May. 07, 2012
REVISED:

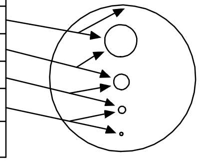
GRAPHICS KEY

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

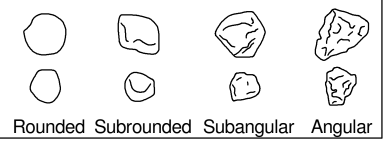
PLATE
A-1a

GRAIN SIZE

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12"	>12"	Larger than basketball-sized
Cobbles		3 - 12'	3 - 12"	Fist-sized to basketball-sized
Gravel	coarse	3/4 -3"	3/4 -3"	Thumb-sized to fist-sized
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized
	fine	#200 - #10	0.0029 - 0.017"	Flour-sized to sugar-sized
Fines		Passing #200	<0.0029	Flour-sized and smaller



ANGULARITY

DESCRIPTION	CRITERIA	
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces	
Subangular	Particles are similar to angular description but have rounded edges	
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges	
Rounded	Particles have smoothly curved sides and no edges	

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL[1]

APPARENT DENSITY	SPT-N_{60} (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12- 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

[1]NOTE: AFTER TERZAGHI AND PECK, 1948

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (Qu)(psf)	CRITERIA
Very Soft	< 1000	Thumb will penetrate soil more than 1 in. (25 mm)
Soft	1000 - 2000	Thumb will penetrate soil about 1 in. (25 mm)
Firm	2000 < 4000	Thumb will indent soil about 1/4 in. (6 mm)
Hard	4000 < 8000	Thumb will not indent soil but readily indented with thumbnail
Very Hard	> 8000	Thumbnail will not indent soil

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4 in. thick, note thickness
Laminated	Alternating layers of varying material or color with the layer less than 1/4 in. thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	Crumbles or breaks with handling or slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	May. 07, 2012
REVISED:	

SOIL DESCRIPTION KEY

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-1b

gINT FILE: U:\gint\projects\2012\124202_sdge Ocean Ranch.gpj   R:KLF_STANDARD_GINT_LIBRARY_BETA.GLB   [LEGEND 1B (SOIL DESCRIPTION KEY)]

BORING LOG B-1

Date Begin - End: 4/25/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Overcast
Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches
Hammer Type - Drop: 140 lb. Automatic - 30"

Latitude: 33.21237° N
Longitude: 117.29526° W
Approximate Surface Elevation (ft): 385.0
Surface Condition: Bare Earth and Grass

		FIELD EXPLORATION						LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		⁙	**Artificial Fill** **Silty SAND (SM)**: fine to coarse grained, non-plastic fines, gray, moist	1	⧗										
		▨	**Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, gray, moist, dense	2	■	BC=16 25 27			8.0	125					Expansion Index (54)
380	5	⁙	**Silty SAND (SM)**: trace clay, fine to coarse grained, non-plastic fines, gray, moist, very dense	3	■	BC=18 26 36									
375	10	⁙	Non-plastic fines, gray, moist, medium dense	4	◣	BC=10 10 15									
370	15	⁙	Non-plastic fines, gray, moist, very dense, decrease in Clay content, increase in Sand content, isolated chuncks of Clay	5	■	BC=18 41 50			8.0	127					
365	20	⁙	Non-plastic fines, gray, moist, dense, becomes coarser grained Sand	6	◣	BC=10 18 22									
360	25	▨	**Sandy CLAY (CL)**: fine to medium grained, low plasticity fines, light brown to light gray, moist, firm, intermixed chunks of firm to hard Clay	7	■	BC=10 18 26			16.0	115					
355	30	▨	Low plasticity fines, light brown to light gray, moist, firm, 4-inch thick SM lense within sample	8	◣	BC=10 17 22									

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-1

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-1

Date Begin - End:	4/25/12	**Drill Company:**	Scott's Drilling		**BORING LOG B-1**
Logged By:	E. Koprulu	**Drill Crew:**			
Hor.-Vert. Datum:	NAD83 - NAD83	**Drill Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Automatic - 30"
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	8 inches		

FIELD EXPLORATION								LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21237° N Longitude: 117.29526° W Approximate Surface Elevation (ft): 385.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Sandy Lean to Fat CLAY (CL-CH)**: fine grained, medium plasticity fines, dark brown to black, strong organic smell odor, moist, very hard, some rootlets	9	■	BC=22 50			6.0	122					
345	40	▨	**Sandy CLAY (CL)**: fine grained, low plasticity fines, light brown, moist, hard	10	◣	BC=9 17 21									
340	45	▨	Low plasticity fines, light brown to white, moist, very hard, caliche	11	◣	BC=15 27 28									
335	50	▨	**Sandy Lean CLAY (CL)**: trace gravel, fine to coarse grained, low plasticity fines, gray, moist, hard	12	◣	BC=9 13 17			32.0						
		▨	<u>**Santiago Formation**</u>												
330	55	▨	**Sandy CLAY (CL)**: fine to coarse grained, low plasticity fines, brown, moist, very hard	13	◣	BC=10 22 37									
325	60	▨													
320	65	▨	Fine grained, low plasticity fines, grayish brown, moist, very hard, moderately cemented	14	◣	BC=28 50/3"									

The boring was terminated at approximately 66 feet below ground surface. Boring was backfilled with bentonite on April 25, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling.

GENERAL NOTES:
The boring location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the boring with an accuracy of 5 to 10 feet.

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202	BORING LOG B-1	PLATE	
DRAWN BY: EK			
CHECKED BY: DH	SDG&E OCEAN RANCH SUBSTATION PACIFIC COAST BUSINESS PARK OCEANSIDE, CALIFORNIA	A-2	
DATE: 5/7/2012			
REVISED:		PAGE: 2 of 2	

Date Begin - End:	4/25/12	**Drill Company:**	Scott's Drilling		**BORING LOG B-2**
Logged By:	E. Koprulu	**Drill Crew:**			
Hor.-Vert. Datum:	NAD83 - NAD83	**Drill Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Automatic - 30"
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	8 inches		

FIELD EXPLORATION								LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21187° N Longitude: 117.29539° W Approximate Surface Elevation (ft): 386.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
385		▨	**Artificial Fill** **Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, gray, moist, predominantly coarse grained Sand												
380	5		Fine to coarse grained, non-plastic fines, moist, dense	1	■	BC=12 18 22			10.0	115					
		▨	**Sandy CLAY (CL)**: fine grained, low plasticity fines, gray to dark gray, moist, very hard												
375	10			2	■	BC=22 25 37			11.0	121					
370	15														
		▨	**Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, gray, moist, firm												
365	20			3	◣	BC=8 12 12									
360	25														
		▨	**Sandy CLAY (CL)**: fine to coarse grained, low plasticity fines, gray, moist, very hard												
355	30			4	■	BC=9 22 50			9.0	124					

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

BORING LOG B-2

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

A-3

Date Begin - End:	4/25/12	**Drill Company:**	Scott's Drilling		**BORING LOG B-2**
Logged By:	E. Koprulu	**Drill Crew:**			
Hor.-Vert. Datum:	NAD83 - NAD83	**Drill Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Automatic - 30"
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Overcast	**Auger Diameter:**	8 inches		

Latitude: 33.21187° N
Longitude: 117.29539° W
Approximate Surface Elevation (ft): 386.0

Surface Condition: Bare Earth and Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	LABORATORY RESULTS USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
350		▨	**Sandy CLAY (CL)**: fine to coarse grained, low plasticity fines, gray, moist, very hard *(continued)*												
345	40	▨	**Santiago Formation** **Sandy Lean CLAY (CL)**: fine grained, low plasticity fines, light brown, moist, very hard	5	◣	BC=9 25 39			12.0						
340	45	▨	Medium plasticity fines, grayish brown to gray, moist, very hard, fissured, iron-oxide staining	6	◣	BC=14 27 38			14.0						
335	50	▨	Medium plasticity fines, grayish brown, moist, very hard	7	◣	BC=23 50									
330	55														
325	60														
320	65														

The boring was terminated at approximately 51 feet below ground surface. Boring was backfilled with bentonite on April 25, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling.
GENERAL NOTES:
The boring location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the boring with an accuracy of 5 to 10 feet.

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

BORING LOG B-2

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

A-4

Date Begin - End: 4/26/12 - 4/27/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny
Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches

BORING LOG B-3

Hammer Type - Drop: 140 lb. Automatic - 30"

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21081° N Longitude: 117.29389° W Approximate Surface Elevation (ft): 367.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**<u>Artificial Fill</u>** **Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, gray, moist												
365		▨													
	5	▨													
360		▨													
	10	▨	**Sandy CLAY (CL)**: fine to medium grained, medium plasticity fines, gray to brown, moist, very hard	1	■	BC=17 32 44									
355		▨													
	15	▨													
350		▨													
	20	▨	Fine to coarse grained, low plasticity fines, gray, moist, very hard	2	■	BC=13 27 40									
345		▨													
	25	▨													
340		▨													
	30	▨	Fine to medium grained, medium plasticity fines, grayish brown, moist, very hard, decrease in grain size	3	■	BC=20 30 50/5"									
335		▨													

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-3

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-5

BORING LOG B-3

Date Begin - End: 4/26/12 - 4/27/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny

Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches

Hammer Type - Drop: 140 lb. Automatic - 30"

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21081° N Longitude: 117.29389° W Approximate Surface Elevation (ft): 367.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Sandy CLAY (CL): fine to medium grained, medium plasticity fines, gray to brown, moist, very hard *(continued)*												
330															
	40		Fine to coarse grained, low plasticity fines, moist, very hard, intermixed color from light gray - dark brown to reddish brown, some scattered sand lenses	4		BC=13 18 24									
325															
	45														
320															
	50		Fine to medium grained, medium plasticity fines, moist, very hard, intermixed color from light gray to reddish brown, some brown lenses of sand	5		BC=21 25 35									
315															
	55														
310															
	60		<u>**Santiago Formation**</u> **Sandy CLAY (CL)**: fine grained, medium plasticity fines, gray, moist, very hard												
305															
	65														
300															

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-3

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-6

Date Begin - End:	4/26/12 - 4/27/12	**Drill Company:**	Scott's Drilling		**BORING LOG B-3**
Logged By:	E. Koprulu	**Drill Crew:**			
Hor.-Vert. Datum:	NAD83 - NAD83	**Drill Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Automatic - 30"
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Sunny	**Auger Diameter:**	8 inches		

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21081° N Longitude: 117.29389° W Approximate Surface Elevation (ft): 367.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Santiago Formation** *(continued)* **Sandy CLAY (CL)**: fine grained, medium plasticity fines, gray, moist, very hard, iron-oxide staining	6	◣	BC=28 45 50/4"									
295															
	75		The boring was terminated at approximately 71.5 feet below ground surface. The Boring was backfilled with bentonite on April 27, 2012.												
290															
	80														
285															
	85														
280															
	90														
275															
	95														
270															
	100														
265															

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling.
GENERAL NOTES:
The boring location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the boring with an accuracy of 5 to 10 feet.

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

BORING LOG B-3

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

A-7

BORING LOG B-4

Date Begin - End: 4/24/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny
Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches
Hammer Type - Drop: 140 lb. Automatic - 30"

Latitude: 33.21102° N
Longitude: 117.29288° W
Approximate Surface Elevation (ft): 374.0
Surface Condition: Bare Earth and Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
				Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Artificial Fill **Silty SAND (SM)**: fine to coarse grained, non-plastic fines, gray, moist, dense	1	⧗										
			Trace Clay	2	■	BC=9 20 28									
370			Increase in Clay content		⧗										
	5		**Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, dark gray, moist, dense	3	■	BC=14 26 40									
365	10		Fine to coarse grained, low plasticity fines, dark gray, moist, very dense, some lenses of dark brown Lean Clay	4	■	BC=12 31 42									
360	15		**Sandy CLAY (CL)**: fine to medium grained, low plasticity fines, moist, very hard, intermixed color from light gray to light tan, some lenses of dark brown Lean Clay	5	■	BC=18 32 42									
355	20		Fine grained, medium plasticity fines, light yellowish brown to light gray, moist, very hard, increase in clay content, decrease in sand content, lenses of Sand	6	■	BC=18 35 50/5.5"									
350	25		Fine to coarse grained, low plasticity fines, gray to brown, trace organic smell odor, moist, very hard, lenses of Sand throughout, dark brown to black lenses of old Top Soil	7	■	BC=16 35 42									
345	30		Fine grained, medium plasticity fines, gray to dark brown, trace organic smell odor, moist, very hard, black lenses of old Top Soil	8	■	BC=12 31 48									
340															

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001
www.kleinfelder.com

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-4

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-8

gINT FILE: U:\gint\projects\2012\124202_sdge Ocean Ranch.gpj C:KLF_STANDARD_GINT_LIBRARY_BETA.GLB [KLF_BORING/TEST PIT LOG]

Date Begin - End: 4/24/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny

Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches

BORING LOG B-4

Hammer Type - Drop: 140 lb. Automatic - 30"

FIELD EXPLORATION

Latitude: 33.21102° N
Longitude: 117.29288° W
Approximate Surface Elevation (ft): 374.0
Surface Condition: Bare Earth and Grass

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
				9	■	BC=20 40 50/5"									
			Silty SAND (SM): fine grained, non-plastic fines, gray, moist, very dense												
335															
	40		**Clayey SAND (SC)**: fine grained, low plasticity fines, white to light brown, moist, very dense, caliche	10	■	BC=17 42 50									
330															
	45		**Sandy CLAY (CL)**: fine grained, medium plasticity fines, dark gray to black, moist, very hard	11	■	BC=19 38 50									
325															
	50		Fine grained, low plasticity fines, dark gray, moist, very hard, increase in Sand content, reddish brown and gray sand lenses	12	■	BC=15 29 46									
320															
	55		Fine to medium grained, low plasticity fines, gray, moist, hard, black colored CL-CH at shoe of sampler	13	■	BC=12 26 28									
315															
	60		**Lean to Fat CLAY (CL-CH)**: fine grained, medium plasticity fines, dark gray to black, moist, hard	14	■	BC=16 22 34									
310															
	65		Fine grained, medium plasticity fines, dark gray to black, moist, very hard, increase in sand content	15	■	BC=19 30 40									
305															

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-4

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-9

Date Begin - End: 4/24/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny
Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches

BORING LOG B-4

Hammer Type - Drop: 140 lb. Automatic - 30"

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21102° N Longitude: 117.29288° W Approximate Surface Elevation (ft): 374.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Alluvium** **Fat CLAY (CH)**: fine grained, high plasticity fines, black, moist, very hard *(continued)*	16	■	BC=15 32 40									
300		▨													
	75	▨	Fine grained, high plasticity fines, black, moist, very hard	17	■	BC=18 37 50									CONSOL
295		▨													
	80	▨		18	■	BC=39 50/4"									
		▨	**Santiago Formation** **Sandy CLAY (CL)**: fine to medium grained, low plasticity fines, gray, moist, very hard												
290			The boring was terminated at approximately 81 feet below ground surface. Boring was backfilled with bentonite on April 24, 2012.												
	85														
285															
	90														
280															
	95														
275															
	100														
270															

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling.
GENERAL NOTES:
The boring location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the boring with an accuracy of 5 to 10 feet.

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

BORING LOG B-4

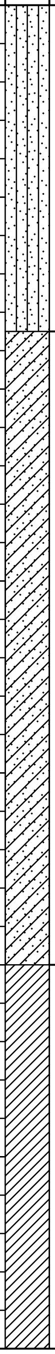
SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-10

Date Begin - End: 4/24/12 - 4/25/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny
Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches

BORING LOG B-5

Hammer Type - Drop: 140 lb. Automatic - 30"



			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21074° N Longitude: 117.29347° W Approximate Surface Elevation (ft): 372.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			Artificial Fill **Silty SAND (SM)**: fine to coarse grained, non-plastic fines, gray, moist, dense												
370															
	5		Fine to coarse grained, non-plastic fines, gray, moist, dense, increase in grain size	1	■	BC=15 24 29									
365															
	10		**Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, gray to dark gray, moist, very dense	2	■	BC=18 28 38									
360															
	15														
355															
	20		Fine grained, low plasticity fines, gray to dark gray, moist, medium dense, increase in Clay content	3	◣	BC=10 12 13									
350															
	25														
345															
	30		**Sandy CLAY (CL)**: fine grained, low plasticity fines, light brown to light gray, moist, firm	4	◣	BC=8 11 13									
340															

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-5

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-11

Date Begin - End: 4/24/12 - 4/25/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny

Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches

BORING LOG B-5

Hammer Type - Drop: 140 lb. Automatic - 30"

FIELD EXPLORATION

LABORATORY RESULTS

Latitude: 33.21074° N
Longitude: 117.29347° W
Approximate Surface Elevation (ft): 372.0

Surface Condition: Bare Earth and Grass

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
335															
	40		Fine to medium grained, low plasticity fines, light gray to reddish brown, moist, hard, trace caliche, 3-inch thick lense of Sand	5		BC=10 15 21									
330															
	45														
325															
	50		**CALICHE**: dense, entire sample Caliche	6		BC=23 19 15									
320															
	55														
315															
	60		Fine to coarse grained, low plasticity fines, light gray to brown, moist, hard, some rootlets	7		BC=8 13 15									
310															
			Alluvium **Fat CLAY (CH)**: high plasticity fines, black, organic odor, moist, hard												
	65														
305															

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-5

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

A-12

Date Begin - End: 4/24/12 - 4/25/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny

Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches

BORING LOG B-5

Hammer Type - Drop: 140 lb. Automatic - 30"

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21074° N Longitude: 117.29347° W Approximate Surface Elevation (ft): 372.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Santiago Formation** **Sandy CLAY (CL)**: fine grained, medium plasticity fines, gray, moist, very hard, strongly cemented	8	■	BC=15 50/3"									GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling. GENERAL NOTES: The boring location and elevation are approximate and were estimated by BHA, Inc. A Garmin etrex GPS unit was used to locate the boring with an accuracy of 5 to 10 feet.
300															
	75		The boring was terminated at approximately 71 feet below ground surface. The Boring was backfilled with bentonite on April 25, 2012.												
295															
	80														
290															
	85														
285															
	90														
280															
	95														
275															
	100														
270															

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

BORING LOG B-5

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-13

Date Begin - End:	4/26/12	**Drill Company:**	Scott's Drilling		**BORING LOG B-6**
Logged By:	E. Koprulu	**Drill Crew:**			
Hor.-Vert. Datum:	NAD83 - NAD83	**Drill Equipment:**	CME-55	**Hammer Type - Drop:**	140 lb. Automatic - 30"
Angle from Vert.:	0 degrees	**Exploration Method:**	Hollow Stem Auger		
Weather:	Sunny	**Auger Diameter:**	8 inches		

FIELD EXPLORATION								LABORATORY RESULTS								
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21047° N Longitude: 117.29423° W Approximate Surface Elevation (ft): 366.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
365		▨	**Artificial Fill** **Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, gray, moist, dense												
360	5	▨	Fine to coarse grained, non-plastic fines, gray, moist, very dense	1	■	BC=16 24 42									
355	10	▨	Coarse grained, non-plastic fines, gray, moist, very dense, decrease in fines content, predominantly coarse grained sand	2	■	BC=16 37 45									
350	15	▨													
345	20	▨	Coarse grained, non-plastic fines, gray, moist, very dense	3	■	BC=16 25 39									
340	25	▨	**Sandy CLAY (CL)**: fine to coarse grained, low plasticity fines, grayish brown, moist, very hard	4	■	BC=20 30 38									
335	30	▨	Fine grained, low plasticity fines, light brown, moist, very hard, gray colored Sand lenses throughout	5	■	BC=23 47 50									

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-6

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-14

Date Begin - End: 4/26/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny
Drill Company: Scott's Drilling
Drill Crew:
Drill Equipment: CME-55
Exploration Method: Hollow Stem Auger
Auger Diameter: 8 inches
Hammer Type - Drop: 140 lb. Automatic - 30"

BORING LOG B-6

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21047° N Longitude: 117.29423° W Approximate Surface Elevation (ft): 366.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
330		▨	**Sandy CLAY (CL)**: fine to coarse grained, low plasticity fines, grayish brown, moist, very hard *(continued)*												
325	40	▨	Fine grained, low plasticity fines, light brown to white, moist, very hard, abundant caliche	6	◣	BC=8 15 19									
		▨	Pieces of debris (metal pieces) observed in soil cuttings												
320	45	▨	**Fat CLAY (CH)**: high plasticity fines, dark brown to black, trace organic odor, moist, hard, some reddish brown to gray colored Sand lenses, some rootlets	7	◣	BC=8 11 18									
315	50	▨	**Sandy CLAY (CL)**: fine grained, medium plasticity fines, grayish brown, moist, hard	8	■	BC=13 25 35									
310	55	▨	Soil cuttings indcate black colored Clay with strong organic smell from approximately 50 to 58 feet												
305	60	▨	Fine grained, low plasticity fines, grayish brown, moist, very hard	9	◣	BC=17 18 28									
300	65	▨	Becomes firm to hard	10	◣	BC=6 10 14									
		▨	__**Alluvium**__ **Fat CLAY (CH)**: trace fine grained, high plasticity fines, black, organic smell odor, moist, firm to hard												

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-6

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-15

Date Begin - End: 4/26/12

Logged By: E. Koprulu

Hor.-Vert. Datum: NAD83 - NAD83

Angle from Vert.: 0 degrees

Weather: Sunny

Drill Company: Scott's Drilling

Drill Crew:

Drill Equipment: CME-55

Exploration Method: Hollow Stem Auger

Auger Diameter: 8 inches

BORING LOG B-6

Hammer Type - Drop: 140 lb. Automatic - 30"

			FIELD EXPLORATION					LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21047° N Longitude: 117.29423° W Approximate Surface Elevation (ft): 366.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	Blow Counts(BC)= Uncorr. blows/6 in	Recovery	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
295		▨	**Alluvium** **Fat CLAY (CH)**: trace fine grained, high plasticity fines, black, organic smell odor, moist, firm to hard *(continued)*												
290	75	▨	**Sandy CLAY (CL)**: fine grained, medium plasticity fines, brown, moist, very hard	11	■	BC=16 24 31									CONSOL
		▨	**Santiago Formation**												
285	80	▨	**Sandy CLAY (CL)**: fine grained, low plasticity fines, gray, moist, very hard, iron-oxide staining	12	◣	BC=18 50/5"									
280	85														
275	90														
270	95														
265	100														

The boring was terminated at approximately 81 feet below ground surface. Boring was backfilled with bentonite on April 26, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling.

GENERAL NOTES:
The boring location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the boring with an accuracy of 5 to 10 feet.

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

BORING LOG B-6

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-16

Date Begin - End: 4/23/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny
Excavation Co.: Cut N Core
Excavation Crew:
Excavation Equip.: CAT 430E Backhoe
Excav. Dimensions: 36 inches

TEST PIT LOG TP-1

			FIELD EXPLORATION			LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21286° N Longitude: 117.29625° W Approximate Surface Elevation (ft): 384.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
380	5	▨	**Santiago Formation** **Clayey SAND (SC)**: fine to coarse grained, low plasticity fines, gray, moist, dense, homogeneous, weakly to moderately cemented, some Clay inseams	1	☒								Expansion Index (5)

Approximate Elevation (feet)	Depth (feet)
375	10
370	15
365	20
360	25
355	30
350	

The test pit was terminated at approximately 5 feet below ground surface. Test Pit was backfilled with excavated material on April 23, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation.

GENERAL NOTES:
The test pit location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the test pit with an accuracy of 5 to 10 feet.
There was no shoring used for the test pit exploration.

TP-1

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

TEST PIT LOG TP-1

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-17
PAGE: 1 of 1

Date Begin - End: 4/23/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny

Excavation Co.: Cut N Core
Excavation Crew:
Excavation Equip.: CAT 430E Backhoe
Excav. Dimensions: 36 inches

TEST PIT LOG TP-2

FIELD EXPLORATION

Latitude: 33.21283° N
Longitude: 117.29574° W
Approximate Surface Elevation (ft): 382.0

Surface Condition: Bare Earth and Grass

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
380		▨	**Santiago Formation** **Clayey SAND (SC)**: fine to coarse grained, low plasticity fines, gray, moist, very dense, fissured, moderately cemented	1	☒								Expansion Index (29)
375	5	▨	**CLAYSTONE (CL-CH)**: fine grained, medium to high plasticity fines, brown to reddish brown, moist, very hard, blocky, strongly cemented	2	☒								
370	10												
365	15												
360	20												
355	25												
350	30												

The test pit was terminated at approximately 8 feet below ground surface. Test Pit was backfilled with excavated material on April 23, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation.
GENERAL NOTES:
The test pit location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the test pit with an accuracy of 5 to 10 feet.
There was no shoring used for the test pit exploration.

TP-2

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

TEST PIT LOG TP-2

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-18

PAGE: 1 of 1

Date Begin - End: 4/23/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny

Excavation Co.: Cut N Core
Excavation Crew:
Excavation Equip.: CAT 430E Backhoe
Excav. Dimensions: 36 inches

TEST PIT LOG TP-3

			FIELD EXPLORATION			LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21221° N Longitude: 117.29648° W Approximate Surface Elevation (ft): 386.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
385			**Santiago Formation** **Clayey SAND (SC)**: fine to coarse grained, low plasticity fines, gray, moist, very dense, blocky, moderately cemented	1	☒								
	5		**CLAYSTONE (CL-CH)**: fine grained, medium to high plasticity fines, brown to reddish brown, moist, very hard, blocky, strongly cemented	2	☒								
380													
	10												
375													
	15												
370													
	20												
365													
	25												
360													
	30												
355													

The test pit was terminated at approximately 6 feet below ground surface. Test Pit was backfilled with excavated material on April 23, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation.
GENERAL NOTES:
The test pit location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the test pit with an accuracy of 5 to 10 feet.
There was no shoring used for the test pit exploration.

TP-3

KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com
5015 Shoreham Place
San Diego, CA 92122
PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

TEST PIT LOG TP-3

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

A-19

Date Begin - End: 4/23/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny
Excavation Co.: Cut N Core
Excavation Crew:
Excavation Equip.: CAT 430E Backhoe
Excav. Dimensions: 36 inches

TEST PIT LOG TP-4

		FIELD EXPLORATION			LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log	Latitude: 33.21125° N Longitude: 117.29421° W Approximate Surface Elevation (ft): 368.0 Surface Condition: Bare Earth and Grass	Sample Number	Sample Type	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Artificial Fill** **Clayey SAND (SC)**: fine to coarse grained, low plasticity fines, light brown, moist, dense, chunks of clay throughout	1	☒								
365	5	▨	**Santiago Formation** **Clayey SAND (SC)**: fine to coarse grained, low plasticity fines, gray, moist, dense	2	☒								

Approximate Elevation (feet)	Depth (feet)
360	
	10
355	
	15
350	
	20
345	
	25
340	
	30
335	

The test pit was terminated at approximately 6 feet below ground surface. Test Pit was backfilled with excavated material on April 23, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation.

GENERAL NOTES:
The test pit location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the test pit with an accuracy of 5 to 10 feet.
There was no shoring used for the test pit exploration.

TP-4

gINT FILE: U:\gint\projects\2012\124202_sdge Ocean Ranch.gpj C:KLF_STANDARD_GINT_LIBRARY_BETA.GLB [KLF_BORING/TEST PIT LOG]

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

TEST PIT LOG TP-4

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-20

PAGE: 1 of 1

TEST PIT LOG TP-5

Date Begin - End:	4/23/12	**Excavation Co.:**	Cut N Core
Logged By:	E. Koprulu	**Excavation Crew:**	
Hor.-Vert. Datum:	NAD83 - NAD83	**Excavation Equip.:**	CAT 430E Backhoe
Angle from Vert.:	0 degrees	**Excav. Dimensions:**	36 inches
Weather:	Sunny		

FIELD EXPLORATION

Latitude: 33.21126° N
Longitude: 117.29373° W
Approximate Surface Elevation (ft): 368.0

Surface Condition: Bare Earth and Grass

LABORATORY RESULTS

Approximate Elevation (feet)	Depth (feet)	Graphical Log	Description	Sample Number	Sample Type	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Artificial Fill** **Sandy CLAY (CL)**: fine to coarse grained, low plasticity fines, light brown, moist, dense, chunks of clay throughout	1	☒								
365	5	⁘	**Santiago Formation** **Silty SAND (SM)**: fine to coarse grained, low plasticity fines, gray, moist, dense, pockets of dark gray Clay, concreteion observed at approximately 5.5 feet	2	☒								

The test pit was terminated at approximately 6 feet below ground surface. Test Pit was backfilled with excavated material on April 23, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation.
GENERAL NOTES:
The test pit location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the test pit with an accuracy of 5 to 10 feet.
There was no shoring used for the test pit exploration.

TP-5

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

TEST PIT LOG TP-5

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

A-21

Date Begin - End: 4/23/12
Logged By: E. Koprulu
Hor.-Vert. Datum: NAD83 - NAD83
Angle from Vert.: 0 degrees
Weather: Sunny

Excavation Co.: Cut N Core
Excavation Crew:
Excavation Equip.: CAT 430E Backhoe
Excav. Dimensions: 36 inches

TEST PIT LOG TP-6

Latitude: 33.21125° N
Longitude: 117.29333° W
Approximate Surface Elevation (ft): 374.0

Surface Condition: Bare Earth and Grass

			FIELD EXPLORATION			LABORATORY RESULTS							
Approximate Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
			<u>**Artificial Fill**</u> **Clayey SAND (SC)**: trace gravel, fine to coarse grained, non-plastic fines, light brown, moist, dense	1	☒								
370			**Silty SAND (SM)**: fine to coarse grained, non-plastic fines, gray, moist, dense, weakly cemented chunks mixed	2	☒								
	5												
365													
	10												
360													
	15												
355													
	20												
350													
	25												
345													
	30												
340													

The test pit was terminated at approximately 9.5 feet below ground surface. Test Pit was backfilled with excavated material on April 23, 2012.

<u>GROUNDWATER LEVEL INFORMATION:</u>
Groundwater was not encountered during excavation.
<u>GENERAL NOTES:</u>
The test pit location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the test pit with an accuracy of 5 to 10 feet.
There was no shoring used for the test pit exploration.

TP-6

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO. 124202
DRAWN BY: EK
CHECKED BY: DH
DATE: 5/7/2012
REVISED:

TEST PIT LOG TP-6

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE
A-22

Date Begin - End:	4/23/12	**Excavation Co.:**	Cut N Core
Logged By:	E. Koprulu	**Excavation Crew:**	
Hor.-Vert. Datum:	NAD83 - NAD83	**Excavation Equip.:**	CAT 430E Backhoe
Angle from Vert.:	0 degrees	**Excav. Dimensions:**	36 inches
Weather:	Sunny		

TEST PIT LOG TP-7

Latitude: 32.21111° N
Longitude: 117.29319° W
Approximate Surface Elevation (ft): 373.0

Surface Condition: Bare Earth and Grass

			FIELD EXPLORATION			LABORATORY RESULTS								
Approximate Elevation (feet)	Depth (feet)	Graphical Log		Sample Number	Sample Type	USCS Symbol	Moisture Content (%)	Dry Density (pcf)	Passing No.4 Sieve (%)	Passing #200 Sieve (%)	Liquid Limit (NV=No Value)	Plasticity Index (NP=No Plasticity)	Other Tests/ Remarks
		▨	**Artificial Fill** **Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, light brownish gray, moist, dense	1	☒								
		▨	**Silty SAND (SM)**: fine to medium grained, non-plastic fines, light gray, moist, dense	2	☒								
370		▨	**Silty SAND (SM)**: coarse grained, non-plastic fines, gray, moist, dense	3	☒								
	5	▨	**Clayey SAND (SC)**: fine to coarse grained, non-plastic fines, gray, moist, dense	4	☒								
365													
	10												
360													
	15												
355													
	20												
350													
	25												
345													
	30												
340													

The test pit was terminated at approximately 8 feet below ground surface. Test Pit was backfilled with excavated material on April 23, 2012.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during excavation.
GENERAL NOTES:
The test pit location and elevation are approximate and were estimated by BHA, Inc.
A Garmin etrex GPS unit was used to locate the test pit with an accuracy of 5 to 10 feet.
There was no shoring used for the test pit exploration.

TP-7

KLEINFELDER
Bright People. Right Solutions.
5015 Shoreham Place
San Diego, CA 92122
www.kleinfelder.com PH. 858-320-2000 FAX. 858-320-2001

PROJECT NO.	124202
DRAWN BY:	EK
CHECKED BY:	DH
DATE:	5/7/2012
REVISED:	

TEST PIT LOG TP-7

SDG&E OCEAN RANCH SUBSTATION
PACIFIC COAST BUSINESS PARK
OCEANSIDE, CALIFORNIA

PLATE

A-23

APPENDIX B

LABORATORY TESTRESULTS

APPENDIX B
LABORATORY TEST RESULTS

GENERAL

Laboratory tests were performed on selected, representative samples as an aid in classifying the soils and to evaluate the condition of the existing soils and physical properties of the soils that may affect foundation design and construction procedures. A description of our laboratory testing program is presented below.

CLASSIFICATION

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. Soil classifications are indicated on the Boring Log and Test Pit excavation sheets in Appendix A.

MOISTURE CONTENT AND DRY UNIT WEIGHT

Natural moisture content and dry unit weight tests were performed on eleven drive samples collected from the borings in accordance with ASTM D 2216 and D 2937, respectively. The results of these tests are presented on the Logs of Borings in Appendix A.

EXPANSION INDEX TEST

Three expansion index (EI) tests were performed on select samples obtained during our investigation. The tests were performed in general accordance with ASTM D4829. The corrected expansion index for the samples are presented in Table B1. The test results indicate a very low to medium expansion potential when compared to Table B2 to qualitatively evaluate the expansion potential of the site soils.

Table B1
Expansion Index Test Results

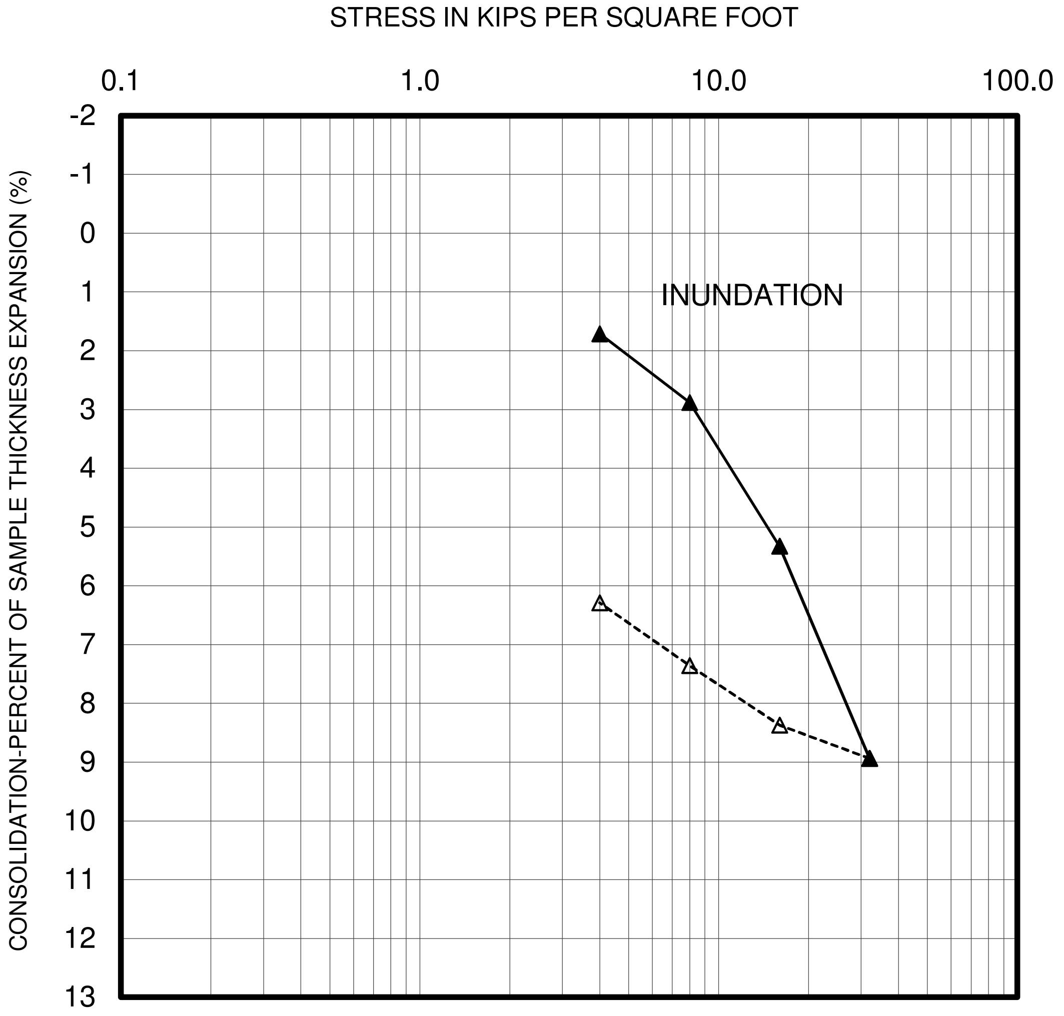
Boring	Depth (ft)	Soil Type	EI
B-1	0.5-4	Clayey Sand	54
TP-1	0-5	Silty Sand	5
TP-3	0-3	Clayey Sand	29

Table B2
ASTM D 4829 Expansion Index and Potential

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

CONSOLIDATION TEST

Two consolidation tests were performed on soils samples of the alluvium / colluvium to aid in evaluating the compressibility of the soils when subjected to new loads. The tests were performed in general accordance with ASTM Test Method D 2435. The results of the test are presented on Plates B1 and B2.



- - -●- - - Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
- - -△- - - Rebound Cycle

Boring No.	**B4**
Sample No.	**17**
Depth	**75'-76.5'**
Sample Description	very dark brown clay

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

KLEINFELDER
Bright People. Right Solutions.

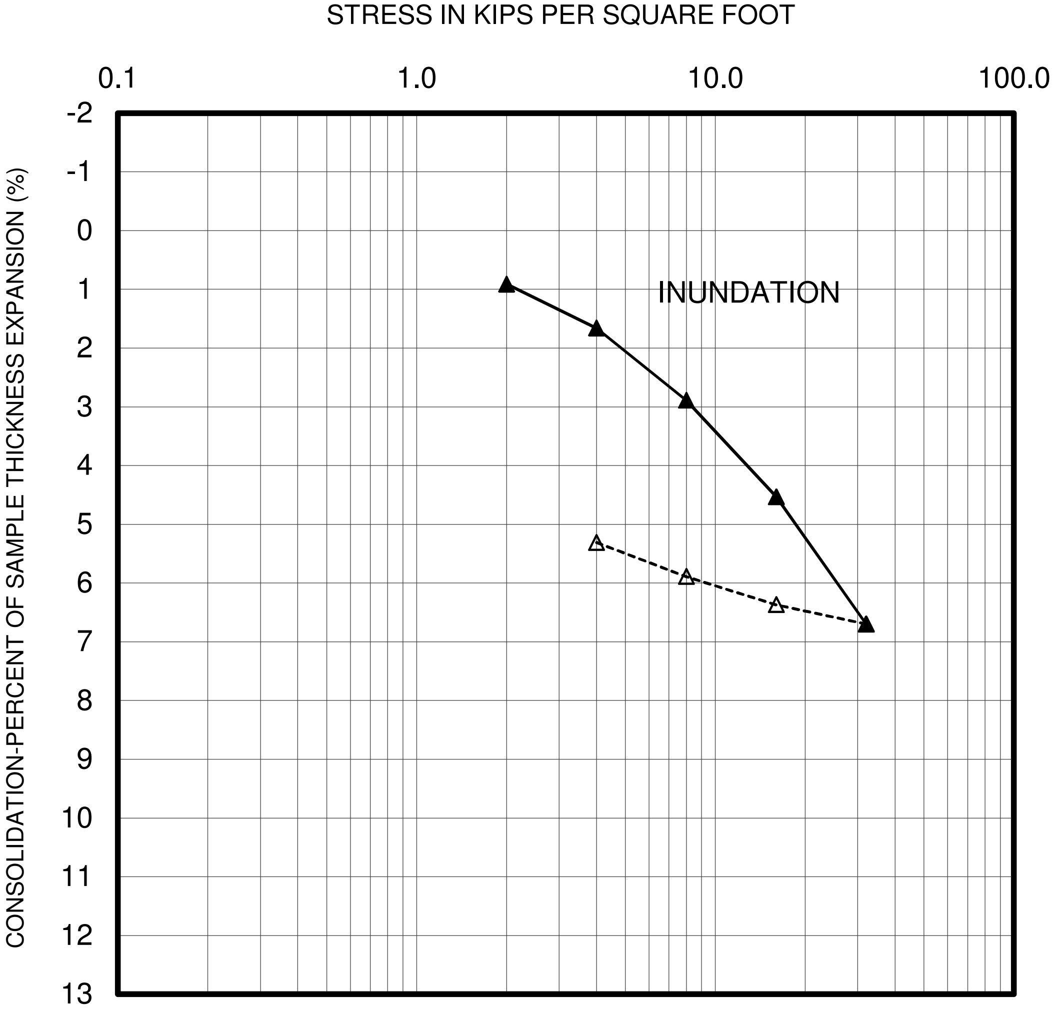
Checked by:		Tech	Uly
Project No.	124202	Date:	5/24/2012

CONSOLIDATION TEST

SDG&E Ocean Ranch Substation
Pacific Coast Business Park
Oceanside, California

Plate

B1



- - ● - - -	Seating Cycle	**Boring No.**	**B6**
——●——	Loading Prior to Inundation	**Sample No.**	**11**
——▲——	Loading After Inundation	**Depth**	**75'-76.5'**
- - △ - - -	Rebound Cycle	**Sample Description**	dark yellowish brown sandy clay

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435

KLEINFELDER
Bright People. Right Solutions.

Checked by:		Tech	Uly
Project No.	124202	Date:	5/24/2012

CONSOLIDATION TEST

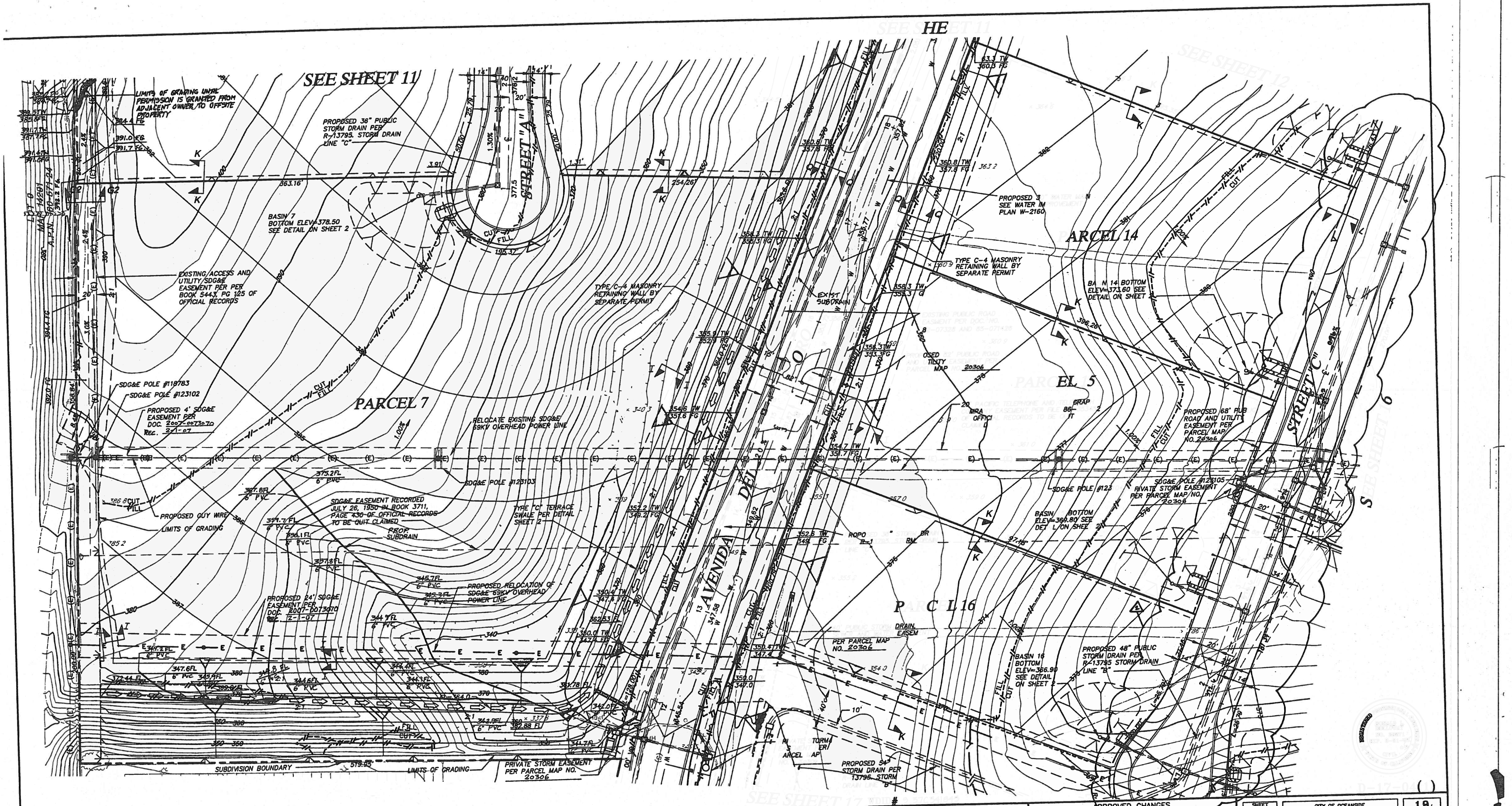
SDG&E Ocean Ranch Substation
Pacific Coast Business Park
Oceanside, California

Plate

B2

APPENDIX C

AS-BUILT GRADING PLANS (2008)



AS-BUILT PLANS

R. Holloway 2-28-09

RONALD L. HOLLOWAY DATE
RCE 29271 EXP. 3-31-09

bHA, Inc.
land planning, civil engineering, surveying
5115 AVENIDA ENCINAS
SUITE "L"
CARLSBAD, CA. 92008-4387
(760) 931-8700

APPROVED CHANGES

NO.	DESCRIPTION	APPV'D	DATE
2	RAISE STREET "C"	M E	1/5/07
	AS-BUILT	SR	3-6-09

BENCH MARK

DESCRIPTION: CITY OF OCEANSIDE D-23 A CHISELED SQUARE IN THE TOP OF THE CURB AT THE NORTHEAST CURB RETURN AT OCEANSIDE BOULEVARD AND PEACOCK

RECORD FROM: CITY OF OCEANSIDE LEVEL BOOK US A E 2

ELEVATION: 338.173 DATUM: NAVD 29

SHEET 15

CITY OF OCEANSIDE
ENGINEERING DEPARTMENT

19 SHEETS

ROUGH GRADING PLAN FOR:
PACIFIC COAST BUSINESS PARK
PARCELS 7 & 14 - 16

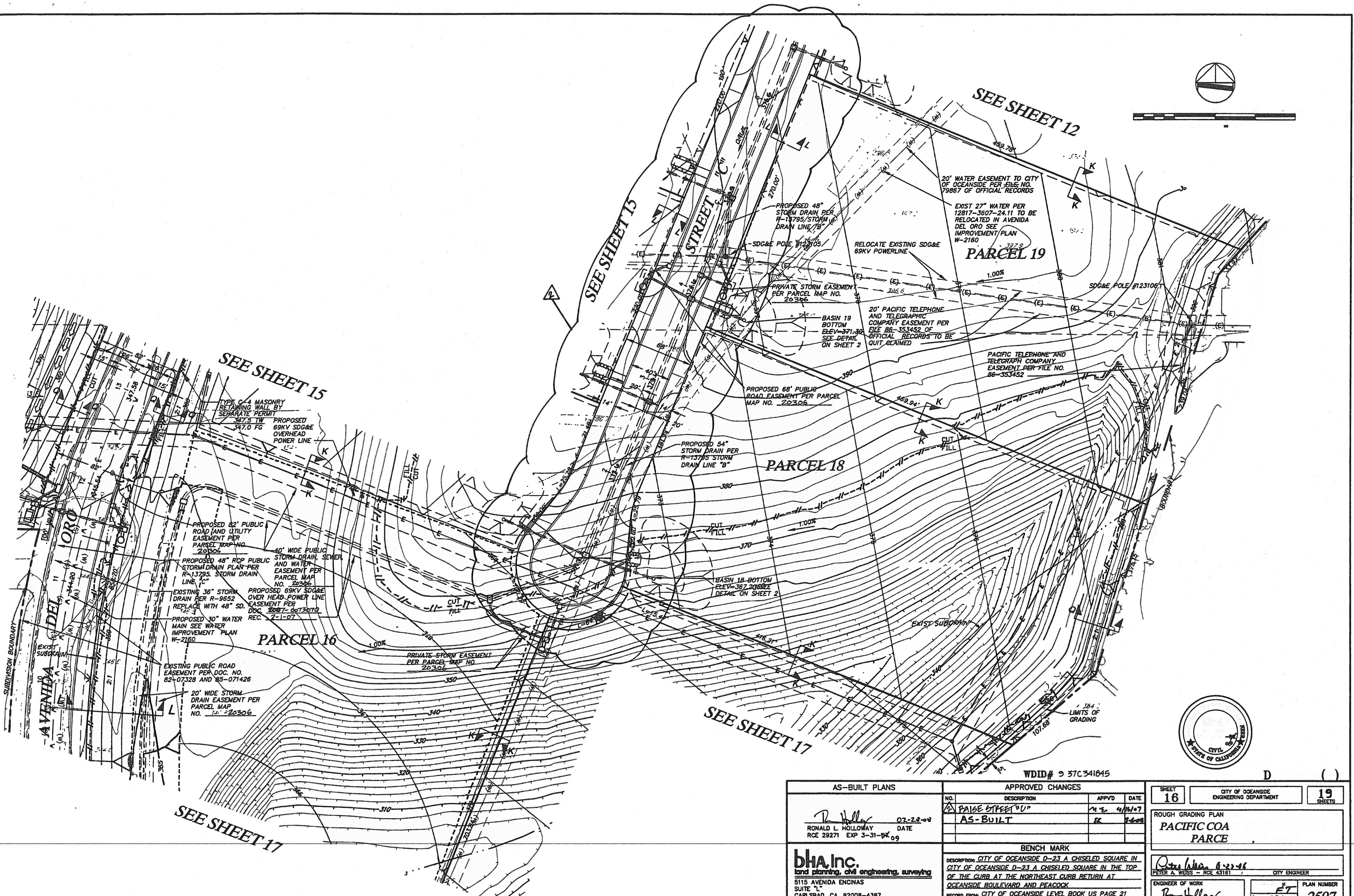
Peter Weiss 8-22-06
PETER A. WEISS – RCE 43161 CITY ENGINEER

ENGINEER OF WORK
R. Holloway
RONALD L. HOLLOWAY R.C.E. 29271

Checked By: FT
Approval Date:

PLAN NUMBER
2597

K:\Land Projects 3\707-0957-400\DWG\RGP\Rough Grading Plans\ACAD-RGP-SHT-15.dwg 4/20/2006 5:09:06 PM PDT



WDID# 9 37C341845

D ( )

AS-BUILT PLANS	
R. Holloway	02-28-08
RONALD L. HOLLOWAY RCE 29271 EXP 3-31-~~07~~09	DATE

APPROVED CHANGES			
NO.	DESCRIPTION	APPV'D	DATE
2	RAISE STREET "U"	M.E.	4/16/07
	AS-BUILT	SR	3-6-08

bHA, Inc.
land planning, civil engineering, surveying
5115 AVENIDA ENCINAS
SUITE "L"
CARLSBAD, CA. 92008-4387
(760) 931-8700

BENCH MARK
DESCRIPTION: CITY OF OCEANSIDE D-23 A CHISELED SQUARE IN CITY OF OCEANSIDE D-23 A CHISELED SQUARE IN THE TOP OF THE CURB AT THE NORTHEAST CURB RETURN AT OCEANSIDE BOULEVARD AND PEACOCK
RECORD FROM: CITY OF OCEANSIDE LEVEL BOOK US PAGE 21
ELEVATION: 338.175 DATUM: NAVD 29

SHEET 16
CITY OF OCEANSIDE ENGINEERING DEPARTMENT
19 SHEETS

ROUGH GRADING PLAN
PACIFIC COA
PARCE ,

Peter Weiss 6-23-06
PETER A. WEISS - RCE 43181 CITY ENGINEER

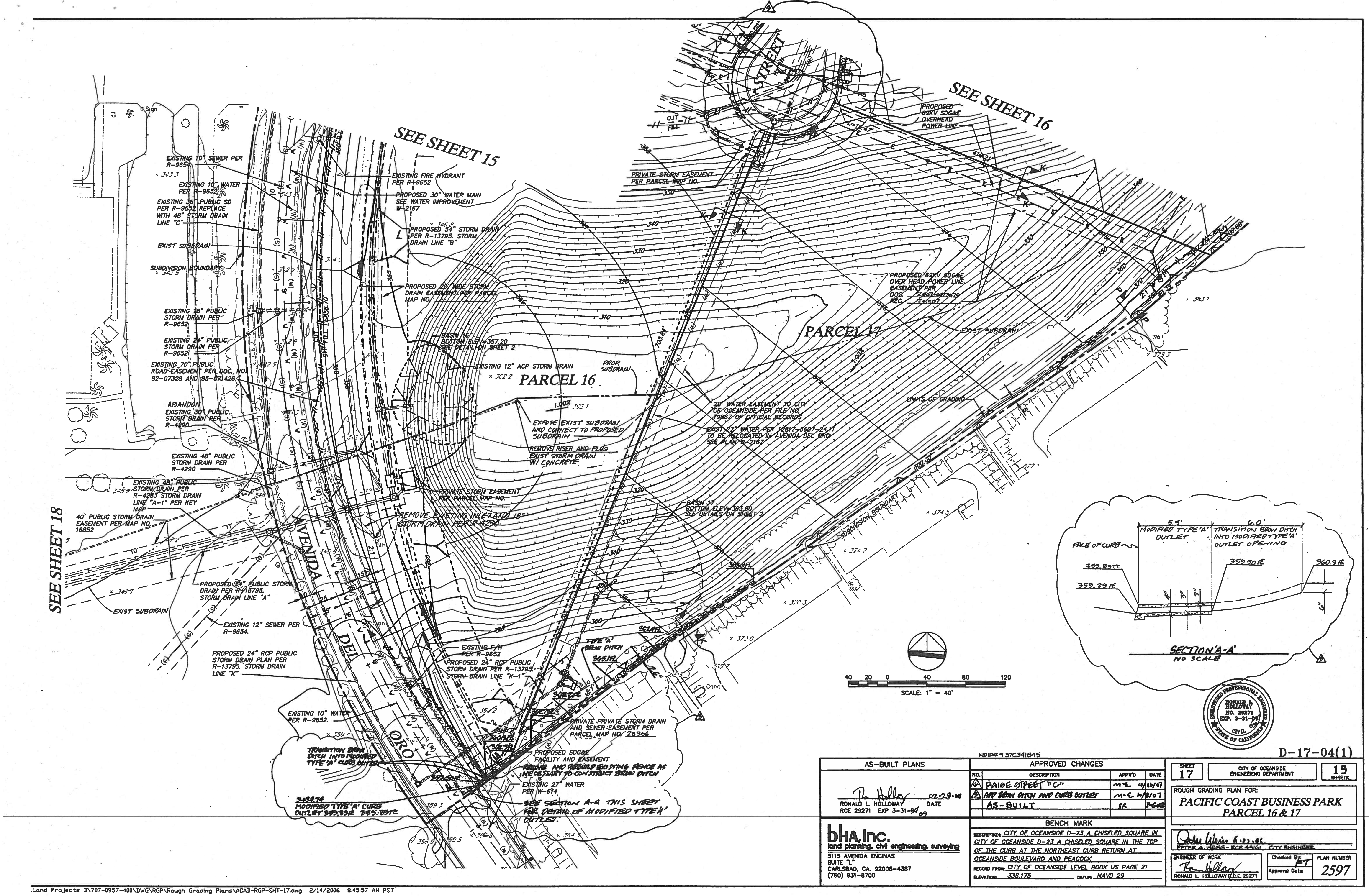
ENGINEER OF WORK
R. Holloway
RONALD L. HOLLOWAY R.C.E. 29271

ET
Approval Date:

PLAN NUMBER
2597

CIVIL
STATE OF CALIFORNIA

K:\Land Projects 3\707-0957-400\DWG\RGP\Rough Grading Plans\ACAD-RGP-SHT-16.dwg 4/20/2006 5:12:14 PM PDT



D-17-04(1)

WDID# 9 37C341845

AS-BUILT PLANS
R. Holloway 02-29-08
RONALD L. HOLLOWAY DATE
RCE 29271 EXP 3-31-~~07~~ 09

APPROVED CHANGES

NO.	DESCRIPTION	APPV'D	DATE
1	RAISE STREET "C"	M-E	9/18/07
2	ADD BROW DITCH AND CURB OUTLET	M-E	10/3/07
	AS-BUILT	SR	3-6-08

BENCH MARK

DESCRIPTION: CITY OF OCEANSIDE D-23 A CHISELED SQUARE IN CITY OF OCEANSIDE D-23 A CHISELED SQUARE IN THE TOP OF THE CURB AT THE NORTHEAST CURB RETURN AT OCEANSIDE BOULEVARD AND PEACOCK

RECORD FROM: CITY OF OCEANSIDE LEVEL BOOK US PAGE 21

ELEVATION: 338.175 DATUM: NAVD 29

bHA, Inc.
land planning, civil engineering, surveying
5115 AVENIDA ENCINAS
SUITE "L"
CARLSBAD, CA. 92008-4387
(760) 931-8700

SHEET 17 | CITY OF OCEANSIDE ENGINEERING DEPARTMENT | 19 SHEETS

ROUGH GRADING PLAN FOR:
PACIFIC COAST BUSINESS PARK
PARCEL 16 & 17

Peter Weiss 6-22-06
PETER A. WEISS - RCE 43161 CITY ENGINEER

ENGINEER OF WORK
R. Holloway
RONALD L. HOLLOWAY R.C.E. 29271

Checked By: FT
Approval Date:

PLAN NUMBER 2597

RONALD L. HOLLOWAY NO. 29271 EXP. 3-31-~~08~~ 09 CIVIL

.Land Projects 3\707-0957-400\DWG\RGP\Rough Grading Plans\ACAD-RGP-SHT-17.dwg 2/14/2006 8:45:57 AM PST

2597(17)

APPENDIX D

ASFE INSERT

Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org