CHRISTIAN WHEELER
ENGINEERING

SUPPLEMENTAL PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

LAKE JENNINGS MARKETPLACE
LAKE JENNINGS PARK ROAD AND OLDE HWY 80
SAN DIEGO COUNTY, CALIFORNIA

RECORD ID: PDS2014-GPA-14-005; PDS2014-REZ-14-004; PDS2014-TM-5590;
PDS2014-STP-14-109; PDS2014-MUP-15-15-004
ENVIRONMENTAL LOG NO.: PDS2014-ER-14-14013

SUBMITTED TO

SOUTH COAST DEVELOPMENT, LLC
POST OFFICE BOX 1053
SOLANA BEACH, CALIFORNIA 92075

SUBMITTED BY

CHRISTIAN WHEELER ENGINEERING
3980 HOME AVENUE
SAN DIEGO, CALIFORNIA 92105

CHRISTIAN WHEELER
ENGINEERING

June 25, 2014

South Coast Development, LLC
Post Office Box 1053
Solana Beach, California 92075
Attention: Keith Gregory

CWE 2140061.02R

Subject: Supplemental Preliminary Geotechnical Investigation Report
Lake Jennings Marketplace, Lake Jennings Park Road and Olde Highway 80
San Diego County, California

Record ID: PDS2014-GPA-14-005; PDS2014-REZ-14-004; PDS2014-TM-5590; PDS2014-STP-14-019; PDS2014-MUP-15-004

Environmental Log No.: PDS2014-ER-14-14013

Reference: Southern California Soil & Testing, Inc., Report of Preliminary Geotechnical Investigation, Lake Jennings Village, SCS&T 0511183, Report No. 1, dated February 21, 2008.

Dear Mr. Gregory,

In accordance with your request, and our proposal dated February 20, 2014, we have completed a supplemental geotechnical investigation for the subject project. We are presenting herewith the supplemental report with our findings and recommendations.

In general, we found that the subject site is suitable for the proposed development, provided the recommendations provided herein are followed. The main geotechnical conditions encountered that will affect the proposed project include potentially compressible soils, hard metamorphic rock, and cut/fill transitions. These conditions are discussed in the attached report.

If you have any questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,

CHRISTIAN WHEELER ENGINEERING

Daniel B. Adler, RCE # 36037

REGISTERED PROFESSIONAL ENGINEER
DANIEL B. ADLER
No. 36037
CIVIL
STATE OF CALIFORNIA

Troy S. Wilson, CEG # 2551

PROFESSIONAL GEOLOGIST
TROY S. WILSON
No. 2551
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

DBA:TSW
cc: Keith@scd2.com

TABLE OF CONTENTS

PAGE

TABLES

FIGURES

PLATES

APPENDICES

SUPPLEMENTAL PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

LAKE JENNINGS MARKETPLACE
LAKE JENNINGS PARK ROAD AND OLDE HWY 80
SAN DIEGO COUNTY, CALIFORNIA

INTRODUCTION

This report presents the supplemental preliminary geotechnical investigation performed for the proposed shopping center to be located at the southeastern intersection of Lake Jennings Park Road and Olde Highway 80, in San Diego County, California. Figure Number 1-3, in Appendix H of this report, presents the regional, vicinity and responsibility area maps.

To assist in the preparation of this report, we have been provided with a Preliminary Site Plan prepared by Smith Consulting Architects, dated December 13, 2013, and a preliminary grading plan prepared by Stuart Engineering, dated March 26, 2014. A copy of the grading plan was used as the base for our Site Plan and Geotechnical Map and is included herewith as Plate No. 1. In addition, we were provided with a "Report of Preliminary Geotechnical Investigation, Lake Jennings Village" prepared by Southern California Soil & Testing, Inc. (SCS&T), dated February 21, 2008. The subsurface exploration logs and laboratory test results from the SCS&T geotechnical report are included in Appendix C.

This report has been prepared for the exclusive use of Southcoast Development, LLC and its design consultants for specific application to the project described herein. Should the project be changed in any way, the modified plans should be submitted to Christian Wheeler Engineering for review to determine their conformance with our recommendations and to determine whether any additional subsurface investigation, laboratory testing and/or recommendations are warranted. Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, express or implied.

PROJECT LOCATION

The project is located in east San Diego County near the community of Lakeside in East San Diego County, south of Old Highway 80, and east of Lake Jennings Park Road (Figures 1 and 2). The project site is mapped within the State Responsibility Area (Figure 3).

PROJECT DESCRIPTION

The proposed project is a commercial shopping center located on an existing vacated site. Work to be done including supporting infrastructure such as sewer, road improvements and utilities, the vacation of an existing paved road, and dedication of a biological open space easement on an approximately 13.10 acre site.

COMMERCIAL SHOPPING CENTER: The project proposes to construct a commercial shopping center with 76,100 square feet (sf) of building area. The project would include six structures, all of which will be located on individual lots. The development will include the following:

1. Market Building (Building A – 43,000 sf) located along the east side of the project site.
2. Financial Building with drive through (Building B – 4,500 sf) located on the northeast intersection of Olde Highway 80 and the proposed signalized project entrance on Olde Highway 80.
3. Restaurant with drive through (Building C – 3,500 sf) located on the northwest intersection of Olde Highway 80 and the proposed signalized project entrance on Olde Highway 80.
4. Restaurant-Retail Building (Building D – 9,600 sf) located along the southern boundary of the project's developed area.
5. Gas Station with convenience store and car wash (43,800 sf pad) at the intersection of Olde Highway 80 and Lake Jennings Park Road, and Commercial Building (Building E – 3,000 sf) located directly south of the gas station.
6. Restaurant-Retail Building (Building F – 12,500 sf) located along the southern boundary of the project's developed area. Building F shares a common wall with Building D.

TRAIL COMPONENT: The project will construct a multi-use trail suitable for pedestrians and equestrian users. The trail will be 10 feet wide and constructed of decomposed granite material. The trail segments adjacent to the two public streets are proposed as standard trail pathways per the Park Lands Dedication Ordinance (PLDO). The trail segment within the open space lot will run along the southern edge of the development area (immediately north of the proposed open space area) within a 20 foot wide trail easement and will include a 10 foot wide treadway.

ACCESS: The project requires four access points; one from Ridge Hill Road located on the west side of the project, and three others located along Olde Highway 80; a right-in (only) approximately 200 feet east of the intersection of Olde Highway 80 and Lake Jennings Park Road, a full signalized project entry half way along the project frontage, and a second non-signalized project entry (right in – right out only) near the northeast corner of the property.

WALLS AND SIGNAGE: There will be a comprehensive coordinated sign program designed for the project. It includes a Freeway Pylon Display, Monument Center ID Displays, Monument Signage at the signalized entrance on Olde Highway 80, and a state required Gas Pricing Sign for the gas station, convenience store and car wash Pad.

PARKING: The project proposes 389 parking spaces. The project parking is almost entirely located within the central portion of the site and will largely be out of the casual view of traffic on Lake Jennings Park Road and Olde Highway 80. The County of San Diego Zoning Ordinance requires a total of 389 parking spaces to be provided by the proposed project based on the size and uses proposed in the buildings. Therefore, the project meets the parking requirements of the County of San Diego Zoning Ordinance.

LANDSCAPING PLAN: A landscape plan has been prepared for the project. The landscape plan incorporates a variety of species that are intended to provide a visual buffer from Interstate 8 and be compatible with the riparian zone associated with Los Coches Creek. The plant palette reflects a selection of native plant material which can naturally be found in riparian zones of Southern California.

PROJECT SCOPE

Our supplemental geotechnical report was intended to provide updated recommendations for the currently planned design and construction. The supplemental geotechnical investigation consisted of surface reconnaissance, subsurface exploration, laboratory tests, analysis of the field and laboratory data, and review of the SCS&T geotechnical report and relevant geologic literature. In consideration of the conditions at the site, the proposed construction, and site access constraints, the following services were provided as part of our supplemental investigation. Our scope of service did not include assessment of hazardous substance contamination, recommendations to prevent floor slab moisture intrusion or the formation of mold within the structures, evaluation or design of storm water infiltration facilities, or any other services not specifically described in the scope of services presented below.

- Perform minor grading to provide access for subsurface exploration equipment to the southern portion of the site.
- Excavate six backhoe trenches in order to explore the existing soil conditions.
- Backfill the trenches with the removed soil. It should be noted that the soil was not compacted and will need to be removed and replaced as compacted fill during the site grading.
- Obtain a boring permit from the County of San Diego Department of Environmental Health to conduct the proposed subsurface investigation.
- Perform approximately ten Cone Penetration Tests (CPT) and seven small-diameter borings in order to explore the existing soil conditions.
- Backfill the CPT holes and borings using a grout or a grout/bentonite mix as required by the County of San Diego Department of Environmental Health.
- Evaluate, by review of the CPT results, limited laboratory tests, and our experience with similar soils, the engineering properties of the various soil strata that may influence the proposed construction, including bearing capacities, expansive characteristics and settlement potential.
- Describe the general geology at the site, including possible geologic hazards that could have an effect on the proposed construction, and provide the seismic design parameters as required by the 2013 edition of the California Building Code.
- Address potential construction difficulties that may be encountered due to soil conditions, groundwater or geologic hazards, and provide recommendations concerning these problems.
- Quantitatively address the potential for soil liquefaction and dynamic settlement at the site in the event of a design level seismic event.
- Provide preliminary site preparation and grading recommendations for the anticipated work.
- Provide preliminary foundation recommendations for the type of construction anticipated.
- Provide preliminary pavement recommendations.
- Provide a supplemental preliminary geotechnical report that presents the results of our investigation which includes a plot plan showing the location of our subsurface explorations, excavation logs, laboratory test results, and our conclusions and recommendations for the proposed project.

Although tests for the presence of soluble sulfates within the soils that may be in contact with reinforced concrete were performed as part of the original SCS&T geotechnical investigation, it should be understood Christian Wheeler Engineering does not practice corrosion engineering. If such an analysis is considered necessary, we recommend that the client retain an engineering firm that specializes in this field to consult with them on this matter. The results of these tests should only be used as a guideline to determine whether additional testing and analysis is necessary.

FINDINGS

SITE DESCRIPTION

The subject site is an irregular-shaped property located southeast of the intersection of Lake Jennings Park Road and Olde Highway 80 in San Diego County, California. The site covers approximately 13 acres. The property is bounded on the north by Olde Highway 80, on the east by Rios Canyon Road and commercial property, on the west by Ridge Hill Road and vacant land, and on the south by rural residential property and Los Coches Creek. Pecan Lane traverses the northern portion of the site in an east-west direction. Additional existing improvements include several abandoned residential structures. Two cultural open easement areas exist in the south central portion of the site. Topographically, the majority of the site slopes gently in a general southwesterly direction. However, a relatively small hillside exists at the northwestern corner of the site. In addition, descending slopes associated with the Los Coches Creek bank exist at the southern portion of the site. Elevations range from about 692 feet the northeastern corner of the site to about 649 feet at the southwestern corner.

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located in the Foothills Physiographic Province of San Diego County. Based on the results of our subsurface explorations and review of pertinent, readily available geologic literature, we have determined that the site is underlain by Jurassic and Cretaceous-age metamorphic rock, Quaternary-age colluvium and alluvium, residual soils, and man-placed fill materials (see Plates No. 1 through 4). These materials are described individually below:

ARTIFICIAL FILL (Qaf): Man-placed fill soil was encountered in the northeastern portion of the site and is associated with existing improvements. It is anticipated that additional fill soils exist locally in other portion of the site. Within the subsurface explorations, the maximum fill depths encountered were approximately 4 feet below existing grade. The existing fill soils typically consisted of brown, humid, loose, silty sand (SM) with some cobble. The fill material was judged to possess a low expansion index (EI between 21 and 50).

RESIDUAL SOILS: Residual soils comprised of topsoil and subsoil was encountered in several of the subsurface explorations. In general, where encountered, the residual soils were observed at grade. However, in some cases the residual soils was observed underlying the artificial fill. The residual soils extend to a combined maximum depth of about 3 feet. The topsoil consists of dark

brown and grayish-brown, humid to moist, loose, silty sand (SM). The subsoil consists of grayish-brown and brown, damp, loose to medium dense, silty sand (SM) and clayey sand (SC). The residual soils were judged to possess a low expansion index (EI between 21 and 50).

YOUNGER ALLUVIUM (Qya): Although younger alluvium was not encountered within our subsurface investigation, this material is expected to overlie the metamorphic rock in Los Coches Creek at the southern edge of the site. The alluvium is expected to consist primarily of humid to saturated, loose to medium dense, silt and sand mixtures (SM, SP, and SW).

COLLUVIUM (Qcol): Colluvium was encountered underlying the majority of the property with the exception of its northeastern portion. In general, the colluvial soils ranged in thickness from a few feet up to about 30 feet (boring B-5). The colluvium typically consisted of brown, dark brown and reddish-brown, humid to saturated, loose to medium dense, silty sand (SM), well graded sand (SW) with silt and gravel; soft, sandy silt, and sandy silt with clay (ML). The colluvium was judged to possess a low expansion index (EI= 38 and 42).

JURASSIC AND CRETACEOUS METAMORPHIC ROCK (KJms): Jurassic and Cretaceous-age metamorphic rock was encountered at grade in the northeastern corner of the site and underlying the fill soils and colluvium and alluvium in all other areas of the site. The rock generally consisted of gray, olive gray, and brown material that, when decomposed, breaks down into a silty sand with gravel and cobble (SM) and sandy gravel with silt and cobble (GM). Hard rock outcrops exist at the northeastern portion of the property. In addition, the subsurface explorations encountered refusal at varying depths as noted in the exploration logs. The rock ranges from decomposed to hard, and based on our observations, some of the rock appears to be non-rippable. In addition, hard rock floaters may exist within the decomposed portion of the rock as well within the colluvium and alluvium. The decomposed rock was judged to have a very low expansion potential (EI<20).

ANTICIPATED PROPOSED BUILDING PADS GEOLOGIC CONDITIONS: The generalized geologic conditions anticipated for each proposed building pads are summarized hereinafter based on the subsurface explorations performed in conjunction with this supplemental investigation and the information provided in the SCT&T report. It should be understood that the following descriptions are based on limited data and may differ substantially from the conditions encountered during grading.

PROPOSED BUILDING PAD A: Proposed grading for Building Pad A will consist of cuts and fills up to about 23 feet and 4 feet deep, respectively. It is anticipated that the majority of the cut

portion of the pad will expose metamorphic rock at finish grade elevations. However, a contact with relatively deep colluvium may exist near the southern edge of the proposed structure (T-16 SCT&T). Large hard rock outcrops exist at the northern portion of the pad. Our recent borings (B-6 and B-7) indicate that the rock is rippable to a depth of about 9 feet below existing grade.

PROPOSED BUILDING PAD B: Proposed grading for Building Pad B will consist of fills up to 5 feet deep. It is anticipated that Building Pad B is underlain by up to about 4 feet of fill soils and/or colluvium. These materials are in turn underlain by metamorphic rock.

PROPOSED BUILDING PAD C: Proposed grading for Building Pad C will consist of fills up to 3 feet deep. It is anticipated that Building Pad C is underlain by fill soils and/or colluvium. The fill soils appear to be relatively shallow and not exceed about 3 feet in depth. The colluvium ranges in depth from about 4 feet to 13 feet below existing grade. The colluvium is underlain by metamorphic rock. The contact between the colluvium and the rock dips sharply to the south and west.

PROPOSED BUILDING PADS D AND F: Proposed grading for Building Pads D and F will consist of fills up to 13½ feet deep. It is anticipated that Building Pads D and F are underlain by colluvium ranging in depth from about 11 feet to at 22 feet below existing grade. The colluvium is underlain by metamorphic rock. The contact between the colluvium and the rock dips to the south and east.

PROPOSED BUILDING PAD E: Proposed grading for Building Pad E (including pump canopies) will consist of cuts up to 13½ feet deep. It is anticipated that grading will expose metamorphic rock at proposed finish grade elevations. The borings performed by SCS&T (B-7 and B-8) indicate that the rock is rippable to a depth of about 8 feet below existing grade.

GROUNDWATER: Groundwater was not encountered in any of our recent subsurface explorations. However, groundwater perched on the underlying rock was encountered during the SCS&T investigation in trenches T-4, T-10, T-11 and borings B-4 and B-5 at depths ranging from about 13 feet to 18 feet below existing grade. In addition, seepage was encountered in trench T-14 at a depth of about 4 feet at the contact between colluvium and decomposed rock. It appears that the groundwater and seepage encountered during the SCS&T investigation (October 2005) is seasonal and/or related to periods of increased precipitation. The groundwater potential effect on the proposed grading or construction should be evaluated prior to the beginning of grading operations. At the present time, we do not anticipate that any groundwater-related problems will be encountered either during or after the proposed construction. However, it should be

recognized that minor groundwater seepage problems might occur after construction and landscaping at a site even where none were present before construction. These are usually minor phenomena and are often the result of an alteration in drainage patterns and/or an increase in irrigation water. Based on the anticipated construction and landscaping, it is our opinion that any seepage problems that may occur will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and when they occur.

TECTONIC SETTING: It should be noted that much of Southern California, including the San Diego County area, is characterized by a series of Quaternary-age fault zones that consist of several individual, en echelon faults that generally strike in a northerly to northwesterly direction. Some of these fault zones (and the individual faults within the zones) are classified as "active" according to the criteria of the California Division of Mines and Geology. Active fault zones are those that have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,000 years). The Division of Mines and Geology used the term "potentially active" on Earthquake Fault Zone maps until 1988 to refer to all Quaternary-age faults for the purpose of evaluation for possible zonation in accordance with the Alquist-Priolo Earthquake Fault Zoning Act. The Alquist-Priolo Act requires the State Geologist to zone faults that are "sufficiently active" and "well-defined" to have a relatively high potential for ground rupture. The Division of Mines and Geology no longer uses the term "potentially active."

The nearest active fault zone is the Rose Canyon Fault Zone, which is located approximately 26 kilometers to the west. Other active fault zones in the region that could possibly affect the site include the Rose Canyon, Coronado Bank and Palos Verde Fault Zones to the west and the Elsinore, Earthquake Valley, San Jacinto, and San Andreas Fault Zones to the northeast.

GEOLOGIC HAZARDS

GENERAL: The site is located in an area where the risks due to significant geologic hazards are relatively low. No geologic hazards of sufficient magnitude to preclude use of the site for residential purposes are known to exist. In our professional opinion and to the best of our knowledge, the site is suitable for the proposed improvements.

SURFACE RUPTURE: There are no known *active* faults that traverse the subject site. Our review of the referenced reports indicates that faulting was not observed on the subject site during the investigations or during the grading operation; therefore, it is our professional opinion that the potential for surface rupture on the subject site is very low.

LANDSLIDE POTENTIAL AND SLOPE STABILITY: The Relative Landslide Susceptibility and Landslide Distribution Map of the El Cajon Quadrangle prepared by the California Division of Mines and Geology (Tan, 1995) indicate that the site is situated within Relative Landslide Susceptibility Area 3-1. Area 3-1 is considered to be "generally susceptible" to slope failures. Based on the findings of this investigation, it is our professional opinion that the potential for slope failures within the site is relatively low.

FLOODING: According to the maps prepared by the Federal Emergency Management Agency, the southern portion of the site near the Los Coches Creek is located within Zone A, which is considered within the 100-year floodplain.

TSUNAMIS: Tsunamis are great sea waves produced by submarine earthquakes or volcanic eruptions. The site is not subject to risk from tsunamis.

SEICHES: Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. The site will not be affected by seiches.

LOS COCHES CREEK: The Los Coches Creek traverses the southern portion of the site in a westerly direction. Although no surface flow was observed at the time of our recent subsurface investigation, surface flow was observed at the time of the SCS&T investigation (October 2005). Surface flow exists in the creek during the rainy season and may rise substantially during periods of heavy precipitation.

LIQUEFACTION

GENERAL: Based on the potential groundwater elevation and the density of the underlying fill and natural material, it is our professional opinion that the near-surface soils encountered at the site possess a low risk potential for liquefaction. In order to be subject to liquefaction, three conditions must be present: loose sandy or cohesionless silty deposits, shallow groundwater, and earthquake shaking of sufficient magnitude and duration. Based on our site-specific study, it appears that shallow groundwater is present at the site and strong earthquake shaking may affect the site. Additionally, as described in the Geologic Setting and Soil Description section of this report above, the materials below the shallow water table in the project area consist of Holocene-age colluvium and alluvium that contains layers of sand (SP), silty sand (SM), and low to medium plasticity silts (ML) that are expected to have soil properties conducive to liquefaction.

It should be noted that the following discussion is in no way a guarantee that the analysis will accurately predict the liquefaction potential at the site. The analysis provides general information only on the site

liquefaction potential. It should be noted that many of the parameters used in liquefaction evaluations are subjective and open to interpretation, and that much is yet unknown about both the seismicity of the San Diego area and the phenomenon of liquefaction.

DESCRIPTION OF ANALYSIS: Our analysis was performed using the Cliq (version 1.7) software developed by Geologismiki, in which the results of our CPT soundings were input and evaluated in accordance with the procedure recommended by the National Center For Earthquake Engineering Research (NCEER, 1998). Our analyses were limited to the upper 50 feet of soils as liquefaction below that depth is not considered to have a significant effect on surface improvements. An assumed finish grade elevation of 40 feet was used in the analyses. Additionally, an algorithm was applied within the software to make corrections for thin stiff layers embedded within softer zones (Robertson, 2009).

EARTHQUAKE PARAMETERS: As permitted in Section 1803.5.12 of the California Building Code, our calculations were performed using a peak ground acceleration (PGA_M = 0.40g) as determined using the procedures set forth in Section 11.8.3 of ASCE 7-10. We have also performed a seismic hazard deaggregation using the interactive program available on the U. S. Geological Survey website. Within the USGS program, the site coordinates were entered and a deaggregation was performed based on the peak ground acceleration with a two-percent probability of exceedance in 50 years (0.40g) for soil with Vs^{30} = 350 m/s (Soil Site Class D). For the subject site, this yielded a modal earthquake magnitude of 6.2. Based on this result and the proximity of the site to the Rose Canyon and Elsinore Fault Zones, we have used an earthquake magnitude of 6.9 in our liquefaction evaluation.

POTENTIAL FOR LIQUEFACTION: Using the parameters described above, the results of our liquefaction analyses indicate that some of the saturated sandy and silty portions of the colluvium and alluvium within the upper approximately 50 feet possess factors-of-safety against soil liquefaction of less than 1.0 and are therefore considered liquefiable.

POST LIQUEFACTION RECONSOLIDATION SETTLEMENT: The potential amount of total vertical settlement due to reconsolidation of the liquefied soils was estimated within the Cliq software using the methods presented by Zhang et al, 2002. The estimated settlements for the five CPT soundings performed on-site ranged from approximately 0 to 1 inch.

In terms of differential settlement, CGS Special Publication 117 notes that considerable difficulty exists in trying to "reliably estimate" the amount of differential settlement at a site caused by soil liquefaction. As such, a conservative estimate of differential settlement at any given site can be assumed to be two-thirds of

the total liquefaction-induced settlement (CGS, 2008). Using this criterion, without any deep ground modification procedures, the subject project area may be assumed to be subject to approximately ¾ inch of liquefaction-induced, differential settlement.

CONCLUSIONS

In general, it is our opinion and judgment that the subject property is suitable for the proposed development, provided the recommendations provided herein are followed. The main geotechnical conditions encountered that will affect the proposed project include existing potentially compressible fill soils, residual soils and colluvium, non-rippable metamorphic rock, as well as cut/fill transitions. These conditions are discussed hereinafter.

POTENTIALLY COMPRESSIBLE SOILS: The property is underlain by potentially compressible fill soils and residual soils. As encountered in the subsurface explorations, the fill and residual soils extend to a maximum depth of about 4 feet and 3 feet below existing grade, respectively. These materials are considered unsuitable, in their present condition, for the support of settlement sensitive improvements and will require removal and replacement as compacted fill. Colluvium was found underlying the surficial soils throughout the majority of the property. As encountered in the subsurface explorations, these deposits range up to a maximum depth of about 30 feet (SCS&T B-5). Some of these materials were found to be potentially compressible and collapsible upon saturation. It is therefore recommended that these materials be partially removed and replaced as compacted fill as recommended hereinafter. Removal depths will depend on the characteristics of individual improvements and the geotechnical conditions at their proposed locations.

METAMORPHIC ROCK: Metamorphic rock exists at grade or shallow depths at the northwestern, and northeastern and eastern portions of the site. In general, cuts up to about 23 feet in depth are proposed in these areas. It is anticipated that heavy ripping and/or blasting will be necessary to achieve the proposed grades. In addition, undercutting proposed building pads exposing rock at grade is recommended in order to facilitate construction and landscaping. Furthermore, grading in these areas will generate oversized rock requiring special handling.

CUT/FILL TRANSITION: Based on the proposed grading layout, it is anticipated that the structure proposed for Building Pad A will span a cut/fill transition. This condition will be mitigated by the undercuts recommended due to the hard rock anticipated for the majority of the pad. Additional cut/fill transitions may occur in other proposed building pads due to the proposed site

preparation recommendations. It is anticipated that this potential condition will be unlikely or limited in extent. This condition will be addressed as necessary during construction.

RECOMMENDATIONS

GRADING AND EARTHWORK

GENERAL: All grading should conform to the guidelines presented in the California Building Code, the minimum requirements of the County of San Diego, and the Recommended Grading Specifications and Special Provisions attached hereto, except where specifically superseded in the text of this report.

PREGRADE MEETING: It is recommended that a pre-construction meeting including representatives of the owner, grading contractor, and Christian Wheeler Engineering be held to discuss the recommendations of this report and address any issues that may affect grading or construction operations.

OBSERVATION OF GRADING: Continuous observation by the Geotechnical Consultant is essential during the grading operation to confirm conditions anticipated by our investigation, to allow adjustments in design criteria to reflect actual field conditions exposed, and to determine that the grading proceeds in general accordance with the recommendations contained herein.

CLEARING AND GRUBBING: Site grading should begin with the demolition of the existing structures and improvements. The resulting debris as well as all vegetation and any other deleterious materials should be removed from the portions of site that will be graded and/or will receive improvements. The resulting materials should be disposed of off-site. Discing of the vegetation is not considered an appropriate means to remove the vegetation and could result in the requirement that soils contaminated with vegetation be exported from the site.

SITE PREPARATION: Site preparation should begin with the removal of all fill material and residual soils that are not removed by planned grading. Based on our subsurface explorations, the maximum fill and residual soils removal depth is expected to be about 4 feet and 3 feet below existing grade, respectively. Deeper removals may be necessary in areas of the site not investigated. Fill soils associated with the exploratory trenches should also be removed. In addition, existing colluvium underlying the site should be removed. The minimum colluvium removal depth should be 5 feet below existing or proposed grade, whichever is more. However, within the area of proposed Buildings D and F and Building C, the minimum removals depth should be increased to 10 feet. If the colluvium/alluvium underlying a proposed structure is

not removed in its entirety and metamorphic rock is encountered within the removal excavation, additional recommendations may be necessary. This condition will be evaluated during grading operations.

The horizontal limits of the removals should include the entire area of the site to be developed. However, no removals are necessary beyond the proposed retaining wall adjacent to the 100-year flood limit or the toe of the proposed fill slope along the southern edge of the proposed development. Deeper removals for proposed Buildings D and F should extend at least 15 feet beyond the perimeter of the proposed structures. All areas cleaned out of unsuitable soils should be approved by the geotechnical engineer or his representative prior to replacing any of the excavated soils. The excavated materials can be replaced as properly compacted fill in accordance with the recommendations presented in the "Compaction and Method of Filling" section of this report.

PROCESSING FILL AREAS: Prior to placing any new fill soils or constructing any new improvements in areas that have been cleaned out to receive fill, the exposed soils should be scarified to a depth of about 12 inches, moisture-conditioned, and compacted to at least 90 percent relative compaction. In areas to support fill slopes, keys should be cut into the competent supporting materials. The keys should be at least 10 feet wide, and be sloped back into the hillside at least two percent. The keys should extend at least 1 foot into the competent supporting materials. Where the existing ground has a slope of 5:1 (horizontal to vertical) or steeper, it should be benched into as the fill extends upward from the keyway.

CULTURAL OPEN EASEMENT AREAS: Two cultural open easement areas exist in the south central portion of the site. Site preparation in these areas will be limited to the removal of existing vegetation. Shallow fills, up to about 4 feet in depth are proposed in this area. It is recommended that stabilizing fabric such as Mirafi 370 HP is placed over this area prior to fill placement.

CUT AREAS: It is recommended that metamorphic rock underlying the cut areas be undercut to a minimum depth of 4 feet below finish pad grade, 3 feet below the bottom of footings (1 foot below retaining wall footing keys), or deepest anticipated excavation depth, whichever is deepest. Rock undercut should extend at least 5 feet beyond the perimeter of the structure or improvement. In proposed parking areas, the minimum undercut depth and limits may be reduced to 2 feet below proposed subgrade. The undercuts should be performed in such a way that low areas with impaired drainage are not created. Undercut areas should be backfilled with properly compacted, low expansive fill (EI<50).

UNDERGROUND UTILITY EXCAVATIONS: Consideration should be given to undercutting areas to receive proposed underground utilities. Undercut areas should be backfilled with properly compacted, low expansive fill (EI<50).

EXCAVATION CHARACTERISTICS: Non-rippable rock should be anticipated at the northwestern, northeastern and eastern portions of the site at depths ranging from at grade (northeastern corner) to about 9 feet from existing grade. The materials encountered above said depth consist of rippable to moderately rippable soil and rock. Heavy ripping, splitting and/or blasting will be necessary to achieve proposed pad grades and excavations. Proposed cuts in moderately rippable and non rippable rock will likely produce primarily angular gravel-and cobble-size materials up to 12 inches, and/or oversized materials depending on the blasting pattern. Furthermore, this material typically has little to no fines, thus requiring mixing with on-site soils.

OVERSIZED ROCK: Oversized rock is defined as rock exceeding 6 inches in maximum dimension. Oversized rock will be generated from proposed cuts in areas underlain by metamorphic rock. Oversized rock may be broken into smaller pieces, utilized for landscaping purposes and/or placed in accordance with the recommendations contained in the "Compaction and Method of Filling" section of this report, Plate No. 5, or County of San Diego specifications, whichever are more stringent.

GROUNDWATER: Groundwater perched on the metamorphic rock was encountered in some of the subsurface explorations performed by SCS&T (October 2005). It appears that this groundwater is seasonal and/or related to periods of increased precipitation. The groundwater potential effect on the proposed grading or construction should be evaluated prior to the beginning of grading operations.

COMPACTION AND METHOD OF FILLING: Except as noted below, all structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of maximum dry density as determined by ASTM Laboratory Test D1557. Fills should be placed at or slightly above optimum moisture content, in lifts six to eight inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by our soil technicians or project geologist. Fill material should be free of rocks or lumps of soil in excess of six inches in maximum dimension.

Utility trench backfill within 5 feet of the proposed structures and concrete flatwork should be compacted to a minimum of 90 percent of its maximum dry density. The upper 12 inches of subgrade beneath asphalt concrete pavement sections should be compacted to 95 percent of its maximum dry density. This

compaction should be obtained by the paving contractor just prior to placing the aggregate base material. Base material should be compacted to 95 percent of its maximum dry density.

FILL SLOPES: Fill slopes should be compacted by back-rolling with a sheepsfoot compactor at vertical intervals not exceeding 4 feet in vertical dimension as the fill is being placed. The face of fill slopes constructed at a 2:1 (horizontal to vertical) or flatter inclination should also be track-walked when the slope is completed. As an alternative, fill slopes can be overfilled by at least 3 feet and cut back to the compacted core at the design finish contour. However, it is recommended that all fill slopes steeper than 2:1 be overfilled and cut back as previously described.

CUT SLOPES: It is recommended that all cut slopes be observed by the engineering geologist to ascertain that no unforeseen adverse conditions are encountered. Due to the characteristics of the metamorphic rock, zones with out-of-slope fractures requiring stabilization or flattening of the proposed slope may exist in the proposed cut slope. Recommendations to mitigate adverse conditions will be provided as necessary. Consideration should be given to buttressing proposed cut slopes as illustrated on the attached Plate No 6.

SURFACE DRAINAGE: The drainage around the proposed improvements should be designed to collect and direct surface water away from proposed improvements and the top of slopes toward appropriate drainage facilities. Rain gutters with downspouts that discharge runoff away from the structure into controlled drainage devices are recommended.

The ground, as well as pervious hard surfaces around the proposed improvements, should be graded so that surface water flows rapidly away from the improvements without ponding. In general, we recommend that the ground adjacent to structures be sloped away at a minimum gradient of two percent. Densely vegetated areas where runoff can be impaired should have a minimum gradient of five percent for the first 5 feet from the structure. It is essential that new and existing drainage patterns be coordinated to produce proper drainage.

Drainage patterns provided at the time of construction should be maintained throughout the life of the proposed improvements. Site irrigation should be limited to the minimum necessary to sustain landscape growth. Over watering should be avoided. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, zones of wet or saturated soil may develop.

GRADING PLAN REVIEW: The final grading plans should be submitted to this office for review in order to ascertain that the geotechnical recommendations remain applicable to the final plan and that no additional

recommendations are needed due to changes in the anticipated development. Our firm should be notified of changes to the proposed project that could necessitate revisions of or additions to the information contained herein.

FOUNDATIONS

GENERAL: Based on our findings and engineering judgment, it is our opinion that, from a geotechnical standpoint, the proposed structures and associated improvements may be supported on conventional foundations. The following recommendations are considered the minimum based on the anticipated soil conditions provided the recommendations in this report are followed, and are not intended to be lieu of structural considerations. All foundations should be designed by a qualified structural engineer.

FOOTING DIMENSIONS: Spread footings supporting the proposed structures should be embedded at least 18 inches below lowest adjacent finish pad grade. However, footings supporting proposed Buildings D and F should be embedded at least 24 inches below lowest adjacent finish pad grade. Continuous and isolated footings should have minimum width of 12 and 24 inches, respectively. Spread footings supporting miscellaneous exterior improvements should be embedded at least 12 inches below lowest adjacent finish pad grade, and should be at least 12 inches wide. Retaining wall footings should have a minimum embedment of 18 inches below the lowest adjacent grade, and should have a minimum width of 24 inches.

BEARING CAPACITY: Spread footings, with the above minimum dimensions, may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot. This value may be increased by 600 pounds per square foot for each additional foot of embedment depth and 400 pounds per square foot for each additional foot of width, up to a maximum of 4,000 psf. This value may be increased by one-third for combinations of temporary loads such as those due to wind or seismic loads. Property line footings may be designed for an allowable soil bearing pressure of 1,000 pounds per square foot.

FOOTING REINFORCING: Reinforcement requirements for foundations should be provided by a structural engineer. However, based on the expected soil conditions, we recommend that the minimum reinforcing for continuous footings consist of at least 1 No. 5 bar positioned above the bottom of the footing and 1 No. 5 bar positioned below the top of the footing. For Buildings D and F and C we recommend that the minimum reinforcing for continuous footings consist of at least 2 No. 5 bars positioned above the bottom of the footing and 2 No. 5 bars positioned below the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.35. The passive resistance may be considered to be equal to an equivalent fluid weight of 350 pounds per cubic foot. These values are based on the assumption that the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

EXPANSIVE CHARACTERISTICS: The prevailing foundation soils are expected to have a low expansive potential (EI between 21 and 50). The recommendations presented in this report reflect this condition.

SETTLEMENT CHARACTERISTICS: The anticipated total and differential settlement is expected to be less than about one inch and 1 inch over 40 feet, respectively, provided the recommendations presented in this report are followed. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to concrete shrinkage during curing or redistribution of stresses, therefore some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

SOLUBLE SULFATES: The water soluble sulfate content was determined in accordance with California Test Method 417 for representative soil samples from the site (SCS&T). The results of these tests indicate that the representative soil samples had a soluble sulfate content that ranged from 0.001 to 0.006 percent, which is considered "negligible."

FOUNDATION PLAN REVIEW: The final foundation plan and accompanying details and notes should be submitted to this office for review. The intent of our review will be to verify that the plans used for construction reflect the minimum dimensioning and reinforcing criteria presented in this section and that no additional criteria are required due to changes in the foundation type or layout. It is not our intent to review structural plans, notes, details, or calculations to verify that the design engineer has correctly applied the geotechnical design values. It is the responsibility of the design engineer to properly design/specify the foundations and other structural elements based on the requirements of the structure and considering the information presented in this report.

FOUNDATION EXCAVATION OBSERVATION: All footing excavations should be observed by Christian Wheeler Engineering prior to forming and placing reinforcing steel to determine if the foundation recommendations presented herein are followed and that the foundation soils are as anticipated in the preparation of this report. All footing excavations should be excavated neat, level, and square. All loose or unsuitable material should be removed prior to the placement of concrete.

SEISMIC DESIGN FACTORS

The seismic design factors applicable to the subject site are provided below. The seismic design factors were determined in accordance with the 2013 California Building Code. The site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters are presented in the following Table I.

TABLE I: SEISMIC DESIGN FACTORS

Site Coordinates: Latitude Longitude	32.843° -116.879°
Site Class	D
Site Coefficient F_a	1.137
Site Coefficient F_v	1.708
Spectral Response Acceleration at Short Periods S_s	0.909 g
Spectral Response Acceleration at 1 Second Period S_1	0.346 g
$S_{MS}=F_aS_s$	1.033 g
$S_{M1}=F_vS_1$	0.591 g
$S_{DS}=2/3*S_{MS}$	0.688 g
$S_{D1}=2/3*S_{M1}$	0.394 g

Probable ground shaking levels at the site could range from slight to moderate, depending on such factors as the magnitude of the seismic event and the distance to the epicenter. It is likely that the site will experience the effects of at least one moderate to large earthquake during the life of the proposed improvements.

ON-GRADE SLABS

GENERAL: It is our understanding that the floor systems of the proposed structures may consist of concrete slabs-on-grade. The following recommendations are considered the minimum slab requirements based on the soil conditions and are not intended in lieu of structural considerations.

INTERIOR FLOOR SLABS: In general, the minimum slab thickness should be 4 inches (actual) and the slab should be reinforced with at least No. 3 bars spaced at 18 inches on center each way. However, for Buildings C, D, and F the minimum slab thickness should be 5 inches (actual) and the slab should be reinforced with at least No. 4 bars spaced at 12 inches on center each way. Slab reinforcement should be supported on chairs such that the reinforcing bars are positioned at mid-height in the floor slab. The slab reinforcement should extend into the perimeter footings at least 6 inches.

UNDER-SLAB VAPOR RETARDERS: Steps should be taken to minimize the transmission of moisture vapor from the subsoil through the interior slabs where it can potentially damage the interior floor coverings. Local industry standards typically include the placement of a vapor retarder, such as plastic, in a layer of coarse sand placed directly beneath the concrete slab. Two inches of sand and 2 inches of sand are typically used above and below the plastic, respectively. This is the most common under-slab vapor retarder system used in San Diego County. The vapor retarder should be at least 15-mil Stegowrap® or similar material with sealed seams and should extend at least 12 inches down the sides of the interior and perimeter footings. The sand should have a sand equivalent of at least 30, and contain less than 10% passing the Number 100 sieve and less than 5% passing the Number 200 sieve. The membrane should be placed in accordance with the recommendation and consideration of ACI 302, "Guide for Concrete Floor and Slab Construction" and ASTM E1643, "Standards Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs." It is the flooring contractor's responsibility to place floor coverings in accordance with the flooring manufacturer specifications.

EXTERIOR CONCRETE SLAB-ON-GRADE: Exterior concrete slabs on grade should have a minimum thickness of 4 inches and be reinforced with at least No. 3 bars placed at 18 inches on center each way. All slabs should be provided with weakened plane joints in accordance with the American Concrete Institute (ACI) guidelines. Special attention should be paid to the method of concrete curing to reduce the potential for excessive shrinkage cracking. It should be recognized that minor cracks occur normally in concrete slabs due to shrinkage. Some shrinkage cracks should be expected and are not necessarily an indication of excessive movement or structural distress.

MASONRY EARTH RETAINING WALLS

FOUNDATIONS: Foundations for proposed retaining walls should be constructed in accordance with the recommendations for shallow foundations presented previously in this report.

PASSIVE PRESSURE: The passive pressure for the design of sliding resistance for the proposed retaining wall footings may be considered to be 350 pounds per square foot per foot of depth. This pressure may be increased one-third for seismic loading. The upper foot of foundation embedment should not be used for passive pressure calculations unless the footing abuts a paved area or slab. The coefficient of friction for concrete to soil may be assumed to be 0.35 for the resistance to lateral movement. When combining frictional and passive resistance, the friction should be reduced by one-third.

ACTIVE PRESSURE: The lateral soil pressure for the design of unrestrained and restrained earth retaining structures with level backfill may be assumed to be equivalent to the pressure of a fluid weighing 37 pounds per cubic foot (pcf) and 63 pcf, respectively. An additional 17 pcf should be added to the above value for a 2:1 (horizontal to vertical) sloping backfill conditions. These pressures do not consider any other surcharge. If any are anticipated, this office should be contacted for the necessary increase in soil pressure. These values are based on a drained, non-detrimentally expansive (EI <50) backfill condition.

Seismic lateral earth pressures on restrained and unrestrained retaining walls may be assumed to equal an inverted triangle starting at the bottom of the wall with the maximum pressure equal to 7H pounds per square foot (where H = wall height in feet) occurring at the top of the retained portion of the wall.

WATERPROOFING AND WALL DRAINAGE SYSTEMS: The need for waterproofing should be evaluated by others. If required, the project architect should provide (or coordinate) waterproofing details for the retaining walls. The design values presented above are based on a drained backfill condition and do not consider hydrostatic pressures. Unless hydrostatic pressures are incorporated into the design, the retaining wall designer should provide a detail for a wall drainage system. Typical retaining wall drain system details are presented as Plate No. 7 of this report for informational purposes. Additionally, outlets points for the retaining wall drain system should be coordinated with the project civil engineer.

BACKFILL: All backfill soils should be compacted to at least 90 percent relative compaction. Expansive or clayey soils should not be used for backfill material. The wall should not be backfilled until the masonry has reached an adequate strength.

SEGMENTAL RETAINING WALLS: Geogrid reinforced segmental block retaining walls up to about 10 feet high may be constructed as part of the subject project. Provided in the following table are design parameters for Geogrid reinforced segmental block walls.

TABLE II: GEOGRID REINFORCED EARTH WALL DESIGN PARAMETERS

	Reinforced Soil	Retained Soil	Foundation Soil
Angle of internal friction (°)	30	30	30
Apparent Cohesion (psf)	150	150	200
Unit Weight (pcf)	127	127	127

A ground acceleration (Kh) equal to 0.13g may be assumed for segmental wall design. The bottom of the walls should extend to a depth such that the outside edge of the lower block is located at least 10 feet from the face of slopes.

PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS

GENERAL: Asphalt concrete pavement sections were calculated utilizing the Caltrans design method. The following pavement sections should be considered preliminary and should be used for planning purposes only. Final pavement designs should be determined after R-value tests have been performed on the actual subgrade material. An R-value of 40 was assumed based on a select grading operation. This value was used in determining the preliminary structural pavement sections.

TRAFFIC INDEX: We have assumed a Traffic Index of 4.5 for the parking areas and driveways, and a Traffic Index 5.5 for the main driveways. A Traffic Index 7.0 was assumed for fire lanes and trash truck routes. The client and/or civil engineer should verify that these assumed indices are consistent with the type and volume of traffic anticipated.

PRELIMINARY STRUCTURAL SECTIONS: Based on the above parameters, the following minimum preliminary pavement sections are recommended.

TABLE III: PRELIMINARY AC PAVEMENT SECTIONS - CALTRANS METHOD

Proposed Use	R-Value	Traffic Index	Asphalt Concrete	Base
Parking Areas and Driveways	40	4.5	3.0	4.0
Main Driveways	40	5.5	3.0	5.0
Fire Lanes and Trash Truck Routes	40	7.0	3.0	9.0

All paving methods and materials should conform to good engineering and paving practices, and comply with the requirements of the County of San Diego. Prior to placing the base material, the subgrade soils should be scarified to a depth of 12 inches, moisture conditioned and compacted to at least 95 percent of its maximum dry density.

The subgrade and base should be prepared and placed per the "Compaction and Method of Filling" section of this report. The base material could consist of Crushed Aggregate Base (CAB) or Class II Aggregate Base.

The Crushed Aggregate Base should conform to the requirements set forth in Section 200-2.2 of the Standard Specifications for Public Works Construction. The Class II Aggregate Base should conform to requirements set forth in Section 26-1.02A of the Standard Specifications for California Department of Transportation. As an alternate, the base material for the pavements may consist of Crushed Miscellaneous Base (recycled base material) that conforms to the requirements set forth in Section 200-2.4 of the Standard Specifications for Public Works Construction. It should be noted, however, that Crushed Miscellaneous Base material has lower durability characteristics than Crushed Aggregate Base or Class II Aggregate Base, which may result in a shorter pavement life. As such, the owner of the project should approve the use of this material for the pavement base. The base material should be compacted to at least 95 percent of its maximum dry density.

The asphalt concrete should comply with the requirements set forth in Section 203-6 of the Standard Specifications for Public Works Construction. We recommend that the asphalt concrete material for the structural section comply with type C1 mix in the Standard Specifications for Public Works Construction. Asphalt concrete pavement should be compacted to at least 95 % of Hveem density.

PRELIMINARY PORTLAND CEMENT CONCRETE PAVEMENT SECTION

Portland Cement Concrete pavement should have a minimum thickness of 7.0 inches and can be placed directly on properly compacted subgrade material. Concrete sections for stamped concrete should be measured below the stamped depth. It is further recommended that in areas where heavy traffic or point loads are anticipated, including areas in front of trash enclosures, the slab be reinforced with at least No. 4 bars placed at 18 inches on center each way. Concrete pavement construction should comply with the requirements set forth in Sections 201-1.1.2 and 302-6 of the Standard Specifications for Public Works Construction. The concrete materials should be a Class 560-C-3250 mix. All slabs should be provided with weakened plane joints in accordance with the American Concrete Institute (ACI) guidelines. Special attention should be paid to the method of concrete curing to reduce the potential for excessive shrinkage cracking. It should be recognized that minor cracks occur normally in concrete slabs due to shrinkage. Some shrinkage cracks should be expected and are not necessarily an indication of excessive movement or structural distress.

LIMITATIONS

REVIEW, OBSERVATION AND TESTING

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the Geotechnical Engineer and Engineering Geologist

so that they may review and verify the applicability of the information presented in this report to the said plans and specifications.

It is recommended that Christian Wheeler Engineering be retained to provide continuous soil engineering services during the earthwork operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

UNIFORMITY OF CONDITIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the Geotechnical Engineer so that he may make modifications if necessary.

CHANGE IN SCOPE

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. It should be verified in writing if the recommendations are found to be appropriate for the proposed changes or our recommendations should be modified by a written addendum.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they are due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

PROFESSIONAL STANDARD

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made, and that our data, interpretations, and recommendations are based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

CLIENT'S RESPONSIBILITY

It is the client's responsibility, or their representatives, to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to insure that the contractor and his subcontractors carry out such recommendations during construction.

FIELD EXPLORATIONS

Twenty three subsurface explorations were made on March 23, 25, and 28, 2014 at the locations indicated on the Site Plan and Geotechnical Map included herewith as Plate No. 1. These explorations consisted of seven borings drilled utilizing a truck mounted drill rig, six backhoe trenches, and ten cone penetrometer probes. The fieldwork was conducted under the observation and direction of our engineering geology personnel.

The explorations were carefully logged when made. The boring and trench logs are presented in Appendix A. The CPT data is presented in Appendix B. The soils are described in accordance with the Unified Soils Classification. In addition, a verbal textural description, the wet color, the apparent moisture, and the density or consistency is provided. The density of granular soils is given as very loose, loose, medium dense, dense or very dense. The consistency of silts or clays is given as either very soft, soft, medium stiff, stiff, very stiff, or hard.

Relatively undisturbed drive samples were collected using a modified California sampler. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin, brass rings with inside diameters of

approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound hammer falling 30 inches in general accordance with ASTM D 3550-84. The driving weight is permitted to fall freely. The number of blows per foot of driving, or as indicated, are presented on the boring logs as an index to the relative resistance of the sampled materials. The samples were removed from the sample barrel in the brass rings, and sealed. Bulk samples of the earth materials encountered were also collected. Samples were transported to our laboratory for testing.

LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed is presented below:

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.

b) **MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for selected soil samples in accordance with D 2937. The results are summarized in the boring logs.

c) **GRAIN SIZE DISTRIBUTION:** The grain size distribution of selected soil samples was determined in accordance with ASTM D 422. The results of these tests are presented on Plate Number 8.

d) **COLLAPSE POTENTIAL TEST:** A collapse potential tests was performed on a selected undisturbed soil sample in accordance with ASTM D 5333. The results of this test are presented on Plate Number 8.