July 15, 2019

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

RJM Design Group
31591 Camino Capistrano
San Juan Capistrano, California 92675

Attention: Mr. Eric Chastian, LLA, LEED AP
Principal Landscape Architect

Proposal No.: **19G109-1**

Subject: **Surficial Geologic Mapping**
Proposed Veterans Memorial Park
Faraday Avenue at Whitman Way
Carlsbad, California

Dear Mr. Chastain:

In accordance with your request, we have completed surficial geologic mapping of potential and existing landslides. In order to prepare this report, we have also conducted geotechnical and geologic research of available sources. This report does not include any field or laboratory testing. A comprehensive geotechnical study will be required prior to developing this site.

Site Location and Proposed Development

The overall site is located at the southeast corner of Whitman Way and Faraday Avenue in Carlsbad, California. The overall site is bounded to the west and south by Faraday Avenue and to the north by Whitman Way, vacant land, and existing single-family residential tracts. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The subject site consists of the westernmost 48± acres of Veteran's Memorial Park. Based on information from the client, the eastern portion of Veteran's Memorial Park is an existing preserve. The park is currently unimproved with dirt trails that are utilized for hiking and/or biking. This area of the park consists of gently sloping terrain with groundcover comprised of heavy native grass, weeds, shrubs with areas of dense large trees.

Based on information provided by the City of Carlsbad, the subject site will be developed with active and passive amenities, open space areas, public art, trails, utilities, parking, restrooms, and maintenance facilities. It is also expected that the park will include lighting, shade structures and fencing. No detailed plans have been provided at the time of this report.

It is assumed that any new buildings at the subject site will be single story structures of wood frame or masonry block construction. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 50 kips and 1 to 3 kips per linear foot, respectively. It is assumed that the proposed structures will be supported on conventional shallow foundations and concrete slab on grade floors.

Regional Geology

The subject site is located within the Peninsular Ranges province. The Peninsular Ranges province consists of several northwesterly-trending ranges in the southwestern California. The province is truncated to the north by the east-west trending Transverse Ranges. Prior to the mid-Mesozoic, the region was covered by seas and thick marine sedimentary and volcanic sequences were deposited. The bedrock geology that dominates the elevated areas of the Peninsular Ranges consists of high-grade metamorphic rocks intruded by Mesozoic plutons. During the Cretaceous, extensive mountain building occurred during the emplacement of the southern California batholith. The Peninsular Ranges have been significantly disrupted by Tertiary and Quaternary strike-slip faulting along the Elsinore and San Jacinto faults. This tectonic activity has resulted in the present terrain.

Geologic Research

Geologic research indicates that the site is located in the southwestern area of the Peninsular Ranges. The primary available reference applicable to the subject site is the Geologic Map of the Oceanside, San Luis Rey, and San Marcos 7.5' Quadrangles, San Diego County, California, by Siang S. Tan and Michael P. Kennedy, 1996. A portion of this map indicating the location of the subject site is included as Plate 3 in Appendix A of this report.

This map indicates that the site is underlain by two geologic units. The first geologic unit is the Holocene-age alluvium and colluvium deposits (Map Symbol Qal) located in a minor portion of the northwestern area of the site. This unit is described as unconsolidated silt, clay, sand and gravel. The second geologic unit is the Tertiary-age Santiago Formation (Map Symbol Tsa) underlying the majority of the subject site. The Santiago Formation consists of light-colored, poorly-bedded, poorly-indurated, fine- to medium-grained sandstone interbedded with siltstone and claystone with localized coarse-grained sandstone and conglomerate. Bedding attitudes on this map indicate that the beds strike generally northeast-southwest, dipping 12 to 15 degrees downward to the northwest. A minor fault (shear joint) plane is depicted on this map near the western boundary of the site. The minor fault plane generally strike northeast-southwest, dipping 80 degrees to the northwest. Three questionable landslides are also mapped 700 to 1,200± feet south-southeast of the subject site. These questionable landslides are located within the Santiago Formation.

Aerial Photograph Review

SCG performed a historic aerial photograph review. Historic aerial photographs were obtained from Google Earth and historicaerials.com. Historic aerial photographs from 1947, 1953, 1967, 1980, 1994, 2002, and 2018 were reviewed as part of this investigation. Aerial photographs from 2018, 1994, and 1947 are included as Plate 4, Plate 5, and Plate 6, respectively.

The subject site appears to be vacant and undeveloped from 1947 to prior to 1980. The subject site appears to have been cleared of vegetation throughout a significant portion of the site after 1980. Faraday Avenue is visible and several dirt hiking trails were also visible for the first time in the 2002 aerial photograph. The site appears to have been in its current configuration since at least 2002.

No geologic hazards such as faulting or landslides were readily visible during the historical aerial photograph review.

Geologic Mapping

As part of this investigation, SCG performed surficial geologic mapping at the subject site. It should be noted that no subsurface investigation was performed as part of this investigation. The geologic mapping was limited to surficial exposure and expression of geologic units and features. Due to the recent rainfall, the site was covered with heavy native grass and weed growth which obscured the near-surface alluvial soils. Bedrock was only exposed in six (6) limited areas throughout the site.

Based on the bedrock exposed at the outcrops at the subject site, it is our opinion that the site is underlain by massive silty fine-grained sandstone with localized interbedded fine-grained sandstone and conglomerate of the Santiago Formation (Map Symbol Tsa). The geologic conditions at the site are generally consistent with the mapped geologic conditions. The bedding attitudes in the Santiago Formation in south-central area of the site generally strike northwest-southeast and dip 15 degrees to the northeast and the bedding attitudes in the Santiago Formation in the eastern area of the site generally strike southeast-southwest and dip 18 to 19 degrees to the northwest. As noted previously, a minor fault (shear joint) plane is mapped near the western boundary of the subject site. However, based on surface observations at the time of the geologic mapping, no evidence of surface expression of faults (i.e. fault scarps, fault line scarps, or displacement in the near surface soils) is present on the subject site. Three questionable landslides are also mapped south-southeast of the subject site. Based on the surface observations at the time of the geologic mapping, no evidence of surface expression of landslides (i.e. head scarps, minor scarps, crown cracks, radial cracks, etc.) is present on the subject site.

Fault Rupture Hazard

Currently, there is no published Alquist-Priolo Earthquake Fault Zone Map for the San Luis Rey Quadrangle. Therefore, the CGS has not mapped any active or potentially active faults with potential surface fault rupture in the San Luis Rey Quadrangle.

The nearest fault zone is the Rose Canyon Fault Zone (RCFZ) located 5.8± miles west of the subject site. The RCFZ is a right-lateral strike-slip fault. The RCFZ has a total length of 30 km with a slip rate ranging from 1.1 to 5 mm/yr. The interval between surface ruptures ranges between 1,200 and 3,000 years (scec.org).

An active fault is defined by the State of California under the Alquist-Priolo Act of 1972 as a fault which has displaced earth materials during the Holocene Epoch (11,000± years). The Santiago Formation bedrock that underlies the subject site is indicated to be Middle Eocene-Tertiary age (45± million years). Therefore, even though this bedrock unit may exhibit indicators of faulting near the subject site, the faulting may be ancient and may not be active.

Based on the age of the bedrock and the lack of surface expression at the subject site, the minor fault mapped outside the western boundary of the subject site is considered to be inactive.

Landslide Hazard

Based on the surficial geologic mapping conducted by SCG, there is no evidence of surface expressions for landslides at the subject site. In addition, there were no mapped landslides at the subject site and there were no indicators of landslides during the aerial photograph review.

Conclusions and Recommendations

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. A minor fault (shear joint) plane is mapped on the western boundary of the subject site. This minor fault (shear joint) is not associated with any known active fault. Based on our observations of the ground surface at the time of the surficial geologic mapping and the historic aerial photograph review, the minor fault (shear joint) does not show surface expression (i.e. fault scarps or fault line scarps). This fault is not identified on the Alquist-Priolo Earthquake Fault Zone map. Therefore, the possibility of significant fault rupture on the site is considered to be low.

There are no mapped landslides on the subject site, no evidence for landslides observed during the surficial geologic mapping, and no evidence for landslides during the historical aerial photograph review. Therefore, the possibility of an active landslide at the subject site is considered low.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Daryl Kas, CEG 2467
Senior Geoloigst

Gregory K. Mitchell, GE 2364
Principal Engineer

Enclosure:
- Plate 1: Site Location Map
- Plate 2: Surficial Geologic Map
- Plate 3: Geologic Map
- Plate 4: Aerial Photograph – 2018
- Plate 5: Aerial Photograph – 1994
- Plate 6: Aerial Photograph - 1947

SOURCE: SAN DIEGO COUNTY
THOMAS GUIDE, 2008

SITE LOCATION MAP

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

SCALE: 1" = 2400'	
DRAWN: AL CHKD: GKM	
SCG PROJECT 19G109-1	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

NORTH
SoCalGeo

GEOTECHNICAL LEGEND

SANTIAGO FORMATION (Tsa) OUTCROP

15 STRIKE AND DIP

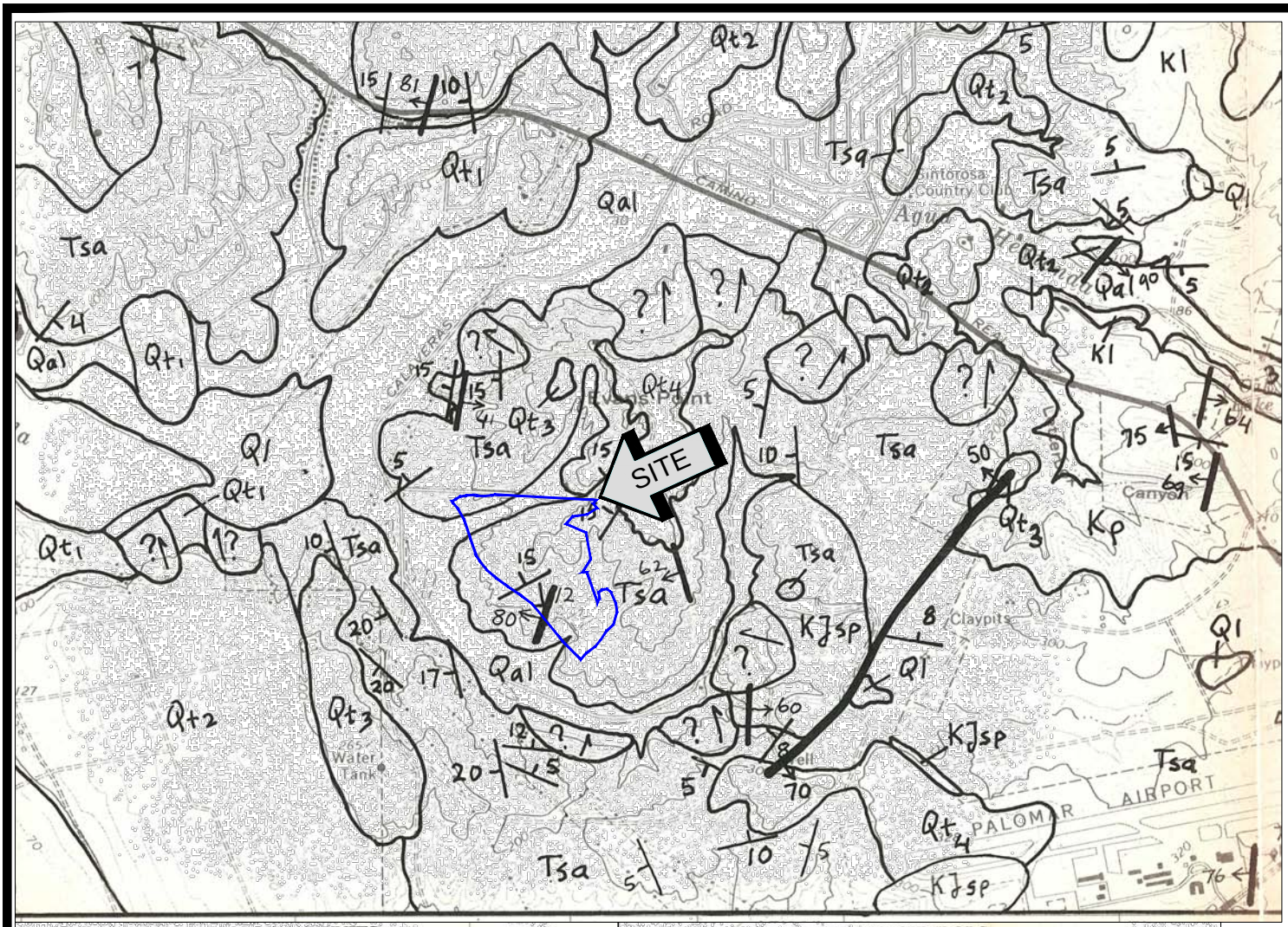
85 JOINTING

NOTE: SURFICIAL GEOLOGIC UNITS OBSCURED BY VEGETATION EXCEPT IN EXPOSED OUTCROP AREAS.

NOTE: BASE MAP PREPARED BY CLIENT

SURFICIAL GEOLOGIC MAP
VETERANS MEMORIAL PARK
CARLSBAD, CALIFORNIA

SCALE: 1" = 200'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: DRK CHKD: GKM	
SCG PROJECT 19G109-1	
PLATE 2	



MAP UNITS

Qal	Alluvium and colluvium Unconsolidated silt, clay, sand and gravel.
Qb	Beach deposits: unconsolidated sand.
Ql	Lake, reservoir and pond deposits; partly submerged, unconsolidated clay, silt, sand and gravel.
?/?	Landslide deposits (includes headscarp area). See further California Division of Mines and Geology Open-File Report 95-04.
Qt1-4	Terrace deposits; reddish brown, poorly bedded, poorly- to moderately-indurated sandstone, siltstone and conglomerate. Subscripts indicate relative level with 1 the lowest elevation (youngest age). The three lower levels have been correlated with the Bay Point Formation and the highest level with the Linda Vista Formation; see Kennedy (1975), Weber (1982), and Wilson (1972).
Tst	Stadium Conglomerate (Poway Group); poorly-bedded, poorly-to moderately-indurated, cobble conglomerate with coarse-grained sandstone matrix.
Tsa / Tj	Santiago Formation; light-colored, poorly-bedded, poorly-indurated, fine- to medium-grained sandstone interbedded with landslide-prone siltstone and claystone. Local coarse-grained sandstone and conglomerate. Renamed from Scripps Formation in the Encinitas (Tan, 1986) and Rancho Santa Fe (Tan, 1987) quadrangles. It interfingers with Torrey Sandstone. Torrey Sandstone (La Jolla Group); light-colored, massive and thick-bedded, well-indurated, medium-to coarse-grained arkosic sandstone. Resistant to landsliding. It interfingers with Santiago Formation.

MAP SYMBOLS

	Contact (boundary) between map units . Most boundaries are not exposed and are inferred.
5	Strike, and dip of inclined beds. Most bedding attitudes are estimated.
⊕	Horizontal beds.
82 U D	Fault; dotted where concealed. Arrow and number indicate direction and amount of dip of exposed fault plane. U indicates upthrown side; D indicates downthrown side.
70	Strike, direction, and amount of dip of minor fault (shear joint) plane. Most fault displacements are less than 5 feet.
	Landslide; arrows indicate general direction of movement. Both the headscarp area and debris deposit are included within the map symbol. Landslides are depicted prior to urban development. Only landslides larger than 300 feet across are shown on the map. For further information see California Division of Mines and Geology Open-File Report 95-04.
?	Questionable landslide.
	Site boundary

SOURCE: "GEOLOGIC MAP OF THE OCEANSIDE, SAN LUIS REY, AND SAN MARCOS 7.5' QUADRANGLES, SAN DIEGO COUNTIY, CALIFORNIA" TAN AND KENNEDY, 1996

GEOLOGIC MAP

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: AL CHKD: GKM	
SCG PROJECT 19G109-1	
PLATE 3	

SOUTHERN CALIFORNIA GEOTECHNICAL

AERIAL PHOTOGRAPH - 2018

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

1" = 300'	
DRAWN: DRK CHKD: GKM	
SCG PROJECT 19G109-1	
PLATE 4	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

AERIAL PHOTOGRAPH - 1994

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

1" = 300'	
DRAWN: DRK CHKD: GKM	
SCG PROJECT 19G109-1	
PLATE 5	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

AERIAL PHOTOGRAPH - 1947

VETERANS MEMORIAL PARK

CARLSBAD, CALIFORNIA

1" = 300'	
DRAWN: DRK CHKD: GKM	
SCG PROJECT 19G109-1	
PLATE 6	

SOUTHERN CALIFORNIA GEOTECHNICAL