CATEGORICAL EXEMPTION EVALUATION REPORT

New School Buildings at Dr. Peter Marshall Elementary School Project

January 2023

This Categorical Exemption Evaluation Report (CE Evaluation) documents the eligibility of Magnolia School District's (District) proposed new buildings at Dr. Peter Marshall Elementary School (Project) from expanded environmental review pursuant to the California Environmental Quality Act (CEQA), under California Public Resources Code Section 21084 and California Code of Regulations, Title 14 (CEQA Guidelines) Sections 15061(b)(2) and 15300 et seq.

Location

The Project is proposed at Dr. Peter Marshall Elementary School (Marshall Elementary) at 2627 Crescent Avenue in the City of Anaheim, Orange County. The school is north of Crescent Avenue, west of North Magnolia Street, south of West Greenleaf Avenue, and east of North Nancita Street. Regional access is via Interstate-5, approximately 0.75 mile north and west of the school. The Project would mainly affect the northwest and southeast portions of the school field (Project site). Figure 1, *Local Vicinity* shows the Marshall Elementary and surrounding uses.

Existing Setting

Land Use and Zoning

Marshall Elementary is on the southern two-thirds of Assessor's Parcel Number (APN) 070-450-04.[1] Peter Marshall Park is in the northern quarter of the parcel. The entire parcel is owned by the District, has a "Parks School" land use designation, and is zoned "T", Transition.[2] The parcel has both "Parks" and "School" designations because the parcel contains both uses.[3] The City's Parks/Open Space designation allows sports fields, playgrounds, nature preserves, golf courses, and other passive and active recreational uses. The Schools designation is for existing public and larger, established private schools, including elementary, junior and high schools,[4] which corresponds to the uses at Marshall Elementary. The "T" Zone District provides land that is used for agricultural uses, in a transitory or interim use, restricted to limited uses because of special conditions, or not zoned to one of the zoning districts in this title for whatever reason, including recent annexation.[5] According to the City, school uses are allowed in the "T" zone.[6] Moreover, the parcel has operated as a school since 1955, prior to the adoption of the effective land use and zoning maps.

Surrounding Land Uses

The parcel is surrounded by residential development on all four sides. The Project site, i.e., school field where the proposed buildings would be constructed, is surrounded by school buildings to the west, the school parking lot to the south, Peter Marshall park to the north, and Magnolia Street and residential uses to the east.

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[1] City of Anaheim. Property Info. Accessed December 2, 2022.
https://gis.anaheim.net/PropertyInfo/?APN=07045004
[2] City of Anaheim. Property Info. Accessed December 2, 2022.
https://gis.anaheim.net/PropertyInfo/?APN=07045004
[3] Jose Barriga, Associate Planner, City of Anaheim, via telephone on December 9, 2022.
[4] City of Anaheim. Anaheim General Plan – Land Use Element. Dated May 2004. Accessed December 2, 2022.
https://anaheim.net/DocumentCenter/View/9522/E-Land-Use-Element?bidId=
[5] City of Anaheim. Anaheim Municipal Code Section 18.14.020. Accessed December 2, 2022.
https://codelibrary.amlegal.com/codes/anaheim/latest/anaheim_ca/0-0-0-66053#JD_Chapter18.14
[6] Charles Guiam, Planner, City of Anaheim, via telephone on January 10, 2023.

Existing Uses

Marshall Elementary encompasses approximately 9 acres of the of the 13.23-acre parcel. The school was constructed in 1955 and has been improved over the years with permanent, modular, and portable structures, underground utilities, landscaping, and parking improvements. The campus is flat with an elevation between 95 and 105 feet above mean sea level.[7]

Off-street parking and onsite passenger car and school bus loading areas are in the southeast portion of the campus, school buildings are along the western perimeter, a grass field is in the northeast corner, and blacktop play space is in the center of the campus. The Project site is on the northwest and southeast portions of the school field. The southeast area of the field contains natural turf. The northwest area is comprised of turf, concrete pavement, and a baseball backstop. Figure 2, *Site Photographs* shows the existing conditions of the Project site and surrounding areas.

Marshall Elementary operates a traditional program for transitional kindergarten through sixth grade students and has 41 classrooms. Using the state-adopted classroom loading factor of 25 pupils for elementary school,[8] Marshall Elementary has an enrollment capacity of 1,025 seats. Table 1, *10-Year Historic Enrollment*, shows the student enrollment at Marshall Elementary over the last ten years. As shown, the school experienced peak enrollment during the 2019-20 school year with 757 students; the lowest enrollment occurred in 2011-12 with 589 students.

Table 1
10-Year Historic Enrollment

Year	No. Students
2021-22	701
2020-21	743
2019-20	757
2018-19	751
2017-18	707
2016-17	697
2015-16	678
2014-15	657
2013-14	638
2012-13	594
2011-12	589

Source: California Department of Education. DataQuest. Accessed December 2, 2022. https://dq.cde.ca.gov/dataquest/.

[7] United States Geological Survey (USGS). 2022. Anaheim Quadrangle, California - Orange County, 7.5-Minute Series. Accessed December 6, 2022. https://ngmdb.usgs.gov/ht-bin/tv_browse.pl?id=61d1619c9ac09d85505a48f510766684.

[8] Office of Public School Construction. School Facility Program Handbook. Page 17. January 2019. https://www.dgs.ca.gov/-/media/Divisions/OPSC/Services/Guides-and-Resources/SFP_Hdbk_ADA.pdf?la=en&hash=B871984008A7D2E35D16DB50DDE0C87791C294A7

Project Description

Project Characteristics

Proposed Buildings

The District proposes the construction of two new buildings at Marshall Elementary for afterschool programming. The buildings would be compliant with California Building Code and California Green Building Code (CALGreen) for public school construction, as well as the requirements of the American with Disabilities Act (ADA). The proposed buildings would be connected to existing utility systems that serve the campus, including but not limited to water, sewer, electrical, communication, and fire alarm.

The proposed building in the southeast corner of the school field would be north of the staff parking lot, adjacent to the mid-eastern perimeter of the campus. This area is developed with natural grass and separated from the school parking lot and eastern perimeter by a chain-link fence, which would remain in-place. The development footprint would be cleared and a one-story, 4,800-square foot prefabricated building would be constructed. The building would include four classrooms, an office/workroom, and a restroom facility with two single occupant restrooms. Access to the proposed building would be from the existing school buildings, across the blacktop and playfield.

The other building would be constructed in the northwest corner of the school field, east of a modular building that was added to the campus in 2014, and south of Peter Marshall Park. The proposed building would be 1,920 square feet and include two classrooms. The existing baseball backstop located within the building footprint would be relocated eastward to make room for the new building.

School Operations

The Project would add six classrooms to the existing campus. Although the classrooms are intended for afterschool programming to enhance student academic achievement, for a conservative analysis, it is assumed the classrooms would also be used for school instruction. Using the state-adopted classroom loading factor of 25 pupils, the six classrooms would increase the school capacity by 150 seats or 14.6 percent of the existing enrollment capacity. No other operational changes would occur at Marshall Elementary. Post-construction, the school would continue to offer the same programs as it does now and would maintain its current operational schedule.

Project Construction

The Project would be implemented in one phase. The development footprints would be cleared during the second quarter of 2023, and the backstop and ball field in the northwest project area would be shifted eastward. Site work, including the installation of the building foundations would be conducted; thereafter, the prefabricated modular buildings would be installed during summer break. Construction would last roughly four months, and the new buildings would be available for occupancy the third quarter of 2023. Construction staging would occur in the staff parking lot in the southeast area the campus. The construction areas would be fenced off from trespassers and students. Construction deliveries would occur before and after school hours if applicable.

4. Applicability of Categorical Exemption

Article 19 of the CEQA Guidelines (Sections 15300 to 15332) provides classes of projects that have been determined not to have a significant effect on the environment and can be categorically exempt from extended environmental review. As discussed below, the Project qualifies for an exemption under categorical exemption classes 4 and 14.

Class 4, Minor Alterations to Land

Class 4 consists of minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes. (CEQA Guidelines § 15304)

- The proposed improvements would disturb soils and require the removal of vegetation, including natural turf grass. No trees would be removed. All areas disturbed by the Project would be restored with new pavement, building, and landscaping to minimize erosion and for continued school operations.

Class 14, Minor Additions to School

Class 14, Minor Additions to School, consists of minor additions to existing schools within existing school grounds where the addition does not increase original student capacity by more than 25 percent or ten classrooms, whichever is less. The addition of portable classrooms is included in this exemption. (CEQA Guidelines § 15314)

- The proposed classrooms would be used for afterschool programming and to support student academic achievement. For a conservative analysis, it is assumed the classrooms would also be used for school instruction. The Project would result in a net addition of six classrooms, which would have a corresponding increase in the enrollment capacity by 150 seats or 14.6 percent of the existing enrollment capacity. Therefore, the Project would be within the ten classroom and 25 percent capacity limits of Class 14.

5. Exceptions to Categorical Exemptions

CEQA Guidelines Section 15300.2, Exceptions, lists conditions under which categorical exemptions are inapplicable. The below addresses whether these conditions apply.

a. Location

Section 15300.2(a) of the CEQA Guidelines states that classes 3, 4, 5, 6, and 11 are qualified by consideration of whether a project is located in a uniquely sensitive environment of hazardous or critical concern that has been designated, precisely mapped, or officially adopted pursuant to federal, state, or local laws, where the project that would ordinarily be insignificant may in the particularly sensitive environment be significant.

Geologic Hazards

The Project site is mapped by the California Department of Conservation, Division of Mines and Geology for liquefaction potential.[9] A geotechnical report prepared for the Project, included as Attachment A to this document, indicates that with the inclusion of recommendations provided in the report, which ensures the Project's compliance with California Building Code standards, the site would be suitable for the proposed development.[10] The Project's plan designs and specifications incorporate the recommendations, which will also be implemented during construction. Therefore, the Project would not result in significant impacts associated with its location within a mapped area of potential liquefaction.

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[9] City of Anaheim. Anaheim General Plan – Safety Element. Figure S-3: Seismic and Geologic Hazards. Dated May 2004. Accessed December 8, 2022. https://www.anaheim.net/DocumentCenter/View/2039/I-Safety-Element-?bidId=.

[10] Global Geo-Engineering, Inc. Geotechnical Investigation, Proposed Modular Building, Dr. Peter Marshall Elementary School, Anaheim, California. Dated November 24, 2022.

Dam Inundation Hazards

The Project site, as with most of Anaheim, is mapped within a dam inundation zone associated with the potential failure of Prado Dam, located approximately 19.6 miles east-northeast of Marshall Elementary.[11] Development in the City, including the Project, has the potential to expose people and structures to dam inundation hazards.[12] The City has taken precautions to reduce the threat of catastrophic flood damage, including providing adequate City storm drain systems and continual coordination with state and federal agencies and participating in their programs to implement flood control measures.[13] The U.S. Army Corps of Engineers, Los Angeles District owns and operates Prado Dam and has prepared an Emergency Action Plan (EAP) for the dam that identifies incidents that can lead to emergency conditions and actions to follow to minimize property damage and potential loss of life due to dam failure. The Prado Dam EAP meets FEMA guidelines and was last updated on May 31, 2020, and meets FEMA guidelines.[14] While the Project is within a mapped dam inundation zone, Project implementation would not exacerbate existing environmental conditions related to the potential failure of Prado Dam. Moreover, the District is aware of this existing hazard at the Project site, and potential school evacuation related to flooding from dam failure during school operations is addressed in the Marshall Elementary School Emergency Plan. Therefore, the Project would not result in a significant impact related to its location within the mapped inundation zone.

Other Mapped Hazards or of Concerns

The Project site is not within other areas of unique sensitive environments of hazardous or critical concern—including biological, noise, or wildfire —mapped and/or designated by federal, state, or local agencies.[15] Additionally, as further discussed below in Section 5(e), Marshall Elementary is not listed on a government database for potential hazardous concerns. This exception does not apply to the Project.

b. Cumulative Impact

Exemptions are inapplicable when there is a significant cumulative impact of "successive projects of the same type in the same place, over time (§ 15300.2(b))." In addition to the proposed Project,[16] the District plans to replace the asphalt at and paint the interior and exterior of the buildings at Marshall Elementary.[17] Funding for these projects has

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[11] City of Anaheim. Anaheim General Plan - Safety Element. Figure S-7: Dam Inundation Map. Dated May 2004. Accessed December 8, 2022. https://www.anaheim.net/DocumentCenter/View/2039/I-Safety-Element-?bidId=.
[12] City of Anaheim. Final Anaheim General Plan and Zoning Code Environmental Impact Report - Hydrology and Water Quality. Environmental Impact Report No. 330. Accessed December 9, 2022. Dated May 2004. https://www.anaheim.net/DocumentCenter/View/2189/57-Hydrology-and-Water-Quality-?bidId=.
[13] City of Anaheim. Anaheim General Plan - Safety Element. Dated May 2004. Accessed December 8, 2022; City of Anaheim. Anaheim General Plan - Public Services and Facilities Element. Dated May 2004. Accessed December 8, 2022. https://www.anaheim.net/DocumentCenter/View/2038/G-Public-Services-and-Facilities-Element-?bidId=.
[14] U.S. Army Corps of Engineers. National Inventory of Dams. Accessed December 19, 2022. https://nid.sec.usace.army.mil/#/dams/system/CA10022/summary
[15] City of Anaheim. Anaheim General Plan. Dated May 2004. Accessed December 9, 2022. https://www.anaheim.net/712/General-Plan.
[16] Magnolia School District. Investing in our Schools – Facilities Improvements and Expansions. Accessed December 5, 2022. https://docs.google.com/spreadsheets/d/1z8zbhBDqJ805Dvn4jA2vJ3OCBk_FWhBWhHmkL5sJ1CI/edit#gid=2088518494
[17] Magnolia School District. Investing in our Schools – Facilities Improvements and Expansions. Accessed December 5, 2022. https://docs.google.com/spreadsheets/d/1z8zbhBDqJ805Dvn4jA2vJ3OCBk_FWhBWhHmkL5sJ1CI/edit#gid=2088518494

not been identified. Therefore, they would not be implemented at the same time as the Project, and their environmental effects would not combine with the Project's to create cumulatively considerable effects.

Also noteworthy, while not proposed at Marshall Elementary, the District proposes the installation of similarly prefabricated buildings, two each at Dr. Albert Schweitzer Elementary School (0.75 mile southeast of the Site) and Dr. Jonas E. Salk Elementary School (1.75 miles southeast of the Site). The District will comply with applicable water quality and air emissions rules and standards and implement best management practices (BMPs), including conducting construction activities during daytime hours, for all of its projects. Compliance with existing regulations would reduce potential environmental effects to acceptable levels at each campus. Therefore, environmental effects would not combine to create cumulatively considerable effects, and CEQA Guidelines Section 15300.2(b) does not apply to the Project.

c. Significant Effects

A categorical exemption shall not be used for an activity where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances. The determination whether this exception applies involves two distinct questions: (1) whether the project presents unusual circumstances, and (2) whether there is a reasonable possibility that a significant environmental impact will result from the unusual circumstances. The lead agency considers the second prong of this test only if it finds that some circumstance of the project is unusual. *Berkeley Hillside Preservation v City of Berkeley* (2015) 60 C4th 1086, 1104.

The Project presents no unusual circumstances or special environmental constraints during Project planning, construction, or operation that could lead to a significant impact. The Project site has operated as a school since 1955. Though the Project would increase the capacity of Marshall Elementary by 150 seats, school operations would remain as they are. Additionally, there are no unusual environmental circumstances related to the development footprints, and construction methods would be typical for school facilities and would comply with the California Building Standards Code and CALGreens. The Project would comply with applicable water quality and air emissions rules and standards and BMPs during construction. No unusual circumstances are expected to occur from Project implementation. CEQA Guidelines Section 15300.2(c) does not apply to the Project.

d. Scenic Highways

A categorical exemption cannot be used for a project that may damage scenic resources—including but not limited to trees, historic buildings, rock outcroppings, or similar resources—within an officially designated state scenic highway. The closest officially designated scenic highway is a segment of California State Route 91 (SR-91), approximately 8.6 miles east of the Project site.[18] Due to the distance, Project implementation would not have the ability to devalue the highway. This exception does not apply to the Project.

e. Hazardous Waste Sites

Subsection 15300.2 of the CEQA Guidelines states that a categorical exemption shall not be used for a project on a site that is on any list compiled pursuant to Government Code Section 65962.5, which requires the Secretary of the Cal EPA to compile lists of hazardous materials sites and waste facilities, also known as the Cortese list[19] from the Department of Toxic Substances Control,[20] Department of Health Services, State Water Resources Control Board,[21] and California Integrated Waste Management Board. A computer search of environmental information of these

[18] ArcGIS, 2017. California Scenic Highways. Accessed December 7, 2022. https://www.arcgis.com/home/item.html?id=f0259b1ad0fe4093a5604c9b838a486a.
[19] CalEPA. Cortese List Data Resources. Accessed December 6, 2022. Cortese List Data Resources | CalEPA
[20] DTSC. EnviroStor. 2022. Accessed December 7, 2022. https://www.envirostor.dtsc.ca.gov/public/.
[21] SWRCB. GeoTracker. 2022. Accessed December 7, 2022. https://geotracker.waterboards.ca.gov/.

databases determined that the Project site is not on hazardous materials/waste site lists compiled by Section 65962.5 of the California Government Code. This exception does not apply to the proposed project.

f. Historic Resources

A categorical exemption cannot be used for a project that may cause a substantial adverse change in the significance of a historical resource, as specified in Public Resources Code Section 21084.1, which defines a resource as one listed in or determined to be eligible for listing in the California Register of Historical Resources and local register of historical resources. According to the Office of Historic Preservation (OHP), sufficient time—usually 50 years—must have passed to obtain a scholarly perspective on the events or individuals associated with a historical resource. As Marshall Elementary was built in 1955, it is possible the Project site has been designated for historic significance.

A records search, conducted via the California Historical Resources Information System (CHRIS) maintained by the OHP at the California State University, Fullerton on December 15, 2022, concluded that no archaeological or historical resources have been identified on the Project site and a surrounding half-mile radius (see Attachment B).[22] Additionally, the City of Anaheim maintains a record of properties deemed eligible for local historic designation. These designations are separated into three categories: Contributors to the significance of one of the City's four historic districts (Colony Historic District, Five Points District, Historic Palm District, and Hoskins District); Citywide Historically Significant Structures; and Citywide Structures of Historical Interest.[23] Marshall Elementary is not within any of the City's historic districts,[24] nor is Marshall Elementary included in the list of Historically Significant Structures or Citywide Structures of Historical Interest.[25] As Project implementation would not require the removal or demolition of permanent buildings and the Project site is not listed on a state or local historical register, this exception does not apply to the project.

6. Conclusion

As documented herein, the proposed Project meets the requirements of Categorical Exemption Class 4, *Minor Alterations to Land,* and Class 14, *Minor Additions to Schools,* and none of the conditions listed in CEQA Guidelines Section 15300.2, *Exceptions*, applies. Accordingly, the Project can be exempt from extended environmental review in accordance with the provisions of CEQA.

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[22] Michael Baker International, California Historical Resources Information System Records Search Results For Dr. Peter Marshall Elementary School, City Of Anaheim, Orange County, California. Dated January 5, 2023.

[23] City of Anaheim Planning Department. City of Anaheim List of Historic Structures. Revised June 14, 2016. Accessed December 8, 2022. https://anaheim.net/DocumentCenter/View/1486/Contributors-and-Citywide-Historic-Structures?bidId=.

[24] City of Anaheim. Historic Districts. Accessed December 8, 2022. https://www.anaheim.net/741/Historic-Districts.

[25] City of Anaheim Planning Department. City of Anaheim List of Historic Structures. Revised June 14, 2016. Accessed December 8, 2022. https://anaheim.net/DocumentCenter/View/1486/Contributors-and-Citywide-Historic-Structures?bidId=.

7. References

Anaheim, City of. Anaheim General Plan. Dated May 2004. Accessed December 9, 2022. https://www.anaheim.net/712/General-Plan.

_______. Anaheim General Plan - Land Use Element. Dated May 2004. Accessed December 2, 2022. https://anaheim.net/DocumentCenter/View/9522/E-Land-Use-Element?bidId=.

_______. Anaheim General Plan - Public Services and Facilities Element. Dated May 2004. Accessed December 8, 2022. https://www.anaheim.net/DocumentCenter/View/2038/G-Public-Services-and-Facilities-Element-?bidId=.

_______. Anaheim General Plan - Safety Element. Dated May 2004. Accessed December 8, 2022. https://anaheim.net/DocumentCenter/View/9522/E-Land-Use-Element?bidId=.

_______. Anaheim Municipal Code. Accessed December 2, 2022. https://codelibrary.amlegal.com/codes/anaheim/latest/anaheim_ca/0-0-0-66053#JD_Chapter18.14.

_______. Final Anaheim General Plan and Zoning Code Environmental Impact Report - Hydrology and Water Quality. Environmental Impact Report No. 330. Accessed December 9, 2022. Dated May 2004. https://www.anaheim.net/DocumentCenter/View/2189/57-Hydrology-and-Water-Quality-?bidId=.

_______. Historic Districts. Accessed December 8, 2022. https://www.anaheim.net/741/Historic-Districts.

_______. Property Info. Accessed December 2022. https://gis.anaheim.net/PropertyInfo/?APN=07045004.

ArcGIS, 2017. California Scenic Highways. Accessed December 7, 2022. https://www.arcgis.com/home/item.html?id=f0259b1ad0fe4093a5604c9b838a486a.

California Department of Education, 2022. Data Quest. Accessed December 2, 2022. https://dq.cde.ca.gov/dataquest/.

California Department of Toxic Substances Control (DTSC), 2022. EnviroStor. Accessed December 7, 2022. https://www.envirostor.dtsc.ca.gov/public/.

California Environmental Protection Agency (CalEPA). Cortese List Data Resources. Accessed December 6, 2022. Cortese List Data Resources | CalEPA.

City of Anaheim Planning Department. City of Anaheim List of Historic Structures. Revised June 14, 2016. Accessed December 8, 2022. https://anaheim.net/DocumentCenter/View/1486/Contributors-and-Citywide-Historic-Structures?bidId=.

Global Geo-Engineering, Inc. Geotechnical Investigation, Proposed Modular Building, Dr. Peter Marshall Elementary School, Anaheim, California. Dated November 24, 2022.

Magnolia School District. Investing in our Schools – Facilities Improvements and Expansions. Accessed December 5, 2022. https://docs.google.com/spreadsheets/d/1z8zbhBDqJ805Dvn4jA2vJ3OCBk_FWhBWhHmkL5sJ1CI/edit#gid=2088518494.

Michael Baker International, California Historical Resources Information System Records Search Results For Dr. Peter Marshall Elementary School, City Of Anaheim, Orange County, California. Dated January 5, 2023.

Office of Public School Construction. School Facility Program Handbook. Page 17. January 2019. https://www.dgs.ca.gov/-/media/Divisions/OPSC/Services/Guides-and-Resources/SFP_Hdbk_ADA.pdf?la=en&hash=B871984008A7D2E35D16DB50DDE0C87791C294A7.

State Water Resources Control Board (SWRCB), 2022. GeoTracker. Accessed December 7, 2022. https://geotracker.waterboards.ca.gov/.

United States Geological Survey (USGS), 2022. Anaheim Quadrangle, California - Orange County, 7.5-Minute Series. Accessed December 6, 2022. https://ngmdb.usgs.gov/ht-bin/tv_browse.pl?id=61d1619c9ac09d85505a48f510766684.

NEW SCHOOL BUILDINGS AT DR. PETER MARSHALL ELEMENTARY SCHOOL PROJECT
ADDRESS OF PROJECT SITE: 2627 CRESCENT AVENUE IN THE CITY OF ANAHEIM

Michael Baker INTERNATIONAL

0 125 250 Feet

Source: ESRI, Magnolia School District

Local Vicinity

Figure 1

View of Marshall Elementary from N. Magnolia Street, facing the southeast portion of the school field where one of two proposed buildings would be constructed. Note, the trees shown in the aerial map are no longer within the development footprint.

View of Marshall Elementary from N. Magnolia Street at the northwest corner of the campus. The other new building would be constructed generally in front of the two buildings shown in the field area.

Michael Baker INTERNATIONAL

Site Photographs

Source: Google Earth Pro. Imagery Date: 10/2022.

Figure 2

Attachment A
Geotechnical Study

GLOBAL GEO-ENGINEERING, INC.

November 24, 2022
Project 9548-04

Magnolia School District
2705 West Orange Avenue
Anaheim, California 92804

Attention: Mr. Richard Schwartz

Subject: Geotechnical Investigation
Proposed Modular Building
Dr. Peter Marshall Elementary School
2627 West Crescent Avenue
Anaheim, California

References: *See Appendix A*

Dear Mr. Schwartz:

1. INTRODUCTION

a) In accordance with your request, we have conducted a geotechnical investigation for the proposed improvements at the above referenced property located in Anaheim, California.

b) We understand that the proposed improvements will consist of construction of a 4,160 ft^2 modular building within the eastern part of the campus.

c) The proposed modular buildings will be light framed structures with perimeter concrete footings and the floors are sufficiently rigid. No slab-on-grade is planned, however, the floor is proposed to be flush with the exterior grade. A 2 to 3 feet crawl space is proposed below the floor of the building.

d) The estimated loads from the walls will be on the order of 1,100 lb/ft^2 and from the pads will be 13,000 lbs.

e) Grading plans are not available at present.

3 Corporate Park, Suite 270, Irvine, California 92606
Office 949 221 0900 Fax 949 221 0091
email: global@globalgeo.net

2. PURPOSE

The purpose of our investigation was to obtain and analyze subsurface information in order to provide site-specific recommendations pertaining to the following:

a) grading;

b) processing of soils;

c) foundation types;

d) foundation depths;

e) bearing capacity;

f) expansivity;

g) sulphate content and cement type;

h) shrinkage factor;

i) settlement;

j) seismicity;

k) liquefaction.

3. SCOPE

The scope of services we provided was as follows:

a) Preliminary planning and evaluations, and review of geotechnical reports related to the project site and nearby surrounding area *(*see *References* - *Appendix A)*;

b) Field exploration, consisting of drilling one exploratory boring to a depth of 51.5 feet below existing grade;

c) Logging of the boring by our Engineering Geologist;

d) Obtaining in-situ and bulk samples for classification and laboratory testing;

e) Laboratory testing of selected samples considered representative of site conditions, in order to derive relevant engineering properties;

f) Geologic and engineering analyses of the field and laboratory data;

g) Preparation of a report presenting our findings, conclusions and recommendations.

4. PRIOR GEOTECHNICAL WORK

a) In 2013, our firm conducted a geotechnical investigation for a, then, proposed modular building within the northwestern portion of the school campus. The field investigation consisted of drilling, sampling and logging two borings to a maximum depth of 51.5 feet below ground surface.

b) In 2017, AESCO conducted a geotechnical investigation for, then, proposed solar panels within the southwestern part of the school property. The field investigation consisted of drilling, sampling and logging two borings to a maximum depth of 50 feet below ground surface.

c) We understand that both the reports were approved by CGS.

5. FIELD EXPLORATION AND LABORATORY TESTING

a) The field exploration program is given in *Appendix B*, which includes the Log of Boring. California Geological Survey (CGS) requires a minimum of two borings. We had drilled two borings in 2013 and AESCO drilled two additional borings in 2017. Therefore, the school site has been explored by drilling five borings including a 51.5 feet deep boring drilled during this investigation. In our opinion, the site was explored with a sufficient number of borings to characterize the subsurface geology.

b) The results of the laboratory testing are included in *Appendix C.*

6. SITE DESCRIPTION

6.1 Location

a) The *Dr. Peter Marshall Elementary School* campus is located northwest of the intersection of Crescent Avenue and Magnolia Street, in the city of Anaheim, County of Orange, California.

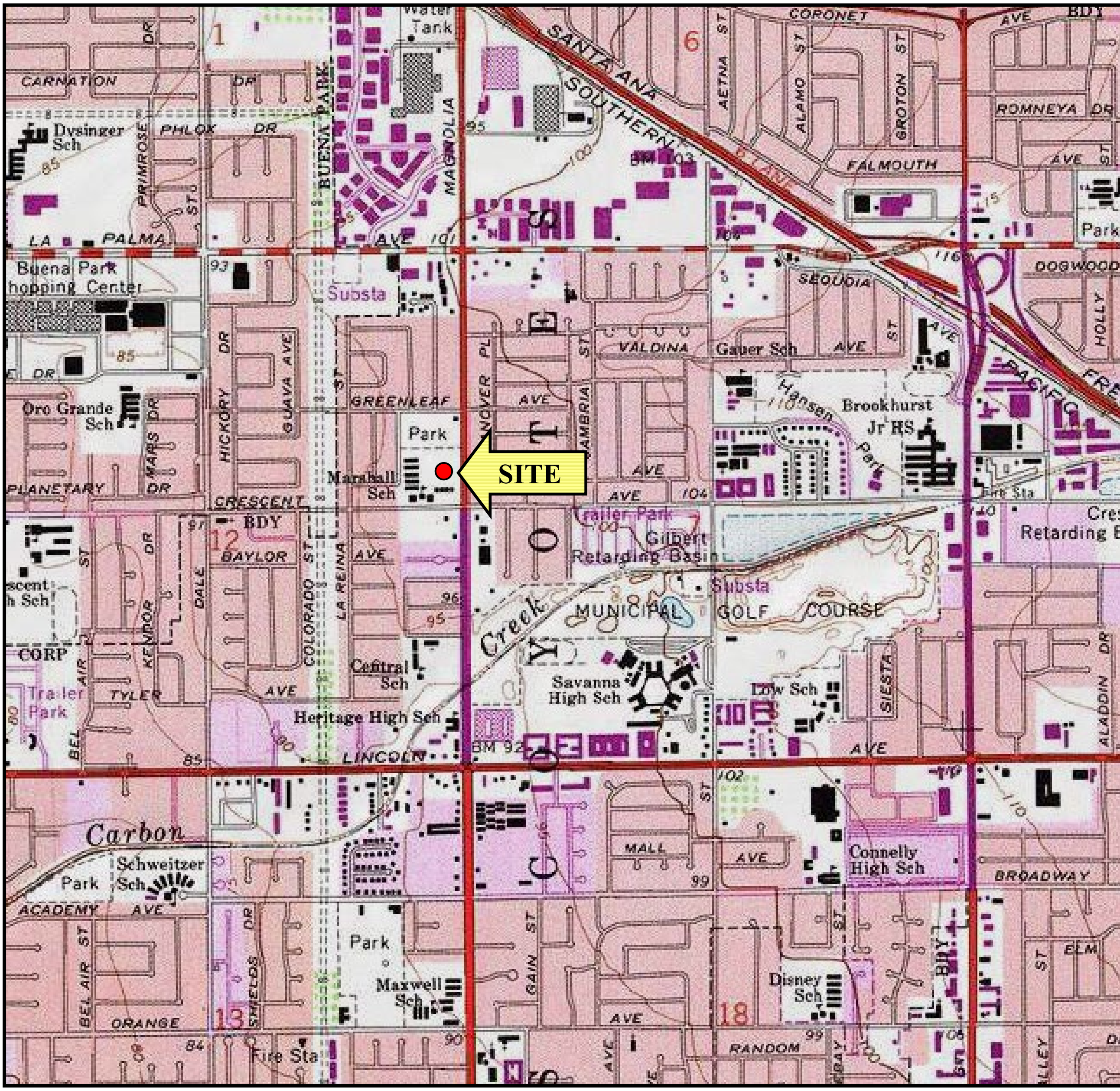
b) An approximate site location is shown on the *Location Map, Figure 1.*

c) The site is located at Latitude 33.8406^{o} and Longitude -117.9765^{o}.

6.2 Existing Surface Conditions

a) The proposed improvement area is primarily covered with grass. The ground surface is relatively level throughout the school site.

LOCATION MAP



BASE MAP: USGS 7.5-Minute Topographic Map, Anaheim, Quadrangle, 1981

2000 0 2000 4000

SCALE FEET

NORTH

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA

Dr. Peter Marshall Elementary School
2627 West Crescent Avenue
Anaheim, California

Date: November 2022

Project No.: 9548-04

Figure No: 1

b) The natural topography of the project site and the immediate surrounding areas generally descends at less than a one percent gradient in the westerly direction. The natural elevation at the site location is shown to be approximately 97 feet above Mean Sea Level (MSL).

c) Surface drainage consists of sheet flow runoff of incident rainfall water derived primarily within the property boundaries and adjacent properties. The nearest drainage course is Carbon Creek, located about 1,700 feet southeast of the project site.

6.3 Geology

6.3.1 Regional Geologic Setting

a) The project site is situated in the Orange County Coastal Plain, which forms part of the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges consist of a series of mountain ranges separated by longitudinal valleys.

b) The ranges trend northwest-southeast and are sub parallel to faults branching from the San Andreas Fault. The Peninsular Ranges extend from the southern side of the Santa Monica and San Gabriel Mountains into Baja California, Mexico (CDMG, 1997).

c) A *Regional Geologic Map* showing the site location is enclosed as *Figure 2.*

6.3.2 Local Geologic Setting

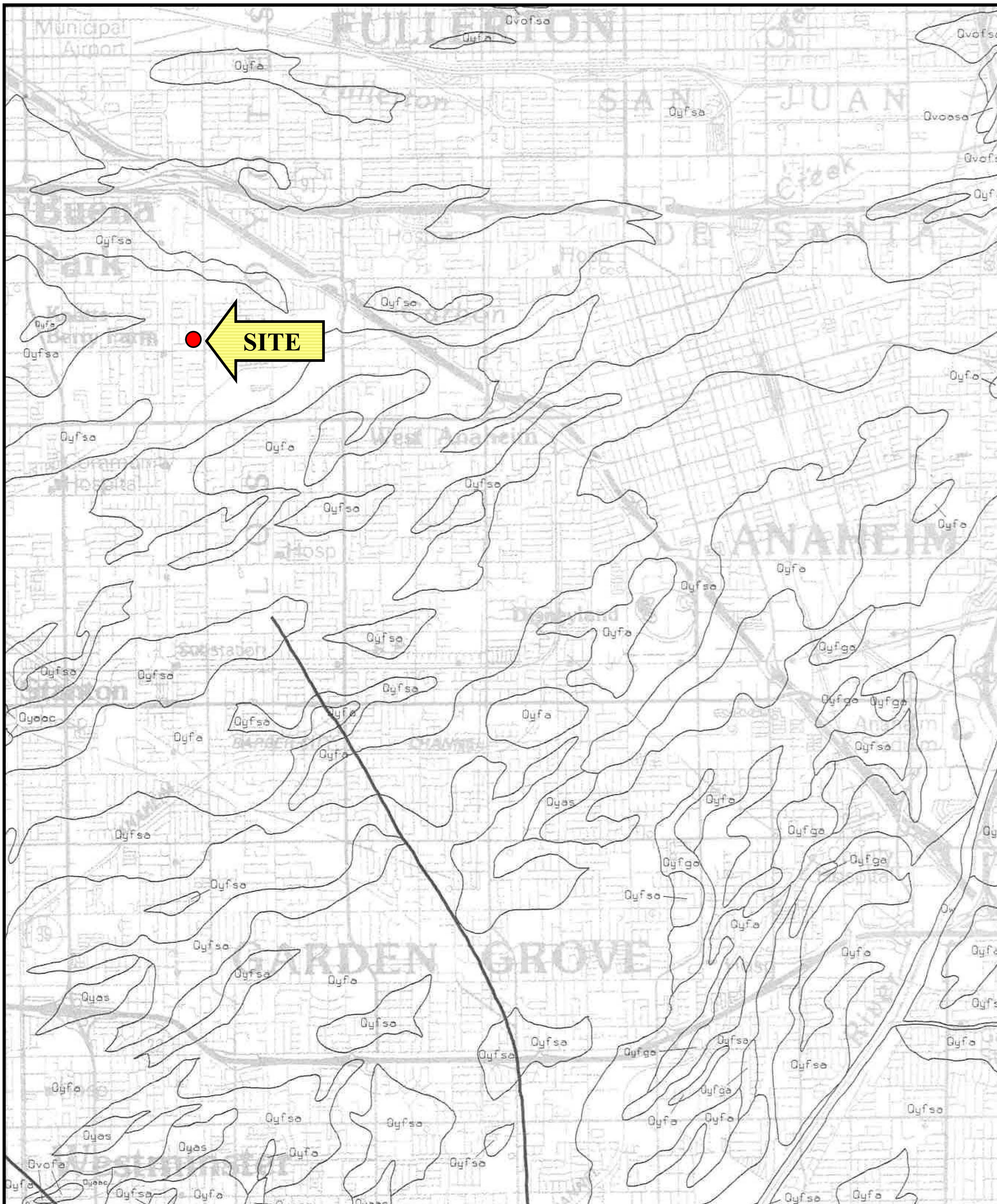
In general, the project site is underlain by a thick sequence of Holocene aged alluvial deposits of the regional coastal basin. These deposits are underlain by the broad, northwest-plunging synclinal Los Angeles Basin, which includes up to 4200 feet of relatively unconsolidated Pleistocene marine and non-marine sediments and up to 170 feet of unconsolidated non-marine sediments

6.4 Subsurface Conditions

6.4.1 General

a) The subsurface conditions, as encountered in our exploration, are described in the following sections.

REGIONAL GEOLOGIC MAP



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b) More detailed descriptions of the subsurface conditions are presented in our *Log of Boring*, which is enclosed as *Figure B-2*. The location of the boring is shown on our *Boring Location Plan, Figure B-3.*

c) The approximate locations of the borings excavated for our geotechnical investigation conducted in 2013 and the AESCO investigation performed in 2017 are also shown on the *Boring Location Plan*. The boring logs for each investigation are additionally enclosed.

6.4.2 Alluvium

a) Holocene-age alluvial deposits were encountered in our boring to the excavated depths.

b) The alluvium was found to generally consist of interbedded layers of SAND, Silty SAND, and Sandy SILT/SILT.

c) The SAND and Silty SAND sediments encountered in our excavations were generally found to be fine to medium grained, olive gray to yellowish brown, damp to very moist and loose to medium dense.

d) The Sandy SILT/SILT deposits were generally observed to be dark olive brown, moist to very moist, and medium stiff.

6.4.3 Groundwater

a) Groundwater was encountered at a depth of 42 feet below ground surface.

b) Our review of the *Seismic Hazard Zone Report for the Anaheim and Newport Beach 7.5 Minute Quadrangles,* prepared by the California Geological Survey (CGS) indicates that the historically highest groundwater level within the site area is about 18 feet below ground surface.

7. SEISMICITY AND GEOLOGIC HAZARDS

7.1 General

a) Seismic risk in Southern California is a well-recognized factor, and is directly related to geologic fault proximity to active or potentially active fault zones, and on the type of geologic structures. In relative terms, seismic damage is generally less intense in consolidated formations, i.e. bedrock, than in unconsolidated materials, such as alluvium.

b) In Southern California, most of the seismic damage to man-made structures results from ground shaking and to a lesser degree from liquefaction and ground rupture caused by earthquakes along active fault zones. In general, the greater the magnitude of the earthquake, the greater the potential damage.

7.2 Deterministic Seismic Hazard Analysis

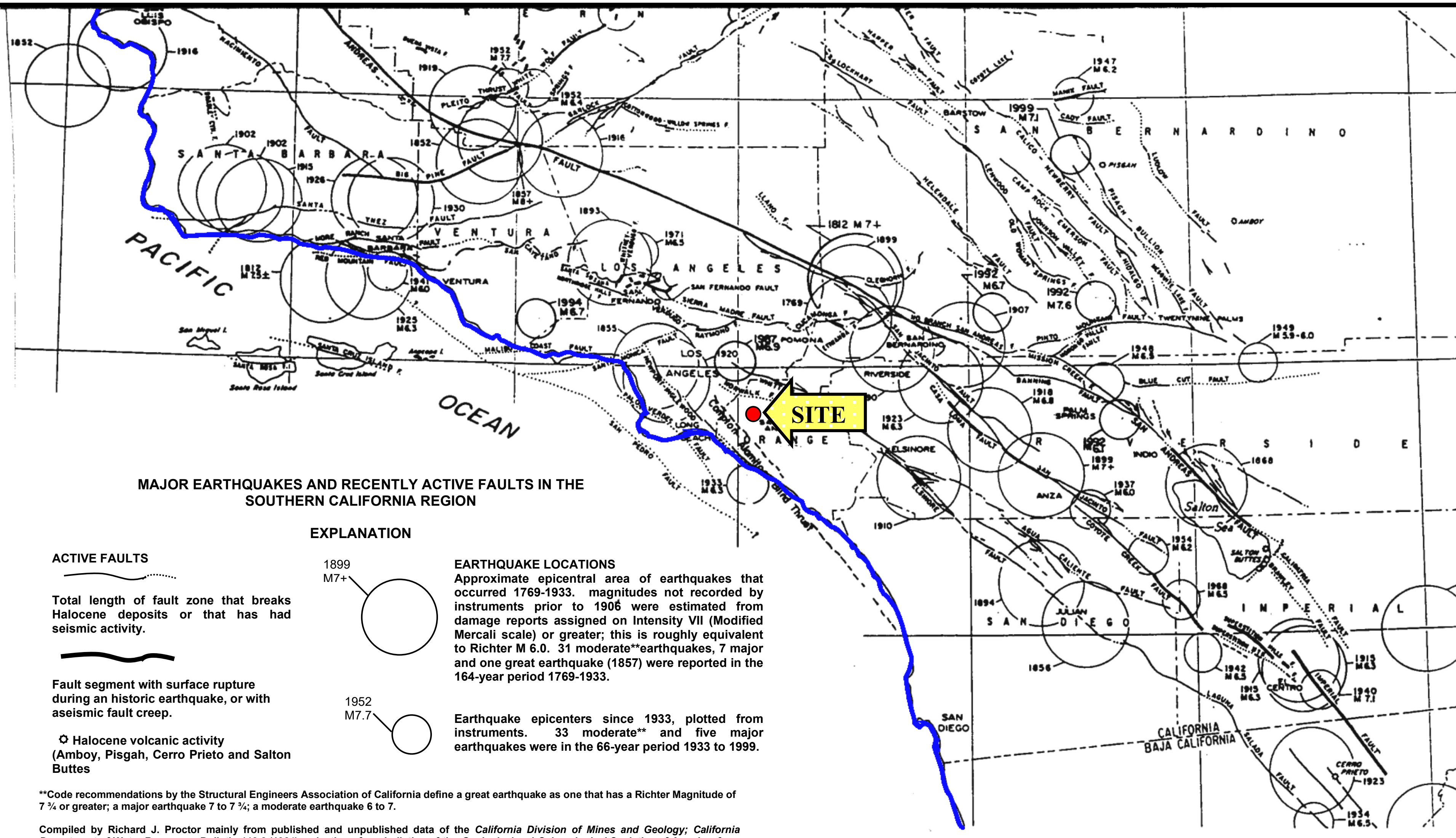
a) We utilized the *U.S. Seismic Design Maps* internet program provided by the California Office of Statewide Health Planning and Development to calculate the peak ground acceleration (PGA) at the project site location. The PGA_M at the subject property resulted to be 0.694g.

b) *Figure 3* shows the geographical relationships among the site locations, nearby faults and the epicenters of significant occurrences. From the seismic history of the region and proximity, the Whittier Fault has the greatest potential for causing earthquake damage related to ground shaking at this site.

7.3 Ground Surface Rupture

a) The subject property is not located within a State of California delineated *Earthquake Fault Zone (EFZ)*; however, during historic times, a number of major earthquakes have occurred along active faults in Southern California.

b) The closest known active fault is the Whittier Fault located at a distance of about 8.2 miles northeast of the project site. Other known nearby active faults include the Newport-Inglewood Fault and the Elsinore Fault Zone located 9.1 and 19.2 miles, respectively, from the project site. Due to the distance of the closest active fault to the site, ground rupture is not considered a significant hazard at the site.



MAJOR EARTHQUAKES AND RECENTLY ACTIVE FAULTS IN THE SOUTHERN CALIFORNIA REGION

EXPLANATION

ACTIVE FAULTS

Total length of fault zone that breaks Halocene deposits or that has had seismic activity.

Fault segment with surface rupture during an historic earthquake, or with aseismic fault creep.

✪ Halocene volcanic activity (Amboy, Pisgah, Cerro Prieto and Salton Buttes

1899
M7+

EARTHQUAKE LOCATIONS
Approximate epicentral area of earthquakes that occurred 1769-1933. magnitudes not recorded by instruments prior to 1906 were estimated from damage reports assigned on Intensity VII (Modified Mercali scale) or greater; this is roughly equivalent to Richter M 6.0. 31 moderateearthquakes, 7 major and one great earthquake (1857) were reported in the 164-year period 1769-1933.**

1952
M7.7

Earthquake epicenters since 1933, plotted from instruments. 33 moderate and five major earthquakes were in the 66-year period 1933 to 1999.**

****Code recommendations by the Structural Engineers Association of California define a great earthquake as one that has a Richter Magnitude of 7 ¾ or greater; a major earthquake 7 to 7 ¾; a moderate earthquake 6 to 7.**

Compiled by Richard J. Proctor mainly from published and unpublished data of the *California Division of Mines and Geology; California Department of Water Resources Bulletin 116-2* (1964); selections from bulletins of the *Geological* and *Seismological Societies of America*; from C.F. Richter, *Elementary Seismology* (1958); and the *National Atlas*, p. 66, and from Working Group on California Earthquake Probabilities- SSA Bulletin V 85.

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Figure No: 3

7.4 Liquefaction

The site is located inside of a State of California delineated *Seismic Hazard Zone* with a potential for liquefaction during a seismic event. A potential for liquefaction is present. A liquefaction analyses was conducted and the results are provided in *Section 8.6.* Mitigating measures to reduce the effects of any liquefaction are provided in the following sections.

7.5 Landslides and Slope Failures

No steep natural slopes exist within the property boundary or in the immediate surrounding areas. The potential for landsliding and or slope failure is considered nil.

7.6 Compressible Soils/Hydroconsolidation

The soils encountered in the borings, in general, comprised of loose to medium dense soils with the moisture content at the optimum level. The structures are lightly loaded. The potential for hydroconsolidation is considered low.

7.7 Seismically-Induced Settlement

a) Strong seismic shaking can cause settlement by allowing sediment particles to become more tightly packed, thereby reducing pore space. Some soft colluvial and alluvial deposits are more susceptible to this phenomenon than are others.

b) Artificial fills, if not adequately compacted, may also experience seismically induced settlement.

c) A potential for seismically induced settlement is present as mentioned in *Section 8.6.*

7.8 Flooding Attributes to Dam/Levee Failure

a) Based on our review of the Orange County General Plan, the project site is located within the Prado Dam Inundation Area. The Prado Dam is located approximately 19.5 miles northeast of the project site.

b) Based on information provided on the Orange County Public Works website, the dam embankment has been raised 28.4 feet to an elevation of 594.4 feet above sea level. Other completed, current or future improvements, which are also expected to significantly reduce the seismically-induced flood danger to areas located within the dam inundation zone, include:

- Raising the spillway crest from elevation of 543 ft. to 563 ft.

- Constructing new outlet works increasing the maximum discharge capacity from 9,000 cfs to 30,000 cfs - Completed.
- Constructing new levees and dikes.
- Acquiring over 1,700 acres of property rights for reservoir expansion.
- Relocating and protecting 30 various utility lines.
- Increasing reservoir area from 6,695 acres to 10,256 acres.
- Increasing-impoundment from 217,000 acre-feet to 362,000 acre-feet.

7.9 Seiches

Confined bodies of water may be subject to large, earthquake-induced waves known as seiches. These waves can cause flooding and other related property damage to adjacent areas. Since no large bodies of water are present on or adjacent to the site, the potential for seiching is regarded as low.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1 General

a) It is our opinion that the site will be suitable for the proposed development from a geotechnical aspect, assuming that our recommendations are incorporated in the project plan designs and specifications, and are implemented during construction.

b) We are of the opinion that the proposed improvements may be supported on shallow foundations founded in the undisturbed native soils.

c) We are also of the opinion that with due and reasonable precautions, the required grading will not endanger adjacent property nor will grading be affected adversely by adjoining property.

d) The design recommendations in the report should be reviewed during the grading phase when soil conditions in the excavations become exposed.

e) The final grading plans and foundation plans/design loads should be reviewed by the Geotechnical Engineer.

8.2 Grading

8.2.1 Processing of On-Site Soils

a) The footings may be excavated in the existing native soils without any overexcavation. The exposed bottom of the footings should be compacted in place to achieve at least 92 percent relative compaction. The footings should be designed using an allowable bearing capacity of 500 lb/ft^2. The lower allowable bearing capacity will reduce the pressure on the underlying soils and reduce the potential of settlement of the underlying compressible soils.

b) The bottom of the overexcavation should be observed and approved by a geotechnical engineer.

c) Prior to placing any new fill, the upper 6 to 8 inches of the subgrade should, after stripping or overexcavation, first be scarified and reworked.

d) Any loosening of reworked or native material, consequent to the passage of construction traffic, weathering, etc., should be made good prior to further construction.

e) The depths of overexcavation, if any, should be reviewed by the Geotechnical Engineer during construction. Any surface or subsurface obstructions, or any variation of site materials or conditions encountered during grading should be brought immediately to the attention of the Geotechnical Engineer for proper exposure, removal or processing, as directed.

f) No underground obstructions or facilities should remain in any structural areas. Depressions and/or cavities created as a result of the removal of obstructions should be backfilled properly with suitable materials, and compacted.

8.2.2 Material Selection

After the site has been stripped of any debris, vegetation and organic soils, excavated on-site soils are considered satisfactory for reuse in the construction of on-site fills, with the following provisions:

a) The organic content does not exceed one percent by volume;

b) Large size rocks or concrete pieces greater than 8 inches in diameter should not be incorporated in compacted fill;

c) Rocks or concrete pieces greater than 4 inches in diameter should not be incorporated in compacted fill to within 1 foot of the underside of the footings and slabs.

8.2.3 Compaction Requirements

a) Reworking/compaction shall include moisture conditioning/drying as needed to bring the soils to slightly above the optimum moisture content. All reworked soils and structural fills should be densified to achieve at least **92 percent relative compaction** with reference to laboratory compaction standard. The optimum moisture content and maximum dry density should be determined in the laboratory in accordance with ASTM Test Designation D1557.

b) Fill should be compacted in lifts not exceeding 8 inches (loose).

8.2.4 Excavating Conditions

a) Excavation of on-site materials may be accomplished with standard earthmoving or trenching equipment. No hard rock was encountered which will require blasting.

b) The current groundwater level was measured at a depth of 42 feet below the existing grade. Dewatering is not anticipated in excavations.

8.2.5 Shrinkage

For preliminary earthwork calculation, an average shrinkage factor of 10 percent is recommended for the fill soils (this does not include handling losses).

8.2.6 Expansion Potential

a) The surface soils below the project improvements consist of Silty SAND. By observation, the expansion potential is considered to be *low*.

b) The soil expansion potential for subgrade soils should be determined during the final stages of rough grading.

8.2.7 <u>Sulphate Content</u>

a) A representative soil sample was tested in the laboratory by AESCO to determine the sulphate content. The sulphate content was found to be 0.0450, less than 0.1 percent. The sulphate exposure is considered *negligible* in accordance with the building code. However, the structural engineer should be notified.

b) The fill materials should be tested for their sulphate content during the final stage of rough grading.

8.2.8 <u>Utility Trenching</u>

a) The walls of temporary construction trenches in fill should stand nearly vertical, with only minor sloughing, provided the total depth does not exceed 3 feet (approximately). Shoring of excavation walls or flattening of slopes may be required, if greater depths are necessary.

b) Trenches should be located so as not to impair the bearing capacity or to cause settlement under foundations. As a guide, trenches should be clear of a 45-degree plane, extending outward and downward from the edge of foundations. Shoring should comply with Cal-OSHA regulations.

c) Existing soils may be utilized for trenching backfill, provided they are free of organic materials.

d) All work associated with trench shoring must conform to the state and federal safety codes.

8.2.9 <u>Construction Cut</u>

a) The construction cut may be made at vertical to a maximum height of 3 feet. The construction cut should be observed by a geotechnical engineer.

b) Any adverse conditions exposed during the excavation will be evaluated by us and mitigating recommendations, if required, will be provided with due consideration given to the exposed geologic conditions including bedding and depth of the excavation.

8.2.10 Surface Drainage Provisions

Positive surface gradients should be provided adjacent to the buildings to direct surface water run-off away from structural foundations and to suitable discharge facilities.

8.2.11 Grading Control

a) All grading and earthwork should be performed under the observation of a Geotechnical Engineer in order to achieve proper subgrade preparation, selection of satisfactory materials, placement and compaction of structural fill.

b) Sufficient notification prior to stripping and earthwork construction is essential to make certain that the work will be adequately observed and tested.

8.3 Slab-on-Grade (if any)

a) Concrete floor slabs may be founded on the compacted fill.

b) The slab-on-grade should be underlain by 4-inch thick granular base as required by the 2016 California Building Code.

c) A plastic vapor barrier is recommended to be placed at the mid-height of the SAND.

d) It is recommended that #4 bars on 16-inch center, both ways or equivalent be provided as minimum reinforcement in slabs-on-grade. Joints should be provided and slabs should be at least 5 inches thick.

e) The FFL should be at least 6 inches above highest adjacent grade.

f) The subgrade should be kept moist prior to the concrete pour.

8.4 Spread Foundations

The proposed structures can be founded on shallow spread footings. The criteria presented below should be adopted. However, we understand that the footings will be at least inches deep below the existing grade.

8.4.1 Dimensions/Embedment Depths

Footings	Minimum Width (ft)	Minimum Embedment Below Lowest Finished Surface (ft)
1-sory Wall Footings	1.0	1.0
Pad Footings	–	1.5

8.4.2 Allowable Bearing Capacity

Embedment Depth (ft)	Allowable Bearing Capacity (lb/ft^2)
1.0	500

(Notes:

- These values may be increased by one-third in the case of short-duration loads, such as induced by wind or seismic forces;
- Planter areas should not be sited adjacent to walls;
- Footing excavations should be observed by the Geotechnical Engineer;
- Footing excavations should be kept moist prior top the concrete pour;
- It should be ensured that the embedment depths do not become reduced or adversely affected by erosion, softening, planting, digging, etc.)

8.4.3 Settlements

Total and differential settlements under spread footings are expected to be within tolerable limits and are not expected to exceed 1 inch and ¾ inches over horizontal span of 40 feet, respectively.

8.5 Seismic Coefficients

a) Using the field blow counts obtained in drilled Boring B-1, we calculated the average field standard penetration resistance using the Equation 20.4.2 in ASCE 7-16. As the soils typically become denser, we assumed, conservatively, the last blow count of 44 for the depth below 51.5 feet. This minimum average is 22 blows/foot, which is classified as Site Class D (Table 20.3-1). The calculations are enclosed in *Figure 4*.

b) For seismic analysis of the proposed project in accordance with the seismic provisions of ASCE 7-16, we recommend the following:

ITEM	VALUE
Site Latitude (Decimal-degrees)	33.8406
Site Longitude (Decimal-degrees)	-117.9765
Site Class	D
Risk Category	II
Mapped Spectral Response Acceleration-Short Period (0.2 Sec) - S_S	1.481
Mapped Spectral Response Acceleration-1 Second Period – S_1	0.523
Short Period Site Coefficient-F_a	1.0
Long Period Site Coefficient F_v	1.77
Adjusted Spectral Response Acceleration @ 0.2 Sec. Period (Sms)	1.481
Adjusted Spectral Response Acceleration @ 1Sec.Period (S_{m1})	0.926
Design Spectral Response Acceleration @ 0.2 Sec. Period (S_{Ds})	0.988
Design Spectral Response Acceleration @ 1-Sec. Period (S_{D1})	0.617

c) A ground motion analysis is not required. The design team is requested to invoke the exception from ASCE 7.16 Section 11.4.8.

8.6 Liquefaction

a) In general, the subsurface soils consist of SAND, Silty SAND, and Sandy SILT/SILT.

b) We performed a liquefaction analysis utilizing the subsurface soils data encountered in our borings and the laboratory test results considering the ground water level at 5 feet below ground surface even though the ground water was encountered at 42 feet below grade. The results of the analysis are included in *Figure 5.*

Average Field Standard Penetration Resistance
(Per ASCE 7.16 Section 20.4 .2)

Depth, ft	Thickness, d_i	Blow Counts, N_i	d_i/N_i
3	3	9.1	0.33
7.5	4.5	8.4	0.54
12	4.5	13	0.35
14	2	9.8	0.20
17.5	3.5	21	0.17
22.5	5	25	0.20
29	6.5	29	0.22
35	6	10	0.60
39	4	13	0.31
45	6	25	0.24
48	3	12	0.25
51.5	3.5	44	0.08
100	48.5	44	1.10
$\Sigma (d_i/N_i)$ =			4.59
N =		21.8	

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Figure 4

c) The results indicate the soils layers from 3 to 14, 29 to 45 feet have a factor of safety less than 1.0. Potentially, these layers will liquefy during a seismic event. From 45 to 48 feet below grade the soils are cohesive SILT and are considered not susceptible to liquefaction based on the screening criteria established by Boulanger and Idriss in *Liquefaction Susceptibility Criteria for Silts and Clays, Figure 14* November 2006. Even if they liquefy, the surface manifestation will be very low.

d) The potential total seismic settlement is computed as 3.11 inches. The seismic settlement calculated for 2013 investigation was 0.16 inches whereas it was 1.2 inches for the 2017 investigation.

e) Due to a relatively smaller footprint of the building and continuous liquefiable layers sandwiched between the non-liquefiable layers, the potential for differential settlement at the surface is present but will be low, 20 percent of the total settlement or 0.6 inches.

f) The proposed structures consist pre-fabricated building with a relatively more rigid framework and floor. This will help in reducing the effects of the potential liquefaction.

8.7 Soil Corrosion Potential

a) Soil Corrosion potential for metal and concrete was estimated by performing water-soluble sulfate, chloride and pH by AESCO.

b) Based on this data, it is our opinion that, in general, on-site near-surface soils are considered *moderately corrosive* in nature. This potential should be considered in design of underground metal pipes.

8. LIMITATIONS

a) Soils and bedrock over an area show variations in geological structure, type, strength and other properties from what can be observed sampled and tested from specimens extracted from necessarily limited exploratory borings. Therefore, there are natural limitations inherent in making geologic and soil engineering studies and analyses. Our findings, interpretations, analyses and recommendations are based on observation, laboratory data and our professional experience; and the projections we make are professional judgments conforming to the usual standards of the profession. No other warranty is herein expressed or implied.

LIQUEFACTION ANALYSES

Legend:

d	Base Depth, ft.	
z	Base Depth, meters	**d/12*2.54**
ω	Moisture Content, %	
γ_{dry}	Dry Density, lb/ft^3	
γ_{wet}	Wet Density, lb/ft^3	**$(1+\omega/100)\gamma_{dry}$**
γ_w	Density of Water, lb/ft^3	**62.4**
γ_o	Effective Density, lb/ft^3	**$\gamma_{wet}-\gamma_{dry}$**
σ_o	Overburden Stress, ton/ft^2	
σ_o'	Effective Overburden Stress, ton/ft^2	
f	Fines Content,%	
s	Degree of Saturation, %	
N	Measured Blow Count, /ft.	
C_N	Depth correction Factor	
C_E	Energy Ratio Correction Factor	**1.00**
C_B	Bore Hole Diameter Correction Factor	**1.00**
C_R	Rod Length Correction Factor	**1.00**
C_s	Sampling Method Correction Factor	**1.00**
$(N_1)_{60}$	Corrected Normalized SPT N-values, SAND	
$(N1)_{60}$	Corrected Normalized SPT N-values, Silty SAND	**$\alpha+\beta(N_1)_{60}$**
α	Coefficient	**$\exp(1.76-(190/f^2))$**
β	Coefficient	
M	Earthquake Design Magnitude	**6.8**
C_m	Magnitude Scaling Factor	**1.28**
r_d	Reduction Factor	
CSR_m	Cyclic Stress Ratio induced by the Design Earthquake of Magnitude M	
CSR	Cyclic Stress Ratio induced by the Earthquake of Magnitude 7.5	
a_{max}	Ground Acceleration, g	**0.69**
CRR	Cyclic Stress Ratio to cause Liquefaction for Magnitude 7.5	
CRR_m	Cyclic Stress Ratio to cause Liquefaction for Magnitude, M	
FS	Factor of Safety	

The source for the equations in this analysis is ***Recommended Procedurs for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California***

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Figure 5.1

LIQUEFACTION ANALYSES

Calculations of $(N_1)_{60cs}$ and Factor of Safety:

d_1	d_2	d	N	ω	γ_{dry}	γ_{wet}	γ_o	f	s	σ'	σ_o'	C_N	$(N_1)_{60}$	α	β	$(N1)_{60cs}$	CRR	r_d	CSR_m	CSR	FS
0.0	3.00	1.50	9	2.6	100.0	102.6	102.6	20	11	0.08	0.08	3.6	32	3.61	1.08	39	1.000	1.00	0.445	0.347	2.9
3.0	7.50	5.25	8	2.7	96.0	98.6	36.2	7	10	0.26	0.19	2.3	18	0.11	1.01	18	0.198	0.99	0.600	0.467	0.4
7.5	12.00	9.75	13	2.7	106.3	109.2	46.8	7	13	0.50	0.29	1.9	24	0.11	1.01	25	0.275	0.98	0.756	0.589	0.5
12.0	14.00	**13.00**	10	11.6	106.1	118.4	56.0	20	55	0.68	0.37	1.6	16	3.61	1.08	21	0.228	0.97	0.801	0.624	0.4
14.0	17.50	17.00	21	2.5	97.2	99.6	37.2	3	100	0.83	0.43	1.5	32	0.00	1.00	32	1.000	0.96	0.828	0.645	1.6
17.5	22.50	20.00	25	2.5	97.2	99.6	37.2	3	100	1.04	0.51	1.4	35	0.00	1.00	35	1.000	0.96	0.872	0.679	1.5
22.5	29.00	25.75	29	2.0	96.7	98.6	36.2	3	100	1.32	0.61	1.3	37	0.00	1.00	37	1.000	0.94	0.903	0.703	1.4
29.0	35.00	32.00	10	2.0	96.7	98.6	36.2	34	100	1.63	0.73	1.2	12	4.95	1.19	19	0.204	0.91	0.911	0.709	0.3
35.0	39.00	37.00	13	2.0	96.7	98.6	36.2	34	100	1.88	0.82	1.1	14	4.95	1.19	22	0.241	0.88	0.898	0.699	0.3
39.0	45.00	42.00	25	2.0	96.7	98.6	36.2	5	100	2.12	0.91	1.0	26	0.00	1.00	26	0.304	0.83	0.870	0.677	0.4
45.0	48.00	46.50	12	2.0	96.7	98.6	36.2	5	100	2.35	0.99	1.0	12	0.00	1.00	12	0.131	0.79	0.835	0.650	NCL
48.0	51.50	49.75	44	2.0	96.7	98.6	36.2	3	100	2.51	1.05	1.0	43	0.00	1.00	43	1.000	0.76	0.806	0.628	1.6

NCL- not susceptible to liquefaction based on the screening criteria

Settlement Calculations:

d_1	d_2	d	$(N_1)_{60}$	f	Corr.	$(N_1)_{60corr}$	s	CSR	ε	Δs
0.0	3.00	1.50	32	20	1.0	33	11	0.347	0.00	0.00
3.0	7.50	5.25	18	7	1.0	19	10	0.467	1.40	0.53
7.5	12.00	9.75	24	7	1.0	25	13	0.589	2.05	0.77
12.0	14.00	13.00	16	20	1.0	17	55	0.624	1.60	0.27
14.0	17.50	15.75	32	3	1.0	33	100	0.645	1.50	0.00
17.5	22.50	20.00	35	3	1.0	36	100	0.679	1.60	0.00
22.5	29.00	25.75	37	3	1.0	38	100	0.703	0.00	0.00
29.0	35.00	32.00	12	34	2.0	14	100	0.709	2.00	1.00
35.0	39.00	37.00	14	34	2.0	16	100	0.699	1.75	0.58
39.0	45.00	42.00	26	5	3.0	29	100	0.677	0.75	0.38
45.0	48.00	46.50	12	5	1.0	13	100	0.650	1.90	0.00
48.0	51.50	49.75	43	3	1.0	44	100	0.628	3.00	0.00
										3.11

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Figure 5.2

b) In the event, that during construction, conditions are exposed which is significantly different from those described in this report, they should be brought to the attention of the Geotechnical Engineer.

c) The recommendations provided in this report are intended to minimize the potential of distress to the structures caused by compressible soils. However, it should be noted that certain amount of settlement of the structures is unavoidable and should be anticipated during the lifetime of the existing and the proposed structures.

d) Additional factors that should be considered with respect to the stability of temporary excavation sidewalls include construction traffic and storage of materials on or near the tops of the slopes, construction scheduling, and weather conditions at the time of construction. All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act of 1970, and the Construction Safety Act should also be followed. No temporary excavations should be left open without proper protections to mitigate safety hazards. **The contractor is solely responsible for ensuring the safety of construction personnel and the general public, and for appointing a designated *Competent Person* to observe and classify temporary excavation sidewalls pursuant to OSHA Safety and Health Regulations for Construction.**

The opportunity to be of service is sincerely appreciated. If you have any questions or if we can be of further assistance, please call.

Very truly yours,

GLOBAL GEO-ENGINEERING, INC.

Mohan B. Upasani
Principal Geotechnical Engineer
RGE 2301
(Exp. March 31, 2023)

Kevin B. Young
Principal Engineering Geologist
CEG 2253
(Exp. October 31, 2023)

MBU/KBY: fdg

Enclosures:

Location Map	- Figure 1
Regional Geologic Map	- Figure 2
Seismicity Map	- Figure 3
Average Field Standard Penetration Resistance Calculations	- Figure 4
Liquefaction Analyses	- Figure 5
Terms and Conditions	
References	- Appendix A
Field Exploration	- Appendix B
Unified Soils Classification System	Figure B-1
Log of Boring (This investigation)	Figure B-2
Boring Location Plan	Figure B-3
Logs of Boring (Our 2013 investigation)	
Logs of Boring (AESCO 2017 investigation)	
Laboratory Testing	- Appendix C

TERMS AND CONDITIONS OF AUTHORIZATION

Consultant shall serve Client by providing professional counsel and technical advice regarding subsurface conditions consistent with the scope of services agreed-to between the parties. Consultant will use his professional judgment and will perform his services using that degree of care and skill ordinarily exercised under similar circumstances, by reputable foundation engineers and/or engineering geologists practicing in this or similar localities.

- In assisting Client, the Consultant may include or rely on information and drawings prepared by others for the purpose of clarification, reference or bidding; however, by including the same, the Consultant assumes no responsibility for the information shown thereon and Client agrees that Consultant is not responsible for any defects in its services that result from reliance on the information and drawings prepared by others. Consultant shall not be liable for any incorrect advice; judgment or decision based on any inaccurate information furnished by the Client or any third party, and Client will indemnify Consultant against claims, demands, or liability arising out of, or contribute to, by such information.

- Unless otherwise negotiated in writing, Client agrees to limit any and all liability, claim for damages, cost of defense, or expenses to be levied against Consultant on account of design defect, error, omission, or professional negligence to a sum **not to exceed ten thousand dollars or charged fees whichever is less**. Further, Client agrees to notify any construction contractor or subcontractor who may perform work in connection with any design, report, or study prepared by Consultant of such limitation of liability for design defects, errors, omissions, or professional negligence, and require as a condition precedent to their performing the work a like limitation of liability on their part as against the Consultant. In the event the Client fails to obtain a like limitation of liability provision as to design defects, errors, omissions or professional negligence, any liability of the Client and Consultant to such contractor or subcontractor arising out of a negligence shall be allocated between Client and Consultant in such a manner that the aggregate liability of Consultant for such design defects to all parties, including the Client shall **not exceed ten thousand dollars or charged fees whichever is less**. No warranty, expressed or implied of merchantability or fitness, is made or intended in connection with the work to be performed by Consultant or by the proposal for consulting or other services or by the furnishing of oral or written reports or findings made by Consultant.

- The Client agrees, to the fullest extent permitted by law, to indemnify, defend and hold harmless the Consultant, its officers, directors, employees, agents and subconsultants from and against all claims, damages, liabilities or costs, including reasonable attorney's fees and defense costs, of any nature whatsoever arising from or in connection with the Project to the extent that said claims, damages, liabilities or costs arise out of the work, services, or conduct of Client or Client's contractors, subconsultants, or other third party not under Consultant's control. Client further agrees that the duty to defend set forth herein arises immediately and is not contingent on a finding of fault against Client or Client's contractors, subconsultants, or other third parties. Client shall not be obligated under this provision to indemnify Consultant for Consultant's sole negligence or willful misconduct.

- Client shall grant free access to the site for all necessary equipment and personnel and Client shall notify any and all possessors of the project site that Client has granted Consultant free access to the project site at no charge to Consultant unless expressly agreed to otherwise in writing.

- If Client is not the property owner for the subject Project, Client agrees that it will notify the property owner of the terms of this agreement and obtain said property owner's approval to the terms and conditions herein. Should Client fail to obtain the property owner's agreement as required herein, Client agrees to be solely responsible to Consultant for all damages, liabilities, costs, including litigation fees and costs, arising from such failure that exceed that limitation of Consultant's liability herein.

- Client shall locate for Consultant and shall assume responsibility for the accuracy of his representations as to the locations of all underground utilities and installations. Consultant will not be responsible for damage to any such utilities or installation not so located.

- Client and Consultant agree to waive claims against each other for consequential damages arising out of or relating to this agreement. Neither party to this agreement shall assign the contract without the express, written consent of the other party.

- Consultant agrees to cover all open test holes and place a cover to carry a 200-pound load on each hole prior to leaving project site unattended. Consultant agrees that all test holes will be backfilled upon completion of the job. However, Client may request test holes to remain open after completion of Consultants work. In the event Client agrees to pay for all costs associated with covering and backfilling said test holes at a later date, and Client shall indemnify, defend and hold harmless Consultant for all claims, demands and liabilities arising from his request, except for the sole negligence of the Consultant, to the extent permitted by law.

- Consultant shall not be responsible for the general safety on the job or for the work of Client, other contractors and third parties.

- Consultant shall be excused for any delay in completion of the contract caused by acts of God, acts of the Client or Client's agent and/or contractors, inclement weather, labor trouble, acts of public utilities, public bodies, or inspectors, extra work, failure of Client to make payments promptly, or other contingencies unforeseen by Consultant and beyond reasonable control of the Consultant.

- In the event that either party desires to terminate this contract prior to completion of the project, written notification of such intention to terminate must be tendered to the other party. In the event Client notifies Consultant of such intention to terminate Consultant's services prior to completion of the contract, Consultant reserves the right to complete such analysis and records as are necessary to place files in order, to dispose of samples, put equipment in order, and (where considered necessary to protect his professional reputation) to complete a report on the work performed to date. In the event that Consultant incurs cost in Client's termination of this Agreement, a termination charge to cover such cost shall be paid by Client.

- If the Client is a corporation, the individual or individuals who sign or initial this Contract, on behalf of the Client, guarantee that Client will perform its duties under this Contract. The individual or individuals so signing or initialing this Contract warrant that they are duly authorized agents of the Client.

- Any notice required or permitted under this Contract may be given by ordinary mail at the address contained in this Contract, but such address may be changed by written notice given by one party to the other from time to time. Notice shall be deemed received in the ordinary course of the mail. This agreement shall be deemed to have been entered into the County of Orange, State of California.

LIMITATIONS

Our findings, interpretations, analyses, and recommendations are professional opinions, prepared and presented in accordance with generally accepted professional practices and are based on observation, laboratory data and our professional experience. Consultant does not assume responsibility for the proper execution of the work by others by undertaking the services being provided to Client under this agreement and shall in no way be responsible for the deficiencies or defects in the work performed by others not under Consultant's direct control. No other warranty herein is expressed or implied.

APPENDIX A

References

1. AESCO, April 10, 2017, *Geotechnical Report, Proposed Solar Panels, Magnolia School District, Dr. Peter Marshall Elementary School, Anaheim, California*, AESCO Project No. 20161115-E3329.

2. California Geological Survey, 1997 (Revised 2001, 2005 and 2006), *Seismic Hazard Zone Report for the Anaheim and Newport Beach 7.5-minute Quadrangles, Orange County, California,* Seismic Hazard Zone Report 003.

3. California Geological Survey, Accessed October 19, 2022, *Earthquake Zones of Required Investigation* (Internet).

4. California Office of Statewide Health Planning and Development, Seismic Design Maps Web Tool, ASCE 7-16 Standard (Internet).

5. Global Geo-Engineering, Inc., December 12, 2013, *Geotechnical Investigation, Proposed Modular Building, Dr. Peter Marshall Elementary School, Magnolia School District, Anaheim, California*, Project No. 5682-04.

6. Morton, P.K., and Miller, R.V., 1973, *Geologic Map of Orange County, California*, California Division of Mines and Geology Preliminary Report 15, Plate 1.

7. United States Geological Survey, 1965 photorevised 1981, Anaheim Quadrangle, 7.5-Minute Topographic Series.

APPENDIX B

Field Exploration

a) The site was explored on October 10, 2022, utilizing a hollow stem drill rig to excavate one boring to a maximum depth of 51.5 feet below the existing ground surface. The boring was subsequently backfilled.

b) The soils encountered in the excavation were logged and sampled by our Engineering Geologist. The soils were classified in accordance with the Unified Soil Classification System described in *Figure B-1*. The Log of Boring is presented as *Figure B-2*. The approximate location of the boring is shown on the *Boring Location Plan, Figure B-3.* The locations of borings during prior investigations are also included in *Figure B-3.* The logs of borings from the prior investigations are enclosed after *Figure B-3.* The log, as presented, is based on the field log, modified as required from the results of the laboratory tests. Driven ring and bulk samples were obtained from the excavation for laboratory inspection and testing. The depths at which the samples were obtained are indicated on the log.

c) The number of blows of the driving weight during sampling was recorded, together with the depth of penetration, the driving weight and the height of fall. The blows required per foot of penetration for given samples was then calculated and shown on the log.

d) Groundwater was encountered at a depth of 42 feet below ground surface in our boring excavation.

UNIFIED SOILS CLASSIFICATION (ASTM D-2487)

PRIMARY DIVISION			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of materials is larger than #200 sieve size	GRAVELS More than half of coarse fraction is larger than #4 sieve	Clean Gravels (<5% fines)	GW	Well graded gravels, gravel-sand mixture, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		Gravel with Fines	GM	Silty gravels, gravel-sand-silt mixture. Non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures. Plastic fines
	SANDS More than half of coarse fraction is smaller than #4 sieve	Clean Sands (<5% fines)	SW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		Sands with Fines	SM	Silty sands, sand-silt mixtures. Non-Plastic fines.
			SC	Clayey sands, sand-clay mixtures. Plastic fines.
FINE GRAINED SOILS More than half of material is smaller than #200 sieve size	SILTS AND CLAYS	LIQUID LIMIT IS LESS THAN 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts, with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS	LIQUID LIMIT IS GREATER THAN 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
	Highly Organic Soils		PT	Peat and other highly organic soils.

CLASSIFICATION BASED ON FIELD TESTS

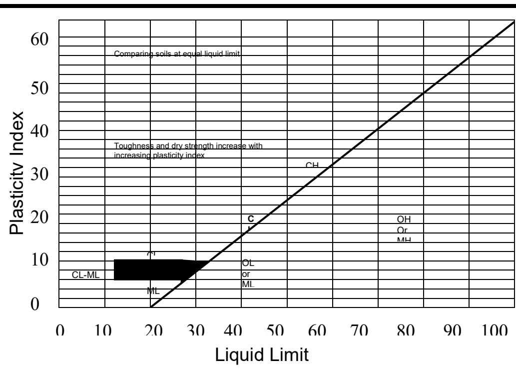
PENETRATION RESISTANCE (PR)	
Sands and Gravels	
Relative Density	Blows/foot
Very loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Clays and Silts		
Consistency	Blows/foot*	Strength**
Very Soft	0-2	0-½
Soft	2-4	¼-½
Firm	4-8	½-1
Stiff	8-15	1-2
Very Stiff	15-30	2-4
Hard	Over 30	Over 4

*Numbers of blows of 140 lb hammer falling 30 inches to drive a 2-inch O.D. (1 3/8 in. I.D.) Split Barrel sampler (ASTM-1568 Standard Penetration Test)

**Unconfined Compressive strength in tons/sq. ft. Read from pocket penetrometer

CLASSIFICATION CRITERIA BASED ON LAB TESTS



Plasticity chart for laboratory
Classification of Fine-grained soils

GW and SW – $C_u = D_{60}/D_{10}$ greater than 4 for GW and 6 for SW; $C_c = (D_{30})^2/D_{10} \times D_{60}$ between 1 and 3

GP and SP – Clean gravel or sand not meeting requirement for GW and SW

GM and SM – Atterberg limit below “A” line or P.I. less than 4

GC and SC – Atterberg limit above “A” line P.I. greater than 7

CLASSIFICATION OF EARTH MATERIAL IS BASED ON FIELD INSPECTION AND SHOULD NOT BE CONSTRUED TO IMPLY LABORATORY ANALYSIS UNLESS SO STATED.

Fines (Silty or Clay)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobbles	Boulders
Sieve Sizes 200	40	10	4	¾”	3”	10”	

Global Geo-Engineering, Inc.
Irvine, California
Geologists and Geotechnical Engineers

Dr. Peter Marshall Elementary School
2627 West Crescent Avenue
Anaheim, California

Project 9548-04

LOG OF BORING B-1

Date : October 10, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified/SPT
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	DESCRIPTION
0–3	Bulk	2.6	100.0	13			SM	Silty SAND: fine grained, olive brown to yellow brown, damp, loose to medium dense
3–5	Bulk						SP	SAND: fine to medium grained, olive gray to yellow brown, damp, loose to medium dense
5	Ring	2.7	96.0	12				
8	Ring	2.7	108.3	11				
10	Standard Penetration Testing			N=13				
12–14	Ring	11.6	106.1	14			SM/SP	Silty SAND: fine grained, olive brown, moist, medium dense with SAND interbeds
14–15							SP	SAND: medium grained, light gray to yellow brown, damp to slightly moist, medium dense
15	Standard Penetration Testing			N=21				
18	Ring	2.5	97.2	17				
20	Standard Penetration Testing			N=25				@20' yellow brown
23	Ring	2.0	96.7	21				
25	Standard Penetration Testing			N=29				
29–30							ML	SILT: olive brown, moist, medium stiff

Figure B-2.1

Global Geo-Engineering, Inc. Irvine, California Geologists and Geotechnical Engineers	LOG OF BORING B-1	Drilling Method : Hollow Stem Sampling Method : California Modified/SPT Hammer Weight (lbs) : 140 Hammer Drop (in) : 30
Dr. Peter Marshall Elementary School 2627 West Crescent Avenue Anaheim, California Project 9548-04	Date : October 10, 2022 Logged By : KBY Diameter of Boring : 6" Drilling Company : Cal Pac Drilling Drilling Rig : Mobile B-61	

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	DESCRIPTION
30	Standard Penetration Testing			N=10			ML	
35	Standard Penetration Testing; Bulk			N=13			ML/SM	@35' with Silty SAND interbeds
40	Standard Penetration Testing			N=25		Seepage Encountered (42)	SM	Silty SAND: fine grained, dark olive gray, very moist, medium dense @42' groundwater encountered
45	Standard Penetration Testing			N=12			ML	Sandy SILT: olive brown, very moist, medium stiff
50	Standard Penetration Testing			N=44			SP	SAND: fine to medium grained, olive gray, very moist, medium dense ALLUVIUM

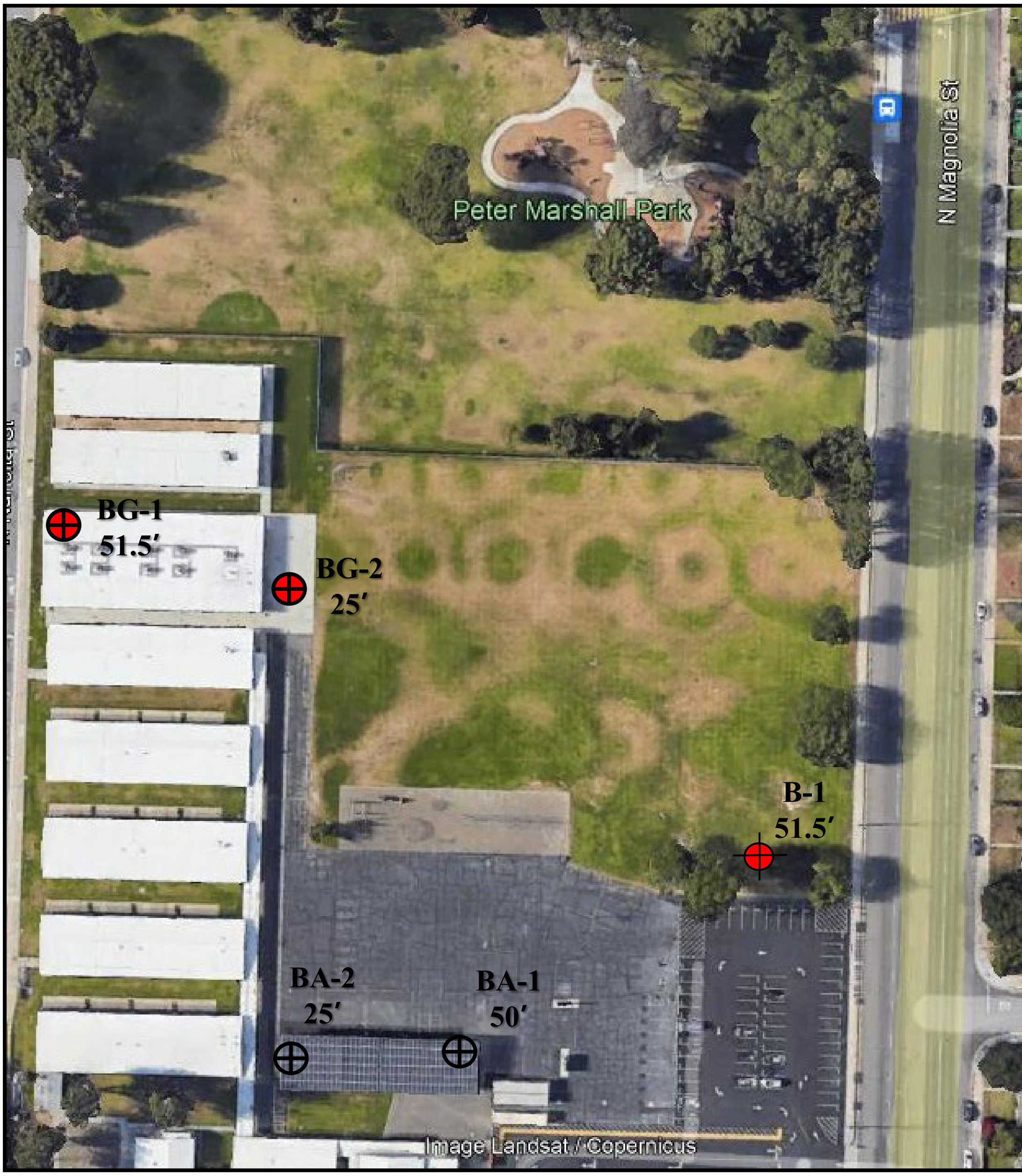
Bottom of Boring at 51.5 feet:

Notes:
1. Caving to 35 feet after augers were removed
2. Groundwater encountred at 42 feet, Standing water level measured at 44'
3. Boring backfilled

55

60

BORING LOCATION PLAN



KEY

B-1 Approximate Location of Boring,
51.5′ Showing Total Depth, this investigation

BA-2 Approximate Location of Boring,
25′ Showing Total Depth (AESCO-2017)

BG-2 Approximate Location of Boring,
25′ Showing Total Depth (GLOBAL-2013)

N

125 0 125 250

APPROXIMATE SCALE FEET

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA

Dr. Peter Marshall Elementary School
2627 West Crescent Avenue
Anaheim, California

Date: November 2022	**Figure No:**
Project No.: 9548-04	B-3

Global Geo-Engineering, Inc. GEOLOGIC AND SOILS TESTING Irvine, California	LOG OF BORING B-1	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Drop (in) : 30 Hammer Weight (lbs) : 140
Peter Marshall Elementary School 2627 Crescent Avenue Anaheim, California	Date : November 25, 2013 Logged By : KBY Diameter of Boring : 8" Drilling Company : Discovery Drilling Rig : CME-75	
Project No: 5682-04		

Sample Type: Ring; Bulk; Standard Penetration Test

Water Levels: ▼ Groundwater Encountered; ▽ Seepage Encountered; ◆ Groundwater Stabilized

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Water Level	USCS	GRAPHIC	DESCRIPTION
0						SM		Silty SAND: fine grained, brown, moist, loose with numerous roots FILL
	Ring / Bulk	2.8	95.2	13		SP		SAND: fine to medium grained, olive brown, moist, loose
5								@5' olive gray
	SPT			N=10				
	Ring	1.2	97.4	15				@7.5' medium grained, loose to medium dense
10	SPT			N=19				
	Ring	21.1	104.3	17		CL		Silty CLAY: dark brown to brown, moist, medium stiff
15	SPT			N=15		SM		Silty SAND: fine grained, olive brown, moist, loose to medium dense with Sandy SILT interbeds
	Bulk / Ring	6.6	107.0	21				
20	SPT			N=15		SP/ML		SAND: fine to medium grained, olive brown, moist, loose to medium dense with Sandy SILT interbeds
	Ring	27.5	93.9	6		ML		Sandy SILT: olive brown, very moist, soft
25	SPT			N=16	▽	SP/ML		SAND: fine to medium grained, olive brown, very moist, loose to medium dense with Sandy SILT interbeds
	Ring	32.3	89.3	9		ML		Sandy SILT: olive brown, very moist, soft, seepage encountered
30								

Figure B-2.1

12-13-2013 C:\Program Files (x86)\mtech2010\Boring Logs 2002 Edition\5682-04 Peter Marshall E.S. - B-1.1.bor

Global Geo-Engineering, Inc. GEOLOGIC AND SOILS TESTING Irvine, California	LOG OF BORING B-1	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Drop (in) : 30 Hammer Weight (lbs) : 140
Peter Marshall Elementary School 2627 Crescent Avenue Anaheim, California Project No: 5682-04	Date : November 25, 2013 Logged By : KBY Diameter of Boring : 8" Drilling Company : Discovery Drilling Rig : CME-75	

Sample Type: Ring; Bulk; Standard Penetration Test

Water Levels: Groundwater Encountered; Seepage Encountered; Groundwater Stabilized

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Water Level	USCS	GRAPHIC	DESCRIPTION
30	Standard Penetration Test			N=8		ML		
	Ring / Bulk	25.1	97.2	8		ML		@32' more Clayey SILT, olive brown to olive gray
35	Standard Penetration Test			N=5		ML		
	Ring / Bulk	27.0	93.2	6		CL		Silty CLAY: olive brown, very moist, soft
40	Standard Penetration Test			N=7		CL		
	Ring	22.4	101.4	15		SM		Silty SAND: fine grained, olive brown, very moist, medium dense
45	Standard Penetration Test			N=15	▼	SM		@45' groundwater encountered, wet
	Standard Penetration Test			N=14		SP		SAND: fine to medium grained, olive brown, wet and dense
50	Standard Penetration Test			N=24		SP		ALLUVIUM

Bottom of Boring at 51.5 feet

1. Caving to 30 feet after augers were removed
2. Groundwater encountered at 45 feet, Standing water level measured at 41.5' after termination of drilling
3. Boring backfilled

55

60

Figure B-2.2

Global Geo-Engineering, Inc.
GEOLOGIC AND SOILS TESTING
Irvine, California

Peter Marshall Elementary School
2627 Crescent Avenue
Anaheim, California

Project No: 5682-04

LOG OF BORING B-2

Date	: November 25, 2013
Logged By	: KBY
Diameter of Boring	: 8"
Drilling Company	: Discovery
Drilling Rig	: CME-75

Drilling Method	: Hollow Stem
Sampling Method	: California Modified
Hammer Drop (In)	: 30
Hammer Weight (lbs)	: 140

Sample Type: Ring; Bulk; Standard Penetration Test

Water Levels: Groundwater Encountered; Seepage Encountered; Groundwater Stabilized

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Water Level	USCS	DESCRIPTION
0	Bulk					SM	Silty SAND: fine grained, brown to olive brown, moist, loose FILL
2	Ring	8.4	104.2	11		SP	SAND: fine to medium grained, olive brown, moist, loose
5	Ring	3.8	95.9	9			
	Ring	2.4	96.8	12			@7' medium grained, yellow brown
10	Ring	3.9	104.9	27			@10' fine to medium grained, medium dense
15	Ring	24.2	96.9	10		ML	SILT: olive brown, moist, medium stiff
						SM/ML	Silty SAND: fine grained, olive brown, moist, medium dense with Sandy SILT interbeds
20	Ring	9.5	101.6	24			
25	Ring	20.7	94.7	16		SP	SAND: fine to medium grained, olive brown, moist, loose to medium dense ALLUVIUM
30							

Bottom of Boring at 25 feet

1. Caving to 17 feet after augers were removed
2. No groundwater encountered
3. Boring backfilled

AESCO

LOG OF BORING NO. B - 1

AESCO

Project: Proposed Solar Panels, Dr. Peter Marshall Elementary School
Location: 2627 West Crescent Avenue, Anaheim, CA
WATER: Encountered at 47 Feet

Client: Opterra Energy Services
Logger:
DRILLING:
Date: 02/20/17
Project No. 20161135-E3329
Hollow Stem Auger/Rotary

FIELD DATA			TESTS	LABORATORY DATA											DESCRIPTION OF STRATUM
SOIL SYMBOL		DEPTH (FT)	N= T= P=	MOISTURE CONTENT %	DRY DENSITY PCF	LIQUID LIMITS %	PLASTIC LIMITS %	PLASTICITY INDEX %	Unconfined Comp. TSF	Unconfined Comp. Strain %	PASSING 200 SIEVE %	DIRECT SHEAR COHESION PSF	DIRECT SHEAR ANGLE Deg	EXPANSION INDEX	AMSL = 95 feet; 6" AC/0" Base
SM				9.6											Brown silty SAND (SM), moist
		3													
			N=16	6.7							12.8				Medium dense at 3'
		5													
	C		N=14	7.0	109.1	19	15	4			28.6	0	29		Dark brown, increase in silt at 5'
		7													
		8													
SP			N=18	3.9											Light brown SAND (SP), medium dense, dry, medium grained
		10													
		13													
SP/SM	C		N=50/4"	2.9	108.2						9.1				Brown SAND/silty SAND (SP/SM), very dense, dry
		15													
		18													
			N=43	2.9											Light brown, dense at 18'
		20													
		23													
			N=27	11.1							11.8				
		25													
		28													
CL			N=12	26.4		26	17	9			59.3				Gray sandy CLAY (CL), stiff, moist, w/silt
		30													
		33													
SM			N=28	12.3							29.8				Light gray silty SAND (SM), medium dense, moist
		35													
		38													
SP/SM			N=58	5.1							9.9				Brown SAND/silty SAND (SP/SM), very dense, dry
		40													
		43													
CL	C		N=22	23.7		44	23	21			82.9				Brown sandy CLAY (CL), very stiff, moist, w/silt
		45													
SP ▼															Brown SAND (SP), very dense, saturated
		48													
			N=50/4"	18.2							3.9				
		50													

Boring Terminated at 50 Feet

TUBE SAMPLE
AUGER SAMPLE
C CALIFORNIA MODIFIED SAMPLER
SPLIT SPOON
NO RECOVERY

▼ Ground Water Level
▽ Hydrostatic Ground Water Level
-------------------- Approximate Division of Soil Type

N= SPT, BLOWS/FT
T= THD,BLOWS/FT
P= HAND PEN.,TSF

SM SP SP/SM CL

REMARKS:
NP: Non Plastic Materials
* Remolded Samples
Blow Counts Corrected for California Modified Sampler (0.6 multipiler)

LOG OF BORING NO. B - 2

AESCO

Project: Proposed Solar Panels
Dr. Peter Marshall Elementary School

Location: 2627 West Crescent Avenue
Anaheim, CA

WATER: Not Encountered

Client: Opterra Energy Services
Date: 02/20/17

Logger:
Project No. 20161135-E3329

DRILLING:
Hollow Stem Auger/Rotary

FIELD DATA			TESTS	LABORATORY DATA											DESCRIPTION OF STRATUM
SOIL SYMBOL		DEPTH (FT)	N= T= P=	MOISTURE CONTENT %	DRY DENSITY PCF	LIQUID LIMITS %	PLASTIC LIMITS %	PLASTICITY INDEX %	Unconfined Comp. TSF	Unconfined Comp. Strain %	PASSING 200 SIEVE %	DIRECT SHEAR COHESION PSF	DIRECT SHEAR ANGLE Deg	EXPANSION INDEX	AMSL = 95 feet 5" AC/0" Base
SM		3		10.6											Brown silty SAND (SM), moist
SP		5	N=9	1.7											Light brown SAND (SP), loose, dry, minor gravel
CL	C	7 8	N=23	8.8	111.7	22	14	8			25.6				Dark gray and black sandy CLAY (CL), very stiff, moist, w/organics, w/silt
SP		10 13	N=16	1.9							2.4				Light brown SAND (SP), medium dense, dry, minor gravel
SM	C	15	N=50/6"	2.5	108.4						18.7	0	32		Light brown silty SAND (SM), very dense, dry
SM		18 20	N=40	1.5											Dense at 18'
SM		23 25	N=27	8.9							16.4				Brown medium dense at 23'

Boring Terminated at 25 Feet

TUBE SAMPLE
AUGER SAMPLE
C CALIFORNIA MODIFIED SAMPLER
SPLIT SPOON
NO RECOVERY

▼ Ground Water Level
▽ Hydrostatic Ground Water Level
---------- Approximate Division of Soil Type

SM SP CL

N= SPT, BLOWS/FT
T= THD,BLOWS/FT
P= HAND PEN.,TSF

REMARKS:
NP: Non Plastic Materials
* Remolded Samples
Blow Counts Corrected for California Modified Sampler (0.6 multipiler)

APPENDIX C

Laboratory Testing Program

The laboratory-testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested as described below.

a) Moisture-Density

Moisture-density information usually provides a gross indication of soil consistency. Local variations at the time of the investigation can be delineated, and a correlation obtained between soils found on this site and nearby sites. The dry unit weights and field moisture contents were determined for selected samples. The results are shown on the Log of Boring.

b) Direct Shear

Direct shear tests were conducted by AESCO on relatively undisturbed samples, using a direct shear machine at a constant rate of strain in accordance with ASTM Test Method D3080. Variable normal or confining loads are applied vertically and the soil shear strengths are obtained at these loads. The angle of internal friction and the cohesion are then evaluated. The samples were tested at saturated moisture contents. The test results are shown in terms of the Coulomb shear strength parameters, as shown below:

Boring No.	Sample Depth (ft)	Soil Description	Coulomb Cohesion (lb/ft^2)	Angle of Internal Friction (°)	Peak/ Residual
BA-1	5-7	Silty SAND	0	29	Ultimate
BA-2	13-15	Silty SAND	0	32	Ultimate

c) Gradations

Representative soil samples were analyzed in accordance with California Test Methods D1140 to determine the fine contents. The results are provided below and in the Grain Size Distribution Chart.

Boring No.	**Sample Depth (ft)**	**Soil Description**	**Fine Contents (%)**
B-1	4-6	SAND	6.9
B-1	20	SAND	3.4
B-1	35	Silty SAND	34.4
B-1	40	Silty SAND	4.8

d) Atterberg Limits

Representative soil samples were analyzed in accordance with California Test Methods D4318 to determine the plasticity index. The results of the Atterberg Limit tests are presented below:

Boring No.	**Sample Depth (ft)**	**Soil Description**	**Liquid Limit**	**Plastic Limit**	**Plasticity index**
B-1	4-6	SAND	Non Plastic	Non Plastic	Non Plastic
B-1	20	SAND	Non Plastic	Non Plastic	Non Plastic
B-1	35	Silty SAND	Non Plastic	Non Plastic	Non Plastic
B-1	40	Silty SAND	Non Plastic	Non Plastic	Non Plastic

e) Corrosion

A near-surface soil sample was analyzed by AESCO for its sulphate content in accordance with California Test Methods The results are given below:

Sulphate Content (%)	**Chloride Content (%)**	**pH**
0.0450	0.0186	7.5

Attachment B
SCCIC Records Search Results

January 5, 2023

Barbara Heyman, Senior Environmental Project Manager
MICHAEL BAKER INTERNATIONAL
9755 Clairemont Mesa Boulevard
Suite 100
San Diego, CA 92124

RE: CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEM RECORDS SEARCH RESULTS FOR DR. PETER MARSHALL ELEMENTARY SCHOOL, CITY OF ANAHEIM, ORANGE COUNTY, CALIFORNIA

Dear Ms. Heyman:

On December 15, 2022, Michael Baker International Senior Archaeologist Marc Beherec PhD, RPA, conducted a records search at the South Central Coastal Information Center (SCCIC) for Peter Marshall Elementary School in the City of Anaheim, California. The records search included the project area and a half-mile radius (see **Attachment 1**). The SCCIC, as part of the California Historical Resources Information System, California State University, Fullerton, an affiliate of the California Office of Historic Preservation (OHP) and the State Historical Resources Commission (SHRC), is the official state repository of cultural resources records and reports for Los Angeles, Ventura, San Bernardino, and Orange Counties. Michael Baker International supplemented this search with available online databases maintained by federal and state repositories. The results of the records search are presented below.

PROJECT AREA

The project area is identified as the boundaries of Dr. Peter Marshall Elementary School, located at 2627 West Crescent Ave in Anaheim, Orange County, California. The project area is mapped within *Anaheim, California* USGS 7.5-minute topographic quadrangle map (see **Attachment 1**).

CULTURAL RESOURCES IDENTIFICATION METHODS

The methods and results of the SCCIC records search and historical map search, are presented below.

SOUTH CENTRAL COASTAL INFORMATION CENTER

As part of the records search, the following federal and California inventories were reviewed:

- National Register of Historic Places (NRHP) (National Park Service 2020).
- Archaeological Resources Directory for Orange County (OHP 2022a). The directory includes the OHP determinations of eligibility for archaeological resources in Orange County.

- Built Environment Resources Directory (BERD) for Orange County (OHP 2022b). The directory includes resources reviewed for eligibility for the NRHP and the California Historical Landmarks programs through federal and state environmental compliance laws, and resources nominated under federal and state registration programs, including the NRHP, California Register of Historical Resources (CRHR), California Historical Landmarks, and California Points of Historical Interest. The BERD was consulted only for buildings located within or within 0.5-mile of the project area that face streets surrounding the project area.
- California Historical Resources (OHP 2022c).

Previous Studies

The records search revealed that the project area has not been previously studied. Four cultural resources studies have previously been completed within a half-mile radius of the project area, as outlined in the table below.

Author	Report No.	Date	Title/Description	Within the Project Area?	Historic Properties Identified within the Project Area?
Keas, Nicole	OR-02756	2001	Proposed Einstein Cellular Site (Nextel #7610a) Anaheim, Ca	No	No
Bonner, Wayne H.	OR-03424	2006	Cultural Resource Records Search and Site Visit Results for Royal Street Communications, LLC Candidate La0685a (Yale-SCE M7-t4 Alamitos-Barre #1), Yale Avenue and La Reina Street, Anaheim, Orange County, California	No	No
Bonner, Wayne H.	OR-03526	2008	Cultural Resources Records Search and Site Visit Results for T-Mobile Candidate LA33406A (Express Car Wash), 590 North Magnolia Avenue, Anaheim, Orange County, California	No	No
Kyle, Carolyn	OR-04384	2004	Cultural Resource Assessment for AT&T Wireless Facility 950-013-074C Located at 830 South	No	No

			Main Street City of Santa Ana, Orange County, California		

Resource Results

The SCCIC records search identified no cultural resources within the project area or within 0.5-mile of the project area.

HISTORICAL AERIAL PHOTOGRAPH REVIEW

Michael Baker International staff reviewed historical aerial photographs curated by National Environmental Title Research (NETR) (NETR 2022) to identify the development history of the project area. These photographs indicate that in 1953 the project area was operated as a farm. A cluster of farm buildings and structures is visible in the southeast part of the project area. By 1963, the farm buildings have been torn down and the school established. The school was progressively developed in the years after 1963, but some of the early 1960s buildings survive and are therefore historic in age.

Sincerely,

Marc Beherec, PhD, RPA
Senior Archaeologist

Attachments:

Attachment 1 – Records Search Map

REFERENCES

National Park Service. 2020. National Register of Historic Places (updated September 2020). https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466.

NETR (National Environmental Title Research). 2022. Online database. Accessed December 2022. https://www.newspapers.com/.

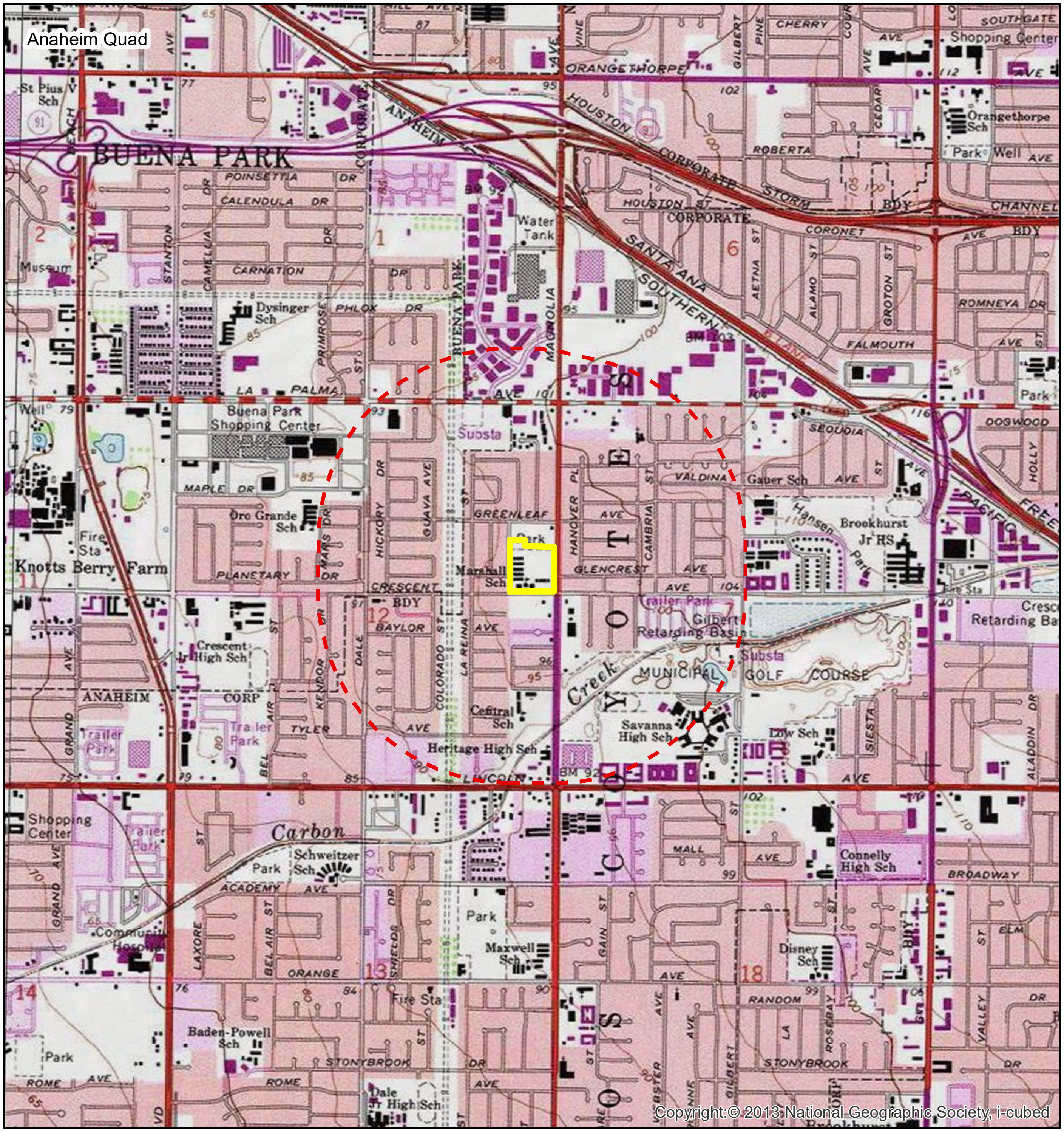
OHP (California Office of Historic Preservation). 2022a. Archaeological Resources Directory for Orange County. On file, South Central Coastal Information Center, California State University, Fullerton.

———. 2022b. Built Environment Resources Directory for Orange County. Accessed December 2022. https://ohp.parks.ca.gov/?page_id=30338.

———. 2022c. “California Historical Resources.” Accessed December 2022. https://ohp.parks.ca.gov/ListedResources/?view=county&criteria=34.

Attachment 1

Records Search Map



Project Area

1/2 Mile Search Area

ANAHEIM USGS 7.5-MINUTE TOPOGRAPHIC QUAD
T04S, R11W, SECTION 12

DR. PETER MARSHALL ELEMENTARY SCHOOL PROJECT
ANAHEIM, CA
1:24,000

Records Search Map

Michael Baker INTERNATIONAL

N

0 0.25 0.5 Miles

Source: Esri, ArcGIS Online, USGS 7.5-Minute topographic quadrangle map: Anaheim, California