GEOTECHNICAL ENGINEERING REPORT

FOR

PROPOSED RELOCATABLE CLASSROOM BUILDINGS
ADOLFO CAMARILLO HIGH SCHOOL
4660 MISSION OAKS BOULEVARD
CAMARILLO, CALIFORNIA

PROJECT NO.: 303275-002
DECEMBER 10, 2019

PREPARED FOR
OXNARD UNION HIGH SCHOOL DISTRICT
ATTENTION: POUL HANSON

BY

EARTH SYSTEMS PACIFIC
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December 10, 2019

Project No.: 303275-002
Report No.: 19-12-17

Oxnard Union High School District
Attention: Poul Hanson
309 South K Street
Oxnard, CA 93030

Project: Proposed Relocatable Classroom Buildings
Adolfo Camarillo High School
4660 Mission Oaks Boulevard
Camarillo, California
Subject: Engineering Geology and Geotechnical Engineering Report

As authorized, Earth Systems Pacific (Earth Systems) has performed an engineering geology and geotechnical engineering study for proposed relocatable classroom buildings on the Adolfo Camarillo High School campus located at 4660 Mission Oaks Boulevard, Camarillo, California. The accompanying Engineering Geology and Geotechnical Engineering Report presents the results of our subsurface exploration and laboratory testing programs, and our conclusions and recommendations pertaining to geotechnical aspects of project design. This report completes Phase 1 of the scope of services described within our Proposal No. VEN-19-07-009 dated July 17, 2019 (Revised August 12, 2019), and authorized by Requisition No. R20-01535 dated August 30, 2019.

We have appreciated the opportunity to be of service to you on this project. Please call if you have any questions, or if we can be of further service.

Respectfully submitted,

EARTH SYSTEMS PACIFIC

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1 - Project File

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INTRODUCTION

This report presents results of an Engineering Geology and Geotechnical Engineering study performed for four (4) proposed 24-foot by 40-foot modular classrooms that will be located in the northeast corner of the Adolfo Camarillo High School located at 4660 Mission Oaks Boulevard in Camarillo, California (see Vicinity Map in Appendix A). The buildings will be prefabricated structures with wood foundations bearing on asphalt pavement.

The site of the proposed classroom buildings is a lawn area just east of Building A. Because the site is essentially level, grading is expected to be limited to preparing near-surface soils to support the new structures. No cut or fill slopes or retaining walls are expected to be incorporated into the grading concept.

PURPOSE AND SCOPE OF WORK

The purpose of the geotechnical study that led to this report was to analyze the geology and soil conditions of the site with respect to the proposed improvements. These conditions include potential geohazards, surface and subsurface soil types, expansion potential, settlement potential, bearing capacity, and the presence or absence of subsurface water. The scope of work included:

1. Reconnaissance of the site.
2. Reviewing geotechnical data gathered during a feasibility study conducted for a proposed pool complex on the school campus in 2009.
3. Drilling, sampling, and logging two (2) hollow-stem-auger borings (B-1 and B-2) to study soil and groundwater conditions.
4. Laboratory testing soil samples obtained from the subsurface exploration to determine their physical and engineering properties.
5. Consulting with owner representatives and design professionals.
6. Analyzing the geotechnical data obtained.
7. Preparing this report.

Contained in this report are:

1. Descriptions and results of field and laboratory tests that were performed for this study for the proposed relocatable classroom buildings.
2. Discussions pertaining to the local geologic, soil, and groundwater conditions.
3. Conclusions pertaining to geohazards that could affect the site.
4. Conclusions and recommendations pertaining to site grading and structural design.

GEOLOGY

The site lies within the Oxnard Plain, which in turn lies within the western Transverse Ranges geomorphic province. The Oxnard Plain and the Transverse Ranges are characterized by ongoing tectonic activity. In the vicinity of the subject site, Tertiary and Quaternary sediments have been folded and faulted along predominant east-west structural trends.

The proposed building areas are underlain by Saugus Formation bedrock consisting primarily of

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There are several faults located within the region, including the Camarillo fault that is mapped along an east-west trend through the athletic field area near the southern end of the campus. The project site is located approximately 400 feet north of the northern limit of the “Fault Rupture Hazard Zone” delineated for the Camarillo fault by the State of California (CDMG. 1972, Revised 1999). However, the Camarillo Fault is not considered capable of generating a large seismic event. The nearest known fault considered capable of generating significant earthquakes is the Simi-Santa Rosa Fault, which is located approximately 1.2 miles north of the subject site.

The site is not within any of the Liquefaction or Seismic-Induced Landslide Hazard Zones designated by the California Division of Mines and Geology (CDMG, 2002b).

No landslides were observed to be located on or trending into the subject property during the field study, or during reviews of the referenced geologic literature.

GEOLOGIC HAZARDS

Geologic hazards that may impact a site include seismic shaking, fault rupture, landsliding, liquefaction, and flooding.

A. Seismic Shaking

1. Although the site is not within a State-designated "fault rupture hazard zone", it is located in an active seismic region where large numbers of earthquakes are recorded each year. Historically, major earthquakes (i.e. those with Richter magnitudes greater than 7.0) felt in the vicinity of subject site have originated from faults outside the area. These include the December 21, 1812 "Santa Barbara Region" earthquake, that was presumably centered in the Santa Barbara Channel, the 1857 Fort Tejon earthquake, the 1872 Owens Valley earthquake, and the 1952 Arvin-Tehachapi earthquake.

2. For this project, seismic design criteria in accordance with CBC 2019/ASCE 7-16 cannot yet be calculated. The new methods prescribed by CBC 2019/ASCE 7-16 include significant revisions for determination of site-specific design parameters and further revisions were prescribed in ASCE 7-16 Supplement 1. As of the date of this report, the California Geological Survey has not specified appropriate analysis methodology, and until that is determined, Earth Systems' in-house procedure cannot be implemented to calculate site specific ground motion parameters for the new building code that takes effect January 1, 2020. Site specific seismic design parameters will be provided for this project as an addendum when appropriate methods have been validated

   The following are the seismic design parameters appropriate for the 2016 CBC and ASCE 7-10 guidelines. The 2016 CBC includes several seismic design parameters that are influenced by the geographic site location with respect to active and potentially active faults, and with respect to subsurface soil or rock conditions. The seismic design parameters presented herein were determined by the U.S. Seismic Design Maps "risk-targeted" calculator on the SEAOC/OSHPD website for the jobsite coordinates (34.2182° North Latitude and 119.0075° West Longitude). The calculator adjusts for Soil Site Class C (for soft rock and very stiff soils), and for Occupancy (Risk) Category III (which includes classroom buildings at public schools). (A listing of the calculated 2016 CBC and ASCE 7-10 Seismic Parameters is presented below and again in Appendix C.)

Summary of Seismic Parameters – 2016 CBC

Site Class (Table 20.3-1 of ASCE 7-10 with 2016 update)	C
Occupancy (Risk) Category	III
Seismic Design Category	E
Maximum Considered Earthquake (MCE) Ground Motion	
Spectral Response Acceleration, Short Period – S_s	2.213 g
Spectral Response Acceleration at 1 sec. – S_1	0.794 g
Site Coefficient – F_a	1.00
Site Coefficient – F_v	1.30
Site-Modified Spectral Response Acceleration, Short Period – S_{MS}	2.213 g
Site-Modified Spectral Response Acceleration at 1 sec. – S_{M1}	1.032 g
Design Earthquake Ground Motion	
Short Period Spectral Response – S_{DS}	1.475 g
One Second Spectral Response – S_{D1}	0.688 g
Site Modified Peak Ground Acceleration - PGA_M	0.817 g
Note: Values Appropriate for a 2% Probability of Exceedance in 50 Years	

Because S1 is greater than or equal to 0.75 g and the Seismic Design Category is “E”, a site-specific seismic analysis was performed in addition to the “general procedure”. For the General Analysis, presented in the table below, the Short Period Spectral Response (S_{DS}) was found to be 1.475 g, and the 1 Second Spectral Response (S_{D1}) was found to be 0.688 g. For the Site-Specific Analysis, the Short Period Spectral Response (S_{DS}) was found to be 1.523 g, and the 1 Second Spectral Response (S_{D1}) was found to be 0.682 g.

The Fault Parameters table (see Appendix C) lists the significant "active" and "potentially active" faults within an approximate 34-mile radius of the subject site. The distance between the site and the nearest portion of each fault is shown, as well as the respective estimated maximum earthquake magnitudes, and the deterministic mean site peak ground accelerations.

3. Southern Ventura County has been mapped by the California Division of Mines and Geology to delineate areas of varying predicted seismic response. The Saugus Formation that underlie the subject area is mapped as having a probable maximum intensity of earthquake response of approximately VII-VIII on the Modified Mercalli Scale. Historically, the highest observed intensity of ground response has been VI in the Camarillo area (C.D.M.G., 1975).

4. The San Andreas is the dominant active fault in California. The fault extends from the Gulf of California to Cape Mendocino in northern California. That portion of the zone extending southward from Parkfield, California is estimated to have been active for the last 12 million years. As much as 190 miles of right lateral displacement has occurred across the zone (Crowell, 1975). This displacement includes offsets on the actual San Andreas Fault and related faults that include the Imperial, Banning, Mission Creek, and San Jacinto faults.

5. Historically, the San Andreas Fault is responsible for two of the three "great" earthquakes experienced in California. ("Great" earthquakes are defined as having Richter magnitudes that are equal to or greater than 8.0.) These are the 1857 Fort Tejon and 1906 San Francisco earthquakes. Each event is credited with approximately 200 miles of surface rupture and horizontal displacements of up to 30 feet. Ground shaking was very intense and damage to man-made structures very wide spread. The 1857 rupture extended along the San Andreas Fault from near Bakersfield to Cajon Pass and was felt throughout most of California. Horizontal displacements of 10 to 13 feet were observed along the fault in the Palmdale area.

6. Recurrence intervals for major earthquakes in southern California are best documented for the San Andreas Fault. It is estimated that a major earthquake has occurred along the southern portion of the San Andreas Fault every 100 to 200 years (Sieh, 1978). The average recurrence interval is estimated to be 140 years. The last major earthquake on the San Andreas Fault in the southern California area occurred in 1857; therefore, the occurrence of a major event in the same general area is considered likely within the estimated lifetime of any new construction.

7. On December 21, 1812, an estimated 7.0 Richter magnitude event occurred in an area believed to be offshore in the western part of the Santa Barbara Channel. This earthquake caused considerable shaking in the area of the proposed project.

8. On March 26, 1872, the greatest recorded earthquake in the western United States, excluding Alaska, occurred along the Owens Valley Fault near Lone Pine. The earthquake is estimated to have had a Richter magnitude of 8.25, and significantly shook most of California.

9. On July 21, 1952, the Arvin-Tehachapi earthquake occurred on the White Wolf Fault. The earthquake registered 7.7 on the Richter Scale and was felt throughout southern California.

B. Fault Rupture

Surficial displacement along a fault trace is known as fault rupture. Fault rupture typically occurs along previously existing fault traces. As mentioned in the "Structure" section above, no existing fault traces were observed to be crossing the site in any of the referenced documents, including the Ventura County General Plan. As a result, it is the opinion of this firm that the potential for fault rupture on this site is low.

C. Landsliding and Rock Fall

The subject site and surrounding areas are gently sloping. Thus, potential hazards due to landsliding and rock fall are nil.

D. Liquefaction

Earthquake-induced vibrations can be the cause of several significant phenomena, including liquefaction in fine sands and silty sands. Liquefaction results in a loss of strength and can cause structures to settle or even overturn if it occurs in the bearing zone. Liquefaction is typically limited to the upper 50 feet of soils underlying a site.

Fine sands and silty sands that are poorly graded and lie below the groundwater table are the soils most susceptible to liquefaction. Soils that have plasticity indices greater than 7, sufficiently dense soils, and/or soils located above the groundwater table are not generally susceptible to liquefaction.

Because the site is underlain at shallow depths by Saugus Formation bedrock, which is sufficiently dense to prevent liquefaction from occurring, even if it were to become saturated, it does not appear that liquefaction poses a hazard to the proposed improvements.

E. Seismic-Induced Settlement of Dry Sands

Sands tend to settle and densify when subjected to earthquake shaking. The amount of settlement is a function of relative density, cyclic shear strain magnitude, and the number of strain cycles. A procedure to evaluate this type of settlement was developed by Seed and Silver (1972) and later modified by Pyke, et al (1975). Tokimatsu and Seed (1987) presented a simplified procedure that has been reduced to a series of equations by Pradel (1998).

Calculations indicate that settlement in the alluvial sands encountered between the overlying artificial fill soils and the underlying bedrock is negligible during a strong seismic event.

F. Flooding

Earthquake-induced flooding types include tsunamis, seiches, and reservoir failure. Due to the inland location of the site, hazards from tsunamis and seiches are considered extremely unlikely.

Interpretation of the Ventura County General Plan Hazards Appendix (2013) indicates that this site is outside the identified dam failure inundation zones for various lakes and dams upgradient from the campus. As a result, the hazard posed by reservoir failure appears to be low.

The site is located within an area designated by FEMA Flood Map Service Center website as Zone X, which is designated as an “area of minimal flood hazard". As a result, it appears that the hazard posed by storm-induced flooding is low.

ENGINEERING GEOLOGY CONCLUSIONS AND RECOMMENDATIONS

Based on the data provided in this report, it appears that the site is suitable for the proposed improvements from an Engineering Geology standpoint provided that the recommendations given in this report are properly implemented into the design and construction phases of the project. Potential hazards that will require consideration and/or mitigation would include seismic shaking, liquefaction related settlements, and ground oscillation related displacements.

SOIL CONDITIONS

Based on the exploratory borings drilled for this study, approximately 2 to 5 feet of artificial fill was encountered beneath the existing pavement section in the area of the proposed modular classroom buildings. The artificial fill consisted of soft to very stiff, silty to sandy clays. The artificial fill was underlain by alluvial soils consisting of silty sands. The alluvial soils were underlain by Saugus Formation bedrock that was encountered at a depth of approximately 10 feet below the ground surface at each test boring location.

Testing indicates that anticipated bearing soils lie in the "very low" expansion range of Table 1809.7 because the expansion index was found to be 13. [A locally adopted version of this classification of soil expansion is included in Appendix B of this report.] It appears that soils can be cut by normal grading and/or drilling equipment.

Groundwater was not encountered to the maximum depth explored of 26.5 feet for this study. Groundwater was not encountered to a depth of 51.5 feet during drilling for a feasibility study conducted for a proposed pool complex on the school campus (see Site-Specific Bibliography). Mapping of historically high groundwater levels by the California Geological Survey (CGS, 2002a) indicates that groundwater has been at least 55 feet below the ground surface near the subject site.

Samples of near-surface soils were tested for pH, resistivity, soluble sulfates, and soluble chlorides. The test results provided in Appendix B should be distributed to the design team for their interpretations pertaining to the corrosivity or reactivity of various construction materials (such as concrete and piping) with the soils. It should be noted that sulfate contents (35 mg/Kg) are in the “S0” (“negligible”) exposure class of Table 19.3.1.1 of ACI 318-14; therefore, it appears that special concrete designs will not be necessary for the measured sulfate contents.

Based on criteria established by the County of Los Angeles (2013), measurements of resistivity of near-surface soils (3,200 ohms-cm) indicate that they are “moderately corrosive” to ferrous metal (i.e. cast iron, etc.) pipes.

GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

The site is suitable for the proposed development from a Geotechnical Engineering standpoint provided that the recommendations contained in this report are successfully implemented into the project.

Conclusions and recommendations addressing these geotechnical considerations, as well as general recommendations regarding the geotechnical aspects of design and construction, are presented in the following sections.

A. Grading

1. Pre-Grading Considerations

- a. Plans and specifications should be provided to Earth Systems prior to grading. Plans should include the grading plans, foundation plans, and foundation details.
- b. Roof draining systems, if required by the appropriate jurisdictional agency, should be designed so that water is not discharged into bearing soils or near structures.
- c. Final site grade should be designed so that all water is diverted away from the structures over paved surfaces, or over landscaped surfaces in accordance with current codes. Water should not be allowed to pond anywhere on the pad for the proposed shade structure.
- d. Shrinkage of soils affected by compaction is estimated to minimal based on an anticipated average compaction of 92 percent.
- e. The existing ground surface should be initially prepared for grading by removing the existing asphalt pavement section, debris, other organic material and non-complying fill. Organics and debris should be stockpiled away from areas to be graded, and ultimately removed from the site to prevent their inclusion in fills. Voids created by removal of such material should be properly backfilled and compacted. No compacted fill should be placed unless the underlying soil has been observed by the Geotechnical Engineer.
- f. It is recommended that Earth Systems be retained to provide Geotechnical Engineering services during site development and grading, and foundation construction phases of the work to observe compliance with the design concepts, specifications and recommendations, and to allow design changes in

the event that subsurface conditions differ from those anticipated prior to the start of construction.

g. Compaction tests shall be made to determine the relative compaction of the fills in accordance with the following minimum guidelines: one test for each two-foot vertical lift; one test for each 1,000 cubic yards of material placed; and two tests at finished subgrade elevation in the pad area.

2. <u>Rough Grading/Areas of Development</u>

a. Grading at a minimum should conform to Appendix J in the 2016 California Building Code (CBC), and with the recommendations of the Geotechnical Engineer during construction. Where the recommendations of this report and the cited section of the 2016 CBC are in conflict, the Owner should request clarification from the Geotechnical Engineer.

b. Earth Systems recommends that soils should be overexcavated to a depth of 3 feet below finished subgrade elevation, or as deep as necessary to remove <u>all</u> uncertified fill, whichever is deeper. Remedial excavations should be performed to the greater distance of 5 feet or a distance equal to the depth of removal laterally beyond the outside edge of the proposed structures. The depth and extent of required overexcavations should be approved in the field by the Geotechnical Engineer or his representative prior to placement of fill or improvements. The remedial excavation may then be brought up to within one foot of finished subgrade using the excavated soil compacted to at least 90 percent of the ASTM D 1557 maximum dry density. The upper foot of subgrade within the remedial excavation limits for the proposed structures should be compacted to achieve a relative compaction of between 95 percent of the ASTM D 1557 maximum dry density. The area may then be paved to match the existing structural paving section.

c. Areas outside the footprint of the proposed classroom buildings to be paved should be excavated a minimum of 1 foot below finished subgrade beneath the finished subgrade elevation. The limits of the remedial excavations should extend at least 2 feet beyond the outside edge of the proposed improvement. The resulting surface should then be scarified to a depth of 6 inches; uniformly moisture-conditioned to above optimum moisture content and compacted to achieve a relative compaction of between 90 percent of the ASTM D 1557 maximum dry density. The upper foot of subgrade beneath areas to be paved should be compacted to achieve a relative compaction of between 95 percent of the ASTM D 1557 maximum dry density. The area may then be paved to match the existing structural paving section.

d. The bottoms of all excavations should be observed by a representative of this firm prior to processing or placing fill.

e. On-site soils may be used for fill once they are cleaned of all organic material, rock, debris and irreducible material larger than 8 inches.

f. Engineered fill should be placed in a series of horizontal layers not exceeding 8 inches in loose thickness, uniformly moisture-conditioned to above optimum moisture content and compacted to achieve a minimum relative compaction of 90 percent of the ASTM D 1557 maximum dry density. Compaction of the engineered fill should be verified by testing. Additional fill lifts should not be placed if the previous lift did not meet the required relative compaction or if soil conditions are not stable. Discing, tilling, and/or blending may be required to uniformly moisture-condition soils used for engineered fill.

g. Import soils used to raise site grade should be equal to, or better than, on-site soils in strength, expansion, and compressibility characteristics. Import soil can be evaluated, but will not be prequalified by the Geotechnical Engineer. Final comments on the characteristics of the import will be given after the material is at the project site.

h. If pumping soils or otherwise unstable soils are encountered during the remedial overexcavation or excavation of utility trenches, stabilization of the excavation bottom will be required prior to placing fill. This can be accomplished by various means. The first method would include drying the soils as much as possible through scarification. If the conditions at the planned remedial excavation depth require further stabilization measures, the bottom of the remedial excavation should be deepened an additional 8 inches. The bottom geogrid layer of the reinforced soil/aggregate mat should be placed on this deepened bottom, and the additional 8 inches be backfilled with compacted aggregate base material or crushed rock. To minimize migration of soil particles from the underlying native soil into the crushed rock, if used, the bottom layer of geogrid should be underlain by a layer of non-woven geotextile fabric.

3. Utility Trenches
   1. Utility trench backfill should be governed by the provisions of this report relating to minimum compaction standards. In general, on-site service lines may be backfilled with native soils compacted to 90% of maximum density. Backfill of offsite service lines will be subject to the specifications of the jurisdictional agency or this report, whichever are greater.
   2. Compacted native soils should be utilized for backfill below structures. Sand should not be used under structures because it provides a conduit for water to migrate under foundations.
   3. Backfill operations should be observed and tested by the Geotechnical Engineer to monitor compliance with these recommendations.
   4. Jetting should not be utilized for compaction in utility trenches.
   5. We recommend that flexible connections should be provided where critical underground utilities enter buildings or other proposed improvements to accommodate the anticipated differential movements due to seismic-induced settlements.

4. Excavations
   1. Excavations within the depth of the recommended remedial grading and underground utilities will typically encounter sands. This material should be easily excavated with conventional earthmoving equipment.
   2. Temporary unshored, unsurcharged, open excavations above the groundwater level may be cut vertically to a maximum height of no more than 4 feet. Excavations extending higher than 4 vertical feet should be sloped back above the 4-foot vertical cut to at least 1H:1V (horizontal to vertical) or flatter provided the adjacent ground is not subject to surcharge loading. If excavations dry out, sloughing will occur. No excavation should be made within a 2:1 line projected downward from the outside edge at the base of any existing footing or slab.
   3. During the time excavations are open, no heavy grading equipment or other surcharge loads (i.e. excavation spoils) should be allowed within a horizontal distance from the top of any slope equal to the depth of the excavation (both distances measured from the top of the excavation slope).
   4. Adequate measures should be taken to protect any structural foundations, pavements, or utilities adjacent to any excavations.

e. All open cuts should be in compliance with applicable Occupational Safety Health Administration (OSHA) regulations (California Construction Safety Orders, Title 8) and should be monitored for evidence of incipient instability. Standard construction techniques should be sufficient for temporary site excavations. Project safety is the responsibility of the Contractor and the Owner. Earth Systems will not be responsible for project safety.

ADDITIONAL SERVICES

This report is based on the assumption that an adequate program of monitoring and testing will be performed by Earth Systems during construction to check compliance with the recommendations given in this report. The recommended tests and observations include, but are not necessarily limited to the following:

1. Review of the building and grading plans during the design phase of the project.
2. Observation and testing during site preparation, grading, placing of engineered fill, and foundation construction.
3. Consultation as required during construction.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

The analysis and recommendations submitted in this report are based in part upon the data obtained from the borings and CPT soundings advanced on the site during earlier site studies. The nature and extent of variations between and beyond the borings and soundings may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

The scope of services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater or air, on, below, or around this site. Any statements in this report or on the soil boring logs regarding odors noted, unusual or suspicious items or conditions observed, are strictly for the information of the client.

Findings of this report are valid as of this date; however, changes in conditions of a property can occur with passage of time whether they be due to natural processes or works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur whether they result from legislation or broadening of knowledge. Accordingly, findings of this report may be invalidated wholly or partially by changes outside the control of this firm. Therefore, this report is subject to review and should not be relied upon after a period of one year.

In the event that any changes in the nature, design, or location of the structure(s) and other improvements are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

This report is issued with the understanding that it is the responsibility of the Owner, or of his representative to ensure that the information and recommendations contained herein are called to the attention of the Architect and Engineers for the project and incorporated into the plan and that the necessary steps are taken to see that the Contractor and Subcontractors carry out such recommendations in the field.

As the Geotechnical Engineers for this project, Earth Systems has striven to provide services in accordance with generally accepted geotechnical engineering practices in this community at this time. No warranty or guarantee is expressed or implied. This report was prepared for the exclusive use of the Client for the purposes stated in this document for the referenced project only. No third party may use or rely on this report without express written authorization from Earth Systems for such use or reliance.

It is recommended that Earth Systems be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications. If Earth Systems is not accorded the privilege of making this recommended review, it can assume no responsibility for misinterpretation of the recommendations.

AERIAL PHOTOGRAPHS REVIEWED FOR STUDY

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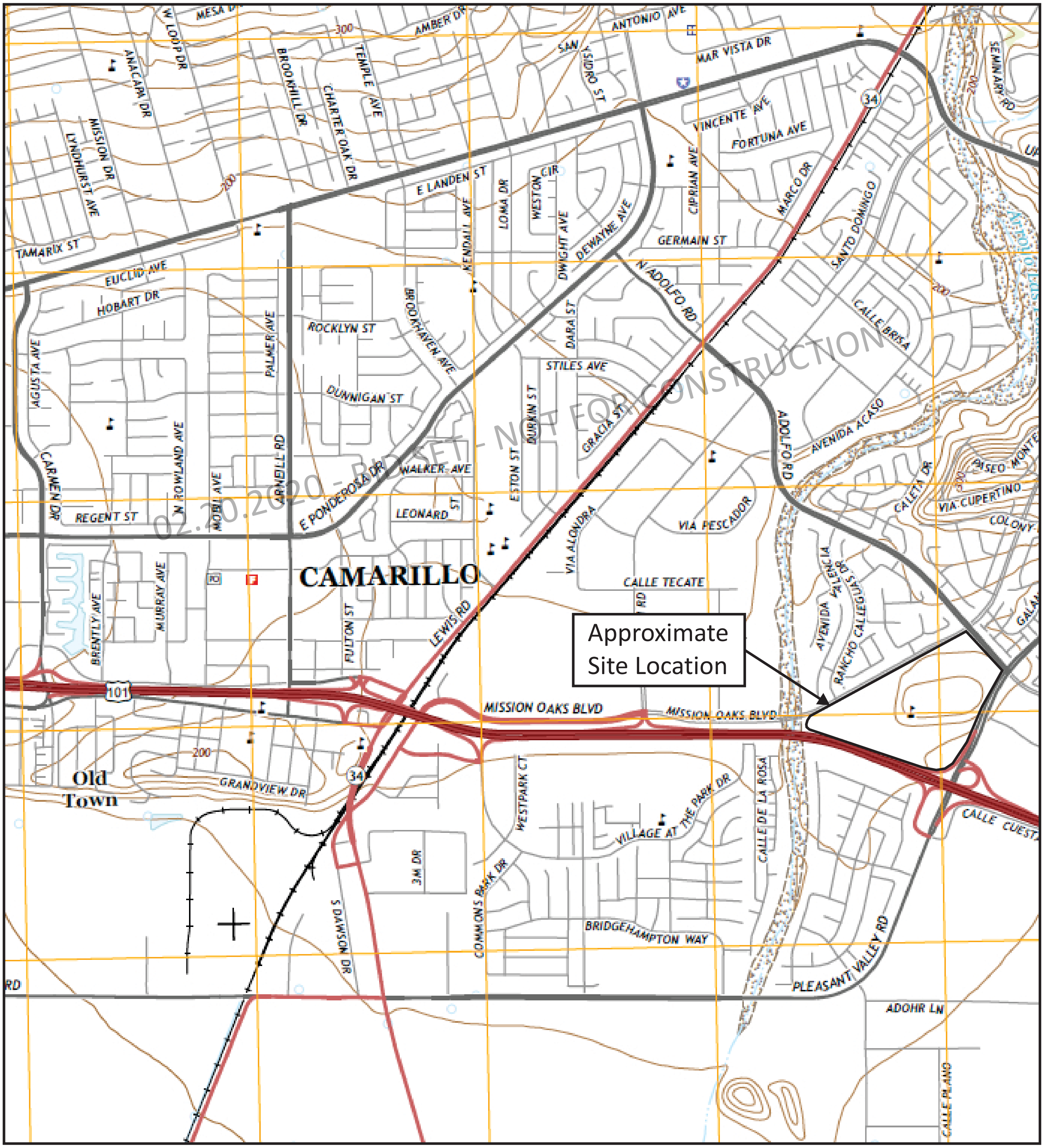
APPENDIX A



*Taken from USGS Topo Map, Camarillo Quadrangle, California, 2015.

Approximate Scale: 1" = 2,000’

0 2,000’ 4,000’

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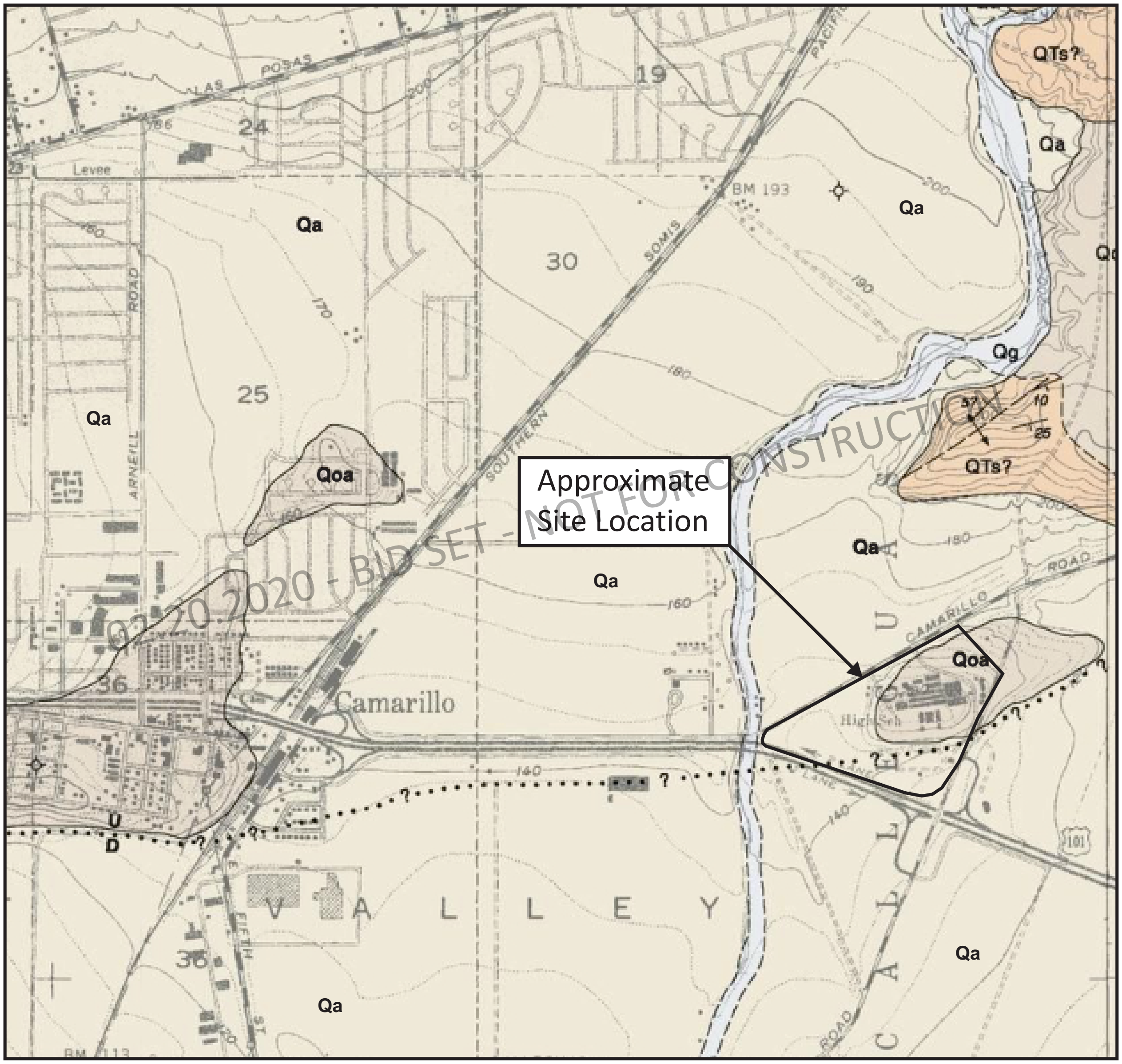
VICINITY MAP

Camarillo High School Relocatables
Camarillo, California

Earth Systems

December 2019	303275-002

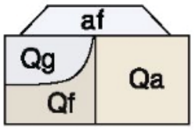


*Taken from Dibblee, Jr., Geologic Map of the Camarillo and Newbury Park Quadrangles, Ventura County, California, 1990, DF-28.

Qoa

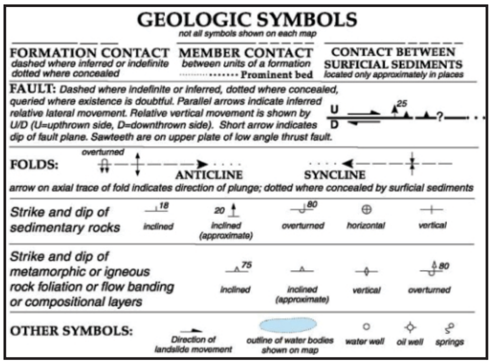
OLDER DISSECTED SURFICIAL SEDIMENTS

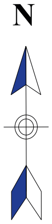
Qoa *Dissected, weakly indurated alluvial gravel, sand and clay*



SURFICIAL SEDIMENTS

af *Artificial fill*
Qg *Stream channel sand and gravel*
Qf *Alluvial fan gravel and sand, locally slightly indurated*
Qa *Alluvium: gravel, sand and clay of flatlands*





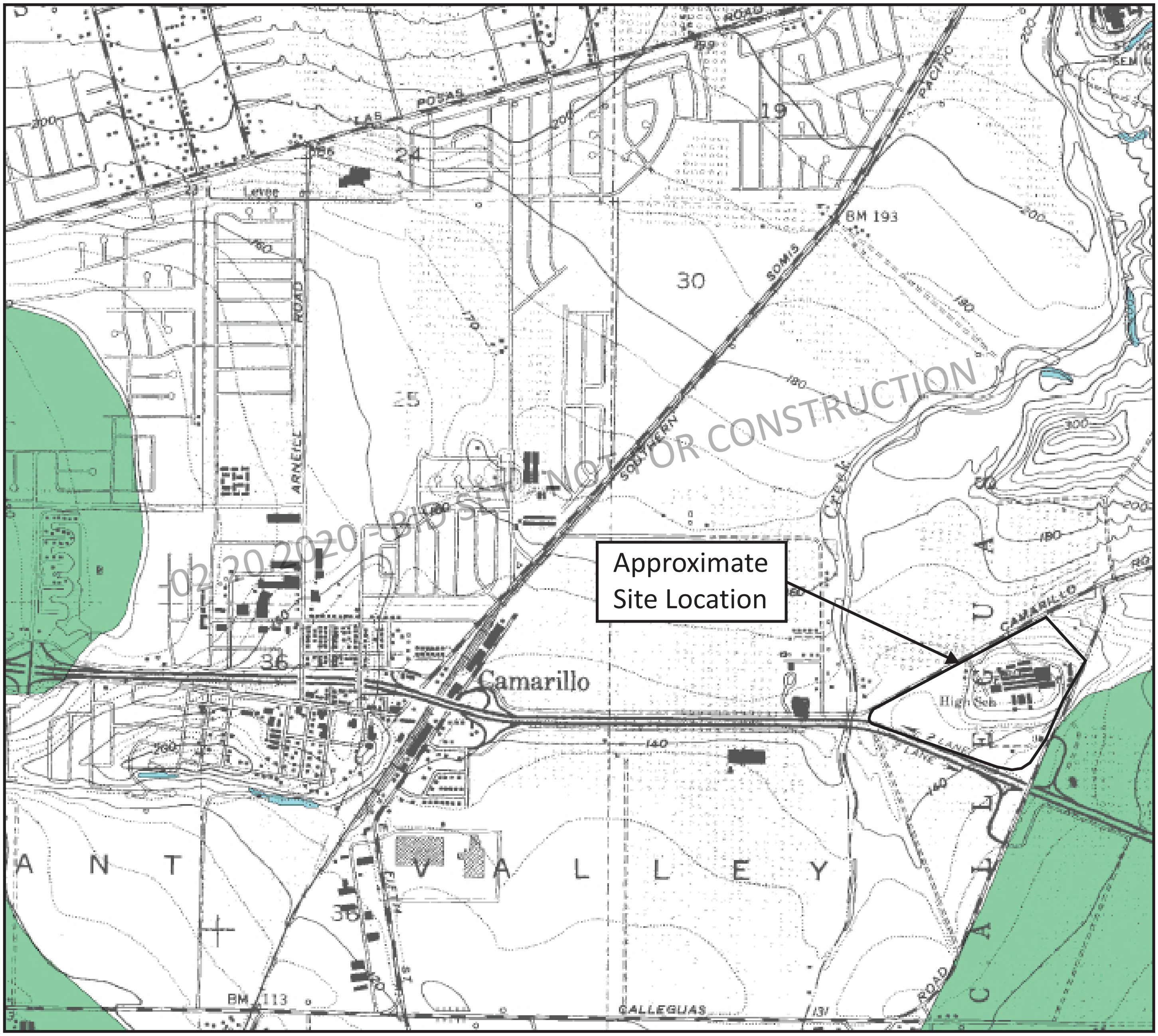
Approximate Scale: 1" = 2,000’

REGIONAL GEOLOGIC MAP

Camarillo High School Relocatables
Camarillo, California

Earth Systems

December 2019	303275-002



Approximate Site Location

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

🟩 Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground-water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

🟦 Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

NOTE: Seismic Hazard Zones identified on this map may include developed land where delineated hazards have already been mitigated to city or county standards. Check with your local building/planning department for information regarding the location of such mitigated areas.

Approximate Scale: 1" = 2,000'

0 2,000' 4,000'

STATE OF CALIFORNIA

SEISMIC HAZARD ZONES

Delineated in compliance with
Chapter 7.8, Division 2 of the California Public Resources Code
(Seismic Hazards Mapping Act)

CAMARILLO QUADRANGLE

OFFICIAL MAP

Released: February 7, 2002

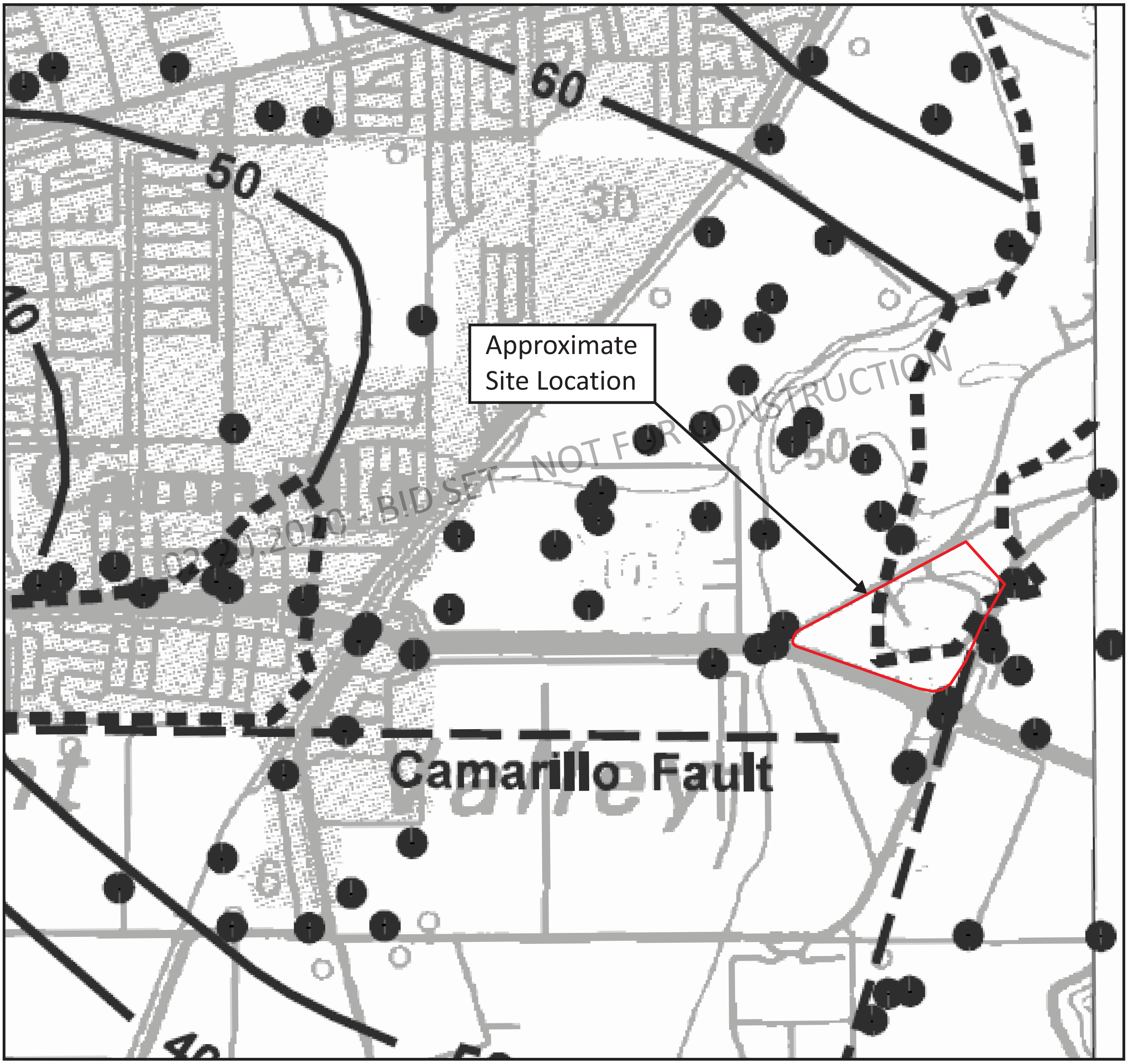
N

SEISMIC HAZARD ZONES MAP

Camarillo High School Relocatables
Camarillo, California

Earth Systems

December 2019	303275-002



*Taken from CGS, Seismic Hazard Zone Report For The Saticoy 7.5-Minute Quadrangle, Ventura County, California, 2003.

30	Depth to historically highest ground water level in feet	Valley / Mountains Boundary	Groundwater Barrier
●	Borehole Site	▲	Approximate location of sand boils and lurch cracks observed following the Point Mugu Earthquake of February 21, 1973.

Approximate Scale: 1" = 2,000'

0 2,000' 4,000'

N

HISTORICAL HIGH GROUNDWATER

Camarillo High School Relocatables
Camarillo, California

Earth Systems

December 2019

303275-002

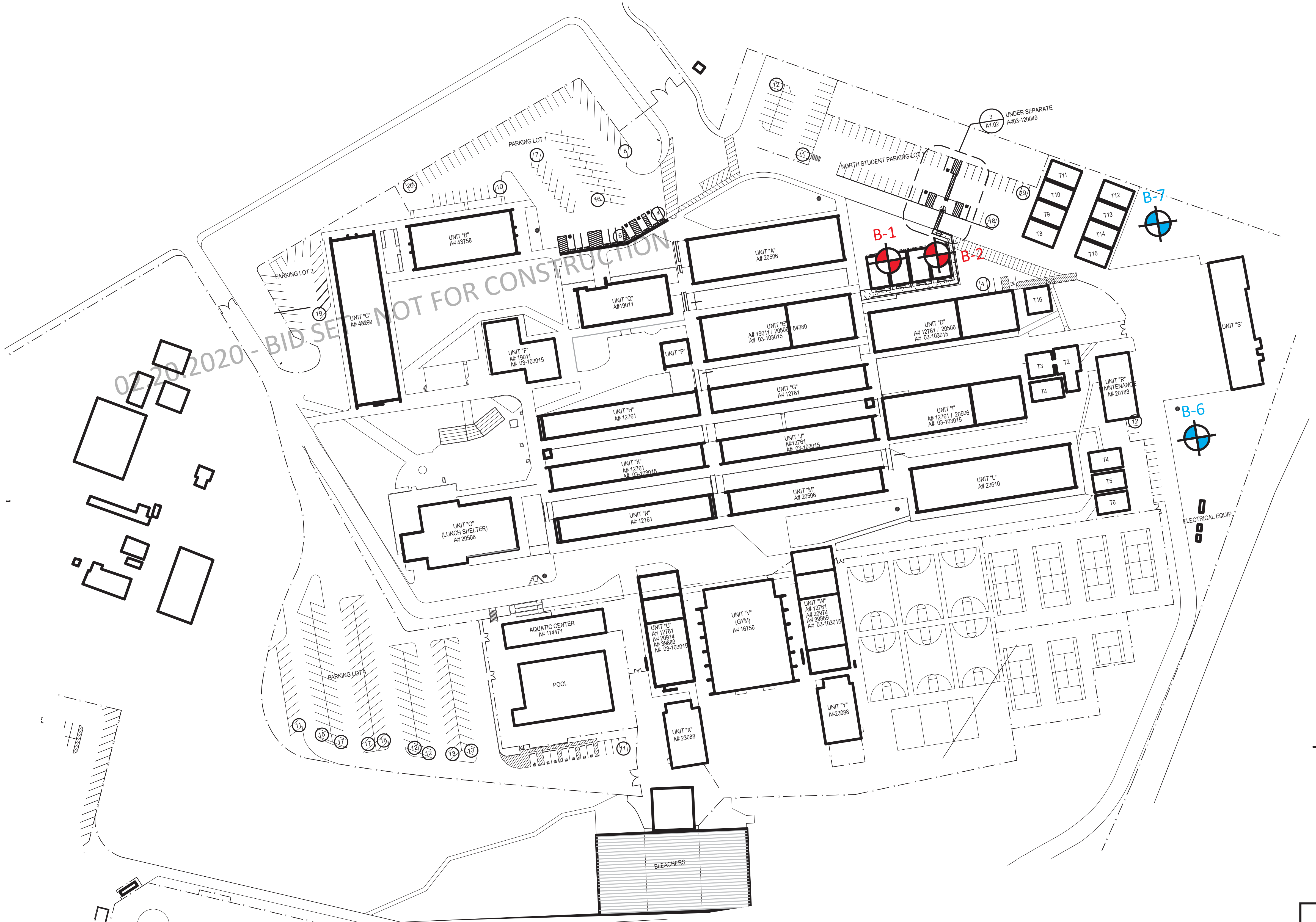
FIELD STUDY

A. Two borings (B-1 and B-2) were drilled to depths ranging from approximately 21.5 to 26.5 feet below the existing ground surface to observe the soil profile and to obtain samples for laboratory analyses. The borings were drilled on October 23, 2019, using 8-inch diameter hollow-stem continuous flight auger powered by a Simco 2800 truck mounted drilling rig. The approximate locations of the borings were determined in the field by pacing and sighting, and are shown on the Site Plan in this Appendix.

B. Samples were obtained within the borings with a Modified California (M.C.) ring sampler (ASTM D 3550 with shoe similar to ASTM D 1586). The M.C. sampler has a 3-inch outside diameter, and a 2.42-inch inside diameter when used with brass ring liners (as it was during this study). The samples were obtained by driving the sampler with a 140-pound hammer dropping 30 inches in accordance with ASTM D 1586. The hammer was operated with an automatic trip mechanism.

C. One bulk sample was collected from the cuttings of the soils encountered in Boring B-1 between the depths of 1 and 5 feet.

D. The final logs of the borings represent interpretations of the contents of the field logs and the results of laboratory testing performed on the samples obtained during the subsurface study. The final logs are included in this Appendix.



B-2

: Approximate boring locations.

B-2

: Approximate boring locations from 2009.

Approximate Scale: 1" = 200’

0 200’ 400’

DSA CLOSE & CERTIFICATIONS STATUS

A#12761	#1
A#16756	#1
A#19011	#1
A#20183	#1
A#20506	#1
A#20974	#1
A#23088	#1
A#23610	#1
A#39889	#1
A#43299	#1
A#43758	#1
A#54380	#1
A#03-103015	#2
A#03-108509	#2
A#03-109962	#1
A#03-109189	#3
A#03-114471	#1

PARKING COUNT

NORTH STUDENT PARKING LOT 1
REGULAR STALLS:
PROVIDED: 67 STALLS
ACCESSIBLE STALLS:
REQUIRED: 3 STALLS
PROVIDED: 3 STALLS (INCLUDES 1 VAN)
TOTAL STALLS:
70 STALLS

SITE LEGEND

PATH OF TRAVEL

DESIGN PROFESSIONAL IN GENERAL RESPONSIBLE CHARGE STATEMENT:
THE POT IDENTIFIED IN THESE CONSTRUCTION DOCUMENTS IS COMPLIANT WITH THE CURRENT APPLICABLE CALIFORNIA BUILDING CODE ACCESSIBILITY PROVISIONS FOR PATH OF TRAVEL REQUIREMENTS FOR ALTERATIONS, ADDITIONS, AND STRUCTURAL REPAIRS . AS PART OF THIS PROJECT, THE POT WAS EXAMINED AND ANY ELEMENTS, COMPONENTS OR PORTIONS OF THE POT THAT WERE DETERMINED TO BE NON-COMPLIANT 1) HAVE BEEN IDENTIFIED AND 2) THE CORRECTIVE WORK NECESSARY TO BRING THEM INTO COMPLIANCE HAS BEEN INCLUDED WITHIN THE SCOPE OF THIS PROJECT'S WORK THROUGH DETAILS, DRAWINGS, AND SPECIFICATIONS INCORPORATED INTO THESE CONSTRUCTION DOCUMENTS. ANY NONCOMPLIANT ELEMENTS, COMPONENTS OR PORTIONS OF THIS POT THAT WILL NOT BE CORRECTED BY THIS PROJECT BASED ON VALUATION THRESHOLD LIMITATIONS OR A FINDING OF UNREASONABLE HARDSHIP ARE SO INDICATED IN THESE CONSTRUCTION DOCUMENTS.

DURING CONSTRUCTION, IF POT ITEMS WIITHIN THE SCOPE OF THE PROJECT REPRESENTED AS CODE COMPLIANT ARE FOUND TO BE NONCONFORMING BEYOND REASONABLE CONSTRUCTION TOLERANCES, THEY SHALL BE BROUGHT INTO COMPLIANCE WITH THE CBC AS PART OF THIS PROJECT BY MEANS OF A CONSTRUCTION CHANGE DOCUMENT.

← — — — →	PATH OF TRAVEL
Ⓧ	(E) STANDARD (9'-0"X18'-0") PARKING STALL COUNT
●	(E) FIRE HYDRANT
▨	(E) 20'-0" WIDE FIRE LANE ON (E) PAVING
— — — —	ASSUMED PROPERTY LINE
▒	PROPOSED CONCRETE PAVING
▨	PROPOSED 24'x40' MODULAR CLASSROOM BUILDING - ONE STORY ON WOOD FOUNDATION, NON-SPRINKLERED

N

SITE PLAN

Adolfo Camarillo High School
Camarillo, California

Earth Systems

December 2019
303275-002

Earth Systems
1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-1
PROJECT NAME: Camarillo H.S. Relocatables
PROJECT NUMBER: 303275-002
BORING LOCATION: Per Plan

DRILLING DATE: October 23, 2019
DRILL RIG: Simco 2800
DRILLING METHOD: 8.0-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type			PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
	Bulk	SPT	Mod. Calif.						
0					▨				4.0" Asphalt; 5.0" Base material.
	☒				▨	SM			**ARTIFICIAL FILL:** Grayish brown silty sand; soft; moist.
	☒		■	8/23/27	▨	SM	116.4	16.1	**ARTIFICIAL FILL:** Dark yellowish brown silty sand; very stiff; moist.
5			■	10/13/16	▒	SM	114.5	14.0	**ALLUVIUM:** Dark yellowish brown clayey silty sand; medium dense; moist.
			■	8/9/10	▒	SM	103.6	11.5	**ALLUVIUM:** Dark yellowish brown silty fine sand; medium dense; moist.
10			■	5/10/11	░	SM	100.4	4.2	**SAUGUS FORMATION:** Mottled pale yellowish brown slightly silty sand; medium dense; damp to moist.
15			■	27/ 50-5"	░	SM	104.9	18.2	**SAUGUS FORMATION:** Dark yellowish brown silty sand to sandy silt; cemented; dense; moist.
20			■	10/17/27	░	SM			**SAUGUS FORMATION:** Dark yellowish brown silty fine sand; medium dense; damp to moist.
									Total Depth: 21.5 feet. No Groundwater Encountered.
25									
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

Earth Systems

1731-A Walter Street, Ventura, California 93003
PHONE: (805) 642-6727 FAX: (805) 642-1325

BORING NO: B-2
PROJECT NAME: Camarillo H.S. Relocatables
PROJECT NUMBER: 303275-002
BORING LOCATION: Per Plan

DRILLING DATE: October 23, 2019
DRILL RIG: Simco 2800
DRILLING METHOD: 8.0-Inch Hollow Stem Auger
LOGGED BY: SC

Vertical Depth	Sample Type: Bulk	Sample Type: SPT	Sample Type: Mod. Calif.	PENETRATION RESISTANCE (BLOWS/6")	SYMBOL	USCS CLASS	UNIT DRY WT. (pcf)	MOISTURE CONTENT (%)	DESCRIPTION OF UNITS
0					▨	CL			5.0" Asphalt; 5.0" Base material. **ARTIFICIAL FILL:** Grayish brown silty clay; soft; moist.
			■	14/19/20	░	SM	115.2	13.6	**ARTIFICIAL FILL:** Mottled dark yellowish brown clayey silty sand; medium dense; moist.
5			■	9/8/10	░	SM	102.1	16.0	Same as above; with silty sand interbeds.
			■	7/10/12	░	SM	102.5	8.0	**ALLUVIUM:** Yellowish brown silty fine sand; medium dense; moist.
10			■	8/11/21	▒	SM	102.1	6.0	**SAUGUS FORMATION:** Pale yellowish brown silty fine sand; lightly cemented; medium dense; damp.
15			■	23/ 50-5"	▒	SM	102.0	21.4	**SAUGUS FORMATION:** Dark yellowish brown silty sand with sandy silt interbeds; dense; damp.
20			■	8/14/29	▒	SM			**SAUGUS FORMATION:** Dark yellowish brown silty sand with sandy silt interbeds; dense; damp.
25			■	6/11/15	▒	SM			**SAUGUS FORMATION:** Yellowish brown silty fine sand and sandy silt; medium dense; damp to moist.
									Total Depth: 26.5 feet. No Groundwater Encountered.
30									
35									

Note: The stratification lines shown represent the approximate boundaries between soil and/or rock types and the transitions may be gradual.

BORING LOG SYMBOLS

■	Modified California Split Barrel Sampler
⧅	Modified California Split Barrel Sampler - No Recovery
◨	Standard Penetration Test (SPT) Sampler
◫	Standard Penetration Test (SPT) Sampler - No Recovery
▽	Perched Water Level
▼	Water Level First Encountered
▼	Water Level After Drilling
⊙	Pocket Penetrometer (tsf)
⊕	Vane Shear (ksf)

1. The location of borings were approximately determined by pacing and/or siting from visible features. Elevations of borings are approximately determined by interpolating between plan contours. The location and elevation of the borings should be considered.

2. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

3. Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. This data has been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, tides, temperature, and other factors at the time measurements were made.

BORING LOG SYMBOLS

Earth Systems

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			***GRAPH SYMBOL***	***LETTER SYMBOL***	***TYPICAL DESCRIPTIONS***
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	░	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			░	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	▥	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	░	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			░	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNTOF FINES)	▥	SM	SILTY SANDS, SAND-SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT 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 GREATER THAN 50	▥	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			▨	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			▤	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

Earth Systems

APPENDIX B

Laboratory Testing
Tabulated Laboratory Test Results
Individual Laboratory Test Results
Table 18-I-D with Footnotes

LABORATORY TESTING

A. Samples were reviewed along with field logs to determine which would be analyzed further. Those chosen for laboratory analyses were considered representative of soils that would be exposed and/or used during grading, and those deemed to be within the influence of proposed structures. Test results are presented in graphic and tabular form in this Appendix.

B. In-situ moisture content and dry unit weight for the ring samples were determined in general accordance with ASTM D 2937.

C. A maximum density test was performed to estimate the moisture-density relationship of typical soil materials. The test was performed in accordance with ASTM D 1557.

D. The relative strength characteristics of soils were determined from the results of a direct shear test on a remolded sample. The specimen was placed in contact with water at least 24 hours before testing, and was then sheared under normal loads ranging from 1 to 3 ksf in general accordance with ASTM D 3080.

F. An expansion index test was performed on a bulk soil sample in accordance with ASTM D 4829. The sample was surcharged under 144 pounds per square foot at moisture content of near 50 percent saturation. The sample was then submerged in water for 24 hours, and the amount of expansion was recorded with a dial indicator.

I. A portion of the bulk sample was sent to another laboratory for analyses of soil pH, resistivity, chloride contents, and sulfate contents. Soluble chloride and sulfate contents were determined on a dry weight basis. Resistivity testing was performed in accordance with California Test Method 424, wherein the ratio of soil to water was 1:3.

TABULATED LABORATORY TEST RESULTS

REMOLDED SAMPLE

BORING AND DEPTH	B-1 @ 1'-5'
USCS	SM
MAXIMUM DRY DENSITY (pcf)	117.0
OPTIMUM MOISTURE (%)	11.0
PEAK COHESION (psf)	60.0
PEAK FRICTION ANGLE	32°
ULTIMATE COHESION (psf)	50.0
ULTIMATE FRICTION ANGLE	32°
EXPANSION INDEX	13
pH	9.1
RESISTIVITY (ohms-cm)	3,200
SOLUBLE CHLORIDES (mg/Kg)	3.8
SOLUBLE SULFATES (mg/Kg)	35

UNIT DENSITIES AND MOISTURE CONTENT

ASTM D2937 & D2216

Job Name: Camarillo High School Relocatables

Sample Location	Depth (feet)	Unit Dry Density (pcf)	Moisture Content (%)	USCS Group Symbol
B-1	2.5	116.4	16.1	SM
B-1	5	114.5	14.0	SM
B-1	7.5	103.6	11.5	SM
B-1	10	100.4	4.2	SM
B-1	15	104.9	18.2	SM
B-2	2.5	115.2	13.6	SM
B-2	5	102.1	16.0	SM
B-2	7.5	102.5	8.0	SM
B-2	10	102.1	6.0	SM
B-2	15	102.0	21.4	SM

File Number: 303275-002 Lab Number: 098308

MAXIMUM DENSITY / OPTIMUM MOISTURE

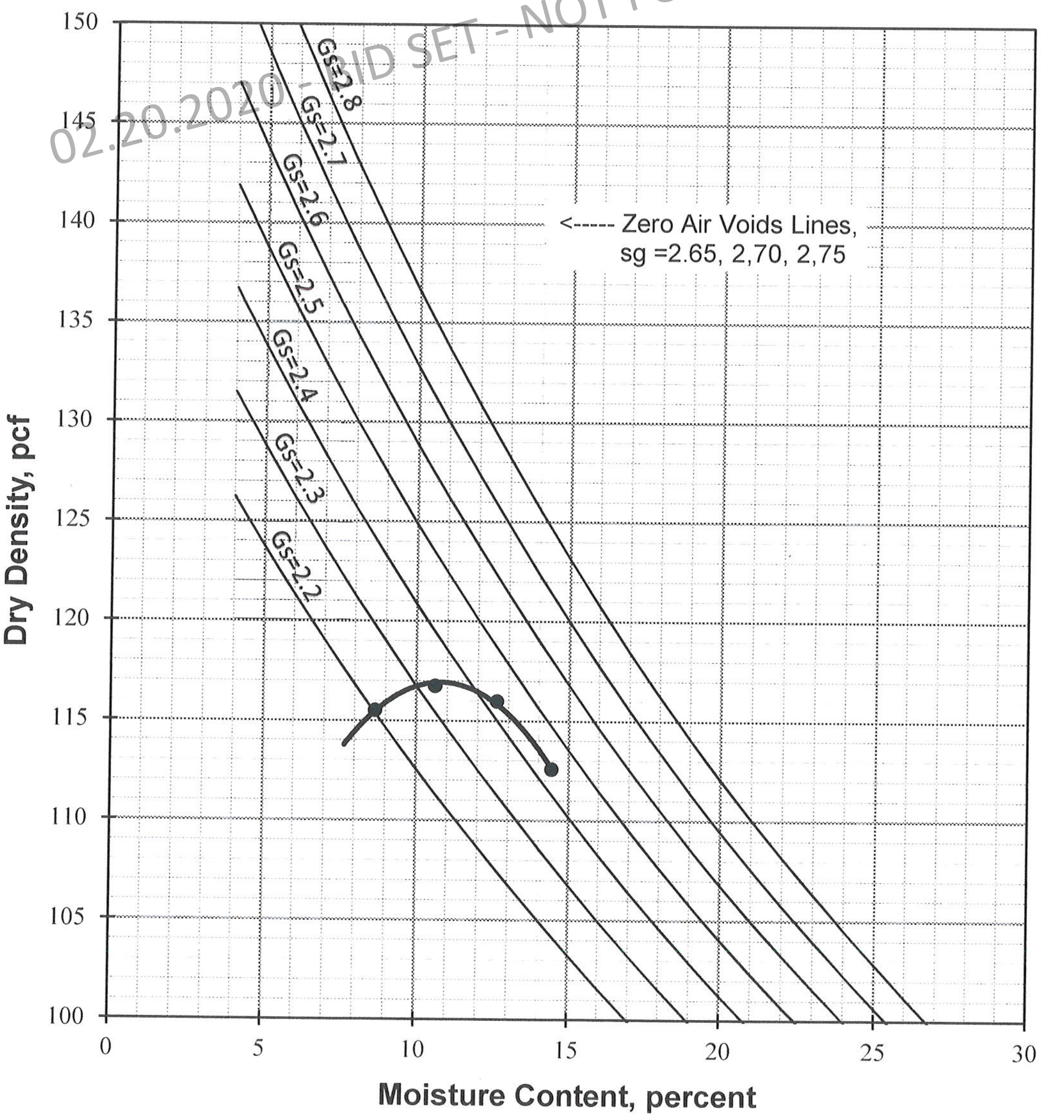
ASTM D 1557-12 (Modified)

Job Name: Camarillo High School Relocatables
Sample ID: B 1 @ 1'-5'
Date: 11/5/2019
Description: Yellowish Brown Silty Sand with Clay
SG: 2.35

Procedure Used: A
Prep. Method: Moist
Rammer Type: Automatic

Maximum Density: **117 pcf**
Optimum Moisture: **11%**

Sieve Size	% Retained
3/4"	0.0
3/8"	0.0
#4	0.8



File No.: 303275-002

EXPANSION INDEX

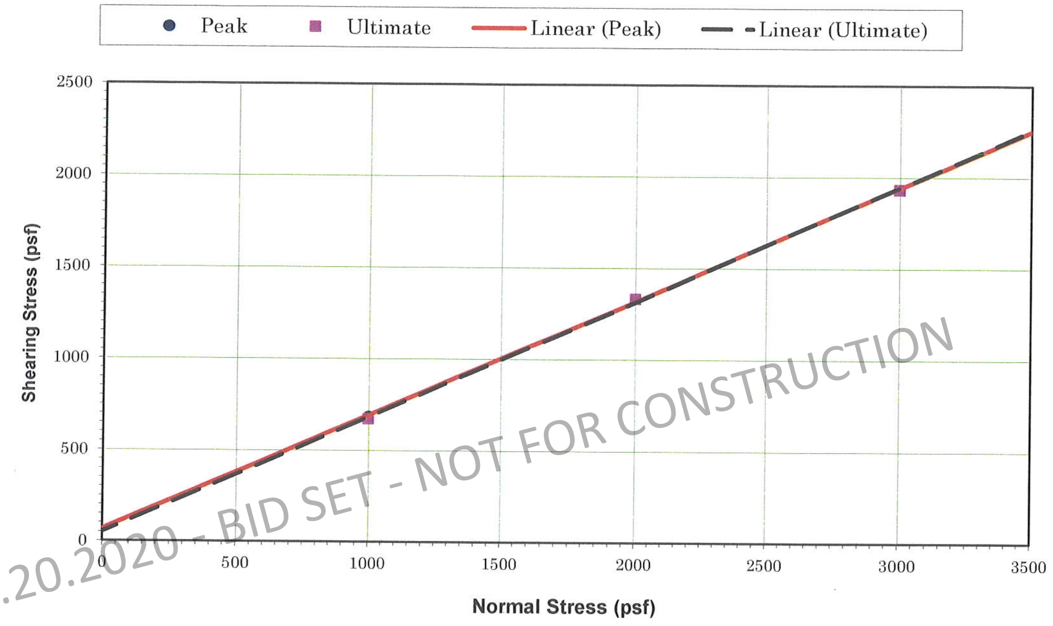
ASTM D-4829, UBC 18-2

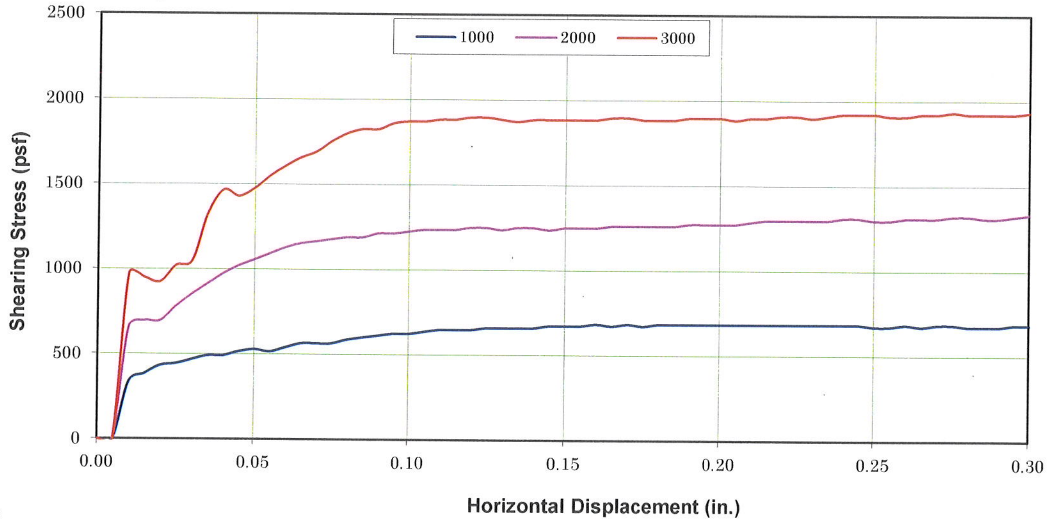
Job Name: Camarillo High School Relocatables
Sample ID: B-1 @ 1'-5'
Soil Description: SM

Initial Moisture, %:	10.6
Initial Compacted Dry Density, pcf:	105.2
Initial Saturation, %:	48
Final Moisture, %:	23.7
Volumetric Swell, %:	1.3

Expansion Index: **13** **Very Low**

EI	UBC Classification
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
130+	Very High





DIRECT SHEAR DATA*

Sample Location: B-1 @ 1'-5'
Sample Description: Yellowish Brown Silty Sand with Clay
Dry Density (pcf): 104.3
Intial % Moisture: 10.8
Average Degree of Saturation: 100.0
Shear Rate (in/min): 0.005 in/min

Normal stress (psf)	1000	2000	3000
Peak stress (psf)	684	1332	1932
Ultimate stress (psf)	672	1332	1932

	Peak	Ultimate
ϕ Angle of Friction (degrees):	32	32
c Cohesive Strength (psf):	60	50

Test Type: Peak & Ultimate

* Test Method: ASTM D-3080

DIRECT SHEAR TEST

Camarillo High School Relocatables

Earth

12/6/2019 | 303275-002

CERTIFICATE OF ANALYSIS

Client: Earth Systems Pacific	Date Sampled: 10/21/19
CAS LAB NO: 191957-01	Date Received: 10/24/19
Sample ID: B1@1'-5'	Sample Matrix: Soil
Analyst: GP	

WET CHEMISTRY SUMMARY

COMPOUND	RESULTS	UNITS	DF	PQL	METHOD	ANALYZED
pH (Corrosivity)	9.1	S.U.	1	---	9045	10/29/19
Resistivity*	3200	Ohms-cm	1	---	SM 120.1M	10/29/19
Chloride	3.8	mg/Kg	1	0.3	300.0M	11/05/19
Sulfate	35	mg/Kg	1	0.3	300.0M	11/05/19

*Sample was extracted using a 1:3 ratio of soil and DI water.

DF: Dilution Factor
PQL: Practical Quantitation Limit
BQL: Below Quantitation Limit
mg/Kg: Milligrams/Kilograms(ppm)

APPENDIX C

2016 CBC & ASCE 7-10 Seismic Parameters
US Seismic Design Maps
Spectral Response Values Table
Spectral Response Curves
Fault Parameters

2016 California Building Code (CBC) (ASCE 7-10) Seismic Design Parameters

			CBC Reference	ASCE 7-10 Reference
Seismic Design Category		**E**	Table 1613.5.6	Table 11.6-2
Site Class		**C**	Table 1613.5.2	Table 20.3-1
Latitude:		34.218 N		
Longitude:		-119.008 W		
Maximum Considered Earthquake (MCE) Ground Motion				
Short Period Spectral Reponse	S_S	**2.213 g**	Figure 1613.5	Figure 22-3
1 second Spectral Response	S_1	**0.794 g**	Figure 1613.5	Figure 22.4
Site Coefficient	F_a	1.00	Table 1613.5.3(1)	Table 11.4-1
Site Coefficient	F_v	1.30	Table 1613.5.3(2)	Table 11-4.2
	S_{MS}	2.213 g	$= F_a*S_S$	
	S_{M1}	1.032 g	$= F_v*S_1$	
Design Earthquake Ground Motion				
Short Period Spectral Reponse	S_{DS}	**1.475 g**	$= 2/3*S_{MS}$	
1 second Spectral Response	S_{D1}	**0.688 g**	$= 2/3*S_{M1}$	
	To	0.09 sec	$= 0.2*S_{D1}/S_{DS}$	
	Ts	0.47 sec	$= S_{D1}/S_{DS}$	
Seismic Importance Factor	I	1.25	Table 1604.5	
	F_{PGA}	1.00		

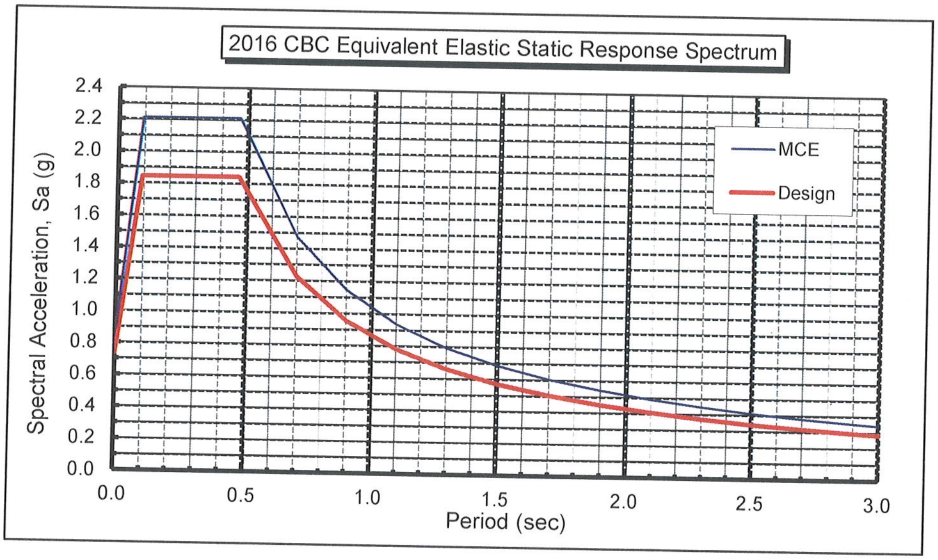


Table 11.5-1 Period T (sec)	Design Sa (g)
0.00	0.738
0.05	1.331
0.09	1.844
0.47	1.844
0.70	1.229
0.90	0.956
1.10	0.782
1.30	0.662
1.50	0.573
1.70	0.506
1.90	0.453
2.10	0.410
2.30	0.374
2.50	0.344
2.70	0.319
2.90	0.297

Camarillo High School Relocatables

Latitude, Longitude: 34.2182, -119.0075

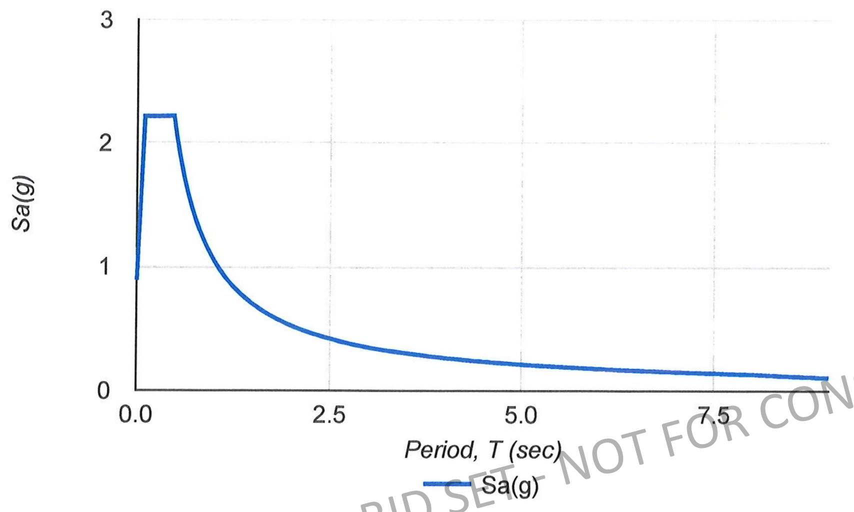
Map data ©2019

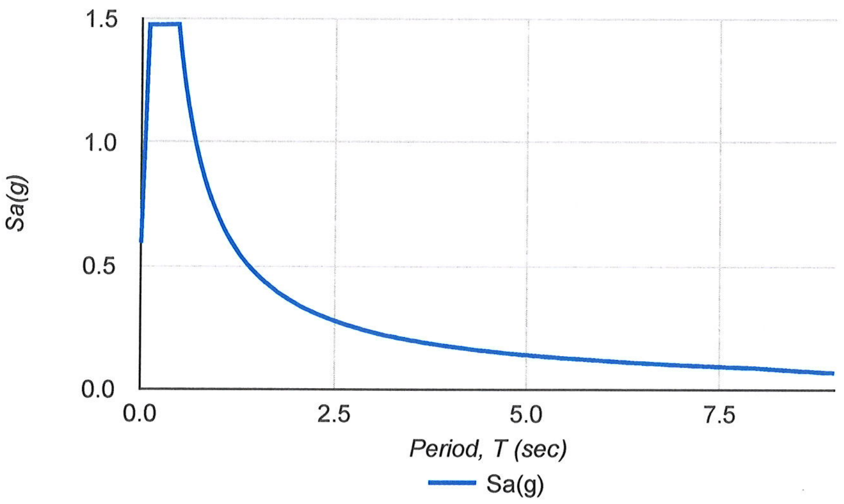
Date	12/2/2019, 12:56:40 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	2.213	MCE$_R$ ground motion. (for 0.2 second period)
S_1	0.794	MCE$_R$ ground motion. (for 1.0s period)
S_{MS}	2.213	Site-modified spectral acceleration value
S_{M1}	1.032	Site-modified spectral acceleration value
S_{DS}	1.475	Numeric seismic design value at 0.2 second SA
S_{D1}	0.688	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	E	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.3	Site amplification factor at 1.0 second
PGA	0.817	MCE$_G$ peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.817	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.218	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.301	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.213	Factored deterministic acceleration value. (0.2 second)
S1RT	0.794	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.819	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.843	Factored deterministic acceleration value. (1.0 second)
PGAd	0.848	Factored deterministic acceleration value. (Peak Ground Acceleration)

Type	Value	Description
C_{RS}	0.964	Mapped value of the risk coefficient at short periods
C_{R1}	0.968	Mapped value of the risk coefficient at a period of 1 s


MCER Response Spectrum


Design Response Spectrum

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Spectral Response Values

Probabilistic and Deterministic Response Spectra for MCE compared to Code Spectra

for 5% Viscous Damping Ratio

Natural Period T (seconds)	GeoMean Probab. 2% in 50 yr MCE Spectrum (1) 2475-yr	Max Rotated Probab. 2% in 50 yr MCEr (2) 2475-yr	Max 84th Percentile Determ. MCE Spectrum (3)	Determ. Lower Limit MCE Spectrum (4)	Determ. MCE Spectrum (5) max(3,4)	**Site Specific MCE Spectrum** (6) min(2.5)	**2016 CBC MCE Spectrum** (7)	Site Specific Design Spectrum (8) 2/3*(6)*	2016 CBC Design Spectrum (9) 2/3*(7)
0.00	0.867	0.919	1.039	0.600	1.039	**0.919**	**0.885**	0.613	0.590
0.05	1.309	1.388	1.321	1.033	1.321	**1.321**	**1.597**	0.881	1.065
0.10	1.751	1.857	1.880	1.465	1.880	**1.857**	**2.213**	1.238	1.475
0.15	1.953	2.070	2.274	1.500	2.274	**2.070**	**2.213**	1.380	1.475
0.20	2.154	2.284	2.453	1.500	2.453	**2.284**	**2.213**	1.523	1.475
0.30	1.974	2.094	2.359	1.500	2.359	**2.094**	**2.213**	1.396	1.475
0.40	1.742	1.933	2.172	1.500	2.172	**1.933**	**2.213**	1.288	1.475
0.50	1.509	1.748	1.961	1.500	1.961	**1.748**	**2.064**	1.166	1.376
0.75	1.161	1.403	1.530	1.040	1.530	**1.403**	**1.376**	0.935	0.918
1.00	0.813	1.023	1.212	0.780	1.212	**1.023**	**1.032**	0.682	0.688
1.50	0.581	0.731	0.835	0.520	0.835	**0.731**	**0.688**	0.487	0.459
2.00	0.349	0.439	0.624	0.390	0.624	**0.439**	**0.516**	0.293	0.344

Crs: 0.964
Cr1: 0.968

* > 80% of (9)

Probabilistic Spectrum from 2008 USGS Ground Motion Mapping Program adjusted for site conditions and maximum rotated component of ground motion using NGA, Column 2 has risk coefficients Cr applied.

Reference: ASCE 7-10, Chapters 21.2, 21.3, 21.4 and 11.4

Mapped MCE Acceleration Values			Site Coefficients		**Site-Specific Design Acceleration Values**		
PGA	0.817	g	F_{PGA}	1.00	**PGA_M**	**0.817**	**g**
Ss	2.213	g	F_a	1.00	**S_{DS}**	**1.523**	**g**
S_1	0.794	g	F_v	1.30	**S_{D1}**	**0.682**	**g**

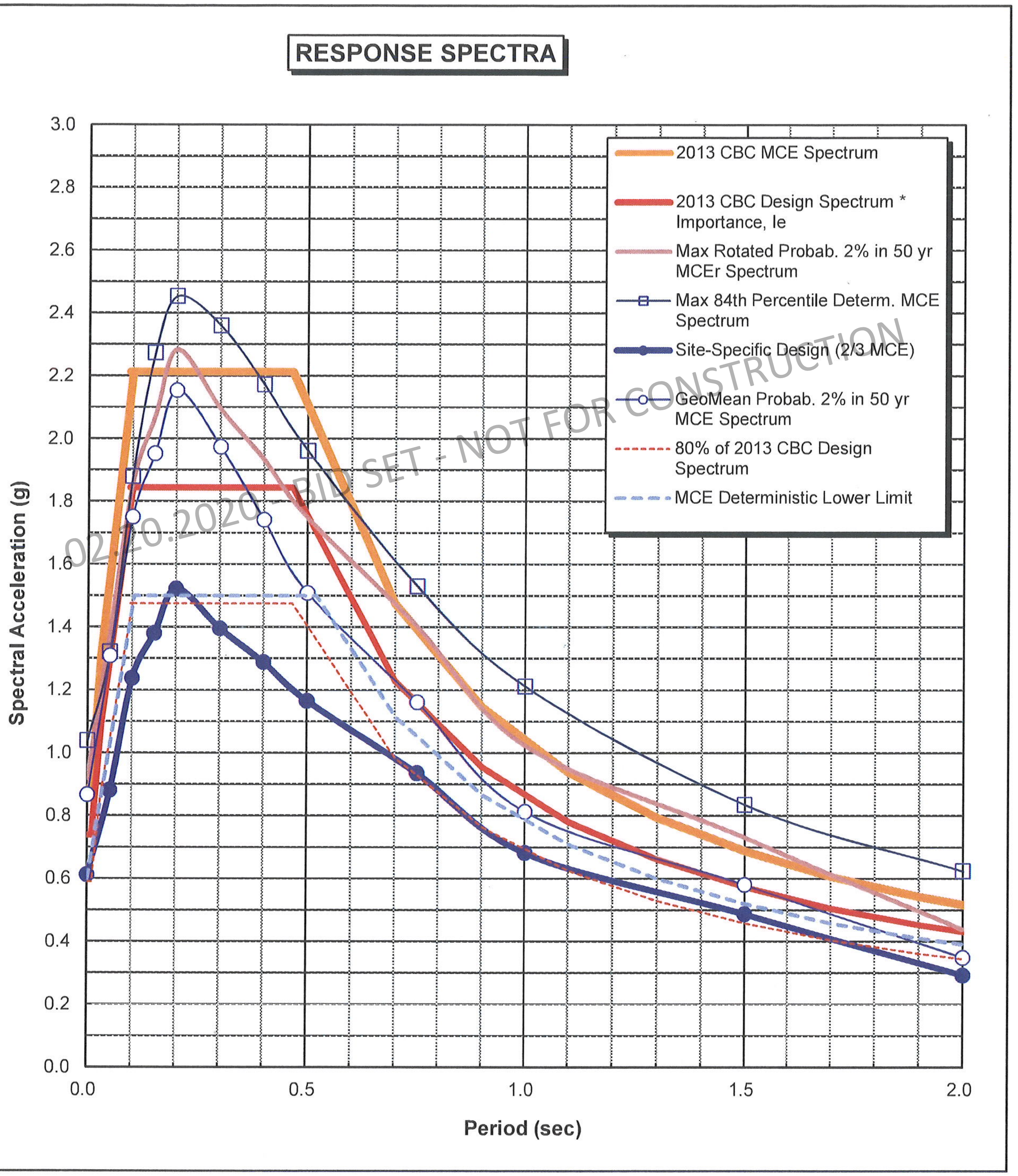
Spectral Amplification Factor for different viscous damping, D (%):

0.5%	2%	10%	20%
1.50	1.23	0.83	0.67

$1 \text{ g} = 980.6 \text{ cm/sec}^2 = 32.2 \text{ ft/sec}^2$

$PSV \text{ (ft/sec)} = 32.2(Sa)T/(2\pi)$

Key: Probab. = Probabilistic, Determ. = Deterministic, MCE = Maximum Considered Earthquake



Based on USGS National Strong Ground Motion Interactive Deaggregation Website using 2008 Parameters

Site Class: C
Latitude: 34.2182
Longitude: -119.0075

Spectral Response Curves

Adolfo Camarillo High School Relocatables
File No.: 303275-002

Earth Systems

Table 1
Fault Parameters

Fault Section Name	Distance (miles)	Distance (km)	Avg Dip Angle (deg.)	Avg Dip Direction (deg.)	Avg Rake (deg.)	Trace Length (km)	Fault Type	**Mean Mag**	Mean Return Interval (years)	Slip Rate (mm/yr)
Simi-Santa Rosa	1.2	1.9	60	346	30	39	B	**7.4**		1
Oak Ridge (Onshore)	8.5	13.7	65	159	90	49	B	**7.2**		4
Malibu Coast (Extension), alt 1	11.3	18.2	74	4	30	35	B'	**6.5**		
Malibu Coast (Extension), alt 2	11.3	18.2	74	4	30	35	B'	**6.9**		
Ventura-Pitas Point	11.5	18.6	64	353	60	44	B	**6.9**		1
Malibu Coast, alt 1	12.6	20.3	75	3	30	38	B	**6.6**		0.3
Malibu Coast, alt 2	12.6	20.3	74	3	30	38	B	**6.9**		0.3
San Cayetano	14.1	22.6	42	3	90	42	B	**7.2**		6
Oak Ridge (Offshore)	15.3	24.7	32	180	90	38	B	**6.9**		3
Sisar	15.5	25.0	29	168	na	20	B'	**7.0**		
Santa Susana, alt 1	16.8	27.1	55	9	90	27	B	**6.8**		5
Anacapa-Dume, alt 1	17.2	27.6	45	354	60	51	B	**7.2**		3
Anacapa-Dume, alt 2	17.2	27.6	41	352	60	65	B	**7.2**		3
Santa Susana, alt 2	17.2	27.6	53	10	90	43	B'	**6.8**		
Northridge Hills	18.1	29.2	31	19	90	25	B'	**7.0**		
Red Mountain	18.8	30.3	56	2	90	101	B	**7.4**		2
Mission Ridge-Arroyo Parida-Santa Ana	19.5	31.3	70	176	90	69	B	**6.8**		0.4
Channel Islands Thrust	19.7	31.8	20	354	90	59	B	**7.3**		1.5
Del Valle	20.6	33.1	73	195	90	9	B'	**6.3**		
Holser, alt 1	21.0	33.8	58	187	90	20	B	**6.7**		0.4
Holser, alt 2	21.0	33.8	58	182	90	17	B'	**6.7**		
Santa Cruz Island	21.7	35.0	90	188	30	69	B	**7.1**		1
Northridge	21.7	35.0	35	201	90	33	B	**6.8**		1.5
Shelf (Projection)	22.0	35.4	17	21	na	70	B'	**7.8**		
San Pedro Basin	22.6	36.4	88	51	na	69	B'	**7.0**		
Santa Ynez (East)	23.1	37.2	70	172	0	68	B	**7.2**		2
Santa Monica Bay	24.4	39.2	20	44	na	17	B'	**7.0**		
North Channel	24.8	39.9	26	10	90	51	B	**6.7**		1
Pine Mtn	24.9	40.1	45	5	na	62	B'	**7.3**		
Channel Islands Western Deep Ramp	25.0	40.3	21	204	90	62	B'	**7.3**		
Compton	26.5	42.7	20	34	90	65	B'	**7.5**		
Pitas Point (Lower)-Montalvo	27.0	43.5	16	359	90	30	B	**7.3**		2.5
Santa Monica, alt 1	28.9	46.5	75	343	30	14	B	**6.5**		1
San Gabriel	29.1	46.8	61	39	180	71	B	**7.3**		1
Santa Monica, alt 2	29.4	47.3	50	338	30	28	B	**6.7**		1
San Pedro Escarpment	29.6	47.7	17	38	na	27	B'	**7.3**		
Santa Cruz Catalina Ridge	30.2	48.7	90	38	na	137	B'	**7.3**		
Sierra Madre (San Fernando)	30.8	49.5	45	9	90	18	B	**6.6**		2
Palos Verdes	30.9	49.8	90	53	180	99	B	**7.3**		3
Pitas Point (Upper)	33.6	54.1	42	15	90	35	B	**6.8**		1

Reference: USGS OFR 2007-1437 (CGS SP 203)

Based on Site Coordinates of 34.2182 Latitude, -119.0075 Longitude

Mean Magnitude for Type A Faults based on 0.1 weight for unsegmented section, 0.9 weight for segmented model (weighted by probability of each scenario with section listed as given on Table 3 of Appendix G in OFR 2007-1437). Mean magntude is average of Ellworths-B and Hanks & Bakun moment area relationship.

APPENDIX D

Liquefaction and Dry Sand Seismic Settlement Analyses