

**GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENCE**



**LA CRESTA
GEOTECHNICAL
INCORPORATED**

**GEOTECHNICAL
CONSULTANTS**

**SADDLEBACK DRIVE
APN 584-100-021
AGUANGA, CALIFORNIA**

PREPARED FOR


AGUANGA, CALIFORNIA

SEPTEMBER 22, 2025



LA CRESTA GEOTECHNICAL INC.

Project No. 2508-12-01
September 22, 2025



Saddleback Drive
Aguanga, California

Subject: **SADDLEBACK DRIVE**
APN NO. 584-100-021
RIVERSIDE COUNTY, CALIFORNIA
GEOTECHNICAL INVESTIGATION
PROPOSED SINGLE FAMILY RESIDENCE

Gentlemen:

In accordance with your authorization, we have performed a geotechnical investigation for the subject property located at Saddleback Drive, APN 584-100-021, in Aguanga, California. The accompanying report presents the results of our study and includes our conclusions and recommendations pertaining to the geotechnical aspects of developing the property as presently proposed. It is our opinion that development of the site is feasible from a geotechnical standpoint provided that the recommendations of this report are followed.

Should you have questions regarding this report or if we may be of further service, please contact the undersigned at your convenience.

Sincerely,

LA CRESTA GEOTECHNICAL INCORPORATED

Mark A. Sweeney
CEG 2339

Ryan Rabbon
PE 66111

MAS/AB

(3) Addressee

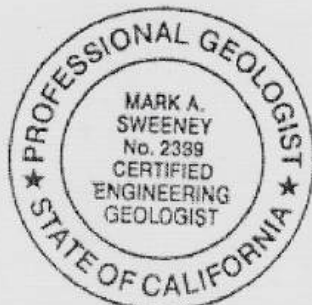


TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	PROJECT DESCRIPTION	1
3.	SITE CONDITIONS	2
3.1	Regional Geologic Setting	2
3.2	Surface Conditions	2
3.3	Subsurface Conditions	2
3.4	Groundwater	2
4.	GENERAL GEOLOGIC CONSIDERATIONS AND HAZARDS.....	3
4.1	Faulting and Seismicity.....	3
4.2	Liquefaction and Seismically Induced Settlement	4
4.3	Lateral Spreading	4
4.4	Soil Subsidence and Collapse	4
5.	CONCLUSIONS AND RECOMMENDATIONS	5
5.1	General Discussion	5
5.2	Soil and Excavation Characteristics.....	6
5.3	Earthwork and Grading	6
5.4	Foundations	8
5.5	2022 California Building Code (CBC), Seismic Design Parameters.....	12
5.6	Drainage	12
5.7	Plan Review	12
6.	CLOSING REMARKS AND LIMITATIONS.....	14

FIGURES, MAPS AND ILLUSTRATIONS

Figure 1, Site Location Map
Figure 2, Site Exploration Map
Figure 3, Seismic Hazards Map

APPENDIX A – LABORATORY TESTING

APPENDIX B – FIELD EXPLORATION

Figures T-1 - T-6, Logs of Exploration Trenches

APPENDIX C – SEISMIC DESIGN CRITERIA

APPENDIX D – REFERENCES

APPENDIX E – GENERAL EARTHWORK SPECIFICATIONS

GEOTECHNICAL INVESTIGATION

1. INTRODUCTION

This report summarizes our findings of our geotechnical investigation for a proposed Single-Family Residence at the subject property, located at Saddleback Drive in the Aguanga area, within Riverside County, California, Assessor's Parcel No. 584-100-021, (see Site Location Map, Figure 1).

The purpose of the investigation was to evaluate the site geologic conditions and observe the prevailing soil conditions, and based on the conditions encountered; provide recommendations regarding the geotechnical aspects of developing the project as presently proposed.

The scope of the investigation included a site visit and reconnaissance, review of pertinent geologic literature, and the excavation of six (6) exploratory trenches. The subsurface conditions encountered in the field explorations are summarized in Appendix B. The approximate locations of the explorations are depicted on the Site Exploration Map, Figure 2.

The base map used to depict the site soil and geologic conditions consist of a *Site Plan* which was provided by the client and *by* utilizing information obtained from the county's GIS Website, (see Site Exploration Map, Figure 2). The Site Exploration Map depicts the property boundary, the geologic units encountered, and the exploratory excavation locations.

2. PROJECT DESCRIPTION

The site consists of an approximate 4.99-acre sized lot located at Saddleback Drive, in Aguanga, California, Assessor's Parcel No. 584-100-021. Presently the property is undeveloped. Topographically the site slopes gently to the northern portion of the property.

Grading is anticipated to consist of remedial grading and minimal cut/fills to create a level pad and access driveway for the residence. The descriptions of the site and proposed development are based on a site reconnaissance, observations during the field investigation, and a review of the referenced *Site Plan* and geologic publications. If the planned improvements and project details are different than presented, La Cresta Geotechnical Incorporated should be contacted for review and possible revision to this report.

3. SITE CONDITIONS

3.1 Regional Geologic Setting

Aguanga is in the northern part of the Peninsular Ranges Geomorphic Province, which is characterized by northwest trending mountain ranges and parallel valleys extending from the Los Angeles Basin to the north and extends southeast into Baja California. The province is bounded on the east by the San Andreas Fault System, and extends offshore to the west at the northern part of the province. The northern onshore portion of the province is divided into three major fault bounded blocks that are as follows starting from west to east, the Santa Ana Mountain block, the Perris Block and the San Jacinto Mountains block. Aguanga is located at the eastern edge of the Perris Block, west of the San Jacinto Block and west of the San Jacinto Fault Zone.

Southern California is located within a seismically active region near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto, Lake Elsinore Rose Canyon-Newport Inglewood, and Elsinore fault zones. These fault systems are estimated to produce up to approximately 55 millimeters of slip per year between the plates.

By definition of the State Mining and Geology Board, an active fault is one, which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). This definition is used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazards Zones Act of 1972 and as revised in 1994 and 1997 as the Alquist-Priolo Earthquake Fault Zoning Act and Earthquake Fault Zones. The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain habitable structures across the trace of active faults.

3.2 Surface Conditions

Topsoil / Young Alluvium (Qal)

Topsoil / Young Alluvium was encountered at the surface in all the exploratory excavations and overlies Older Alluvium Formation. As encountered in our limited subsurface investigation, the Topsoil / Young Alluvium is approximately 30"-36" inches in thickness and generally consisted of dry, light gray, silty, fine SAND, trace clay, (Sm). If used to support any structures or flat concrete work, the Topsoil / Young

Alluvium should be removed; moisture conditioned and recompact to a minimum of 90% relative compaction.

3.3 Subsurface Conditions

Older Alluvium (Qalo)

Older Alluvium Formation underlies the entire site at a depth of approximately 36-inches, in the area of the future building pad. As encountered these materials can generally be described as medium dense, gray, silty, fine-grained SAND, trace clay, (Sm). The Older Alluvium Formation is generally considered suitable for support of fill or structures.

3.4 Groundwater Conditions

Groundwater was not observed within the exploratory excavations. Groundwater conditions may vary in the future from those observed in the field explorations due to rainfall, surface flows or irrigation.

4. GENERAL GEOLOGIC CONSIDERATIONS AND HAZARDS

4.1 Faulting and Seismicity

Based on our review of the referenced literature, the site is not located within an Earthquake Fault Hazard Zone (see Seismic Hazards Map, Figure 4). The site could, however, be subjected to significant shaking in the event of a major earthquake on nearby or regional faults. The nearest known active surface fault is the San Jacinto Fault, Clark Segment, a Type A Fault, which is located approximately 12.1 Kilometers east of the subject site.

The principal seismic considerations for most structures in Southern California are surface rupturing of fault traces and damage caused by ground shaking or seismically induced ground movement. The possibility of damage due to ground rupture is considered low due to the absence of active or potentially active faults underlying the site or projecting toward the site. Lurching or cracking of the ground surface due to nearby or distant seismic events is not considered a significant hazard at the site, although it is a possibility throughout Southern California.

4.2 Liquefaction and Seismically Induced Settlement

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations. Due to the dense formational material, it is our opinion that the potential for liquefaction at this site is low. Settlement due to dynamic densification of the subsurface soils is not considered a significant hazard at the site due to the occurrence of shallow Older Alluvium formation and lack of shallow water.

4.3 Lateral Spreading

Lateral spreading refers to landslides that commonly occur on gentle slopes and that have rapid, fluid-like, flow movement (USGS, 2006). Liquefaction induced lateral spreads are further characterized as blocks of mostly intact, surficial soils that are displaced downslope or toward a free face along a shear zone that has formed within a liquefied sediment (Bartlett and Youd, 1995). Lateral spreads commonly occur in loose sands and silty sands with shallow groundwater and in proximity to a free face or in sloping terrain and that are subject to strong ground shaking. The potential for liquefaction induced lateral spreading to occur at the site is considered low because the recommended remedial grading proposed herein and the formational soils are not considered susceptible to liquefaction.

4.4 Soil Subsidence and Collapse

Subsidence can result from the extraction of gases or fluids from the subsurface materials or the oxidation of near-surface organic materials. The potential for subsidence due to gas or petroleum extraction is considered remote due to the absence of this practice in the vicinity of the site. The soils at the site do not have a high organic content and are not susceptible to subsidence due to oxidation of organic materials. Subsidence induced by groundwater extraction is not considered a significant hazard at the site nor is it known to have caused related distress in the vicinity of the site.

Settlement due to soil collapse, which is also referred to as hydro collapse or hydro compaction, results from the collapse of the soil structure due to increased loading and subsequent wetting of moisture deficient, low-density soils or the dissolution of cementing compounds such as calcium carbonate. The collapse potential of soils generally decreases with increasing dry density. The collapse potential of the Older Alluvium Formation is considered negligible. The potential for hydro collapse is considered remote.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 General Discussion

No soil or geologic conditions were encountered at the site that would preclude the development of the property as currently proposed provided that the recommendations of this report and appropriate construction practices are followed.

The site is not located within an Earthquake Fault Hazard Zone. The site could, however, be subjected to significant shaking in the event of a major earthquake on the Elsinore or San Jacinto Faults or other regional faults. Structures for the site should be constructed in accordance with current CBC seismic codes and local ordinances.

Portions of the site are mantled by Topsoil / Young Alluvium which is underlain by Older Alluvium Formation. The Topsoil / Young Alluvium is considered unsuitable for support of settlement sensitive structures and will require complete removal, moisture conditioning and re-compaction. The Formational materials are considered suitable in its present condition for support of settlement sensitive structures or new fill for building pads. **Removals on the order of approximately 36-inches is anticipated to remove the Topsoil / Young Alluvium in the area of the future building pad.** The removed materials, less any organic or deleterious materials, and oversize greater than 1 foot, may be used in compacted fill.

The potential for liquefaction at this site is considered low based on the absence of shallow groundwater, proposed remedial grading, and the presence of shallow formation.

Groundwater was not encountered in the field explorations performed at this site. Therefore, groundwater related problems are not expected during site development. If shallow perched groundwater is encountered during construction, it is our opinion that it can be managed with the use of sump pumps placed in the bottoms of excavations.

It is anticipated that the expansion potential of the onsite materials is "Low" based on the laboratory test results and our experience in the area and with similar materials. Post-grading testing should be conducted to define as-graded expansive soil characteristics. The results of those tests and the final as-graded conditions will govern design of foundations.

5.2 Soil and Excavation Characteristics

In our opinion, the formational materials are generally rippable with conventional grading equipment that is in good working condition with experienced operators. Some oversize rock (greater than 12 inches in diameter) or cemented clasts may be encountered which should either be broken into smaller than 12-inch fragments for inclusion in fills or should be placed in accordance with the *Recommended Grading Specifications* presented in Appendix C and County of Riverside criteria.

All excavations should be performed in conformance with OSHA requirements. Excavations made adjacent to property lines or the existing improvements should not be left open during hours when construction is not being performed.

Laboratory testing for water-soluble sulfate contents should be performed at finish grade (materials within 3 feet of pad grade elevations) to determine the degree of sulfate exposure of concrete in contact with soil using guidelines of the California Building Code (CBC). The results of sulfate content testing should be used to design a suitable concrete mix to be used for foundations and slabs.

La Cresta Geotechnical Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, it is recommended that further evaluation by a corrosion engineer be performed. The recommendations from the corrosion engineer should be reviewed by the appropriate design team members (i.e. project architect, engineer, etc.) and incorporated into the plans and implemented during construction.

5.3 Earthwork and Grading

A qualified geotechnical consultant should observe foundation excavation and site grading. During grading, the geotechnical consultant should provide observation and testing services continuously. Such observations are considered essential to identify field conditions that differ from those anticipated from the geotechnical investigation, to adjust designs to actual field conditions, and to determine that the grading is accomplished in general conformance with the geotechnical recommendations. The geotechnical consultant should perform sufficient testing of fill during grading to support their professional opinion as to compliance with compaction recommendations.

Recommendations presented in this report are contingent upon La Cresta Geotechnical Incorporated performing such construction observation, or at a minimum, providing oversight and review of the field testing during the grading operation. Sufficient testing of any fill placement should be performed during grading, as recommended herein, to support our professional opinion in regard to compliance with compaction recommendations

Any future grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix C and the requirements of the County of Riverside. Where the recommendations of this section conflict with those of Appendix C the recommendations of this section take precedence.

Prior to any future proposed grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

Site preparation should begin with the demolition and the removal of deleterious material, underground utilities, construction debris and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill or for the support of fill are relatively free of organic matter. Removal of trees should also include the removal of stumps and root balls that can extend to well below grade. Material generated during stripping and/or site demolition should be exported from the site.

The Topsoil / Young Alluvium should be removed to expose firm unyielding Older Alluvium Formation in areas to receive fill and for the support of settlement sensitive structures. **Removals on the order of approximately 36-inches is anticipated to remove the Topsoil / Young Alluvium in the area of the future building pad**, but may vary and may be locally deeper than estimated herein. The geotechnical consultant should determine the actual removal depths during grading based on the subsurface conditions encountered.

During remedial grading, temporary slopes should be planned for an inclination no steeper than 1½:1 (horizontal:vertical). Grading should be scheduled to backfill against these slopes as soon as practical. Removals along the edge of grading should include excavation of unsuitable soils that would adversely affect the performance of the planned fill, i.e., extend removals within a zone defined by a plane projected down and out at an inclination of 1:1 from the limit of grading (where possible) to intersect with competent soils.

After removal of surficial soils, the exposed ground surface should be scarified, moisture conditioned to slightly above optimum moisture content, and compacted. Fill soils may then be placed and compacted in layers to the design finish grade elevations. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of the laboratory maximum dry density and at or above optimum moisture content, as determined by ASTM Test Procedure D1557-91.

Building pads that contain a transition between cut in bedrock materials and compacted fill will require over-excavation to reduce the potential for differential settlement. In general, the cut portion of the pad should be undercut at least 3 feet, or 1/2 of the maximum fill thickness, whichever is greater, and replaced with compacted fill. The bottom of the undercut portion should be sloped at a minimum of 1 percent towards the fill portion. The over-excavation should extend laterally from the building footprint a distance equal to the depth of removal below foundation grade or a minimum of five feet, whichever is greater. The lateral extent of removals need not exceed eight feet measured horizontally from the building footprint.

5.4 Foundations

Foundations and slabs should be designed in accordance with the structural considerations, the seismic parameters provided in this report and the recommendations presented in Table 6.5.1, (minimum foundation slab design recommendations). These recommendations are generally consistent with methods typically used in Southern California. Other alternatives may be available. These recommendations are based on geotechnical considerations and are not intended to preclude more restrictive criteria of governing agencies or the structural engineer.

Foundation categories are provided below for structure foundations bearing on compacted fill placed in accordance with the grading recommendations of this report or medium dense to dense formational materials. Foundation Category I is considered applicable for the proposed development. Continuous or isolated spread footings may be dimensioned for an allowable soil bearing pressure of 2,000 psf (dead plus live loads), if founded in Engineered Fill after the site has been graded. This bearing pressure may be increased by one-third for transient loads such as wind or seismic forces.

For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 250 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed natural soils. The allowable passive pressure assumes a horizontal surface extending at least 5 feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. An allowable friction coefficient of 0.35 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

Category I, II, and III foundations may be designed for ½-inch; 1 inch; and 1½-inch total settlement, respectively. Differential settlement over a span of 40 feet may be taken as one-half of the estimated total settlement.

Foundations constructed on soils with an Expansion Index (EI) greater than 50 should comply with the CBC, Preliminary Post-Tension design parameters. Based on the results of our laboratory testing, it is anticipated that the majority of the buildings at this site can be designed for a low expansion, (EI <50). We recommend that as grading progresses, final post graded pad be evaluated for its expansion potential. Foundation and slab design for the structure should be performed by the structural engineer based on the as-graded conditions of the building pad.

**TABLE 6.5.1
FOUNDATION RECOMMENDATIONS BY CATEGORY**

Foundation Category	Minimum Footing Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	18	No. 4 bars two on top and two on bottom	6 x 6 - 10/10 welded wire fabric or No. 4 bars at 18 inches on center, each way

CATEGORY CRITERIA

Category I: Maximum fill thickness is less than 20 feet or differential fill thickness is less than 10 feet across any one building.

Notes:

1. All footings should have a minimum width of 15 inches.
2. Footing depth is measured from lowest adjacent compacted soil grade. These depths apply to both exterior and interior footings.
3. All interior living area and garage concrete slabs-on-grade should be at least 4 inches thick. All slab reinforcement shall be placed at slab mid-depth and maintained during concrete placement.
4. All interior concrete slabs should be underlain by at least 4 inches of clean sand.
5. All slabs expected to receive moisture sensitive floor coverings or used to store moisture sensitive materials should be underlain by a 10-mil vapor barrier covered with at least 2 inches of the clean sand recommended in No. 4 above.
6. Exterior slabs and flatwork not subjected to vehicle traffic may be 4 inches thick and reinforced with W6 x W6 - 10/10 welded wire mesh at slab mid-depth.

No special subgrade preparation is deemed necessary prior to placing concrete, however, the exposed foundation and slab subgrade soils should be sprinkled, as necessary, to maintain a moist soil condition as would be expected in any such concrete placement. However, where drying of subgrade soils has occurred, reconditioning of surficial soils will be required prior to foundation excavation. This recommendation applies to foundations as well as exterior concrete flatwork.

Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building and wall footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- For cut slopes in dense formational materials, or fill slopes inclined at 3:1 (horizontal:vertical) or flatter,
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, it is recommended that the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height.
- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. La Cresta Geotechnical Incorporated should be consulted for specific recommendations.

For foundations constructed on soils with an Expansion Index (EI) greater than 20, design should be in conformance with Chapter 18 of the 2022 CBC. Preliminary testing showed onsite soils have an EI of 45.

The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soils and differential settlement of fill materials of varying thickness. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entry slab corners occur.

5.5 2022 California Building Code (CBC), Seismic Design Parameters

The following table summarizes seismic design parameters obtained from the 2022 California Building Code (CBC). The nearest known active surface fault is the San Jacinto Fault, Clark Segment, a Type A Fault, which is approximately 12.1 Kilometers east of the subject site.

2022 CBC Seismic Design Parameters

The following 2022 CBC seismic parameters may be used for structural design.

Site Class:	D
Site Coefficients:	F_a : 1.000 F_v : N/A
Mapped Spectral Accelerations:	S_S : 1.500 S_1 : 0.585
Adjusted Spectral Accelerations:	S_{MS} : 1.500 S_{M1} : N/A
Design Spectral Accelerations,	S_{DS} : 1.000 S_{D1} : N/A

5.6 Drainage

Finish grading should be performed to ensure that adequate drainage conditions exist to prevent any ponding or direction of drainage towards the building foundation, slab, pavements, and away from the top of slopes. Drainage control devices, including area drains, culverts, berms, and basins may need to be installed to insure adequate drainage.

5.7 Plan Review

The soil engineer and engineering geologist should review the grading plans and foundation plans to verify that they are in conformance with the recommendations of this report.

6. CLOSING REMARKS AND LIMITATIONS

The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not change significantly from those observed and reported in this investigation. If any changed conditions are encountered during construction, or if the proposed construction will differ from that assumed, La Cresta Geotechnical Incorporated, should be notified so that supplemental recommendations can be given.

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 brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

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

33.52365, -116.80494 X Q

Show search results for 33.52365, -11...

Map navigation controls: +, -, Home, Back, Forward, Refresh



*San Jacinto Fault
Clark Segment*

Site Location

12.1 km



116.823 375 77 Degrees

*Seismic Hazard Map
Fig III*

APPENDIX A

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected samples were tested for in-place dry density and moisture content, grain size characteristics, and expansion potential characteristics. Results of the laboratory tests are summarized herein.

**TABLE C-I
SUMMARY OF MAXIMUM DRY DENSITY TEST RESULTS
ASTM D 1557-00**

Boring No. & Sample Depth	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
T1-1	Medium gray brown, fine to coarse, silty SAND (SM).	124.2	10.1

**TABLE C-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-95**

Boring No. & Sample Depth	Expansion Index	Expansion Potential
T1-1	45	Low

APPENDIX B

FIELD EXPLORATION

The field explorations were performed on September 9, 2025 and consisted of a site reconnaissance, review of aerial photos and the excavation of six (6) exploratory trenches.

The soil conditions encountered in the excavations were visually classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D2488). Logs of the exploratory borings / trenches are presented on the following figures T-1 through T-6. The trench logs depict the soil and geologic conditions encountered. The approximate locations of the exploratory excavations are shown on the Site Exploration Map, Figure 2.

The field explorations were approximately located by taping distances in the field from landmarks or topographic features shown on the referenced plans provided. The locations should not be considered more accurate than is implied by the method of measurement used. The lines designating the interface between soil types on the exploration logs are determined by interpolation and are therefore approximations. The transition between the materials may be abrupt or gradual. Further, soil conditions at locations between the explorations may be substantially different from those at the specific locations explored. The passage of time can result in changes in the subsurface conditions reported in the logs.

LOG OF EXPLORATION TEST PIT NO. T-1

Logged by: MAS

Date Excavated: 8/2/2023

Equipment Used: New Holland backhoe with 24-inch bucket

Elevation: Pad Grade

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LABORATORY TESTS
1		<u>Topsoil / Young Alluvium</u> Loose, dry, light gray, brown, silty, fine SAND, (Qal) few roots	Expansion Index Maximum Density
2			
3		<u>OLDER ALLUVIUM</u> Medium dense, gray, damp, silty, fine SAND, (Qalo).	
4			
5			
6			
7			
8			
9			
10			
11			
12			

Total depth excavated: 5 feet.
No groundwater encountered.

LOG OF EXPLORATION TEST PIT NO. T-2

Logged by: MAS

Date Excavated: 9/9/2025

Equipment Used: New holland backhoe with 24-inch bucket

Elevation: Pad Grade

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LABORATORY TESTS
1		<u>Topsoil / Young Alluvium</u> Loose, dry, light gray, brown, silty, fine SAND, (Qal)	
2			
3			
4		<u>OLDER ALLUVIUM</u> Medium dense, gray, damp, silty, fine SAND, (Qalo).	
5			
6			
7			
8			

Total depth excavated: 5 feet.
No groundwater encountered.

LOG OF EXPLORATION TEST PIT NO. T-3

Logged by: MAS

Date Excavated: 8/2/2023

Equipment Used: New Holland backhoe with 24-inch bucket

Elevation: Pad Grade

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LABORATORY TESTS
1		<u>Topsoil / Young Alluvium</u> Loose, dry, light gray, brown, silty, fine SAND, (Qal) some small roots	
2			
3		<u>OLDER ALLUVIUM</u> Medium dense, gray, damp, silty, fine SAND, (Qalo).	
4			
5			
6			
7			
8			
9			
10			
11			
12		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Total depth excavated: 5 feet. No groundwater encountered. </div>	

LOG OF EXPLORATION TEST PIT NO. T-4

Logged by: MAS

Date Excavated: 9/9/2025

Equipment Used: New holland backhoe with 24-inch bucket

Elevation: Pad Grade

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LABORATORY TESTS
1		<u>Topsoil / Young Alluvium</u> Loose, dry, light gray, brown, silty, fine SAND, (Qal) few small roots	
2			
3		<u>OLDER ALLUVIUM</u> Medium dense, gray, damp to moist, silty, fine SAND, (Qalo).	
4			
5			
6			
7			
8		<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Total depth excavated: 4 feet. No groundwater encountered. </div>	

LOG OF EXPLORATION TEST PIT NO. T-5

Logged by: MAS

Date Excavated: 8/2/2023

Equipment Used: New Holland backhoe with 24-inch bucket

Elevation:

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LABORATORY TESTS
1		<u>Topsoil / Young Alluvium</u> Loose, dry, light gray, brown, silty, fine SAND, (Qal)	
2			
3		<u>OLDER ALLUVIUM</u> Medium dense, gray, damp to moist, silty, fine SAND, (Qalo).	
4			
5			
6			
7			
8			
9			
10			
11			
12		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> Total depth excavated: 4.5 feet. No groundwater encountered. </div>	

LOG OF EXPLORATION TEST PIT NO. T-6

Logged by: MAS

Date Excavated: 9/9/2025

Equipment Used: New holland backhoe with 24-inch bucket

Elevation:

DEPTH (FT)	BULK SAMPLE	DESCRIPTION	LABORATORY TESTS
1		<u>Topsoil / Young Alluvium</u> Loose, dry, light gray, brown, silty, fine SAND, (Qal)	
2			
3		<u>OLDER ALLUVIUM</u> Medium dense, gray, damp, silty, fine SAND, (Qalo).	
4			
5			
6			
7			
8		<div style="border: 1px solid black; padding: 2px; display: inline-block;"> Total depth excavated: 4 feet. No groundwater encountered. </div>	

APPENDIX C
SEISMIC DESIGN CRITERIA

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.5	S_{D1} :	N/A
S_1 :	0.585	T_L :	8
F_a :	1	PGA :	0.511
F_v :	N/A	PGA _M :	0.562
S_{MS} :	1.5	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1
S_{DS} :	1	C_v :	1.4

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Tue Sep 23 2025

Date Source: [USGS Seismic Design Maps](#)

APPENDIX D

REFERENCES

- Anderson, J. G., *Synthesis of Seismicity and Geologic Data in California*, U.S. Geologic Survey Open-File Report 84-424, 1984, pp. 1-186.
- Bartlett, S.F., and Youd, T.L. "Empirical Prediction of Liquefaction-Induced Lateral Spread," *Journal of Geotechnical Engineering*, Vol. 121, No. 4, April 1995.
- California Department of Transportation, Standard Specifications, May 2006.
- California State Mining and Geology Board/California Geological Survey, Special Publication 117, "Guidelines for Evaluating and Mitigating Seismic Hazards in California," adopted March 13, 1997.
- Dunn, I.S., Anderson, L.R., Kiefer, F.W., 1980, "*Fundamentals of Geotechnical Analysis*," Department of Civil Engineering, Utah State University, John Wiley and Sons, New York.
- Jennings, C. W., *Preliminary Fault Activity Map of California*, California Division of Mines and Geology, Open File Report 92-03, 1992, and revised map dated 1994.
- Kramer, S. L., 1996. "Geotechnical Earthquake Engineering," Prentice-Hall, Inc., Upper Saddle River, NJ 07458.
- Peck, R.B., Hanson, W.E., Thornburn, T.H., "Foundation Engineering," 2nd ed., John Wiley & Sons, NY.
- United States Geological Survey. USGS glossary:
<http://earthquake.usgs.gov/learning/glossary.php>, last modified: November 13, 2006.
- United States Geological Survey/California Geological Survey (2003). Seismic Shaking Hazards in California, based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, 2002 (revised April 2003).

APPENDIX D

GENERAL EARTHWORK SPECIFICATIONS