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January 14, 2021
Project No. 1-0359

Attention: Ms. Kim Prijatel

Subject: **GEOTECHNICAL INVESTIGATION**
11700 Arkansas Street
City of Artesia, California

References: See Appendix A

Dear Ms. Prijatel:

Alta California Geotechnical, Inc. (Alta) is pleased to present this geotechnical investigation for the proposed residential development located at 11700 Arkansas Street, in the City of Artesia, California. This report is based on a recent subsurface investigation conducted by Alta, laboratory testing, review of the conceptual density study and a review of the referenced reports.

Alta's review of the data indicates that the proposed development is feasible, from a geotechnical perspective, provided that the recommendations presented in this report are incorporated into the grading and improvement plans and implemented during site development.

Also included in this report are:

- Discussion of the site geotechnical conditions.
- Recommendations for remedial and site grading, including unsuitable soil removals.
- Geotechnical site construction recommendations.
- Foundation design parameters.

If you have any questions or should you require any additional information, please contact the undersigned at (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
Alta California Geotechnical, Inc.

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1.0 INTRODUCTION

The following report presents Alta's findings, conclusions, and geotechnical recommendations for the proposed residential development located at 11700 Arkansas Street, in the City of Artesia, California.

1.1 Purpose

The purpose of this report is to examine the existing onsite geotechnical conditions and assess the impacts that the geotechnical conditions may have on the proposed development. The property is depicted on the enclosed Plate 1. This report is suitable for use in developing grading plans and engineer's cost estimates.

1.2 Scope of Work

Alta's *Scope of Work* for this geotechnical investigation included the following:

- Reviewing the referenced reports and air photos (Appendix A).
- Site geologic mapping.
- Excavating, logging, and sampling five (5) hollow-stem auger borings to a maximum depth of 51.5-feet below the existing surface (Appendix B).
- Conducting two (2) CPT soundings to a maximum depth of 50-feet (Appendix B).
- Conducting laboratory testing on samples obtained during our investigation (Appendix C).
- Performing an infiltration study on an additional two (2) additional borings to provide an assessment of the infiltration characteristics of the onsite soil and their impact on storm water disposal.
- Conducting a liquefaction analysis.
- Evaluating engineering geologic and geotechnical engineering data, including laboratory data, to develop recommendations for site remedial grading including specialized grading techniques for unsuitable soil removals along the property boundary, import soil, foundations and utilities.
- Preparing this report and accompanying exhibits.

1.3 Report Limitations

The conclusions and recommendations presented in this report are based on the field and laboratory information generated during this investigation, and a review of the referenced reports. The information contained in this report is intended to be used for development of grading plans and preliminary construction cost estimates.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Existing Conditions

The rectangular-shaped, approximately 2.6-acre site is located at 11700 Arkansas Street in the City of Artesia. The site is relatively flat and is currently occupied by a single-family residential structure, a commercial structure, an RV storage yard and asphalt pavement. The site is bounded to the north by Arkansas Street, to the east by commercial development, and to the south, and west by residential developments. Historic aerial photographs indicate that the site has been used for residential and commercial/light industrial purposes since at least 1963. The RV storage section of the site was paved by 1994. Two small structures in the northern section of the site were removed in 2019. The site has remained relatively unchanged since then.

2.2 Proposed Development

Based on our review of the conceptual density study plan, the existing structures and asphalt pavement will be demolished, and the site will be redeveloped to support ten multi-family residential structures (58 units) with drive aisles and associated improvements (Plate 1). Alta anticipates that remedial grading will be required to develop the site to support the proposed structures with shallow foundations and reinforced concrete slabs-on-grade. Significant height slopes are not anticipated for the project.

3.0 SITE INVESTIGATION

3.1 Investigation and Laboratory Testing

Alta conducted a subsurface investigation on December 23, 2020, consisting of the excavation, logging and select sampling of five (5) hollow-stem auger borings up to a maximum depth of 51.5 feet, conducting two (2) CPT soundings to a maximum depth of 50-feet, and the installation of two (2) five feet deep wells for infiltration testing. The locations of the exploratory excavations are shown on enclosed Plate 1 and the boring logs are presented in Appendix B.

Laboratory testing was performed on bulk and ring samples obtained during the field investigation. A brief description of the laboratory test procedures and the test results are presented in Appendix C.

3.2 Infiltration Testing

It is Alta's understanding that the project may utilize infiltration systems for storm water disposal. Details of the system are not known at this time.

Infiltration testing was undertaken using two (2) five-foot-deep borings (P-1 and P-2). The testing was performed on December 24, 2020 in general accordance with the County of Los Angeles WQMP standards. The two test wells were presoaked at least 24 hours prior to testing. During testing, the water level readings were recorded every 30 minutes until the readings stabilized

The data was then adjusted to provide an infiltration rate utilizing the Porchet Method. The resulting infiltration rates are presented in Table 3-1. The results do not include a factor of safety. Recommendations for infiltration BMP design are presented in Section 6.2.

Table 3-1-Summary of Infiltration Testing (No Factor of Safety)		
Test Designation	P-1	P-2
Approximate Depth of Test	5 ft	5 ft
Time Interval	30 minutes	30 minutes
Radius of Test Hole	4 inches	4 inches
Tested Infiltration Rate	5.4 (in/hr)	4.4 (in/hr)

4.0 GEOLOGIC CONDITIONS

4.1 Geologic and Geomorphic Setting

Regionally, the subject site is located in the Peninsular Ranges geomorphic province, which characterizes the southwest portion of southern California where right lateral major active fault zones predominately trend northwest-southeast. The Peninsular Ranges province is composed of plutonic and metamorphic rock, with lesser amounts of Tertiary volcanic and sedimentary rock, Quaternary drainage in-fills and sedimentary veneers.

4.2 Stratigraphy

Based on our literature review and subsurface investigation, the site is underlain by undocumented artificial fill and young alluvial fan and valley deposits. These geologic units are briefly described below.

4.2.1 Artificial Fill - Undocumented (no map symbol)

The undocumented artificial fill observed at the site consists mainly of light brown and tan silty sand in a dry to moist medium dense condition. The unit was logged to a depth of up to 1 feet below the ground surface and is underlain by younger alluvium.

4.2.2 Younger Alluvium (map symbol Qyf)

The younger alluvium observed at the site consists mainly of light brown to brown, gray brown, and orange brown silty sand, sand, sandy silt, silt and silty clay in a moist to wet, medium dense/stiff condition. The unit was logged to a depth of 51.5 feet below the ground surface.

4.3 Geologic Structure

4.3.1 Tectonic Framework

Jennings and Bryant (1985, 2010) defined eight structural provinces within California that have been classified by predominant regional fault trends and similar fold structure. These provinces are in turn divided into blocks and sub-blocks that are defined by “major Quaternary faults.” These blocks and sub-blocks exhibit similar structural features. Within this framework, the subject site is located within Structural Province I, which is controlled by the dominant northwest trend of the San Andreas Fault and is divided into two blocks, the Coast Range Block and the Peninsular Range Block. The Peninsular Range Block, on which this site is located, is characterized by a series of parallel, northwest trending faults that exhibit right lateral dip-slip movement. These faults are terminated by the Transverse Range block to the north and extend southward into the Baja Peninsula. These northwest trending faults divide the Peninsular Range block into eight sub-blocks. The site is located on the northwest portion of the Santa Ana Sub-block, one of the eight sub-blocks, which is bound on the east by the Elsinore fault zone and on the west by the Newport-Inglewood fault zone.

4.3.2 Regionally Mapped Active Faults

Several large, active fault systems including the Elsinore-Whittier, Newport-Inglewood, and the San Andreas occur in the region surrounding the site. These fault systems have been studied extensively and in a large part control the geologic structure of southern California.

4.3.3 Geologic Structure

Based upon our site investigation and literature review, the sediments are of Quaternary age, and are not folded or faulted.

4.4 Groundwater

Groundwater was encountered at a depth of approximately 21 to 22 feet below the ground surface during our subsurface investigation. Based on state-provided information, the historic-high groundwater is approximately 8 feet below the ground surface (CGS, 1998). Two state water wells are in the vicinity. State Well No. 03S12W23C003S, at elevation 87.9-ft, showed a depth of groundwater of 52.34-ft in 1986. State Well No. 03S11W17F002S, at elevation 98.18-ft, showed a depth of groundwater of 123.1-ft in 2020.

4.5 Earthquake Hazards

The subject site is located in southern California, which is a tectonically active area. The type and magnitude of seismic hazards affecting a site are dependent on the distance to the causative fault and the intensity and magnitude of the seismic event. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction and/or ground lurching.

4.5.1 Local and Regional Faulting

The site is located on the western portion of the Santa Ana sub-block, where the Puente Hills, Newport-Inglewood, Elsinore, Elysian Park, Palos Verdes, and San Joaquin Hills faults surround the site approximately 2.4, 6.6, 7.2, 8.0, 12.8, 13.4, and 15.3 miles away respectively.

4.5.2 Surface Rupture

Active faults are not known to exist within the project and a review of Special Publication 42 indicates the site is not within a California State designated earthquake fault zone. Accordingly, the potential for fault surface rupture on the subject site is very low.

4.5.3 Seismicity

Ground shaking hazards caused by earthquakes along other active regional faults do exist. The 2019 California Building Code requires use-modified spectral accelerations and velocities for most structural designs. Seismic design parameters using soil profile types identified in the 2019 California Building Code are presented in Section 7.3.

4.5.4 Liquefaction

Seismic agitation of relatively loose saturated sands, silty sands, and some silts can result in a buildup of pore pressure. If the pore pressure exceeds the overburden stresses, a temporary quick condition known as liquefaction can occur. Liquefaction effects can manifest in several ways including: 1) loss of bearing; 2) lateral spread; 3) dynamic settlement; and 4) flow failure. Lateral spreading has typically been the most damaging mode of failure.

In general, the more recent that a sediment has been deposited, the more likely it will be susceptible to liquefaction. Other factors that must

be considered are groundwater, confining stresses, relative density, and the intensity and duration of seismically-induced ground shaking.

Groundwater was encountered during our subsurface investigation at a depth approximately 21 to 22 feet below the ground surface in all five hollow stem borings (B-1 through B-5). The regional groundwater map indicates that the historic-high groundwater level is approximately 8 feet below the ground surface (CGS, 1998).

Alta performed a liquefaction analysis utilizing data from the CPT soundings to analyze the liquefaction potential of the younger alluvium. A description of Alta's analysis and calculations are presented in Appendix D of this report. A groundwater level of 8 feet below existing ground surface was assumed. The results of our findings are discussed below under the headings of the specific types of liquefaction which can be manifested during seismic shaking. Conclusions regarding liquefaction are presented in Section 6.3.

➤ **Loss of Bearing:**

Liquefaction can potentially cause foundation bearing failure due to ground softening and near-failure in bearing. Based on the removal recommendations presented in this report, Alta anticipates that the potential for loss of bearing will be minimal.

➤ **Lateral Spreading:**

The lateral displacement of surficial blocks of sediment can occur as a result of liquefaction in a subsurface layer. The most pervasive forms of lateral spreading typically involve sites located near a "free-face" (large slopes, channels, etc.), however, it has been noted that lateral spreading can occur on sites with gently sloping (1% or more) ground, such as the subject site.

Determination of the potential for lateral spread is based on the presence of continuous potentially liquefiable soil layers underneath the structures, the presence of lateral confinement,

and various analyses such as empirical modeling. Bartlett, Hansen and Youd (2002) states that surface manifestation of lateral spread is typically limited to sites with liquefiable soils within 10 meters (32 feet) of grade, and that sites underlain by soils with $(N1)_{60}$ values 15 and greater do not experience significant displacements from earthquakes with magnitudes less than 8.

Given the flat nature of the site, the limited liquefiable layers with $(N1)_{60}$ values less than 15, our recommended unsuitable soil removals (Section 6.1.2) and our foundation design recommendations (Section 7.1), it is our opinion that the potential for lateral spread to occur onsite is considered within design tolerances of the proposed foundation systems, upon the completion of remedial grading.

➤ **Settlement:**

Settlement due to seismic shaking can occur as a result of both liquefaction of saturated sediments or rearrangement of dry sand particles. Our liquefaction analysis was performed utilizing SPT data and laboratory test results to analyze the potential amount of settlement. A description of Alta's analysis and calculations are presented in Appendix D of this report. A discussion of settlement analysis results is presented in Section 6.3. Dynamic settlement design recommendations are presented in Section 7.1.

➤ **Flow Failure:**

Due to the relatively flat nature of the site, and the relatively horizontal deposition of the underlying deposits, the potential for flow failure onsite is considered minimal.

4.5.5 Dry Sand Settlement

Dry sand settlement is the process of non-uniform settlement of the ground surface during a seismic event. Based on our subsurface investigation and our removal/recompaction recommendations, the potential for dry sand settlement is anticipated to be low and within foundation design tolerances. Design dynamic settlement parameters are presented in Table 7-1.

5.0 ENGINEERING PROPERTIES AND ANALYSIS

5.1 Materials Properties

Presented herein is a general discussion of the engineering properties of the onsite materials that will be encountered during construction of the proposed project. Descriptions of the soil (Unified Soil Classification System) are presented on the boring logs in Appendix B.

5.1.1 Excavation Characteristics

Based on the data provided from the subsurface investigations, it is our opinion that the majority of the onsite materials possess favorable excavation characteristics such that conventional earth moving equipment can be utilized.

5.1.2 Compressibility

The artificial fill and upper portions of the younger alluvium onsite are considered compressible and unsuitable to support the proposed improvements. Recommended removal depths are presented in Section 6.1.2.

5.1.3 Hydro-Consolidation

Hydro-consolidation is the effect of introducing water into soil that is prone to collapse. Upon loading and initial wetting, the soil structure and apparent strength are altered resulting in almost immediate settlement. That settlement can have adverse impacts on engineered structures, particularly in areas where it is manifested differentially. Differential settlements are typically associated with differential wetting, irregularities in the subsurface soil conditions, or irregular loading patterns.

Based on our laboratory testing (Appendix C), there is a minimal potential for hydro-collapse in the younger alluvium onsite.

5.1.4 Expansion Potential

Expansion index testing was performed on samples taken during our subsurface investigation. Based on the results, it is anticipated that the majority of materials onsite are “very low” in expansion potential ($0 \leq EI \leq 20$, Appendix C) when tested per ASTM D: 4829.

5.1.5 Earthwork Adjustments

The values presented in Table 5-1 are deemed appropriate for estimating purposes and may be used in an effort to balance earthwork quantities. As is the case with every project, contingencies should be made to adjust the earthwork balance when grading is in-progress and actual conditions are better defined.

TABLE 5-1 Earthwork Adjustment Factors		
Geologic Unit	Adjustment Factor Range	Average
Artificial Fill- Undocumented/Younger Alluvium	Shrink 8% to 12%	10%

5.1.6 Chemical Analyses

Chemical testing was performed on samples of material underlying the proposed site. Soluble sulfate test results indicate that the soluble sulfate concentrations of the soils tested are classified as negligible (Category S0) per ACI 318-14.

Negligible chloride levels were detected in the onsite soils. Resistivity testing conducted as part of this investigation, indicates that the soils are mildly corrosive to moderately corrosive to buried metals (per Romanoff, 1989). Additional discussions on corrosion are presented in Section 7.9. Corrosion tests results are presented in Appendix C.

5.2 Engineering Analysis

Presented below is a general discussion of the engineering analysis methods that were utilized to develop the conclusions and recommendations presented in this report.

5.2.1 Bearing Capacity and Lateral Earth Pressures

Ultimate bearing capacity values were obtained using the graphs and formula presented in NAVFAC DM-7.1. Allowable bearing was determined by applying a factor of safety of at least 3 to the ultimate bearing capacity. Static lateral earth pressures were calculated using Rankine methods for active and passive cases. If it is desired to use Coulomb forces, a separate analysis specific to the application can be conducted.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on Alta's findings during our subsurface investigation, the laboratory test results, our staff's previous experience in the area, it is Alta's opinion that the development of the site is feasible from a geotechnical perspective. Presented below are recommendations that should be incorporated into site development and construction plans.

6.1 Remedial Grading Recommendations

All grading shall be accomplished under the observation and testing of the project geotechnical consultant in accordance with the recommendations contained herein and the City of Artesia criteria.

6.1.1 Site Preparation

Vegetation, construction debris, and other deleterious materials are unsuitable as structural fill material and should be disposed of off-site prior to commencing grading/construction. Any septic tanks, seepage pits or wells should be abandoned as per the County of Los Angeles Department of Health Services.

Existing concrete should be removed prior to the placement of engineered fill. The demolished concrete may be incorporated into compacted, engineered fills after it is crushed to a maximum size of six (6) inches. Prior to placement as engineered fill any protruding steel rebar should be cut from the concrete pieces and disposed of offsite.

Existing asphaltic concrete should be removed prior to the placement of engineered fill. From a geotechnical perspective, this material may be incorporated into compacted, engineered fills after it is crushed to a maximum size of six (6) inches. The crushed asphalt should not be placed under residential structures, but rather, it can be placed in approved non-residential areas, such as streets, parking areas or open space. These recommendations should be verified by the environmental consultant.

6.1.2 Unsuitable Soil Removals

The artificial fill and the upper portions of the younger alluvium near the surface are compressible and as such, are not suitable to support the proposed structures. As such, it is anticipated that, on average, the upper five (5) feet of existing soils will require removal and recompaction, extending a minimum of five (5) feet horizontally outside the structures. This recommended removal combined with the foundation recommendations presented in Section 7.1 should provide suitable support for the proposed structures.

Footings for structures should be underlain by a minimum of two (2) feet of compacted fill. As such, for building pads where unsuitable soil removals do not provide the minimum depth of compacted fill, or where design grades and/or remedial grading activities create cut/fill transitions, the cut and shallow fill portions of the building pads should be over-excavated during grading and replaced with compacted fill.

The Project Geotechnical Consultant should observe the removal bottom prior to placing fill. If unsuitable soils such as undocumented artificial fill is exposed upon the completion of the removals recommended above, additional removals may be required.

For fill areas in streets, in general, a minimum removal and recompaction of the upper two (2) feet is recommended, however all undocumented artificial fill shall be removed and recompacted. For cuts greater than two (2) feet in street areas, removals are not required. For cuts less than two (2) feet, the two (2) foot removal and recompaction applies.

Material removed as part of the unsuitable soil removals can be used as artificial fill, provided it is free of deleterious materials.

6.2 General Earthwork Recommendations

6.2.1 Compaction Standards

All fill and processed natural ground shall be compacted to a minimum relative compaction of 90 percent, as determined by ASTM Test Method: D-1557. Fill material should be moisture conditioned to optimum moisture or above, and as generally discussed in Alta's Earthwork Specification Section presented in Appendix F. Compaction shall be achieved with the use of sheepfoot rollers or similar kneading type

equipment. Mixing and moisture conditioning will be required in order to achieve the recommended moisture conditions.

6.2.2 Groundwater/Seepage

It is anticipated that groundwater will not be encountered during construction. It is possible that perched water conditions could be encountered depending on the time of year construction occurs.

6.2.3 Documentation of Removals

All removal/over-excavation bottoms should be observed and approved by the project Geotechnical Consultant prior to fill placement. Consideration should be given to surveying the removal bottoms and undercuts after approval by the geotechnical consultant and prior to the placement of fill. Staking should be provided in order to verify undercut locations and depths.

6.2.4 Treatment of Removal Bottoms

At the completion of removals/over-excavation, the exposed removal bottom should be ripped to a minimum depth of eight (8) inches, moisture-conditioned to above optimum moisture content and compacted in-place to the project standards.

6.2.5 Fill Placement

After removals, scarification, and compaction of in-place materials are completed, additional fill may be placed. Fill should be placed in eight-inch bulk maximum lifts, moisture conditioned to optimum moisture content or above, compacted and tested as grading/construction progresses until final grades are attained.

6.2.6 Moisture Content

The moisture content of the upper in-situ soils is above optimum, as shown on the boring logs in Appendix B. The contractor shall take this into account when determining the most appropriate method for fill placement.

6.2.7 Fill Placement

The moisture content of the upper in-situ soils varies, as shown on the boring logs in Appendix B. Moisture conditioning will be required during grading to achieve optimum or above conditions. Most soils will require the addition of water and mixing prior to placement as compacted fill.

6.2.8 Mixing

Mixing of materials may be necessary to prevent layering of different soil types and/or different moisture contents. The mixing should be accomplished prior to and as part of compaction of each fill lift.

6.2.9 Import Soils

Import soils, if necessary, should consist of clean, structural quality, compactable materials similar to the on-site soils and should be free of trash, debris, or other objectionable materials. The project Geotechnical Consultant should be notified not less than 72 hours in advance of the locations of any soils proposed for import. Import sources should be sampled, tested, and approved by the project Geotechnical Consultant at the source prior to the importation of the soils to the site. The project Civil Engineer should include these requirements on plans and specifications for the project.

6.2.10 Utility Trenches

6.2.10.1 Excavation

Utility trenches should be supported, either by laying back excavations or shoring, in accordance with applicable OSHA standards. In general, existing site soils are classified as Soil Type "B" and "C" per OSHA standards. Upon completion of the recommended removals and recompaction, the artificial fill will be classified as Soil Type "B". The Project Geotechnical Consulting should be consulted if geologic conditions vary from what is presented in this report.

6.2.10.2 Backfill

Trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D-1557.

Onsite soils will not be suitable for use as bedding material but will be suitable for use in backfill provided oversized materials are removed. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks, or other construction materials and equipment. Drainage above excavations should be directed away from the banks. Care should be taken to avoid saturation of the soils. Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

Under-slab trenches should also be compacted to project specifications. If select granular backfill ($SE > 30$) is used, compaction by flooding will be acceptable.

6.2.11 Backcut Stability

Temporary backcuts, if required during unsuitable soil removals, should be made no steeper than 1:1 without review and approval of the geotechnical consultant. Flatter backcuts may be necessary where geologic conditions dictate and where minimum width dimensions are to be maintained.

Care should be taken during remedial grading operations in order to minimize risk of failure. Should failure occur, complete removal of the disturbed material will be required.

In consideration of the inherent instability created by temporary construction backcuts for removals, it is imperative that grading schedules are coordinated to minimize the unsupported exposure time of these excavations. Once started, these excavations and subsequent fill operations should be maintained to completion without intervening delays imposed by avoidable circumstances. In cases where five-day workweeks comprise a normal schedule, grading should be planned to avoid exposing at-grade or near-grade excavations through a non-work weekend. Where improvements may be affected by temporary instability, either on or offsite, further restrictions such as slot cutting, extending workdays, implementing weekend schedules, and/or other requirements considered critical to serving specific circumstances may be imposed.

6.3 Liquefaction

As discussed in Section 4.5.4 of this report, there is a potential for liquefaction to occur at the site during seismic shaking. More specifically, liquefaction could cause differential settlement. Alta's calculations indicate that as much as 4.71 inches of vertical settlement may occur due to liquefaction, upon the completion of the recommended removals. Typically, half to two thirds of that settlement should be considered differential (California Division of Mines and Geology, 2008, Special Publication 117a). For lightly loaded, well-constructed structures underlain by a non-liquefiable layer over the liquefiable layers, such as will be developed at the site, the ultimate differential settlement across the structure may be more limited (Idriss and Boulanger, 2008). The differential settlement shown between the CPT's was 0.1-inches. This shows that the dynamic differential settlement across the site is likely.

In consideration of the proposed removal and recompaction of the soils below the proposed structures, the minimal differential settlement shown in the liquefaction calculations, and the relatively uniform thickness of the liquefiable layers under the site, it is Alta's opinion that a dynamic differential settlement of 2.0-inches in 40 feet can be utilized in the design of the proposed structures onsite. It is recommended that the structures onsite be supported on a post-tensioned slab/foundation system.

6.4 Storm Water Infiltration Systems

From a geotechnical perspective, allowing storm water to infiltrate the onsite soil in concentrated areas increases the potential for settlement, liquefaction, and water-related damage to structures/improvements, such as wet slabs or pumping subgrade, and should be avoided where possible. If infiltration systems are required on this site, care should be taken in designing systems that control the storm water as much as possible.

Preliminary infiltration testing was conducted at the site as part of this investigation, and the methodology is discussed in 3.2. The resulting infiltration rates for P-1 and P-2 were calculated to be 5.4-inches per hour and 4.4-inches per hour, respectively. The results do not include a factor of safety. Test P-1 and P-2 were conducted in silty sand and sandy silt lenses of the younger alluvium at approximately 5-feet below the ground surface.

Groundwater was encountered during our investigation at a depth of approximately 21 to 22 feet below the ground surface. The historic high ground water is approximately 8 feet below the ground surface (CDMG, 1998). Nearby groundwater wells indicate groundwater is deeper than 50-feet.

Based on the infiltration rates of the underlying soil, infiltration-type WQMP's are likely feasible for project within the depths tested, although historic high groundwater may be a limiting factor. The Project Geotechnical Consultant should review the final WQMP design prior to construction.

6.5 Boundary Conditions

The site is bounded to the north by Arkansas Street, to the east by commercial development, and to the south, and west by residential developments.

Construction of retaining/screen walls along these boundaries may require additional geotechnical recommendations concerning unsuitable soil removals and foundation design parameters. Boundary conditions for the project should be reviewed by the Project Geotechnical Consultant as the design progresses.

7.0 DESIGN CONSIDERATIONS

7.1 Structural Design

It is anticipated that multi-story wood-framed residential structures with slab on-grade and shallow foundations will be constructed. Upon the completion of rough grading, finish grade samples should be collected and tested in order to

provide specific recommendations as they relate to the individual building pads. These test results and corresponding design recommendations should be presented in a final rough grading report. Final slab and foundation design recommendations should be made based upon specific structure sitings, loading conditions, and as-graded soil conditions.

It is anticipated that the majority of onsite soils will possess “very low” to “low” expansion potential when tested in general accordance with ASTM Test Method D: 4829. For budgeting purposes, the following foundation design requirements for a range of potential expansion characteristics are presented. Due to the potential for dynamic settlement onsite, it is recommended to utilize post-tensioned slabs for this project.

7.1.1 Foundation Design

Foundations may be preliminary designed based on the values presented in Table 7-1 below.

Table 7-1	
Foundation Design Parameters*	
Allowable Bearing	2000 lbs/ft ² (assuming a minimum embedment depth and width of 12 inches)
Lateral Bearing	250 lbs/ft ² at a depth of 12 inches plus 250 lbs/ft ² for each additional 12 inches of embedment to a maximum of 2000 lbs/ft ² .
Sliding Coefficient	0.30
Settlement	Static Settlement – 0.5 inch in 40 feet Dynamic Settlement – 2.0 inches in 40 feet

*These values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern depth and reinforcement requirements and should be evaluated.

7.1.2 Post-Tensioned Slabs/Foundation Design Recommendations

Post-tensioned slabs for the project may be designed utilizing the parameters presented in Tables 7-1 and 7-2. The parameters presented herein are based on methodology provided in the Design of Post-Tensioned Slabs-On-Ground, Third Edition, by the Post-Tensioning Institute, in accordance with the 2019 CBC.

TABLE 7-2 POST-TENSION SLAB DESIGN PARAMETERS						
Category	Expansion Potential	Minimum Embedment*	Edge Lift		Center Lift	
			Em (ft)	Ym (inch)	Em (ft)	Ym (inch)
I	Very Low to Low	12 inches	5.4	0.61	9.0	0.26
Slab Subgrade Moisture						
Category I	Minimum 110% of optimum moisture to a depth of 12 inches prior to pouring concrete					
Embedment*						
The minimum footing embedments presented herein are based on expansion indexes. The structural engineer should determine minimum embedments based on the number of floors supported by the footings, the structural loading, and the requirements of the latest California Building Code. If mat slabs are utilized, alternate embedment depths can be provided.						
Moisture Barrier						
A moisture barrier should be provided in accordance with the recommendations presented in Section 7.2						
<i>The parameters presented herein are based on procedures presented in the <u>Design of Post-Tensioned Slabs-On-Ground, Third Edition</u>. No corrections for vertical barriers at the edge of the slab, or for adjacent vegetation have been assumed. The design parameters are based on a Constant Suction Value of 3.9 pF.</i>						

7.2 Moisture Barrier

A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive and should be capable of effectively preventing the migration of water and reducing the transmission of water vapor to acceptable levels. Historically, a 10-mil plastic membrane, such as Visqueen, placed between two to four inches of clean sand, has been used for this purpose. The use of this system or other systems can be considered, at the discretion of the designer, provided the system reduces the vapor transmission rates to acceptable levels.

7.3 Seismic Design

In accordance with the requirements in Section 11.4.8 of ASCE 7-16 for sites with Site Class F, Alta has performed a site-specific ground motion analysis for the subject project. The analysis was performed in accordance with Chapter 21 of ASCE 7-16, the 2019 CBC, and the 2014 USGS Ground Acceleration Maps. The USGS Unified Hazard Tool

(<https://earthquake.usgs.gov/hazards/interactive/index.php>) and the USGS National Seismic Hazard Map source model was utilized to perform the analysis.

The site class was determined based on the referenced reports and published geologic maps in the area in general conformance with Chapter 20 of ASCE 7-16. There is a potential for liquefaction onsite which would result in a Site Class of F. However, it is assumed that the proposed structures onsite will have a fundamental period of vibration equal to or less than 0.5s. As such, per Section 20.3.1 of ASCE 7-16, a Site Class of D may be utilized for the onsite soils. The structural engineer shall verify the fundamental period of vibration of the proposed structures.

Probabilistic (MCER) ground motions were determined in accordance with Method 2 of Section 21.2.1 of ACE 7-16. The site specific MCER was taken as the lesser of the probabilistic and deterministic ground motions.

The design response spectrum was determined per Section 21.3 of ASCE 7-16. Design acceleration parameters were determined per Section 21.4 of ASCE 7-16 and the results are presented in Table 7-3. These parameters should be verified by the structural engineer. Additional parameters should be determined by the structural engineer based on the Occupancy Category of the proposed structures.

TABLE 7-3 Seismic Ground Motion Values 2019 CBC and ASCE 7-16	
<i>Parameter</i>	<i>Value</i>
Site Class	D (assuming structures fundamental period of vibration is equal to or less than 0.5s)
Site Latitude	33.8789
Site Longitude	-118.0838
Spectral Response Acceleration Parameter, S_s	1.561
Spectral Response Acceleration Parameter, S_1	0.558
Site Coefficient, F_a	1.0
Site Coefficient, F_v (Per Table 11.4-2 of ASCE 7-16. Site Specific Parameters Govern)	1.8
<i>Site Specific Parameters Per Chapter 21 of ASCE 7-16</i>	
MCE Spectral Response Acceleration Parameter, S_{Ms}	1.561
MCE Spectral Response Acceleration Parameter, S_{M1}	1.180
Design Spectral Response Acceleration Parameter, S_{Ds}	1.041
Design Spectral Response Acceleration Parameter, S_{D1}	0.789
Peak Ground Acceleration, PGA_M	0.73

7.4 Fence and Garden Walls

Block walls, if used, should be embedded a minimum of 2 feet below the lowest adjacent grade. Construction joints (not more than 20 feet apart) should be included in the block wall construction. Side yard walls should be structurally separated from the rear yard wall.

7.5 Footing Excavations

Soils from the footing excavations should not be placed in slab-on-grade areas unless properly compacted and tested. The excavations should be cleaned of all loose/sloughed materials and be neatly trimmed at the time of concrete placement. The Project Geotechnical Consultant should observe the footing excavations prior to the placement of concrete to determine that the excavations are founded in suitably compacted material.

7.6 Retaining Walls

Retaining walls should be founded on engineered fill and should be backfilled with granular soils that allow for drainage behind the wall. Foundations may be designed in accordance with the recommendations presented in Table 7-1, above. Unrestrained walls, free to horizontally move $0.0005H$ (for dense cohesionless backfill), may be designed to resist lateral pressures imposed by a fluid with a unit weight determined in accordance with the Table 7-4 below. The table also presents design parameters for restrained (at-rest) retaining walls. These parameters may be used to design retaining walls that may be considered as restrained due to the method of construction or location (corner sections of unrestrained retaining walls).

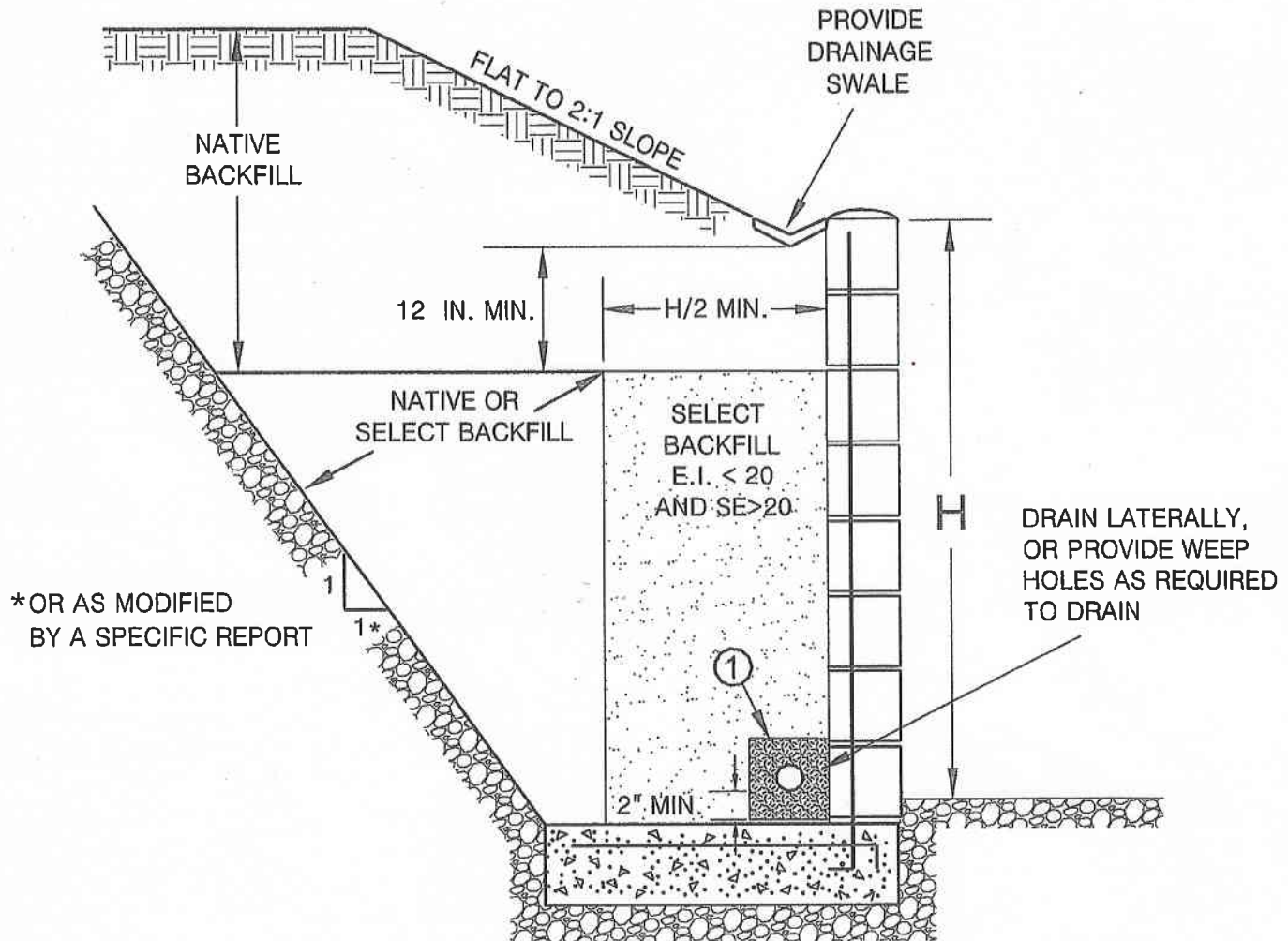
TABLE 7-4		
Equivalent Fluid Pressures for 90% Compacted Fill (Select Material)		
Backfill	Active Pressure (psf/ft)	At-Rest Pressure (psf/ft)
Level	35	55

Per the requirements of the 2019 CBC, the seismic force acting on the retaining walls with backfill exceeding 6-feet in height may be resolved utilizing the formula $15H^2$ lb/lineal ft (H =height of the wall). This force acts at approximately $0.6H$ above the base of the wall. The seismic value can be converted as required by the retaining wall engineer. Retaining walls should be designed in general accordance with Section 1807A.2 of the 2019 CBC.

- Restrained retaining walls should be designed for “at-rest” conditions.
- The design loads presented in the above table are to be applied on the retaining wall in a horizontal fashion and as such friction between wall and retained soils should not be allowed in the retaining wall analyses.
- Additional allowances should be made in the retaining wall design to account for the influence of construction loads, temporary loads, and possible nearby structural footing loads.
- Select backfill should be granular, structural quality backfill with a Sand Equivalent of 20 or better and an ASCE Expansion Index of 20 or less. The backfill must encompass the full active wedge area. The upper one foot of backfill should be comprised of native on-site soils (see Plate A).
- The wall design should include waterproofing (where appropriate) and backdrains or weep holes for relieving possible hydrostatic pressures. The backdrain should be comprised of a 4-inch perforated PVC pipe in a 1 ft. by 1 ft., $\frac{3}{4}$ -inch gravel matrix, wrapped with a geofabric. The backdrain should be installed with a minimum gradient of 2 percent and should be outletted to an appropriate location. For subterranean walls this may include drainage by sump pumps.
- No backfill should be placed against concrete until minimum design strengths are achieved.

It should be noted that the allowable bearing and lateral bearing values presented in Table 7-1 are based on level conditions at the toe. Modified design parameters can be presented for retaining walls with sloping condition at the toe. Other conditions should be evaluated on a case by case basis.

RETAINING WALL BACKFILL DETAIL



①

PIPE: 4-INCH PERFORATED PVC, SCHEDULE 40, SDR35 OR APPROVED ALTERNATE
MINIMUM 8 PERFORATIONS (1/4-IN. DIA.) PER LINEAL FT. IN BOTTOM HALF OF PIPE

ROCK: MINIMUM VOLUME OF 1 CU. FT. OF 3/4-IN. MAX. ROCK PER. LINEAL FOOT OF PIPE, OR APPROVED ALTERNATE

FILTER FABRIC: MIRAFI 140 FILTER FABRIC OR APPROVED EQUIVALENT



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VER. 1/10

PLATE A

7.7 Exterior Slabs and Walkways

Exterior concrete slabs and walkways should be designed and constructed in consideration of the following recommendations.

7.7.1 Subgrade Compaction

The subgrade below exterior concrete slabs should be compacted to a minimum of 90 percent relative compaction as determined by ASTM Test Method: D 1557.

7.7.2 Subgrade Moisture

The subgrade below concrete slabs should be moisture conditioned to a minimum of 110 percent of optimum moisture prior to concrete placement.

7.7.3 Concrete Slab Thickness

Concrete flatwork and driveways should be designed utilizing four-inch minimum thickness.

7.7.4 Concrete Slab Reinforcement

Utilization of reinforcement for flatwork and driveways is subject to a cost/benefit analysis. Reinforcement will decrease the amount of cracking that may occur in flatwork, however, planning for occasional repairs may be more cost effective. Utilizing closely spaced control joints is likely more cost-effective than utilizing reinforcement. The majority of the soils onsite are classified as very low in expansion potential. Consideration should be given to reinforcing flatwork with irregular (non-square/rectangular) shapes.

7.7.5 Control Joints

Weakened plane joints should be installed on walkways at intervals of approximately eight feet (maximum) or less. Exterior slabs should be designed to withstand shrinkage of the concrete.

7.8 Concrete Design

As stated in Section 5.1.7, negligible concentrations of sulfates were detected in the onsite soils (Class S0). Therefore, the use of sulfate resistant concrete is not required per ACI 318-14 at this time. Post-grading conditions should be evaluated, and final recommendations made at that time.

7.9 Corrosion

Based on preliminary testing, the onsite soils are mildly corrosive to moderately corrosive to buried metal objects. Buried ferrous metals should be protected against the effects of corrosive soils in accordance with the manufacturer's recommendations. Typical measures may include using non-corrosive backfill, protective coatings, wrapping, plastic pipes, or a combination of these methods. A corrosion engineer should be consulted if specific design recommendations are required by the improvement designer.

Per ACI 318-14, an exposure class of C1 would be applicable to metals encased in concrete (rebar in footings) due to being exposed to moisture from surrounding soils. Per Table 19.3.2.1 of ACI 318-14, the requirements for concrete with an exposure class of C1 are a minimum compressive strength of 2500 psi and a maximum water-soluble chloride ion content in concrete of 0.30 (percent by weight of cement).

7.10 Pavement Design

Pavement sections for the proposed streets shall be designed based on laboratory testing conducted on samples taken from the soil subgrade. Preliminarily, based on an assumed R-Value of 30, the pavement may be designed utilizing the sections presented in Table 7-5. These sections should be verified upon the completion of grading, based on R-Value testing. The ultimate pavement section design for public streets is under the City of Artesia's purview.

Table 7-5		
Preliminary Pavement Sections		
Traffic Index	Pavement Section Options OR	
5.0	3-inch AC on 6-inch AB	4-inch AC on 4-inch AB
5.5	3-inch AC on 7-inch AB	4-inch AC on 5-inch AB
6.0	3.5-inch AC on 7.5-inch AB	4-inch AC on 6.5-inch AB
AC-Asphalt Concrete AB-Caltrans Class II Base		

Construction of the streets should be accomplished in accordance with the current criteria of the City of Artesia. Prior to the placement of base material, the subgrade should be suitably moisture conditioned, processed and compacted to a minimum 95 percent of the laboratory maximum density (ASTM: D 1557) to at least twelve (12) inches below subgrade. After subgrade compaction, the exposed grade should then be "proof"-rolled with heavy equipment to ensure the grade does not "pump" and is verified as non-yielding. Aggregate base material should be placed on the compacted subgrade and compacted in-place to a minimum 95 percent of the laboratory standard obtained per ASTM: D 1557.

7.11 Site Drainage

Positive drainage away from the proposed structures should be provided and maintained. Roof, pad, and lot drainage should be collected and directed away from the structures toward approved disposal areas through drainage terraces, gutters, down drains, and other devices. Design fine grade elevations should be maintained through the life of the structure or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water, away from structures.

8.0 LOT MAINTENANCE

Ongoing maintenance of the improvements is essential to the long-term performance of structures. As such, the owners must implement certain maintenance procedures. The attached "Maintenance and Improvement Considerations" presented in the Appendix E may be included as part of the sales packet to educate the owners in issues related to drainage, maintenance, improvements, etc. The following recommendations should also be implemented.

8.1 Lot Drainage

Roof, pad, and lot drainage should be collected and directed away from structures and slopes and toward approved disposal areas. Design fine grade elevations should be maintained through the life of the structure or if design fine grade elevations are altered, adequate area drains should be installed in order to provide rapid discharge of water, away from structures and slopes. Residents should be made aware that they are responsible for maintenance and cleaning of all drainage terraces, down drains, and other devices that have been installed to promote structure and slope stability.

8.2 Burrowing Animals

Owners should undertake a program for the elimination of burrowing animals.

9.0 FUTURE PLAN REVIEWS

This report represents a geotechnical review of the site. As the project design for the project progresses, site specific geologic and geotechnical issues should be considered in the design and construction of the project. Consequently, future plan reviews may be necessary. These reviews may include reviews of:

- Grading Plans
- Foundation Plans
- Utility Plans

These plans should be forwarded to the project Geotechnical Consultant for review.

10.0 CLOSURE

10.1 Geotechnical Review

For the purposes of this report, multiple working hypotheses were established for the project, utilizing the available data and the most probable model is used for the analysis. Future information collected during the proposed grading operations is intended to evaluate the hypothesis and as such, some of the assumptions summarized in this report may need to be changed. Some modifications of the grading recommendations may become necessary, should the conditions encountered in the field differ from the conditions hypothesized in this report.

Plans and sections of the project specifications should be reviewed by Alta to evaluate conformance with the intent of the recommendations contained in this report. If the project description or final design varies from that described in herein, Alta must be consulted regarding the applicability of the recommendations contained herein and whether any changes are required. Alta accepts no liability for any use of its recommendations if the project description or final design varies and Alta is not consulted regarding the alterations.

10.2 Limitations

This report is based on the following: 1) the project as presented on the attached plan; 2) the information obtained from Alta's laboratory testing included herein; and 3) from the information presented in the referenced reports. The findings and recommendations are based on the results of the subsurface investigation, laboratory testing, and office analysis combined with an interpolation and extrapolation of conditions between and beyond the subsurface excavation locations. However, the materials adjacent to or beneath those observed may have different characteristics than those observed, and no precise representations are made as to the quality or extent of the materials not

observed. The results reflect an interpretation of the direct evidence obtained. Work performed by Alta has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by a geotechnical consultant who is familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this report.

The conclusions and recommendations included in this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of Alta.

Alta has no responsibility for construction means, methods, techniques, sequences, procedures, safety precautions, programs in connection with the construction, acts or omissions of the CONTRACTOR or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

APPENDIX A

REFERENCES

APPENDIX A

Selected References

1. California Code of Regulations, 2019, California Building Code, Title 24, Part 2, Volume 2, Based on the 2018 International Building Code, Effective Date January 1, 2020.
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APPENDIX B

Subsurface Investigation

APPENDIX B
Subsurface Investigation

Alta's subsurface investigation consisted of excavating, logging, and sampling five (5) hollow-stem auger borings and commissioning two (2) CPT soundings. Details of the subsurface investigation are presented in Table B. The approximate location of the exploratory excavation is shown on the accompanying Plate 1 and the Geotechnical Logs are attached.

TABLE B <i>SURFACE INVESTIGATION DETAILS</i>			
Equipment	Range of Depths	Sampling Methods	Sample Locations
Hollow-stem auger	Up to 51.5 feet	1. Bulk 2. Ring Samples	1. Bulk-Select Depths 2. Rings-Every 2.5 feet or 5 feet

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description	Major Divisions	grf	ltr	Description
Coarse Grained Soils	Gravel and Gravelly Soils		GW	Well-graded gravels or gravel sand mixtures, little or no fines	Fine Grained Soils		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			GP	Poorly-graded gravels or gravel sand mixture, little or no fines			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			GM	Silty gravels, gravel-sand-silt mixtures			OL	Organic silts and organic silt-clays of low plasticity
			GC	Clayey gravels, gravel-sand-clay mixtures			MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
	Sand and Sandy Soils		SW	Well-graded sands or gravelly sands, little or no fines	More than 50% passes on No. 200 sieve		VH	Inorganic clays of high plasticity, fat clays
			SP	Poorly-graded sands or gravelly sands, little or no fines			OH	Organic clays of medium to high plasticity
			SM	Silty sands, sand-silt mixtures			PT	Peat and other highly organic soils
			SC	Clayey sands, and-clay mixtures				

BOUNDARY CLASSIFICATION: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

U.S. STANDARD SERIES SIEVE					CLEAR SQUARE SIEVE OPENINGS		
200	40	10	4		3/4"	3"	12"
Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sands and Gravels	Blows/Foot (SPT)
Very Loose	<4
Loose	4-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

CONSISTENCY CLASSIFICATION

Silts and Clays	Criteria
Very Soft	Thumb penetrates soil >1 in.
Soft	Thumb penetrates soil 1 in.
Firm	Thumb penetrates soil 1/4 in.
Stiff	Readily indented with thumbnail
Very Stiff	Thumbnail will not indent soil

HARDNESS

Bedrock
Soft
Moderately Hard
Hard
Very Hard

LABORATORY TESTS

Symbol	Test
DS	Direct Shear
DSR	Direct Shear (Remolded)
CON	Sieve Analysis
SA	Maximum Density
MAX	Resistance (R) Value
RV	Expansion Index
EI	Sand Equivalent
SE	Atterberg Limits
AL	Chemical Analysis
CHEM	Hydrometer Analysis
HY	

SOIL MOISTURE

Increasing Visual Moisture Content

Dry - Dry to touch
 Moist - Damp, but no visible free water
 wet - Visible free water

SIZE PROPORTIONS

Trace - <5%
 Few - 5 to 10%
 Some - 15 to 25%



GEOTECHNICAL BORING LOG

SHEET 1 OF 2

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV. 22
 GW DEPTH (FT) 22
 DRIVE WT. 140 lbs.
 DROP 30 in.

BORING DESIG. B-1
 LOGGED BY FR
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
5					SM	1" Asphalt over 3" Base				
		R	19		SM	ARTIFICIAL FILL-UNDOCUMENTED (afu): SILTY SAND, medium grained, light brown, moist, medium dense @ 1.0ft 3" Concrete	8.8	104	39	
10		R	14		ML	YOUNGER ALLUVIUM (Qyf): SILTY SAND, medium grained, light brown, moist, medium dense @ 5.0ft. SANDY SILT, brown, moist, stiff	16.1	108	80	
		R	14		SM	@ 10.0ft. SILTY SAND, fine grained, light brown, moist, medium dense	7.9	107	39	CON, HY
15		R	27		ML	@ 15.0ft. SILT, light brown, moist, very stiff, fine grained sand	11.9	101	50	
		R	6			@ 20.0ft. brown, moist to wet, firm, trace clay ▼ @ 22.0ft. Groundwater Encountered	27.8	95	99	
25		S	3,4,3		SM	@ 25.0ft. SILTY SAND, fine grained, brown, moist, firm, few silt				
		S	3,3,3		SP	@ 30.0ft. SAND, fine to medium grained, brown, moist, loose, trace gravel up to 1/4" in diameter				
35					CL	@ 31.5ft. SILTY CLAY, gray brown, moist, firm				
		S	4,6,6		ML	@ 35.0ft. SANDY SILT, brown, moist, stiff	25.9			AL, HY
Continued.										
SAMPLE TYPES: <input checked="" type="checkbox"/> RING (DRIVE) SAMPLE <input checked="" type="checkbox"/> SPT (SPLIT SPOON) SAMPLE <input checked="" type="checkbox"/> BULK SAMPLE <input type="checkbox"/> TUBE SAMPLE					▼ GROUNDWATER ► SEEPAGE J: JOINTING C: CONTACT B: BEDDING F: FAULT S: SHEAR RS: RUPTURE SURFACE					Alta California Geotechnical, Inc. P.N. 1-0359 PLATE B-1

GEOTECHNICAL BORING LOG

SHEET 2 OF 2

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV.
 GW DEPTH (FT) 22
 DRIVE WT. 140 lbs.
 DROP 30 in.

BORING DESIG. B-1
 LOGGED BY FR
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
45 <										

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV. 22
 GW DEPTH (FT) 140 lbs.
 DRIVE WT. 30 in.
 DROP

BORING DESIG. B-2
 LOGGED BY FR
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
					SM	1" Asphalt over 3" Base over 1" concrete/slurry				
		R	10		SM	ARTIFICIAL FILL-UNDOCUMENTED (afu): SILTY SAND, medium grained, light brown, moist, medium dense				
5		R	11		ML	YOUNGER ALLUVIUM (Qyf): SILTY SAND, fine to medium grained, brown, moist, medium dense				
						@ 5.0ft. SANDY SILT, brown, moist, stiff	21.5	102	91	MAX, EI, HY, CHEM
10		R	14				17.9	108	89	
15		R	12		ML	@ 15.0ft. orange brown, more sand	23.7	95	84	
						@ 16.0ft. SILT, orange brown to brown, moist, stiff				
20		R	20		ML	@ 20.0ft. SANDY SILT, brown, wet, stiff, fine to medium sand	29.9	92	99	
						▼ @ 22.0ft. Groundwater encountered				
25		S	6,7,9		SM	@ 25.0ft. SILTY SAND, fine grained, orange brown, moist to wet, medium dense				
						TOTAL DEPTH 26.5 FEET GROUNDWATER ENCOUNTERED AT 22.0 FEET NO CAVING OBSERVED				

SAMPLE TYPES:
☒ R RING (DRIVE) SAMPLE
☒ S SPT (SPLIT SPOON) SAMPLE
☒ B BULK SAMPLE ☐ T TUBE SAMPLE

▼ GROUNDWATER
 ► SEEPAGE
 J: JOINTING C: CONTACT
 B: BEDDING F: FAULT
 S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0359

PLATE B-2

GEOTECHNICAL BORING LOG

SHEET 1 OF 2

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV.
 GW DEPTH (FT) 21
 DRIVE WT. 140 lbs.
 DROP 30 in.

BORING DESIG. B-3
 LOGGED BY FR
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
5					SM SM	ARTIFICIAL FILL-UNDOCUMENTED (afu): SILTY SAND, fine to medium grained, tan, dry, medium dense @ 0.2ft. 1" Asphalt				
		R	10		ML	YOUNGER ALLUVIUM (Qyf): SILTY SAND, fine to medium grained, tan, dry, medium dense @ 0.25ft. brown, moist @ 5.0ft. SANDY SILT, brown, moist, stiff	21.2	100	87	
		R	10			@ 10.0ft. trace clay	18.5	97	70	
		R	18				17.5	91	57	
20		R	14			@ 20.0ft. moist to wet ▼ @ 21.0ft. Groundwater Encountered	22.0	104	99	AL, HY
25		S	5,7,10		SP	@ 25.0ft. SAND, fine grained, brown, moist to wet, medium dense, few silt				
30		S	3,4,5			@ 30.0ft. gray brown, trace clay				
35		S	5,7,13			@ 35.0ft. trace gravel up to 0.5" in diameter				
Continued.										
SAMPLE TYPES:					▼ GROUNDWATER ► SEEPAGE J: JOINTING C: CONTACT B: BEDDING F: FAULT S: SHEAR RS: RUPTURE SURFACE					
<input checked="" type="checkbox"/> RING (DRIVE) SAMPLE <input checked="" type="checkbox"/> SPT (SPLIT SPOON) SAMPLE <input checked="" type="checkbox"/> BULK SAMPLE <input type="checkbox"/> TUBE SAMPLE					Alta California Geotechnical, Inc. P.N. 1-0359 PLATE B-3					

GEOTECHNICAL BORING LOG

SHEET 2 OF 2

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV.
 GW DEPTH (FT) 21
 DRIVE WT. 140 lbs.
 DROP 30 in.

BORING DESIG. B-3
 LOGGED BY FR
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS		
45		S	5,6,10		ML	<u>YOUNGER ALLUVIUM</u> (Qyf): Continued; SILT, gray brown, moist, stiff, trace sand						
		S	4,5,17			@ 45.0ft. trace clay						
50		S	8,13,13			@ 50.ft. dark gray brown, trace fine sand						
TOTAL DEPTH 51.5 FEET GROUNDWATER ENCOUNTERED AT 21.0 FEET NO CAVING OBSERVED												
SAMPLE TYPES: <input checked="" type="checkbox"/> RING (DRIVE) SAMPLE <input checked="" type="checkbox"/> SPT (SPLIT SPOON) SAMPLE <input checked="" type="checkbox"/> BULK SAMPLE <input type="checkbox"/> TUBE SAMPLE						<input checked="" type="checkbox"/> GROUNDWATER <input checked="" type="checkbox"/> SEEPAGE J: JOINTING C: CONTACT B: BEDDING F: FAULT S: SHEAR RS: RUPTURE SURFACE					Alta California Geotechnical, Inc. P.N. 1-0359 PLATE B-3	

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV. 22
 GW DEPTH (FT) 140 lbs.
 DRIVE WT. 30 in.
 DROP

BORING DESIG. B-4
 LOGGED BY FR
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
5		R	15		SM SM	ARTIFICIAL FILL-UNDOCUMENTED (afu): SILTY SAND, fine to medium grained, tan, dry, medium dense @ 0.25ft. 2.5" concrete YOUNGER ALLUVIUM (Qyf): SILTY SAND, fine to medium grained, brown, moist, medium dense				
10		R	14		ML	@ 5.0ft. CLAYEY SILT w/SAND, brown, moist, stiff, fine grained sand @ 10.0ft. trace clay	22.8	102	98	MAX, EI, HY, CHEM CON, HY
15		R	22		SM	@ 15.0ft. SILTY SAND, fine grained, orange brown, moist, medium dense	12.0	98	46	
20		R	16		ML	@ 20.0ft. SANDY SILT, brown, moist, stiff, fine sand ▼ @ 22.0ft. Groundwater Encountered	17.6	112	99	
25		S	5,8,9		SP	@ 25.0ft. SAND, fine to medium grained, brown, moist to wet, medium dense TOTAL DEPTH 26.5 FEET GROUNDWATER ENCOUNTERED AT 22.0 FEET NO CAVING OBSERVED				

SAMPLE TYPES:

- ☒ RING (DRIVE) SAMPLE
☒ SPT (SPLIT SPOON) SAMPLE
☒ BULK SAMPLE ☐ TUBE SAMPLE

- ▼ GROUNDWATER
 ► SEEPAGE
 J: JOINTING C: CONTACT
 B: BEDDING F: FAULT
 S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0359

PLATE B-4

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV.
 GW DEPTH (FT) 22
 DRIVE WT. 140 lbs.
 DROP 30 in.

BORING DESIG. B-5
 LOGGED BY FR
 NOTE

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
5 										

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV. _____
 GW DEPTH (FT) _____
 DRIVE WT. _____
 DROP _____

BORING DESIG. P-1
 LOGGED BY FR
 NOTE _____

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
5					SM	1" Asphalt over 3" Base over 1" concrete/slurry				
					SM	ARTIFICIAL FILL-UNDOCUMENTED (afu): SILTY SAND, medium grained, light brown, moist, medium dense YOUNGER ALLUVIUM (Qyf): SILTY SAND, fine to medium grained, brown, moist, medium dense				
					ML	@ 5.0ft. SANDY SILT, brown, moist, stiff				
TOTAL DEPTH 5.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED										

SAMPLE TYPES:

☒ RING (DRIVE) SAMPLE

☒ SPT (SPLIT SPOON) SAMPLE

☒ BULK SAMPLE ☐ TUBE SAMPLE

GROUNDWATER

SEEPAGE

J: JOINTING C: CONTACT

B: BEDDING F: FAULT

S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0359 PLATE B-6

GEOTECHNICAL BORING LOG

SHEET 1 OF 1

PROJECT NO. 1-0359
 DATE STARTED 12/23/20
 DATE FINISHED 12/23/20
 DRILLER 2R Drilling
 TYPE OF DRILL RIG 8" Hollow Stem Auger

PROJECT NAME 11700 Arkansas St
 GROUND ELEV. _____
 GW DEPTH (FT) _____
 DRIVE WT. _____
 DROP _____

BORING DESIG. P-2
 LOGGED BY FR
 NOTE _____

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT- URATION (%)	OTHER TESTS
5					SM	ARTIFICIAL FILL-UNDOCUMENTED (afu): SILTY SAND, fine to medium grained, tan, dry, medium dense @ 0.25ft. 2.5" concrete YOUNGER ALLUVIUM (Qyf): SILTY SAND, fine to medium grained, brown, moist, medium dense				
					SM					
					ML	@ 5.0ft. SANDY SILT, brown, moist, stiff, fine grained sand TOTAL DEPTH 5.0 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:

☒ RING (DRIVE) SAMPLE

☒ SPT (SPLIT SPOON) SAMPLE

☒ BULK SAMPLE ☐ TUBE SAMPLE

GROUNDWATER

SEEPAGE

J: JOINTING C: CONTACT

B: BEDDING F: FAULT

S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0359 PLATE B-7

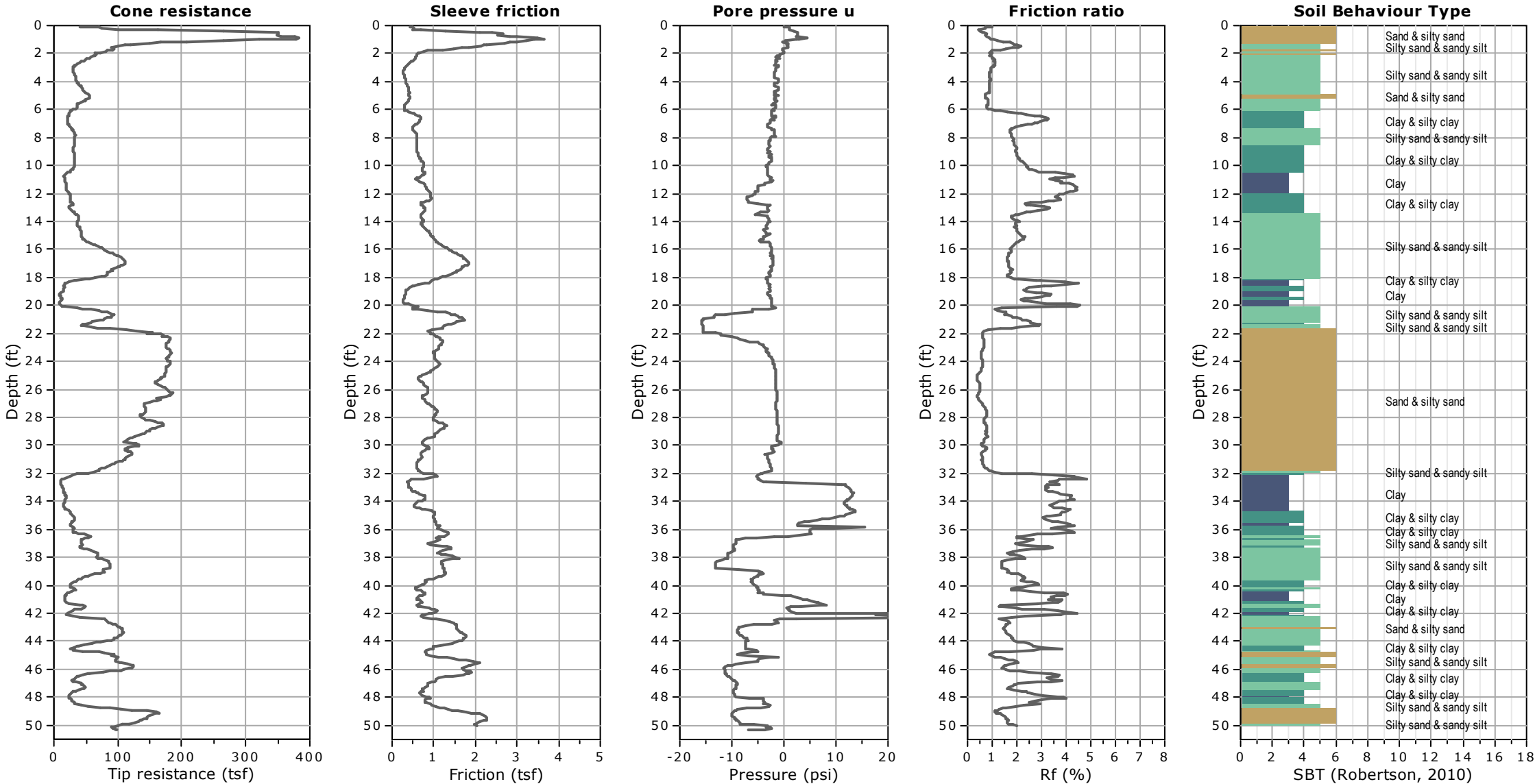


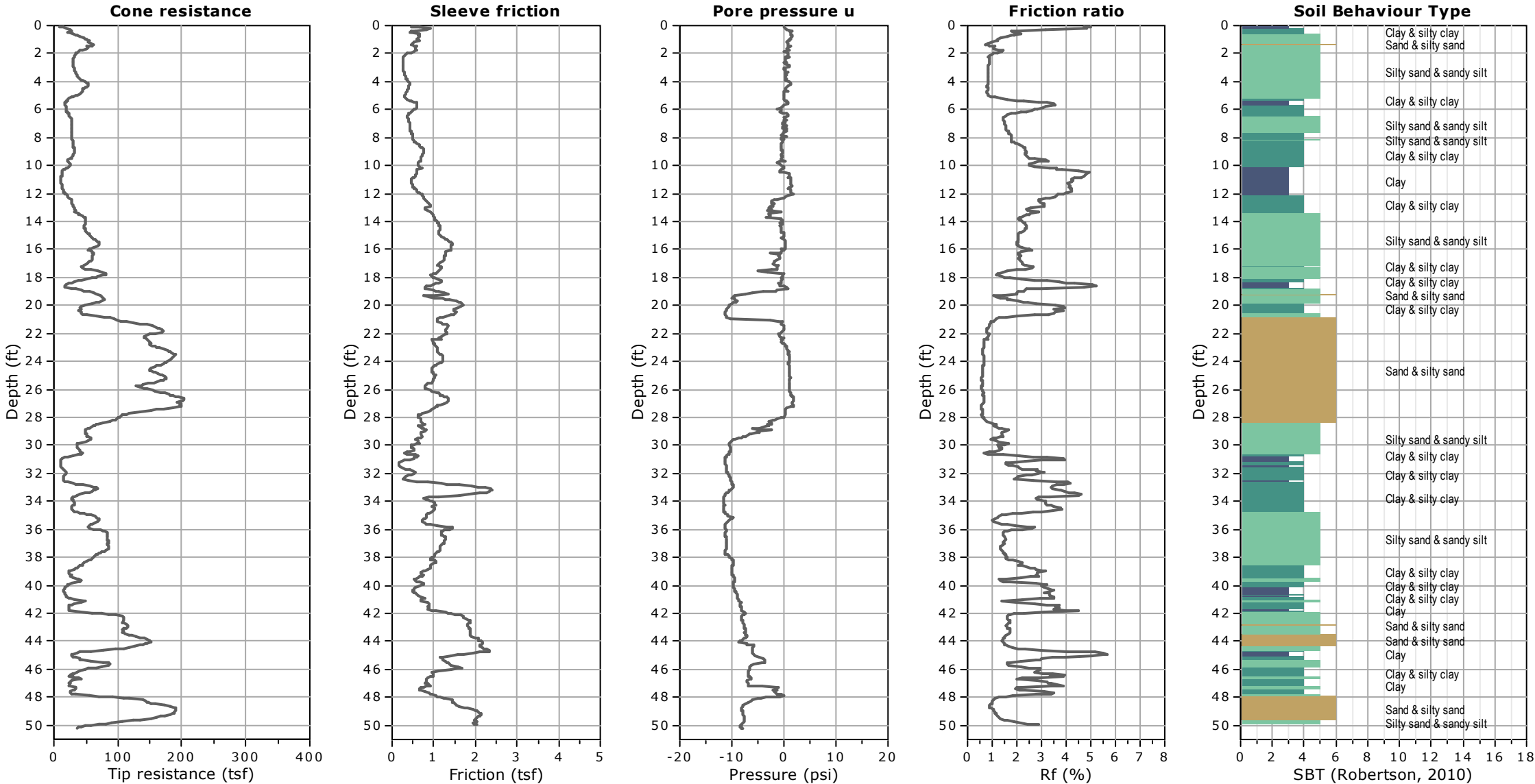
Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: Alta California Geotechnical
Location: 11700 Arkansas St, Artesia, CA

CPT-1

Total depth: 50.33 ft, Date: 1/8/2021





APPENDIX C

Laboratory Testing

LABORATORY TESTING

The following laboratory tests were performed on a representative sample in accordance with the applicable latest standards or methods from the ASTM, California Building Code (CBC) and California Department of Transportation.

Classification

Soils were classified with respect to the Unified Soil Classification System (USCS) in accordance with ASTM D-2487 and D-2488.

Particle Size Analysis

Modified hydrometer testing was conducted to aid in classification of the soil. The results of the particle size analysis are presented in Table C.

Maximum Density/Optimum Moisture

The maximum dry density and optimum moisture content of two representative bulk samples were evaluated in accordance with ASTM D-1557. The results are summarized in Table C.

Expansion Index Tests

Two (2) expansion index tests were performed to evaluate the expansion potential of typical on-site soil. Testing was carried out in general conformance with ASTM Test Method D-4829. The results are presented in Table C.

Consolidation Tests

Consolidation testing was performed on two (2) relatively “undisturbed” soil samples at their natural moisture content in accordance with procedures outlined in ASTM D-2435. The samples were placed in a consolidometer and loads were applied incrementally in geometric progression. The samples (2.42-inches in diameter and 1-inch in height) were permitted to consolidate under each load increment until the slope of the characteristic linear secondary compression portion of the thickness versus log of time plot was apparent. The percent consolidation for each load cycle was recorded as the ratio of the amount of vertical

compression to the original 1-inch height. The consolidation test results are shown on Plates C-1 and C-2.

Atterberg Limits

Atterberg Limit testing of two samples were performed by Alta. The results of the test are presented in Table C.

Chemical Analyses

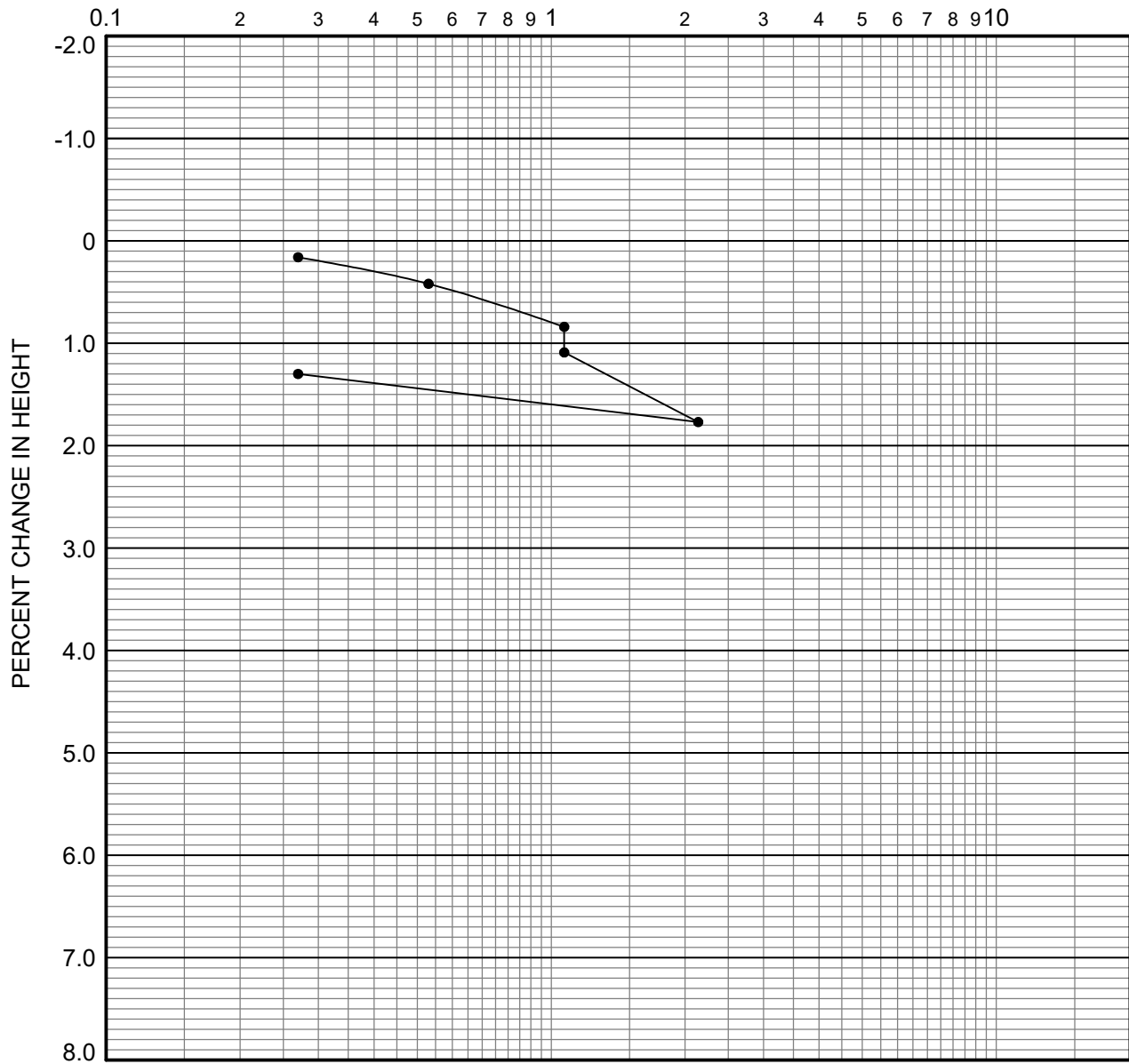
Chemical testing was performed on two select samples by Alta. The results of these tests (sulfate content, resistivity, chloride content and pH) are presented on Table C.

TABLE C
SUMMARY OF LABORATORY TEST DATA
P.N. 1-0359

Boring/Pit No.	Depth (Feet)	Soil Description	Group Symbol - Unified Soil Classification System	Maximum Dry Density		Direct Shear	Grain Size Analysis				Expansion Index	Sulfate Content (%)	Consolidation	Other Tests Remarks
				Maximum Density (pcf)	Optimum Moisture (%)		Gravel (% + No. 4 Screen)	% Sand	% Silt (0.074 to 0.005mm)	% Clay (<0.005 mm)				
B-1	10	Silty Sand (Qyf)	SM	-	-	-	0	72	21	7	-	-	See Plate C-1	-
B-1	35	Sandy Silt (Qyf)	ML	-	-	-	0	50	39	11	-	-	-	LL: 22, PL: N/P, PI: 0
B-2	1-4	Silty Sand (Qyf)	SM	117.7	11.6	-	1	65	27	7	1	ND	-	Min. Resistivity: 13,000 OHM-CM Chloride: 0ppm PH: 8.08
B-3	20	Sandy Silt (Qyf)	ML	-	-	-	0	42	47	11	-	-	-	LL: 25, PL: N/P, PI: 0
B-4	1-4	Silty Sand (Qyf)	SM	119.0	10.8	-	4	61	28	7	1	ND	-	Min. Resistivity: 6,100 OHM-CM Chloride: 5ppm PH: 7.83
B-4	5	Clayey Silt w/Sand (Qyf)	ML	-	-	-	0	20	54	26	-	-	See Plate C-2	-

Alta California Geotechnical, Inc.

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-1	10.0	107	7.9	39	28	SM	Silty Sand (Qyf)

REMARKS: WATER ADDED AT 1.07 TSF

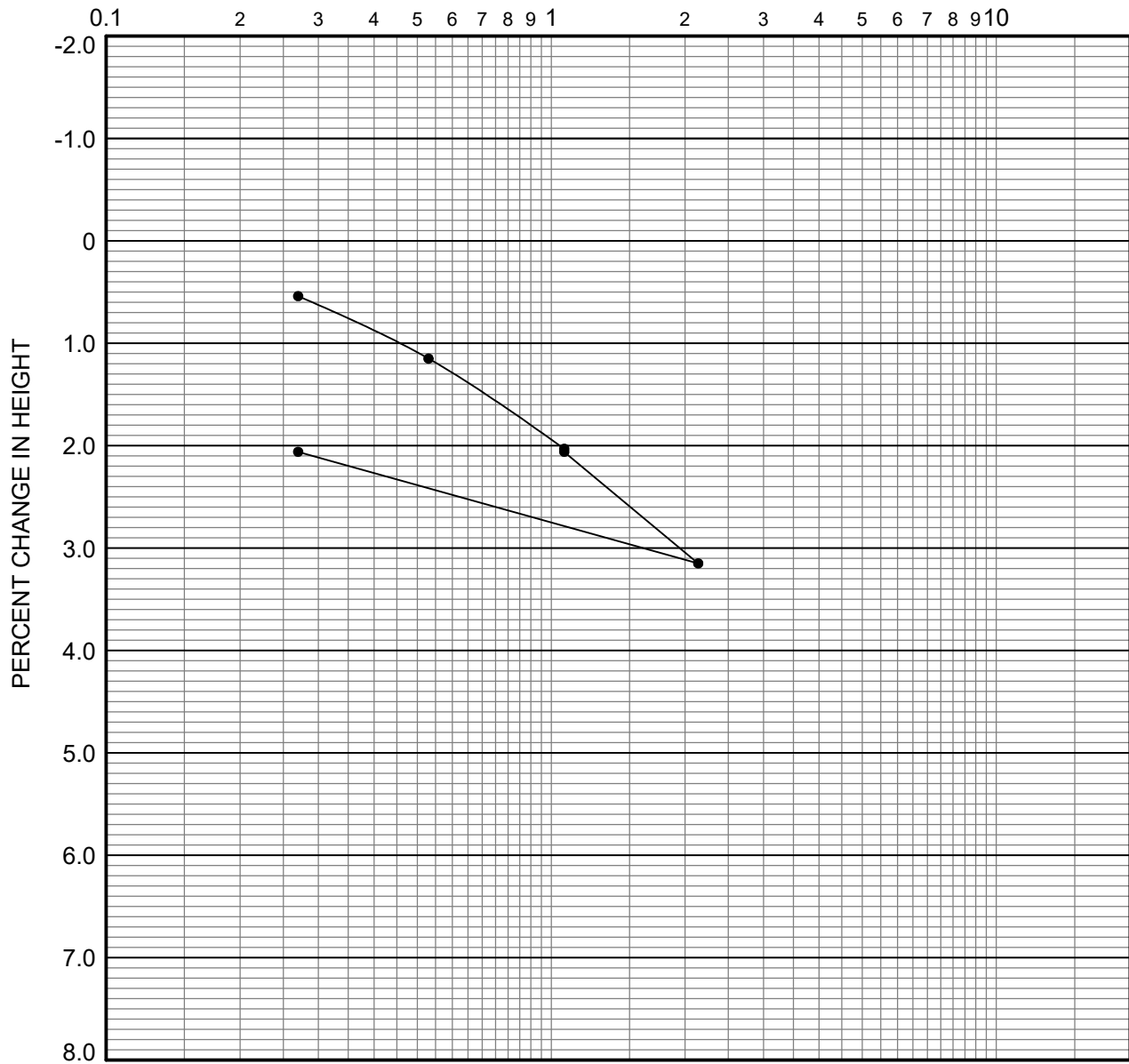
CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0359

PLATE C-1

COMPRESSIVE STRESS IN TSF



boring	depth (ft.)	dry density (pcf)	in situ moist. (%)	in situ satur. (%)	-200 sieve (%)	group symbol	typical names
B-4	5.0	102	22.8	98	80	ML	Clayey Silt w/Sand (Qyf)

REMARKS: WATER ADDED AT 1.07 TSF

CONSOLIDATION CURVE

Alta California Geotechnical, Inc.

P.N. 1-0359

PLATE C-2

APPENDIX D

Liquefaction Analysis

APPENDIX D

LIQUEFACTION ANALYSIS

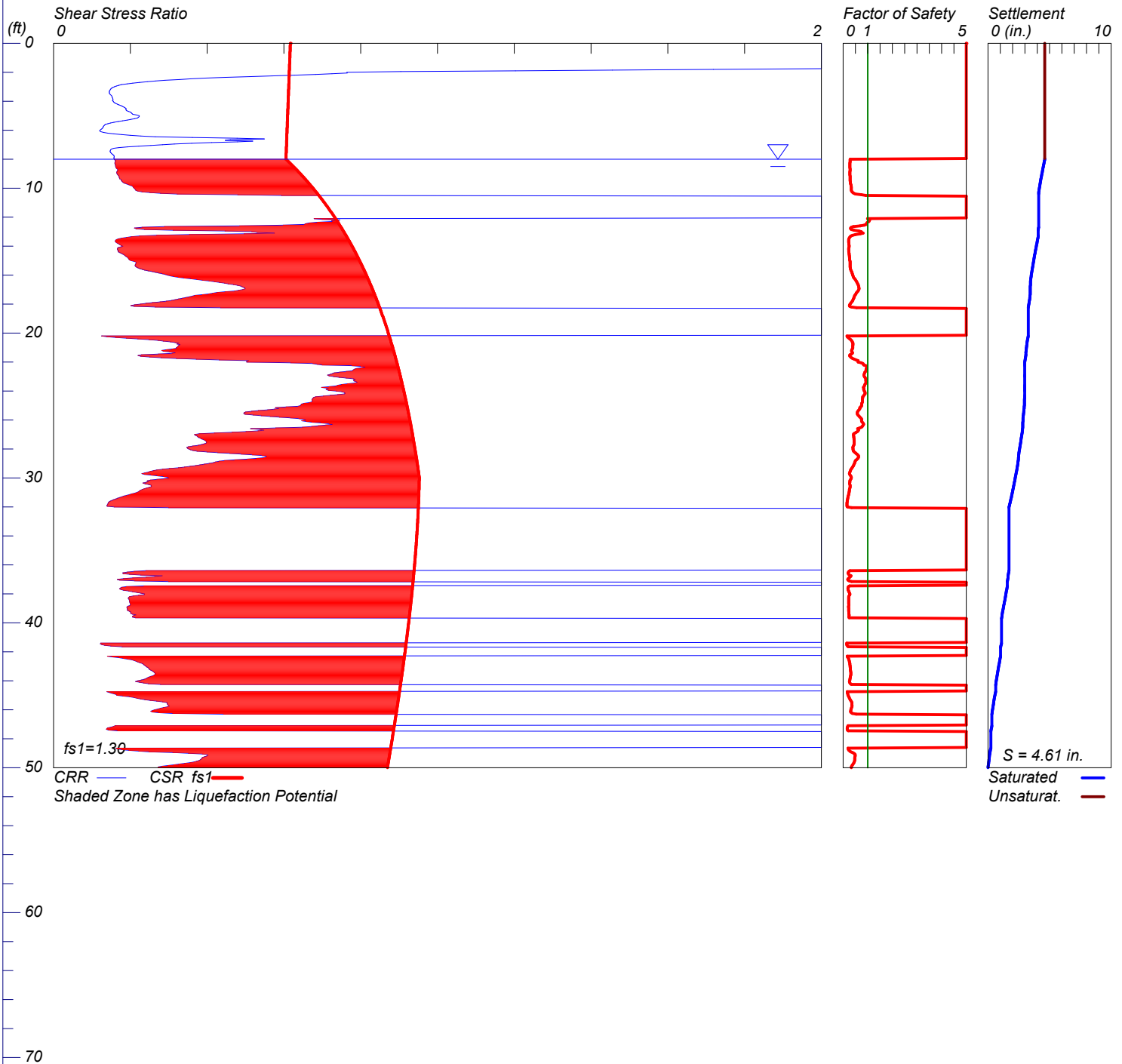
A liquefaction analysis was performed for the site based on CPT data presented on the enclosed logs by Kehoe Testing & Engineering. The Ishihara/Yoshimine method was used to analyze dynamic settlement for the CPT data. The calculations used the following constants: 0.73g for site acceleration, 7.3 for the magnitude of the earthquake, and a groundwater depth of 8 feet below existing grade. A factor of safety of 1.3 was utilized. The results are presented on Plates D-1 and D-2.

LIQUEFACTION ANALYSIS

1-0359

Hole No.=CPT-1 Water Depth=8 ft

Magnitude=7.3
Acceleration=0.73g

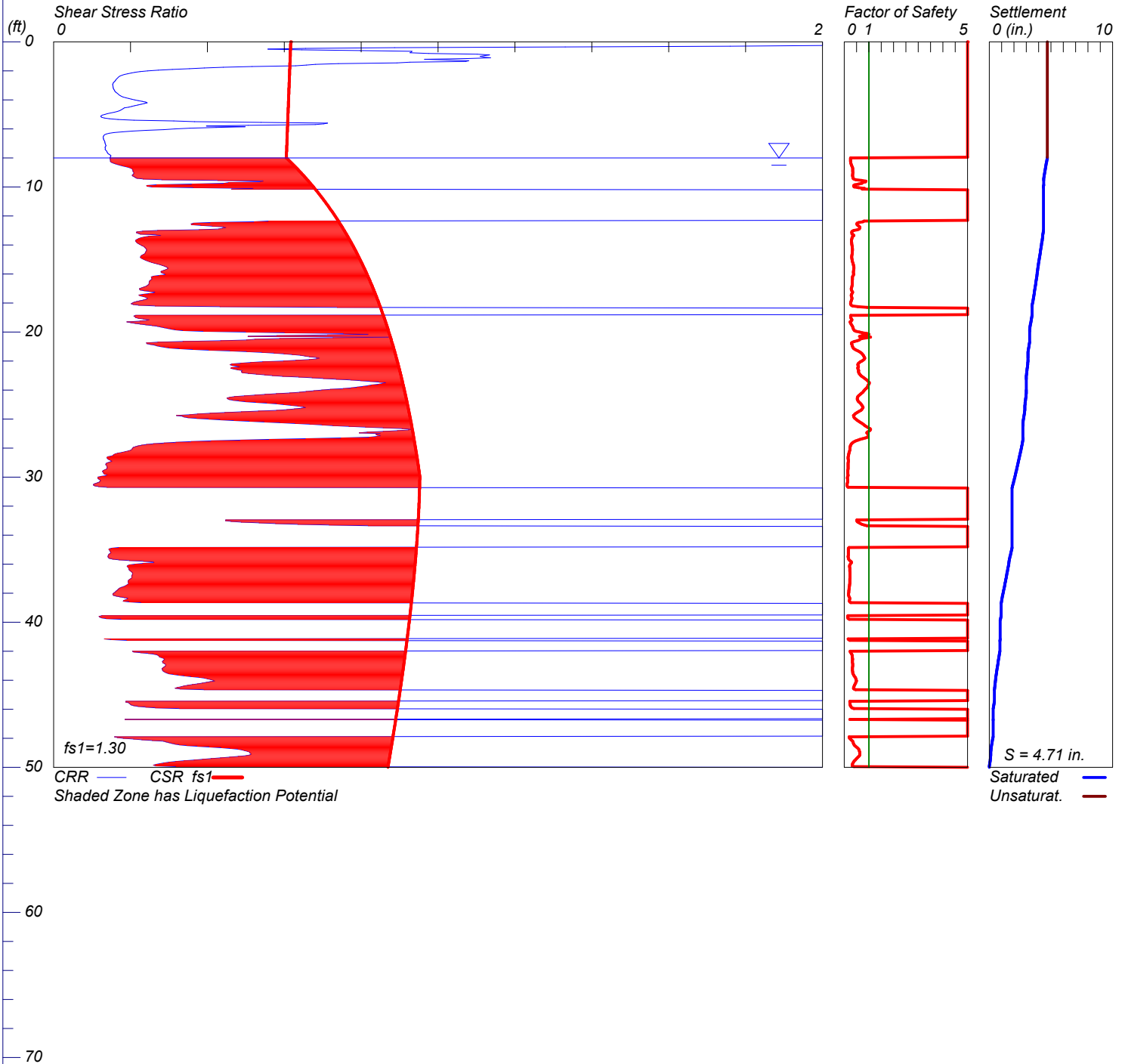


LIQUEFACTION ANALYSIS

1-0359

Hole No.=CPT-2 Water Depth=8 ft

Magnitude=7.3
Acceleration=0.73g



APPENDIX E

Maintenance and Improvement Considerations

MAINTENANCE AND IMPROVEMENT CONSIDERATIONS

General

Owners purchasing property must assume a certain degree of responsibility for improvements and for maintaining conditions around their home. Of primary importance from a geotechnical standpoint are maintaining drainage patterns and minimizing the soil moisture variation below all improvements. Such design, construction and owner maintenance provisions may include:

- Employing contractors for improvements who design and build in recognition of local building codes and specific site soils conditions.
- Establishing and maintaining positive drainage away from all foundations, walkways, driveways, patios, and other improvements.
- Avoiding the construction of planters adjacent to structural improvements. Alternatively, planter sides/bottoms can be sealed with an impermeable membrane and drained away from the improvements via subdrains into approved disposal areas.
- Sealing and maintaining construction/control joints within concrete slabs and walkways to reduce the potential for moisture infiltration into the subgrade soils.
- Utilizing landscaping schemes with vegetation that requires minimal watering. Watering should be done in a uniform manner, as equally as possible on all sides of the foundation, keeping the soil "moist" but not allowing the soil to become saturated.
- Maintaining positive drainage away from structures and providing roof gutters on all structures with downspouts that are designed to carry roof runoff directly into area drains or discharged well away from the foundation areas.
- Avoiding the placement of trees closer to the proposed structures than a distance of one-half the mature height of the tree.
- Observation of the soil conditions around the perimeter of the structure during extremely hot/dry or unusually wet weather conditions so that modifications can be made in irrigation programs to maintain relatively uniform moisture conditions.

Sulfates

Owners should be cautioned against the import and use of certain inorganic fertilizers, soil amendments, and/or other soils from offsite sources in the absence of specific information relating to their chemical composition. Some fertilizers have been known to leach sulfate compounds into soils and increase the sulfate concentrations to potentially detrimental levels.

Site Drainage

- The owners should be made aware of the potential problems that may develop when drainage is altered through construction of hardscape improvements. Pondered water, drainage over the slope face, leaking irrigation systems, overwatering, or other conditions which could lead to ground saturation must be avoided.
- No water should be allowed to flow over the slopes. No alteration of pad gradients should be allowed that would prevent pad and roof runoff from being directed to approved disposal areas.
- Drainage patterns have been established at the time of the fine grading should be maintained throughout the life of the structure. No alterations to these drainage patterns should be made unless designed by qualified professionals in compliance with local code requirements and site-specific soils conditions.

Slope Drainage

- Residents should be made aware of the importance of maintaining and cleaning all interceptor ditches, drainage terraces, down drains, and any other drainage devices, which have been installed to promote slope stability.
- Subsurface drainage pipe outlets may protrude through slope surfaces and/or wall faces. These pipes, in conjunction with the graded features, are essential to slope and wall stability and must be protected in-place. They should not be altered or damaged in any way.

Planting and Irrigation of Slopes

- Seeding and planting of the slopes should be planned to achieve, as rapidly as possible, a well-established and deep-rooted vegetal cover requiring minimal watering.
- It is the responsibility of the landscape architect to provide such plants initially and of the residents to maintain such planting. Alteration of such a planting scheme is at the resident's risk.
- The resident is responsible for proper irrigation and for maintenance and repair of properly installed irrigation systems. Leaks should be fixed immediately.

- Sprinklers should be adjusted to provide maximum uniform coverage with a minimum of water usage and overlap. Overwatering with consequent wasteful runoff and serious ground saturation must be avoided.
- If automatic sprinkler systems are installed, their use must be adjusted to account for seasonal and natural rainfall conditions.

Burrowing Animals

- Residents must undertake a program to eliminate burrowing animals. This must be an ongoing program in order to promote slope stability.

Owner Improvement

Owner improvements (pools, spas, patio slabs, retaining walls, planters, etc.) should be designed to account for the terrain of the project, as well as expansive soil conditions and chemical characteristics. Design considerations on any given lot may need to include provisions for differential bearing materials, ascending/descending slope conditions, bedrock structure, perched (irrigation) water, special geologic surcharge loading conditions, expansive soil stresses, and long-term creep/settlement.

All owner improvements should be designed and constructed by qualified professionals utilizing appropriate design methodologies, which account for the on-site soils and geologic conditions. Each lot and proposed improvement should be evaluated on an individual basis.

Setback Zones

Manufactured slopes maybe subject to long-term settlement and creep that can manifest itself in the form of both horizontal and vertical movement. These movements typically are produced as a result of weathering, erosion, gravity forces, and other natural phenomenon. A setback adjacent to slopes is required by most building codes, including the California Building Code. This zone is intended to locate and support the residential structures away from these slopes and onto soils that are not subject to the potential adverse effects of these natural phenomena.

The owner may wish to construct patios, walls, walkways, planters, swimming pools, spas, etc. within this zone. Such facilities may be sensitive to settlement and creep and should not be constructed within the setback zone unless properly engineered. It is suggested that plans for such improvements be designed by a professional engineer who is familiar with grading ordinances and design and construction requirements. In addition, we recommend that the designer and contractor familiarize themselves with the site specific geologic and geotechnical conditions on the specific lot.

APPENDIX F

Earthwork Specifications

ALTA CALIFORNIA GEOTECHNICAL, INC.
EARTHWORK SPECIFICATIONS

These specifications present the generally accepted standards and minimum earthwork requirements for the development of the project. These specifications shall be the project guidelines for earthwork except where specifically superseded in preliminary geology and soils reports, grading plan review reports or by the prevailing grading codes or ordinances of the controlling agency.

A. GENERAL

1. The Contractor shall be responsible for the satisfactory completion of all earthwork in accordance with the project plans and specifications.
2. The project Geotechnical Engineer and Engineering Geologist, or their representatives, shall provide observation and testing services, and Geotechnical consultation for the duration of the project.
3. All clearing, grubbing, stripping and site preparation for the project shall be accomplished by the Contractor to the satisfaction of the Geotechnical Engineer/Engineering Geologist.
4. It is the Contractor's responsibility to prepare the ground surface to receive fill to the satisfaction of the Geotechnical Engineer and to place, spread, mix, moisture condition, and compact the fill in accordance with the job specifications and as required by the Geotechnical Engineer. The Contractor shall also remove all material considered by the Geotechnical Engineer to be unsuitable for use in the construction of engineered fills.
5. The Contractor shall have suitable and sufficient equipment in operation to handle the amount of fill being placed. When necessary, equipment will be shut down temporarily in order to permit the proper preparation of fills.

B. PREPARATION OF FILL AREAS

1. Excessive vegetation and all deleterious material should be disposed of offsite as required by the Geotechnical Engineer.

Existing fill, soil, alluvium or rock materials determined by the Geotechnical Engineer as being unsuitable for placement in compacted fills shall be removed and hauled from the site. Where applicable, the Contractor may obtain the

approval of the Soils Engineer and the controlling authorities for the project to dispose of the above described materials, or a portion thereof, in designated areas onsite.

After removal of the deleterious materials have been accomplished, earth materials deemed unsuitable in their natural, in-place condition, shall be removed as recommended by the Geotechnical Engineer/Engineering Geologist.

2. Upon achieving a suitable bottom for fill placement, the exposed removal bottom shall be disced or bladed by the Contractor to the satisfaction of the Geotechnical Engineer. The prepared ground surfaces shall then be brought to the specified moisture content mixed as required, and compacted and tested as specified. In localities where it is necessary to obtain the approval of the controlling agency prior to placing fill, it will be the Contractor's responsibility to contact the proper authorities to visit the site.
3. Any underground structure such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines or other structures not located prior to grading are to be removed or treated in a manner prescribed by the Geotechnical Engineer and/or the controlling agency for the project.

C. ENGINEERED FILLS

1. Any material imported or excavated on the property may be utilized as fill, provided the material has been determined to be suitable by the Geotechnical Engineer. Deleterious materials shall be removed from the fill as directed by the Geotechnical Engineer.
2. Rock or rock fragments less than twelve inches in the largest dimension may be utilized in the fill, provided they are not placed in concentrated pockets and the distribution of the rocks is approved by the Geotechnical Engineer.
3. Rocks greater than twelve inches in the largest dimension shall be taken offsite, or placed in accordance with the recommendations of the Geotechnical Engineer in areas designated as suitable for rock disposal.
4. All materials to be used as fill, shall be tested in the laboratory by the Geotechnical Engineer. Proposed import materials shall be approved by the Geotechnical Engineer 48 hours prior to importation.
5. The fill materials shall be placed by the Contractor in lifts, that when compacted, shall not exceed six inches. Each lift shall be spread evenly and shall be

thoroughly mixed to achieve a near uniform moisture condition and a uniform blend of materials.

All compaction shall be achieved at or above the optimum moisture content, as determined by the applicable laboratory standard. The Contractor will be notified if the fill materials are too wet or too dry to achieve the required compaction standard.

6. When the moisture content of the fill material is below the limit specified by the Geotechnical Engineer, water shall be added and the materials shall be blended until a uniform moisture content, within specified limits, is achieved. When the moisture content of the fill material is above the limits specified by the Geotechnical Engineer, the fill materials shall be aerated by discing, blading, mixed with dryer fill materials, or other satisfactory methods until the moisture content is within the specified limits.
7. Each fill lift shall be compacted to the minimum project standards, in compliance with the testing methods specified by the controlling governmental agency, and in accordance with recommendations of the Geotechnical Engineer.

In the absence of specific recommendations by the Geotechnical Engineer to the contrary, the compaction standard shall be the most recent version of ASTM:D 1557.

8. Where a slope receiving fill exceeds a ratio of five-horizontal to one-vertical, the fill shall be keyed and benched through all unsuitable materials into sound bedrock or firm material, in accordance with the recommendations and approval of the Geotechnical Engineer.
9. Side hill fills shall have a minimum key width of 15 feet into bedrock or firm materials, unless otherwise specified in the soil report and approved by the Geotechnical Engineer in the field.
10. Drainage terraces and subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency and/or with the recommendations of the Geotechnical Engineer and Engineering Geologist.
11. The Contractor shall be required to maintain the specified minimum relative compaction out to the finish slope face of fill slopes, buttresses, and stabilization fills as directed by the Geotechnical Engineer and/or the governing agency for the project. This may be achieved by either overbuilding the slope and cutting

back to the compacted core; by direct compaction of the slope face with suitable equipment; or by any other procedure which produces the required result.

12. The fill portion of fill-over-cut slopes shall be properly keyed into rock or firm material; and the fill area shall be stripped of all soil or unsuitable materials prior to placing fill.

The design cut portion of the slope should be made first and evaluated for suitability by the Engineering Geologist prior to placement of fill in the keyway above the cut slope.

13. Pad areas in cut or natural ground shall be approved by the Geotechnical Engineer. Finished surfaces of these pads may require scarification and recompaction, or over excavation as determined by the Geotechnical Engineer.

D. CUT SLOPES

1. The Engineering Geologist shall observe all cut slopes and shall be notified by the Contractor when cut slopes are to be started.
2. If, during the course of grading, unforeseen adverse or potentially adverse geologic conditions are encountered, the Engineering Geologist and Soil Engineer shall investigate, analyze and make recommendations to remediate these problems.
3. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the superjacent, prevailing drainage.
4. Unless otherwise specified in specific geotechnical reports, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.
5. Drainage terraces shall be constructed in compliance with the ordinances of the controlling governmental agencies, and/or in accordance with the recommendations of the Geotechnical Engineer or Engineering Geologist.

E. GRADING CONTROL

1. Fill placement shall be observed and tested by the Geotechnical Engineer and/or his representative during grading.

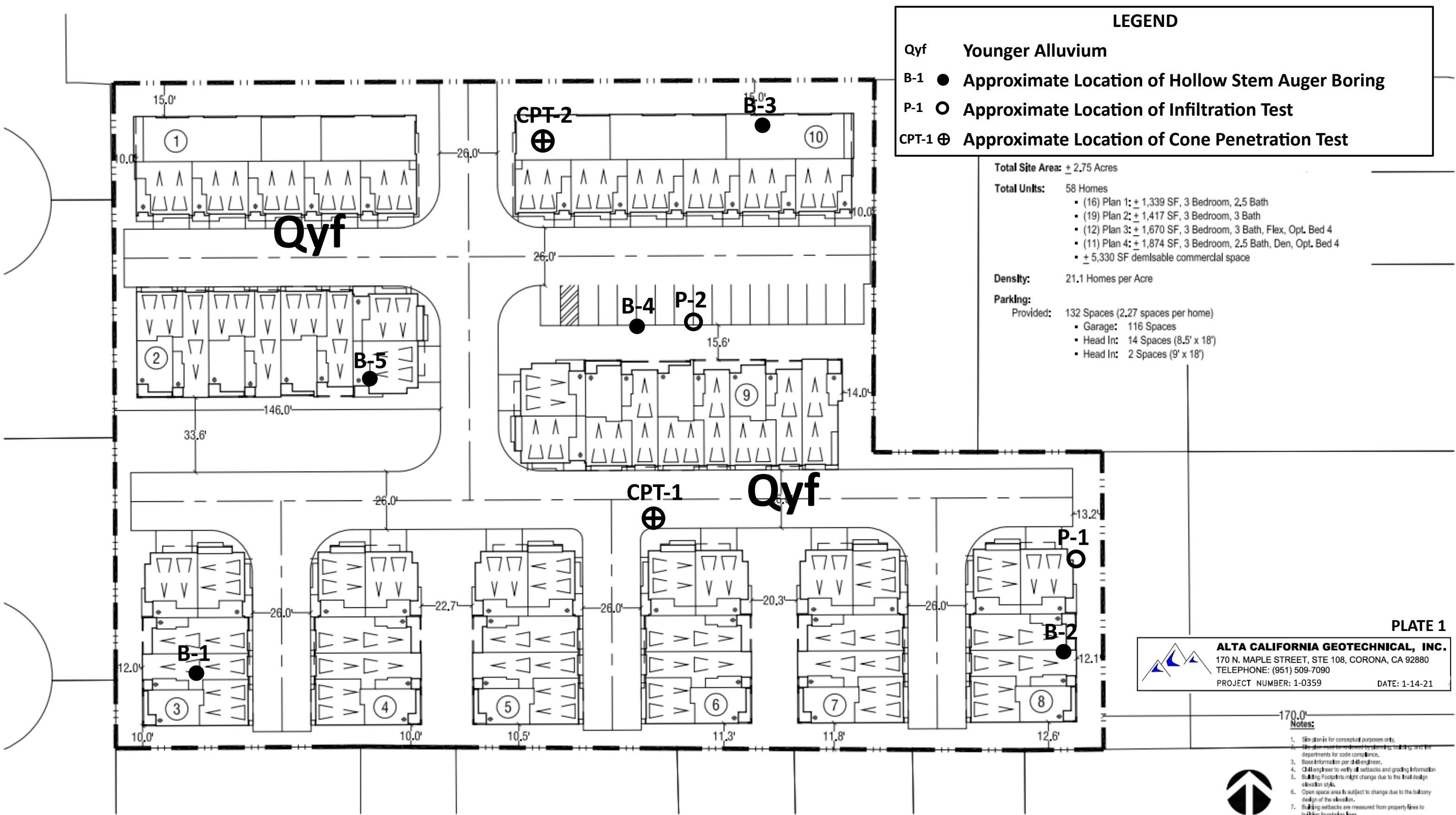
Field density tests shall be made by the Geotechnical Engineer and/or his representative to evaluate the compaction and moisture compliance of each fill lift. Density tests shall be conducted at intervals not to exceed two feet of fill

height. Where sheepsfoot rollers are used, the fill may be disturbed to a depth of several inches. Density determinations shall be taken in the compacted material below the disturbed surface at a depth determined by the Geotechnical Engineer or his representative.

2. Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture content is in evidence, that particular layer or portion thereof shall be reworked until the required density and/or moisture content has been attained. Additional fills shall not be placed over an area until the previous lift of fill has been tested and found to meet the density and moisture requirements for the project and the previous lift is approved by the Geotechnical Engineer.
3. When grading activities are interrupted by heavy rains, fill operations shall not be resumed until field observations and tests by the Geotechnical Engineer indicate the moisture content and density of the fill are within the specified limits.
4. During construction, the Contractor shall properly grade all surfaces to maintain good drainage and prevent the ponding of water. The Contractor shall take remedial action to control surface water and to prevent erosion of graded areas until such time as a permanent drainage and erosion devices have been installed.
5. Observation and testing by the Geotechnical Engineer and/or his representative shall be conducted during filling and compacting operations in order that he will be able to state in his opinion that all cut and filled areas are graded in accordance with the approved specifications.
6. Upon the completion of grading activities and after the Geotechnical Engineer and Engineering Geologist have finished their observations of the work, final reports shall be submitted. No further excavation or fill placement shall be undertaken without prior notification of the Geotechnical Engineer and/or Engineering Geologist.

F. FINISHED SLOPES

All finished cut and fill slopes shall be planted and irrigated and/or protected from erosion in accordance with the project specifications, governing agencies, and/or as recommended by a landscape architect.



LEGEND

Qyf

Younger Alluvium

B-1

●

Approximate Location of Hollow Stem Auger Boring

P-1

○

Approximate Location of Infiltration Test

CPT-1

⊕

Approximate Location of Cone Penetration Test

- Total Site Area: ± 2.75 Acres
- Total Units: 58 Homes
- (16) Plan 1: ± 1,339 SF, 3 Bedroom, 2.5 Bath

▪ (19) Plan 2: ± 1,417 SF, 3 Bedroom, 3 Bath

▪ (12) Plan 3: ± 1,670 SF, 3 Bedroom, 3 Bath, Flex, Opt. Bed 4

▪ (11) Plan 4: ± 1,874 SF, 3 Bedroom, 2.5 Bath, Den, Opt. Bed 4

▪ ± 5,330 SF demisable commercial space
- Density: 21.1 Homes per Acre
- Parking:
- Provided: 132 Spaces (2.27 spaces per home)

▪ Garage: 116 Spaces

▪ Head In: 14 Spaces (8.5' x 18')

▪ Head In: 2 Spaces (9' x 18')

PLATE 1

ALTA CALIFORNIA GEOTECHNICAL, INC.

170 N. MAPLE STREET, STE 108, CORONA, CA 92880

TELEPHONE: (951) 509-7090

PROJECT NUMBER: 1-0359

DATE: 1-14-21

- Notes:
1. Site plan is for conceptual purposes only.

2. Site plan must be reviewed by planning, building, and fire departments for code compliance.

3. Base information per civil engineer.

4. Civil engineer to verify all setbacks and grading information.

5. Building footprints might change due to the final design elevation style.

6. Open space area is subject to change due to the building design of the elevation.

7. Building setbacks are measured from property lines to building foundation lines.

CONCEPTUAL SITE PLAN

11700 ARKANSAS STREET SITE

ARTESIA, CA

