# Appendix E:
# Geology and Soils Supporting Information

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SOILS ENGINEERING, INC.
Consulting Geotechnical Engineers

2860 WALNUT AVE. - SIGNAL HILL, CALIF. 90755 - PHONE 562/426-7990 - FAX 562/426-1842

May 31, 2019
Project No. 6619.19.2
County Geologic Report No. 190001

**Blue River Development**
**c/o Oxbow Partners**
2855 Pacific Coast Highway, Suite 227
Corona del Mar, California 92625

Attention: Mr. Tom Grabiel

Subject: Fault Investigation, The Trails at Corona Residential Development, Tentative Tract No. 37500, City of Corona, Riverside County, California

References See Page 5

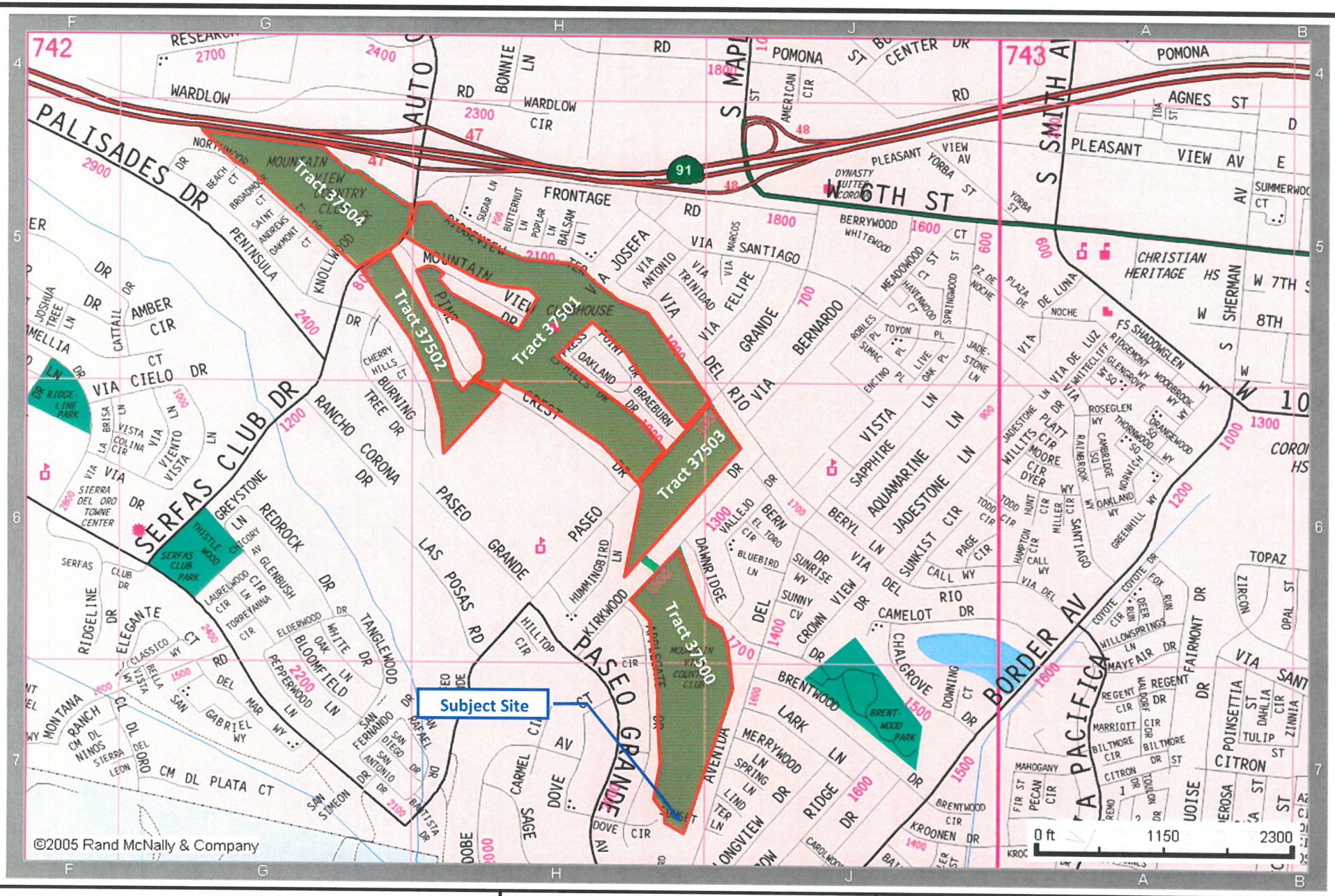
Gentlemen:

Associated Soils Engineering, Inc. (ASE) has completed a geologic fault investigation of the subject site (the "Site"). This report presents a summary of our findings and conclusions regarding the existence of active fault ruptures that would impact the proposed residential development. This report supplements ASE's "Report of Supplementary Geotechnical Investigation & Grading Plan Review, Proposed Residential Development of 'The Trails at Corona', Tentative Tract No.'s 37500, 37501, 37502, 37503 and 37504, Corona, California" dated November 19, 2018 (ASE 2018). The approximate location of the Site is shown on Figure 1.

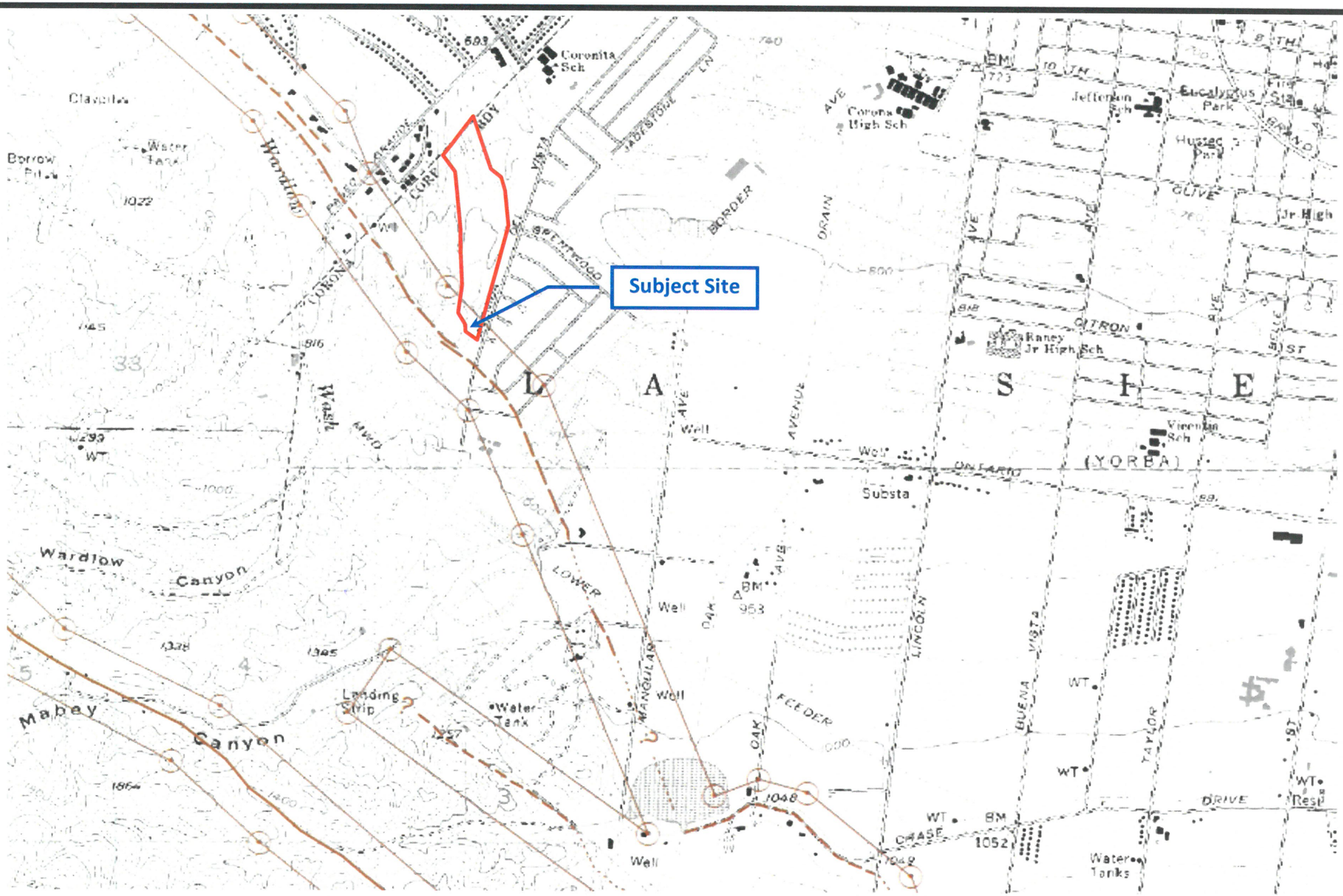
## INTRODUCTION

The purpose of this investigation was to perform a geologic evaluation of surface rupture potential within the Site in accordance with the State of California Alquist-Priola Earthquake Fault Zoning Act. The intent of the act is to require fault investigations on sites located within Earthquake Fault Zones (EFZ) to preclude new construction of certain habitable structures across the trace of active faults. An active fault is defined by the State of California as "a fault that has had surface displacement within Holocene time (about the last 11,000 years), hence constituting a potential hazard to structures that might be located across it" (CGS 2007). The southern-most portion of Tract 37500 is within an EFZ associated with the Chino fault as shown on Figure 2.

Our fault investigation study included the review of available geologic literature, reports, maps and aerial photographs relevant to the subject site; geologic reconnaissance of the site and adjacent areas; excavation, logging and backfilling of an exploratory fault trench, consultation with Riverside County Geologist Daniel Walsh; and preparation of this report. A list of the reports, maps and aerial photographs reviewed for this study is provided on Page 5. The 60-scale Tentative Tract Map No. 37500 (KWC 2019) was used as the base map for our study. The location of the fault trench is shown on Plate A1. The log of the fault trench is provided on Plate A2.




| | | | |
|---|---|---|---|
| **Associated Soils Engineering, Inc.**<br>2860 Walnut Avenue<br>Signal Hill, CA 90755<br>Tel (562) 426-7990 Fax (562) 426-1842 | **Site Location Map** | Proj. Name: | **Proposed "The Trails at Corona" Residential Development** |
| | | **Figure 1** | Proj. No.: **6619.19.2** |
| | | | Date: **May 31, 2019** |




*(Partial Excerpt of the State of California Earthquake Fault Zones Corona South Quadrangle Revised Official Map, Effective: May 1, 2003)*

**Active Faults**

1906 C

? 

Faults considered to have been active during Holocene time and have potential for surface rupture; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed; query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by fault creep.

**Earthquake Fault Zone Boundaries**

These are delineated as straight-line segments that connect encircled turning points so as to define Earthquake Fault Zone segments.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**Tel (562) 426-7990 Fax (562) 426-1842**


| | | | |
|---|---|---|---|
| Project Name: | **Prop. Residential Development, Mountain View Golf Course, 2121 Mountain View Dr., Corona, CA** | | |
| **Figure 2** | **Earthquake Fault Zones** | | |
| Proj. No.: | **6619.19.2** | Date: | **May 31, 2019** |

## SITE DESCRIPTION

Tract 37500 is a part of the proposed "The Trails at Corona" residential development located on the grounds of the former Mountain View Golf course in the City of Corona. The subject study area is located at the southern end of Tract 37500 (Figure 1 and Plate A1). Access is from Kirkwood Drive at the north side of Tract 37500. Residential lots are planned for at the western side of the tract, site of a portion of the former golf course, on a flood plain surface that gently slopes to the north. A natural, steep-sided drainage swale comprises most of the eastern side of the Tract 37500. The Site is bordered residential housing tracts to the west, north and south, and by a church facility to the south. Based on review of historical aerial photographs, development within the Chino EFZ east of the Site began between 1959 and 1967, and to the south and west of the Site between 1975 and 1980.

## GEOLOGIC SETTING

The Site is located within the Chino Basin at the southeastern end of the Northeastern Block of the Los Angeles Basin. The Los Angeles Basin is a large northwest-trending synclinal depression at the northwestern end of the Peninsular Ranges geomorphic Province of California. The Northeastern Block is southwesterly bounded by the Whittier-Elsinore fault zone, located approximately 2 miles from the Site, and the Cucamonga fault zone, located approximately 18 miles from the Site.

## CHINO FAULT

The Chino fault is a splay of the Elsinore fault zone that separates from the Main Street fault of the Elsinore fault zone southeast of the Site and extends approximately 21 kilometers northwest to the City of Chino Hills. Near the Site, the fault across older alluvial fan deposits derived from the Santa Mountains and is expressed at the surface by subdued scarps, offset drainages, and photo lineaments suggested by soil tonal and vegetation variations (CDMG 1977 and CGS 2002). Apparent movement of the fault is right lateral strike slip with a vertical component of reverse faulting. Slip rate estimates range from 0.2 to 0.5 millimeters per year (CGS 2002). At its closest location to the Site, the Chino fault is shown on the State of California Earthquake Fault Zones, Corona South Quadrangle (Figure 2) to be approximately 230 feet southwest of the southern Tract 37500 boundary. The U.S. Geological Survey's Geologic Map of the Corona South 7.5' Quadrangle (USGS 2002) shows the Chino fault to be approximately 100 feet from the southern Tract 37500 boundary (Figure 3).

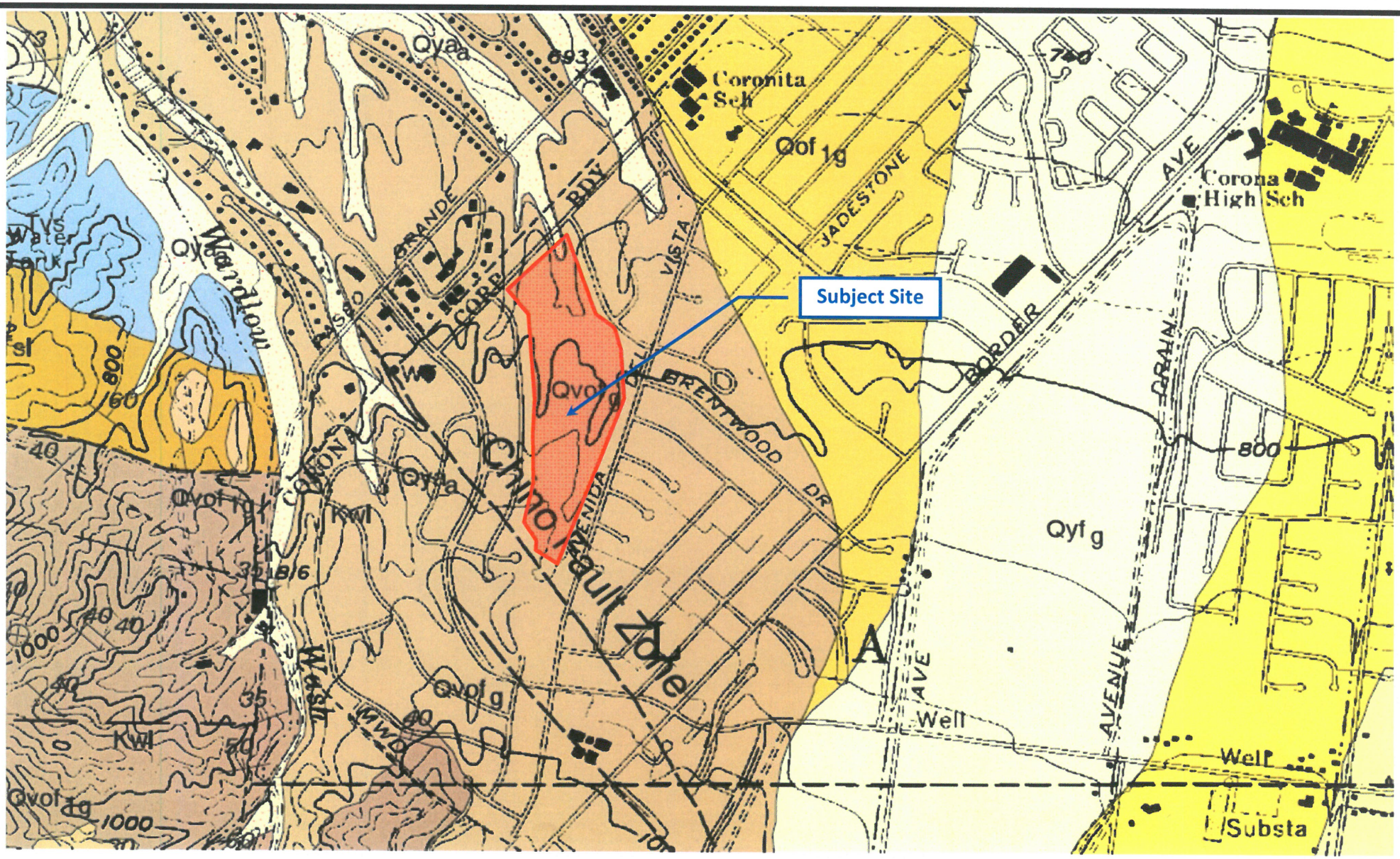
## SITE CONDITIONS

### ARTIFICIAL FILL:

Relatively minor man-made fill deposits were exposed in the fault trench. These fills include golf course bunker sand comprised of white fine to coarse loose sand; and, irrigation trench backfill and miscellaneous surface fill comprised of brown to reddish brown loose silty sand with gravel.

### VERY OLD ALLUVIAL FAN DEPOSITS:

The native soils exposed at the Site have been identified as very old alluvial fan deposits of early Pleistocene age (USGS 2002), as shown on Figure 3. Very old alluvial fan deposits are scattered along the foot of the Santa Ana Mountains extending outward up to a distance of 2 miles. Near the surface in the study area, the fault trench exposed a Bt soil horizon consisting of yellowish red (5YR 4/6 to 5/8) to strong brown (7.5YR 4/6 to 5/6) clayey silt and sandy clay with sand, gravel, and cobbles. Below the Bt horizon, the alluvium grades to reddish




*(Partial Excerpt of the Geologic Map of the Corona South 7.5' Quadrangle, Riverside and Orange Counties, California, USGS Open-File Report 02-21, Version 1.0, 2002)*

**Qvof** — **Very old alluvial fan deposits (early Pleistocene)**—Mostly well-dissected, well-indurated, reddish-brown cobble and gravel deposits. Commonly contains duripans and locally silcretes. Found scattered along foot of Santa Ana Mountains and extending out from foot for 3 km. Most are fault-bounded and probably displaced laterally, as they commonly do not head at major canyons. Includes: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| | | | |
|---|---|---|---|
| Project Name: | Prop. Residential Development, Mountain View Golf Course, 2121 Mountain View Dr., Corona, CA | | |
| Figure 3 | Regional Geologic Map | | |
| Proj. No.: | 6619.19.2 | Date: | May 31, 2019 |

yellow (5YR 4/6 to 6/8) sandy silt and clayey sand with an increasing volume of sand, gravel and cobbles. Matrix clay development includes columnar structure and clay film on clasts and fracture surfaces. Granitic cobbles were observed to be decomposed to grus. In the drainage channel to the east of the fault trench, the volume of cobbles increase and boulders are present below the elevation of the trench bottom.

## PREVIOUS GEOLOGIC STUDIES, REPORTS AND PUBLICATIONS

The reports, publications and maps used for this fault investigation are listed on Page 5. No geotechnical reports related to the residential developments adjacent to the site were found. However, the California Geological Survey Fault Evaluation Report for the Chino fault (CGS 2002) refers to a 1978 geotechnical investigation by Medall & Associates, for the residential development located south and east of the Site, that reports direct evidence of faulting observed in a fault trench.

## AERIAL PHOTOGRAPH REVIEW

ASE reviewed the aerial photographs listed on Page 5. No obvious evidence suggesting the presence of faulting was observed in the photos within the project boundaries. Scarps were identified in the photos dated earlier than 1975 (prior to grading of the housing developments and church site) east and south of the subject tract boundary at the mapped locations of the Chino fault. No evidence of faulting within the subject Site was observed in the photographs examined by ASE.

## FAULT TRENCHING

A fault trench was excavated using a backhoe with 24-inch wide bucket at the location shown on Plate A1. The trench was excavated roughly perpendicular to the known trend of the Chino fault and was extended as close to the eastern property limit as was practical and approximately 15 feet beyond the western AP Zone limit. The trench was located using a compass and 300-foot tape. The trench was 285 feet long and ranged in depth from 4 to 5 feet. This excavation provided a continuous exposure of the near surface stratigraphy across the entire area of the proposed Tract 37500 improvements within the Chino EFZ. The fault trench was loosely backfilled with the excavated soils.

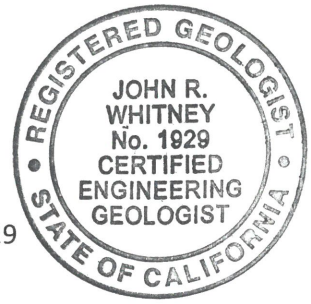
A detailed graphic log of the fault trench is provided on Plate A2. The trench exposed man-made fill and very old alluvium fan deposits. The contacts between the fill and old alluvium deposits were observed and noted on the trench log. No offset beds, shears, or other evidence of faulting and seismic-induced ground failures were observed.

## FAULT INVESTIGATION CONCLUSIONS

Based on the fault investigation described above, no faults are known to exist that would adversely impact construction of the proposed improvements. No indicators of earth movement were observed during the field reconnaissance or in the fault trench. However, since the fault trench does not extend beyond the south tract boundary within the Chino Earthquake Fault Zone, the existence of active faulting beyond the southern extent of the fault trench cannot be ruled out. As such, ASE recommends a restricted use zone for non-critical human-occupancy structures only comprising the area within 50 feet from the southern end of the fault trench measured perpendicular from the trend of the Chino EFZ. The recommended restricted use zone is shown on Plate A1. Seismic hazards other than surface rupture that may affect the project, such as ground shaking, are addressed in in the project geotechnical investigation report (ASE 2018).

We thank you for the opportunity of working with you on this project. If you have any questions or require additional information regarding the fault investigation described herein, please contact the undersigned.

Respectfully submitted,
**ASSOCIATED SOILS ENGINEERING, INC.**




John R. Whitney, PG
Engineering Geologist, CEG 1929

JRW:jw

Enclosed: Plate A1- Fault Trench Location Map
Plate A2- Log of Fault trench

## REFERENCES


Associated Soils Engineering, Inc. (**ASE 2016**), Report of Supplementary Geotechnical Investigation & Grading Plan Review, Proposed Residential Development of 'The Trails at Corona'', Tentative Tract No.'s 37500, 37501, 37502, 37503 and 37504, Corona, California, Project No. 6619.18.1, November 19, 2018.

California Division of Mines and Geology (**CDMG 1977**), Seismic Hazards Related to Geologic Factors, Elsinore and Chino Fault Zones, Northwestern Riverside County, California, Open-File Report 77-4, by F. Harold Weber, Jr., May 1977.

California Geological Survey (**CGS 2002**), Chino Fault, California Geological Survey Fault Evaluation Report FER-247, by Jerome A. Treiman, October 8, 2002.

California Geological Survey (**CGS 2003**), State of California Earthquake Fault Zones, Corona South Quadrangle, Revised Official Map, effective May 1, 2003.

California Geological Survey (**CGS 2007**), Fault-Rupture Hazard Zones in California, Special Publication 42, by William A. Bryant & E.W. Hart, Interim Revision 2007.

KWC Engineers (**KWC 2019**), Tentative Tract Map No. 37550, The Trails at Corona, City of Corona, Job No. 15.1511.1, plot date April 11, 2019.

Riverside County Planning Department (**Rivco 2019**), Review Comments, County Geologic Report No. 19001, "Report of Supplementary Geotechnical Investigation & Grading Plan Review, Proposed Residential Development of 'The Trails at Corona'', Tentative Tract No.'s 37500, 37501, 37502, 37503 and 37504, Corona, California, February 5, 2019.

United States Geological Survey (**USGS 2002**), Geologic Map of the Corona South 7.5' Quadrangle, Riverside and Orange Counties, California, Version 1.0, by C.H. Gray, Jr., D.M. Morton & F.H. Weber, Jr., released January 24, 2002.


## AERIAL PHOTOGRAPHS REVIEWED

| Source | Flight No. | Photo No. | Date Flown |
|---|---|---|---|
| Continental Aerial Photo, Inc. | 4F | 98, 99, 100 | 5-5-49 |
| Continental Aerial Photo, Inc. | 18-W | 163 | 11-6-59 |
| Continental Aerial Photo, Inc. | 4HH | 178, 179, 181 | 5-15-67 |
| Continental Aerial Photo, Inc. | 60-4 | 101, 102 | 1-30-70 |
| Continental Aerial Photo, Inc. | 132-12 | 1, 2 | 11-5-73 |
| Continental Aerial Photo, Inc. | 157-13 | 5, 6 | 1-13-75 |
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| Continental Aerial Photo, Inc. | 80033 | 29 | 2-25-80 |
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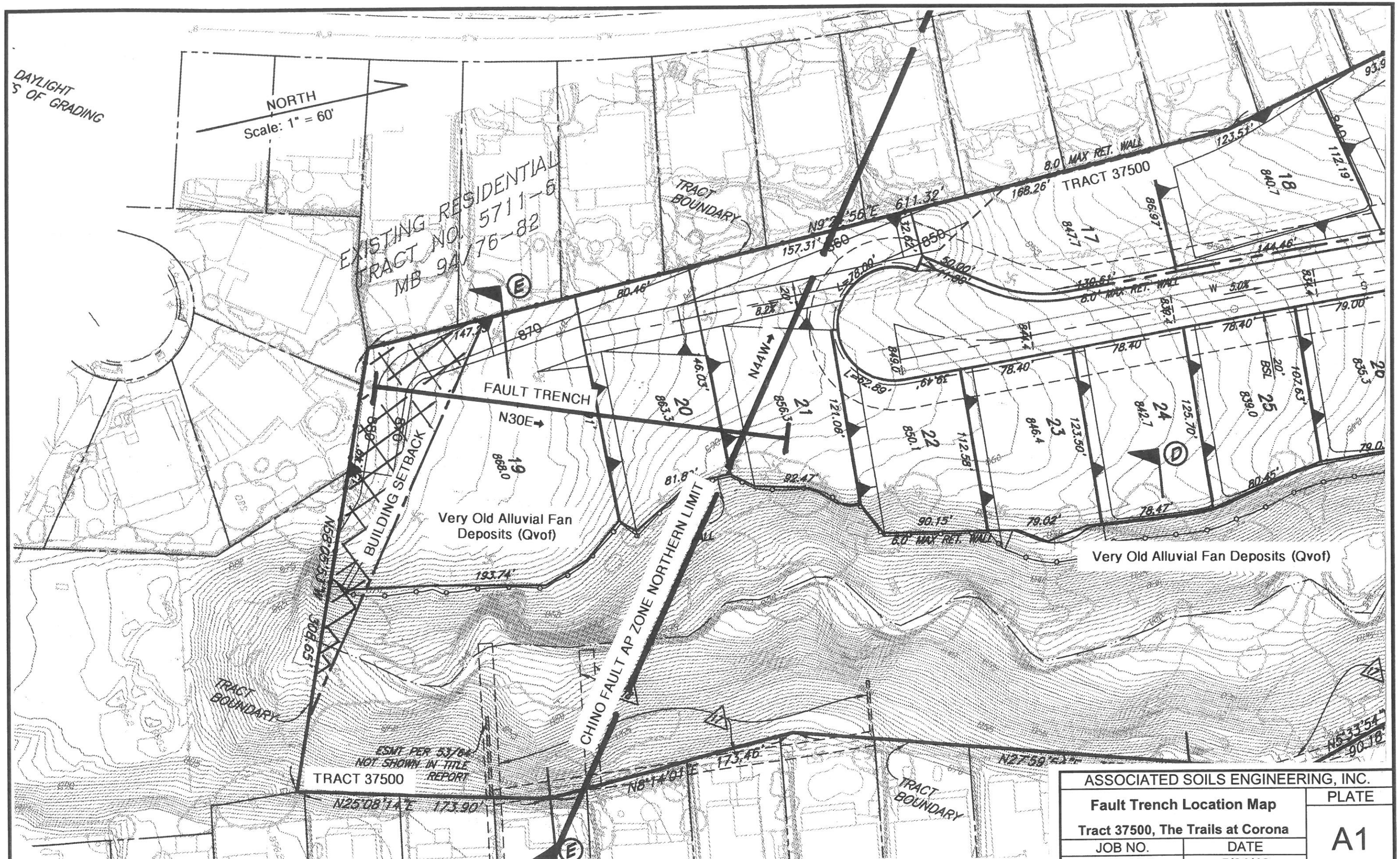
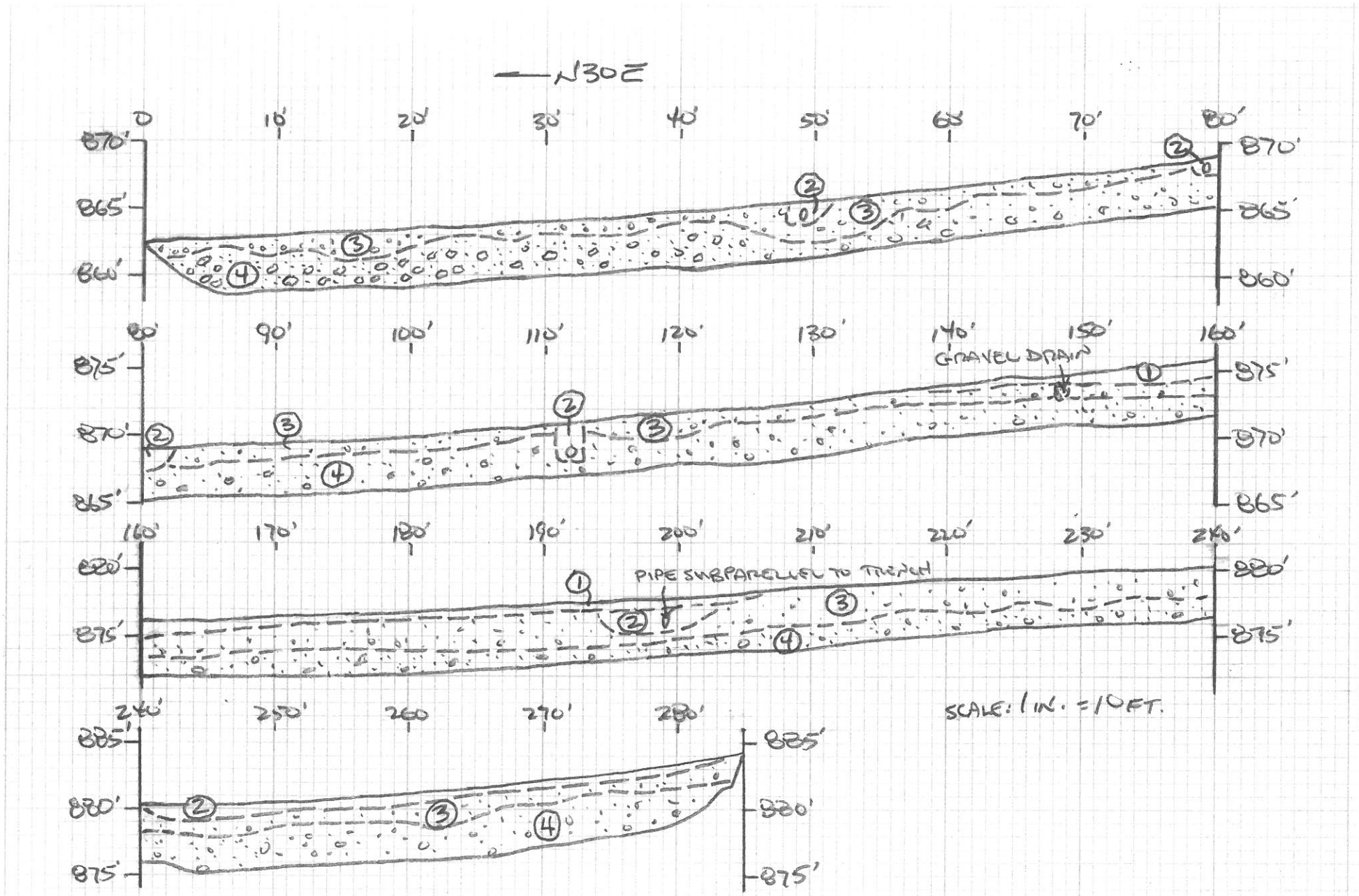
| Continental Aerial Photo, Inc. | C84-14 | 21, 22 | 6-12-90 |
| Continental Aerial Photo, Inc. | C92-15 | 293, 294 | 5-19-93 |
| Continental Aerial Photo, Inc. | C103-33 | 234, 235 | 1-29-95 |
| Continental Aerial Photo, Inc. | C118-33 | 148, 149 | 10-16-97 |
| Continental Aerial Photo, Inc. | C-133-33 | 234, 235 | 2-23-99 |




| ASSOCIATED SOILS ENGINEERING, INC. | |
|---|---|
| **Fault Trench Location Map**<br>**Tract 37500, The Trails at Corona** | PLATE<br>A1 |
| JOB NO. | DATE |
| **6619.19.2** | **5/31/19** |




| FAULT TRENCH EXPLANATION | |
|---|---|
| UNIT | DESCRIPTION |
| ① | Artificial Fill (af)<br>Sand, white, fine to coarse, loose, golf course bunker fill. |
| ② | Silty Sand with Gravel, brown to reddish brown, dry to moist, loose, common roots, surficial and pipe trench backfill. |
| ③ | Very Old Alluvial Fan Deposits (Qvof)<br>Clayey Silt with Sand & Gravel, Bt Horizon, yellowish red (5YR 4/6-5/8 to strong brown (7.5YR 4/6-5/6), dry, desiccated, small roots, pin head pores, columnar structure with clay film on fracture surfaces, scattered very fine to coarse sand, some angular decomposed granitic cobbles. |
| ④ | Grades from above to Sandy Silt and Clayey Sand with Gravel, reddish yellow to strong brown (5YR 4/6-6/8), moderately to well indurated, slightly moist becoming moist with increasing with depth, blocky fracture with clay film on surfaces, fine to coarse sand and gravel, grusified granitic cobbles and small boulders. |

| ASSOCIATED SOILS ENGINEERING, INC. | | |
|---|---|---|
| **Fault Trench Log**<br>**Tract 37500, The Trails at Corona** | | PLATE |
| JOB NO. | DATE | A2 |
| **6619.19.2** | **5/31/19** | |

ASSOCIATED SOILS ENGINEERING, INC.
Consulting Geotechnical Engineers

# REPORT OF SUPPLEMENTAL GEOTECHNICAL INVESTIGATION & GRADING PLAN REVIEW

**Proposed Residential Redevelopment of "The Trails at Corona"**

**Tentative Tract Map No.'s 37500, 37501, 37502, 37503 & 37504**

**Corona, California**

***Prepared For:***

**BLUE RIVER DEVELOPMENT**

**c/o Oxbow Partners**

**2855 Pacific Coast Highway, Suite 227**

**Corona del Mar, California 92625**

**Project No. 6619.18.1** **November 19, 2018**

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ASSOCIATED
SOILS ENGINEERING, INC.
Consulting Geotechnical Engineers

November 19, 2018
Project No. 6619.18.1

**Blue River Development**
**c/o Oxbow Partners**
2855 Pacific Coast Highway, Suite 227
Corona del Mar, California 92625

Attn.: Mr. Tom Grabiel

Subject: **REPORT OF SUPPLEMENTARY GEOTECHNICAL INVESTIGATION & GRADING PLAN REVIEW**
Proposed Residential Development of "The Trails at Corona"
Tentative Tract No.'s 37500, 37501, 37502, 37503 and 37504
Corona, California

Ladies and Gentlemen:

Presented herewith is the Report of Supplemental Investigation and Grading Plan Review (the Soils Report) prepared by Associated Soils Engineering, Inc. (ASE) for the proposed development of "the Trails at Corona" project (the Residential Development) consisting of single-family residential structures (the Buildings) to be located within Tentative Tract No.'s 37500, 37501, 37502, 37503 and 37504, in the City of Corona, California (the Site). This work was conducted in accordance with ASE's Proposal No. 6619.18.1, dated August 2, 2018, and your subsequent authorization.

The subject geotechnical investigation was planned and performed based on the relevant development information provided by your office. Provided information included the Tentative Tract Maps for the subject Tracts, prepared by KWC Engineers and Plot-dated June 1, 2018, showing the preliminary grading parameters for the proposed residential development.

The purpose of this study was to evaluate the subsurface soils conditions at the Site, followed by performance of engineering analyses and formulation/assembly of recommendations for the geotechnical design and construction of the planned Buildings. ASE's study has concluded that the Residential Development is geotechnically feasible, provided that the recommendations and design guidelines with respect to site grading and foundation construction presented in the Soils Report are incorporated in the project plans and design, and implemented during construction. This Soils Report also incorporates 1) the findings of the geotechnical field investigation, 2) the summary of potential geological/seismic hazard assessment, and 3) the results of laboratory tests performed.

We at ASE appreciate the opportunity to provide our professional services on this important project, and look forward to assisting you during site grading and construction of the Residential Development and associated appurtenant improvements.

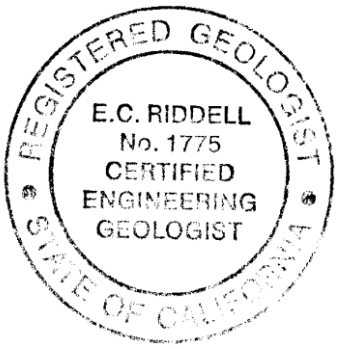
If you have any questions or require additional information, please contact the undersigned.

Respectfully submitted,
**ASSOCIATED SOILS ENGINEERING, INC.**

Lawrence J.D. Chang, P.E.
Geotechnical Engineer, RGE 2881

Edward C. (Ted) Riddell, P.G.
Engineering Geologist, CEG 1775

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## 1.0 INTRODUCTION

This Soils Report presents the results of ASE's supplemental geotechnical investigation and grading plan review for the proposed new residential development (the Residential Development) consisting of single-family residential structures (the Buildings) located within the former Mountain View Golf Course in the City of Corona, California (the Site). The approximate location of the Site and configuration of the Tracts is shown on the Site Location Map (Figure 1). The purpose of this supplemental investigation was to evaluate the general subsurface soil conditions at the Site and provide geotechnical recommendations for the design and construction of the Residential Development. This Soils Report presents the summary of the data collected, and the results of ASE's engineering evaluations/analyses, which provide the basis for the formulation of relevant geotechnical conclusions and recommendations.

### 1.1 Project Description

The following provided project information is understood to be applicable at the time of preparation of this Soils Report.

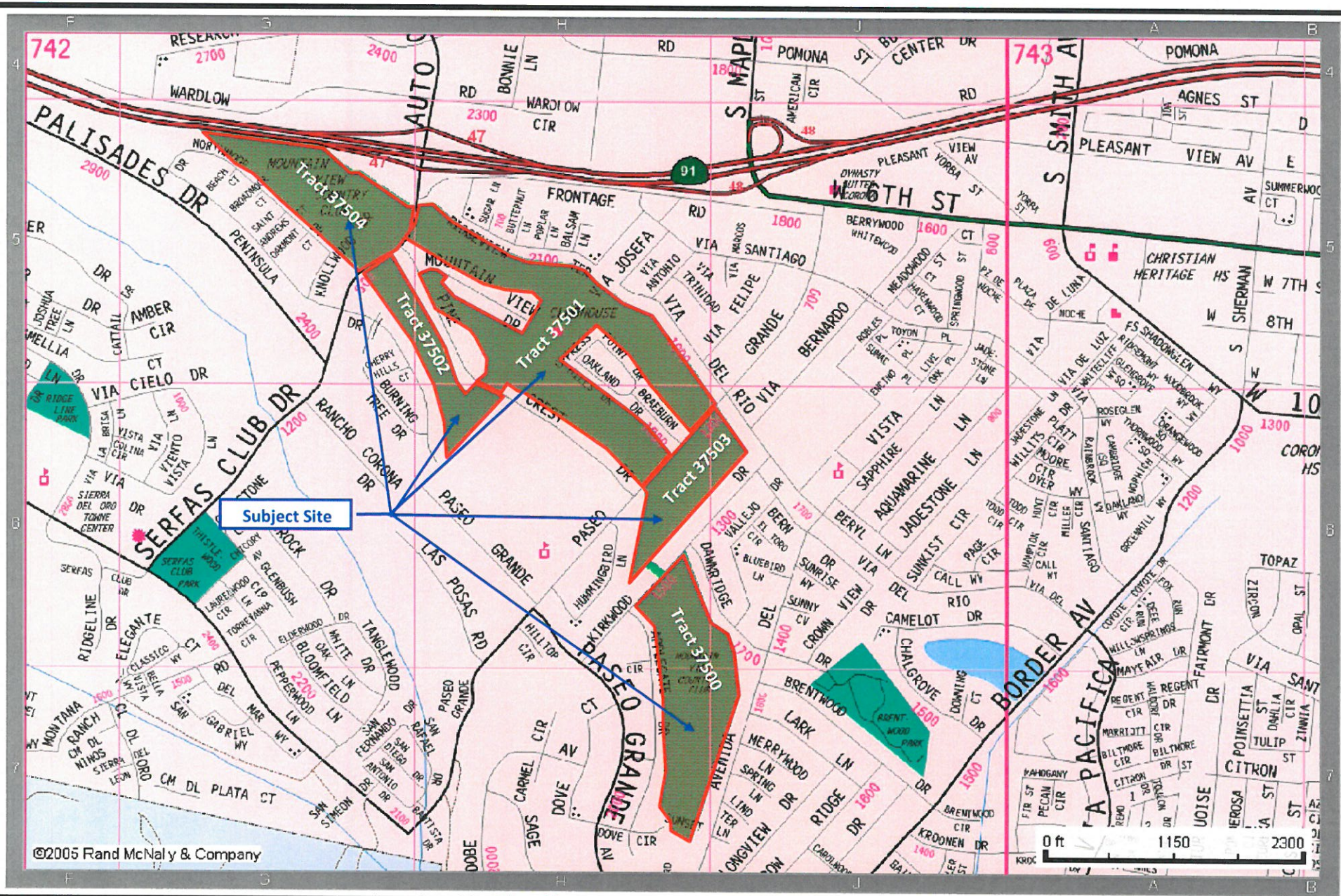
#### 1.1.1 Building/Development Concepts:

The proposed Residential Development is to be located on five (5) separate Tracts of the former Mountain View Golf Course in the City of Corona, California. The five Tentative Tract No.'s are loosely defined as follows:

- TT 37500, Lots 1-56 – Former golf holes southeast of Kirkwood Drive,
- TT 37501, Lots 1-225 – Former golf holes northwest of Paseo Grande and southeast of Serfas Club Drive, including former Golf Clubhouse parcel,
- TT 37502, Lots 1-47 – Former golf holes southeast of Serfas Club Drive and Southwest of Pine Crest Drive,
- TT 37503, Lots 1-31 – Former Golf holes southeast of Paseo Grande and northwest of Kirkwood Drive,
- TT 37504, Lots 1-67 and Commercial Pad – Former golf holes southeast of State Route 91 and west of Serfas Club Drive.

The new residential Buildings will consist of single and two-story frame, stucco and masonry construction. According to the proposed grading as shown on the Tentative Tract Maps (TTM), typical cut/fill grading will be utilized to create individual building pads for subsequent construction of the Buildings, along with associated streets, parkways, slopes and common areas. Cuts and fills are proposed to the existing grades with the following maximums on a per tract basis:

- TT 37500 – cuts up to 15 feet, fills up to 20 feet;
- TT 37501 – cuts up to 19 feet, fills up to 10 feet;





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# Site Location Map

| | |
|---|---|
| Proj. Name: | **Proposed "The Trails at Corona" Residential Development** |
| **Figure 1** | Proj. No.: **6619.18.1** |
| | Date: **November, 2018** |

- TT 37502 – cuts up to 14 feet, fills up to 13 feet
- TT 37503 – cuts up to 13 feet, fills up to 15 feet;
- TT 37504 – cuts up to 17 feet, fills up to 13 feet.

1.1.2 Structural Loading:

In the absence of structural loading information, ASE assumed that the Buildings will be supported by isolated pad footings and continuous spread footings, with a maximum concentrated column load (dead plus live loads) on the order of 20 to 50 kips, and with a maximum line load (dead plus live loads) of 2,000 to 4,000 pounds per linear foot. Tolerable total and differential settlements resulted from the aforementioned structural loadings on the order of one (1) inch and one-quarter (¼) inch over a distance of 30 feet, respectively, have also been assumed by ASE.

## 1.2 Scope of Exploration

In accomplishing the subject investigation, ASE's staff had performed the following geotechnical tasks:

A. Review of readily available background information, including in-house geotechnical data, geotechnical literature, geologic maps, seismic hazard maps, and literature relevant to the subject Site, specifically ASE's previous Report of Geotechnical Investigation dated March 29, 2016.

B. A geotechnical site reconnaissance to observe the general surficial soil conditions at the Site, map the surface geology and to select and mark suitable exploratory boring locations, followed by notification to Underground Service Alert (USA) of the planned boring operations at least 72 hours prior to field exploration.

C. Field exploration (including previous investigation) consisting of drilling twenty seven (27) exploratory borings with truck-mounted rotary drilling rig to depths ranging from 5 feet 1 inch to 46 feet 6 inches deep from the respective existing site grades. Field logging and sampling of soils encountered in the exploratory borings were carried out by ASE's engineer. Locations of the exploratory borings are also shown on the Geotechnical Maps, Plates A-1 through A-6, in Appendix A.

D. Laboratory testing on retrieved representative soil samples for classification and for determination of pertinent engineering properties.

E. Engineering analyses of data obtained from literature review, and the site and laboratory testing covering the following aspects:

- Evaluation of general subsurface conditions and description of types, distribution, and engineering characteristics of subsurface materials.
- Assessment of geologic/seismic hazards based on the pertinent criteria required by the California Geological Survey (CGS).

- Determination of the seismic design parameters in accordance with Chapters 16 and 18 of the California Building Code, 2016 Edition (2016 CBC).
- Evaluation of the suitability of on-site soils for foundation support and establishment of qualification criteria for on-site or imported fill material.
- Recommendations for site grading and subgrade preparation, inclusive of slab-on-grade and pavement support and geotechnical design criteria.
- Recommendations for design of shallow foundations such as conventional footings, including allowable soils bearing capacity, estimated settlement, and lateral resistance.
- Recommendations for temporary excavation and shoring.
- Evaluation of the corrosion and expansion potential of the on-site materials.

F. Preparation of this Soils Report presenting the work performed and data acquired, as well as summarizing our conclusions and geotechnical recommendations for the design and construction of the Residential Development.

*Please note that ASE's geotechnical investigation did not include any evaluation or assessment of hazardous or toxic materials which may or may not exist on or beneath the site. ASE does not consult in the field of potential site contamination/mitigation.*

## 2.0 SITE AND SUBSURFACE CONDITIONS

### 2.1 Location, Boundary Conditions and Existing Development

The Site is located within the grounds of the Mountain View Golf Course in and around the former Golf Clubhouse at 2121 Mountain View Drive, in the City of Corona, California. The overall project extends from State Route 91 on the northwest to south of Kirkwood drive on the southeast.

The Site consists of the former Mountain View Golf Course holes and Clubhouse. The former golf course itself is generally located within the natural drainage courses which run from the southeast (TT 37500) toward the northwest (TT 37504). The sides of each of the drainage courses are lined with existing residential development, with the exception of TT 37504, which is bound by the Riverside Freeway (SR 91) to the northwest and existing commercial development to the north.

### 2.2 Subsurface Conditions

2.2.1 Artificial Fill (af):

Artificial fill was observed in four (4) of ASE's exploratory borings to approximate depths of 1 foot in Borings B-1 and B-4, 2.5 feet in Boring B-3, and 4 feet in Boring B-10. The encountered artificial fill generally consists of dark yellowish brown to brown to light yellowish brown silty fine to medium

sand, clayey fine to medium sand, silty fine sand with trace clay, and fine to medium sand. Leaf litter was encountered in Boring B-1. The encountered artificial fill material has been classified as "undocumented fill" and evaluated accordingly due to the lack of documentation substantiating prior compaction effort. Additional areas of artificial fill were mapped during geologic mapping as shown on the Geotechnical Maps, Plates A-1 through A-6.

2.2.2 Very Old Alluvial Fan Deposits (Qoal) / Young Alluvial Channel Deposits (Qal):

Native site soils consisting of early Pleistocene-age very old alluvial fan deposits and Holocene to late Pleistocene young alluvial channel deposits were encountered at-grade, or below the pavement sections and/or artificial fill, in ASE's borings. Per References 4 and 5, the very old alluvial fan deposits are found scattered along the foot of the Santa Ana Mountains and extending outward up to a distance of 3 km. Per the same references, the young alluvial channel deposits are associated with deposition of the Temescal and Wardlow Canyon Washes and their tributaries. Soils within these units were found to predominantly consist of sand, silt, and clay. In specific, on-site alluvial fan and channel soils consist of silty sands, silty sands with clay, silty sands with gravel, clayey sands, clayey sands with gravel, clayey sands and gravel, gravelly sand with silt, clayey gravel with sand, silty clays, silty clays with sand, sandy clays, clayey silts, sandy silts, sandy silts with clay, and silts with sand. Plates A-1 through A-6 show geologic material distribution within the project Sites.

Site subsurface soils were, in general, in a damp to very moist condition within the explored depths at the time of ASE's site investigations. Blow counts recorded from advancing Modified California barrel sampler and Standard Penetration Test (SPT) sampler empirically indicate that the granular, sandy soils (i.e. silty sands/clayey sands) are in a loose to very dense state, while the fine-grained, cohesive soil strata (i.e. silts/clays) generally exhibit firm to hard consistencies.

More detailed descriptions of soils encountered and conditions observed during the subsurface exploration are shown in the Field Logs of Borings ("B" Plates) in Appendix A, together with information of soil classifications, depths and types of soil samples, blow counts, field dry densities and moisture contents, and corresponding laboratory tests performed.

Please note that the subsurface soils descriptions presented above have been interpreted from conditions exposed during the field investigations and/or information inferred from the reviewed geologic literature. As such, it is likely that not all of the subsurface conditions at the Site could be captured or represented. It is therefore essential that the Geotechnical Consultant should be on site during grading and foundation construction such that information/recommendations deciphered during preliminary and supplemental geotechnical investigation phases could be verified and, if necessary, amended as appropriate.

## 2.3 Groundwater and Caving

During field exploration, groundwater was not encountered to the maximum explored depth of 46 feet 6 inches in Boring B-5. A search on Google Earth indicates that the subject Site ranges from approximately 588 to 607 feet above Mean Sea Level (MSL) in TT 37504, and 758 to 841 feet above Mean Sea Level (MSL) in TT 37500.

Information available from the State of California Department of Water Resources website (www.water.ca.gov/waterdatalibrary/groundwater/hydrographs) indicates that the historic high groundwater level in Well No. 03S07W35B001S, close to the Site at the southwest corner of South Lincoln Avenue and South Smith Avenue, was 111.7 feet below ground surface elevation on March 16, 2015. The ground surface elevation of the well is 729.0 feet above MSL, or 141 feet higher to 112 feet lower than minimum and maximum Site grades. The depth to groundwater for the most recent reading in this well (taken October 15, 2015) was 114.6 feet below grade. Additional information from the State of California Water Resources Control Board Geotracker website (http://geotracker.waterboards.ca.gov) indicates that the minimum depth to groundwater in remediation/groundwater monitoring well B-23 located on the west side of Serfas Club Drive just south of the 91 Freeway offramp, i.e. 800 Serfas Club Drive, was 94.31 feet deep, read on March 7, 2006.

Generally, seasonal and long-term fluctuations in the groundwater may occur as a result of variations in subsurface conditions, rainfall, run-off conditions and other factors. Therefore, variations from the limited observations made in ASE's exploratory borings during the time of field investigation cannot be ruled out. Also, the use of hollow-stem augers during drilling precluded observation of potential caving conditions which may have otherwise occurred in an uncased hole. While caving and/or sloughing were not measured during the extraction of auger stem at the completion of boring operations, the potential for caving and/or soil sloughing cannot be ruled out in excavations greater in dimension that our exploratory borings.

## 2.4 Utilities

No overhead or underground utilities were encountered within the area of ASE's on-site investigation. However, underground and overhead lines are present which service the existing site structures, and are along the site bordering and crossing streets. Irrigation lines are present in turf and planter areas. Other utilities, though not known at the time of this report preparation, may be present on site, and should be located and incorporated into site development plans accordingly.

# 3.0 GEOLOGY

## 3.1 Regional Geologic Setting

The Site is located within the Chino Basin at the southeastern end of the Northeastern Block of the Los Angeles Basin. The Los Angeles Basin is a large northwest-trending synclinal depression at the northwestern

end of the Peninsular Ranges geomorphic Province of California. The Northeastern Block is southwesterly bounded by the Whittier Fault Zone, located approximately 1.9 to 2.2 miles (3.1 to 3.6 km) from the Site, and the Cucamonga Fault Zone, located approximately 18.1 to 19.3 miles (29.1 to 31.0 km) from the Site.

## 4.0 FAULTING AND SEISMICITY

Corona, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto, Newport-Inglewood and Whittier-Elsinore fault zones.

By the definition of the CGS, an active fault is one which has had surface displacement within the Holocene Epoch (roughly the last 11,000 years). The CGS has defined a potentially active fault as any fault which has been active during the Quaternary Period (approximately the last 1,600,000 years). These definitions are used in delineating Earthquake Fault Zones as mandated by the Alquist-Priolo Geologic Hazard Zones Act of 1972 and as subsequently revised in 1997 as Alquist-Priolo Earthquake Fault Zoning Act and Earthquake Fault Zones. The intent of the act is to require fault investigations on sites located within Special Studies Zones to preclude new construction of certain inhabited structures across the trace of active faults. The area of the proposed development has been located on the Corona South Quadrangle Earthquake Fault Zones Map and the southeastern-most portion of the parcel identified as TT 37500 (Lots 19 through 21) is located within a "Fault Rupture Hazard Zone" as defined in the "Alquist-Priolo Earthquake Fault Zoning Act" of the State of California Geologic Survey (formerly known as the Division of Mines and Geology). This portion of the Site is underlain by the Elsinore/Chino Fault Zone, a known active fault. The remaining Tentative Tract Map No.'s, 37501, 37502, 37503, and 37504, are not located within the Alquist-Priolo Earthquake Fault Zone. No evidence of active or potentially active faulting was observed during our investigation.

A Fault Evaluation and Investigation Report is required for most development within a Fault Rupture Hazard Zone (FRHZ). For the purpose of this investigation, ASE has assumed that this was accomplished as a portion of the overall development of the existing residences that surround the zoned area and will not have to be replicated by ASE. The City of Corona should have on file the previous fault study reports for the area and a fault study is not a part of this investigation. If a site-specific fault study is required, ASE should be consulted for the additional investigation and analysis.

Several sources were researched for information pertaining to site seismicity. The majority of data was obtained from the program, EQFAULT, by Blake (2000) that allows for an estimation of peak horizontal ground acceleration (PGA) using a data file of approximately 150 digitized California faults. This program compiles information including the dominant type of faulting within a particular region, the maximum

earthquake magnitude each fault is capable of generating, the estimated slip-rate for each fault, and the approximate location of the fault trace.

### 4.1 2016 CBC Seismic Design Parameters

The earthquake design requirements listed in 2016 CBC and other governing standards account for faults classified as "active", in accordance with the most recent fault listing as per the United States Geological Survey (USGS) or the CGS. The seismic design of the proposed structures should be implemented in accordance with the applicable provisions stipulated in 2016 CBC unless otherwise specified by the governing authority having jurisdiction over the project.

The 2016 CBC seismic design criteria for the Site based on a Risk Category II and a scenario of Risk-Targeted Maximum Considered Earthquake ($MCE_R$) that carries a 2% exceedance probability in 50 years had been determined utilizing the U.S. Seismic Design Maps web-application available from the Seismic Design Maps and Tools webpage on the website of Earthquake Hazard Program of USGS (http://earthquake.usgs.gov/hazards/designmaps/usdesign.php). Summaries of the seismic coefficients for the Site are tabulated below.

| 2016 CBC SEISMIC DESIGN PARAMETERS | | | | | |
|---|---|---|---|---|---|
| **Seismic Parameter** | **Tentative Tract No.** | | | | |
| | 37501 | 37502 | 37504 | 37500 | 37503 |
| | **Recommended Value** | | | | |
| **Site Class** [b] | D | | | | |
| **Soil Profile Name** [b] | Stiff Soil Profile | | | | |
| **Site Coefficient, Fa** [c] | 1.0 | | | | |
| **Site Coefficient, Fv** [d] | 1.5 | | | | |
| **0.2-Second Spectral Response Acceleration, $S_S$** [e] **(g)** | 2.532 | 2.501 | 2.461 | 2.621 | 2.563 |
| **1.0-Second Spectral Response Acceleration, $S_1$** [f] **(g)** | 0.973 | 0.959 | 0.938 | 1.017 | 0.990 |
| **Adjusted 0.2-Second Spectral Response Acceleration, $S_{MS}$** [g] **(g)** | 2.532 | 2.501 | 2.461 | 2.621 | 2.563 |
| **Adjusted 1.0-Second Spectral Response Acceleration, $S_{M1}$** [h] **(g)** | 1.460 | 1.439 | 1.407 | 1.526 | 1.485 |
| **Design 0.2-Second Spectral Response Acceleration, $S_{DS}$** [i] **(g)** | 1.688 | 1.668 | 1.641 | 1.748 | 1.709 |
| **Design 1.0-Second Spectral Response Acceleration, $S_{D1}$** [j] **(g)** | 0.973 | 0.959 | 0.938 | 1.017 | 0.990 |
| **Long -Period Transition Period, $T_L$** [k] **(sec)** | 8 | | | | |
| **Mapped $MCE_G$ Geometric Mean Peak Ground Acceleration, PGA** [l] **(g)** | 0.978 | 0.965 | 0.949 | 1.022 | 0.993 |
| **Site Coefficient, $F_{PGA}$** [m] | 1.0 | | | | |
| **$MCE_G$ Peak Ground Acceleration adjusted for Site Class Effect, $PGA_M$** [n] **(g)** | 0.978 | 0.965 | 0.949 | 1.022 | 0.993 |
| **Risk Category** | **I or II or III** | | | **IV** | |
| **Seismic Design Category based on $S_1$** [o] | E | | | F | |

a Per 2016 CBC Table 1604.5
b Per 2016 CBC Section 1613.3.2
c Per 2016 CBC Table 1613.3.3(1)
d Per 2016 CBC Table 1613.3.3(2)
e Per 2016 CBC Figure 1613.3.1(1)
f Per 2016 CBC Figure 1613.3.1(2)
g Per 2016 CBC Equation 16-37
h Per 2016 CBC Equation 16-38
i Per 2016 CBC Equation 16-39
J Per 2016 CBC Equation 16-40
K Per ASCE 7-10 Figure 22-12
L Per ASCE 7-10 Figure 22-7
M Per ASCE 7-10 Table 11.8-1
N Per ASCE 7-10 Equation 11.8-1 = PGA x $F_{PGA}$
O Per 2016 CBC Table 1613A.3.5(2)

Please note that conformance to the 2016 CBC seismic design criteria does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not take place during the occurrence of a $MCE_R$ event. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive. Following a major earthquake, a building may be damaged beyond repair, yet not collapse. The Structural Consultant should review the pertinent parameters to evaluate the seismic design.

## 5.0 GEOLOGIC HAZARDS

### 5.1 Surface Fault Rupture and Ground Shaking

The majority of the Site is not located within an Alquist-Priolo Earthquake Fault Zone. However, the southeastern-most portion of the TT 37500 is within the Alquist-Priolo Earthquake Fault Zone. The known active Elsinore/Chino Fault Zone is shown adjacent to the Site, and crossing the Site in the southerly portion of TT 37500, on published maps reviewed. While evidence for active faulting was not observed by ASE in any of the exploratory borings completed during field investigation, the risk of surface rupture within Lots 19 through 21, inclusive, of Tentative Tract no. 37500 cannot be ruled out. Being in close proximity to several known active and potentially active faults, severe ground shaking should be expected during the life of the Residential Development.

### 5.2 Seismic Hazards

5.2.1 Liquefaction:

The term "liquefaction" describes a phenomenon in which a saturated cohesionless soil loses strength and acquires a degree of mobility as a result of strong ground shaking during an earthquake. The factors knows to the influence liquefaction potential include soil type and depth, grain size, relative density, groundwater level, degree of saturation, and both the intensity and duration of ground shaking. The soils to the maximum explored depth of 46 feet 6 inches consist predominantly of loose to very dense granular soils, and firm to hard silty/clayey soil strata.

During ASE's field exploration, groundwater was not encountered to the maximum explored depth of 46 feet 6 inches below grade in Boring B-5. Information available from the State of California Department of Water Resources indicates that the high groundwater level in a well east of the Sites is 111.7 feet below well grade, with the well grade 43 to 63 feet higher than site grades. In addition, information available from the Water Resources Control Board Geotracker website indicates that the minimum groundwater level in a well located on the west side of Serfas Club Drive just south of the 91 Freeway was 94.31 feet below grade.

Considering that: 1) groundwater was not encountered to a maximum explored depth of 46 feet 6 inches below existing grade, 2) the historic high groundwater level from the groundwater

monitoring wells located near the Site is 94.31 feet deep, 3) the as-graded soil condition of the Site is anticipated to result in soils exhibiting dense to very dense consistency in the upper ten (10) feet, and 4) the subsurface soils to the maximum explored depths generally consist of loose to very dense granular soils, and firm to hard fine-grained soils, the onsite subsurface soils encountered are deemed to exhibit negligible liquefaction potential.

5.2.2 Earthquake-Induced Landslides:

There is no indication that recent landslides or unstable slope conditions exist on or adjacent to the project Site that would otherwise result in an obvious landslide hazard to the proposed development or adjacent properties.

Due to the significant relief on or adjacent to the Site, the potential for seismic shaking, the loose nature of some site native soils, and the site remedial grading extents outlined in the Grading Section of this Soils Report, the potential for earthquake induced landslides in the future is deemed low, but cannot be totally ruled out, especially when the Site is impacted by prolonged torrential rains. However, subsequent to the recommended grading, as shown on the Tentative Tract Maps, and following the recommendations presented herein and in the attached General Earthwork & Grading Specifications, the potential for earthquake induced landslides is deemed to be very low.

5.2.3 Seismic Settlements:

Ground accelerations emitted from a seismic event can cause densification of loose soils both above and below the groundwater table that may result in settlements on ground surface due to volumetric compression of soil mass. This phenomenon is often referred to as seismic settlement and commonly takes place in relatively clean sands, as well as soils with low plasticity and less fines. The earth materials on site consist of loose to very dense silty sands and clayey sands, and firm to hard fine-grained soils. While the granular soils at the Site are considered non-liquefiable due to deep groundwater beneath the Site, as discussed in Section 4.2.1 above, they may still undergo seismically-induced volumetric densification during the MPE.

Settlement of on-site granular soils above the historic high groundwater contour as a result of seismically-induced densification (i.e. "dry" seismic settlement) is estimated to be less than one-half (½) inch after the completion of site grading outlined in Sections 6.1 and 6.2 below. Such magnitude of seismically induced “dry” soil settlement is expected to affect relatively large areas. Thus, the corresponding differential settlement over short distance is likely to be small.

5.2.4 Lateral Spreading:

Lateral spreading, a phenomenon associated with seismically-induced soil liquefaction, is a display of

lateral displacement of soils due to inertial motion and lack of lateral support during or post liquefaction. It is typically exemplified by the formation of vertical cracks on the surface of liquefied soils, and usually takes place on gently sloping ground or level ground with nearby free surface such as drainage or stream channel. Since there is no presence of "free surface" (unlined slopes, excavations, channels, etc.) on or near by the Site, and since the potential for liquefaction at the Site is nil, the potential for the occurrence of seismically-induced lateral spreading is unlikely on the Site.

5.2.5 Tsunamis and Seiches:

Due to the elevation of the Site and absence of nearby waterfront, hazard from a tsunami is considered very low.

Seiches are rhythmic movements of water within a lake or other enclosed or semi-enclosed body of water, generally caused by earthquakes. Since no lakes or other bodies of water lie on or near the site, the hazard from seiches is not present at the Site.

5.2.6 Flood Hazards:

The Site is located on the ESRII/FEMA Hazard Awareness site. Per ASE's review of FEMA Flood Insurance Rate Map Nos. 06065C0688G and 06065C1351G, both dated August 28, 2008, the majority of site parcels in Tentative Tract No.'s 37500, 37501, 37502 and 37503 are not located within the 100-year floodplain. However, the low TT 37504, as well as the northwesterly and southwesterly fringes of TT No.'s 37501 and 37502 are located within the 100-year floodplain. It should be noted that the "Limits of Detailed Study" of flood areas (i.e. Zones A and AE) stop at Kirkwood Drive, therefore no flood areas are shown extending into TT 37500. As such, 100-year flood hazard in TT 37500 should be evaluated by the Project Civil Consultant. In addition, the Project Architect or Civil Consultant should incorporate all requirements/ordinances regarding 100-year flood protection planning imposed by local governing authority.

## 6.0 GEOTECHNICAL CONSIDERATIONS AND RECOMMENDATIONS

Based on the results of field exploration, laboratory testing, and engineering analysis, it is ASE's geotechnical opinion that the construction of the Residential Development may be implemented as planned, provided that the ground preparation and foundation design criteria recommended herein are incorporated into the project plans and specifications and implemented during construction.

The major geotechnical factors affecting the design and construction of the Residential Development include the following:

1. Soil disturbances as a result of site demolition, clearing and excavation operations.

2. Presence of undocumented fill soils to depths ranging from 1 to 4 feet below existing site grades in areas of the planned Buildings.
3. Presence of loose, low density soils within the zone of foundation bearing stratum.
4. Presence of some soils that exhibit "Medium" expansion potential at shallow depth that may heave or shrink unevenly upon saturation and drying, respectively, resulting in potentially excessive uneven displacement of overlying foundations, structural improvements, flatworks, and pavements.
5. The need for raising site grade due to 100-year flood consideration that could incur undesirable consolidation settlement of underlying soil strata.

In consideration of the above factors, it is ASE's opinion that overexcavation and backfilling with properly compacted fill in the building pads of the Buildings, as recommended herein, will be essential to reduce unfavorable static foundation displacement caused by static settlements of underlying soils, and to provide satisfactory bearing stratum in support of the Buildings and appurtenant improvements. The grading recommendations provided herein should be reviewed and, if necessary, revised when final grading plans become available. It is assumed that some of the finish grades will be close to existing site grades (± one foot). However, raising grade in areas within the 100-year flood zones will be needed, and should be planned and designed by the Project Civil Consultant. ASE should be consulted for assessment of potential surcharge-induced soils settlement when raising of grade through fill placement is finalized.

Conventional shallow foundations comprising continuous spread footings and isolated pad footings bearing on properly compacted fill may be considered for structural support.

## 6.1 Site Preparation

6.1.1 Existing Improvements:

Prior to grading operations, it will be necessary to remove designated existing construction, including any remaining buried obstructions, which may be in the areas of the Residential Development construction. Structure removal should include foundations. Concrete flatwork and asphalt pavement should also be removed from the areas of proposed construction. Concrete and asphalt fragments from site demolition operations should be disposed of off-site, unless they can be stockpiled and processed to meet specifications for Crushed Miscellaneous Base ("CMB"), or Processed Miscellaneous Base ("PMB), as outlined in Sections 200-2.4 or 200-2.5, respectively, of the latest edition of the "Standard Specifications for Public Works Construction (i.e. the Greenbook), and reused as approved fill or base material.

6.1.2 Surface Vegetation:

Surface vegetation should be stripped from areas of proposed construction. Stripping should

penetrate six (6) inches into surface soils. Any soil contaminated with organic matter (such as root systems or strippings mixed into the soil) should be disposed of off-site or set aside for future use in non-structural landscaped areas. Removal of trees and shrubs should include rootballs and attendant root systems.

6.1.3 Underground Utilities:

Any underground utilities to be abandoned within the zone of proposed construction should be cut off a minimum of 5 feet from the area of the new structures. The ends of cut-off lines should be plugged a minimum of 5 feet with concrete exhibiting minimum shrinkage characteristics to prevent water migration to or from hollow lines. Capping of lines may also be required should the plug be subject to any line pressure.

Alternatively, deep hollow lines may be left in place provided they are filled with lean concrete or 2-sack control density fill (slurry fill). Unless otherwise assessed and approved by the Geotechnical Consultant, no filled line should be permitted within two (2) feet from the bottom of new footings. Local ordinances relative to abandonment of underground utilities, if more restrictive, will supersede the above minimum requirements.

## 6.2 Site Grading

In view of minimizing the potential adverse effects associated with the development of excessive total or differential settlement underneath the Buildings and structural improvements of the Residential Development, as well as to ensure uniform bearing competency for the foundations, slabs, driveways and hardscapes, preparation of on-site soils are recommended in the following sections.

6.2.1 Undocumented Fill/Disturbed Native Soils:

Undocumented fill soils ranging from 1 to 4 feet deep below existing grades were observed in ASE's exploratory Borings B-1, B-3, B-4, and B-10, and mapped in other areas of the project. As such, any undocumented fill soil encountered during site grading in the building pad areas of the Residential Development, as well as any native soils disturbed during demolition and clearing operations, should be excavated full depth under the observation and confirmation by the Geotechnical Consultant. Lateral extent of overexcavation beyond the perimeters of the Buildings, where possible, should be to a minimum distance equal to the depth of undocumented fill/disturbed soil encountered or five (5) feet, whichever is greater. For other secondary improvements such as free-standing walls or hardscape, the lateral extent of removal should be to a minimum distance equal to the depth of undocumented fill/disturbed soils encountered or one (1) foot, whichever is greater.

The exposed excavation bottom should be scarified/reworked to a minimum one (1) foot depth and recompacted to at least 90 percent relative compaction with a minimum moisture content of two (2) percentage points above optimum moisture content, prior to backfilling with approved soils as specified in Section 6.2.9. Unless otherwise stated, the measurement of relative compaction in this report should always refer to ASTM D1557-12 Test Method.

6.2.2 Expansive Soils:

Laboratory test results on near surface soil samples indicates a "Very Low" to "Medium" soil expansion potential (i.e. Expansion Indices, "EI" = 10 to 55 per ASTM D4829-11 Test Method) as defined in 2016 CBC. While foundation and slab design recommendations presented in this Soils Report have taken into account the likely presence of "Medium" expansive soils on site, it may be desirable that the soil expansion potential be re-evaluated through additional testing during or after rough grading operations to verify the design adequacy of foundation or slab-on-grade against the re-tested soil expansion potential as heterogeneity within soil mass is not uncommon.

Lightly loaded structural elements such as shallow foundations and slabs could undergo movements that might potentially result in distress due to the "Medium" expansion potential of site clayey/silty soils. Design provisions presented in Sections 6.2 and 6.3, such as the use of "Very Low" to "Low" expansive fill beneath lightly loaded structural elements, adequate reinforcements, deeper foundations or other measures, may help alleviate the effects of soils expansion but may not completely eliminate the problem

6.2.3 Remedial Grading:

Different areas across the project will require different depths of remedial grading that can be better defined when actual grading plans are developed. In general, to provide acceptable support for building foundations and slabs, it is recommended that on-site soils within the footprint of the Buildings be overexcavated and removed uniformly to a minimum depth of three (3) feet below existing grade or finish grade, whichever is lower, in areas exposing older alluvium (Map Symbol Qoal) and up to ten (10) feet below existing grades in areas of younger alluvium (Map Symbol Qal - i.e., canyon bottoms), and replaced with properly compacted fill such that the building foundations and slabs are supported on a re-engineered, compacted fill layer. The excavation bottoms should be near uniform. The overexcavation should extend laterally to a minimum distance equal to the depth of removal beyond the perimeters of the Buildings, wherever possible. Requirements on the quality, corrosivity and expansion potential of fill soils as per stipulated in Sections 6.2.9 and 6.2.10 below should be complied with.

Soils exposed at excavation bottoms to a depth of one (1) foot should be scarified, reworked and recompacted to exhibit a minimum 90 percent relative compaction with a minimum moisture

content of two (2) percentage points above the optimum moisture content prior to receiving fill placement. The exposed excavation bottoms should be observed, tested, and approved by the Geotechnical Consultant prior to placing compacted fill. In case of the presence of localized loose soils, the overexcavation needs to be deepened accordingly to delete the loose soil condition. However, this deepened overexcavation may be terminated when the exposed native, undisturbed soils exhibit a natural relative compaction greater than 85 percent, subject to the testing and inspection by the representative from the Geotechnical Consultant.

The Geotechnical Consultant should be provided with appropriate foundation details and staking during grading to verify that depths and/or locations of the recommended overexcavation are adequate. For areas on site that grading recommendations stipulated in both Sections 6.2.1 and 6.2.3 apply, the more stringent grading criteria between the two sections should govern.

The depth of overexcavation should be reviewed by the Geotechnical Consultant during the actual construction. Any subsurface obstruction, buried structural elements, and unsuitable material encountered during grading, should be immediately brought to the attention of the Geotechnical Consultant for proper exposure, removal and processing, as recommended.

6.2.4 Pumping and Heaving of Subgrade Soils:

Some site soils within the zone of recommended remedial grading were found to contain high moisture content at the time of ASE's site investigation, as evidenced in the respective Field Log of Boring in Appendix A. Therefore, pumping and/or heaving conditions may be anticipated during site overexcavation and grading operations. If soils exhibiting high moisture content are encountered during site overexcavation and grading, the grading contractor may need to use track-mounted equipment in lieu of rubber tire mounted, wherever possible.

If excavated site soils are highly moist or wet at the time of site grading, the excavated soils should be evenly spread and left aerated for a period of time to reduce the moisture content prior to being re-used. If project schedule does not allow prolonged drying of any encountered wet site soils, alternative measures such as using or blending with site drier soils or imported “Very Low” to “Low” expansive fill, may be considered. The Geotechnical Consultant should be consulted at the time of site grading for the assessment of such alternative measures.

When pumping and heaving conditions are observed with soils exposed at the overexcavation bottom, it will be necessary to deepen the overexcavation within the area of observed pumping and heaving an additional 18 inches, under the observation and evaluation of the Geotechnical Consultant’s representative. The area of the deepened overexcavation should subsequently be backfilled with 3/4” to 1” open-graded crushed rocks (per Section 200-1.2 of the Greenbook)

rammed tightly to form a stiffened platform to facilitate the ensuing fill placement and compaction. The crushed rock layer should be sandwiched top and bottom by a layer of filtering geofabric (such as Mirafi 140N or equivalent) prior to and after the placement of crushed rocks, respectively. Alternative, site-specific recommendations for stabilizing excavation bottoms may be provided by the Geotechnical Consultant based on a review of soil conditions exposed during site grading.

6.2.5 Bulking, Shrinkage and Hydro-consolidation:

Bulking and shrinkage occur when soils are excavated and recompacted on site. The bulking/ shrinkage due to the removal of the loose, on-site fill soils is estimated to be approximately 10 to 20 percent. For estimating purposes, ASE recommends that a shrinkage factor on the order of 15 percent should be considered for preliminary planning. The amount of shrinkage will vary with the depth of removal, stripping loss, and actual field conditions at the time of grading. Shrinkage figures should therefore be considered rough estimates only and should be confirmed in the field during grading.

As evidenced by the results of One-Dimensional Consolidation Properties of Soils, Plates C-1 through C-22 in Appendix A, certain on-site soils up to twenty (20) feet deep could undergo substantial volumetric contraction upon moisture inundation, which could manifest on surface as significant and uneven subsidence, potentially causing distress to foundations if unmitigated. The completion of site remedial grading mentioned in Section 6.2.3 above could ensure hydro-consolidation potential for site soils up to eleven (11) feet deep from existing or finish grade, whichever is greater, will be minimized. Soils deeper than eleven (11) feet from existing or finish grade, whichever is greater, is less susceptible to excessive moisture infiltration and, thus, the impact of hydro-consolidation of soils, due to the depth.

6.2.6 Permanent Slopes

Based on the grading plan provided, it appears that proposed permanent cut and fill slopes will be formed across the project Site. The permanent slopes should have a slope ratio not greater than 2:1 (horizontal: vertical). Fill slopes constructed in natural ground with a gradient greater than 20 percent will require construction of a keyway at the toe of the fill slope. Slopes constructed in this manner are considered grossly and surficially stable. All cut slopes and keyways should be inspected and verified by the Geotechnical Consultant for the possible presence of loose sands, weak rock, fractures, adverse bedding, groundwater seepage or other forms of weakness that may affect slope stability. Recommendations and guidelines as stipulated in Appendix B, General Earthwork & Grading Specifications, should be adopted during hillside grading.

Upon fill slope grading, the slope faces should be overbuilt, cut to grade and compacted by back-rolling with a loaded sheepfoot roller at vertical intervals not to exceed 4 feet and track-walked upon

completion. The outer surface of the slope should be compacted to at least 90 percent relative compaction. To enhance the surficial stability of the fill slopes, slopes should be planted or otherwise covered as soon as feasible after grading. The use of purely Non-Plastic (NP) artificial earth materials such as poorly graded sand on slope faces should be avoided.

6.2.7 Temporary Excavation:

Excavations of site soils 4 feet or deeper should be temporarily shored or sloped in accordance with Cal OSHA requirements.

a) Temporary Sloping:

In areas where excavations deeper than 4 feet are not adjacent to existing structures of public right-of-ways, sloping procedures may be utilized for temporary excavations. It is recommended that temporary slopes in both fill and native soils be graded no steeper than 1.5:1 (H:V) for excavations up to 20 feet in depth. The above temporary slope criteria is based on level soils conditions behind temporary slopes with no surcharge loading (structures, traffic) within a lateral distance behind the top of slope equivalent to the slope height.

It is recommended that excavated soils be placed a minimum lateral distance from top of slope equal to the height of slope. A minimum setback distance equivalent to the slope height should be maintained between the top of slope and heavy excavation/grading equipment.
Should running sand conditions be experienced during excavation operations, flattening of cut slope faces, or other special procedures may be required to achieve stable, temporary slopes.

Soil conditions should be reviewed by the Geotechnical Consultant as excavation progresses to verify acceptability of temporary slopes. Final temporary cut slope design will be dependent upon the soil conditions encountered, construction procedures and schedule.

b) Temporary Shoring:

Temporary shoring will be required for those excavations where temporary sloping as specified above is not feasible.

Temporary cantilever shoring, if used, should be designed to resist an active earth pressure of 40 pounds per cubic foot (pcf) equivalent fluid pressure (EFP) for level soil conditions behind shoring. The resultant lateral deflection of shoring and surficial settlement immediately behind shoring are estimated to be on the order of one (1) to one and one half (1 ½) percent of the shored excavation depth. Should this ground deformation be intolerable to the existing structure, ASE should be consulted for more detailed analysis and further recommendations.

The design shoring should also include surcharge loading effects of existing structures and anticipated traffic, including delivery and construction equipment, when loading is within a distance from the shoring equal to the depth of excavation. In addition, a minimum uniform lateral pressure of 100 pounds per square foot (psf) in the upper ten (10) feet of shoring should be incorporated in the design when normal traffic is permitted within ten (10) feet of the shoring.

6.2.8 Exterior Slab-on-Grade/Concrete Flatwork/Hardscape/Pavement Support:

For the purpose of reducing future unsightly and uneven movements and cracks of any newly re-constructed exterior slab-on-grade, concrete flatwork, hardscape, or pavement, it is recommended that the upper eighteen (18) inches of soils below the bottom of and one (1) foot laterally beyond the footprint of exterior slab-on-grade/concrete flatwork/hardscape/pavement should consist predominantly of "Very Low" to “Low” expansive, suitable site, import or blended material (EI ≤ 35), compacted to at least 90 percent relative compaction with a minimum moisture content of two (2) percentage points above optimum moisture content. Prior to placement of the above recommended fill layer, the upper twelve (12) inches of exposed subgrade soils should be reworked to at least 90 percent relative compaction with a minimum moisture of two (2) percentage points above optimum moisture content.

From geotechnical viewpoint, new landscape area with only softscape is not subject to subgrade preparation and remedial grading requirements mentioned in Sections 6.2.1, 6.2.3 and 6.2.7.

6.2.9 Suitable Soils and Imported Soils:

Any soil re-used or imported as fill for the completion of subgrade preparation should consist of predominantly “Very Low” to “Low” expansive, granular material exhibiting an EI not greater than 35, and should be exhibiting a relatively uniform gradation, free of debris, particles greater than 4 inches in maximum dimension, organic matter or other deleterious materials. For the excavated on-site soils to be blended such that the resultant EI is not exceeding 35, a general rule-of-thumb would be blending one (1) part of excavated site soils with two (2) parts of imported “Very Low” (EI ≤ 20) expansive soils.

Unless otherwise approved by the Geotechnical Consultant, the fill materials should also comply with the soil corrosivity criteria tabulated on next page with respect to the desired concrete and reinforcement protection.

| Corrosivity Criteria for Select Fill and General Fill | | | |
|---|---|---|---|
| **Soluble Sulfate (% by weight) [1]** | **Soluble Chloride (ppm) [2]** | **Resistivity Value (ohm-cm) [3]** | **pH-Value [4]** |
| ≤ 0.1 | ≤ 500 | ≥ 2000 | 7.0 ~ 8.8 |

(1) California Test Method 417. (2) California Test Method 422. (3) ASTM G187-12a Test Method. (4) California Test Method 532.

All blended material and potential import material must be approved by the Geotechnical Consultant or his representative, prior to its use and arrival on site, and should be subjected to continuing verification testing during site grading.

6.2.10 Backfilling and Compaction Requirements:

Unless indicated otherwise, existing site soils having EI ≥ 35 are considered suitable for re-use as fill in depths greater than two (2) feet from finish subgrade during site grading within the footprint of the Buildings and flatworks. Any fill placed within two (2) feet from finish subgrade should exhibit a tested EI ≤ 35. This could be achieved by using approved "Very Low" to "Low" site soils , imported "Very Low" to "Low" expansive soils, or blended site soils and imported soils with a tested "Very Low" expansive soils, as per discussed previously in Section 6.2.3. There is no depth restriction to the re-use of site soils for fill in non-structural or landscape areas, and backfilling of utility trenches. All fill soils should also be ensured that they are 1) free of debris, particles greater than 4 inches in maximum dimension, organic matter or other deleterious materials, 2) not environmentally contaminated, and 3) adequately moisture conditioned to permit achieving the required compaction. No nesting of large particles (2 to 4-inch size) should be permitted during backfilling operations.

On-site soils and import materials approved for use as fill should be placed in horizontal lifts not exceeding 8 inches in loose thickness, moisture conditioned to a minimum of two (2) percentage points above optimum moisture content for "Low" expansive import or blended material, as well as for untreated site clayey/silty soils, and to a minimum of one (1) percentage point above optimum moisture content for "Very Low" expansive import material, and compacted to a minimum 90 percent relative compaction, per ASTM D1557-12 Test Method, unless otherwise stated.

6.2.11 Tests and Observations:

All subgrade preparation, compaction, and backfill operations should be performed under the observation of and testing by the Geotechnical Consultant's field representative. An adequate number of field tests should be taken to ensure compliance with this report and local ordinances.

If it is determined during grading that site soils require overexcavation to greater depths for obtaining proper support for the proposed structures, this additional work should be performed in accordance with the recommendations of the Geotechnical Consultant.

Imported fill soils or base materials should be examined by a representative of this office, and tested as necessary for evaluating their suitability for use as fill prior to being hauled to the Site. Final acceptance of any imported soil will be based upon review and testing of the soil actually delivered to the Site. All blended soils to be used as fill must be tested and approved by the Geotechnical Consultant prior to being used for fill placement.

## 6.3 Foundation Design

It is ASE's opinion that conventional continuous spread footings and isolated pad footings or alternative PT slabs bearing on approved compacted fill soils may be used to provide foundation support for the Buildings, provided that the site grading recommendations presented in Section 6.2 above are incorporated in project planning and design, and implemented during site construction. Presented below are the recommended geotechnical design and construction criteria for shallow footing foundation, slab-on-grade, and PT slabs.

### 6.3.1 Conventional Shallow Footing Foundation:

a) Minimum Footing Dimension and Reinforcement:

In order to mobilize sufficient soils bearing capacity supporting the new footings for the Buildings, it is recommended that the following tabulated minimum footing embedments, widths and reinforcements for various footing types be considered.

| Minimum Footing Dimension & Reinforcement | | | | | |
|---|---|---|---|---|---|
| Continuous Spread Footing/Strip Footing | | | Isolated Pad Footing | | |
| Depth [1] (in) | Width (in) | Reinforcement [2] | Depth [1] (in) | Width (in) | Reinforcement [2] |
| 18/24[3] | 15 | Four #4 bars – two near the top and two near the bottom | 18/24[3] | 30 square | Four #4 bars – two near the top and two near the bottom |

(1) Footing embedment measured from the nearest adjacent lowest soils grade.
(2) Based strictly from geotechnical point of view.
(3) Two-story construction/Three-story construction.

Foundation design details such as concrete strength, reinforcements, etc. should be established by the Structural Consultant.

b) Allowable Soils Bearing Capacity:

For footings complying with the minimum dimension requirements stipulated in Section 6.3.1 a) above, the allowable soils bearing capacities, inclusive of both dead and live loads, should be as per tabulated below:

| Allowable Soils Bearing Capacity (psf) | | Increase per 12-inch Increment in Footing Width (psf) | Increase per 12-inch Increment in Footing Depth (psf) | Maximum Composite Ceiling Value (psf) |
|---|---|---|---|---|
| Continuous Spread Footing/Strip Footing | Isolated Pad Footing | | | |
| 2,000 | 2,000 | 50 | 300 | 3,000 |

The above allowable bearing capacities may be increased by one-third (1/3) when subject to short-term, transient loading induced by wind or seismic activities.

c) Lateral Resistance:

Resistance to lateral loads can be assumed to be provided by passive lateral earth pressure and by friction acting on structural components in permanent contact with the subgrade soils.

For site preparation implemented as per recommended in the above Section 6.2, lateral resistance on the sides of foundations may be computed using a passive lateral earth pressure of 220 pcf EFP for footings embedded into approved compacted fill soil, subject to a maximum of 2,200 psf. An ultimate coefficient of friction on the order of 0.3 may also be used for structural dead load acting between the footing bottom and the supporting soils. The above passive lateral earth pressure may be used in conjunction with the ultimate coefficient of friction in calculating composite lateral resistance, provided the passive lateral earth pressure value is reduced by one-third (1/3). The composite lateral resistance may be increased by one-third (1/3) under short term, transient wind or seismic loading.

d) Settlements:

Total static settlements resulting from compression of subgrade soils for conventional footings designed and constructed in accordance with the above criteria, and supporting maximum assumed dead plus live (D+L) column and wall loads mentioned in Section 1.1.2 above, are not anticipated to exceed one (1) inch, upon implementation of site preparation as per recommended in Section 6.2 above. A differential settlement on the order of 1/4 inch over a distance of 30 feet is anticipated between similarly loaded adjacent isolated pad footings, as well as for continuous wall footings over a distance of approximately 30 feet. Differential settlements on the order of 1/4 inch are anticipated between pad and wall footings supporting the assumed column/wall loads.

Please be reminded that the Geotechnical Consultant should be contracted for further evaluation and recommendations, as necessary, should final design structural loads exceed the maximum loads assumed in the above analyses by more than ten (10) percent.

6.3.2 Post-Tensioned Slabs:

If adopted, PT slabs should be designed based on the latest PTI design method (Reference 23), which is stipulated in References 24 and 25. Both of References 24 and 25 are part of the PT-slab

design procedures per 1026 CBC. The slabs should be designed for at least one (1.0) inch of differential settlement (static and dynamic) over the width of each building.

The following table presents suggested minimum coefficients to be used for soils with different degrees of expansion potential. For the encountered site soils, a "**MEDIUM**" soil expansion category should be considered for preliminary PT slab design, with verification on a lot-by-lot basis at the completion of rough grading:

| **PTI METOD (3RD EDITION) DESIGN PARAMETERS** | | | | | |
|---|---|---|---|---|---|
| **Thornswaite Index** | **-20** | **Soil Fabric Factor, Ft** | 1.0 | **Equilibrium Suction, pF** | 3.909 |
| **Surface Equilibrium Wet Suction, $(pF)_{wet}$** | 3.0 [a] | **Surface Equilibrium Dry Suction, $(pF)_{dry}$** | 4.5 [a] | | |

| **Soil Expansion Classification** | Very Low (EI ≤ 20) | Low (20 < EI ≤ 50) | Medium (50 < EI ≤ 90) | High (90 < EI ≤ 130) |
|---|---|---|---|---|
| **$(e_m)$ edge lift (ft)** [b] | 5.20 [c] | 4.64 [c] | 4.13 [c] | 3.78 [c] |
| **$(e_m)$ center lift (ft)** [b] | 9.00 [c] | 9.00 [c] | 8.55 [c] | 7.34 [c] |
| **$(y_m)$ edge lift (in)** | 0.25 | 0.62 | 1.11 | 1.61 |
| **$(y_m)$ center lift (in)** | 0.10 | 0.25 | 0.43 | 0.60 |

a. Values per PTI recommendations.
b. Soil parameters such as Atterberg Limits and % passing #200 have been derived from typical values available from Day (2005), Bowles (1996), and PTI (2004).
c. Governed by soil aspect consideration.

The above tabulated coefficients are considered minimums and may not be adequate to represent worst-case conditions such as adverse drainage and/or improper landscaping and maintenance. The above parameters are applicable provided structures have gutters and downspouts and positive drainage is maintained away from structures.

Deepened footings/edges around the slab perimeter must be used to minimize non-uniform surface moisture migration (from an outside source) beneath the slab. An edge depth of at least 12 inches should be considered for soils with "Low" to "Very Low" EI's and 18 inches for soils with "Medium" to "High" EI's. The bottom of the deepened footing/edge should be designed to resist tension.

The entirety of each Building should be underlain by a minimum 15-mil polyvinyl chloride membrane vapor barrier with a minimum overlap of 12 inches in all directions. In complying with the requirements of 2016 CRC Section R506.2.3, the interior slab should be placed in direct contact with the vapor retarder, underlain by four (4) inches of clean sand or aggregate as a capillary break. The concrete slab shall consist of a concrete mix design which will address bleeding, shrinking and curling. As an alternative from a geotechnical viewpoint, the impermeable visqueen layer may be sandwiched by at least 2 inches of clean sand top and bottom prior to casting of the slab.

6.3.3 Retaining Walls:

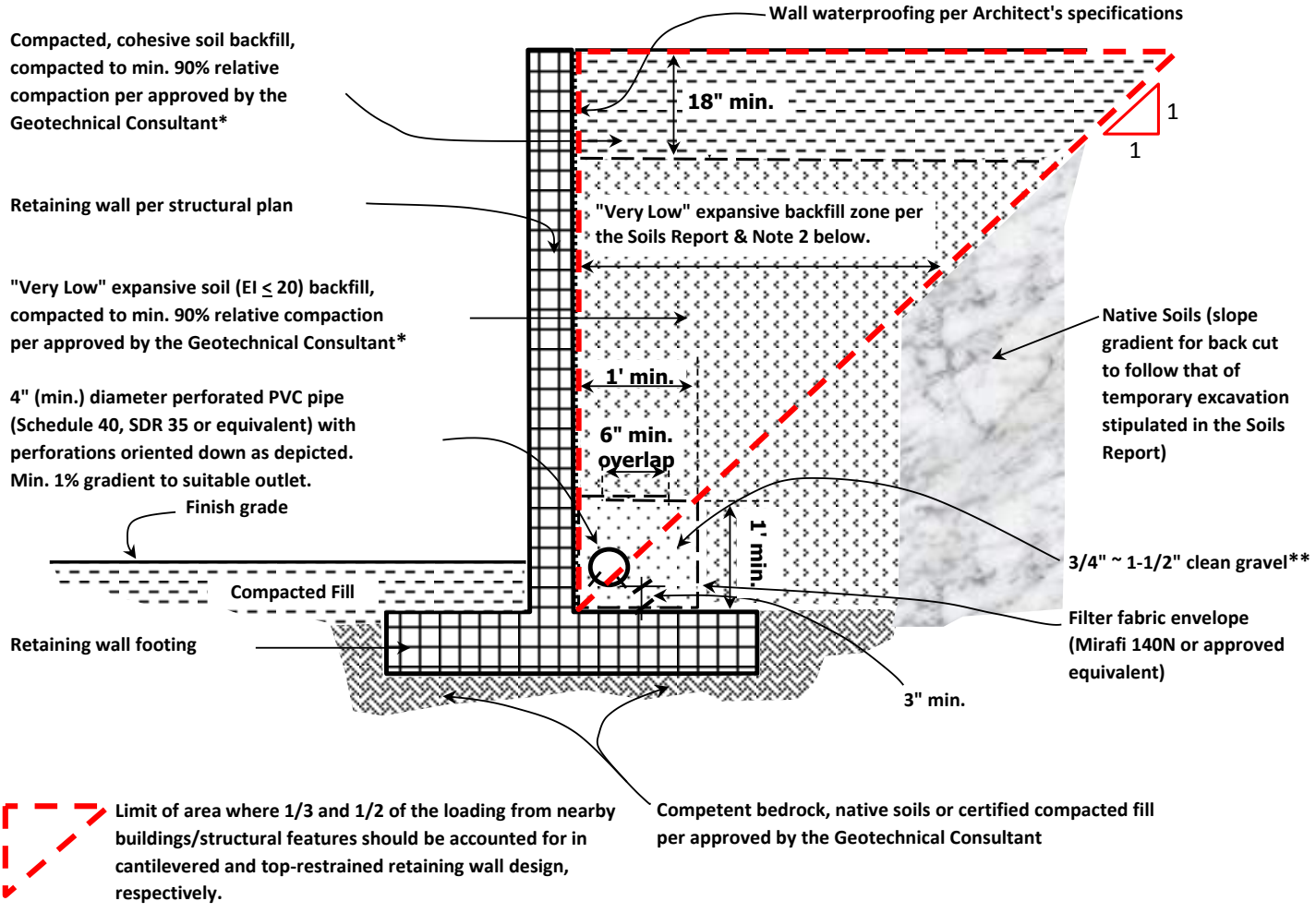
Cantilevered retaining walls should be designed for an "active" lateral earth pressure value tabulated on next page for approved granular backfill soils or site soils and level backfill conditions, whereas an "At-rest" lateral earth pressure value for approved granular backfill or site soils and level backfill conditions tabulated below should be used for top-restrained retaining walls. Retaining walls subject to uniform surcharge loads should be designed for an additional uniform lateral pressure equal to one-third (1/3) and one-half (1/2) of the anticipated surcharge pressure over the full retained height of the retaining wall (measuring from the top of wall to the heel of wall footing) for cantilevered and top-restrained wall fixity conditions, respectively, as shown in Figure 2, Nearby Building Surcharge Consideration and Retaining Wall Drainage Details. Any retaining wall with a retained height exceeding six (6) feet should additionally be designed to resist seismic lateral earth pressure. The Geotechnical Consultant should be consulted if this condition exists, or if the local governing agency requires the retaining wall to be designed for seismic lateral earth pressure regardless of the retained height. Footings should be reinforced as recommended to by Structural Consultant. Appropriate back drainage should be provided to avoid excessive build-up of hydrostatic wall pressures.

The Geotechnical Consultant should be on-site during temporary back cut and retaining wall construction to inspect and evaluate the stability of cuts and, if necessary, to provide additional remedial or mitigative recommendations.

| Retaining Wall Design Parameter | Value |
|---|---|
| Allowable Soils Bearing Capacity | 2,000 psf (1)(2) |
| Active Pressure [site soils/granular backfill (3): level] | 40/35pcf EFP |
| At-rest Pressure [site soils/granular backfill (3): level] | 60/55 pcf EFP |
| Passive Pressure (per foot of depth) | 220 pcf (4) |
| Coefficient of Friction | 0.3 (4) |
| Minimum Footing Depth | 18 inches |
| Minimum Footing Width | 15 inches |
| Minimum Reinforcement | Four No. 4 rebar - 2near top and 2 near bottom |

(1) Based on compliance with earthwork recommendations per Section 6.2 of this Soils Report.
(2) Allowable soils bearing capacity increase for larger retaining wall footings should be as per Section 6.3.1 b).
(3) Design values assuming a drained condition with "Very Low" to "Low" expansive materials (EI ≤ 30) within the backfill zone and no surcharge loading conditions.
(4) Passive lateral resistance may be combined with frictional resistance provided the passive lateral earth pressure is reduced by 1/3. See Section 6.3.1 c.

Preferably, the backfill should consist of approved "Very Low" to "Low" expansive material (i.e. EI ≤ 35) and should be compacted to a minimum relative compaction of 90 percent. Site soils may be used for retaining wall backfill as well. The width of the "Very Low" to "Low" expansive backfill zone should be a minimum of one (1) foot measured from the rear side of the stem of the retaining wall, or the space between the rear side of the stem and the heel of the retaining wall, or one-half (1/2)




| SPECIFICATIONS FOR CALTRANS CLASS II PERMEABLE MATERIAL | |
|---|---|
| U.S. STANDARD SIEVE SIZE | % PASSING |
| 1" | 100 |
| 3/4" | 90 ~ 100 |
| 3/8" | 40 ~ 100 |
| No. 4 | 25 ~ 40 |
| No. 8 | 18 ~ 33 |
| No. 30 | 5 ~ 15 |
| No. 50 | 0 ~ 7 |
| No. 200 | 0 ~ 3 |
| Sand Equivalent > 75 | |

* Based on ASTM D-1557-02

** If Caltrans Class II permeable material (see gradation to left) is used in place of 3/4" ~ 1-1/2" gravel, filter fabric may be deleted. Caltrans Class 2 permeable material should be compacted to minimum 90 percent relative compaction. Unless otherwise specified, a minimum of 1 cubic foot of gravel should be used for each 1 foot run of drain.

Note 1: Composite drainage products such as Contech C-Drain, Miradrain or J-Drain may be used as alternative to gravel or Class II. Installation should be performed in accordance with manufacturer's specifications.

Note2: Min. Extent of " Very Low" expansion backfill zone should be as per indicated by the red-dotted wedge area behind retaining wall.

**Schematic Not To Scale**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| | | | |
|---|---|---|---|
| Project: | Proposed "The Trails at Corona" Residential Development | | |
| Figure 2 | Nearby Building Surcharge Consideration & Retaining Wall Drainage Details | | |
| Proj. No.: | 6619.18.1 | Date: | November, 2018 |

of the retained height of the retaining wall, whichever is greater. In order to be able to use the "granular backfill" lateral earth pressure values tabulated above, the "Very Low" expansive backfill (i.e. EI≤20) zone should be as per the red-dotted wedge area behind the retaining wall indicated in Figure 2. Flooding or jetting of backfill should not be permitted. Granular backfill should be capped with 18 inches (minimum) of relatively impervious fill to seal the backfill and prevent saturation. Figure 2 illustrates the general configuration and requirements for retaining wall drainage. Should any conflict noticed between recommendations stated in this report and those shown in Figure 2, the fore should govern. Other retaining wall drainage alternatives may be considered but should first be reviewed and approved by the Geotechnical Consultant prior to implementation.

Should the space behind the new retaining wall be too tight to implement the above recommended backfill effort, as an alternative, 2-sack slurry fill may be used in lieu of regular soil backfill, provided that the integrity and functionality of wall backdrain is protected and maintained.

It should be noted that the use of heavy compaction equipment in close proximity to retaining structures can result in wall pressures exceeding design values and corresponding wall movement greater than that normally associated with the development of active or at-rest conditions. In this regard, the contractor should take appropriate precautions during the backfill placement.

6.3.4 Footing/Foundation Observation:

All footing/foundation excavations should be observed by the Geotechnical Consultant's representative to verify minimum embedment depths and competency of bearing soils. Such observations should be made prior to placement of any reinforcing steel or concrete.

## 6.4 Slabs-on-Grade in Non-Loading Areas

Concrete floor slabs in the Buildings and exterior concrete flatwork should be supported on properly compacted soils as recommended in the Site Grading section (i.e. Section 6.2) of this report. The slab subgrade soils should also be proof-rolled just prior to construction to provide a firm, unyielding surface, especially if the subgrade has been disturbed or loosened by the passage of construction traffic. Final compaction and testing of slab subgrade should be performed just prior to placement of concrete.

Per the 2016 CBC requirements, when the WRI/CRSI Design of Slab-on-Ground Foundations is adopted, the Effective Plasticity Index (EPI) should be utilized for slab-on-grade design. The EPI defined as the weighted plasticity index (WPI) x Cs x Co. Subsequent to grading, the building pad area is anticipated to be underlain by "Very Low" to "Low" expansive site or import (EI ≤ 35) soils above possibly deeper compacted site soils. However, it is of essential importance that the EPI's for final slab-on-grade design should be based on additional laboratory tests performed on soils samples retrieved from rough graded or stabilized building pad.

| Area | WPI | $C_S$ (1) | $C_0$ (2) | EPI |
|---|---|---|---|---|
| With expansive site soils (EI > 35) from finish subgrade | 22 | 1.0 | 1.0 | 22 |
| With 2' of "Very Low" to "Low" Expansive (EI ≤ 35) fill from finish grade(3) | 18 | 1.0 | 1.0 | 18 |

(1) For essentially flat ground, $C_s$ = 1.0.
(2) For over-consolidated foundation materials with unconfined compressive strength not exceeding 6000 psf, $C_0$ effect is deemed less significant.
(3) A PI of 0 is assumed for Select Fill.

For structural design of concrete slabs supported by approved compacted "Very Low" to "Low" expansive fill (EI ≤ 35) soils, a modulus of subgrade reaction ("k") on the order of 120 per square inch per inch ("psi/in"), and an allowable bearing capacity of 900 psf may be used. Interior and exterior slabs should be properly designed and reinforced for the construction and service loading conditions, as well as considering the soil expansion potential. To minimize slab distress due to soil expansion induced ground movement, geotechnically, it would be prudent to provide a minimum actual slab thickness of four (4) inches with minimum reinforcement consisting of number 3 reinforcing bars spaced maximum 18 inches on centers each way. The structural details, such as slab thickness, concrete strength, amount and type of reinforcements, joint spacing, etc., should be established by the Structural Consultant in accordance with pertinent sections in 2016 CBC.

The entire slabs within the Buildings should be underlain by an impermeable vapor barrier (minimum 15-mil-thick visqueen) per 2016 California Residential Code, Section R506.2.3. A minimum 12-inch overlap between visqueen sheets should be ensured during placement. All visqueen sheets should be puncture free prior to slab construction. Above the visqueen, the interior slab may be underlain by 2 inches of clean sand with a Sand Equivalent (S.E.) value tested per ASTM D2419-14 Test Method of no less than 30. The visqueen should also be underlain by a minimum 4-inch-thick capillary break layer consisting of aggregate complying with the following criteria:

| Sieve Size | 1/2 inch | No. 16 | No. 200 | Sand Equivalent |
|---|---|---|---|---|
| **Percent Passing** | 100 | 50 – 85 | < 15 | ≥ 50 |

Exterior slabs should be properly jointed to limit the number of concrete shrinkage cracks. For long/thin sections, such as sidewalks, expansion or control joints should be provided at spacing intervals equal to the width of the section. Slabs between 5 and 10 feet in minimum dimension should have a control joint at centerline. Slabs greater than 10 feet in minimum dimension should have joints such that unjointed sections do not exceed 10 feet in maximum dimension. Where flatwork adjoins structures, it is recommended that a foam joint or similar expansion material be utilized. Joint depth and spacing should conform to the ACI recommendations. It is, however, cautioned that uneven heaving of exterior slabs may develop in the future when prolonged irrigation or seepage permeates the subgrade soil, especially in areas that expansive soil pockets exist due to inadequate control or inspection of earthwork construction.

## 6.5 Site Drainage

Per Section 1804.3 of 2016 CBC, a minimum 5% descending gradient away from the Buildings of the Residential Development for a minimum distance of 10 feet should be incorporated for earth grade placed adjacent to the foundation. This descending gradient may be reduced to 2% for any impervious areas, such as concrete paved walkways, within the 10-foot zone. For areas where the 10-foot drainage distance is not attainable, alternative measure such as concrete-lined swales having a minimum 2% gradient may be adopted to divert the water away from the Buildings, provided that the minimum 5% gradient is maintained in the distance between the building footprint and the diversion measure such as swales. For more specific site drainage guidelines, the Civil Consultant should refer to the pertinent sections in 2016 CBC. However, final site drainage planning shall be decided by the Civil Consultant based on the functionality of the Buildings and the surficial coverage adjacent to the Buildings.

Any planter areas to be placed adjacent to structure perimeters should be provided with solid bottoms and a drainage pipe, to divert water away from foundation and slab subgrade soils. Excessive moisture variations in site soils could result in significant volume changes and movement.

## 6.6 Soil Corrosivity Evaluation

Soils corrosivity tests were performed on representative samples of site soil. These tests were meant to determine the corrosive potential of on-site soils to proposed concrete foundations/flatwork and underground metal conduits. The soils corrosivity test results are presented in Appendix A.

### 6.6.1 Concrete Corrosion:

Disintegration of concrete may be attributed to the chemical reaction of soils sulfates and hydrated lime and calcium aluminate with the cement. The severity of the reaction resulting in expansion and disruption of the cement is primarily a function of the concentration of soluble sulfates and the water-cement ratio of the concrete.

Soluble sulfate contents of 0.002% to 0.047% by weight have been recorded from testing per CTM 417 conducted on on-site soils, as indicated in Appendix A. Per Table 4.2.1 of ACI 318-14, soils exhibiting soluble content less than 0.1% by weight are classified as having “Not Applicable” sulfate exposure and “S0” sulfate exposure category. As such, for structural features to be in direct contact with on-site soils, the special geotechnical requirements on the type of Portland cement or water cement ratio corresponding to the tested “S0” sulfate exposure category as per stipulated in Table 4.3.1 of ACI 318-14 should be considered.

### 6.6.2 Metal Corrosion:

In the evaluation of soil corrosivity to metal, the hydrogen ion concentrates (pH) and the electrical resistivity of the site and backfill soils are the principal variables in determining the service life of

ferrous metal conduit. The pH of soil and water is a measure of acidity or alkalinity, while the resistivity is a measure of the soils resistance to the flow of electrical current.

Currently available design charts indicate that corrosion rates decrease with increasing resistivities and increasing alkalinities. It can also be noted that for alkaline soils, the corrosion rate is more influenced by resistivity than by pH-value.

Resistivity values of 1,190 to 1,641 ohm-cm per ASTM G187-12a Test Method coupled with pH-values of 7.41 to 7.91 per CTM 643, as shown in Appendix A, classify the on-site soils tested to be corrosive to buried ferrous metals. Based on CTM 643, the year to perforation for 18-gauge steel in contact with soils of similar resistivities and pH-values is approximately 27 to 31 years for the corrosive soils. In lieu of additional testing, alternative piping materials, i.e. plastic piping, may be used instead of metal if longer service life is desired or required. The resistivity values of on-site soils may also have implications to other building materials and depths of embedment for steel reinforcement etc., therefore it might be desirable that a qualified corrosion consultant be engaged to review the building plans.

Soluble chloride contents of 27 to 73 ppm were recorded in our laboratory tests per CTM 422. Per Caltrans guidelines and specifications (References 19 and 20), soils exhibiting soluble chloride contents exceeding 500 ppm are considered "corrosive". The soils are thus classified as "non-corrosive" per Caltrans criterion. In addition, special measure in terms of rebar protection against chloride corrosion under Exposure Class "C0" ("Not Applicable") stipulated in Tables 4.2.1 and 4.3.1 of ACI 318-14 may be required as a result of the soluble chloride content tested. However, the compliance with the corrosivity criteria stipulated in Section 6.2.9 above will ensure that no other particular reinforcement protection measure will be needed for slab-on-grade in contact with import fill.

### 6.7 Utility Trenches

All trenches should be backfilled with approved fill material compacted to relative compaction of not less than 90 percent per ASTM D1557-12 Test Method. Care should be taken during backfilling to prevent utility line damage.

The on-site soils may be used for backfilling utility trenches from one (1) foot above the top of pipe to the surface, provided the material is free of organic matter and deleterious substances. Any soft and/or loose materials or fill encountered at pipe invert should be removed and replaced with properly compacted fill or adequate bedding material.

On-site soils are not considered suitable for bedding or shading of utilities. Imported soils for pipe bedding should consist of non-expansive granular soils. Bedding materials should consist of sand with a Sand Equivalent value (ASTM Test Method D2419-14) not less than 30.

If sandy soils are used for trench backfill, the backfill should be topped with a minimum 2-foot thick cap of compacted fine-grained, cohesive soil. Also, a minimum 10-foot length of trench at the entrance and exit points of structures should be backfilled with fine-grained soils to serve as a plug to prevent water migration into structure foundation support zones.

The walls of temporary construction trenches may not be stable when excavated nearly vertical due to the potential for caving. Shoring of excavation walls or flattening of slopes as stipulated in Section 6.2.6 above will be required if excavation depths greater than 4 feet are necessary.

Trenches should be located so as not to impair the bearing capacity of soils or cause settlement under foundations. As a guide, trenches parallel to foundations should be clear of a 45-degree plane extending outward and downward from the edge of the foundations. All work associated with trenches, excavations and shoring must conform to the State of California Safety Code.

### 6.8 Plan Review, Observations and Testing

Once foundation and grading plans are completed, they should be forwarded to the Geotechnical Consultant for review of conformance with the intent of these recommendations and criteria presented in the pertinent sections of this report.

All excavations should be observed by a representative of this office to verify minimum embedment depths, competency of bearing soils and that the excavations are free of loose and disturbed materials. Such observations should be made prior to placement of any fill, reinforcing steel or concrete. All grading and fill compaction should be performed under the observation of and testing by a Geotechnical Consultant or his representative.

## 7.0 FIELD PERCOLATION TESTING AND ANALYSIS

Observation of water levels in Borings B-P1 through B-P5 after overnight pre-soaking indicated the time interval between readings should be 30 minutes. The percolation tests were performed using the normal soil method (i.e. six hour test maximum) for the borings in accordance with the Orange County Technical Guidance Document Appendices (Appendix VII) procedures modified to test the cross sectional zone of typical soils within the level of anticipated storm water infiltration (e.g. approximately 1 foot to 5 feet below existing grade).

Field percolation testing was conducted on January 13 and 27, 2016 for Borings B-P1 and B-P2, while Borings B-P3, B-P4 and B-P5 were tested on September 28, 2018. Stabilized field percolation test data indicates a preadjusted percolation test rate varying from approximately 2.67 to 120.0 minutes per inch (mpi) for clean water at each of the boring locations

Tabulated on the following table are the results of percolation testing conducted at the locations of Borings BP-1 through BP-5, including the infiltration rate derived from the Porchet Method of Percolation Rate Conversion procedures outlined in Appendix VII of the Technical Guidelines Document.

| | Depth Tested | Percolation Test Rate | Infiltration Rate* |
|---|---|---|---|
| **Boring No./TT No.** | **(Feet)** | **(Minutes/Inch)** | **(Inches/Hour)** |
| BP-1/ 37501 | 1-5 | 120.0 | 0.01 |
| BP-2/37504 | 1-5 | 120.0 | 0.01 |
| BP-3/37500 | 1-4 | 2.67 | 0.642 |
| BP-4/37503 | 3-8 | 6.67 | 0.113 |
| BP-5/37501 | 1-5 | 3.64 | 0.341 |

*Infiltration Rate derived from Porchet Method Conversion from Percolation Rate using a Factor of Safety of 2

The rate presented above is anticipated to be the fastest rate that can be absorbed by the site soils at the boring locations. However, with time and depending on the degree of saturation of soils and other factors, the percolation rate may reduce which is typical for sewage disposal or stormwater dispersal fields.

Please be informed that during installation of on-site storm water dispersal system, the following factors should be noted:

- The degree of compactive effort in the upper 1 to 1.5 feet of soils above any filter material should be between 90 and 92 percent relative compaction. As any greater compactive efforts in the soil strata of water retention system construction may cause the percolation rates to reduce substantially, it is not advisable to impose significant structural loading in these areas, from a geotechnical viewpoint.
- The rate of water transmission from the filter material to the soil will be limited the porosity characteristics of the fabric wrap around the filter material.

## 8.0 CLOSURE

This report has been prepared for the exclusive use of **Blue River Development** and their design consultants for use in the design and construction of the proposed Residential Development at the Site. The report has not been prepared for use by other parties, and may not contain sufficient information for purposes of other parties.

Blue River Development or its representatives are responsible for ensuring the information and recommendations contained in this report are brought to the attention of the project engineers and architects, incorporated into the project plans, and implemented by project contractors. This report should be reflected on project grading plans as a part of the project specifications.

ASE requests and recommends proper notification from the Client should any of the following occur:

1. Final plans for site development indicate utilization of areas not originally proposed for construction.
2. Structural loading conditions vary from those utilized for evaluation and preparation of this report.
3. The Site is not developed within 12 months following the date of this report.
4. Change of ownership of property occurs that would render the property development indicated in this report irrelevant or significantly different.

If changes or delays do occur, this office should be notified and provided with finalized plans of site development for our review to enable us to provide the necessary recommendations for additional work and/or updating of the report. Any charges for such review and necessary recommendations would be at the prevailing rate at the time of performing review work.

The findings contained in this report are based upon our evaluation and interpretation of the information obtained from the limited number of test borings and the results of laboratory testing and engineering analysis. As part of the engineering analysis it has been assumed, and is expected, that the geotechnical conditions existing across the area of study are similar to those encountered in the test excavations. However, no warranty is expressed or implied as to the conditions at locations or depths other than those excavated. Should conditions encountered during construction differ significantly from those described in this report, this office should be contacted immediately for recommendations prior to continuation of work.

Our findings and recommendations were obtained in accordance with generally accepted current professional principles and local practice in geotechnical engineering and reflect our best professional judgment. We make no other warranty, either express or implied.

These recommendations are, however, dependent on the aforementioned assumption of uniformity and upon proper quality control of engineered fill and foundations. Geotechnical observations and testing should be provided on a continuous basis during grading at the site to confirm preliminary design assumptions and to verify conformance with the intent of our recommendations. If parties other than ASE are engaged to provide geotechnical services during construction, they must be informed that they will be

required to assume complete responsibility for the geotechnical phase of the project by either concurring with the recommendations in this report or providing alternative recommendations.

This concludes our scope of services as indicated in ASE's proposal dated August 2, 2018, however, our report is subject to review by the controlling authorities for the project. Any further geotechnical services that may be required of our office to respond to questions/comments of the controlling authorities after their review of the report will be performed on a time-and-expense basis as per our current fee schedule. We would not proceed with any response to report review comments/questions without authorization from your office.

The following Appendices contain the substantiating data and laboratory test results to complement the engineering evaluations and recommendations contained in the report.

## APPENDIX A

### Site Exploration

On January 12 and 26, and February 26, 2016, supplemented on September 27, 2018, field exploration was performed by drilling twenty seven (27) exploratory borings at the approximate locations as per indicated on the Boring Location Plan, Plate A. The exploratory borings were drilled by Geoboden, Inc., utilizing a truck mounted, rotary drilling rig equipped with 8-inch diameter continuous flight, hollow-stem rotary augers. The borings were extended to terminal depths ranging from 5 feet 1 inch to 46 feet 6 inches from the existing grades.

Continuous observations of the materials encountered in the borings were recorded in the field. The soils were classified in the field by visual and textural examination and these classifications were supplemented by obtaining bulk soil samples for future examination in the laboratory. Relatively undisturbed samples of soils were extracted in a Modified California barrel sampler lined with 2.416-inch diameter by one-inch high rings and tipped with tapered cutting shoe. Additional samples were obtained in a Standard Penetration sampler in accordance with specifications outlined in ASTM D1586-08a Test Method. All samples were secured in moisture-resistant bags immediately after retrieval from exploratory boring to minimize the loss of field moisture, followed by timely transportation to ASE's laboratory for ensuing testing.

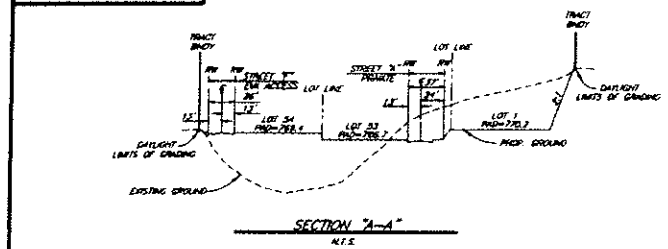
Upon completion of exploration, the borings were backfilled with excavated materials and compacted by tamping.

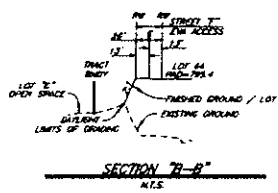
Description of the soils encountered, depth of samples, field density and moisture content of tested samples, respective laboratory tests performed, as well as Standard Penetration Test ("N" Values) and Modified California barrel sampler blow counts are presented in the attached Field Logs of Borings ("B" Plates).

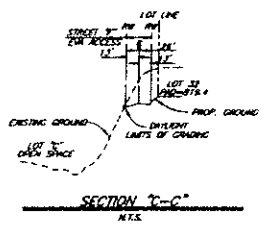
| | |
|---|---|
| Plates A-1 thru A-6 | Geotechnical Map |
| Plates B-1 thru B-22 | Field Logs of Borings |
| Plates B-P1 thru B-P5 | Field Logs of Percolation Borings |

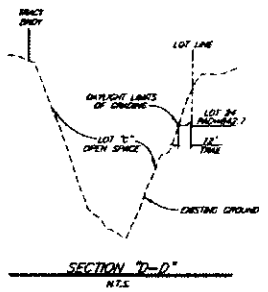
DPR18-XXX

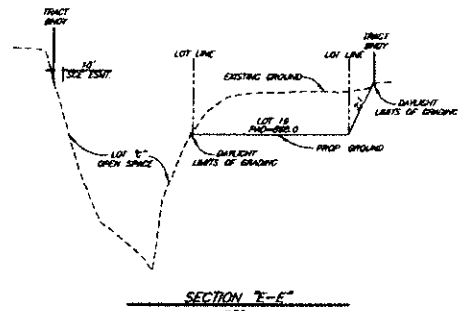
# THE TRAILS AT CORONA
# TENTATIVE TRACT MAP NO. 37500
# IN THE CITY OF CORONA

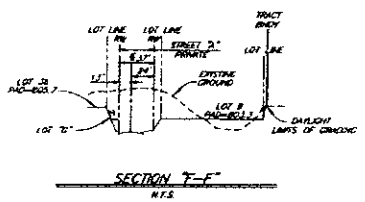






TENTATIVE TRACT MAP NO. 37500
THE TRAILS AT CORONA
CITY OF CORONA

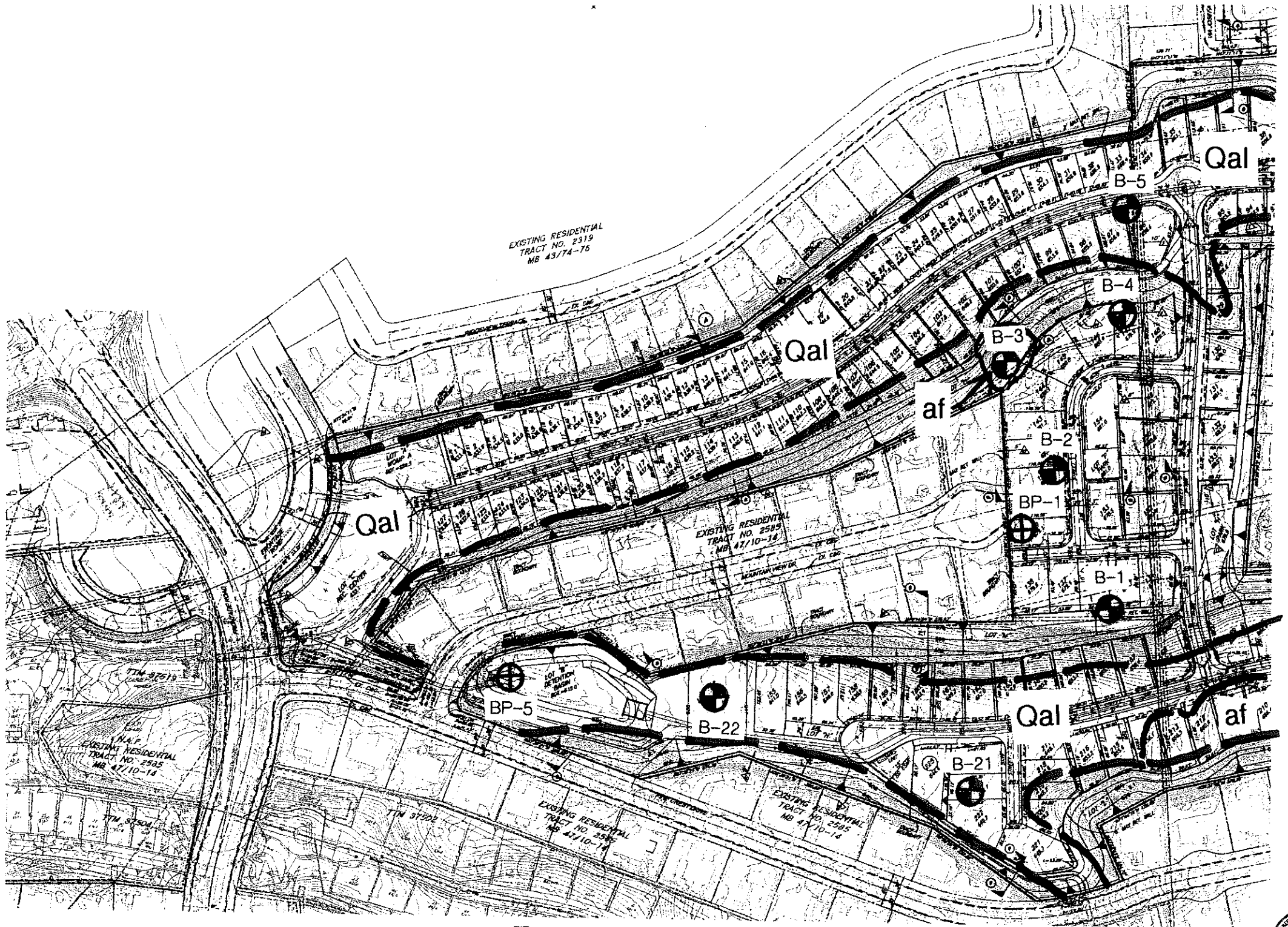
PREPARED FOR
PINECREST BADGER ASSOCIATES, LLC
4890 MILMONT DRIVE
FREMONT, CA 94538
(951) 394-3718

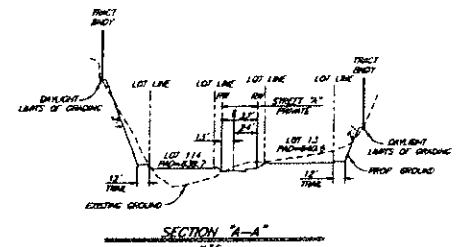
PREPARED BY
KWC ENGINEERS

SHEET 2 OF 2 SHEETS

PLATE A-1

# THE TRAILS AT CORONA
# TENTATIVE TRACT MAP NO. 37501
# IN THE COUNTY OF RIVERSIDE

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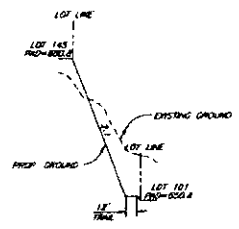
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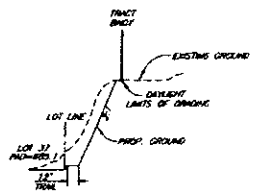
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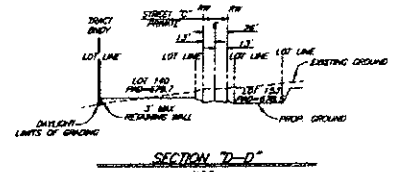
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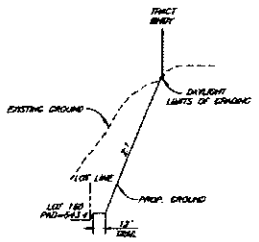
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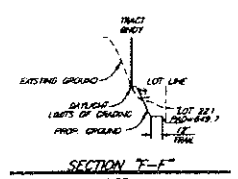
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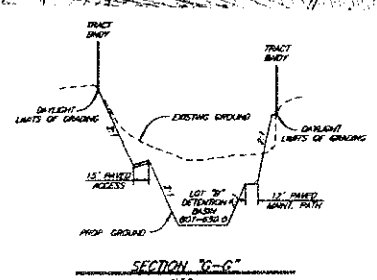
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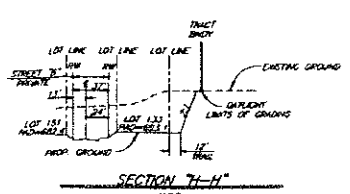
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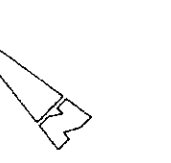


REGISTERED PROFESSIONAL ENGINEER
No. R-4253
Exp. 6/30/15
CIVIL
STATE OF CALIFORNIA

| REVISIONS | | | |
|---|---|---|---|
| Date | By | | Appr'd |
| 08/07/14 | BY | | |
| 05/07/15 | BY | | |

**TENTATIVE TRACT MAP NO. 37501**
**THE TRAILS AT CORONA**
**COUNTY OF RIVERSIDE**

PREPARED FOR:
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PREPARED BY:
HWG ENGINEERS
SAN BERNARDINO · RIVERSIDE · ONTARIO

SHEET 2 OF 3 SHEETS

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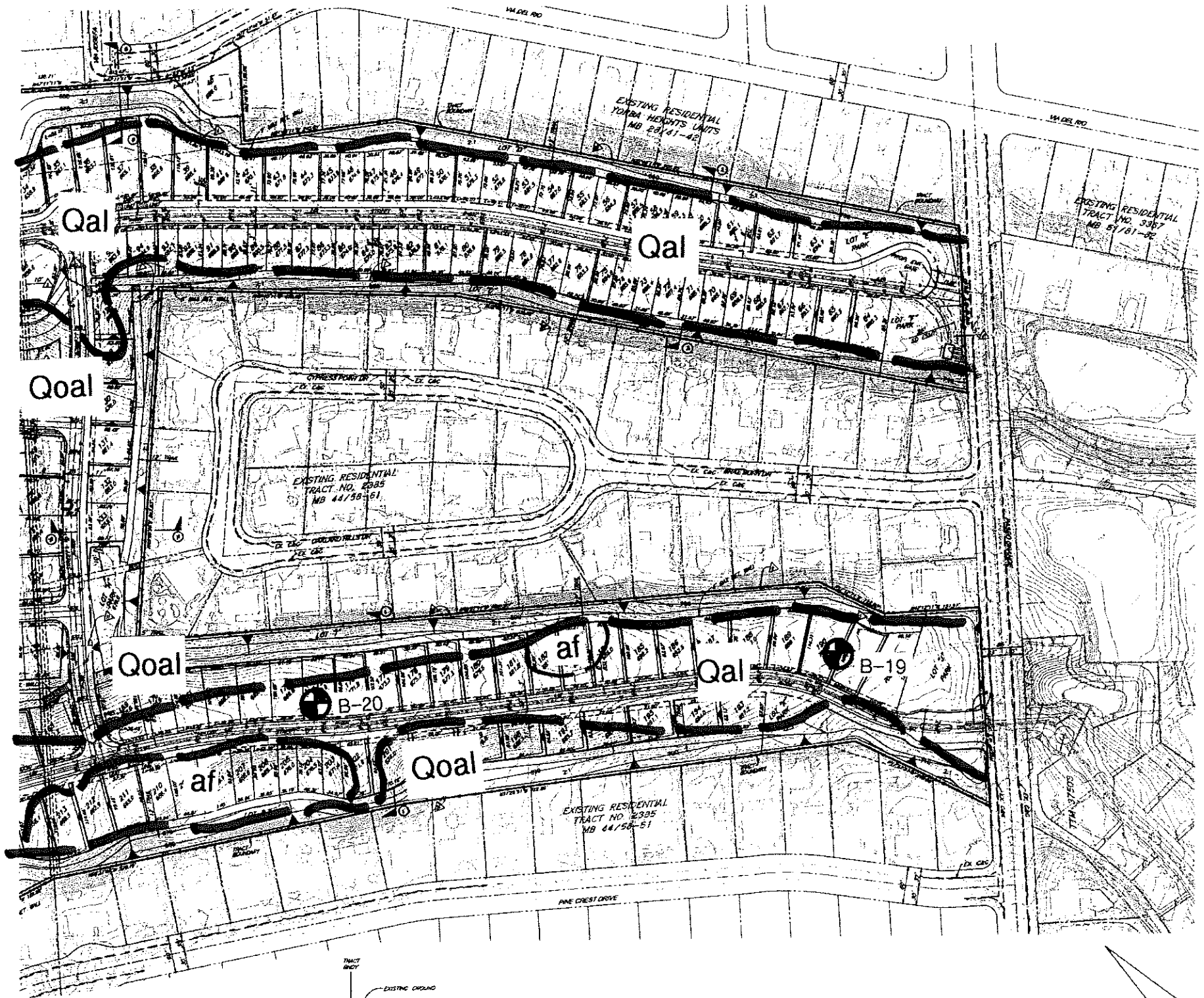
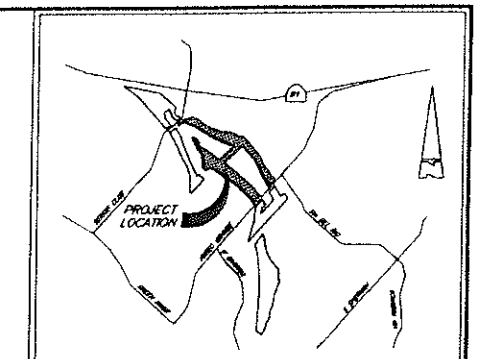
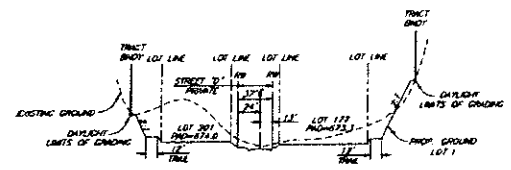
PLATE A-2

# THE TRAILS AT CORONA
# TENTATIVE TRACT MAP NO. 37501
# IN THE COUNTY OF RIVERSIDE

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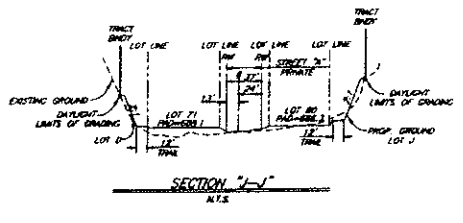


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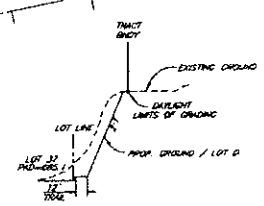


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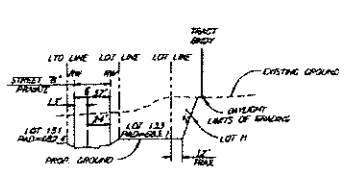


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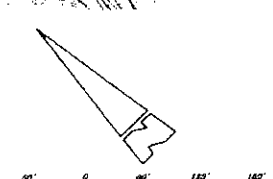


REGISTERED PROFESSIONAL ENGINEER — STEVE C. KWC — No. 64253 — Exp. 6/30/19 — CIVIL — STATE OF CALIFORNIA

| BY DATE | CENTERLINE |
|---|---|
| 6/30/18 | by date |
| 6/30/16 | |

| Date | By | REVISIONS | App'd |
|---|---|---|---|
| | | | |

TENTATIVE TRACT MAP NO. 37501
THE TRAILS AT CORONA
COUNTY OF RIVERSIDE

PREPARED FOR: PINECREST BADGER ASSOCIATES, LLC
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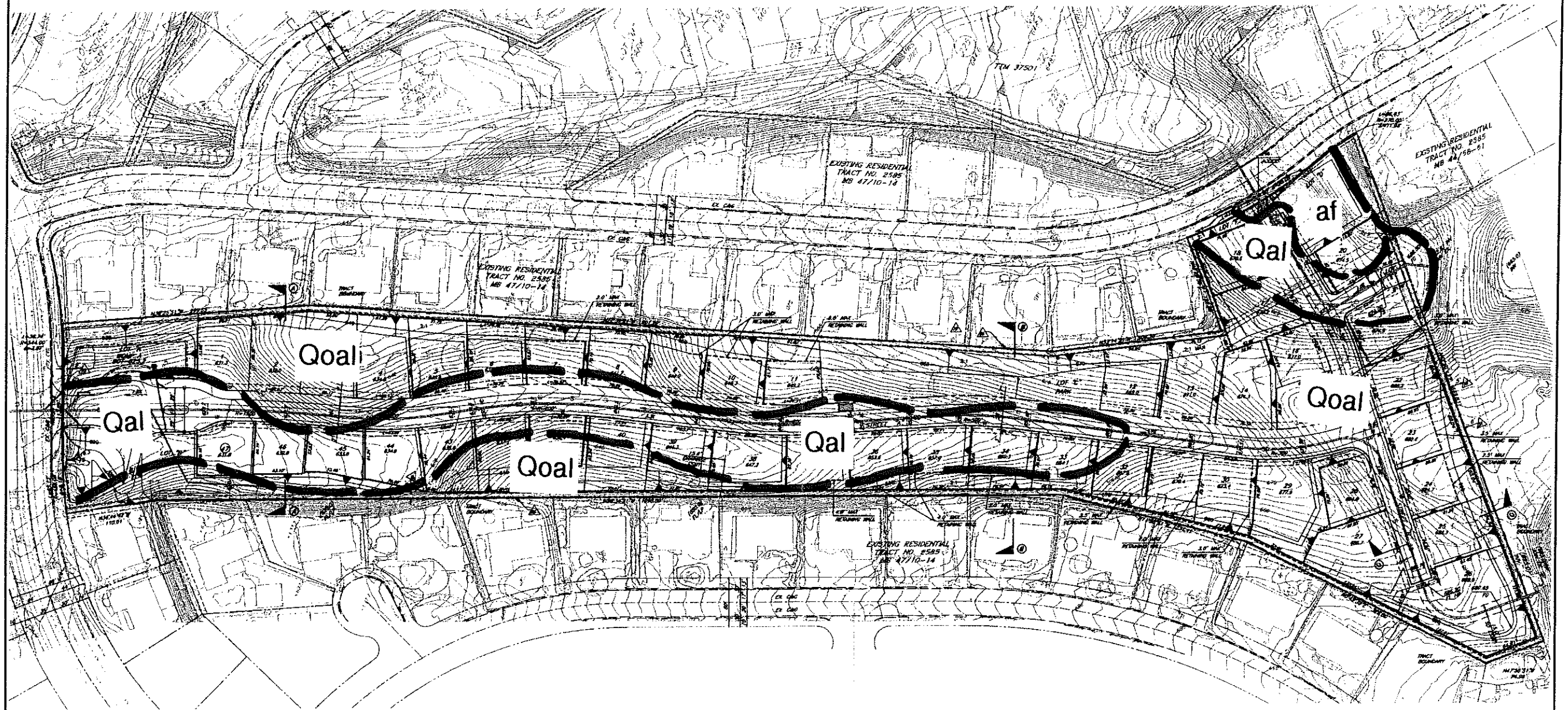
FREMONT, CA 94538
(951) 394-3718

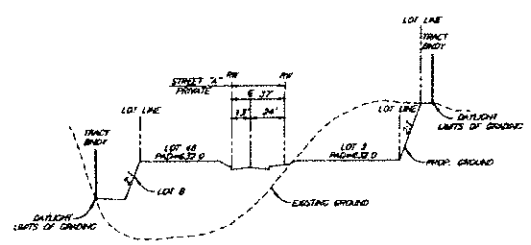
PREPARED BY: KWC ENGINEERS

SHEET 3 OF 3 SHEETS

PLATE A-3

# THE TRAILS AT CORONA
# TENTATIVE TRACT MAP NO. 37502
# IN THE COUNTY OF RIVERSIDE

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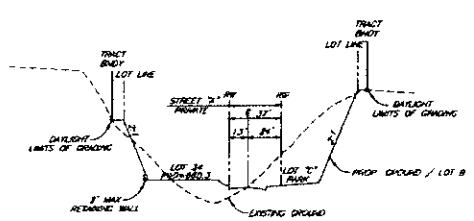


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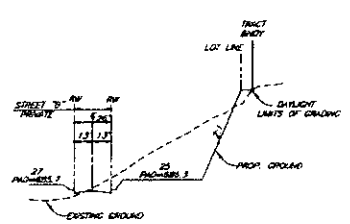


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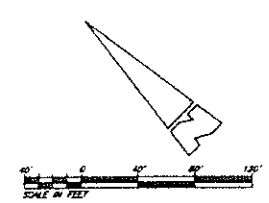



TENTATIVE TRACT MAP NO. 37502
THE TRAILS AT CORONA
COUNTY OF RIVERSIDE

PREPARED FOR:
PINECREST BADGER ASSOCIATES, LLC
4890 MILMONT DRIVE
FREMONT, CA 94538
(951) 394-3718

PREPARED BY:
KWC ENGINEERS

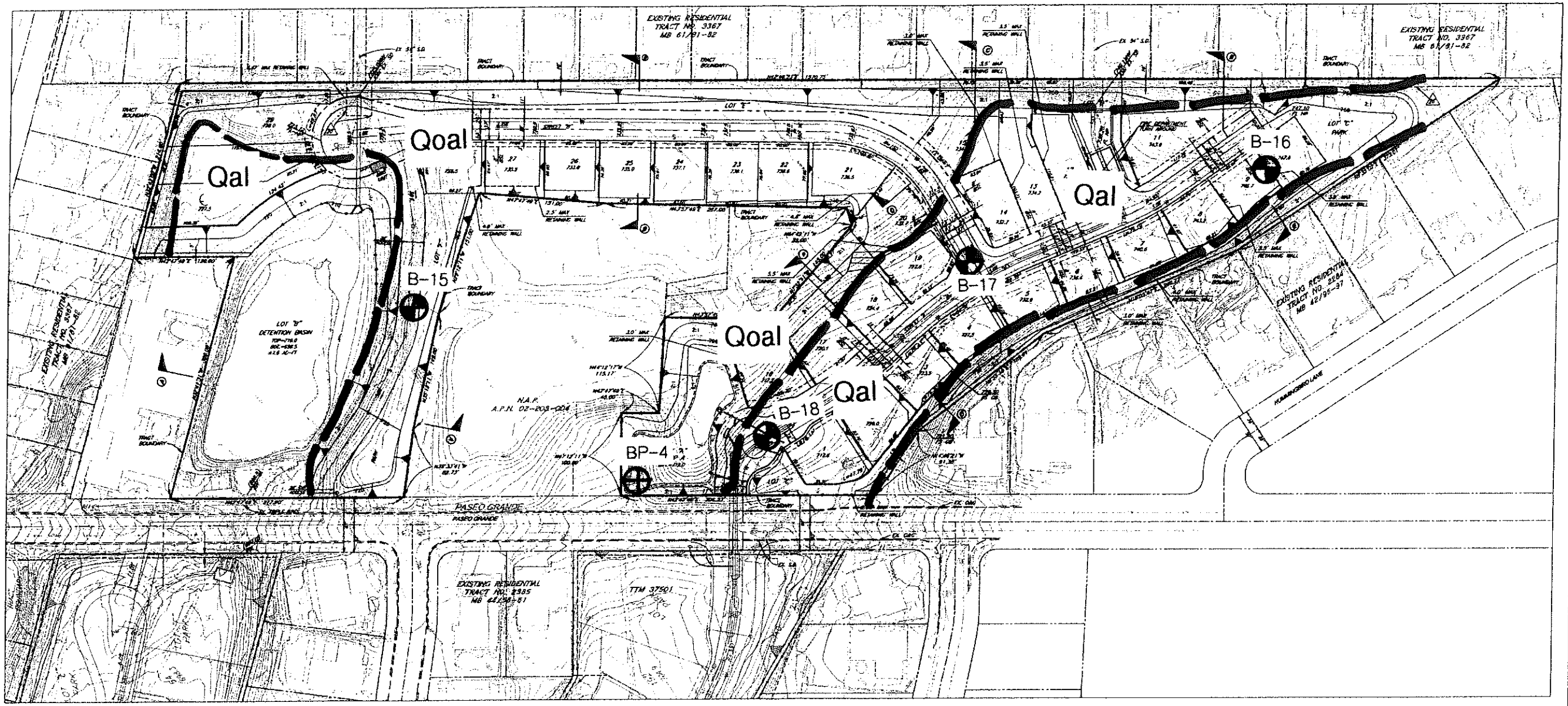
TTM DATE IDENTIFIED
06/07/18
BY
DATE
06/07/18

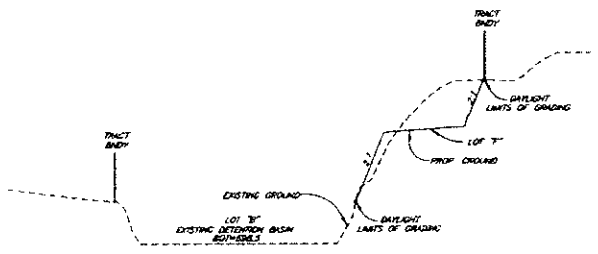
REVISIONS

SHEET 2 OF 2 SHEETS

PLATE A-4

# THE TRAILS AT CORONA
# TENTATIVE TRACT MAP NO. 37503
# IN THE COUNTY OF RIVERSIDE

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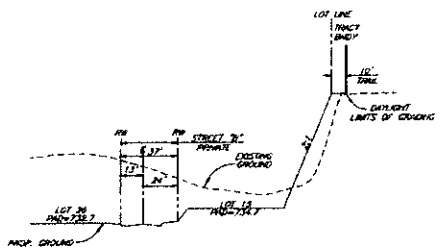


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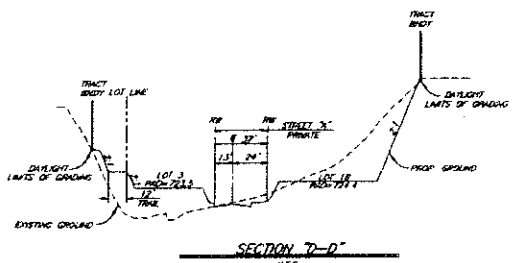


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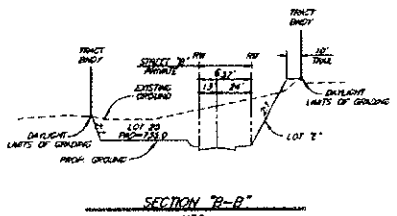


SECTION "B-B"
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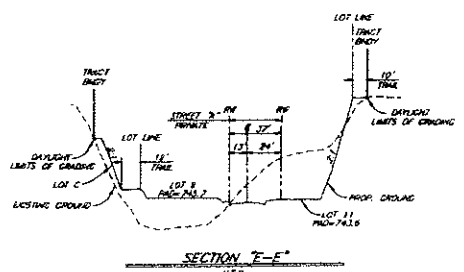


SECTION "E-E"
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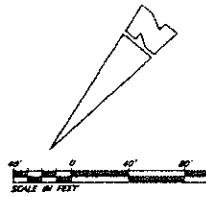



REGISTERED PROFESSIONAL ENGINEER — STATE OF CALIFORNIA — No. 84263 Exp. 6/30/19 — CIVIL

| TTM DATE EXHIBIT 'B' | |
|---|---|
| 04/27/18 | BY: BKP |
| REVISIONS | |
| 06/07/18 | |

| Date | By | REVISIONS | Appr'd |
|---|---|---|---|
| | | | |

**TENTATIVE TRACT MAP NO. 37503**
**THE TRAILS AT CORONA**
**COUNTY OF RIVERSIDE**

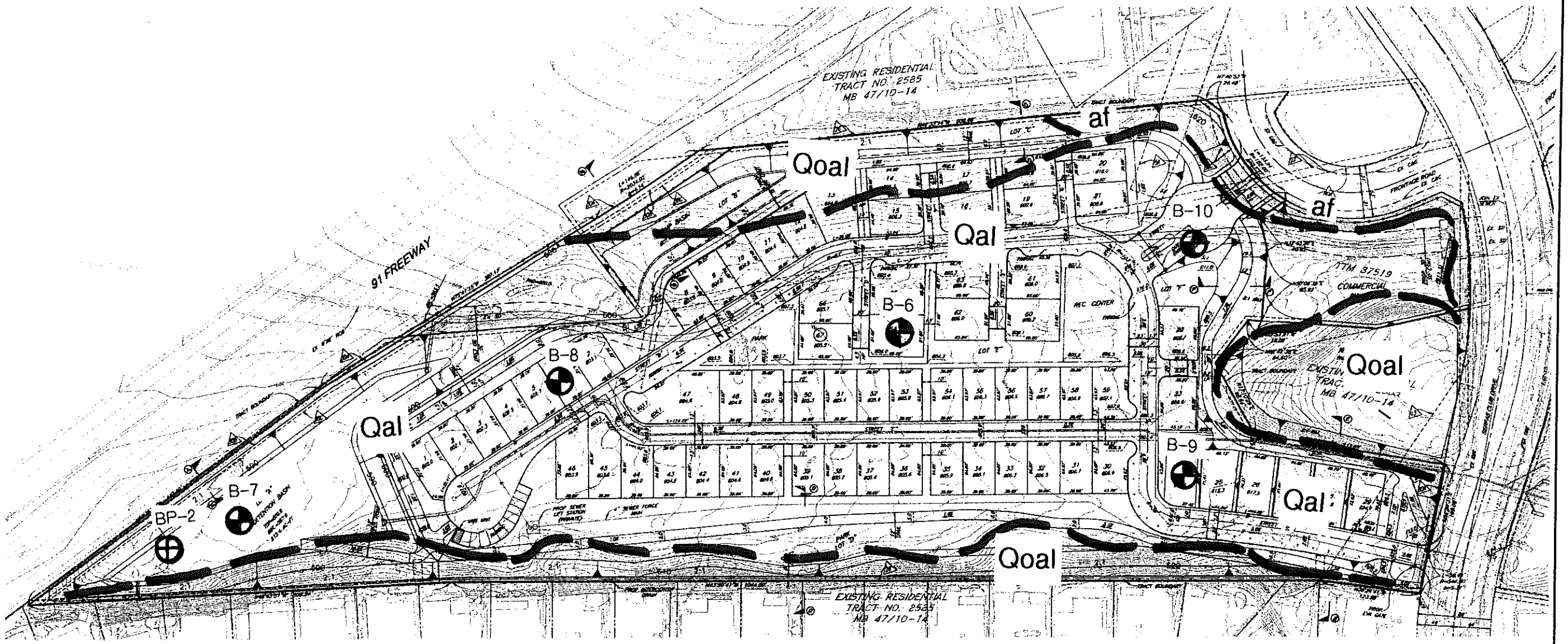
PREPARED FOR:
PINECREST BADGER ASSOCIATES, LLC
4890 WILMONT DRIVE
FREMONT, CA 94538
(951) 394-3718

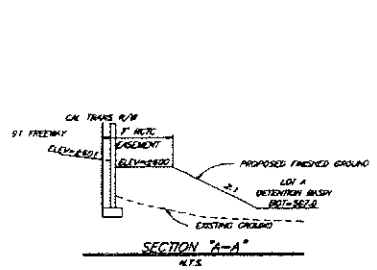
PREPARED BY:
KWC ENGINEERS
1880 IRVINE BLVD. SUITE 200, TUSTIN, CA 92782 (949) 546-8000

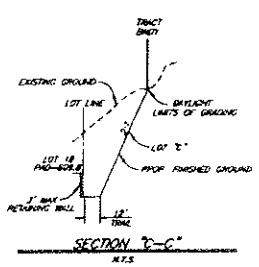
SHEET 2 OF 2 SHEETS

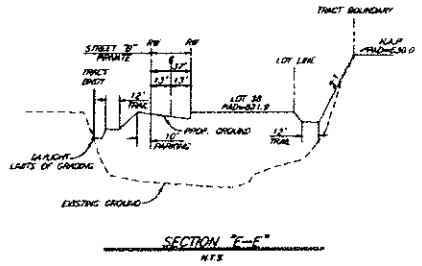
PLATE A-5

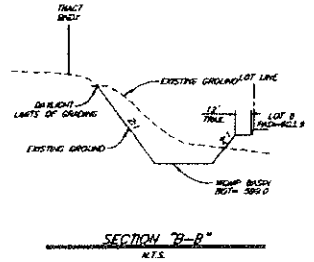
# THE TRAILS AT CORONA
# TENTATIVE TRACT MAP NO. 37504
# IN THE COUNTY OF RIVERSIDE

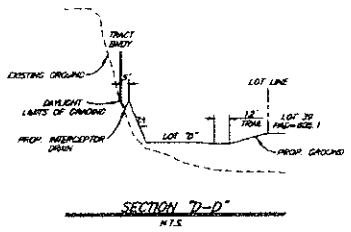


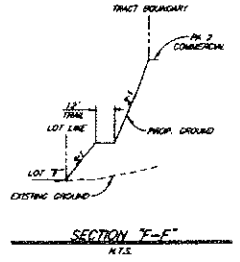



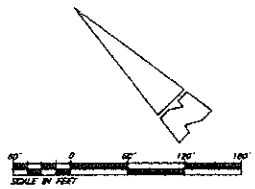




TENTATIVE TRACT MAP NO. 37504
THE TRAILS AT CORONA
COUNTY OF RIVERSIDE

PREPARED FOR:
PINECREST BADGER ASSOCIATES, LLC
4990 MILMONT DRIVE
FREMONT, CA 94538
(951) 394-3718

PREPARED BY:
KWC ENGINEERS

SHEET 2 OF 2 SHEETS

| Date | By | REVISIONS | Appr'd |
|---|---|---|---|

PLATE A-6

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-1

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/12/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **26 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | Org | LEAF LITTER: FILL-Loose,dump fill | | | | |
| | | | | | | SC | CLAYEY SAND WITH GRAVEL: NATIVE-Yellowish brown with strong brown,damp,fine to medium-grained sand | | | | MAX DENSITY, EXPANSION, REMOLD SHEAR, CORROSIVITY TESTS, ATTERBERG LIMITS |
| | | | | 25(Ring) | | | | 116.6 | 5.8 | | |
| 5 | 5 | | | | | | | | | | |
| | | | | | | CL | SILTY CLAY WITH SAND: Dark brown to yellowish red,moist,fine-grained sand,with some pebbles and gravel-size rock pieces | | | | |
| | | | | 26(Ring) | | | | 105.5 | 15.6 | | SHEAR |
| 10 | 10 | | | 66(Ring) | | SC | CLAYEY SAND WITH GRAVEL: Dark yellowish brown with strong brown,moist,fine to medium-grained sand | 121.4 | 8.7 | | |
| | | | | | | | same as above,becoming light olive brown with yellowish brown | | | | |
| 15 | 15 | | | 26/6" (Ring) | | SC | *insufficient sample for density | * | 11.1 | | |
| | | | | 23/6" (Ring) | | CL | SANDY CLAY: Yellowish brown with strong brown,moist,fine to medium-grained sand | 110.8 | 15.4 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED
SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 1

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 24(SPT) | | SM | SILTY SAND: Yellowish brown,moist,fine-grained sand | | 14.3 | | |
| | | | | | | SM | SILTY SAND: Light olive broiwn,moist to very moist,fine-grained sand,with some clay and pebbles/gravel-size rock pieces | 93.7 | 20.5 | | |
| 25 | 25 | | | 5/6"(Ring) | | | | * | | | |
| | | | | 12/6" (Ring) | | SM | SILTY SAND: Light olive brown,moist,fine-grained sand,trace clay and gravel *insufficient sample for density | | 10.9 | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-2

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/12/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **26 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | | ASPHALTIC CONCRETE PAVEMENT: 4.25' | | | | |
| | | | | | | SC | AGGREGATE BASE MATERIAL: 5.25" | | | | |
| | | | | 24/6" (Ring) | | | CLAYEY SAND: Dark yellowish brown,moist,fine to medium-grained sand,trace gravel-size rock pieces | 109.8 | 10.4 | | SHEAR |
| | | | | 40/5" (Ring) | | CL | | 116.0 | 8.8 | | |
| 5 | 5 | | | | | | SANDY CLAY: Dark yellowish brown,damp to moist,fine to medium-grained sand | | | | |
| | | | | | | SM | SILTY SAND WITH CLAY: Light olive brown,moist,fine to medium-grained sand,trace gravel | 107.8 | 9.3 | | |
| | | | | 26/6" (Ring) | | | | | | | |
| | | | | 22/6" (Ring) | | SC | | 110.5 | 10.4 | | |
| | | | | | | | CLAYEY SAND: Yellowish brown,moist,fine to medium-grained sand | | | | |
| 10 | 10 | | | 23/6" (Ring) | | SC | same as above | 111.0 | 10.7 | | |
| | | | | 23/6" (Ring) | | CL | SILTY CLAY WITH SAND: Yellowish brown to dark yellowish brown,moist,fine to medium-grained sand | 119.0 | 9.5 | | |
| 15 | 15 | | | 22(SPT) | | CL | same as above | | 12.4 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 2

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 17(Ring) | | SM | SILTY SAND: Yellowish brown to light olive brown,moist,fine-grained sand,trace clay | 103.6 | 9.4 | | |
| 25 | 25 | | | 11(SPT) | | SM | same as above,becoming olive yellow | | 14.3 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-3

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/12/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **26 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SC | CLAYEY SAND: FILL-Brown to dark yellowish brown,moist,fine to medium-grained sand | | | | |
| | | | | | | ML | SANDY SILT: NATIVE-Brown to dark brown,moist,fine-grained sand,trace clay | 94.9 | 11.1 | | |
| | | | | 7/6"(Ring) | | | | | | | |
| | | | | 21/6" (Ring) | | ML | SILT WITH SAND: Dark yellowish brown,damp,fine-grained sand | 104.6 | 7.1 | | |
| 5 | 5 | | | | | | | | | | |
| | | | | 60(Ring) | | SC | CLAYEY SAND: Dark yellowish brown,damp to moist,fine to medium-grained sand,with pebbles and gravel-size rock pieces | 110.0 | 7.5 | | SHEAR |
| 10 | 10 | | | 53(Ring) | | GC | CLAYEY GRAVEL: Dark yellowish brown,moist,with fine to medium sand | 108.6 | 11.3 | | |
| 15 | 15 | | | 28(SPT) | | CL | SILTY CLAY: Dark yellowish brown,moist,trace fine to medium sand | | 16.3 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED
SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 3

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | 27(Ring) | | SM | SILTY SAND: Yellowish brown,moist,fine-grained sand,trace clay | 102.0 | 13.6 | | |
| 25 | 25 | | 12(SPT) | | ML | SILT WITH SAND: Yellowish brown,moist,fine-grained sand,trace organics | | 20.5 | | |

ASSOCIATED
SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-4

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/12/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **26 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: FILL-Brown,moist,fine to medium-grained sand | | | | |
| | | | | | | CL | SANDY CLAY: NATIVE-Dark yellowish brown with strong brown,moist,fine to medium-grained sand,with some gravel-size rock pieces | | | | |
| | | | | 55(Ring) | | | | 118.4 | 11.1 | | |
| 5 | 5 | | | | | | | | | | |
| 10 | 10 | | | 34(Ring) | | SM | SILTY SAND WITH GRAVEL: Light olive brown,damp,fine-grained sand | 110.5 | 5.8 | | |
| 15 | 15 | | | 17(SPT) | | SM | SILTY SAND: Brownish yellow,moist,fine-grained sand,trace clay and gravel | | 9.3 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B - 4

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 18(Ring) | | SM | SILTY SAND: Brownish yellow,moist,fine-grained sand,trace clay and gravel | 86.6 | 16.3 | | |
| | | | | | | SM | SILTY SAND WITH GRAVEL: Brownish yellow,moist,fine-grained sand | | | | |
| 25 | 25 | | | 21(SPT) | | | | | 13.0 | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-5

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/12/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **46 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | SM | SILTY SAND: Dark brown,very moist,fine-grained sand,trace clay,scattered gravel,with small roots | | | | MAX DENSITY, EXPANSION, REMOLD SHEAR, CORROSIVITY TESTS, ATTERBERG LIMITS |
| | | | 13(Ring) | | | | 98.0 | 22.0 | | |
| 5 | 5 | | | | | | | | | |
| | | | 9(Ring) | | SC | CLAYEY SAND WITH GRAVEL: Brown to dark brown,moist,fine-grained sand | 109.7 | 15.6 | | CONSOL |
| | | | | | SM | SILTY SAND: Brown,moist,fine-grained sand | | | | |
| 10 | 10 | | 4/6"(Ring) | | | | 102.9 | 8.1 | | CONSOL |
| | | | 5/6"(Ring) | | SM | SILTY SAND: Dark brown,moist,fine-grained sand<br>*insufficient sample for density | * | 14.7 | | |
| 15 | 15 | | 9(SPT) | | SC | CLAYEY SAND: Dark brown,moist,fine-grained sand | | 13.6 | | |
| 20 | 20 | | | | | | | | | |

ASSOCIATED
SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 5

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 14(Ring) | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine-grained sand,with some gravel | 106.7 | 12.4 | | CONSOL |
| 25 | 25 | | | 13(SPT) | | SM | SILTY SAND WITH CLAY: Dark yellowish brown,moist,fine-grained sand,trace gravel | | 9.9 | | |
| 30 | 30 | | | 21(Ring) | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine-grained sand,with some gravel | 117.6 | 13.6 | | |
| 35 | 35 | | | 37(SPT) | | SC | same as above,becoming yellowish brown | | 12.4 | | |
| 40 | 40 | | | 5/6"(Ring) | | SC | same as above | 100.2 | 19.3 | | |
| | | | | 15/6" (Ring) | | SM | SILTY SAND: Yellowish brown,moist,fine-grained sand | 100.9 | 8.6 | | |
| 45 | 45 | | | 24(SPT) | | ML | SANDY SILT WITH CLAY: Yellowish brown,moist,fine-grained sand | | 18.3 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-6

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **36 Feet** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: Brown,moist,fine-grained sand | | | | MAX DENSITY, EXPANSION, REMOLD SHEAR, CORROSIVITY TESTS, ATTERBERG LIMITS |
| | | | | 24(Ring) | | SM | same as above,becoming very pale brown,damp | 91.6 | 4.7 | | |
| 5 | 5 | | | 34(Ring) | | SM | same as above,becoming pale brown with brown,moist | 99.9 | 10.5 | | CONSOL |
| | | | | 22(Ring) | | SM | same as above,damp | 98.3 | 6.4 | | |
| 10 | 10 | | | 55(Ring) | | SM | same as above,becoming pale brown | 110.4 | 7.5 | | CONSOL |
| 15 | 15 | | | 21/6" (Ring) | | SM | same as above,with trace gravel *insufficient sample for density | * | 5.8 | | |
| | | | | 20/6" (Ring) | | ML | CLAYEY SILT: Yellowish brown,moist | 114.5 | 8.8 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 6

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK / DRIVE / TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | 10(SPT) | | SM | SILTY SAND WITH CLAY: Yellowish brown,moist,fine-grained sand | | 8.1 | | |
| 25 | 25 | 22(Ring) | | CL | SANDY CLAY: Dark yellowish brown,moist,fine-grained sand | 119.8 | 12.4 | | |
| 30 | 30 | 21(SPT) | | CL | same as above | | 11.7 | | |
| | | | | SC | CLAYEY SAND: Yellowish brown,moist,fine to medium-grained sand | | | | |
| 35 | 35 | 81/10" (Ring) | | | | 128.8 | 8.7 | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-7

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **37 Feet** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | ML | SANDY SILT WITH CLAY: Dark brown,moist,fine-grained sand | | | | MAX DENSITY, EXPANSION, REMOLD SHEAR, CORROSIVITY TESTS, ATTERBERG LIMITS |
| | | | | 6(Ring) | | ML | same as above | 102.1 | 20.5 | | |
| 5 | 5 | | | | | | | | | | |
| | | | | 8(Ring) | | CL | SILTY CLAY WITH SAND: Brown to dark brown,moist to very moist,fine-grained sand | 101.2 | 22.0 | | CONSOL |
| 10 | 10 | | | 9(Ring) | | CL | SANDY CLAY: Brown to dark brown,moist,fine-grained sand | 108.5 | 17.7 | | CONSOL |
| 15 | 15 | | | 7/6"(Ring) | | CL | same as above | 104.0 | 20.2 | | |
| | | | | 7/6"(Ring) | | CL | SANDY CLAY: Dark yellowish brown,moist,fine-grained sand | 120.2 | 13.2 | | CONSOL |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 7

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 8(SPT) | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine-grained sand | | 11.1 | | |
| 25 | 25 | | | 58(Ring) | | SC | CLAYEY SAND WITH GRAVEL: Dark yellowish brown,moist,fine-grained sand | 125.0 | 11.1 | | |
| 30 | 30 | | | 65(SPT) | | SC | same as above | | 12.4 | | |
| 35 | 35 | | | 35/6" (Ring) | | SC | CLAYEY SAND WITH GRAVEL: Yellowish brown,moist,fine to medium-grained sand *insufficient sample for density | * | 9.8 | | |
| | | | | 50/5" (Ring) | | SM | SILTY SAND: Yellowish brown,moist,fine to coarse-grained sand | 116.0 | 8.4 | | |

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# FIELD LOG OF BORING B-8

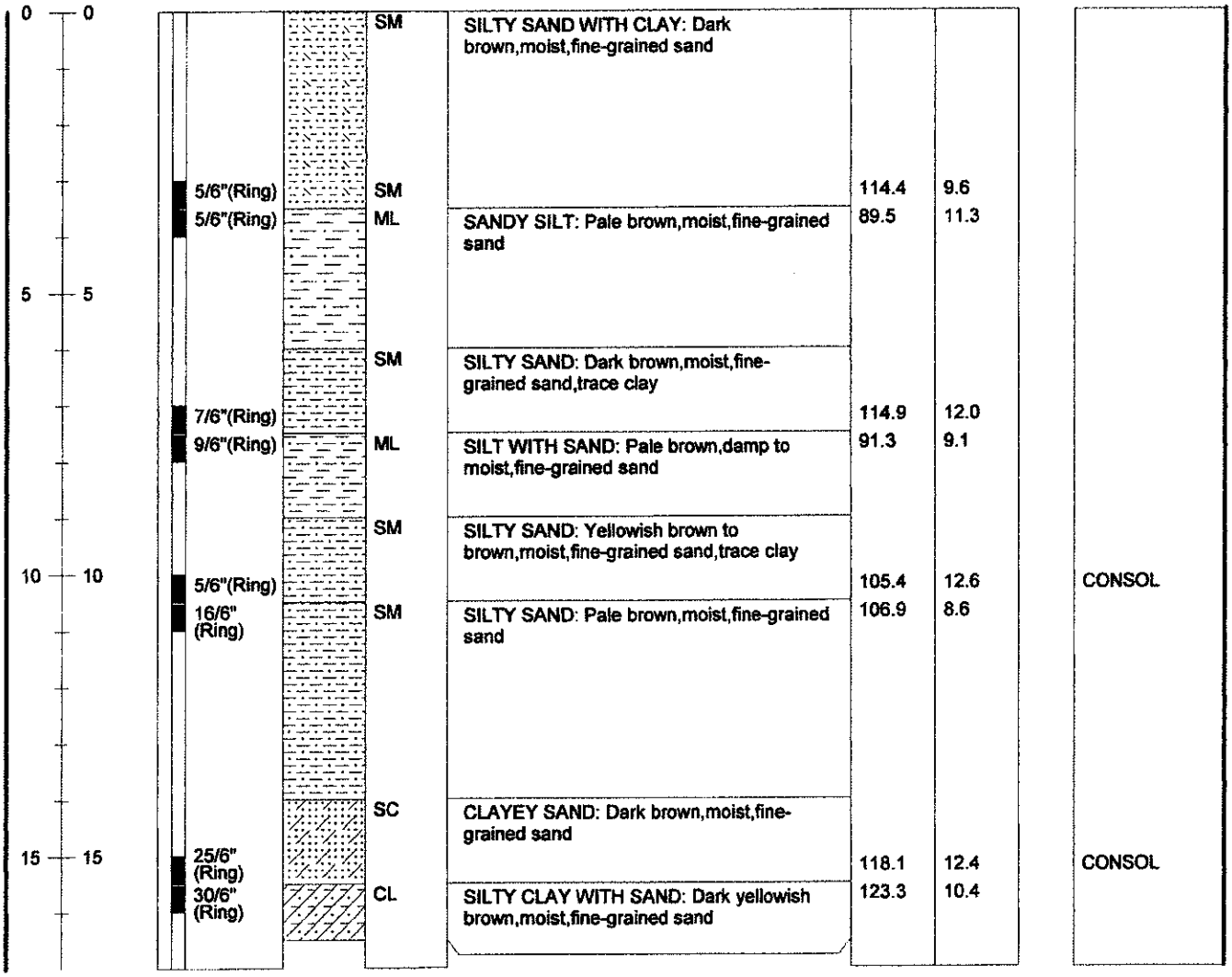
Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **16 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.



ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-9

Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **21 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND WITH CLAY: Dark brown,moist to very moist,fine-grained sand | | | | |
| | | | | 5/6"(Ring) | | | | 102.6 | 20.5 | | |
| | | | | 5/6"(Ring) | | SM | SILTY SAND: Dark brown,moist,fine-grained sand | 104.5 | 15.2 | | |
| | | | | | | SC | CLAYEY SAND: Dark brown,moist,fine-grained sand | | | | |
| 5 | 5 | | | 10/6" (Ring) | | | | 98.1 | 25.2 | | |
| | | | | 9/6"(Ring) | | SM | SILTY SAND: Brown to dark brown,moist,fine-grained sand,trace clay | 111.1 | 15.1 | | |
| 10 | 10 | | | 12/6" (Ring) | | SM | same as above | 107.9 | 16.9 | | |
| | | | | 13/6" (Ring) | | SM | SILTY SAND: Light olive brown,damp,fine-grained sand | 111.1 | 6.1 | | |
| | | | | | | ML | SANDY SILT: Pale brown,damp to moist,fine-grained sand,trace clay | | | | |
| 15 | 15 | | | 19/6" (Ring) | | | | 103.5 | 7.5 | | |
| | | | | 22/6" (Ring) | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine-grained sand,trace gravel | 116.2 | 9.3 | | |
| 20 | 20 | | | 18(Ring) | | SM | SILTY SAND: Yellowish brown,moist,fine-grained sand,trace clay | 115.0 | 8.1 | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-10

Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **16 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 in.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: FILL-Brown to yellowish brown,moist,fine-grained sand,trace clay | | | | |
| | | | | 5/6"(Ring) | | | | 97.6 | 10.5 | | |
| | | | | 5/6"(Ring) | | SP | SAND: FILL-Light yellowish brown,damp,fine to medium-grained sand | 98.7 | 5.1 | | |
| | | | | | | SC | CLAYEY SAND: NATIVE-Yellowish brown to dark yellowish brown,moist,fine-grained sand | | | | |
| 5 | 5 | | | 11/6" (Ring) | | | | 105.2 | 10.5 | | |
| | | | | 14/6" (Ring) | | ML | SANDY SILT: Light yellowish brown,damp to moist,fine-grained sand | 103.0 | 7.2 | | |
| 10 | 10 | | | 28(Ring) | | ML | same as above,becoming brown to pale brown | 100.0 | 8.7 | | |
| 15 | 15 | | | 21(Ring) | | SM | SILTY SAND WITH CLAY: Yellowish brown,moist,fine-grained sand | 101.2 | 9.3 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-11

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,inc.** | Total Depth: | **31 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND WITH GRAVEL: Light yellowish brown,damp,fine-grained sand | | | | MAX DENSITY, EXPANSION, REMOLD SHEAR, ATTERBERG LIMITS, CORROSIVITY TESTS |
| | | | | 45/6" (Ring) | | | | 125.6 | 4.4 | | |
| | | | | 19/6" (Ring) | | SC | CLAYEY SAND WITH GRAVEL: Brown to dark brown,moist,fine-grained sand | 121.8 | 9.0 | | |
| 5 | 5 | | | | | | | | | | |
| | | | | 22(Ring) | | SM | SILTY SAND: Yellowish brown,damp,fine-grained sand,with some gravel | 106.1 | 4.7 | | CONSOL |
| 10 | 10 | | | 16(Ring) | | SM | SILTY SAND WITH GRAVEL: Yellowish brown,damp,fine to medium-grained sand | 109.1 | 4.2 | | |
| 15 | 15 | | | 18(Ring) | | SM | SILTY SAND WITH CLAY: Yellowish brown,damp to moist,fine-grained sand,with some gravel | 103.8 | 7.5 | | CONSOL |

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# FIELD LOG OF BORING B - 11

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 18(Ring) | | SM | SILTY SAND: Light yellowish brown,damp,fine-grained sand,trace clay,with some gravel and cobbles | 103.8 | 6.4 | | |
| 25 | 25 | | | 25(SPT) | | | #no recovery | | # | | |
| | | | | | | SM | SILTY SAND WITH CLAY: Yellowish brown,damp to moist,fine-grained sand | | | | |
| 30 | 30 | | | 18(SPT) | | | | | 7.0 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-12

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **26 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE; "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: Brown to yellowish brown,damp,fine-grained sand,trace clay,with some gravel and small roots | | | | |
| | | | | 20(Ring) | | SM | | 101.8 | 4.7 | | |
| 5 | 5 | | | | | | | | | | |
| | | | | 28(Ring) | | SM | same as above,with some small pores | 102.6 | 3.1 | | |
| 10 | 10 | | | 10(Ring) | | SM | SILTY SAND: Light yellowish brown,damp,fine-grained sand,trace clay and gravel | 98.8 | 5.9 | | |
| 15 | 15 | | | 12(Ring) | | SM | SILTY SAND: Yellowish brown,moist,fine-grained sand,trace clay and gravel | 106.5 | 10.5 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 12

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 25(Ring) | | SM | SILTY SAND WITH GRAVEL: Yellowish brown,damp,fine to medium-grained sand | 107.0 | 4.6 | | |
| 25 | 25 | | | 29(SPT) | | SM | SILTY SAND WITH GRAVEL: Yellowish brown,moist,fine to medium-grained sand,trace clay | | 8.7 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-13

Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **20 Feet 2 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SC | CLAYEY SAND WITH GRAVEL: Strong brown,damp to moist,fine to medium-grained sand,with roots | | | | |
| 5 | 5 | | | 37(Ring) | | SC | same as above | 113.0 | 8.1 | | SHEAR |
| 10 | 10 | | | 50/2" (Ring) | | | becoming gravelly and cobbly below 9.5 feet depth<br>#no recovery | # | | | |
| 15 | 15 | | | 50/2" (Ring) | | | #no recovery | # | | | |
| 20 | 20 | | | 50/2" (Ring) | | | #no recovery | # | | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-14

Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **21 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: Dark yellowish brown,damp,fine-grained sand,trace clay,with some gravel | | | | |
| 5 | 5 | | | 28(Ring) | | SC | CLAYEY SAND: Dark yellowish brown to dark brown,moist,fine to medium-grained sand,with some gravel | 120.4 | 8.1 | | |
| 10 | 10 | | | 19(Ring) | | SC | same as above | 113.5 | 9.3 | | |
| 15 | 15 | | | 42(Ring) | | SC&GP | CLAYEY SAND AND GRAVEL: Dark yellowish brown to dark brown,damp,fine to medium-grained sand<br>*unable to retrieve relatively undisturbed sample,too many oversize particles | * | 6.7 | | |
| 20 | 20 | | | 90(Ring) | | SM | SILTY SAND WITH GRAVEL: Brown,moist,fine to coarse-grained sand,trace clay | 118.4 | 8.1 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-15

Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **21 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine to medium-grained sand,with some gravel and cobbles | | | | |
| 5 | 5 | | | 53(Ring) | | SC | CLAYEY SAND WITH GRAVEL: Dark yellowish brown,damp to moist,fine to coarse-grained sand | 119.6 | 7.6 | | |
| 10 | 10 | | | 72(Ring) | | SP-SM | GRAVELLY SAND WITH SILT: Yellowish brown to brown,moist,fine to medium-grained sand | 111.3 | 8.3 | | SHEAR |
| 15 | 15 | | | 24(Ring) | | SM | SILTY SAND WITH CLAY: Yellowish brown,moist,fine to medium-grained sand,with gravel | 113.0 | 9.9 | | |
| 20 | 20 | | | 53(Ring) | | SP-SM | GRAVELLY SAND WITH SILT: Light olive brown,damp,fine to medium-grained sand,trace clay | 119.2 | 6.7 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-16

Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **16 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE, TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | SM | SILTY SAND: Dark yellowish brown,moist,fine-grained sand,with some gravel | | | | |
| 5 | 5 | | 19(Ring) | | SC | CLAYEY SAND: Dark brown to dark yellowish brown,moist,fine-grained sand,with some gravel | 122.1 | 10.5 | | |
| 10 | 10 | | 34(Ring) | | SC | CLAYEY SAND WITH GRAVEL: Dark yellowish brown,moist,fine to medium-grained sand | 119.8 | 9.3 | | |
| 15 | 15 | | 62(Ring) | | SC | same as above,becoming yellowish brown | 122.0 | 10.5 | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-17

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **31 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND WITH CLAY: Dark yellowish brown,moist,fine to medium-grained sand | | | | MAX DENSITY, EXPANSION, REMOLD SHEAR, ATTERBERG LIMITS, CORROSIVITY TESTS |
| 5 | 5 | | | 6(Ring) | | SM | same as above | 116.1 | 8.1 | | |
| 10 | 10 | | | 10(Ring) | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine to medium-grained sand | 117.4 | 12.4 | | CONSOL |
| 15 | 15 | | | 8(Ring) | | SC | same as above,grading to yellowish brown | 117.1 | 14.3 | | CONSOL |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 17

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 13(Ring) | | SM | SILTY SAND: Yellowish brown,moist,fine to medium-grained sand,trace clay and gravel | 112.1 | 9.3 | | |
| 25 | 25 | | | 58(Ring) | | SP-SM | GRAVELLY SAND WITH SILT: Yellowish brown to light olive brown,damp to moist,fine to medium-grained sand,with some clay<br>with cobbles below 27.5 feet depth | 110.4 | 7.5 | | |
| 30 | 30 | | | 53(Ring) | | SC | CLAYEY SAND: Strong brown,moist,fine to medium-grained sand,with some gravel | 123.4 | 13.0 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-18

Sheet 1 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **2/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **31 Feet 6 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine to medium-grained sand,with some gravel | | | | |
| 5 | 5 | | | 15(Ring) | | SM | SILTY SAND: Dark yellowish brown,damp to moist,fine to medium-grained sand,trace clay,with some gravel | 114.7 | 7.5 | | |
| 10 | 10 | | | 19(Ring) | | SP-SM | GRAVELLY SAND WITH SILT: Yellowish brown,damp,fine to medium-grained sand,trace clay | 121.1 | 5.2 | | CONSOL |
| 15 | 15 | | | 6(Ring) | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine to medium-grained sand | 109.0 | 14.3 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B - 18

Sheet 2 of 2

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK / DRIVE / TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | 9(Ring) | | CL | SANDY CLAY: Dark yellowish brown,moist,fine to medium-grained sand | 115.5 | 16.3 | | CONSOL |
| 25 | 25 | 41(Ring) | | SC | CLAYEY SAND WITH GRAVEL: Yellowish brown with strong brown,moist,fine to medium-grained sand | 121.5 | 12.4 | | |
| 30 | 30 | 77(Ring) | | SC | same as above,becoming yellowish brown | 119.1 | 13.0 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-19

Sheet 1 of 2

Project: *The Trails at Corona-Tracts 37500 to 37504*

Location: *2121 Mountain View Drive* | Project No. *6619.18.1*

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **9/27/2018** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **26 Feet** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | ML | SANDY SILT: Yellowish brown,damp,fine-grained sand,trace gravel-size rock pieces | | | | |
| | | | | 14(Ring) | | | | 99.2 | 5.8 | | |
| 5 | 5 | | | | | SC | CLAYEY SAND: Brown to dark brown,moist,fine-grained sand,with some gravel-size rock pieces | | | | |
| | | | | 6(Ring) | | | | 99.8 | 11.2 | | CONSOL |
| 10 | 10 | | | 14(Ring) | | SM | SILTY SAND WITH CLAY: Yellowish brown to light olive brown,moist,fine-grained sand | 113.4 | 11.1 | | CONSOL |
| 15 | 15 | | | 5(SPT) | | SC | CLAYEY SAND: Yellowish brown,moist,fine-grained sand,trace gravel-size rock pieces | | 12.4 | | |

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# FIELD LOG OF BORING B - 19

Sheet 2 of 2

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 15(Ring) | | SC | CLAYEY SAND: Yellowish brown,moist,fine to medium-grained sand,trace gravel-size rock pieces | 115.8 | 11.1 | | |
| 25 | 25 | | | 50/6" (SPT) | | CL | SANDY CLAY: Dark yellowish brown,moist,fine-grained sand,trace gravel-size rock pieces | | 15.6 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-20

Sheet 1 of 2

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **9/27/2018** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **25 Feet 3 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | ML | SANDY SILT: Brown,damp,fine-grained sand,trace gravel-size rock pieces | | | | |
| | | | | 17(Ring) | | | | 109.1 | 5.5 | | |
| 5 | 5 | | | | | SM | SILTY SAND WITH CLAY: Brown to dark brown,moist,fine-grained sand,with some gravel-size rock pieces | | | | |
| | | | | 13(Ring) | | | | 110.6 | 8.8 | | |
| 10 | 10 | | | 15/6" (Ring) | | SM | same as above | 119.4 | 10.0 | | CONSOL |
| | | | | 20/6" (Ring) | | SM | SILTY SAND WITH GRAVEL: Yellowish brown,damp,fine to medium-grained sand | 126.7 | 3.7 | | |
| 15 | 15 | | | 5(SPT) | | SM | SILTY SAND: Yellowish brown,moist,fine-grained sand | | 9.9 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B - 20

Sheet 2 of 2

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 10(Ring) | | SM | SILTY SAND WITH CLAY: Light olive brown,moist,fine-grained sand,with some gravel-size rock pieces | 115.4 | 9.3 | | |
| | | | | | | | drilling effort increases at 22 feet | | | | |
| 25 | 25 | | | 50/3" (SPT) | | SM | same as above<br>#no recovery | | # | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-21

Sheet 1 of 2

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **9/27/2018** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **31 Feet** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE, TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | SM | SILTY SAND: Brown,dry to damp,fine-grained sand | | | | MAX DENSITY, EXPANSION, REMOLD SHEAR, CORROSIVITY TESTS |
| | | | 11(Ring) | | SM | SILTY SAND WITH CLAY: Yellowish brown to dark yellowish brown,moist,fine-grained sand | 106.1 | 8.1 | | |
| 5 | 5 | | | | SC | CLAYEY SAND: Dark yellowish brown,moist,fine-grained sand | | | | |
| | | | 14(Ring) | | | | 118.3 | 12.4 | | CONSOL |
| 10 | 10 | | 14(Ring) | | SC | same as above,trace gravel-size rock pieces | 113.5 | 13.0 | | CONSOL |
| 15 | 15 | | 6/6"(Ring) | | SC | same as above,yellowish brown to dark yellowish brown | 119.3 | 11.8 | | |
| | | | 7/6"(Ring) | | SM | SILTY SAND: Yellowish brown,moist,fine-grained sand,with some clay | 121.3 | 10.0 | | |
| 20 | 20 | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B - 21

Sheet 2 of 2

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 15(Ring) | | SM | SILTY SAND WITH CLAY: Dark yellowish brown,moist,fine to medium-grained sand,with some gravel-size rock pieces | 118.6 | 12.7 | | |
| 25 | 25 | | | 43(Ring) | | SM | #no recovery | # | # | | |
| | | | | | | SM | SILTY SAND WITH CLAY: Light olive brown with dark yellowish brown and pale yellow,moist,fine to medium-grained sand,with some gravel-size rock pieces<br>drilling effort increases at 26 feet | | | | |
| 30 | 30 | | | 62(Ring) | | SM | same as above | 119.4 | 12.1 | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-22

Sheet 1 of 2

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **9/27/2018** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **26 Feet** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: Brown,dry to damp,fine-grained sand | | | | |
| | | | | | | SC | CLAYEY SAND: Brown,moist,fine-grained sand | | | | |
| 5 | 5 | | | 9(Ring) | | | | 106.5 | 13.6 | | |
| 10 | 10 | | | 14(Ring) | | SC | same as above,yellowish brown | 112.4 | 14.3 | | CONSOL |
| 15 | 15 | | | 12(Ring) | | SC | same as above | 111.6 | 13.6 | | |
| 20 | 20 | | | | | | | | | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B - 22

Sheet 2 of 2

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20 | | | 13(Ring) | | SM | SILTY SAND: Dark yellowish brown,moist,fine-grained sand,with some clay and gravel-size rock pieces | 116.5 | 9.9 | | |
| 25 | 25 | | | 37(Ring) | | SM | SILTY SAND WITH GRAVEL: Light olive brown with brownish yellow and pale yellow,damp,fine to medium-grained sand,trace clay | 115.0 | 4.4 | | |

ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-P1

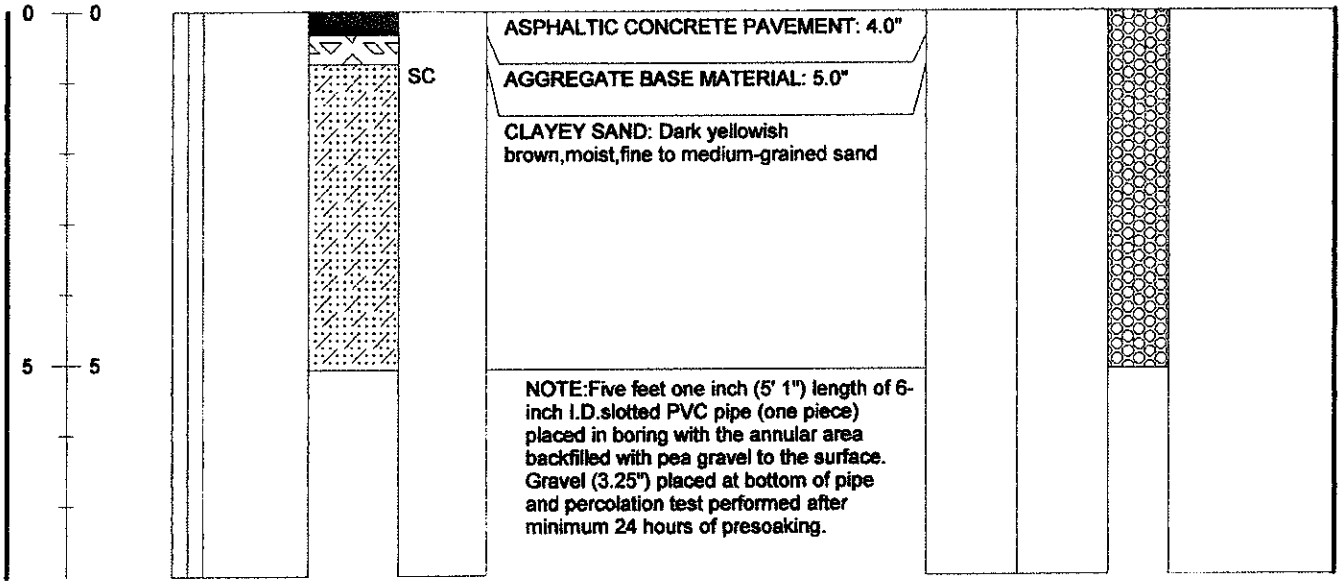
Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/12/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **5 Feet 1 Inch** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.



ASSOCIATED SOILS ENGINEERING, INC.

# FIELD LOG OF BORING B-P2

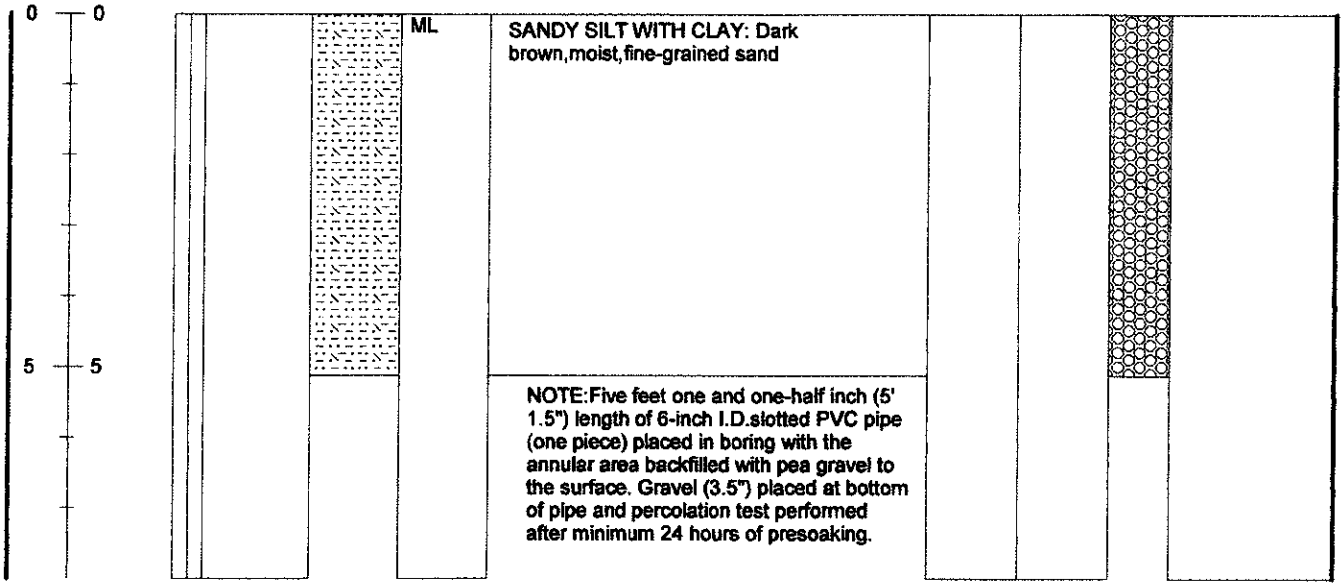
Sheet 1 of 1

Project: ***Redevelopment of Mountain View Golf Course-Corona***

Location: ***2121 Mountain View Drive*** Project No. ***6619.16***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **1/26/2016** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **5 Feet 1.5 Inch** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Backfill not determined.



ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-P3

Sheet 1 of 1

Project: *The Trails at Corona-Tracts 37500 to 37504*

Location: *2121 Mountain View Drive* | Project No. *6619.18.1*

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **9/27/2018** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **5 Feet 4 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Boring backfills to 4.0 ft.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE, TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | SM | SILTY SAND: Brown,damp,fine-grained sand | | | | |
| | | | 25(Ring) | | ML | SANDY SILT WITH CLAY: Yellowish brown to light yellowish brown,moist,fine-grained sand,trace gravel-size rock pieces | 102.1 | 9.3 | | |
| 5 | 5 | | | | | NOTE:Boring backfills to 4 feet. Five feet two inch (5' 2") length of 6-inch I.D. slotted PVC pipe (one piece) placed in boring, with one foot two inch (1' 2") portion of pipe sticking out above grade, with the annular area backfilled with pea gravel to surface. Three (3) inches of pea gravel placed at bottom of pipe. Percolation test performed after presoaking. | | | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-P4

Sheet 1 of 1

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Avenue*** | Project No. ***6619.18.1***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **9/27/2018** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **9 Feet** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. Boring backfills to 8 ft. 4 in.

| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: Brown,dry to damp,fine-grained sand | | | | |
| | | | | | | ML | SANDY SILT WITH CLAY: Brown to dark brown,damp,fine-grained sand,trace gravel-size rock pieces | | | | |
| | | | | 32(Ring) | | | | 103.3 | 6.7 | | |
| 5 | 5 | | | | | | | | | | |
| | | | | 43(Ring) | | ML | same as above,brown | 102.9 | 7.5 | | |
| 10 | 10 | | | | | | NOTE:Eight feet three inch (8' 3") length of 6-inch I.D. slotted PVC pipe (two pieces:upper 5 feet 3 inch solid,lower 3 feet slotted) placed in boring,with three inch (3") portion of pipe sticking out above grade, with the annular area backfilled with pea gravel to surface. Four and one-half inches (4.5") of pea gravel placed at bottom of pipe. Percolation test performed after overnight presoaking. | | | | |

ASSOCIATED SOILS ENGINEERING, INC

# FIELD LOG OF BORING B-P5

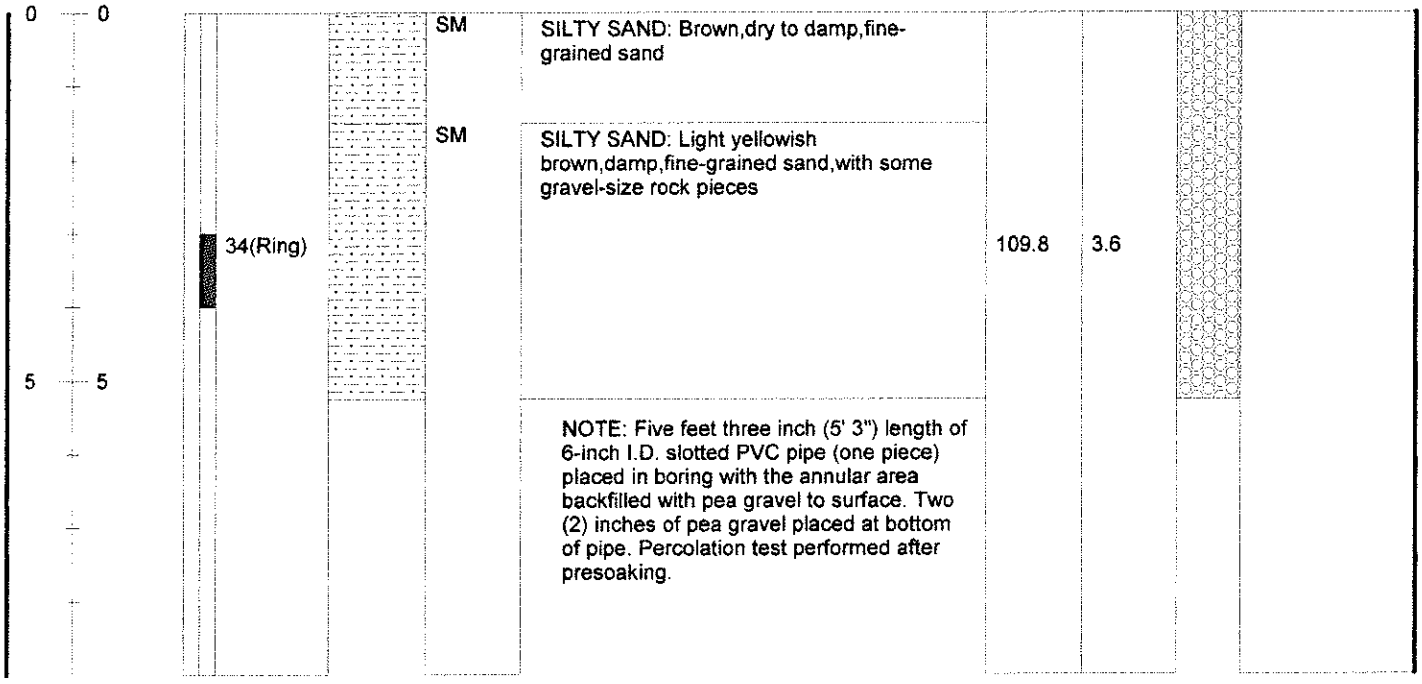
Sheet 1 of 1

Project: ***The Trails at Corona-Tracts 37500 to 37504***

Location: ***2121 Mountain View Drive*** | Project No. ***6619.18.1***

| | | | |
|---|---|---|---|
| Dates(s) Drilled: | **9/27/2018** | Logged By: | **Ted Riddell** |
| Drilled By: | **Geoboden,Inc.** | Total Depth: | **5 Feet 3 Inches** |
| Rig Make/Model: | **CME 75** | Hammer Type: | **Automatic** |
| Drilling Method: | **Hollow-stem Auger** | Hammer Weight/Drop: | **140 Lb./±30 In.** |
| Hole Diameter: | **8 Inches** | Surface Elevation: | **N/A** |

Comments: Groundwater not encountered. No caving.




| DEPTH (Ft.) | ELEVATION (MSL) | SAMPLE INTERVALS: BULK | SAMPLE INTERVALS: DRIVE | SAMPLE INTERVALS: TYPE, "N" or (Blows/ft.) | LITHOLOGY | USCS | GEOTECHNICAL DESCRIPTION | DRY DENSITY (Pcf) | MOISTURE CONTENT (%) | WELL COMPLETION | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | SM | SILTY SAND: Brown,dry to damp,fine-grained sand | | | | |
| | | | | | | SM | SILTY SAND: Light yellowish brown,damp,fine-grained sand,with some gravel-size rock pieces | | | | |
| | | | | 34(Ring) | | | | 109.8 | 3.6 | | |
| 5 | 5 | | | | | | NOTE: Five feet three inch (5' 3") length of 6-inch I.D. slotted PVC pipe (one piece) placed in boring with the annular area backfilled with pea gravel to surface. Two (2) inches of pea gravel placed at bottom of pipe. Percolation test performed after presoaking. | | | | |

## Laboratory Tests

After samples were visually classified in the laboratory, a testing program aimed at generating sufficient data for subsequent evaluation was established and implemented.

- Moisture Content and Density Tests

The undisturbed soils retained within the rings of the Modified California barrel sampler were tested in the laboratory to determine in-place dry density and moisture content. Test results are presented on the Field Logs of Boring, Plates B-1 through B-22 and B-P1 through B-P5.

- Consolidation and Direct Shear Tests

Consolidation (ASTM D 2435-11 Test Method) and direct shear (ASTM D 3080-11 Test Method) tests were performed on selected relatively undisturbed and remolded samples to determine the settlement characteristics and shear strength parameters of various soil samples, respectively. The results of these tests are shown graphically on the appended “C” and “D” Plates.

- Atterberg Limit Tests

The Atterberg Limits (liquid limit-plastic limit and plasticity index) were determined on selected soils samples in accordance with ASTM D4318-10 test procedures, Method A (multi-point test), dry preparation procedures. The test results are as follows and are presented on the appended "E" Plates.

| Sample ID | Liquid Limit, LL (%) | Plastic Limit, Pl (%) | Plasticity Index, PI | Soil Classification |
|---|---|---|---|---|
| B-1 @ 1’-5’ | 30 | 14 | 16 | CL |
| B-5 @ 0-5’ | 35 | 16 | 19 | CL |
| B-6 @ 0-5’ | 40 | 21 | 19 | CL |
| B-7 @ 0-5’ | 43 | 21 | 22 | CL |
| B-11 @ 0-5’ | 31 | 14 | 17 | CL |
| B-17 @ 0-5’ | 33 | 15 | 18 | CL |

**Laboratory Tests** - continued

- Soil Corrosivity Tests

Tests of soluble sulfate and chloride contents were performed in accordance with California Test Methods 417 and 422, respectively, to assess the degree of corrosivity of the subgrade soils with regard to concrete and normal grade steel. Resistivity and pH-value tests were performed in accordance with ASTM G187-12a Test Method and California Test Method 643, respectively, to assess the degree of corrosivity of the subgrade soils with regard to ferrous metal piping. The test results are shown below.

| Sample ID | Sulfate Content [1] (%)/ Degree of Severity | Chloride Content [2] (ppm) / Degree of Severity | Resistivity [3] (OHM-cm)/ Degree of Corrosivity | pH-Value [4] |
|---|---|---|---|---|
| B-1 @ 1'-5' | 0.047/Not Applicable | 27/Not Applicable | 1,213/Corrosive | 7.87 |
| B-5 @ 0-5' | 0.024/Not Applicable | 73/Not Applicable | 1,472/Corrosive | 7.91 |
| B-6 @ 0-5' | 0.017/Not Applicable | 39/Not Applicable | 1,295/Corrosive | 7.52 |
| B-7 @ 0-5' | 0.002/Not Applicable | 42/Not Applicable | 1,641/Corrosive | 7.41 |
| B-11 @ 0-5' | 0.005/Not Applicable | 62/Not Applicable | 1,190/Corrosive | 7.54 |
| B-17 @ 0-5' | 0.003/Not Applicable | 24/Not Applicable | 1,595/Corrosive | 7.45 |
| B-21 @ 0-5' | 0.00 (ND)/Not Applicable | 38/Not Applicable | 2,692/Moderately Corrosive | 7.71 |

1. California Test Method 417. 2. California Test Method 422. 3. ASTM G57 Test Method. 4. California Test Method 643.

- Maximum Dry Density/Optimum Moisture Content Tests

Maximum density tests were conducted in accordance with ASTM D1557-12, Method A, using 5 equal layers, 25 blows each layer, 10-pound hammer, 18 inch drop in a 1/30 cubic foot mold. The results are as follows:

| Sample ID | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Material Classification |
|---|---|---|---|
| B-1 @ 1'-5' | 132.0 | 9.0 | SC |
| B-5 @ 0-5' | 128.0 | 10.5 | SM |
| B-6 @ 0-5' | 119.0 | 13.5 | SM |
| B-7 @ 0-5' | 113.0 | 16.0 | ML |
| B-11 @ 0-5' | 132.5 | 8.5 | SC |
| B-17 @ 0-5' | 125.5 | 10.0 | SM |
| B-21 @ 0-5' | 132.5 | 8.5 | SM |

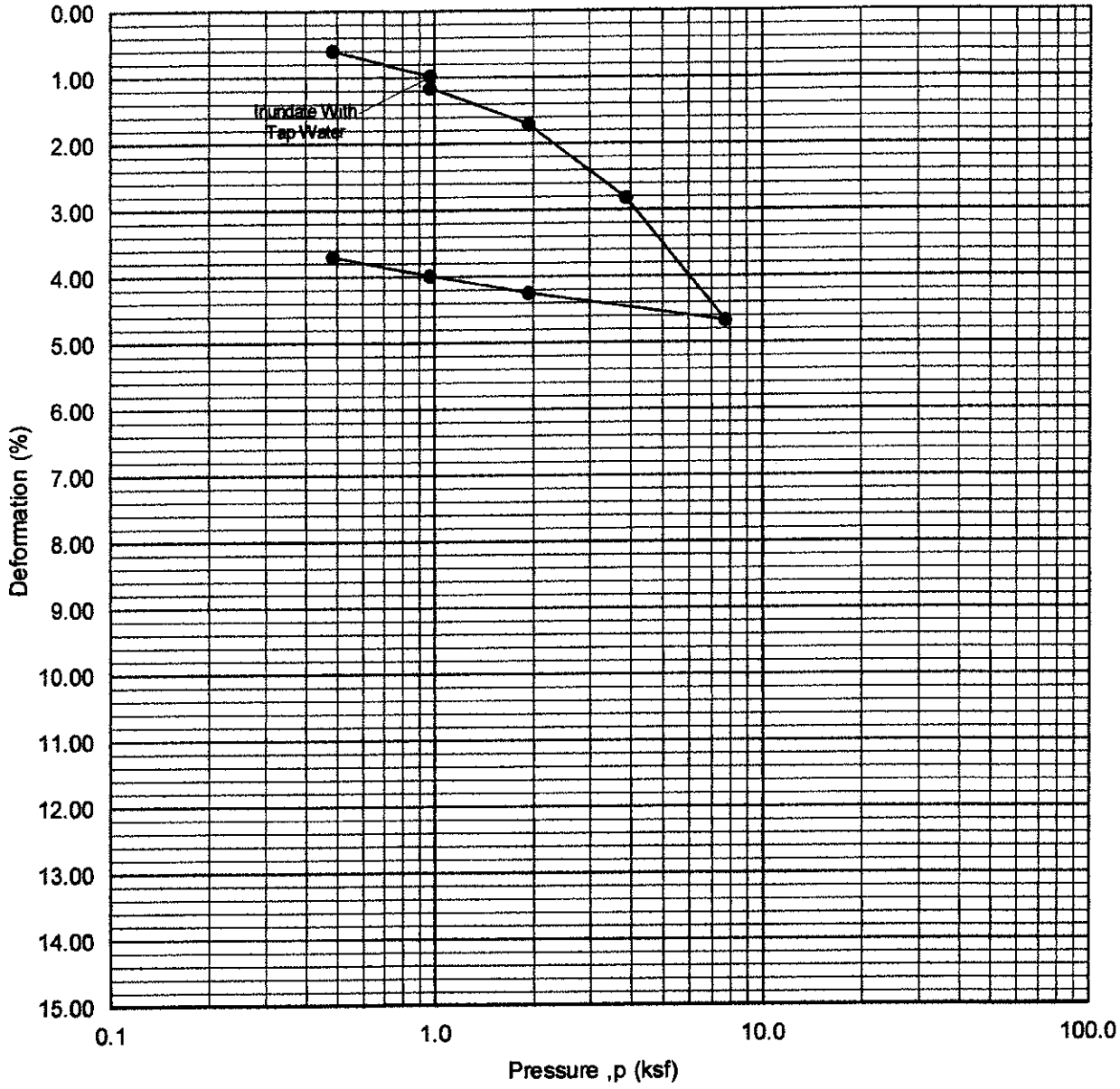
**Laboratory Tests** - continued

- Expansion Tests

Expansion tests were performed on soil samples to determine the swell characteristics. The expansion tests were conducted in accordance with ASTM D4829-08a test procedures. The expansion samples were remolded to approximately 90 percent relative compaction at near optimum moisture content subjected to 144 pounds per square foot surcharge load and were saturated.

| Sample ID | Molded Dry Density (pcf) | Molded Moisture Content (%) | % Saturation | Expansion Index (EI) | Expansion Classification |
|---|---|---|---|---|---|
| B-1 @ 1'-5' | 119.3 | 8.2 | 53.8 | 22 | Low |
| B-5 @ 0-5' | 114.8 | 10.3 | 59.9 | 30 | Low |
| B-6 @ 0-5' | 106.7 | 12.5 | 58.1 | 55 | Medium |
| B-7 @ 0-5' | 102.3 | 16.1 | 67.3 | 45 | Low |
| B-11 @ 0-5' | 118.5 | 8.4 | 54.0 | 10 | Very Low |
| B-17 @ 0-5' | 111.8 | 9.5 | 50.5 | 40 | Low |
| B-21 @ 0-5' | 117.3 | 9.0 | 55.9 | 17 | Very Low |

| | |
|---|---|
| Plates C-1 through C-22 | Uni-axial Consolidation Test Results |
| Plates D-1 through D-12 | Direct Shear Test Results |
| Plates E-1 through E-6 | Atterberg Limits Test Results |

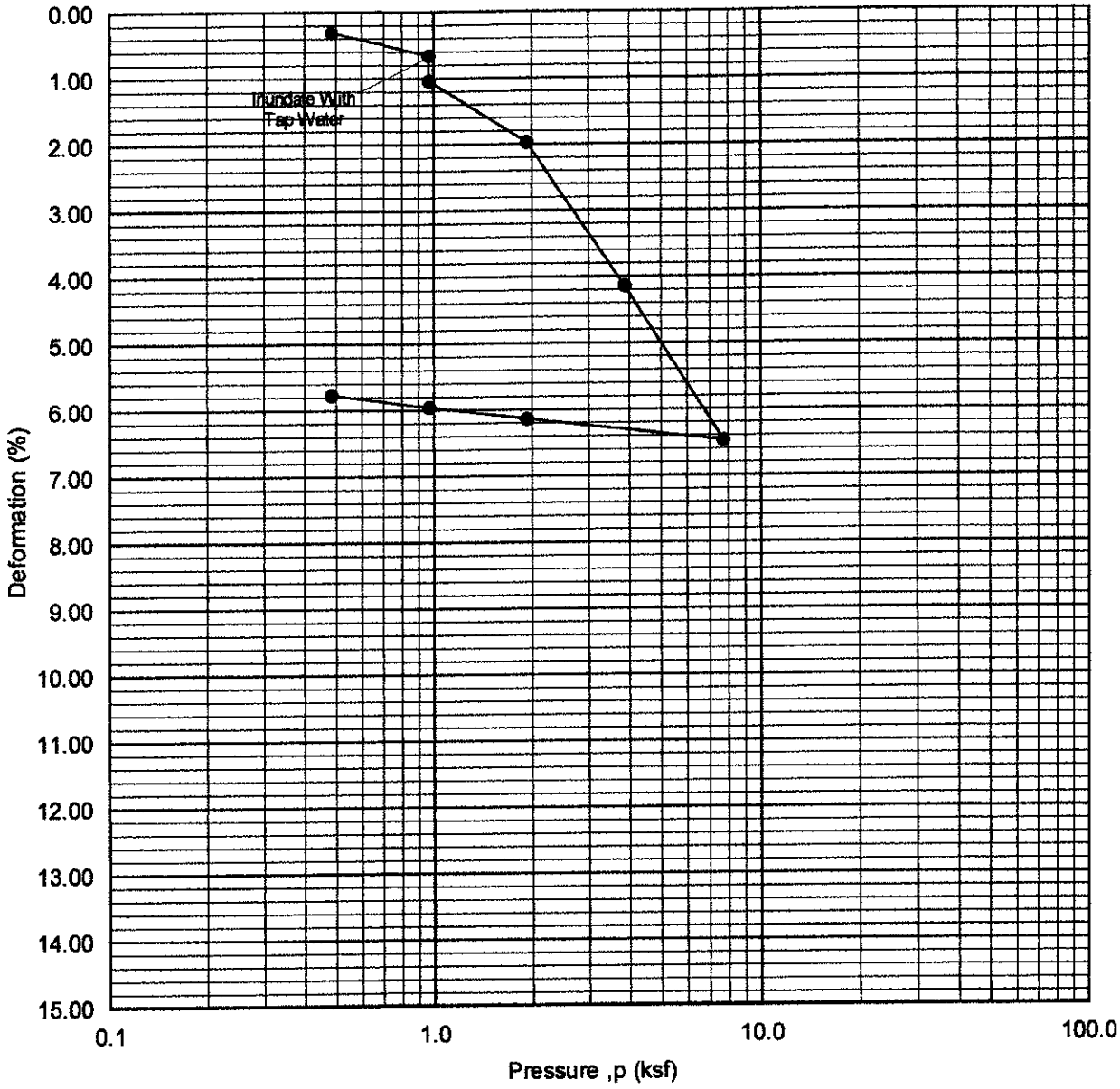



Boring No. : B-5
Depth (ft.) : 7.0
Sample Type: Clayey Fine Sand with Gravel

Dry Density (pcf) = 109.7
Moisture (%) = 15.6

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

PLATE C-1

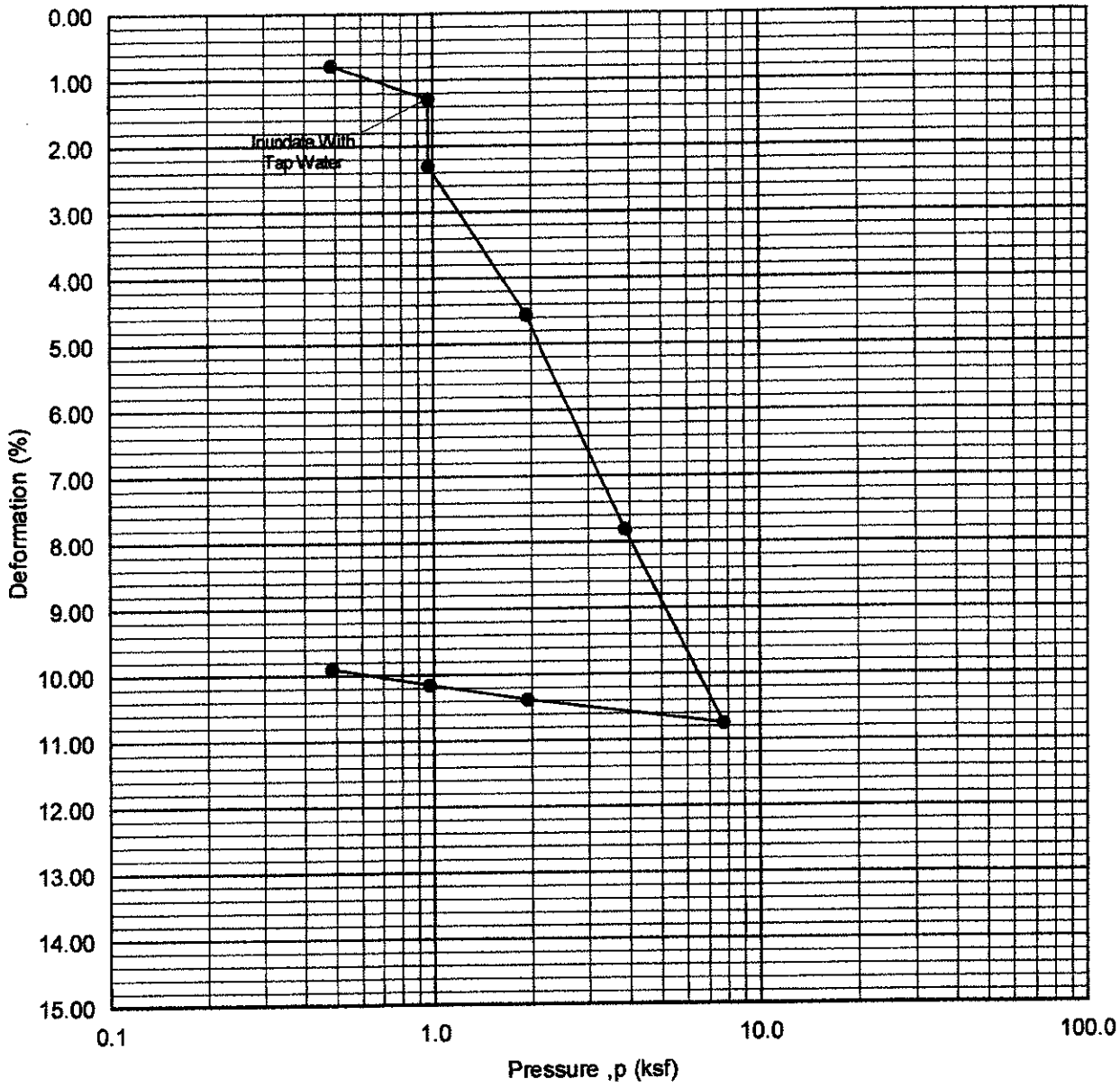



Boring No. : B-5
Depth (ft.) : 10.0
Sample Type: Silty Fine Sand

Dry Density (pcf) = 102.9
Moisture (%) = 8.1

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-2**

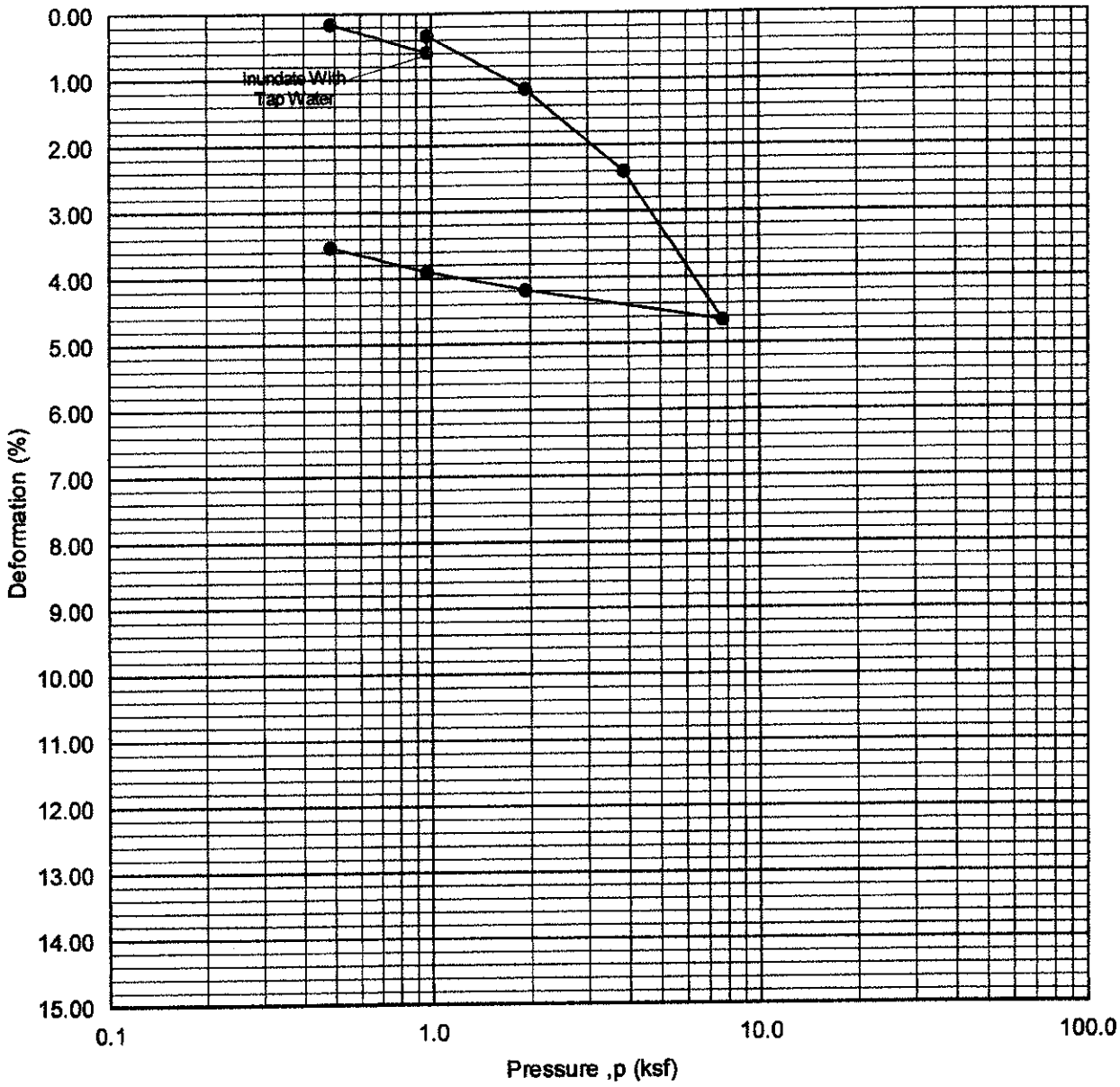



Boring No. : B-5
Depth (ft.) : 20.0
Sample Type: Clayey Fine Sand with some Gravel

Dry Density (pcf) = 106.7
Moisture (%) = 12.4

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-3**

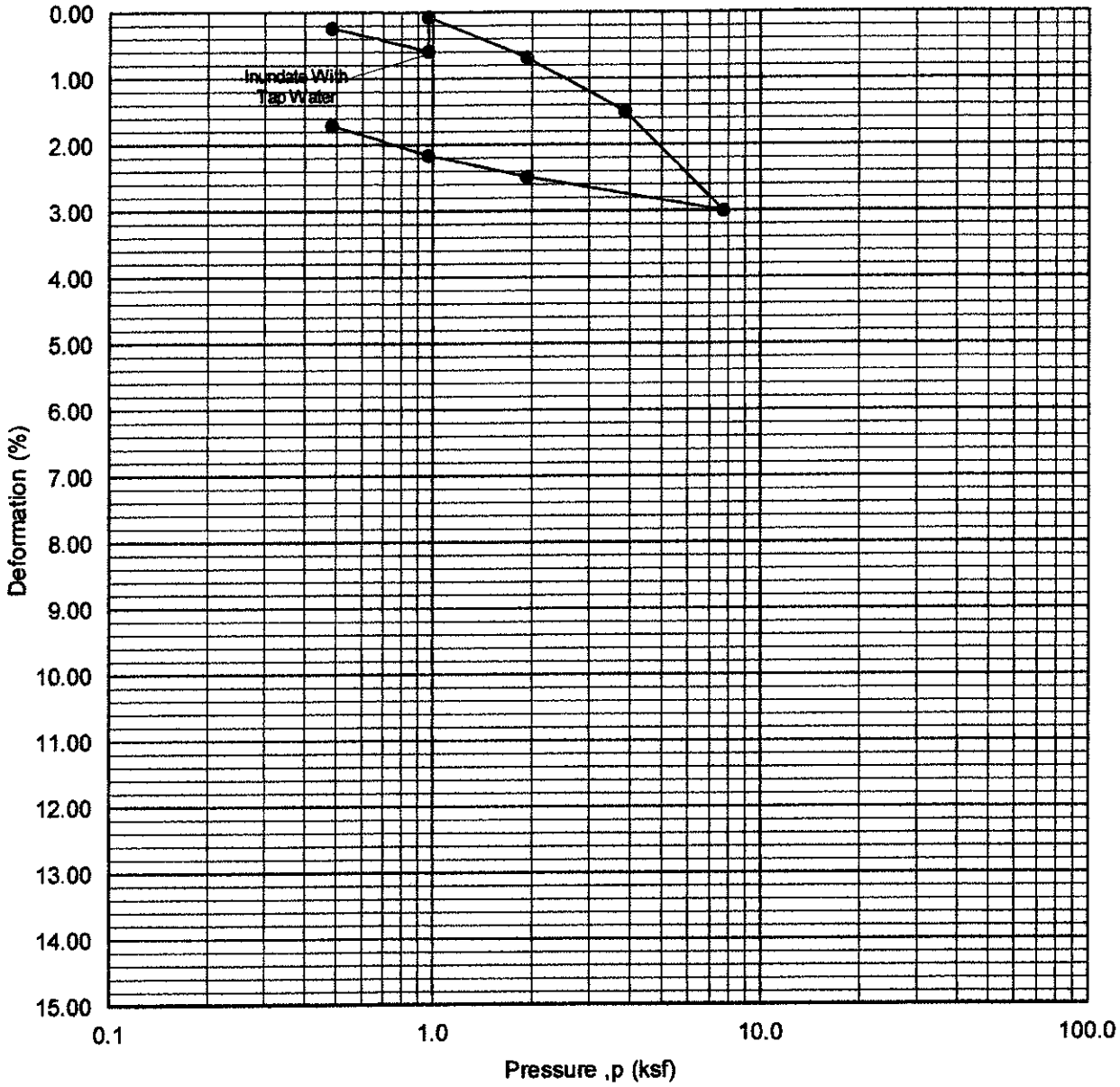



Boring No. : B-6
Depth (ft.) : 5.0
Sample Type: Silty Fine Sand

Dry Density (pcf) = 99.9
Moisture (%) = 10.5

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-4**

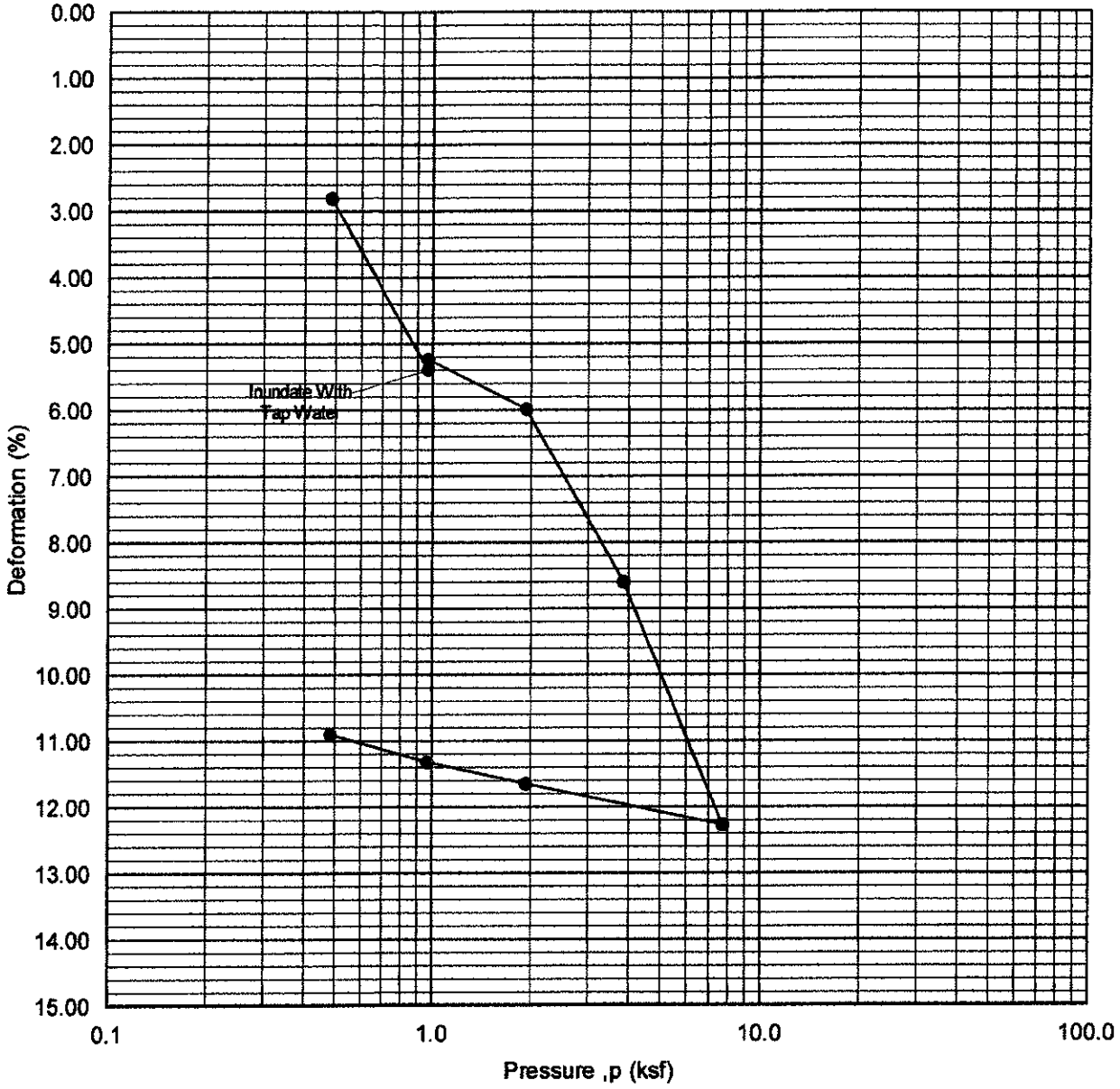



Boring No. : B-6
Depth (ft.) : 10.0
Sample Type: Silty Fine Sand

Dry Density (pcf) = 110.4
Moisture (%) = 7.5

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-5**

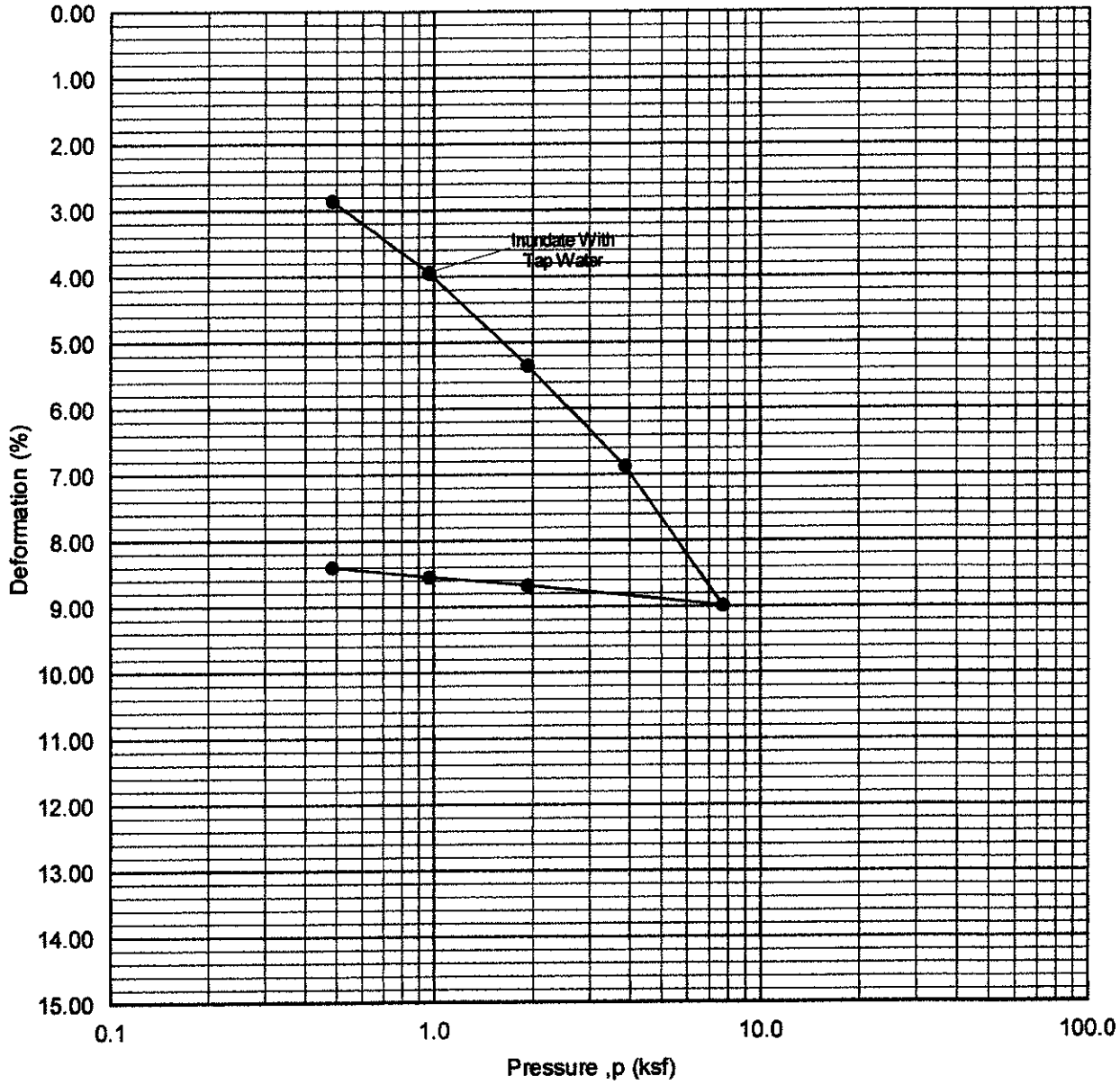



Boring No. : B-7
Depth (ft.) : 7.0
Sample Type: Silty Clay with Fine Sand

Dry Density (pcf) = 101.2
Moisture (%) = 22.0

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-6**

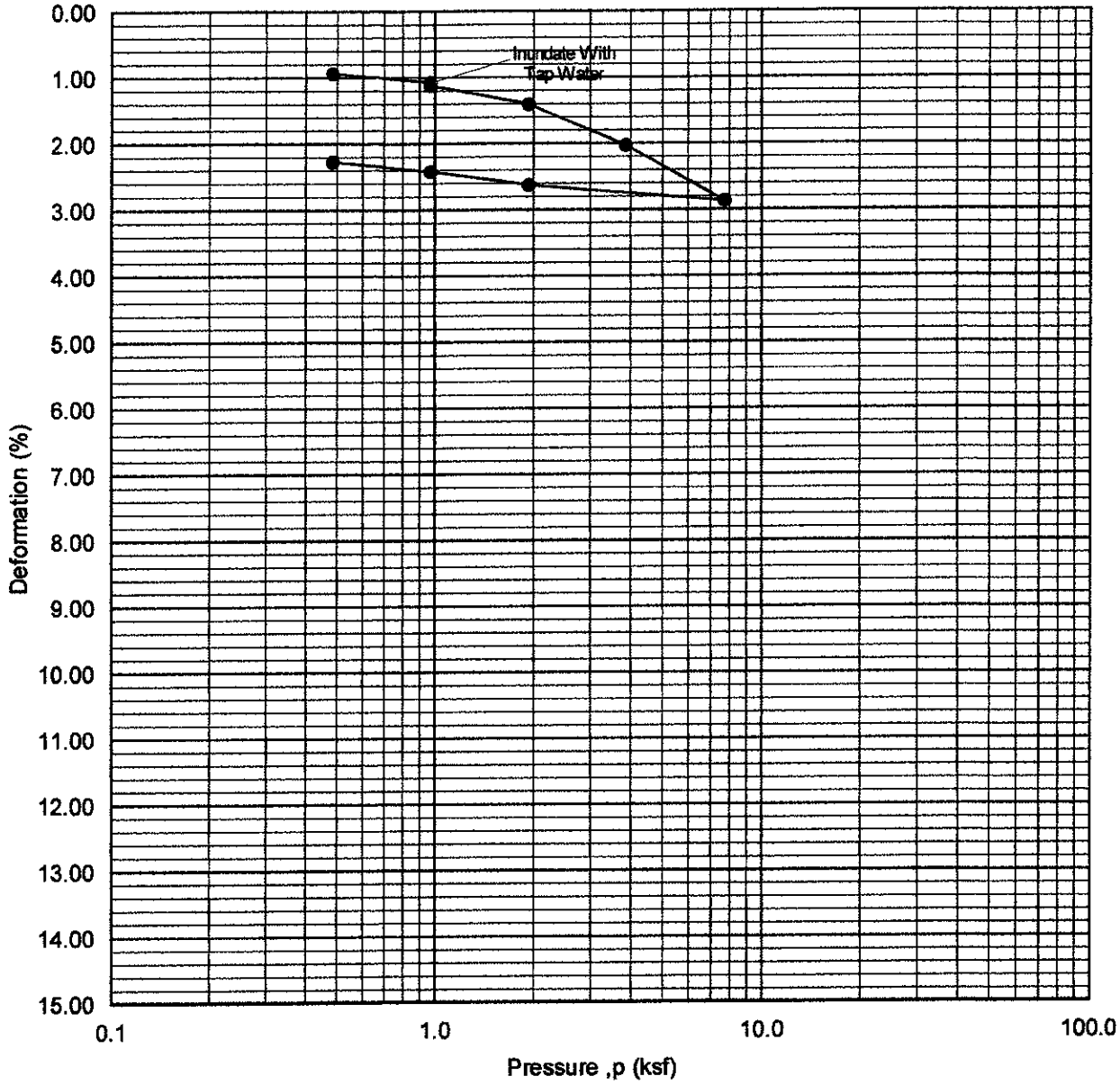



Boring No. : B-7
Depth (ft.) : 10.0
Sample Type: Fine Sandy Clay

Dry Density (pcf) = 108.5
Moisture (%) = 17.7

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-7**

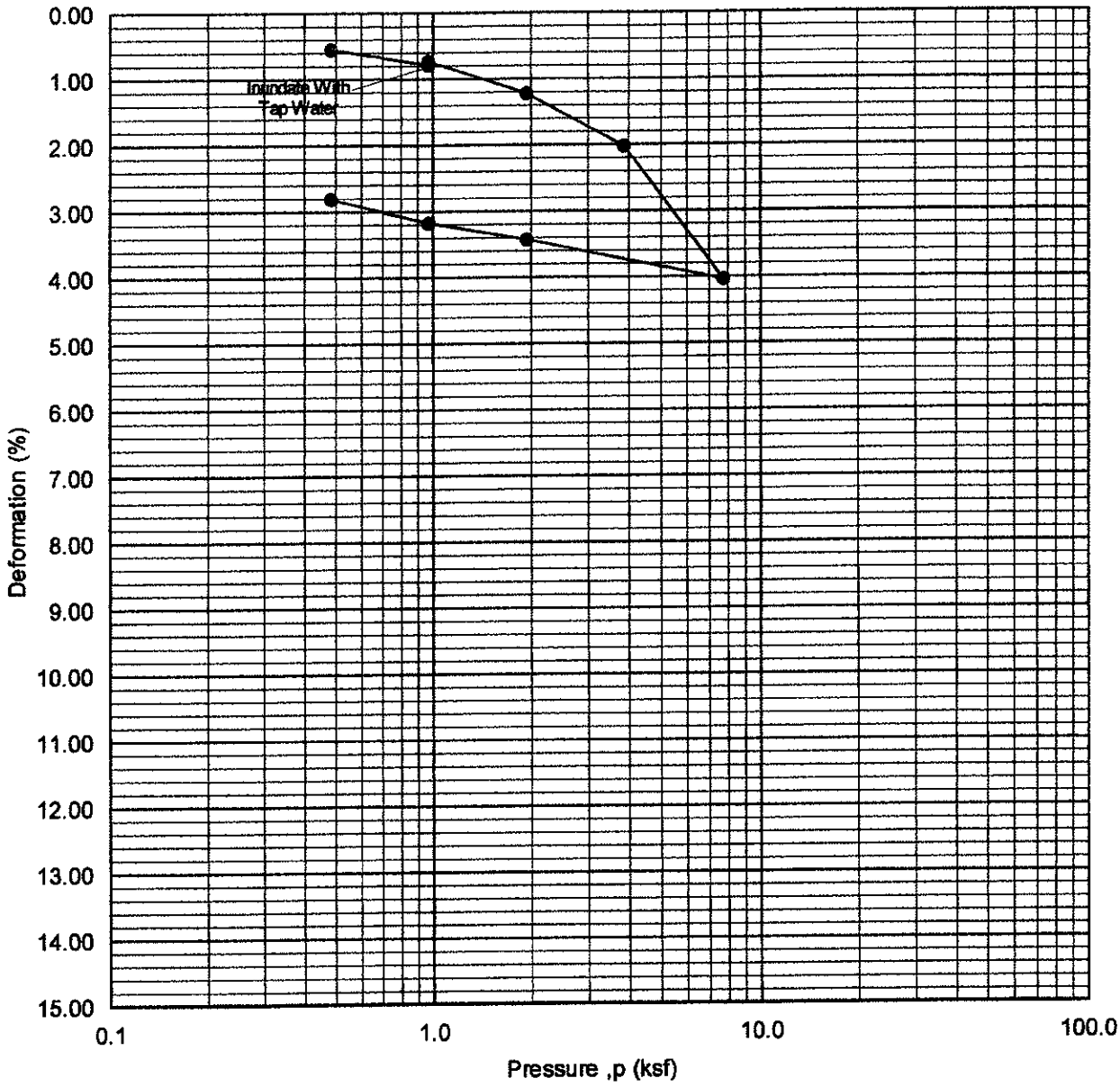



Boring No. : B-7
Depth (ft.) : 15.5
Sample Type: Fine Sandy Clay

Dry Density (pcf) = 120.2
Moisture (%) = 13.2

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-8**

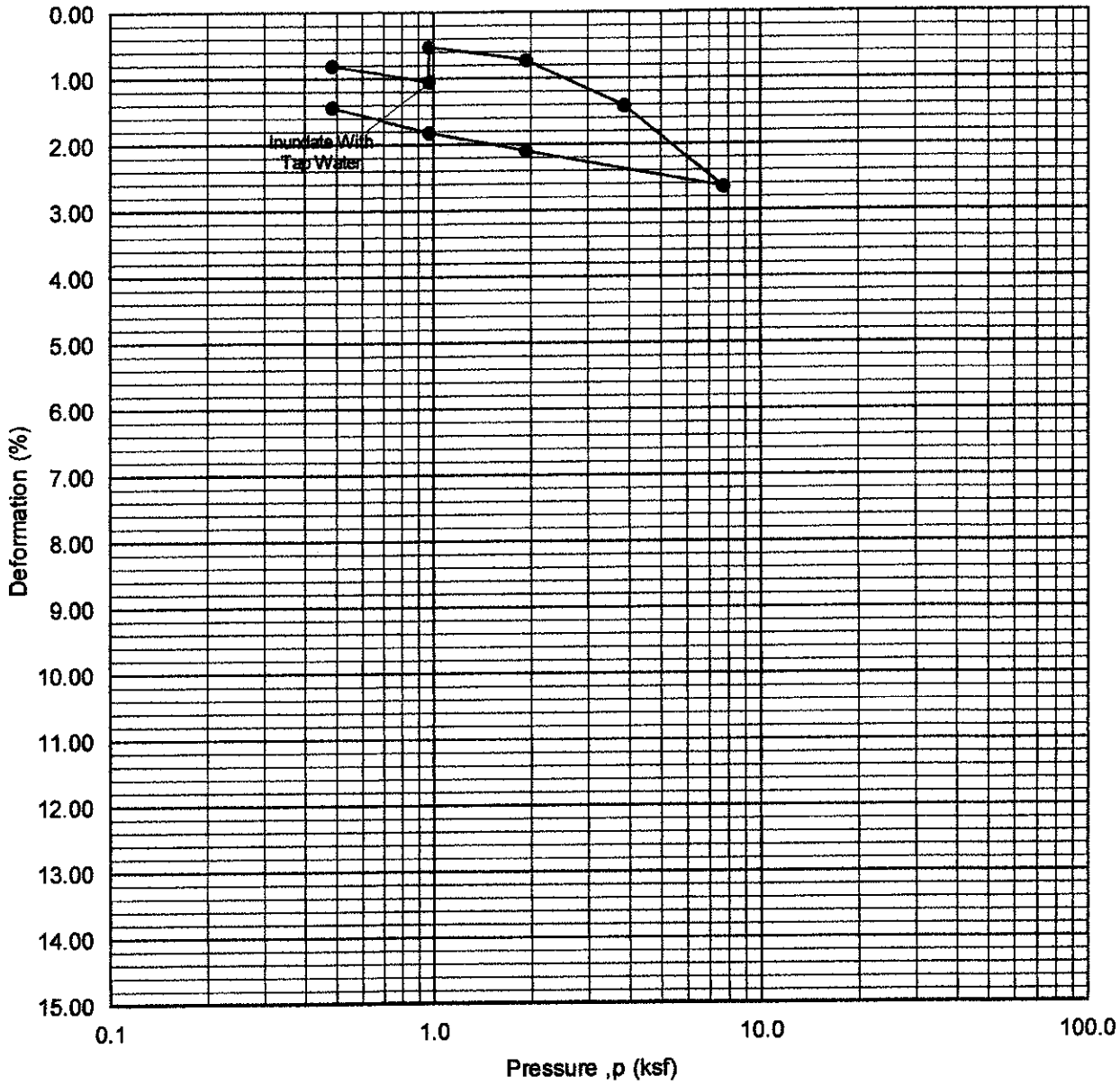



Boring No. : B-8
Depth (ft.) : 10.0
Sample Type: Silty Fine Sand with trace Clay

Dry Density (pcf) = 105.4
Moisture (%) = 12.6

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-9**

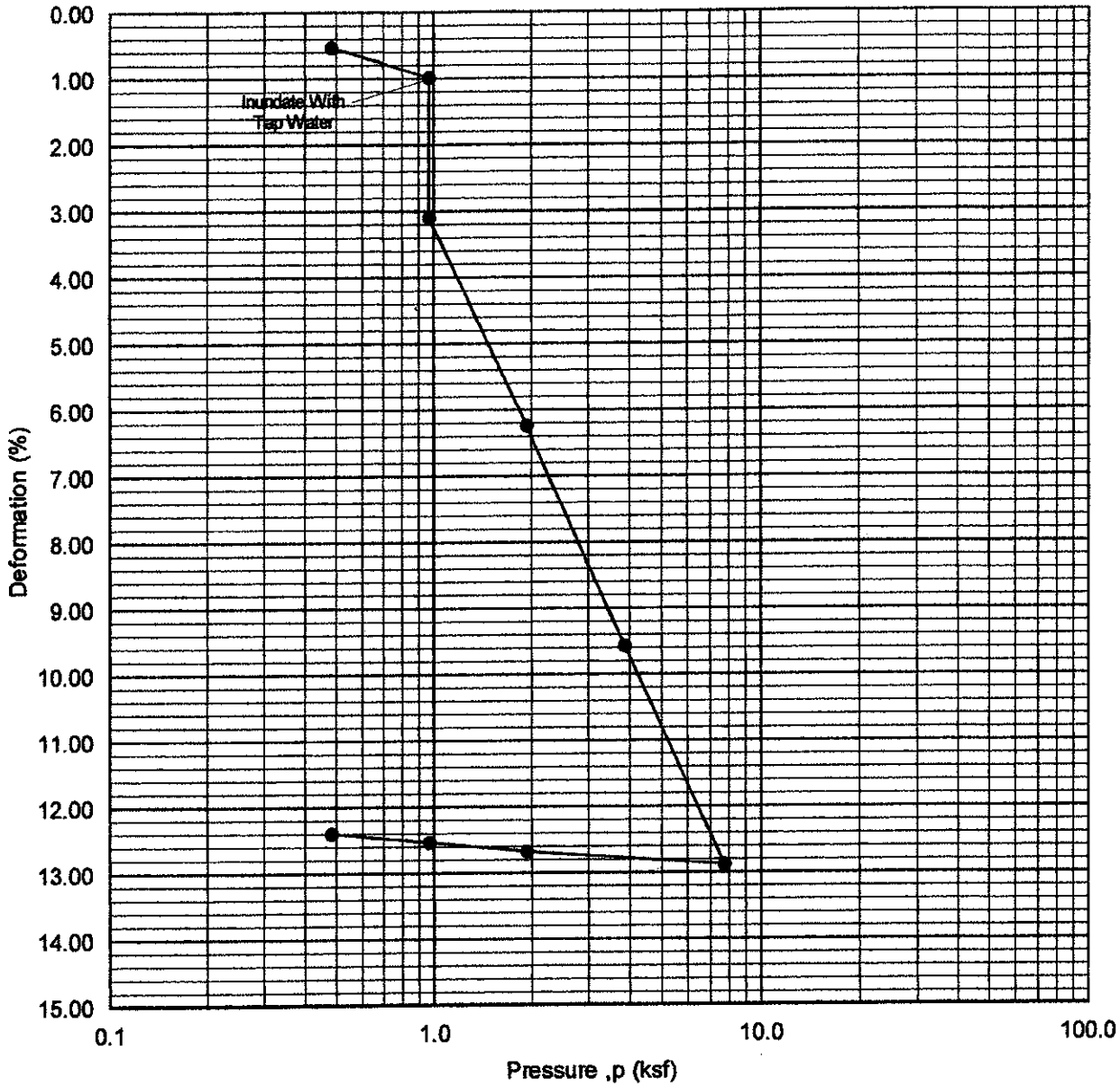



Boring No. : B-8
Depth (ft.) : 15.0
Sample Type: Clayey Fine Sand

Dry Density (pcf) = 118.1
Moisture (%) = 12.4

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-10**

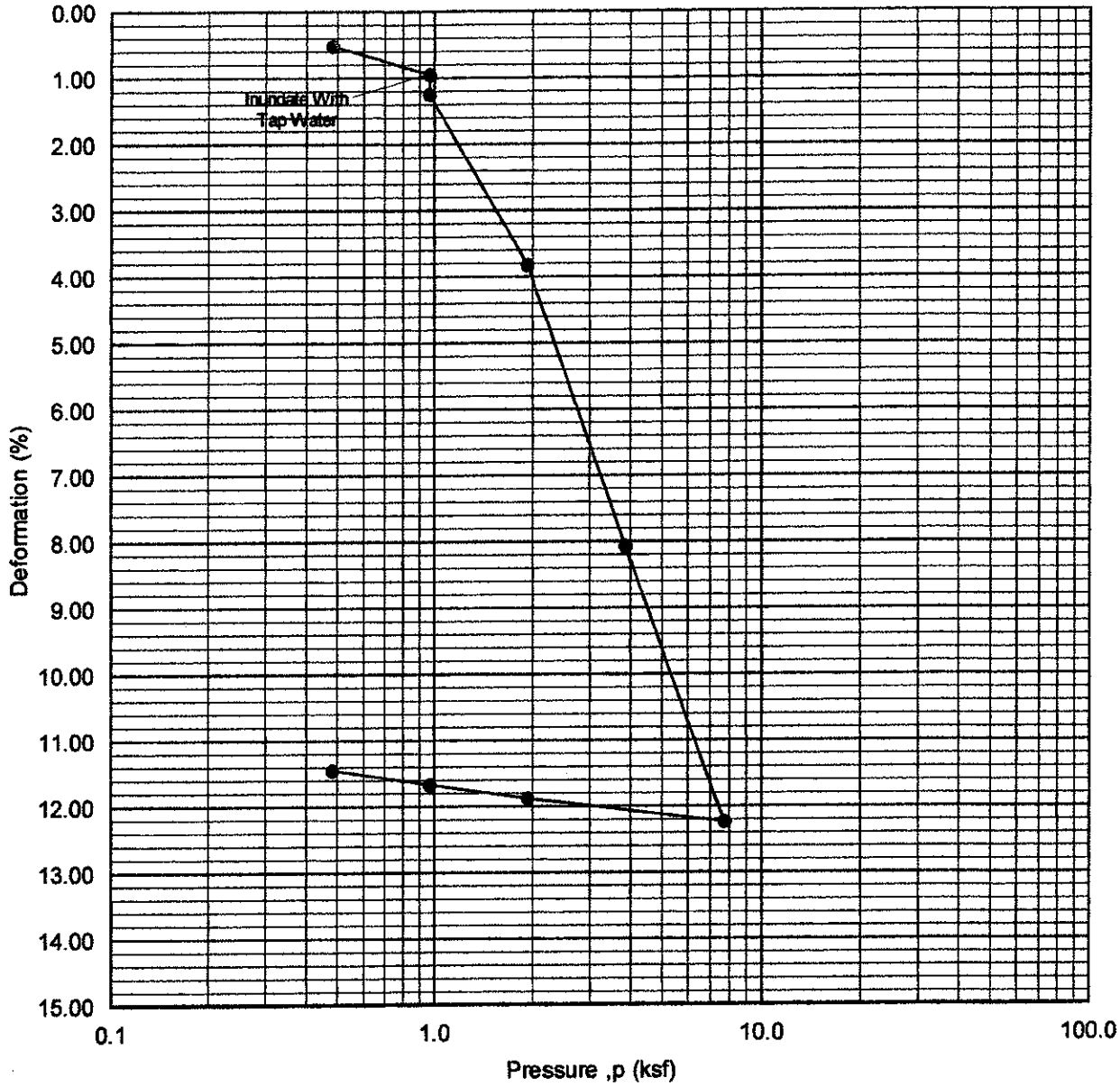



Boring No. : B-11
Depth (ft.) : 7.0
Sample Type: Silty Fine Sand with some Gravel

Dry Density (pcf) = 106.1
Moisture (%) = 4.7

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-11**

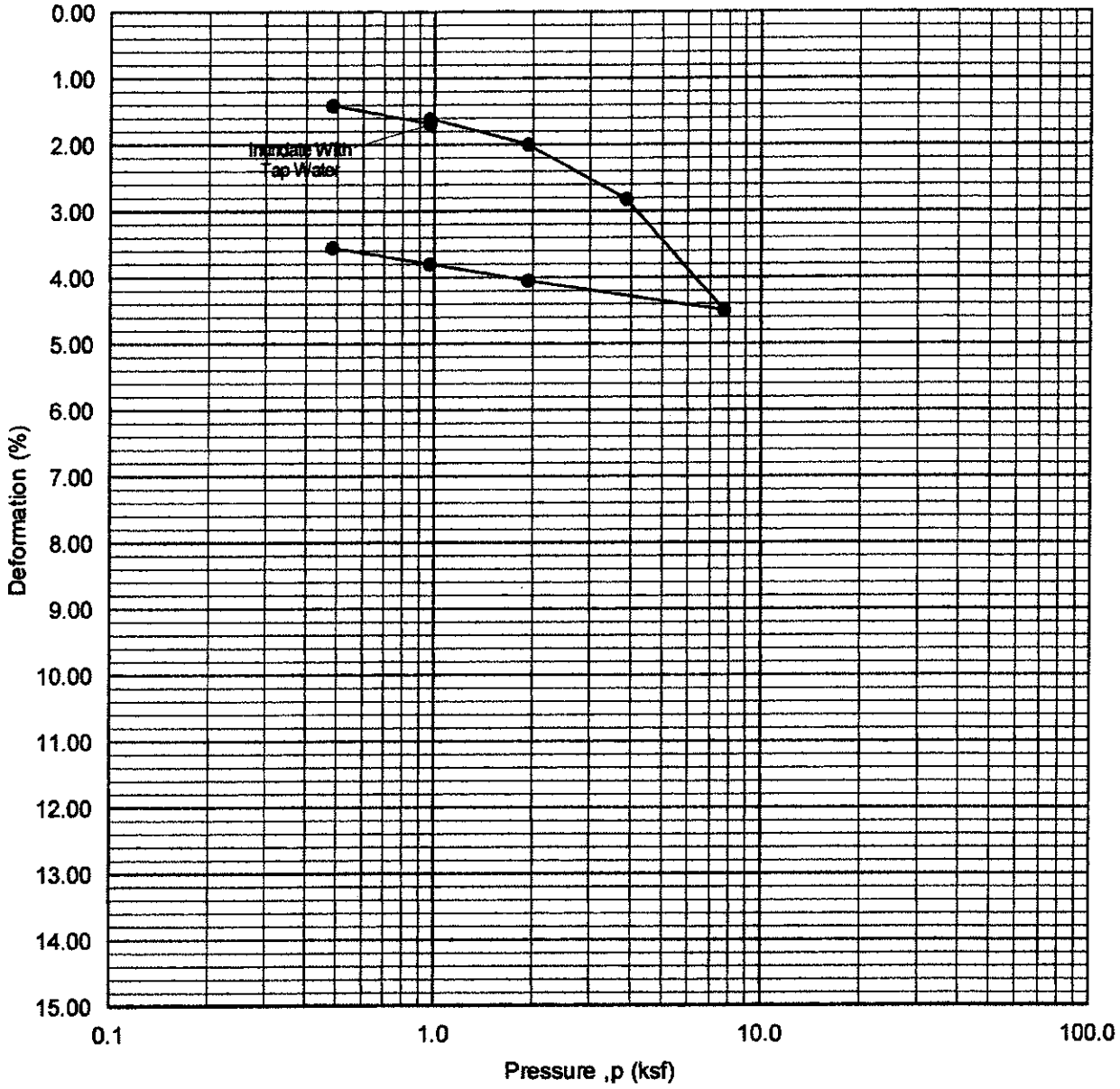



Boring No. : B-11
Depth (ft.) : 15.0
Sample Type: Silty Fine Sand with Clay and some Gravel

Dry Density (pcf) = 103.8
Moisture (%) = 7.5

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-12**

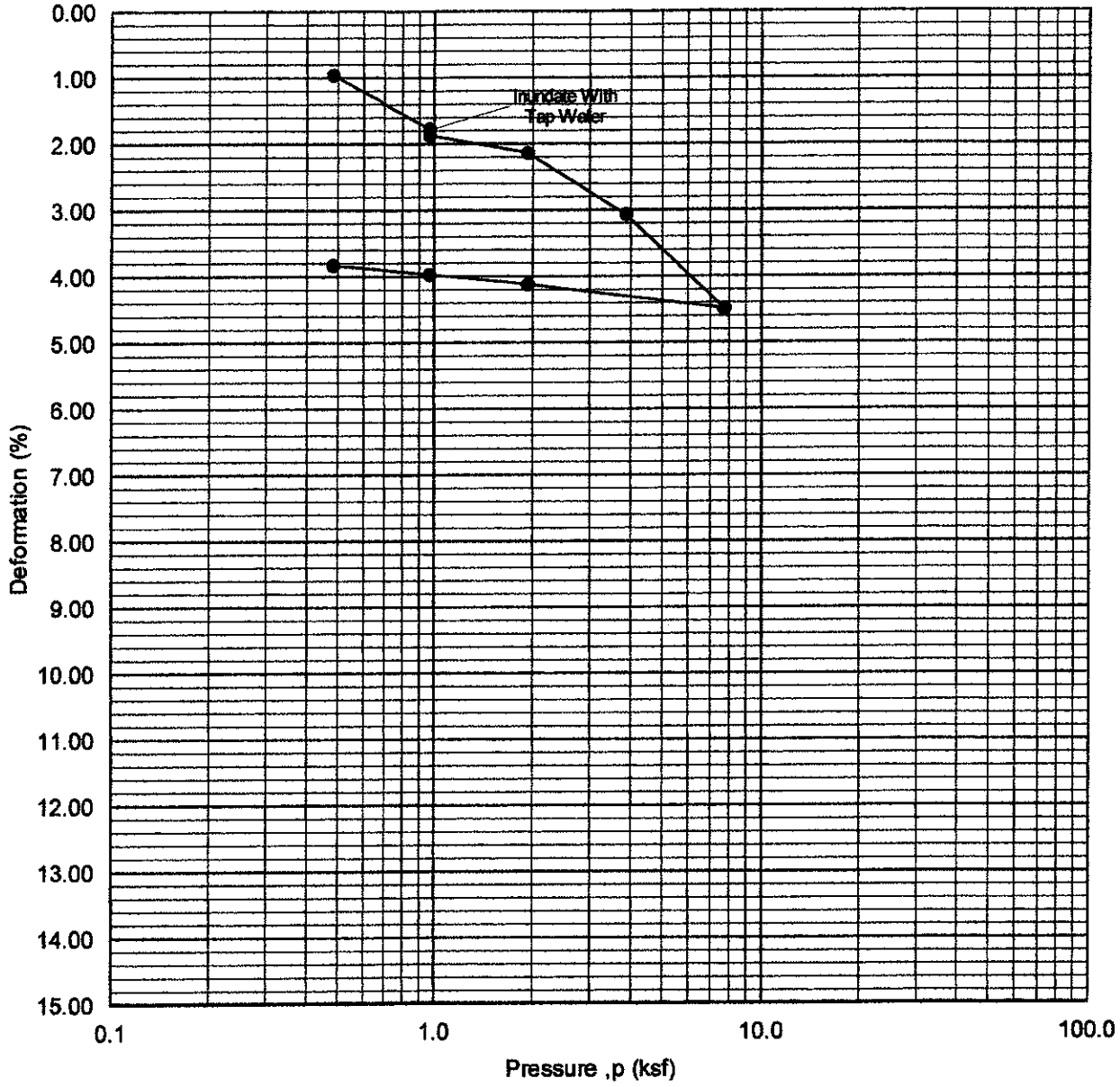



Boring No. : B-17
Depth (ft.) : 10.0
Sample Type: Clayey Fine to Medium Sand

Dry Density (pcf) = 117.4
Moisture (%) = 12.4

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-13**

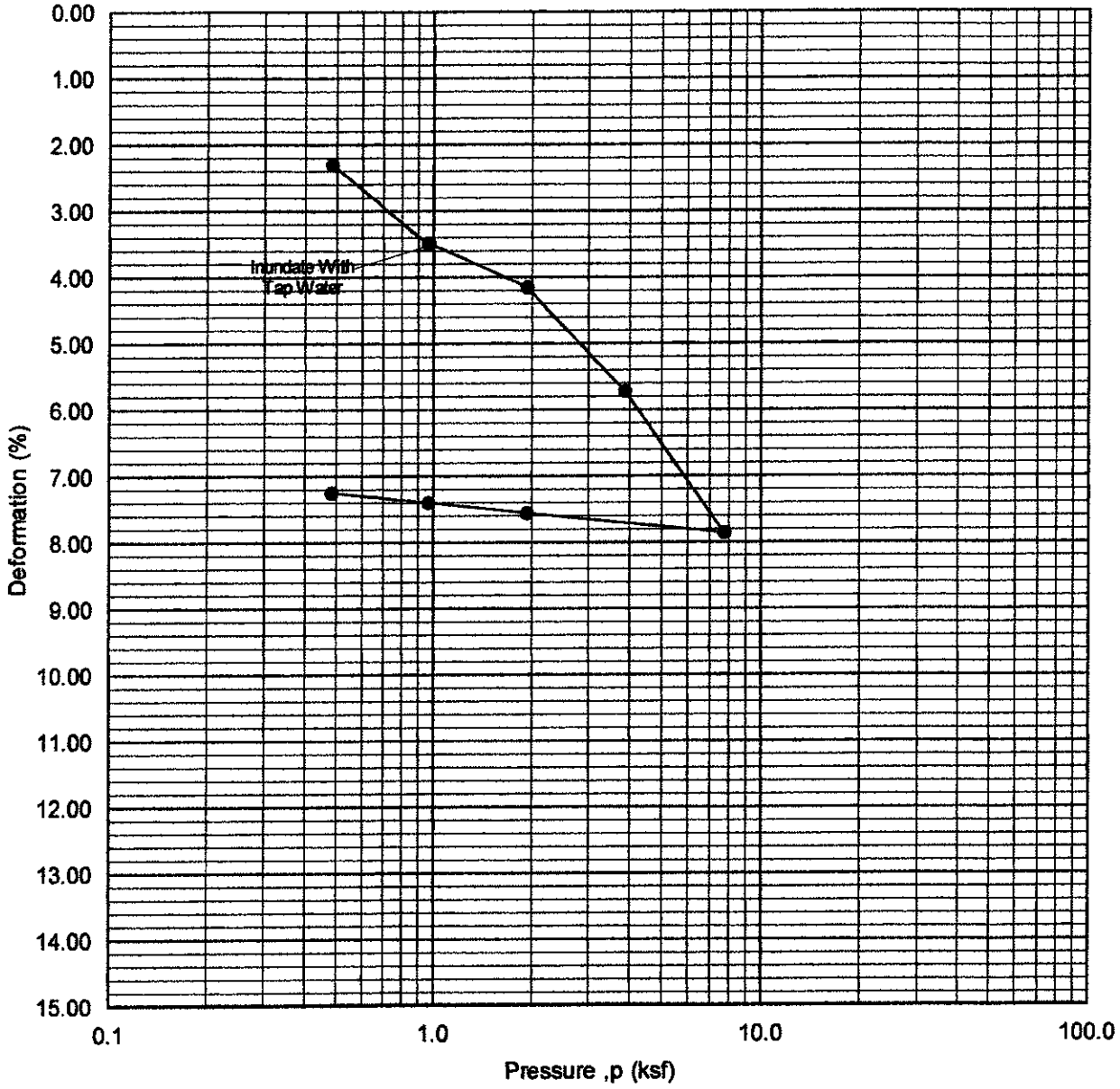



Boring No. : B-17
Depth (ft.) : 15.0
Sample Type: Clayey Fine to Medium Sand

Dry Density (pcf) = 117.1
Moisture (%) = 14.3

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-14**

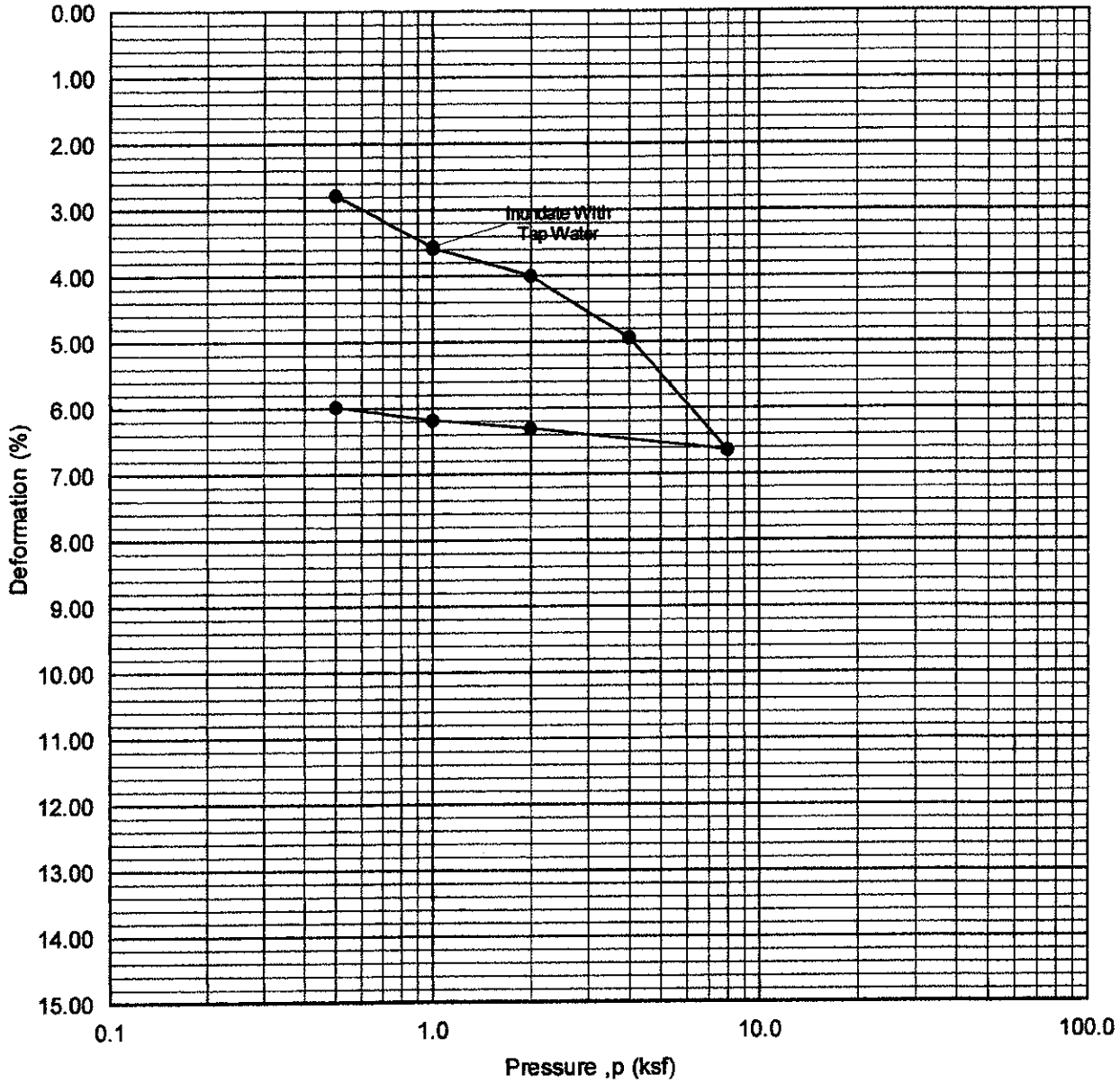



Boring No. : B-18
Depth (ft.) : 10.0
Sample Type: Silty Fine to Medium Sand with Gravel and trace Clay

Dry Density (pcf) = 121.1
Moisture (%) = 5.2

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-15**

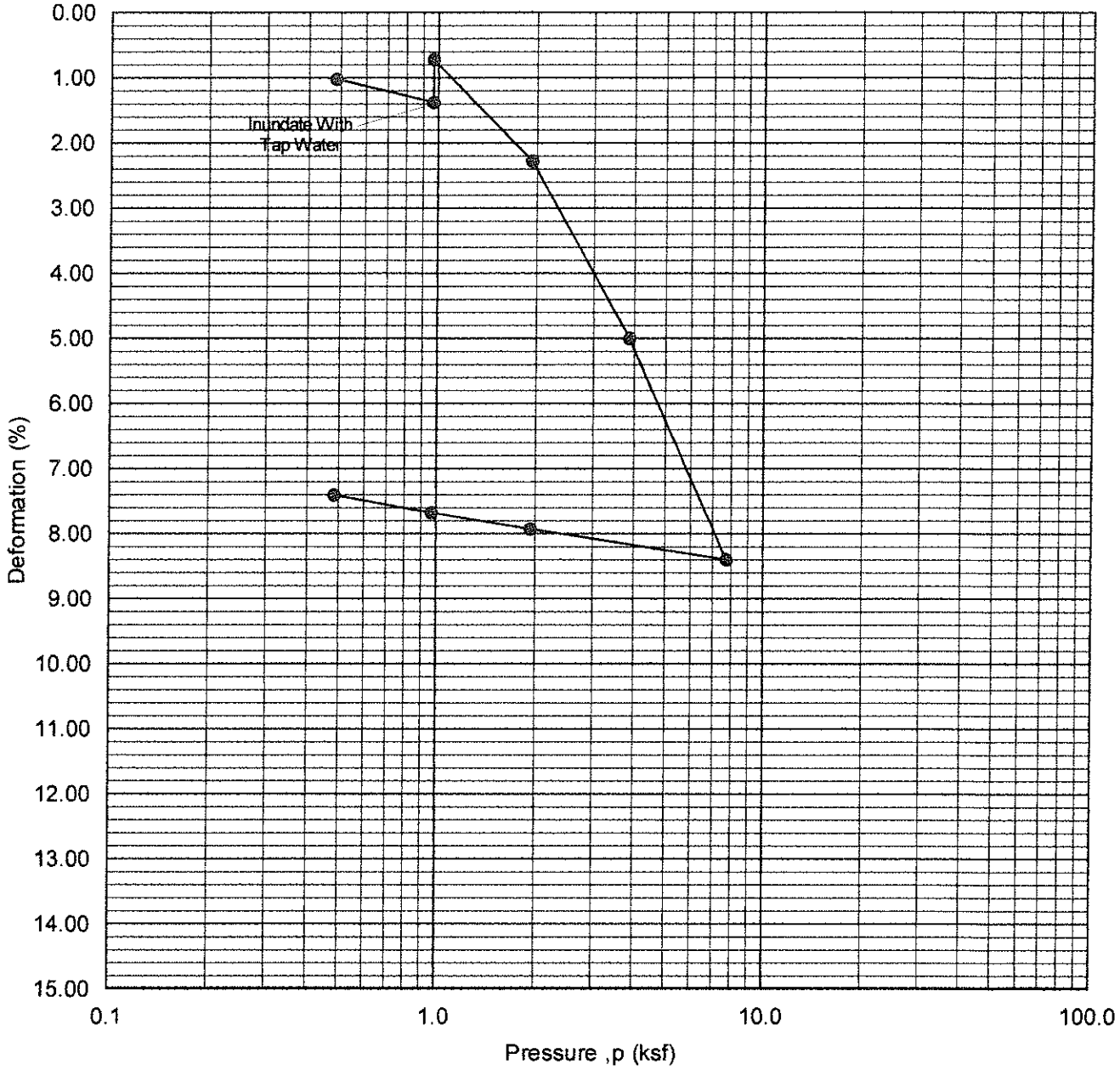



Boring No. : B-18
Depth (ft.) : 20.0
Sample Type: Fine to Medium Sandy Clay

Dry Density (pcf) = 115.5
Moisture (%) = 16.3

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

**PLATE C-16**

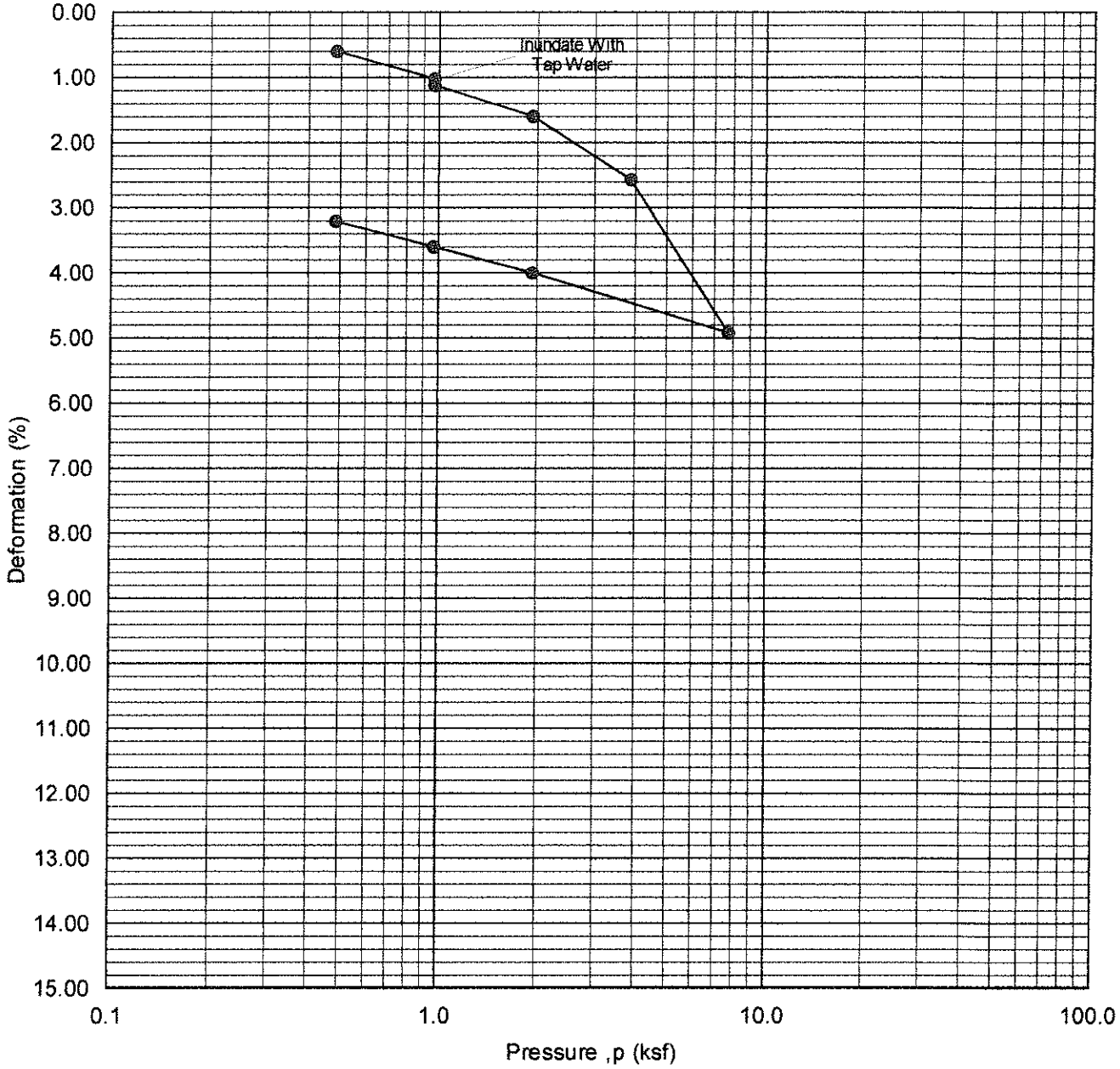



Boring No. : B-19
Depth (ft.) : 7.0
Sample Type: Clayey Fine Sand with some Gravel-size rock pieces

Dry Density (pcf) = 99.8
Moisture (%) = 11.2

| Project Name:The Trails at Corona-Tracts 37500 to 37504 | Project No.: 6619.18.1 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

PLATE C-17

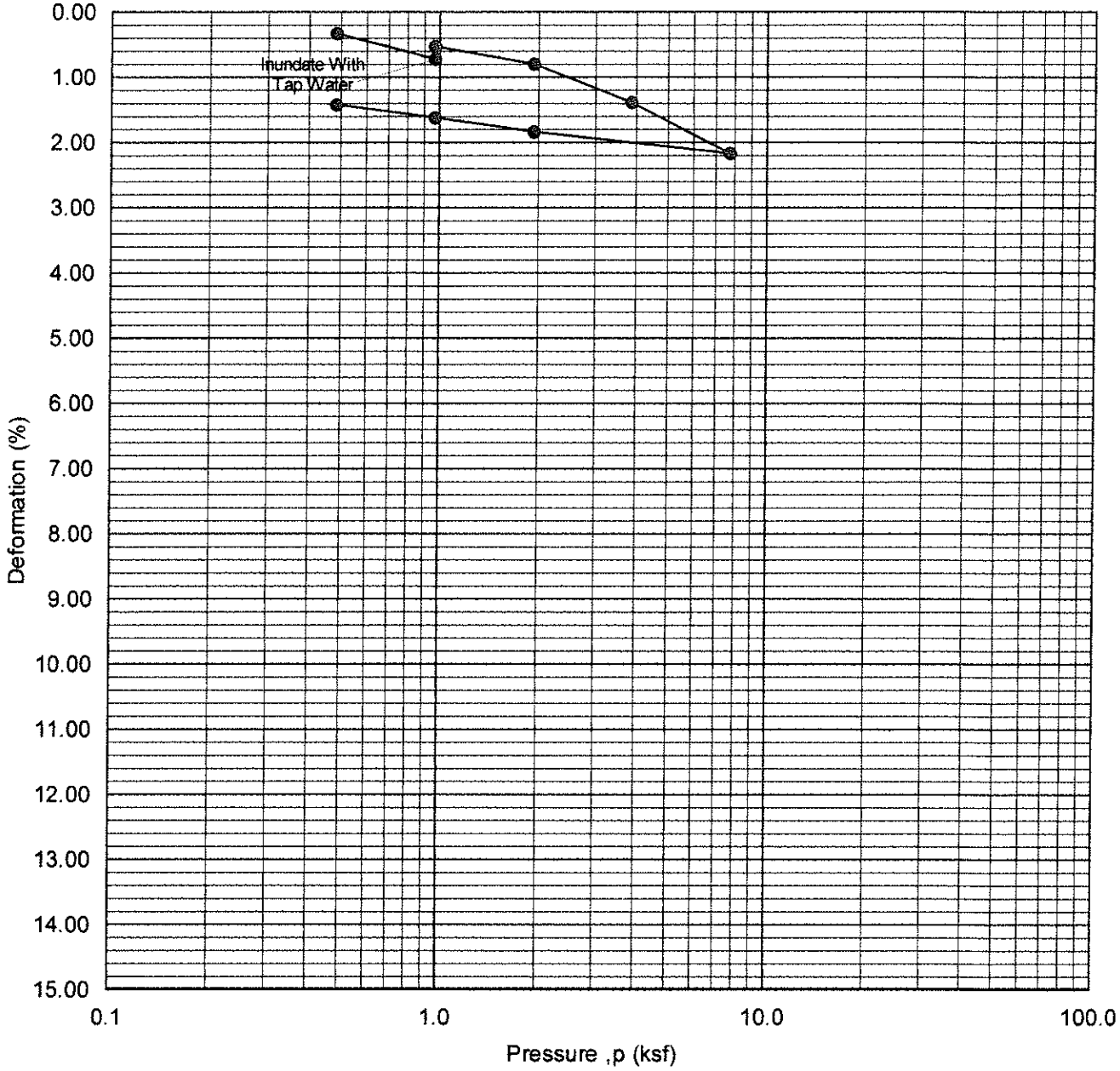



Boring No. : B-19
Depth (ft.) : 10.0
Sample Type: Silty Fine Sand with Clay

Dry Density (pcf) = 113.4
Moisture (%) = 11.1

| Project Name:The Trails at Corona-Tracts 37500 to 37504 | Project No.: 6619.18.1 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

PLATE C-18

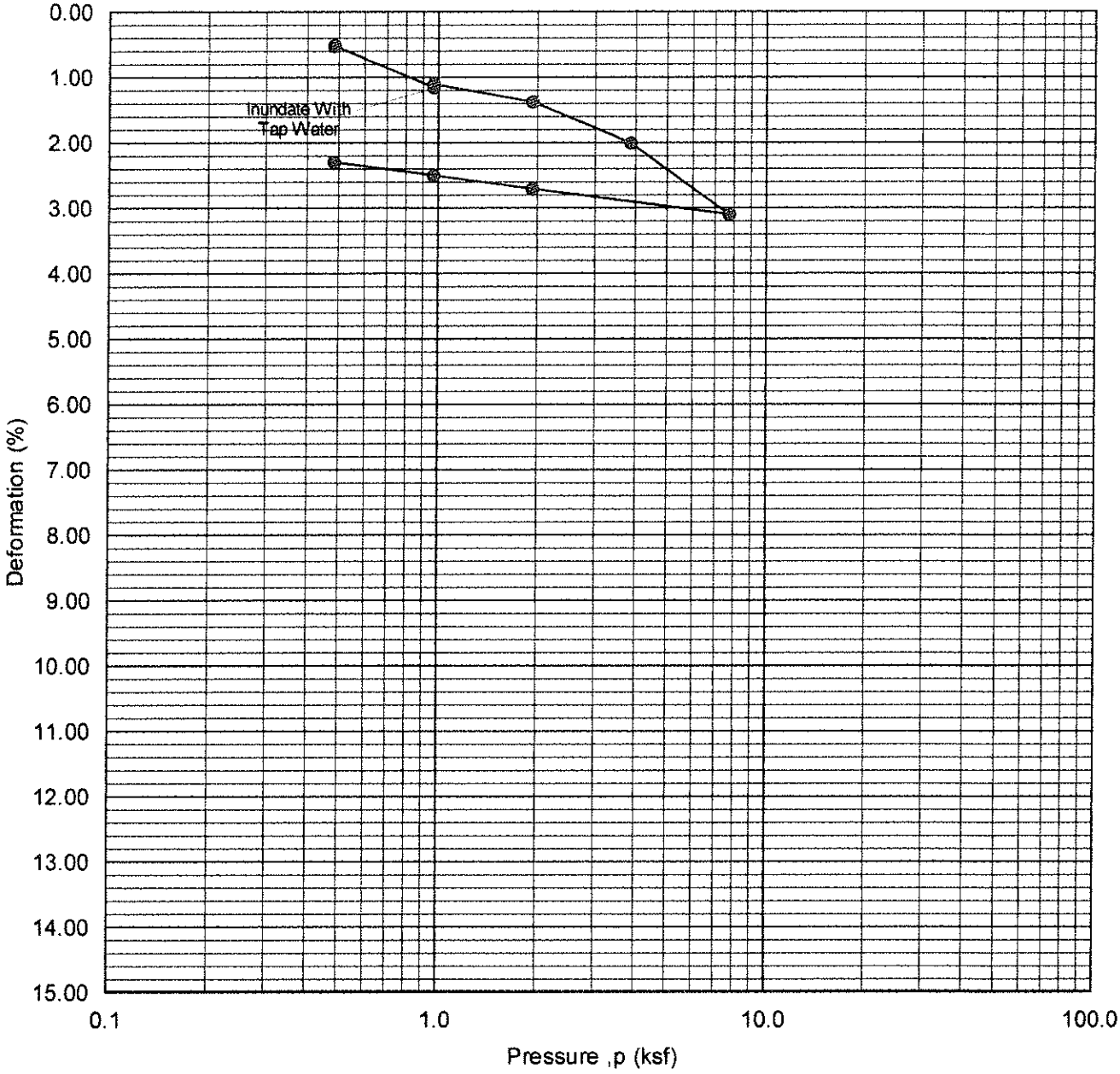



Boring No. : B-20
Depth (ft.) : 10.0
Sample Type: Silty Fine Sand with Clay and some Gravel-size rock pieces

Dry Density (pcf) = 119.4
Moisture (%) = 10.0

| Project Name:The Trails at Corona-Tracts 37500 to 37504 | Project No.: 6619.18.1 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

PLATE C-19

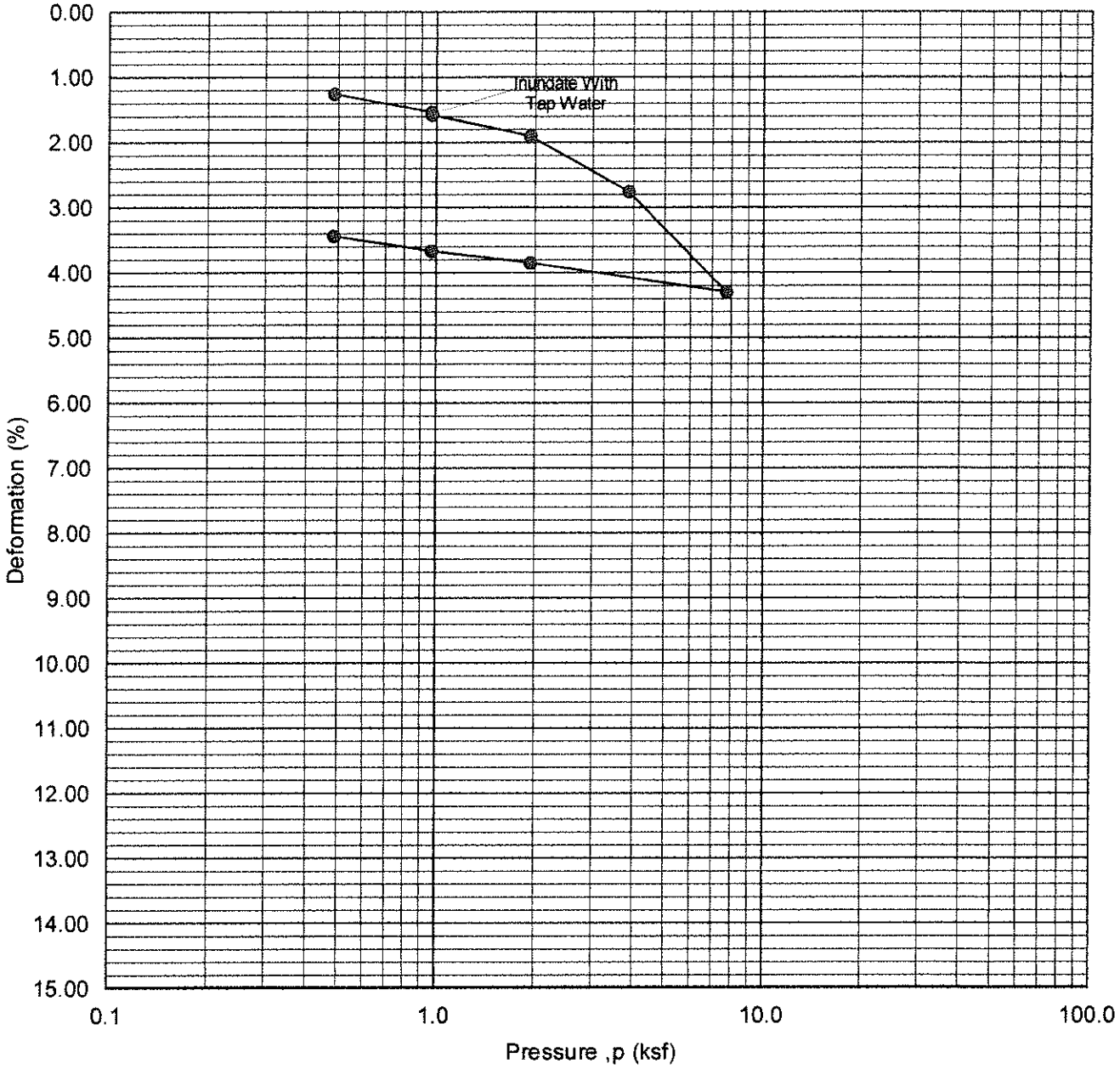



Boring No. : B-21
Depth (ft.) : 7.0
Sample Type: Clayey Fine Sand

Dry Density (pcf) = 118.3
Moisture (%) = 12.4

| Project Name:The Trails at Corona-Tracts 37500 to 37504 | Project No.: 6619.18.1 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

PLATE C-20

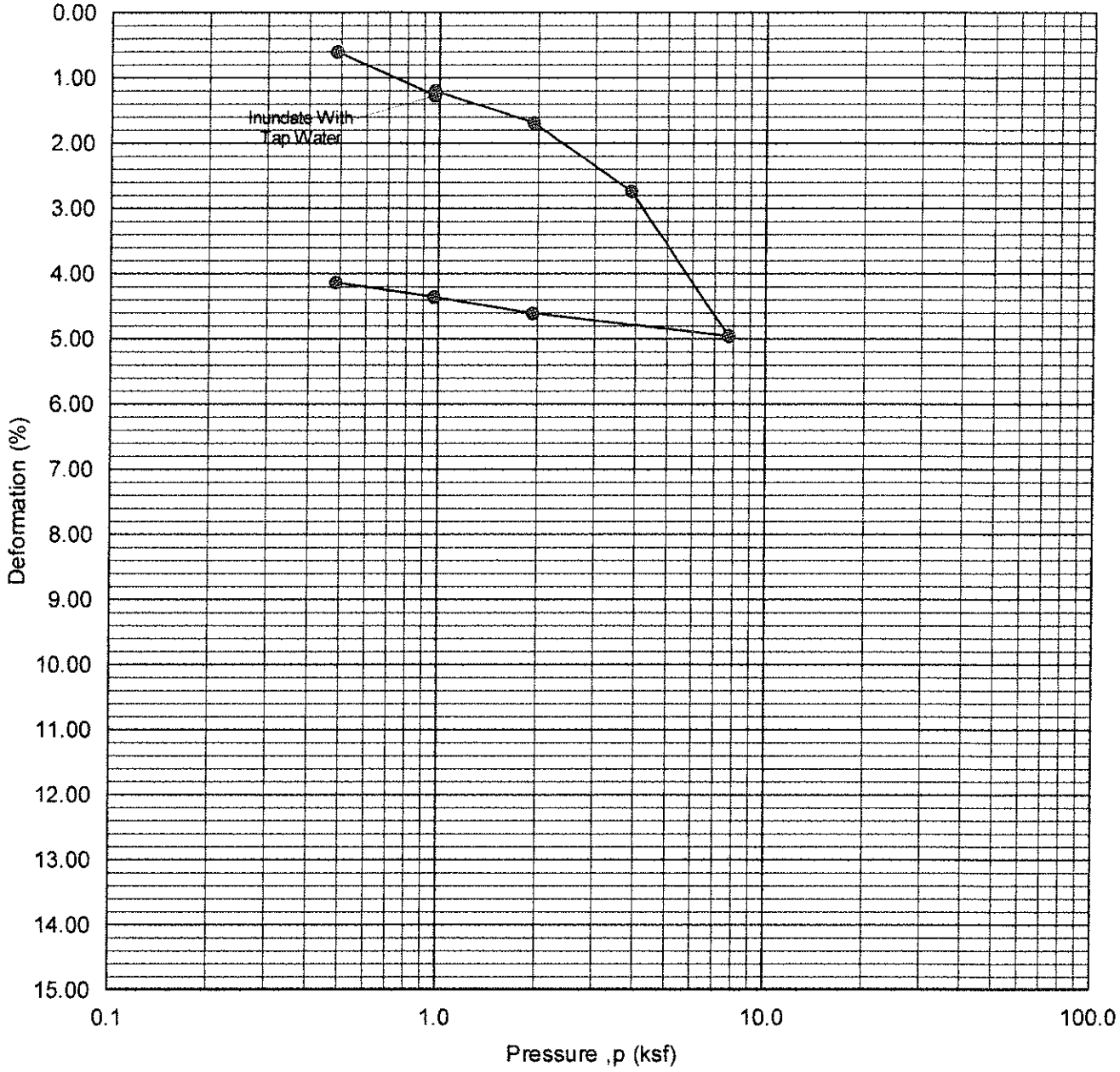



Boring No. : B-21
Depth (ft.) : 10.0
Sample Type: Clayey Fine Sand with trace Gravel-size rock pieces

Dry Density (pcf) = 113.5
Moisture (%) = 13.0

| Project Name:The Trails at Corona-Tracts 37500 to 37504 | Project No.: 6619.18.1 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

PLATE C-21

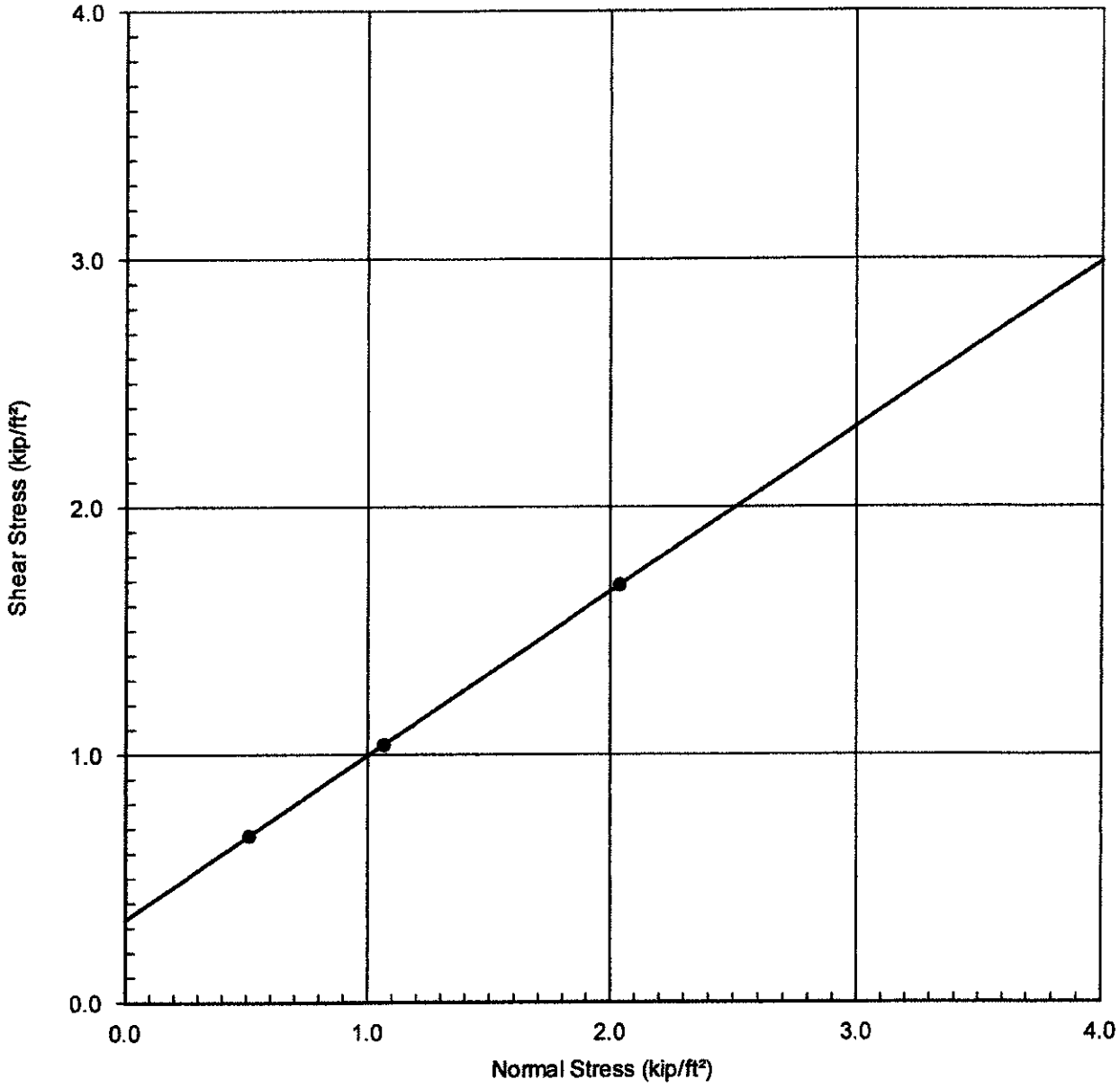



Boring No. : B-22
Depth (ft.) : 10.0
Sample Type: Clayey Fine Sand

Dry Density (pcf) = 112.4
Moisture (%) = 14.3

| Project Name:The Trails at Corona-Tracts 37500 to 37504 | Project No.: 6619.18.1 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | ONE-DIMENSIONAL CONSOLIDATION PROPERTIES OF SOILS (ASTM D 2435) |

PLATE C-22

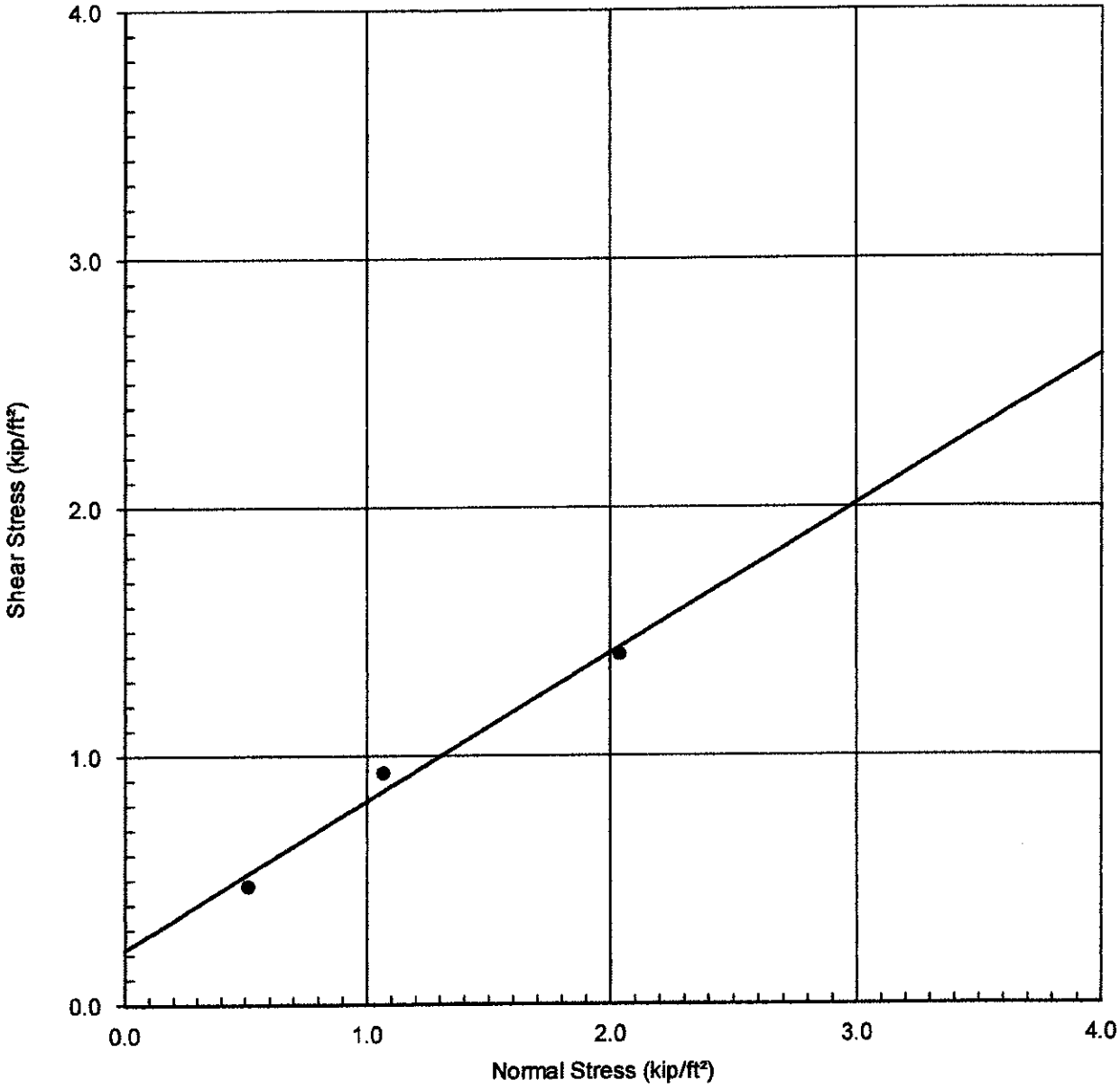



Boring No. : B-1
Depth (ft.) : 7.0
Sample Type : Relatively Undisturbed
Soil Type : Silty Clay with Fine Sand and some Gravel

Cohesion(C) = 330 psf
Friction (ϕ) = 33.5°
Dry Density (pcf) = 105.5
Moisture (%) = 15.6

| Project Name: Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-1**

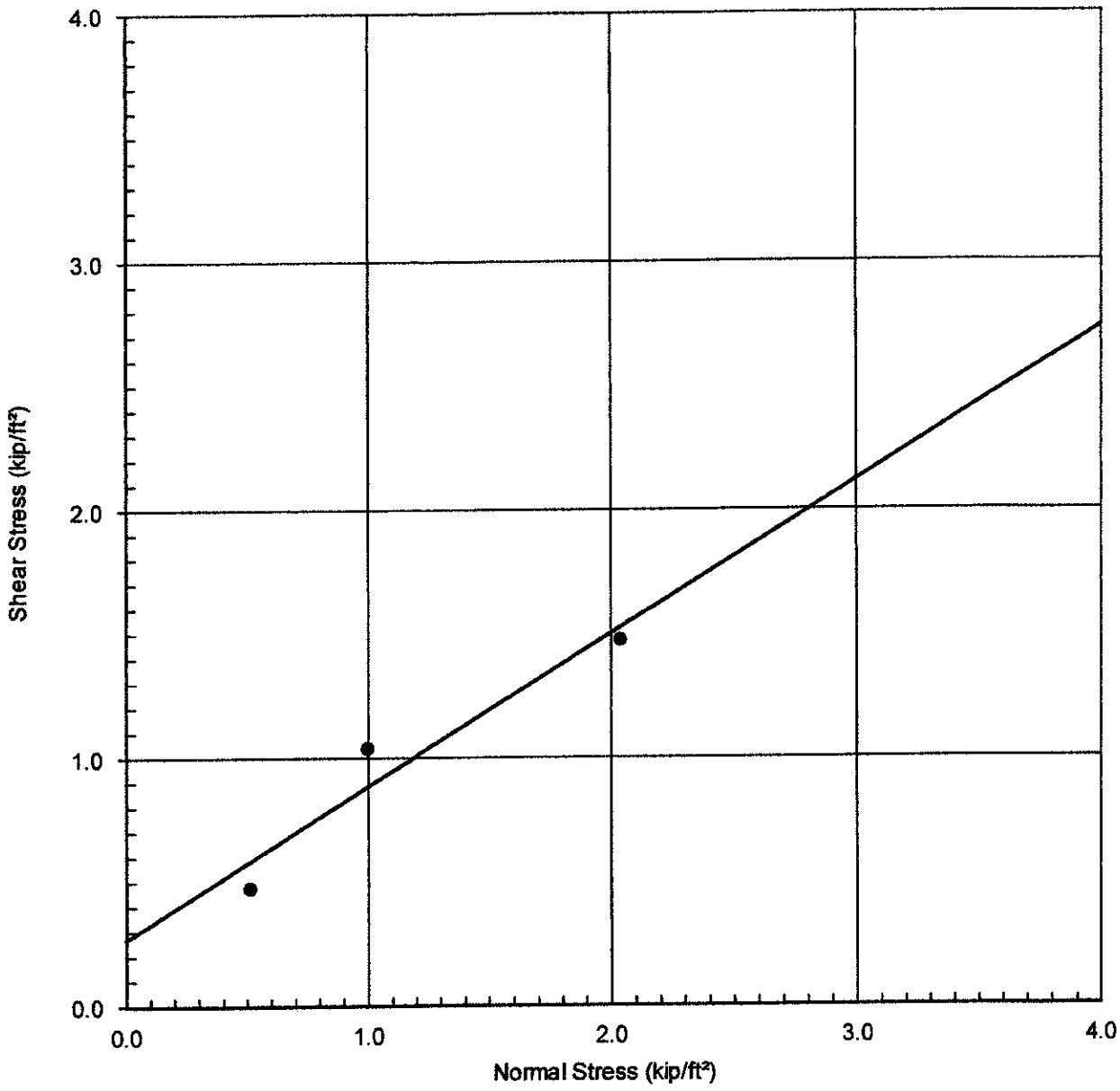



Boring No. : B-2
Depth (ft.) : 3.0
Sample Type : Relatively Undisturbed
Soil Type : Clayey Fine to Medium Sand with trace Gravel

Cohesion(C) = 215 psf
Friction (ϕ) = 30.5°
Dry Density (pcf) = 109.8
Moisture (%) = 10.4

| | |
|---|---|
| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-2**

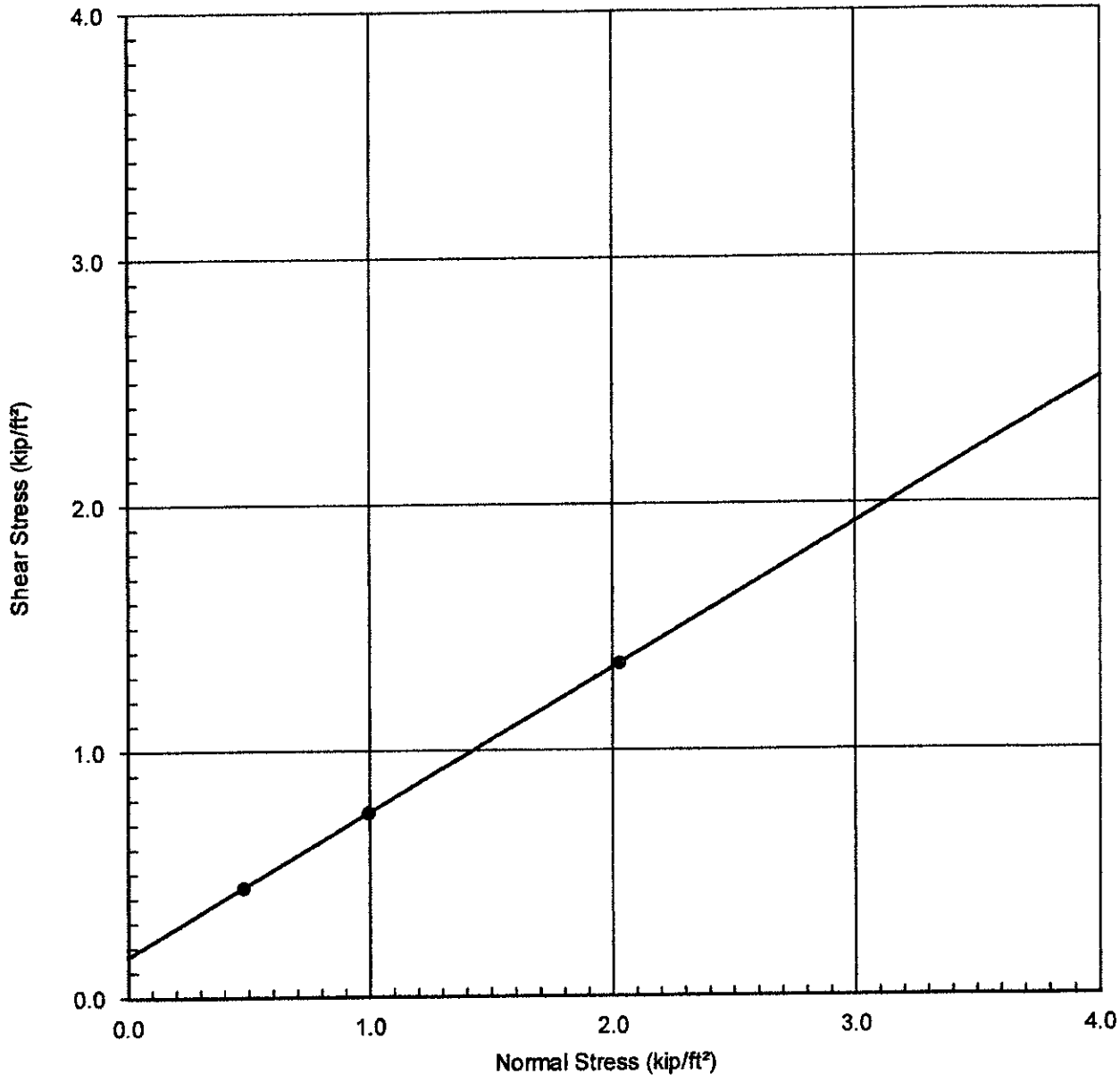



Boring No. : B-3
Depth (ft.) : 7.0
Sample Type : Relatively Undisturbed
Soil Type : Clayey Fine to Medium Sand with some Gravel

Cohesion(C) = 265 psf
Friction (ϕ) = 31.5°
Dry Density (pcf) = 110.0
Moisture (%) = 7.5

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-3**

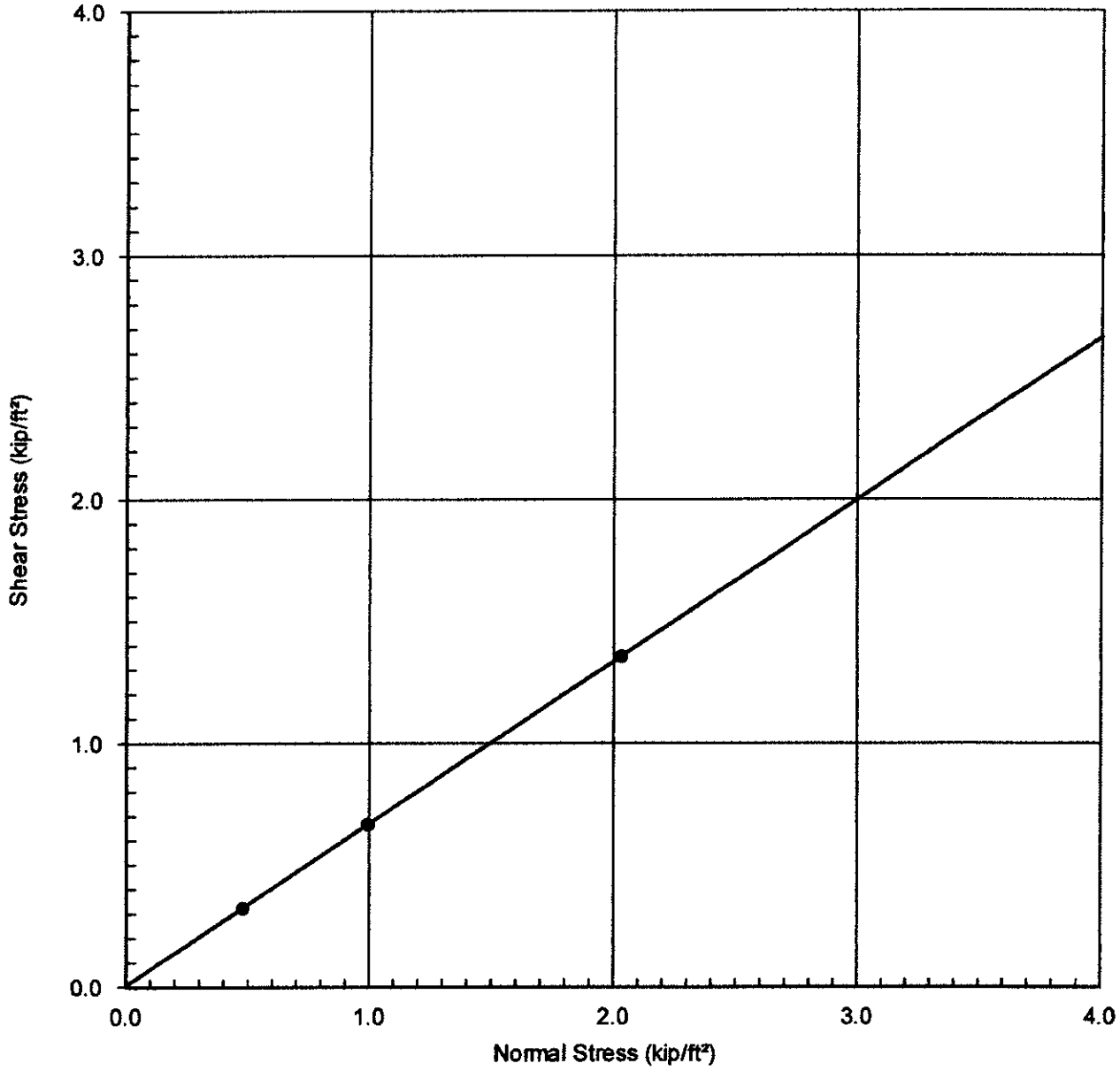



Boring No. : B-1
Depth (ft.) : 1-5
Sample Type : Remolded (90% of Maximum Density)
Soil Type : Clayey Fine to Medium Sand with Gravel

Cohesion(C) = 165 psf
Friction (ϕ) = 30°
Dry Density (pcf) = 118.8
Moisture (%) = 9.0

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-4**

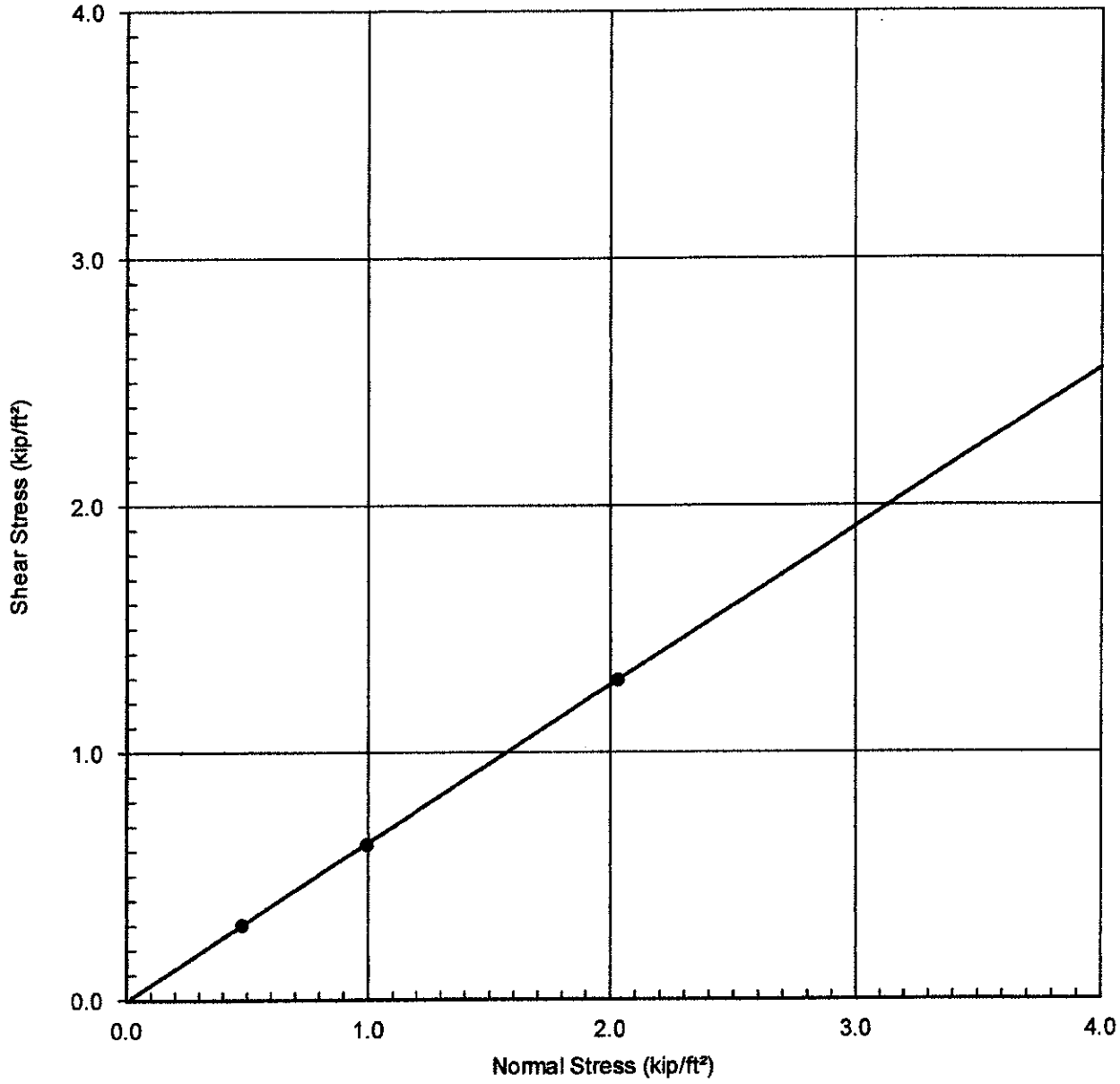



Boring No. : B-5
Depth (ft.) : 0-5
Sample Type : Remolded (90% of Maximum Density)
Soil Type : Silty Fine Sand with trace Clay

Cohesion(C) = 5 psf
Friction (ϕ) = 33.5°
Dry Density (pcf) = 115.2
Moisture (%) = 10.5

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-5**

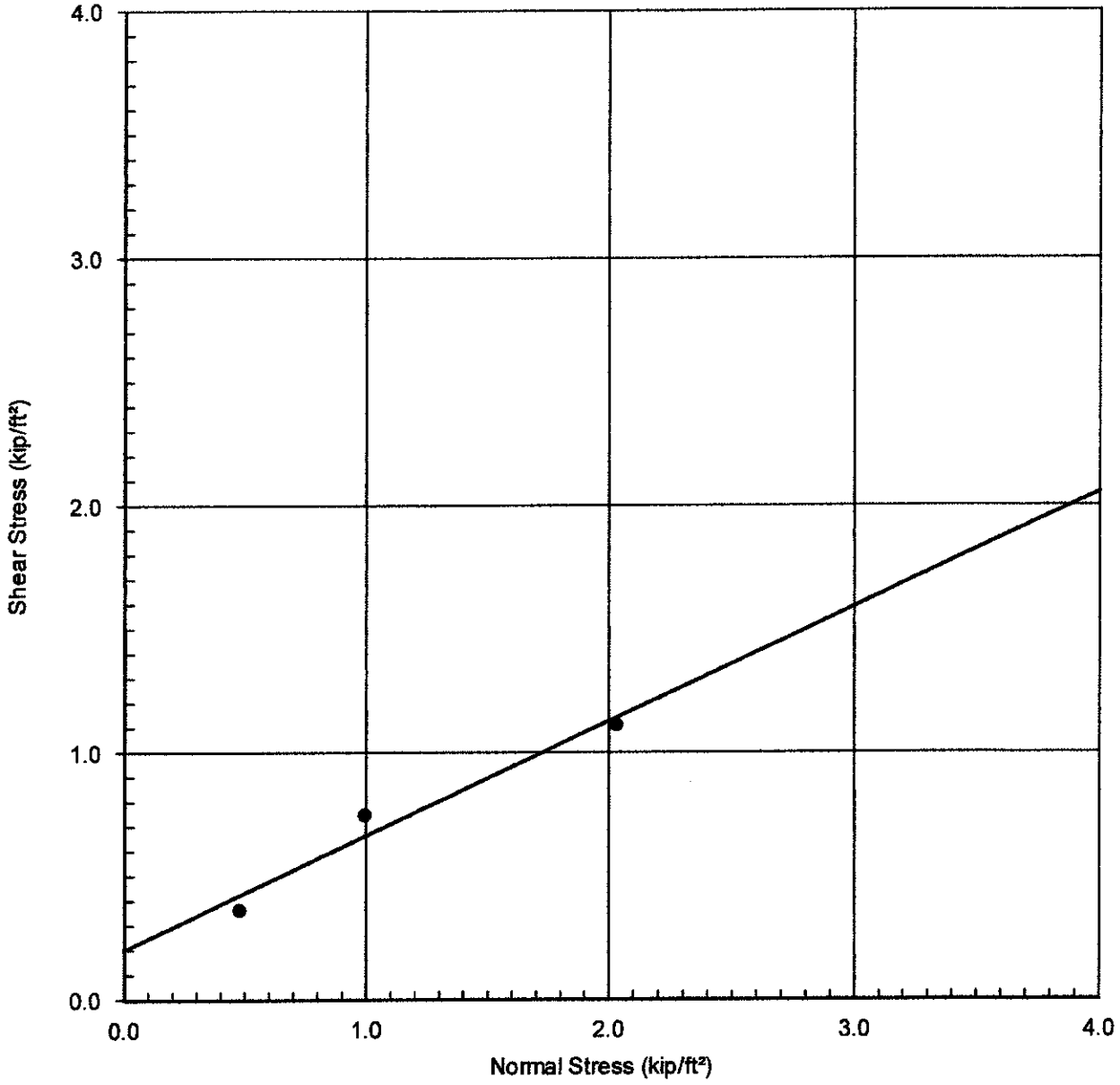



Boring No. : Boring B-6
Depth (ft.) : 0-5
Sample Type : Remolded (90% of Maximum Density)
Soil Type : Silty Fine Sand

Cohesion(C) = 0 psf
Friction (ϕ) = 32.5°
Dry Density (pcf) = 107.1
Moisture (%) = 13.5

| Project Name: Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-6**

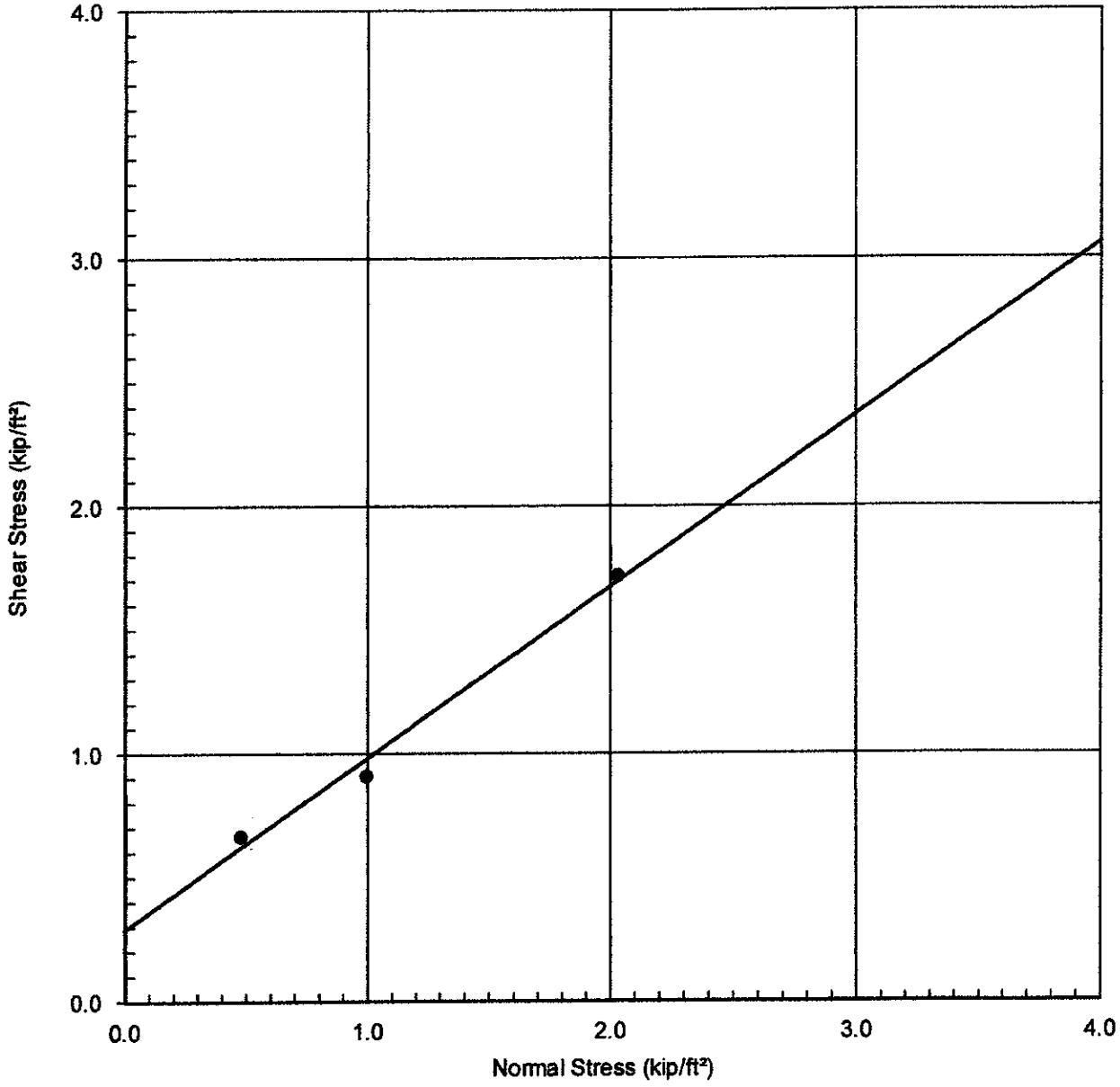



Boring No. : Boring B-7
Depth (ft.) : 0-5
Sample Type : Remolded (90% of Maximum Density)
Soil Type : Fine Sandy Silt with Clay

Cohesion(C) = 200 psf
Friction (ϕ) = 24.5°
Dry Density (pcf) = 101.7
Moisture (%) = 18.0

| Project Name: Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-7**

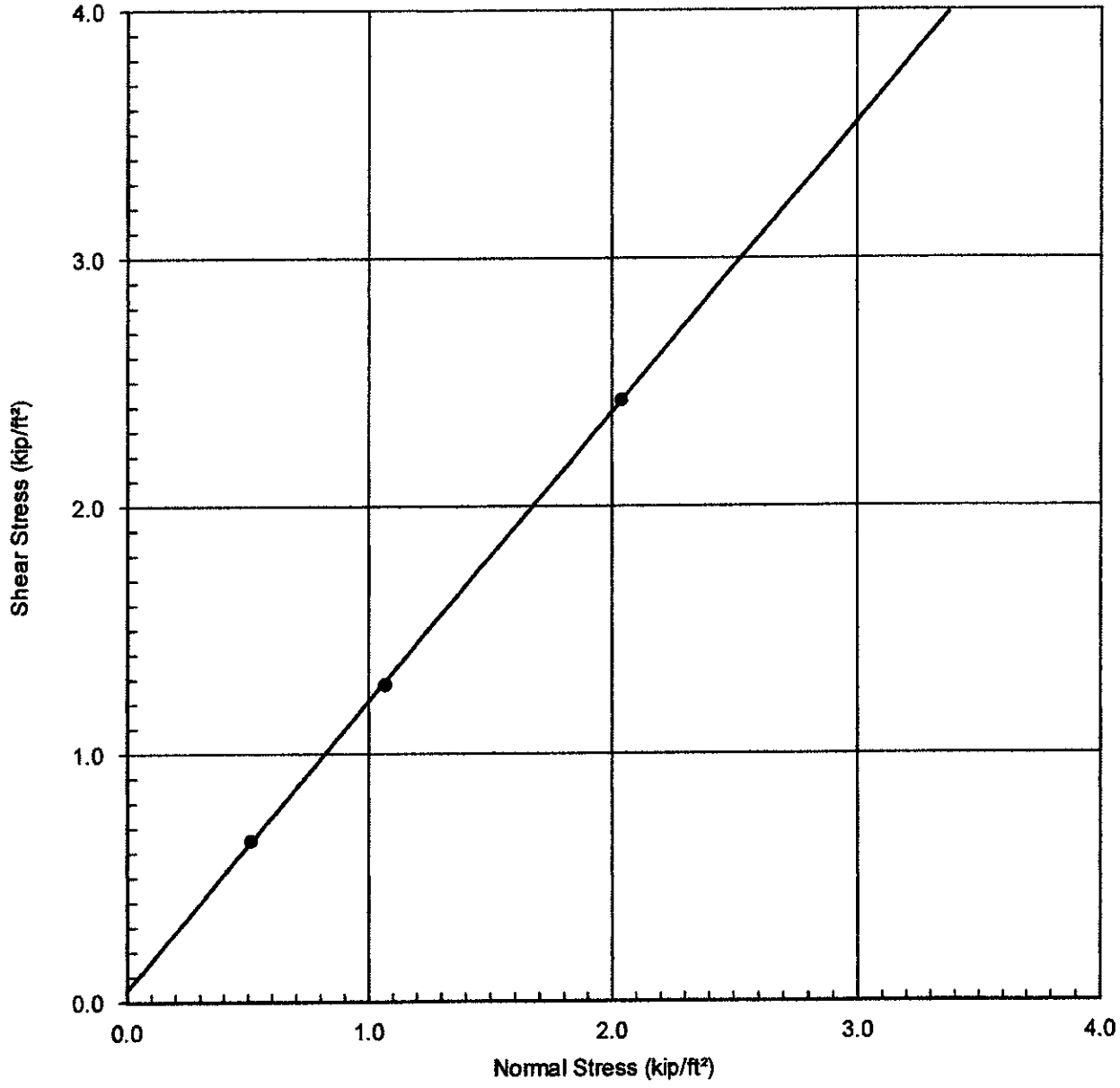



Boring No. : B-11
Depth (ft.) : 0-5
Sample Type : Remolded (90% of Maximum Density)
Soil Type : Silty Fine Sand with Gravel

Cohesion(C) = 290 psf
Friction (ϕ) = 34.5°
Dry Density (pcf) = 119.3
Moisture (%) = 8.5

| | |
|---|---|
| Project Name: Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-8**

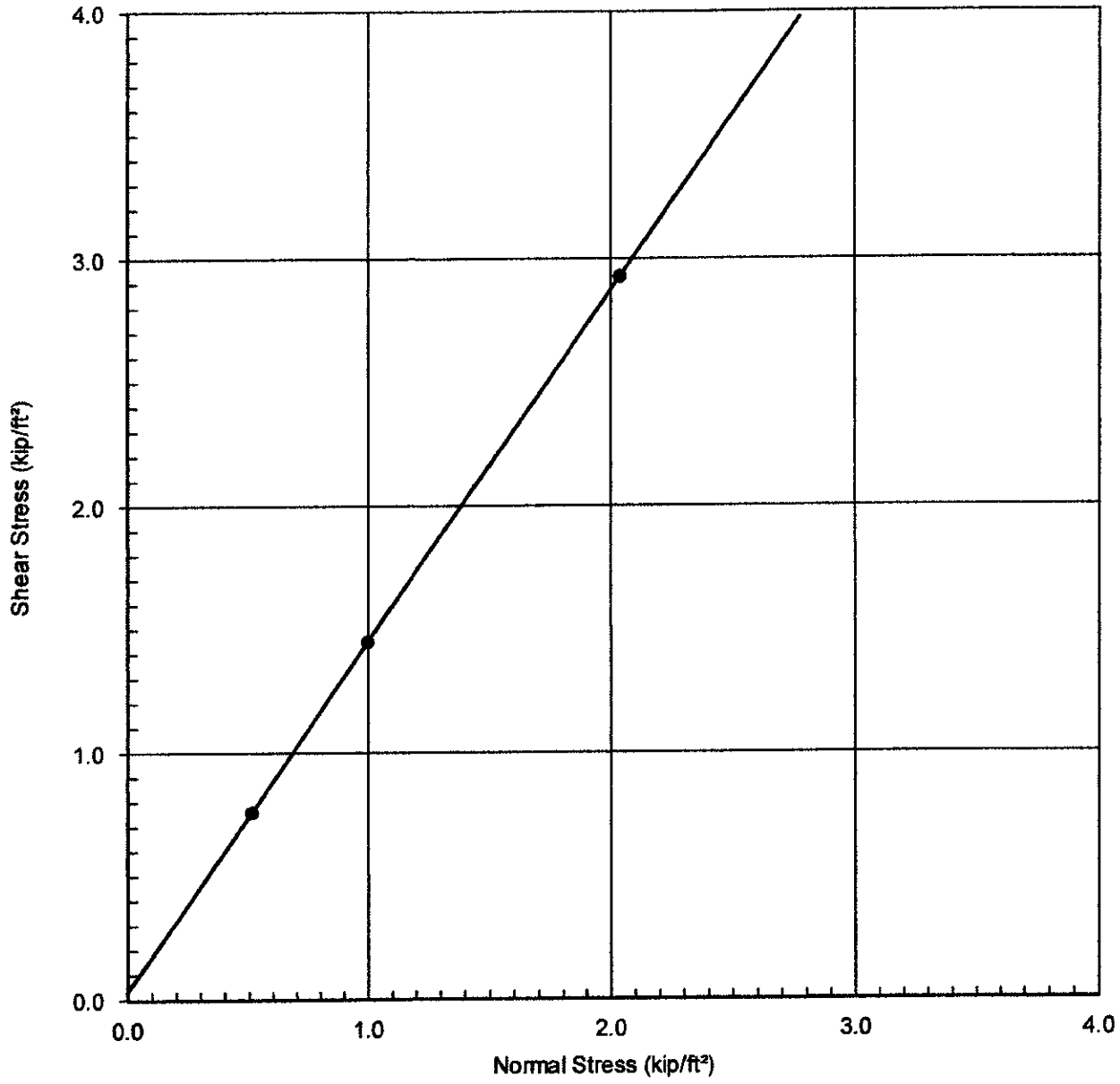



Boring No. : B-13
Depth (ft.) : 5.0
Sample Type : Relatively Undisturbed
Soil Type : Clayey Fine to Medium Sand with Gravel

Cohesion(C) = 45 psf
Friction (ϕ) = 49°
Dry Density (pcf) = 113.0
Moisture (%) = 8.1

| Project Name: Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-9**

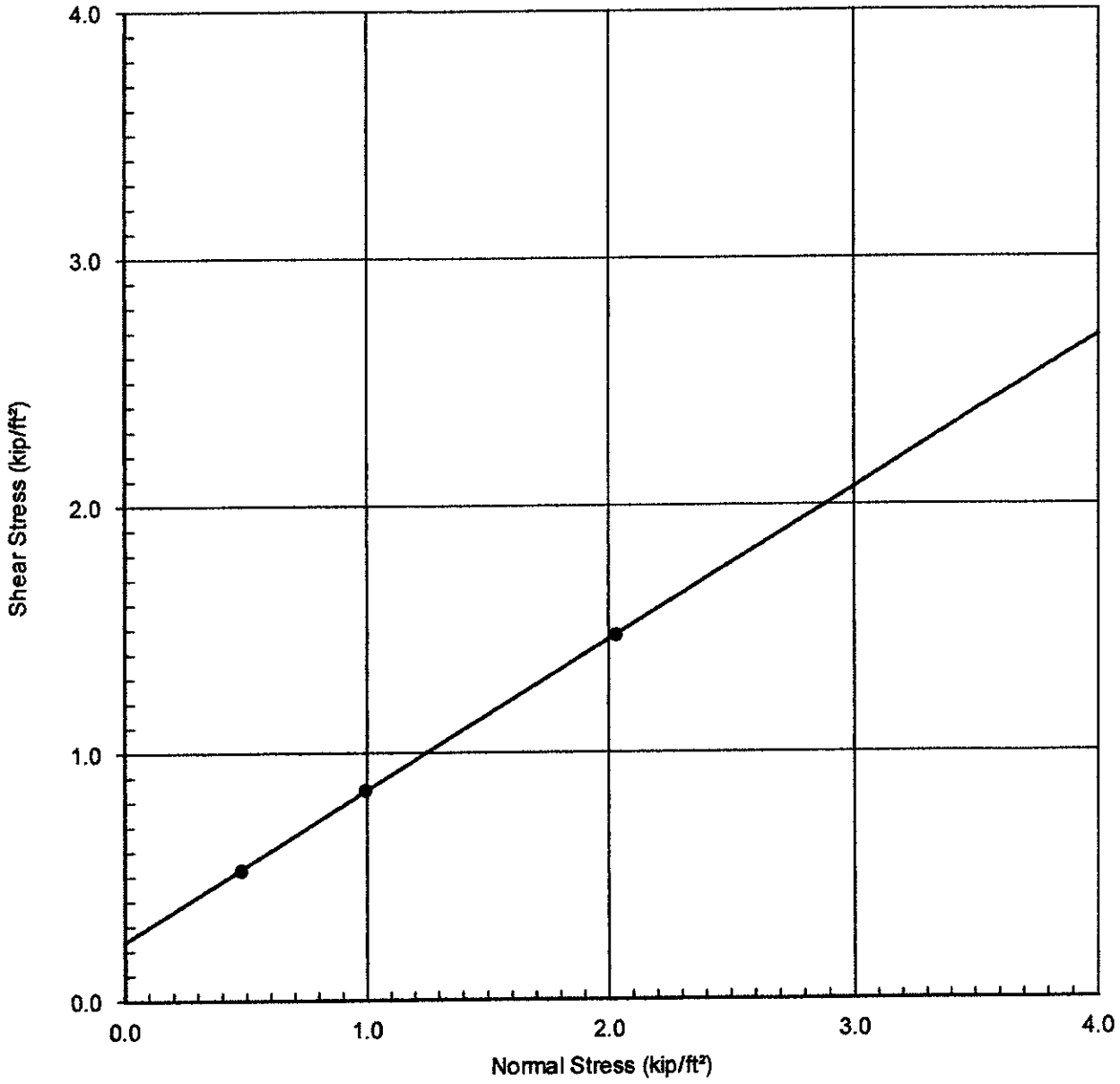



Boring No. : B-15
Depth (ft.) : 10.0
Sample Type : Relatively Undisturbed
Soil Type : Silty Fine to Medium Sand with Gravel

Cohesion(C) = 30 psf
Friction (ϕ) = 54.5°
Dry Density (pcf) = 111.3
Moisture (%) = 8.3

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D-10**

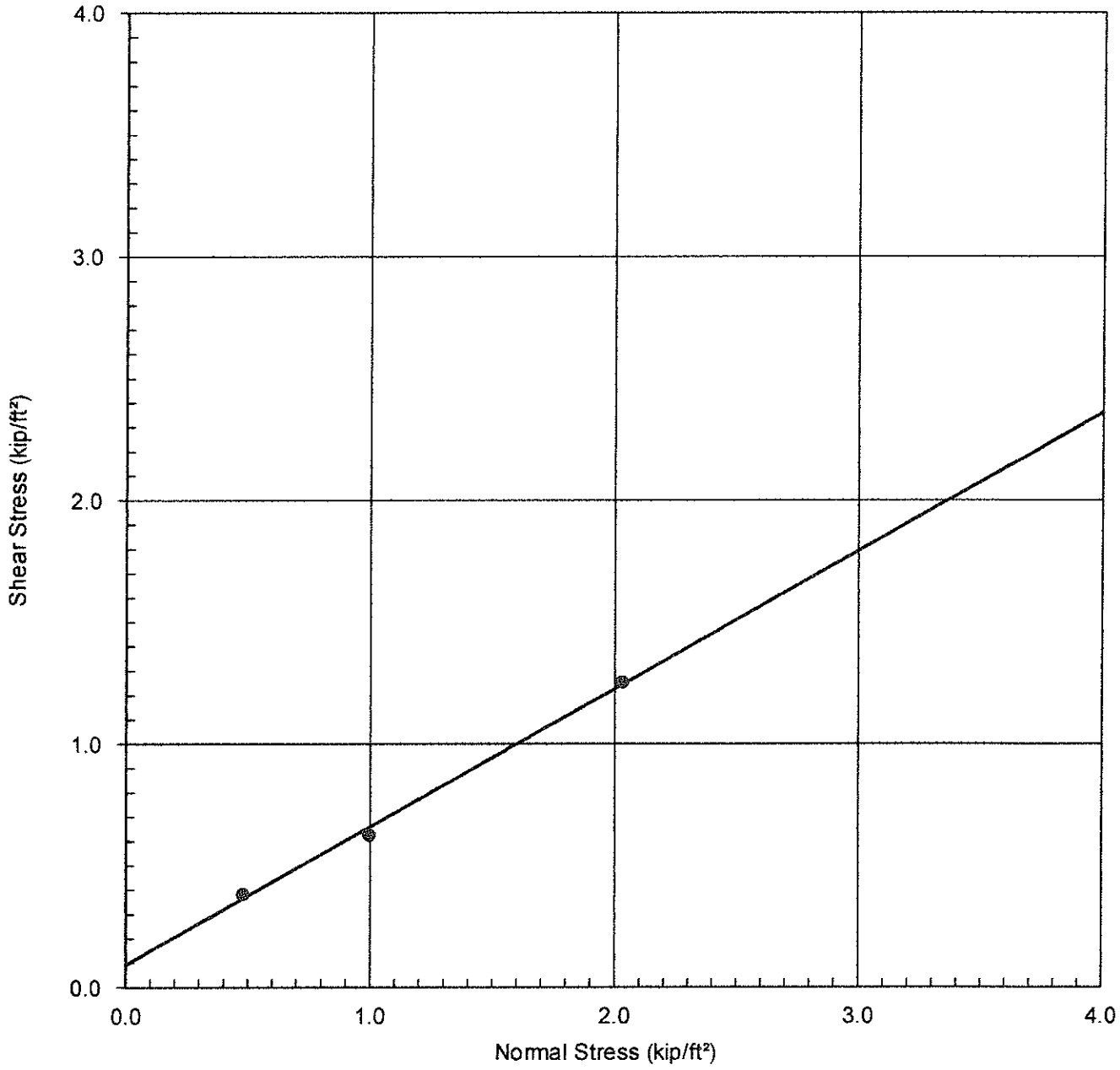



Boring No. : B-17
Depth (ft.) : 0-5
Sample Type : Remolded (90% of Maximum Density)
Soil Type : Silty Fine to Medium Sand with Clay

Cohesion(C) = 235 psf
Friction (ϕ) = 31°
Dry Density (pcf) = 113.0
Moisture (%) = 10.0

| Project Name:Redevelopment of Mountain View Golf Course-Corona | Project No.: 6619.16 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

**PLATE D11**




Boring No. : B-21
Depth (ft.) : 0-5
Sample Type : Remolded (90% of Maximum Density)
Soil Type : Silty Fine Sand with Clay

Cohesion(C) = 90 psf
Friction (ϕ) = 29.5°
Dry Density (pcf) = 119.3
Moisture (%) = 8.5

| Project Name:The Trails at Corona-Tracts 37500 to 37504 | Project No.: 6619.18.1 |
|---|---|
| ASSOCIATED SOILS ENGINEERING, INC. | DIRECT SHEAR TEST RESULTS (ASTM D 3080) |

PLATE D-12

# ATTERBERG LIMITS

**ASTM D 4318-93**

Project Name: Redevelopment of Mountain View Golf Course-2121 Mountain View Drive,Corona
Project No. : 6619.16
Boring No. : B-1
Depth (feet): 1.0-5.0
Visual Sample Description: Clayey Fine to Medium Sand with Gravel (SC)

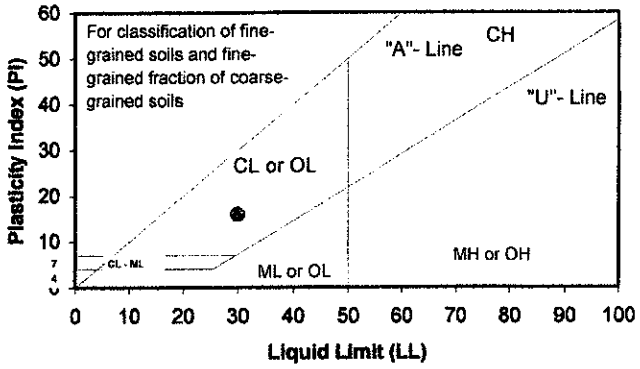
| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 38 | 28 | 17 | |
| Container No. | c1 | a | A1 | B1 | C1 | |
| Wet Wt. of Soil + Cont. (gm) | 13.39 | 12.52 | 16.35 | 15.75 | 15.28 | |
| Dry Wt. of Soil + Cont. (gm) | 12.31 | 11.46 | 15.17 | 14.72 | 14.14 | |
| Wt. of Container (gm) | 4.30 | 4.28 | 11.04 | 11.24 | 10.60 | |
| Moisture Content (%) [Wn] | 13.48 | 14.76 | 28.57 | 29.60 | 32.20 | |

| | |
|---|---|
| **Liquid Limit** | **30** |
| **Plastic Limit** | **14** |
| **Plasticity Index** | **16** |
| **USCS Classification** | **CL** |

PI at "A" - Line = 0.73(LL-20) = 7.3

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$




**PROCEDURES USED**

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test

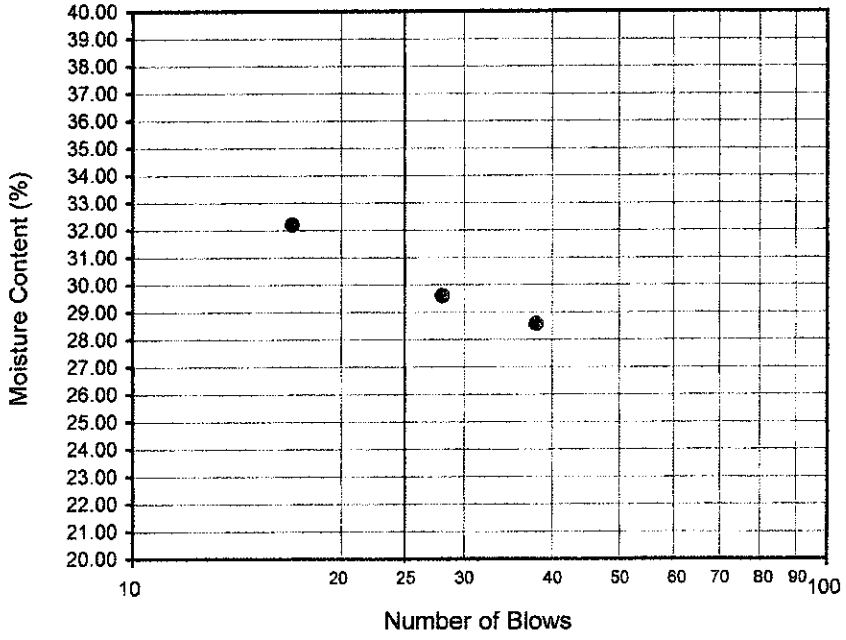



PLATE E-1

# ATTERBERG LIMITS

**ASTM D 4318-93**

Project Name: Redevelopment of Mountain View Golf Course-2121 Mountain View Drive,Corona
Project No. : 6619.16
Boring No. : B-5
Depth (feet): 0-5.0
Visual Sample Description: Silty Fine Sand with trace Clay (SM)

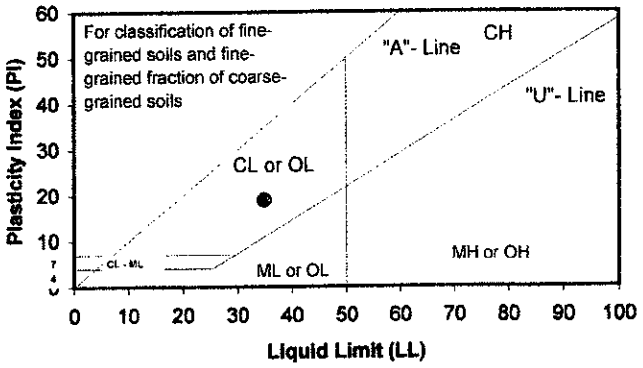
| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 34 | 27 | 17 | |
| Container No. | b2 | c2 | A2 | B2 | C2 | |
| Wet Wt. of Soil + Cont. (gm) | 10.46 | 11.76 | 16.32 | 16.45 | 15.97 | |
| Dry Wt. of Soil + Cont. (gm) | 9.63 | 10.75 | 14.91 | 15.12 | 14.58 | |
| Wt. of Container (gm) | 4.25 | 4.29 | 10.76 | 11.32 | 10.78 | |
| Moisture Content (%) [Wn] | 15.43 | 15.63 | 33.98 | 35.00 | 36.58 | |

| | |
|---|---|
| **Liquid Limit** | **35** |
| **Plastic Limit** | **16** |
| **Plasticity Index** | **19** |
| **USCS Classification** | **CL** |

PI at "A" - Line = 0.73(LL-20) = 10.95

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$




**PROCEDURES USED**

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test

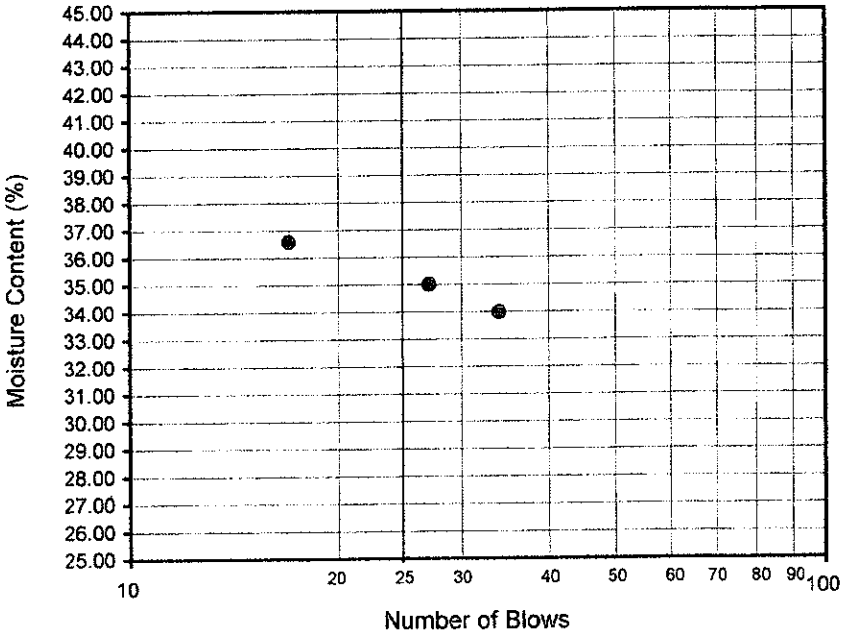



PLATE E-2

# ATTERBERG LIMITS

**ASTM D 4318-93**

Project Name: Redevelopment of Mountain View Golf Course-2121 Mountain View Drive,Corona
Project No. : 6619.16
Boring No. : B-6
Depth (feet): 0-5
Visual Sample Description: Silty Fine Sand (SM)

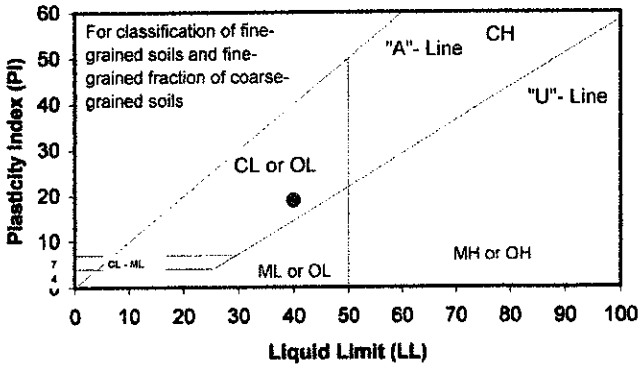
| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 35 | 26 | 18 | |
| Container No. | b1 | c1 | A1 | B1 | C1 | |
| Wet Wt. of Soil + Cont. (gm) | 13.06 | 13.78 | 15.83 | 16.61 | 15.58 | |
| Dry Wt. of Soil + Cont. (gm) | 11.49 | 12.14 | 14.50 | 15.09 | 14.11 | |
| Wt. of Container (gm) | 4.28 | 4.29 | 11.04 | 11.24 | 10.60 | |
| Moisture Content (%) [Wn] | 21.78 | 20.89 | 38.44 | 39.48 | 41.88 | |

| | |
|---|---|
| **Liquid Limit** | **40** |
| **Plastic Limit** | **21** |
| **Plasticity Index** | **19** |
| **USCS Classification** | **CL** |

PI at "A" - Line = 0.73(LL-20) = 14.6

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$




**PROCEDURES USED**

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test

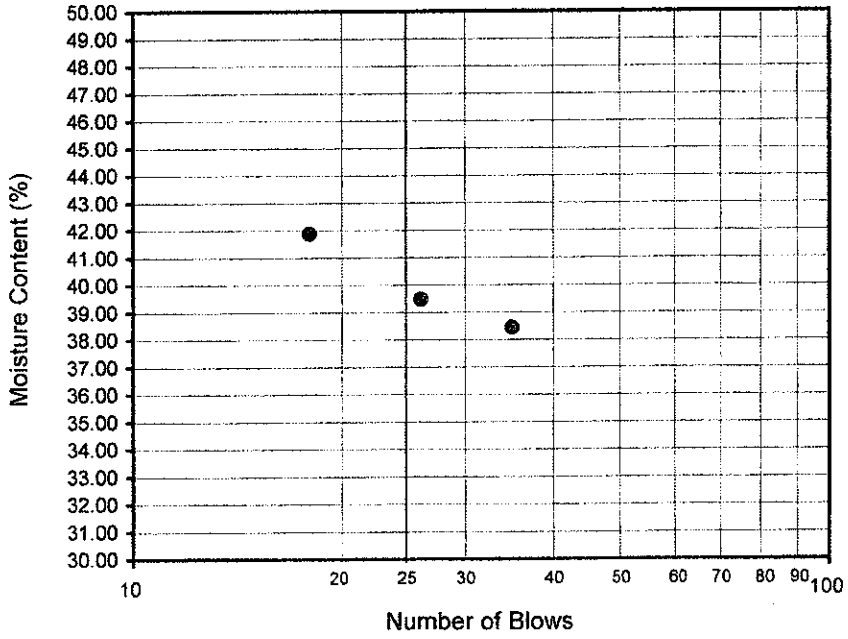



PLATE E-3

# ATTERBERG LIMITS

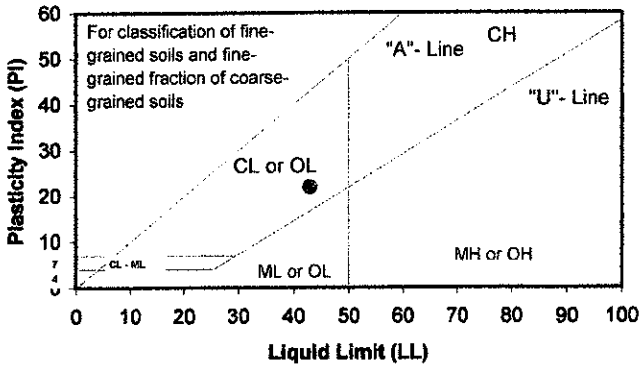
**ASTM D 4318-93**

Project Name: Redevelopment of Mountain View Golf Course-2121 Mountain View Drive,Corona
Project No. : 6619.16
Boring No. : B-7
Depth (feet): 0-5
Visual Sample Description: Fine Sandy Silt with Clay (ML)

| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 33 | 24 | 17 | |
| Container No. | b2 | c2 | A2 | B2 | C2 | |
| Wet Wt. of Soil + Cont. (gm) | 12.59 | 13.60 | 16.92 | 16.60 | 15.70 | |
| Dry Wt. of Soil + Cont. (gm) | 11.13 | 11.99 | 15.10 | 15.00 | 14.17 | |
| Wt. of Container (gm) | 4.24 | 4.29 | 10.76 | 11.31 | 10.77 | |
| Moisture Content (%) [Wn] | 21.19 | 20.91 | 41.94 | 43.36 | 45.00 | |

| | |
|---|---|
| **Liquid Limit** | **43** |
| **Plastic Limit** | **21** |
| **Plasticity Index** | **22** |
| **USCS Classification** | **CL** |

PI at "A" - Line = 0.73(LL-20) = 16.79
One - Point Liquid Limit Calculation
LL =Wn(N/25)$^{0.121}$




**PROCEDURES USED**

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test

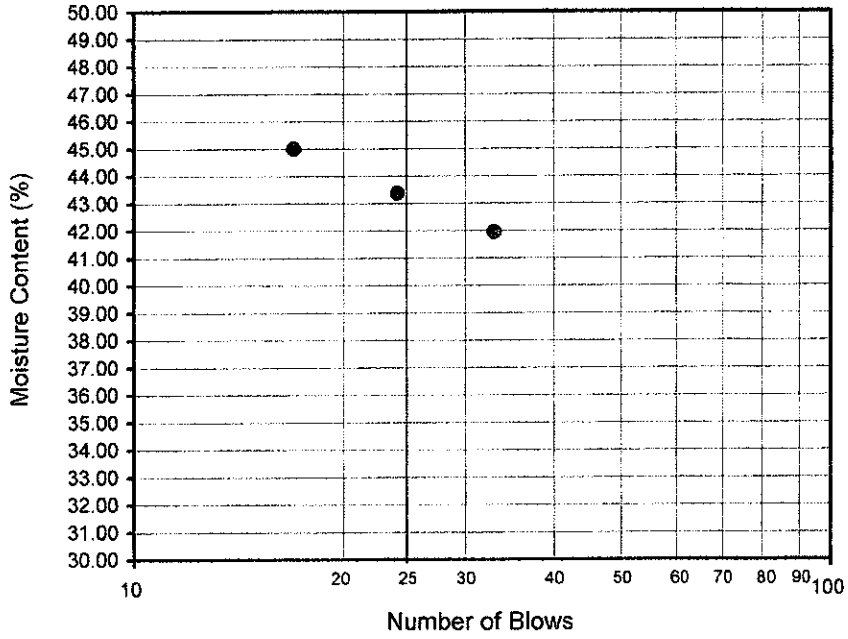



PLATE E-4

# ATTERBERG LIMITS

**ASTM D 4318-93**

Project Name: Redevelopment of Mountain View Golf Course-2121 Mountain View Drive,Corona
Project No. : 6619.16
Boring No. : B-11
Depth (feet): 0-5
Visual Sample Description: Silty Fine Sand with Clay and Gravel (SM)

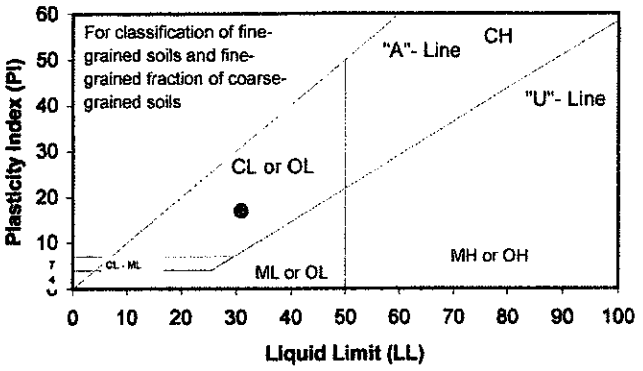
| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 36 | 27 | 20 | |
| Container No. | b2 | c2 | A2 | X | C2 | |
| Wet Wt. of Soil + Cont. (gm) | 12.68 | 12.28 | 17.04 | 11.89 | 18.00 | |
| Dry Wt. of Soil + Cont. (gm) | 11.65 | 11.31 | 15.63 | 10.58 | 16.27 | |
| Wt. of Container (gm) | 4.25 | 4.29 | 10.76 | 6.25 | 10.78 | |
| Moisture Content (%) [Wn] | 13.92 | 13.82 | 28.95 | 30.25 | 31.51 | |

| | |
|---|---|
| **Liquid Limit** | **31** |
| **Plastic Limit** | **14** |
| **Plasticity Index** | **17** |
| **USCS Classification** | **CL** |

PI at "A" - Line = 0.73(LL-20) = 8.03

One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$




**PROCEDURES USED**

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test

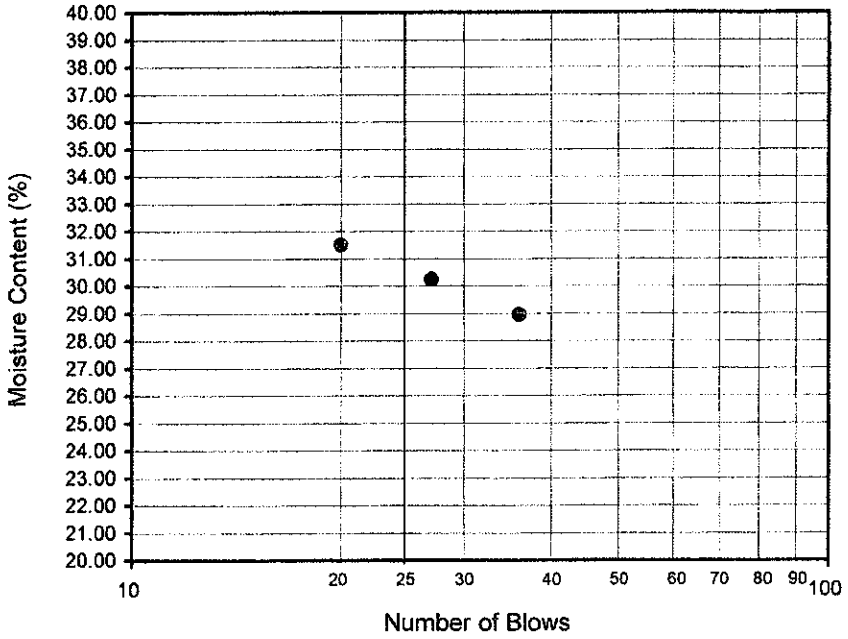



PLATE E-5

# ATTERBERG LIMITS

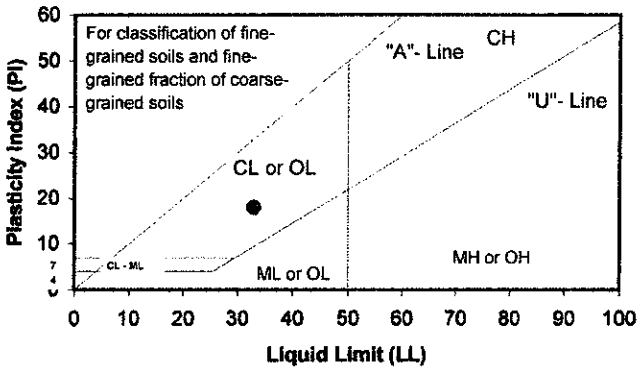
**ASTM D 4318-93**

Project Name: Redevelopment of Mountain View Golf Course-2121 Mountain View Drive,Corona
Project No. : 6619.16
Boring No. : B-17
Depth (feet): 0-5
Visual Sample Description: Silty Fine to Medium Sand with Clay (SM)

| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 31 | 23 | 17 | |
| Container No. | b3 | c3 | B3 | C3 | B4 | |
| Wet Wt. of Soil + Cont. (gm) | 12.90 | 13.08 | 16.65 | 16.35 | 16.34 | |
| Dry Wt. of Soil + Cont. (gm) | 11.83 | 11.95 | 15.34 | 14.96 | 15.01 | |
| Wt. of Container (gm) | 4.25 | 4.29 | 11.20 | 10.84 | 11.29 | |
| Moisture Content (%) [Wn] | 14.12 | 14.75 | 31.64 | 33.74 | 35.75 | |

| | |
|---|---|
| **Liquid Limit** | **33** |
| **Plastic Limit** | **15** |
| **Plasticity Index** | **18** |
| **USCS Classification** | **CL** |

PI at "A" - Line = 0.73(LL-20) = 9.49
One - Point Liquid Limit Calculation
LL =Wn(N/25)$^{0.121}$




**PROCEDURES USED**

- [ ] Wet Preparation
  Multipoint - Wet
- [X] Dry Preparation
  Multipoint - Dry
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test

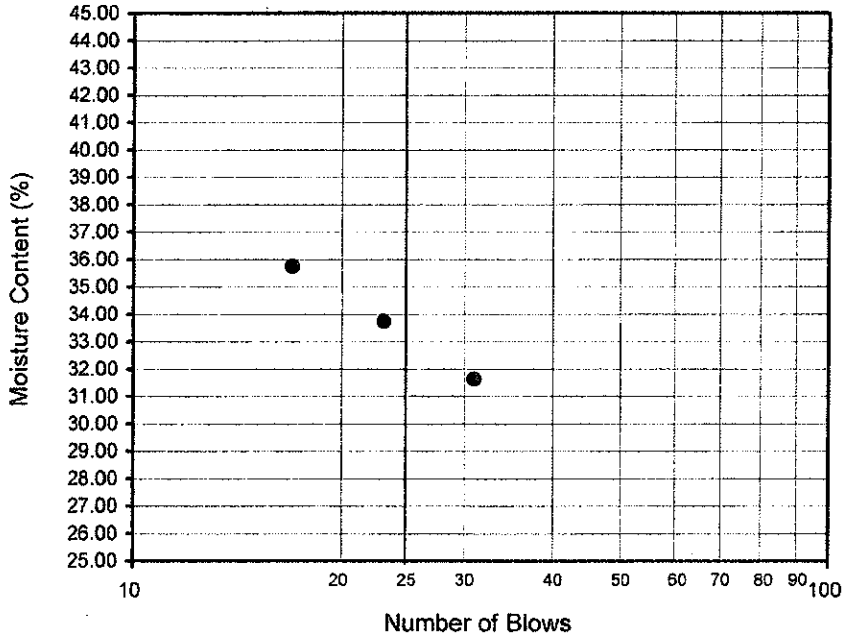



PLATE E-6

# APPENDIX B – GENERAL EARTHWORK & GRADING SPECIFICATIONS AND DETAILS

## 1.0 GENERAL

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the project-specific Geotechnical Report(s) (Geotechnical Report). These Specifications are a part of the recommendations contained in the Geotechnical Report. In case of conflict, the specific recommendations in the Geotechnical Report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the Geotechnical Report.

1.2 The Geotechnical Consultant of Record: Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved Geotechnical Report and accepting the adequacy of the preliminary Geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the Geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditions and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, Geotechnical Report and these Specifications prior to commencement of grading. The

Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved Geotechnical Report and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

## 2.0 PREPARATION OF AREAS TO BE FILLED

2.1 Clearing and Grubbing: Vegetation, such as brush grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. All organic materials should be nested prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory

shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved Geotechnical Report and the grading plan(s), soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys and benches.

## 3.0 FILL MATERIAL

3.1 General: Material to be used as fill essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, strong corrosivity, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. of the potential import source. The Geotechnical Consultant shall be notified at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

## 4.0 FILL PLACEMENT AND COMPACTION

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain relatively uniform moisture content at or slightly over optimum. Maximum dry density and optimum soil moisture content tests shall be performed in accordance with the latest edition of the American Society of Testing and Materials (ASTM) Test Method D1557.

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (or relative compaction) per the latest edition of ASTM Test Method D1557. Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent per the latest edition of ASTM Test Method D1557.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces, near areas of high moisture content, and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken as intervals not exceeding 2 feet in vertical rise and/or 500 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 2,000 square feet of slope face and/or each 5 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established to that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

## 5.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in accordance with the approved Geotechnical Report, the grading plan(s), and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

## 6.0 EXCAVATION

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on Geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

## 7.0 TRENCH BACKFILLS

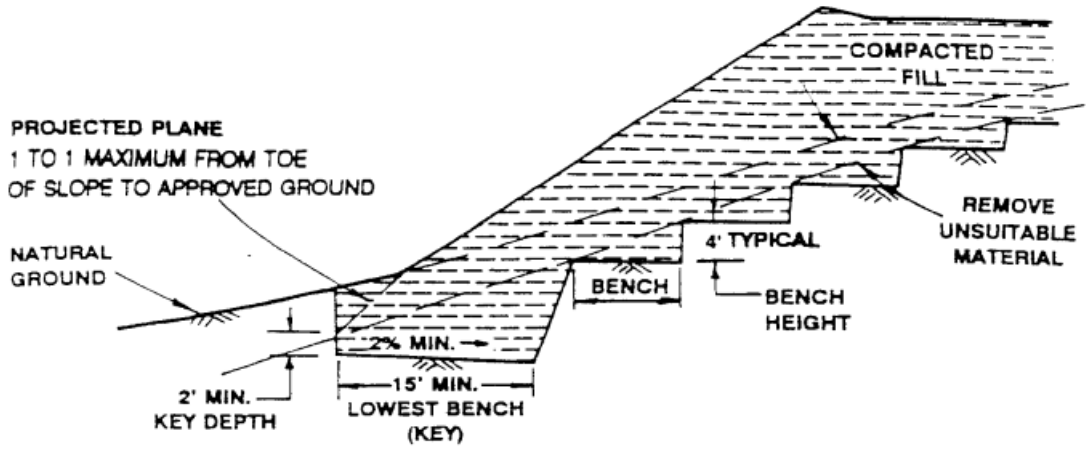
7.1 Safety: The Contractor shall follow all OSHA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill: All bedding and backfill of utility trenches shall be performed in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material

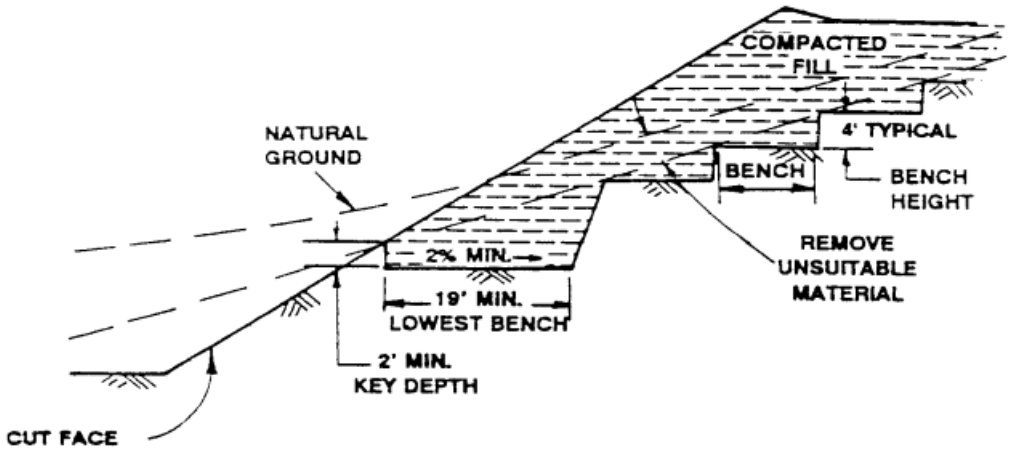
shall have a Sand Equivalent (Cal Test 217) greater than 30 (SE>30). The bedding shall be placed to 1 foot above the top of the conduit to the surface.

7.3 Lift Thickness: Lift thickness of trench backfill shall not exceed those allowed in the latest edition of Standard Specifications of Public Works Construction (i.e. "Green Book") unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum required relative compaction by his alternative equipment and method.

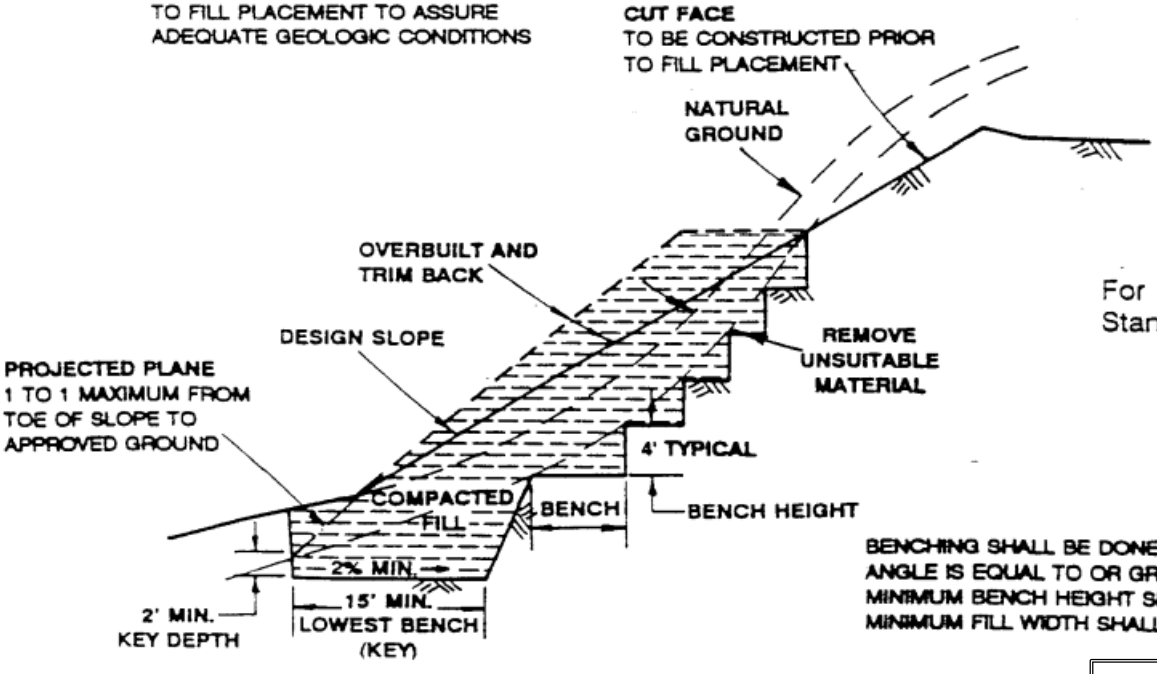
7.4 Observation and Testing: If acceptable by the Geotechnical Consultant, the jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.




FILL SLOPE




FILL-OVER-CUT SLOPE




CUT-OVER-FILL SLOPE

For Subdrains See Standard Detail C

BENCHING SHALL BE DONE WHEN SLOPES ANGLE IS EQUAL TO OR GREATER THAN 5:1
MINIMUM BENCH HEIGHT SHALL BE 4 FEET
MINIMUM FILL WIDTH SHALL BE 9 FEET

**Schematic Not To Scale**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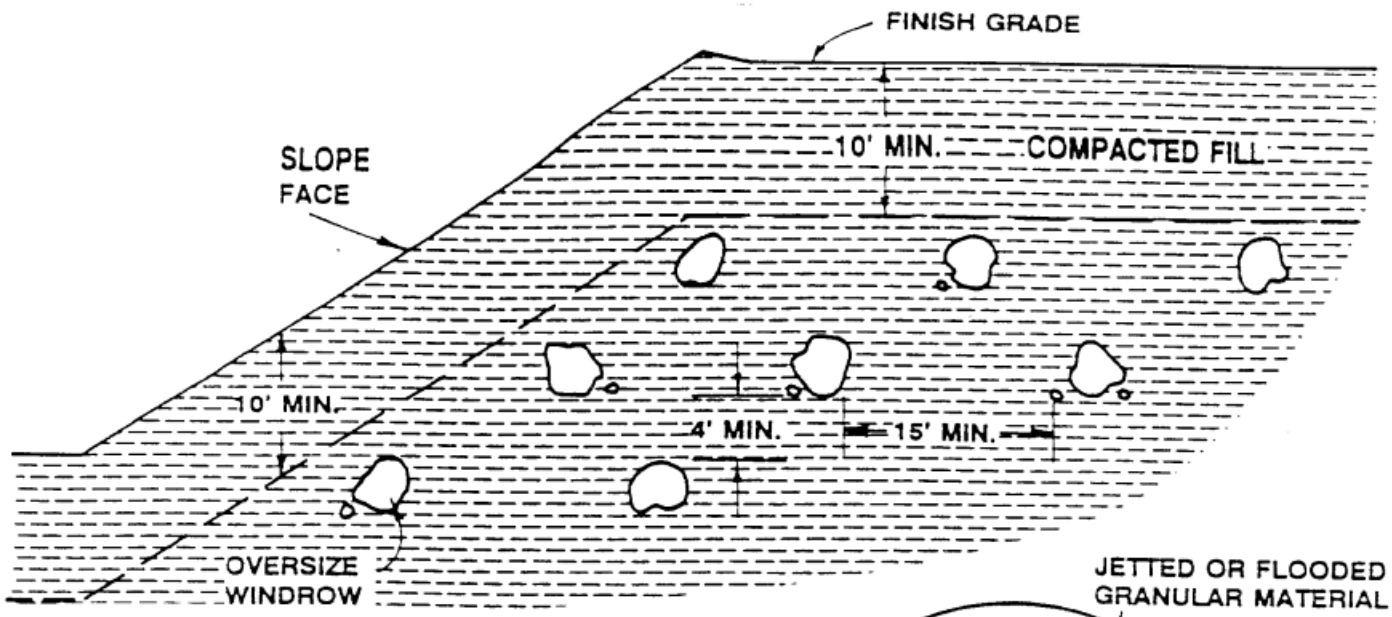
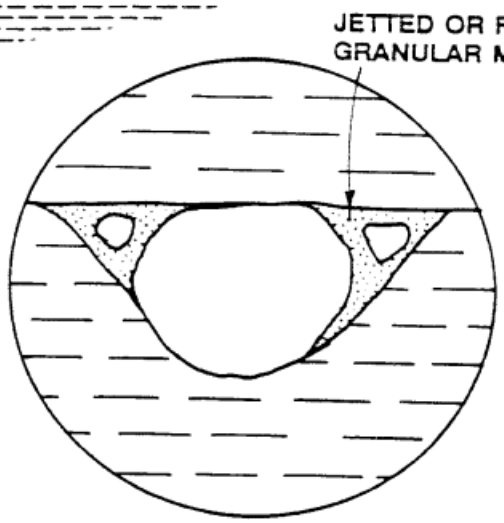
|---|---|---|---|
| Project: | **Prop. Residential Development The Trails at Corona** | | |
| **Details "A"** | **KEYING & BENCHING** | | |
| Proj. No.: | **6619.18.1** | Date: | **November, 2018** |

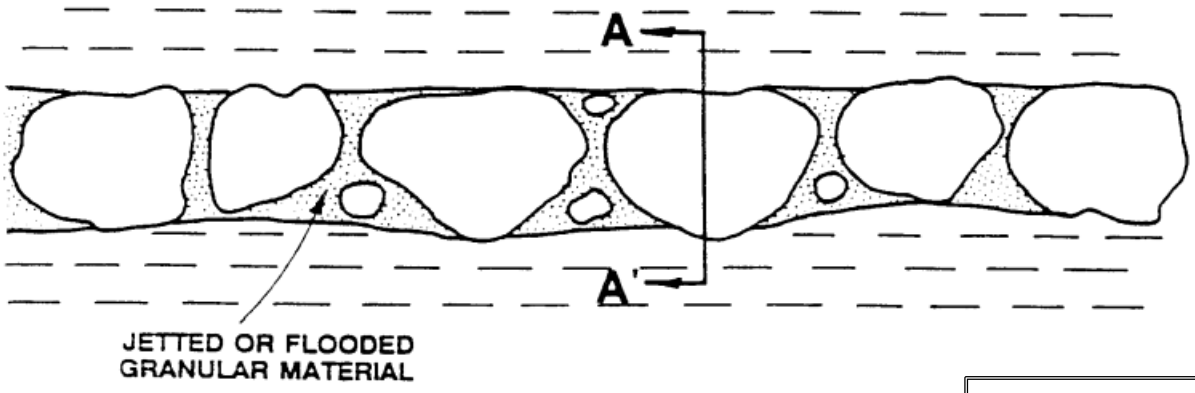



- Oversize rock is larger than 8 inches in largest dimension.
- Excavate a trench in the compacted fill deep enough to bury all the rock.
- Backfill with granular soil jetted or flooded in place to fill all the voids.
- Do not bury rock within 10 feet of finish grade.
- Windrow of buried rock shall be parallel to the finished slope fill.




ELEVATION A-A'

PROFILE ALONG WINDROW

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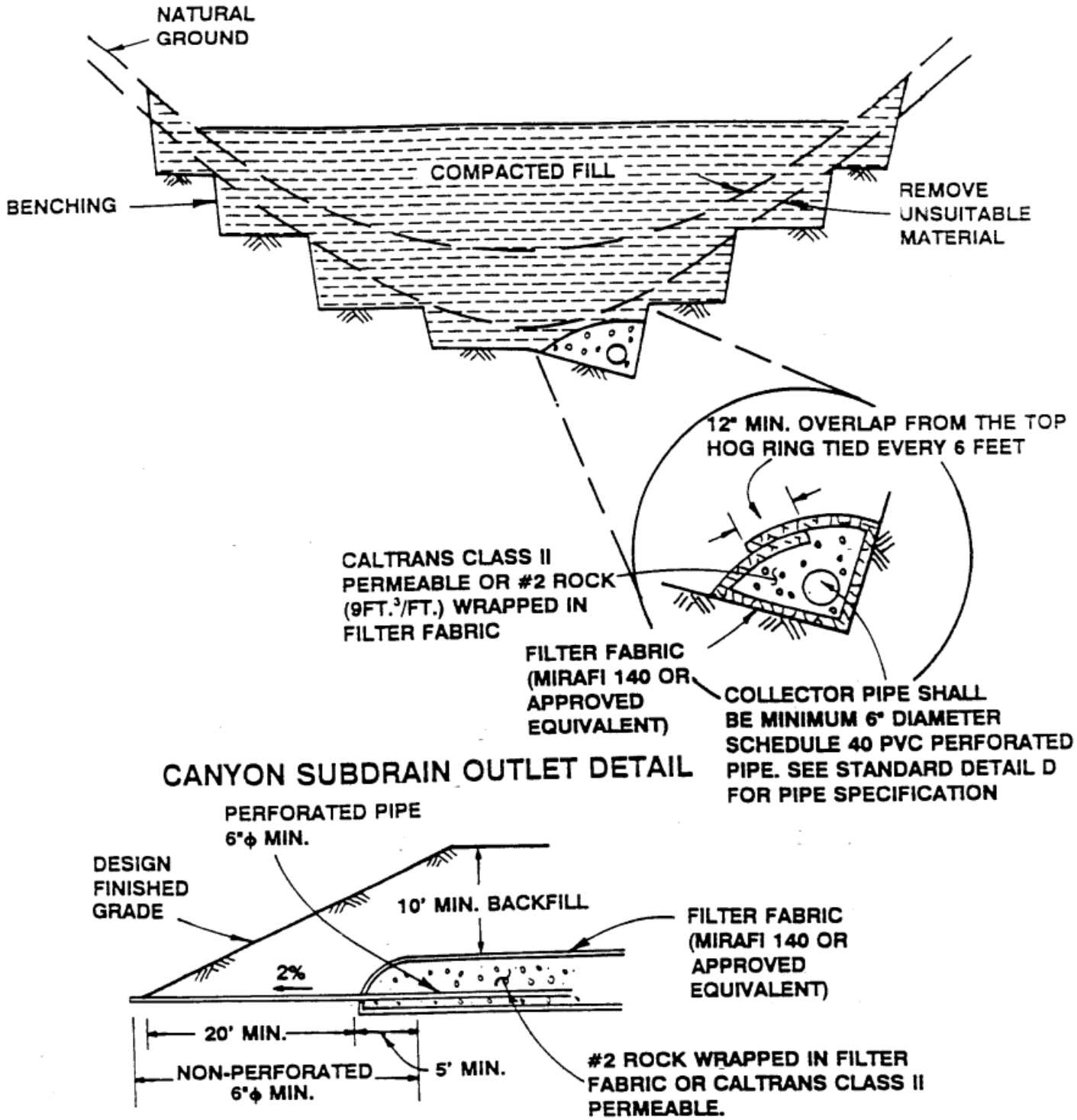
| Project: | **Prop. Residential Development The Trails at Corona** | | |
| **Details "B"** | **OVERSIZE ROCK DISPOSAL** | | |
| Proj. No.: | **6619.18.1** | Date: | **November, 2018** |

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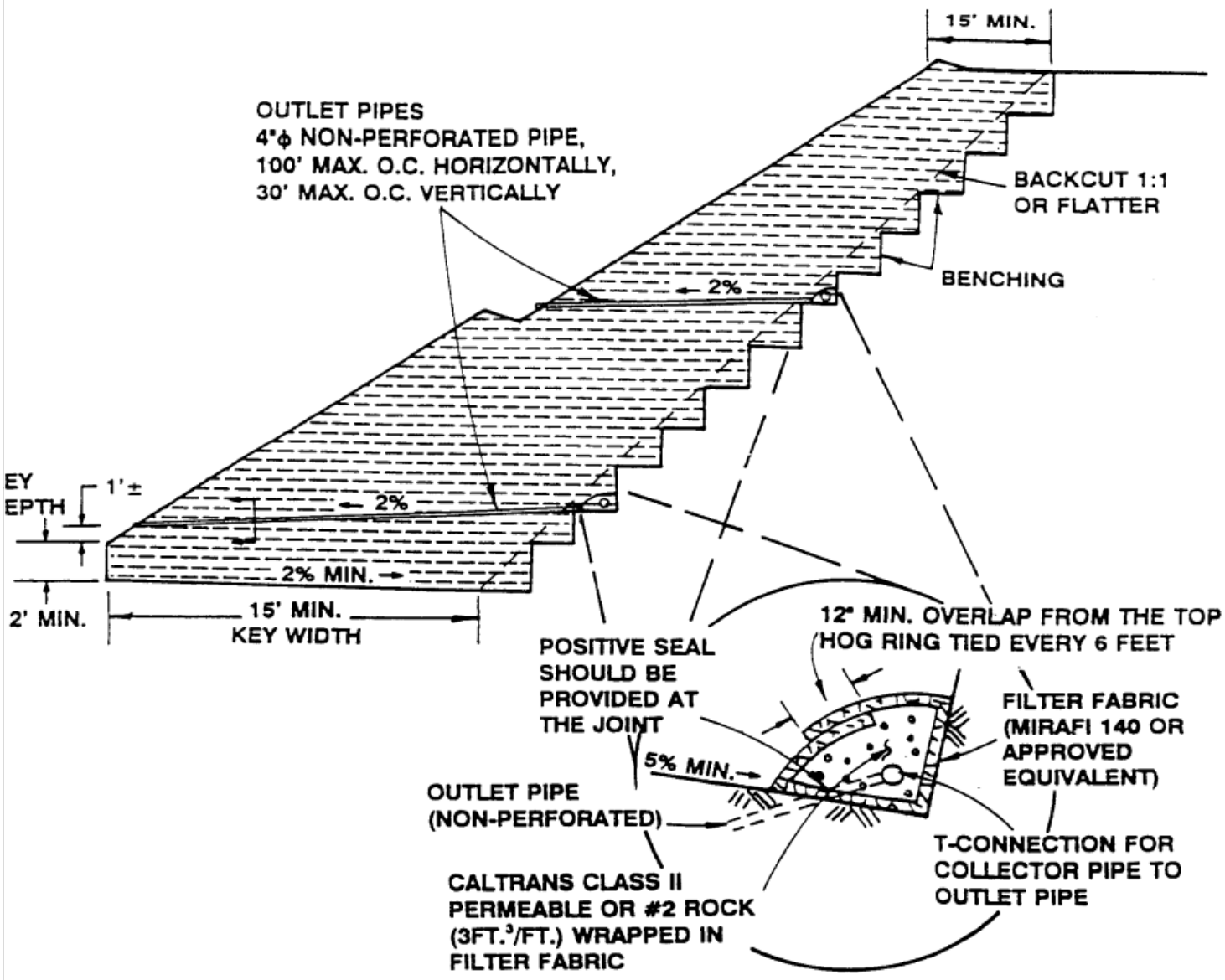
|---|---|---|---|
| Project: | **Prop. Residential Development The Trails at Corona** | | |
| **Details "C"** | **CANYON SUBDRAINS** | | |
| Proj. No.: | **6619.18.1** | Date: | **November, 2018** |




- SUBDRAIN INSTALLATION - Subdrain collector pipe shall be installed with perforations down or, unless otherwise designated by the geotechnical consultant. Outlet pipes shall be non-perforated pipe. The subdrain pipe shall have at least 8 perforations uniformly spaced per foot. Perforation shall be ¼" to ½" if drilled holes are used. All subdrain pipes shall have a gradient at least 2% towards the outlet.

- SUBDRAIN PIPE - Subdrain pipe shall be ASTM D2751, SDR 23.5 or ASTM D1527, Schedule 40, or ASTM D3034, SDR 23.5, Schedule 40 Polyvinyl Chloride Plastic (PVC) pipe.

- All outlet pipe shall be placed in a trench no wider than twice the subdrain pipe. Pipe shall be in soil of SE≥30 jetted or flooded in place except for the outside 5 feet which shall be native soil backfill.

**Schematic Not To Scale**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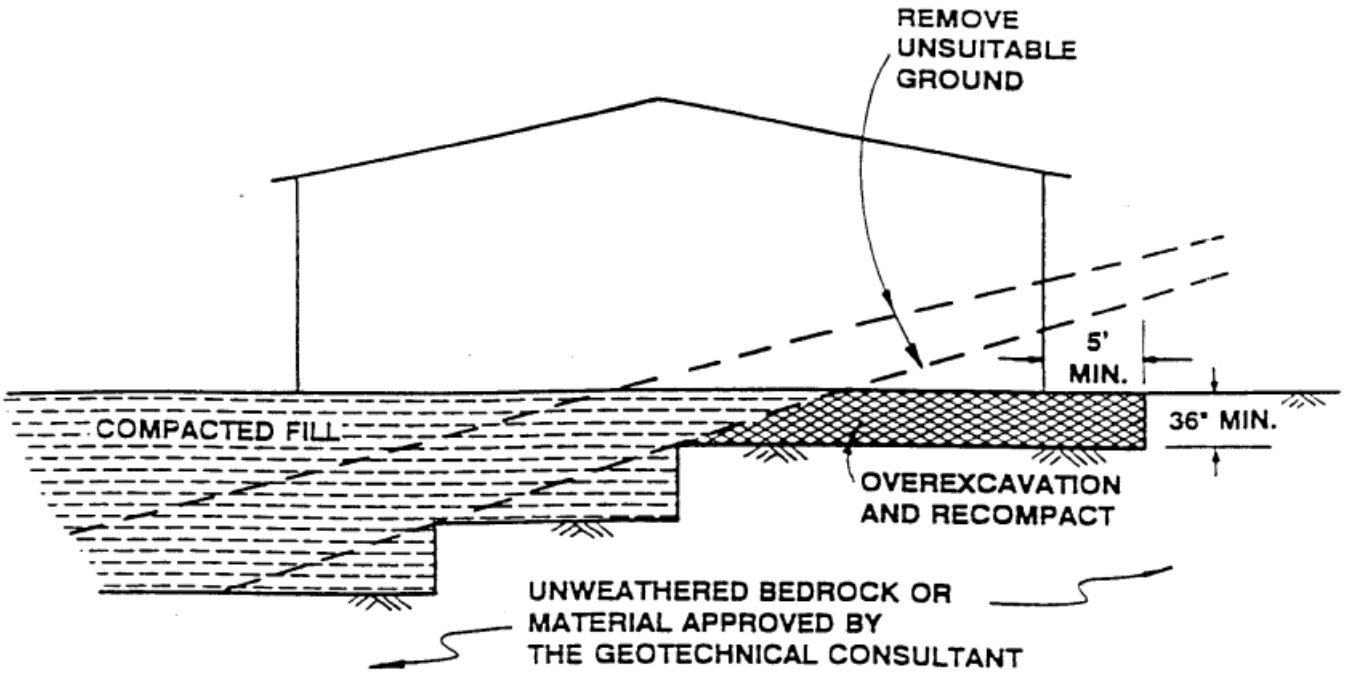
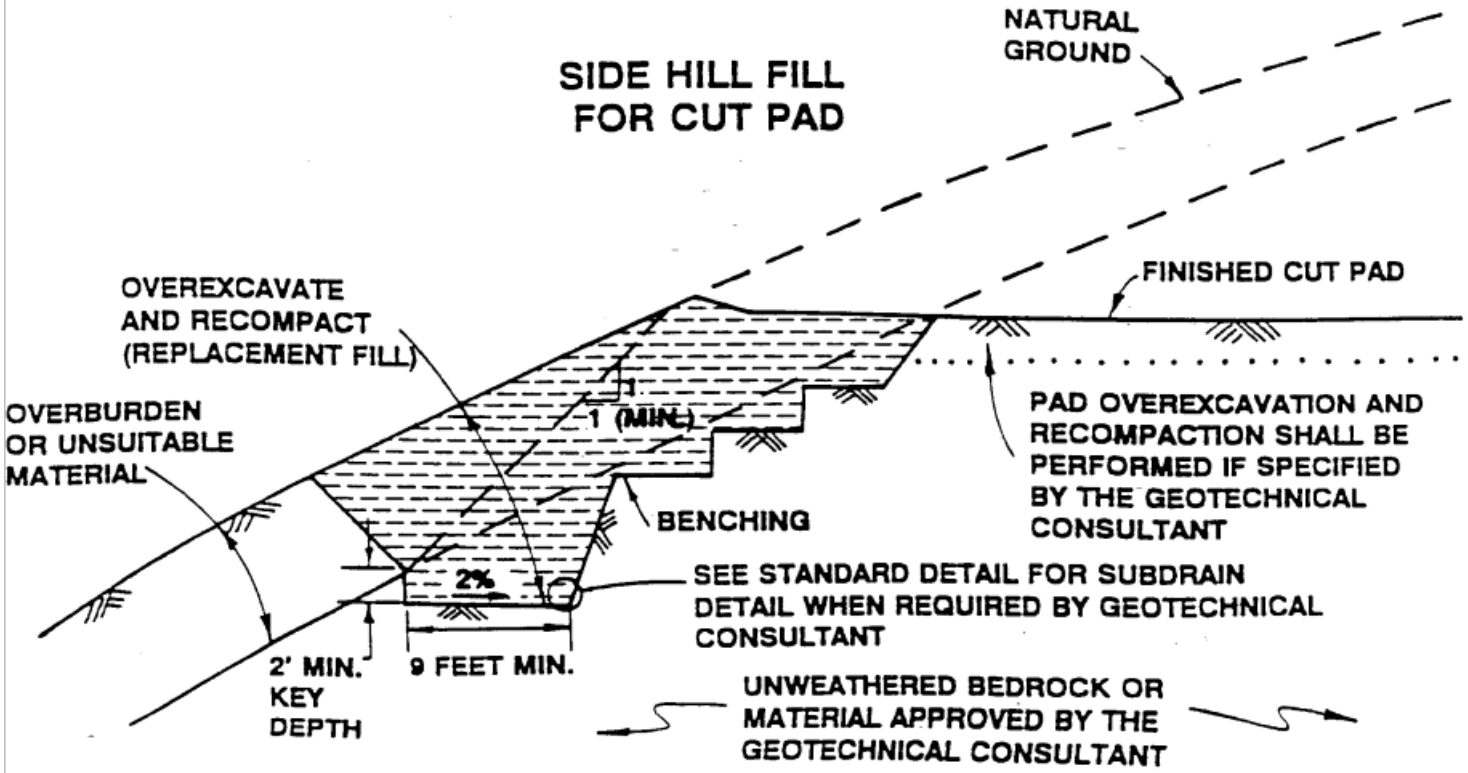
| Project: | **Prop. Residential Development The Trails at Corona** | | |
| **Details "D"** | **BUTTRESS OR REPLACEMENT FILL SUBDRAINS** | | |
| Proj. No.: | **6619.18.1** | Date: | **November, 2018** |

## CUT AND CUT-FILL LOT




## SIDE HILL FILL FOR CUT PAD




**Schematic Not To Scale**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|---|---|---|---|
| Project: | **Prop. Residential Development The Trails at Corona** | | |
| **Details "E"** | **TRANSITION LOT FILLS & SIDE HILL FILLS** | | |
| Proj. No.: | **6619.18.1** | Date: | **November, 2018** |

## APPENDIX C - LIST OF REFERENCES


1. Blake, T.F., 2000, EQFAULT, A Computer Program for the Deterministic Predication of Peak Horizontal Acceleration from Digitized California Faults.

2. Guidelines for Evaluating and Mitigating Seismic Hazards in California, 2008, Special Publication 117A, California Geological Survey.

3. United States Geological Survey (USGS), 2002, Geologic Map of the Corona North 7.5' Quadrangle, Riverside and San Bernardino Counties, California, Version 1.0, released January 23.

4. United States Geological Survey (USGS), 2002, Geologic Map of the Corona South 7.5' Quadrangle, Riverside and Orange Counties, California, Version 1.0, released January 24.

5. California Division of Mines and Geology, (now California Geological Survey), 2003, Special Studies Zones Official Map, Corona North Quadrangle, released May 1.

6. California Division of Mines and Geology, (now California Geological Survey), 2003, Special Studies Zones Revised Official Map, Corona South Quadrangle, released May 1.

7. City of Corona, 2008, Draft Environmental Impact Report, Foothill Parkway Westerly Extension, Section 5.10 – Geologic and Seismic Hazards, draft released August.

8. California Building Code, 2013 Edition: Sacramento, CA, California Building Standards Commission, 2 Volumes.

9. Soil Mechanics Design Manual 7.1 (NAVFAC DM-7.1), 1982, Department of the Navy, Naval Facilities Engineering Command, p. 347.

10. Foundation and Earth Structures Design Manual 7.2 (NAVFAC DM-7.2), 1982, Department of the Navy, Naval Facilities Engineering Command.

11. Winterkorn, H.F., and Fang, H.Y., 1976, Foundation Engineering Handbook: New York, NY, Van Nostrand Reinhold, 751 p.

12. Stewart, J.P., Whang, D.H., Moyneur, M., and Duku, P., 2004, Seismic Compression of As-Compacted Fill Soils with Variable Level of Fines Content and Fines Plasticity, CUREE Publication No. EDA-05, 101p.

13. 2008 Interactive Deaggregations, Hazards Program, United States Geological Survey, website: http:/eqint.cr.usgs.gov/deaggint/2008/dndez.php.

14. Settlement Analysis, 1994, Technical Engineering and Design Guides as adapted from the US Army Corps of Engineers, No. 9, published by American Society of Civil Engineers, New York, NY, p. 136.

15. Minimum Design Loads for Buildings and Other Structures, 2010, American Society of Civil Engineers, ASCE Standard 7-10, 388p.

16. Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary, 2014, published by American Concrete Institute, Farmington Hill, MI, 514 p.

**APPENDIX C - LIST OF REFERENCES** - continued


17. Federal Emergency Management Agency, 2008, National Flood Insurance Program, Flood Insurance Rate Map, Riverside County, California and Incorporated Areas, Panel 688 of 3805, Map Number 06065C0688G, effective date August 28.

18. Federal Emergency Management Agency, 2008, National Flood Insurance Program, Flood Insurance Rate Map, Riverside County, California and Incorporated Areas, Panel 1351 of 3805, Map Number 06065C1351G, effective date August 28.

19. Corrosion Guidelines, Version 2.0, November 2012, Published by California Department of Transportation (Caltrans), 44p.

20. Bridge Design Specifications, September 2003, Published by California Department of Transportation (Caltrans).

21. Cao, T., Bryant, W.A. Rowshandel, B., Branum, D., and Wills, C.J., 2003, the Revised 2002 California Probabilistic Seismic Hazard Maps, California Geological Survey.

22. Peterson, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, Probabilistic Seismic Hazard Assessment for the State of California, California Department of Conservation, Division of Mines and Geology, Open-File Report 96-706.

23. Design of Post-Tensioned Slabs-on-Ground, 3rd Edition, 2004, issued by Post-tensioning Institute, 106 p.

24. Standard Requirements for Design of Shallow Concrete Foundations on Expansive Soils, 4th Edition, dated May 2008, issued by Post-tensioning Institute, 25 p.

25. Standard Requirements for Design of Shallow Concrete Foundations on Expansive Soils, 4th Edition, dated May 2008, issued by Post-tensioning Institute, 17 p.

SOILS ENGINEERING, INC.
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March 29, 2024
Proposal No. 6619.24.1

**Oxbow Partners**
2855 Pacific Coast Highway, Suite 227
Corona del Mar, California 92625

Attention: Mr. Tom Grabiel

Subject: Geotechnical Review of MSHCP Riparian/Riverine Assessment Report, The Trails at Corona Specific Plan, City of Corona, County of Riverside, California

References: See Attached List

Ladies and Gentlemen:

In accordance with your request, Associated Soils Engineering, Inc. (ASE) has reviewed the Western Riverside County Multiple-Species Habitat Conservation Plan (MSHCP) Riparian/Riverine Assessment Report (Reference No. 1) by FirstCarbon Solutions (FCS) as it pertains to "Drainage Features A & B" noted in the referenced report.

The proposed development is to be located across an area that was previously portions of the former Mountain View Golf Course in the City of Corona, California. The referenced FCS report refers to Drainage Feature A in the southern portion of the Project (Tent. Tract 37500) south of Kirkwood Drive and Drainage Feature B in the northern portion of the Project (Tent. Tract 37501) northwest of Paseo Grande and east of Serfas Club Drive. ASE personnel visited the site on March 28, 2024 to observe the drainage features. ASE concurs with the MSHCP that the features occurred due to the abnormally heavy rainy season of 2022/2023 winter rainy season.

The drainage features consist of erosion gullies in areas of alluvial soils and some fill soils. As noted in ASE's Geotechnical Report for the Project (Reference No. 2), these areas are subject to remedial removals of up to 10 feet, with complete removal of any fill soils required. As such, ASE's recommendations presented in Reference No. 2 remain applicable and are not materially impacted by the "Drainage Features."

We sincerely appreciate the opportunity to submit this proposal. If there are any questions or you need clarification, please contact us at (562) 426-7990.

Very truly yours,

**Associated Soils Engineering, Inc.**

PROFESSIONAL GEOLOGIST
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CERTIFIED
ENGINEERING
GEOLOGIST
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Edward C. (Ted) Riddell
President, Principal Engineering Geologist

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## LIST OF REFERENCES


1. First Carbon Solutions, 2024, Western Riverside County Multiple-Species Habitat Conservation Plan Riparian/Riverine Assessment Report for the Trails Specific Plan Project, City of Corona, County of Riverside, California, dated February 28.

2. Associated Soils Engineering, Inc., 2018, Report of Supplemental Geotechnical Investigation & Grading Plan Review, Proposed Residential Redevelopment of "The Trails at Corona," Tentative Tract Map No.'s 37500, 37501, 37502, 37503 & 37504, Corona, California, Project No. 6619.18.1, dated November 19.