# APPENDIX A

## INITIAL STUDY AND NOTICE OF PREPARATION

# City of Hesperia

Gateway to the High Desert

## NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT

**Date**: November 7, 2024

**To**: State Agencies, Responsible Agencies, Local and Public Agencies, and Interested Parties

**From/Lead Agency**: City of Hesperia, Planning Department

**Subject**: **Notice of Preparation of an Environmental Impact Report for the Hesperia Big Box Retail Project**

This Notice of Preparation (NOP) has been prepared to notify agencies and interested parties that the City of Hesperia (City), as lead agency, is commencing the preparation of an Environmental Impact Report (EIR) pursuant to the California Environmental Quality Act (CEQA) to evaluate the potential environmental effects associated with implementation of the Hesperia Big Box Retail Project (Project).

The City is requesting input from interested individuals, organizations, and agencies regarding the scope and content of the environmental analysis to be included in the EIR. In accordance with CEQA, the City requests that agencies provide comments on the environmental issues related to the statutory responsibilities of their particular agency. This NOP contains a description of the Project, its location, and a preliminary determination of the environmental resource topics to be addressed in the EIR.

### Project Location

The approximately 27.25-acre project site is located in the western part of the City, within the Victor Valley region of San Bernardino County (see Figure 2-1 in the attached Initial Study). The project site is located north of Main Street, south of the California Aqueduct, east of Key Pointe Drive and Amargosa Road, and west of Interstate 15 (I-15). From I-15, access to the project site is provided via Main Street, Key Pointe Drive, and Amargosa Road. Regional access to the site is provided from I-15. The project site includes four parcels: Assessor Parcel Numbers (APNs) 0405-062-72, 0405-062-73, 3064-481-06, and 3064-481-07.

### Project Summary

The Project would allow for the construction and operation of a 167,664-square-foot (sf) wholesale big box retail center with 774 parking spaces on a 16.7-acre parcel north of Amargosa Road (APN 0405-062-72). A 14-pump (28 fueling positions) fuel station with an approximately 205-sf office building and an approximately 2,623-sf automated carwash facility are proposed on 10.55 acres located south of Amargosa Road.

*Larry Bird, Mayor*
*Rebekah Swanson, Mayor Pro Tem*
*Cameron Gregg, Council Member*
*Brigit Bennington, Council Member*
*Allison Lee, Council Member*

*Rachel Molina, City Manager*

*9700 Seventh Avenue*
*Hesperia, CA 92345*
*760-947-1000*
*TD 760-947-1119*

*www.cityofhesperia.us*

To implement the Project, the Applicant would need to obtain, at a minimum, the following discretionary permits/approvals:

- Conditional Use Permit (CUP) to allow the retail center with alcoholic beverage sales, the fuel station, and carwash
- Certification of the Final Environmental Impact Report
- Approvals and permits necessary to execute the proposed Project, including but not limited to grading permits and building permits.

Additional permits could be required from the California Department of Fish and Wildlife (CDFW), San Bernardino County Flood Control, and/or the U.S. Army Corps of Engineers (USACE) if determined jurisdictional waters or protected species would be impacted as a result of the Project.

**Potential Environmental Impacts of the Project**

As discussed in the Initial Study, the EIR will evaluate whether Project implementation may potentially result in one or more significant environmental impacts. The potential environmental effects to be addressed in the EIR will include but may not be limited to the following:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Energy
- Geology and Soils (Paleontological Resources)
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use and Planning
- Noise
- Public Services
- Transportation
- Tribal Cultural Resources
- Utilities and Service Systems

The EIR will also address all other CEQA-mandated topics, including cumulative impacts and alternatives.

**Public Scoping Comment Period**

The City has established a 30-day public scoping period from November 7, 2024, to December 6, 2024. During the scoping period, the City's intent is to disseminate Project information to the public and solicit comments from agencies, organizations, and interested parties, including nearby residents and business owners, regarding the scope and content of the environmental information to be included in the EIR, including mitigation measures or Project alternatives to reduce potential environmental effects.

During this period, this NOP and the attached Initial Study may be accessed electronically at the following website: **https://www.cityofhesperia.us/1466/CEQA--Environmental-Documents**

This NOP and the attached Initial Study are also available for review in person at Hesperia City Hall, Planning Department, 9700 Seventh Avenue, Hesperia, California 9234. All comments must be received in writing by December 6, by 5:00 p.m., which is the end of the 30-day public scoping period. All written comments should indicate an associated contact person for the agency or organization, if applicable, and reference the Project name in the subject line. Pursuant to CEQA, responsible agencies are requested to indicate their statutory responsibilities in connection with the Project when responding. Please mail or email comments and direct any questions to the following contact person:

Edgar Gonzales, Senior Planner
City of Hesperia Planning Department
9700 Seventh Avenue
Hesperia, California 92345
Phone: (760) 947-1330
Email: egonzalez@hesperiaca.gov

# Hesperia Big Box Retail Project

## Initial Study

November 2024

**Lead Agency:**

**City of Hesperia**
9700 Seventh Avenue
Hesperia, California 92345

**Consultant:**

**Kimley-Horn and Associates, Inc.**
1100 West Town and Country Road, Suite 700
Orange, California 92868

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# 1.0 INTRODUCTION

## 1.1 Statutory Authority and Requirements

This Initial Study has been prepared in accordance with the California Environmental Quality Act (CEQA) (California Public Resources Code §21000 et seq.) and the State CEQA Guidelines (California Code of Regulations, Title 14, §15000 et seq.). The purpose of the analysis provided in the Initial Study is to determine if the proposed Hesperia Big Box Retail Project (proposed Project or Project) could have a significant effect on the environment. The project site is approximately 27.25 acres and consists of four vacant and undeveloped parcels (Assessor Parcel Numbers [APNs]: 0405-062-72, 0405-062-73, 3064-481-06, and 3064-481-07) in the City of Hesperia (City). The Project includes the construction of a 167,664-square-foot (sf) warehouse retail center, a 14-pump (28 fueling positions) fuel station with an approximately 205-sf office building, an approximately 2,623-sf automated carwash facility, and 774 parking spaces. The Project requires the approval of a Conditional Use Permit (CUP) to allow for the development of a retail center with alcohol sales, a fuel station, and a carwash, and certification of the Final Environmental Impact Report (EIR).

According to State CEQA Guidelines Section 15063(b), if there is substantial evidence that any aspect of a project, either individually or cumulatively, may cause a significant effect on the environment, the Lead Agency shall either prepare an EIR, use a previously prepared EIR, or determine, which of a project's effects were adequately examined by an earlier EIR or Negative Declaration (ND). Conversely, the Lead Agency shall prepare an ND if there is no substantial evidence that the project or any of its aspects may have a significant effect on the environment.

The purposes of an Initial Study, as per State CEQA Guidelines Section 15063(c), are to:

- Provide the Lead Agency with information to use as the basis for deciding whether to prepare an EIR or an ND;
- Enable an applicant or Lead Agency to modify a project, mitigating adverse impacts before an EIR is prepared, thereby enabling the project to qualify for an ND;
- Assist in the preparation of an EIR, if one is required;
- Facilitate environmental assessment early in the design of a project;
- Provide documentation of the factual basis for the finding in an ND that a project will not have a significant effect on the environment;
- Eliminate unnecessary EIRs; and
- Determine whether a previously prepared EIR could be used with the project.

This Initial Study is intended to aid in decision-making by the Lead Agency and responsible agencies regarding the proposed Project. Responsible agencies would use this environmental analysis to consider any discretionary actions associated with Project implementation, if applicable.

State CEQA Guidelines Section 15063(g) states that once a Lead Agency has determined that an Initial Study is required for a project, it shall consult informally with all responsible and trustee agencies affected by the project to obtain their recommendations regarding the need for an EIR, Mitigated Negative Declaration (MND), or ND.

## 1.2 Summary of Findings

In accordance with State CEQA Guidelines Section 15367, the City, as the Lead Agency, is responsible for conducting an environmental review and approving the environmental documentation. This Initial Study evaluates the environmental issues outlined in **Section 3.1: Environmental Factors Potentially Affected**. This Initial Study aims to inform decision-makers and the public about the Project's potential environmental effects.

Based on the Environmental Checklist Form and supporting environmental analysis, the Project would have no impact or a less than significant impact concerning all environmental issue areas, except the following, for which the Project could have a potentially significant impact:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Energy
- Geology and Soils (Paleontological Resources)
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use and Planning
- Noise
- Public Services
- Transportation
- Tribal Cultural Resources
- Utilities and Service Systems

As set forth in State CEQA Guidelines Section 15081, the decision to prepare an EIR will be made either during a preliminary review under State CEQA Guidelines Section 15060 or at the conclusion of an Initial Study after applying the standards described in State CEQA Guidelines Section 15064. Based on this initial evaluation, the Lead Agency has found that the proposed Project may have a significant effect on the environment and an EIR will be prepared.

## 1.3 Initial Study Public Review Process

Pursuant to State CEQA Guidelines Section 15375, the City has issued a Notice of Preparation (NOP) to inform relevant responsible agencies, trustee agencies, the Office of Planning and Research, and federal agencies that the City (i.e., Lead Agency) intends to prepare an EIR for the Project. The purpose of the NOP is to seek guidance from these agencies regarding the scope and content of the environmental information to be included in the EIR.

Upon receipt of the NOP, each responsible and trustee agency, as well as the Office of Planning and Research, must provide the Lead Agency with detailed information within 30 days regarding the scope and content of the environmental information pertaining to their respective areas of statutory responsibility, to be included in the EIR. The NOP and Initial Study are available for public review for 30 days on the City's website at https://www.cityofhesperia.us/1466/CEQA--Environmental-Documents and can be requested from the Community Development Department. For further information, please contact Edgar Gonzalez, Senior Planner, at 760-947-1330 or via email at egonzalez@cityofhesperia.us.

Written responses to the NOP or comments on this Initial Study may be submitted to:

Edgar Gonzalez, Senior Planner
City of Hesperia
9700 Seventh Avenue
Hesperia, CA 92345
Email: egonzalez@cityofhesperia.us

Please include in the subject matter line "Hesperia Big Box Retail Project NOP/IS Comment."

## 1.4 Report Organization

This document is organized into the following sections:

**Section 1.0: Introduction** provides an overview of the Project, including its background, relevant statutory provisions, and a summary of the Initial Study's findings.

**Section 2.0: Project Description** includes details about the project site location, environmental context, background, discretionary actions, construction plan, phasing, and agreements, as well as the necessary permits and approvals. This section also outlines the Initial Study's intended uses and lists the anticipated permits and approvals.

**Section 3.0: Environmental Checklist Form** provides an overview of the Project's background and potential impacts resulting from its implementation.

**Section 4.0: Evaluation of Environmental Impacts** analyzes the environmental impacts identified in the environmental checklist.

**Section 5.0: References** lists the resources used to prepare the Initial Study.

# 2.0 PROJECT DESCRIPTION

## 2.1 Project Location

The project site is in the western part of the City in San Bernardino County. The site is located north of Main Street, south of the California Aqueduct, east of Key Pointe Drive, and Amargosa Road, and west of Interstate 15 (I-15).; see **Figure 2-1: Regional Map**.

The project site is approximately 27.25 acres and includes four parcels with APNs 0405-062-72, 0405-062-73, 3064-481-06, and 3064-481-07. APN 0405-062-72 is north of Amargosa Road, while the other three parcels are south of Amargosa Road and north of Main Street; see **Figure 2-2: Vicinity Map**. Regional access to the project site is provided from I-15. From I-15, access to the project site is provided via Main Street, Key Pointe Drive, and Amargosa Road.

## 2.2 Environmental Setting

The City is located north of the Cajon Pass, 35 miles north of the City of San Bernardino at the intersection of Highway 395 and I-15. It is one of four incorporated cities in the Victor Valley region of San Bernardino County. The incorporated area and Sphere of Influence of Hesperia (referred to herein inclusively as the City) encompasses approximately 110 square miles. Currently, the City consists of rural, suburban, agricultural, commercial, and industrial land uses.

The project site is located in a semi-urbanized area of the City, bordered by a hotel, gas station, and fast-food restaurant to the southwest along Key Pointe Drive, I-15 to the east and southeast, and vacant land to the north and west. The California Aqueduct is located approximately 170 feet north of the project site's northern boundary. Additionally, there is a recreational vehicle (RV) park located further west, approximately 730 feet from the Amargosa Road at Key Pointe Drive intersection. The project site is mostly flat with elevations ranging between 3,482 to 3,505 feet above mean sea level (msl). As depicted in **Figure 2-2**, the project site is undeveloped and vacant with shrubs, grasslands, and western Joshua trees within its boundaries.

Amargosa Road is a paved two-lane road with no curb or pedestrian facilities. It eventually expands into a four-lane road with curb and pedestrian sidewalks approximately 500 feet east of the Amargosa Road at the Key Pointe Drive intersection.

### 2.2.1 Existing General Plan and Zoning

The Hesperia General Plan Land Use Element designates the project site as Main Street and Freeway Corridor Specific Plan; see **Figure 2-3: General Plan Land Use Designation and Zoning Map**. The project site is zoned Regional Commercial (RC) within the Main Street and Freeway Corridor Specific Plan Zoning District; see **Figure 2-4: Main Street/Freeway Corridor Specific Plan Zone Map**. Permitted uses in the RC zone include large-scale "big box" regional shopping centers, hospitality, and entertainment uses such as live performance theatres, casinos, hotels, and convention spaces, as well as restaurants, specialty, and supporting retail. Conditional uses in the RC zone include vehicle fuel stations, vehicle wash facilities, and off-site alcohol sales. The surrounding area shares the same land use designation and zoning, except the RV park, which is designated and zoned Low Density Residential.

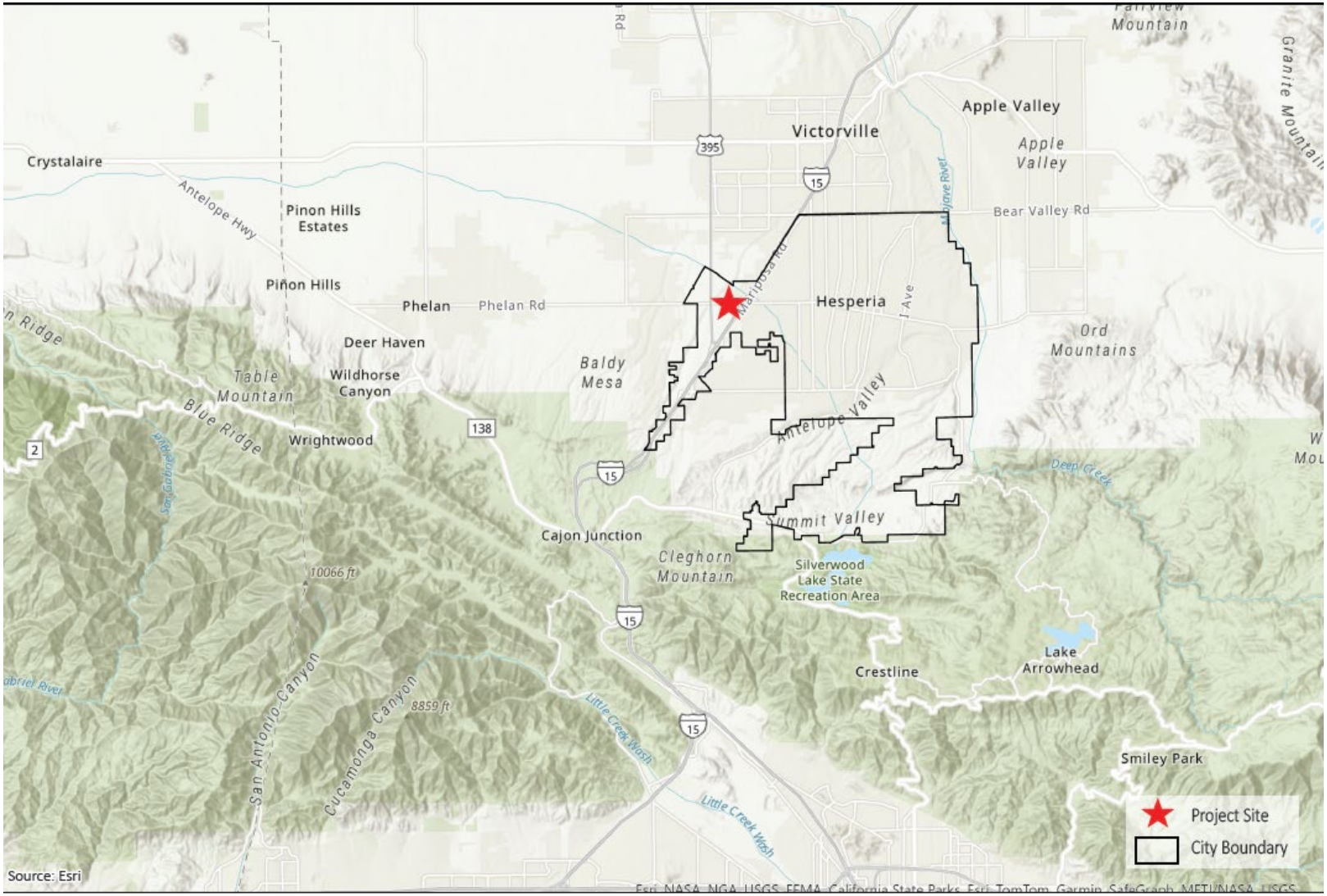



**Figure 2-1: Regional Map**
Hesperia Big Box Retail Project

Not to scale

**Figure 2-2: Vicinity Map**
Hesperia Big Box Retail Project

Not to scale

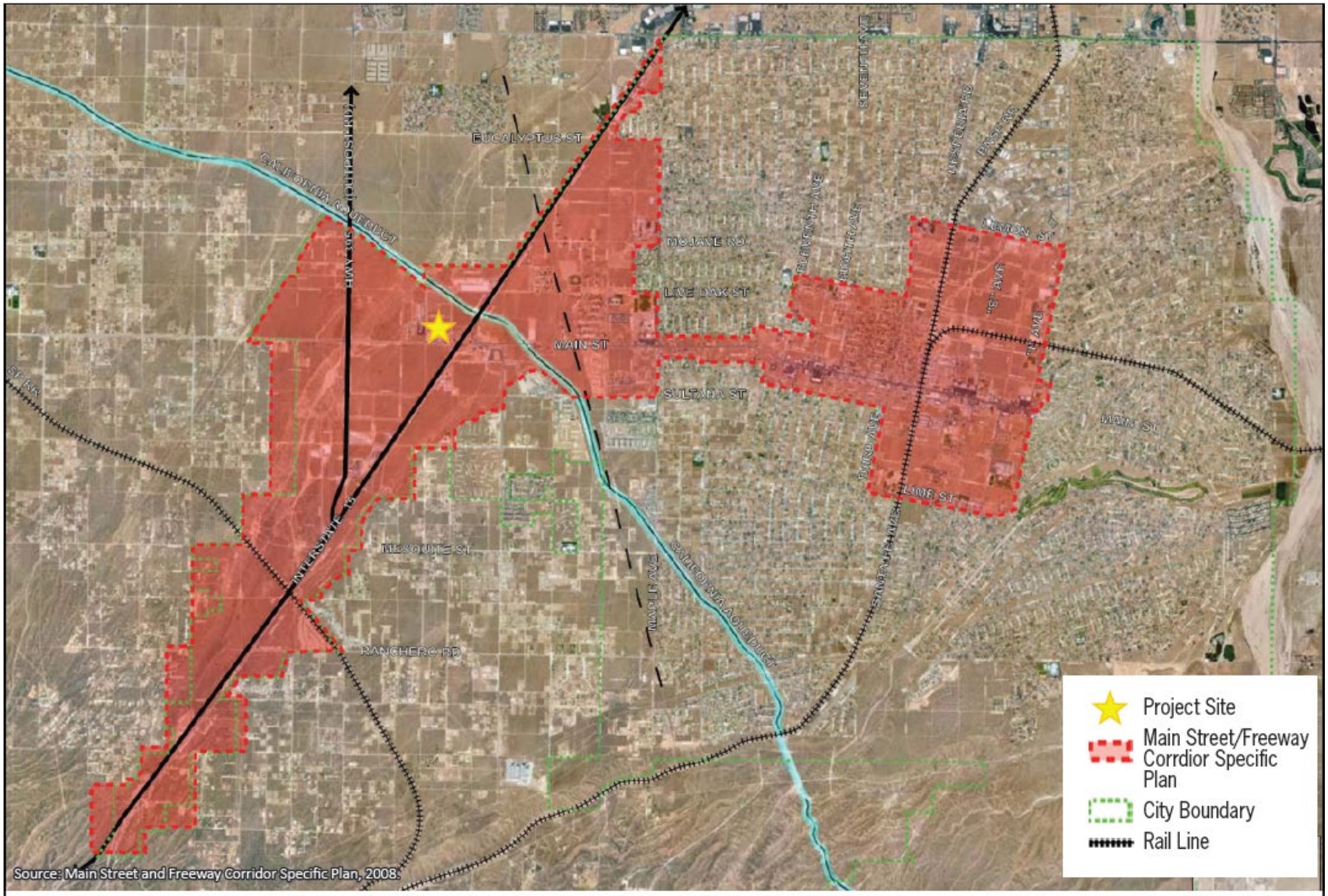



**Figure 2-3: General Plan Land Use Designation and Zoning Map**
Hesperia Big Box Retail Project

Not to scale

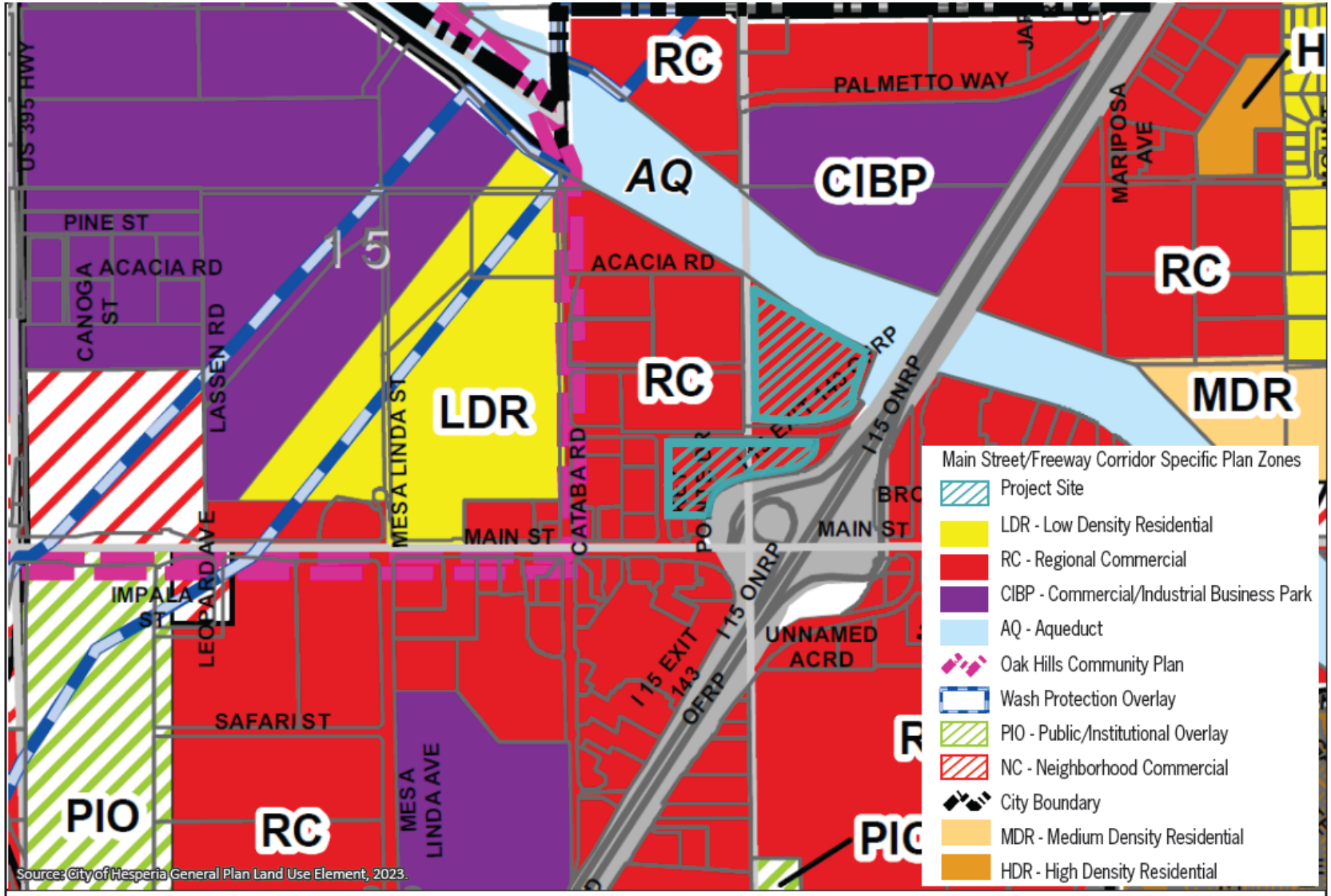



**Figure 2-4: Main Street/Freeway Corridor Specific Plan Zone Map**
Hesperia Big Box Retail Project

Not to scale

## 2.3 Project Characteristics

### 2.3.1 Project Overview

The Project would allow for the construction and operation of a 167,664-sf big box retail center with 774 parking spaces on a 16.7-acre parcel north of Amargosa Road (APN 0405-062-72). A 14-pump (28 fueling positions) fuel station with an approximately 205 sf office building and an approximately 2,623-sf automated carwash facility are proposed on 10.55 acres located south of Amargosa Road (APN 0405-062-73 and 3064-481-06, -07). The parcel containing the retail center is referred to as the northern parcel, while the parcel containing the fuel station and carwash is referred to as the southern parcel; see **Figure 2-5: Conceptual Site Plan**.

#### Retail Center

The proposed retail center would be located on the northern parcel, north of Amargosa Road. The retail center would be located on the northern portion of the site with surface parking to the east and south. A retention basin is proposed at the site's northwest corner for water quality purposes. The retail center has a maximum height of approximately 33 feet measured from finished floor to top of parapet. The retail center could include alcohol sales, a tire and battery center, a vision center, and food service area, among others. The retail center is proposed to include six loading dock doors for trucks on the west side of the building that would connect to the interior receiving area. A curbside pickup area is proposed on the south side of the building.

#### Fuel Station and Carwash Facility

The proposed 14-pump (28 fueling position) fuel station and automated carwash facility would be located on the southern parcel. The fuel station would be located on the western portion of the site, closer to the Amargosa Road at Key Pointe Drive intersection; the carwash would be located on the eastern portion of the southern parcel, closer to I-15. The fuel station would have three underground storage tanks for fuel storage, as well as a 205-sf kiosk/office area for employees. A retention basin is proposed at the eastern corner of the southern parcel for water quality purposes. The office would be located north of the proposed fuel pumps and would contain a bathroom, equipment room, and general office space. The fuel station would have a canopy displaying the tenant signage. The canopy is proposed to be 13.5 feet tall, measured from finish floor to the bottom of canopy. The carwash facility would be automated and include a 1,791-sf wash bay with a 832-sf equipment room.

#### Building Design

As shown in **Figure 2-6: Building Elevations** and **Figure 2-7: Fuel Station and Carwash Facility Elevation**, the building design would be modern, with a blue and grey color scheme. The proposed building materials include precast concrete panels, concrete masonry units, quartztile stone finishes, and metal finishings. The fuel station and carwash would have the same architecture style and paint schemes.

#### Landscaping

Existing vegetation would be removed. The proposed Project would include landscaping around the project site perimeter, building frontages, and parking areas. The Project would be subject to compliance with the development standards contained in Hesperia Municipal Code Chapter 16.20, Article XII (Landscape Regulations), Hesperia Municipal Code Chapter 16.24 (Protected Plants), and Chapter 10 of the Main Street and Freeway Corridor Specific Plan. These standards include requirements concerning landscape coverage, landscaping materials, landscape planters, trees, screening, entry statements, landscape and irrigation design, recycled water use, and maintenance.

## Lighting

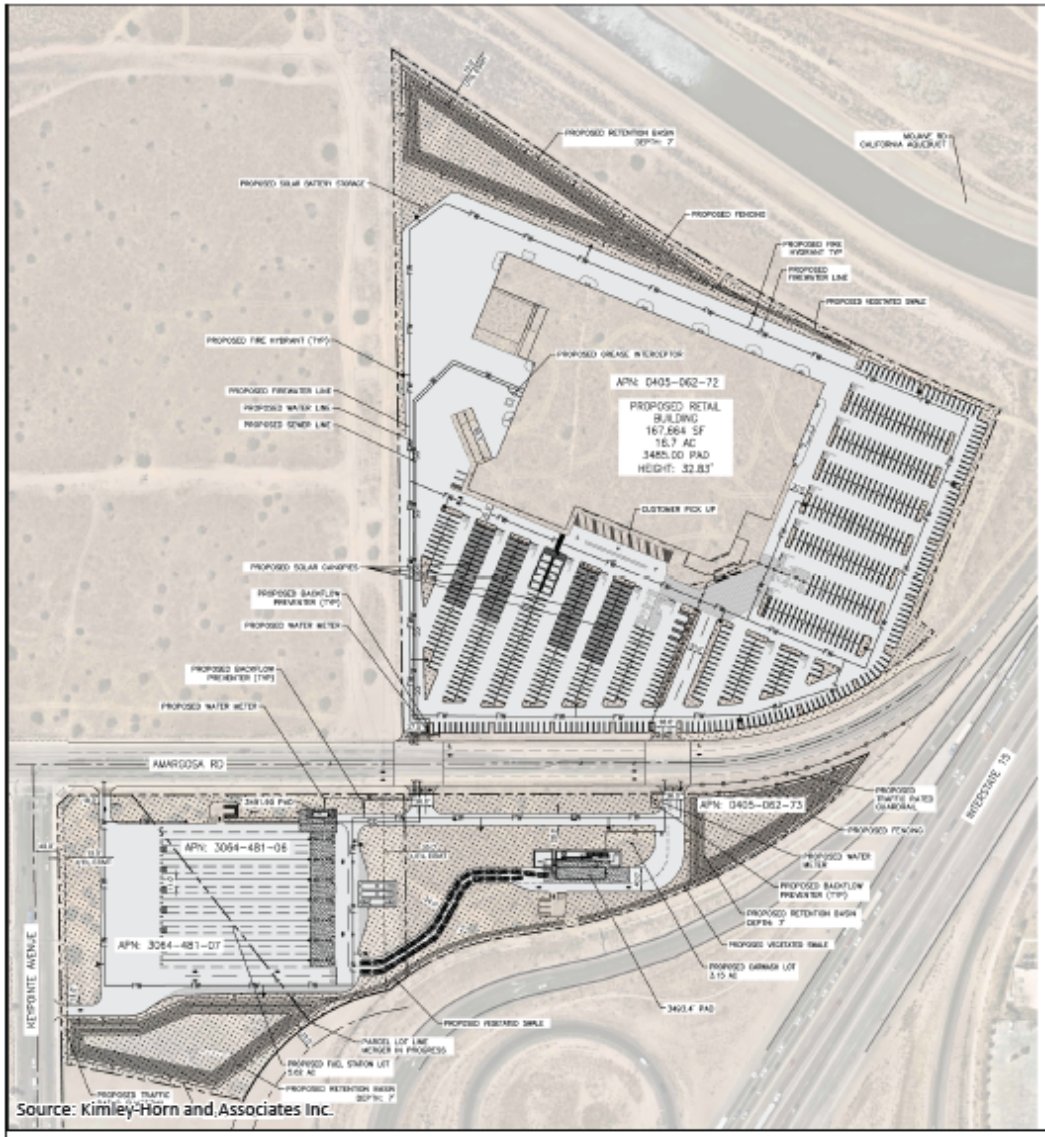
Project lighting would include light sources typically used in commercial retail developments, including outdoor parking lot lighting for security and wayfinding. Additionally, exterior lighting fixtures along the building frontage, fuel station, and carwash facility would provide illumination for the development and would be shielded down to prevent light pollution and preserve dark skies.

## Parking and Access

Access to the project site would be provided from five new driveways along Amargosa Road and one new driveway along Key Pointe Drive. The northern parcel would have two driveway access points along Amargosa Road. The southern parcel would have three driveways along Amargosa Road and one driveway along Key Pointe Drive. **Table 2-1: Driveway Descriptions** provides additional details about access points for the proposed Project.

**Table 2-1: Driveway Descriptions**

| Parcel | Driveway | Location | Movement | Use |
|---|---|---|---|---|
| Northern Parcel | 1 | Amargosa Road; approximately 600 feet east of Key Pointe Drive | Full Access (unrestricted turn movements) | Public |
| | 2 | Amargosa Road; approximately 1,100 feet east of Key Pointe Drive | Full Access (unrestricted turn movements) | Public |
| Southern Parcel | 3 | Key Pointe Drive; approximately 400 feet south of Amargosa Road | Restricted – Ingress only | Public |
| | 4 | Amargosa Road; approximately 100 feet east of Key Pointe Drive | Restricted – Ingress only | Public |
| | 5 | Amargosa Road; approximately 600 feet east of Key Pointe Drive | Restricted – Egress only | Public |
| | 6 | Amargosa Road; approximately 1,100 feet east of Key Pointe Drive | Restricted – Egress only | Public |
| Source: Kimley-Horn, 2024. | | | | |




Source: Kimley-Horn and Associates Inc.

| SITE DATA | |
|---|---|
| ADJUSTED GROSS AND NET ACREAGE | 25.37 |
| BUILDING SIZE | 167,664 SF |
| LANDSCAPE COVERAGE RATIO | .38 |
| CITY REQUIRED PARKING | 667 |
| PROPOSED PARKING | 774 |
| PROPOSED PARKING RATIO ($\frac{774}{167664} * 1000$) | 4.61:1000 |
| PROPOSED ADA VAN | 4 |
| PROPOSED ADA STANDARD | 10 |

## LEGEND

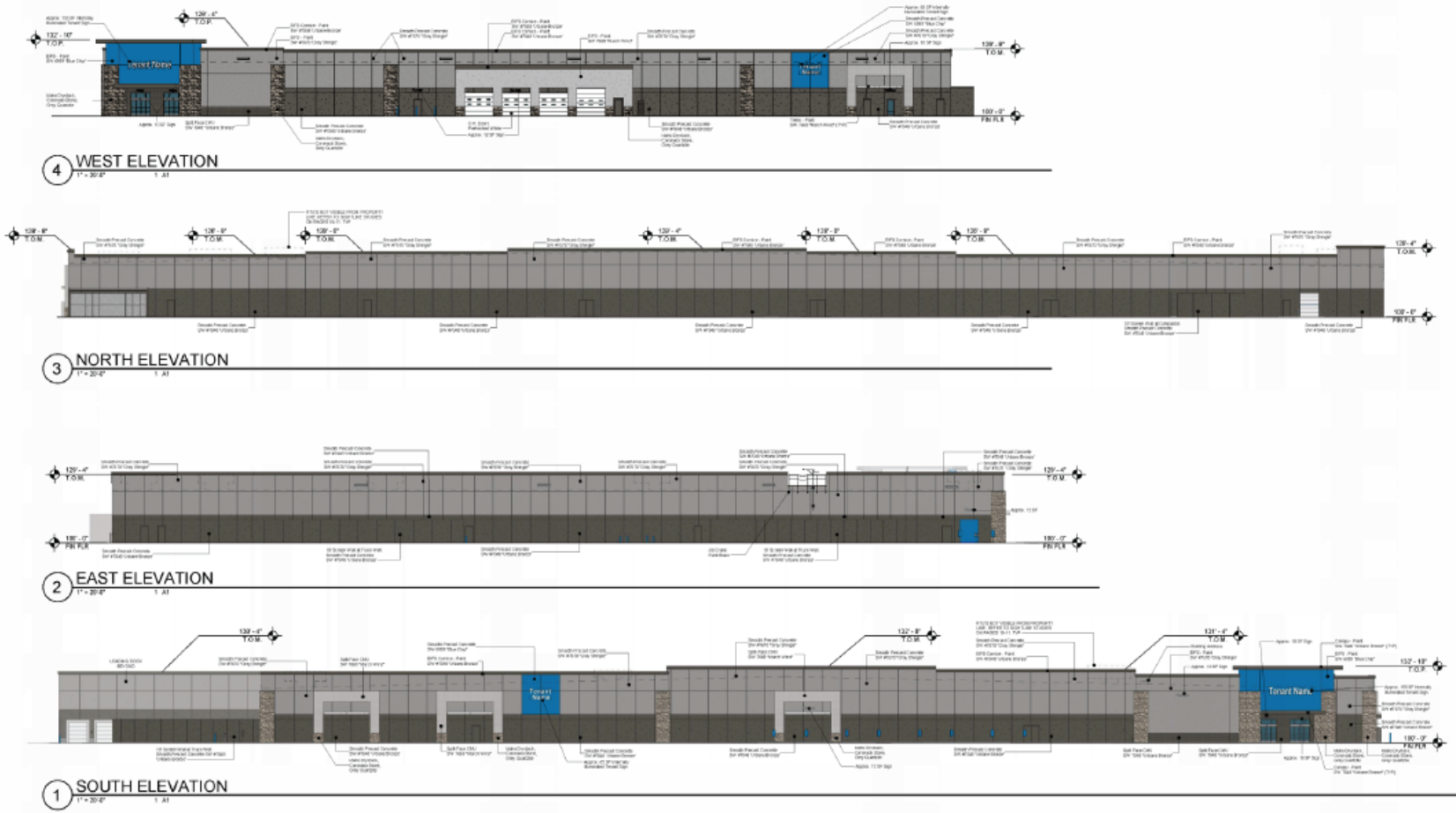
- PROPERTY LINE
- EXISTING EASEMENT
- EXISTING FENCE
- PROPOSED WATER LINE
- PROPOSED SANITARY LINE
- PROPOSED FIRE WATER LINE
- CONCRETE PAVEMENT. REFER TO STRUCTURAL PLANS FOR MORE INFORMATION.
- PROPOSED HEAVY DUTY ASPHALT PAVING
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE SIDEWALK
- PROPOSED DECORATIVE CONCRETE PAVEMENT

**Figure 2-5: Conceptual Site Plan**

Big Box Hesperia Project

Not to scale

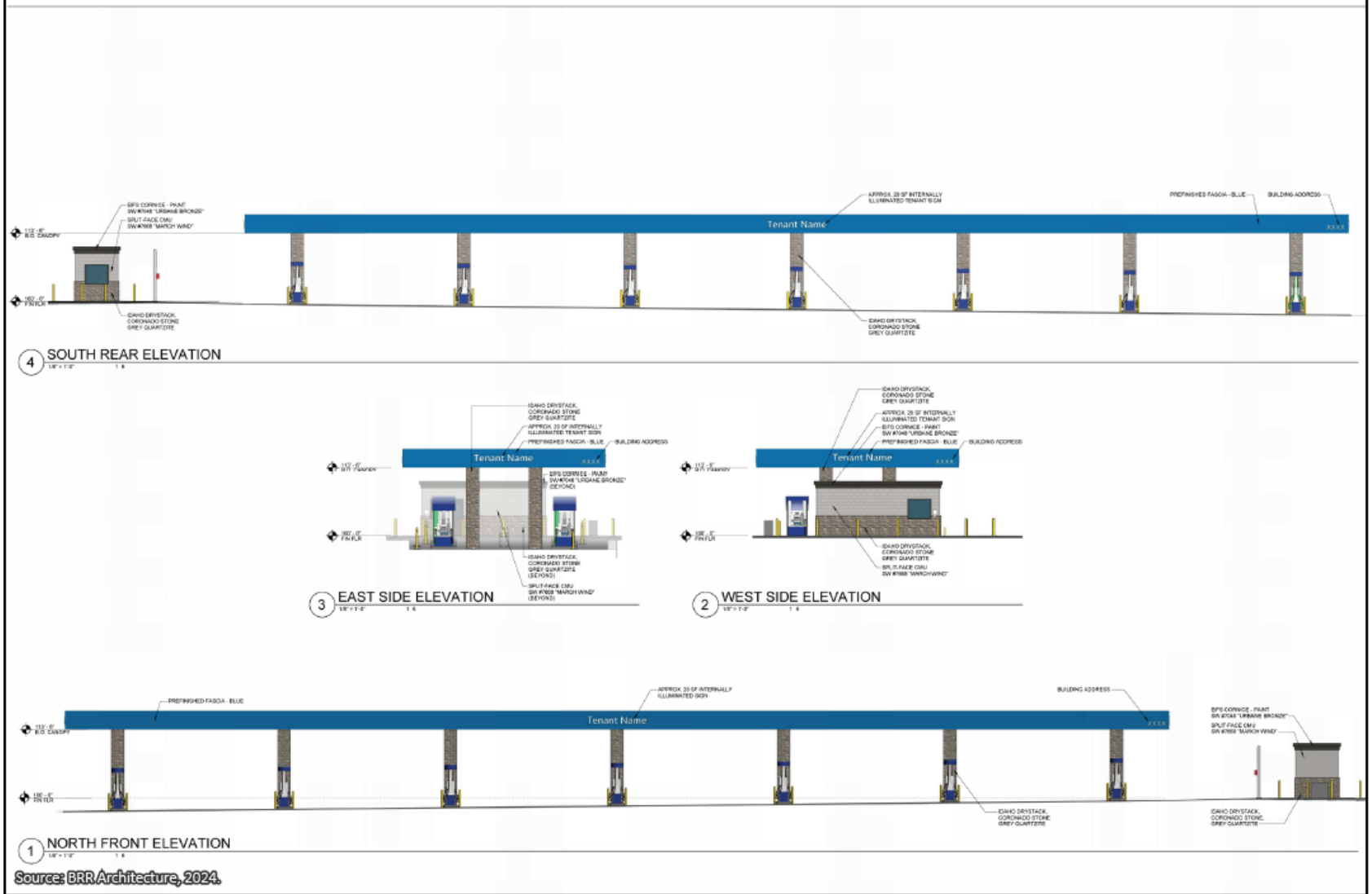
Kimley»Horn




Source: BRR Architecture, 2024.

**Figure 2-6: Retail Center Building Elevation**
Hesperia Big Box Retail Project

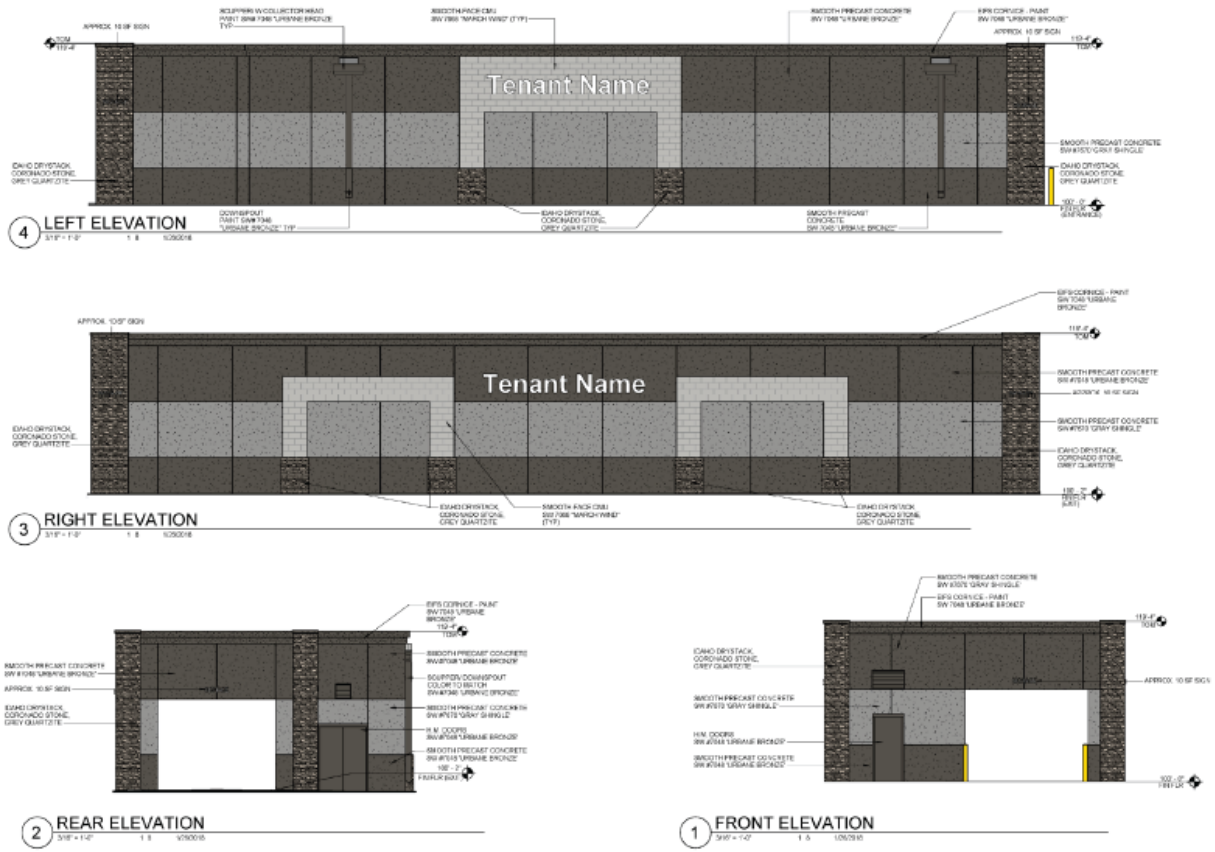
Not to scale




Source: BRR Architecture, 2024.

**Figure 2-7: Fuel Station Elevation**
Hesperia Big Box Retail Project

Not to scale




Source: BRR Architecture, 2024.

**Figure 2-8: Carwash Facility Elevation**
Hesperia Big Box Retail Project

Not to scale

The parking for the retail center would be located on the northern parcel and parking for the fuel facility and carwash station would be located on the southern parcel. The Specific Plan identifies that the off-street parking requirements for the RC zone default to parking standards set forth in Hesperia Municipal Code Section 16.2.080. According to the Hesperia Municipal Code, the Project is required to provide 573 parking spaces. The proposed Project proposes 774 spaces, including 10 Americans with Disabilities (ADA) stalls, 4 ADA van stalls, and 760 standard stalls, exceeding the City's parking requirements. Four solar canopies are proposed over approximately 120 parking stalls on the northern parcel.

#### Sustainability Features

The Project proposes energy-saving and sustainable design features pursuant to California Code of Regulations Title 24 (California Building Standards Code) requirements (i.e., Title 24 Part 3 – California Electrical Code, Title 24 Part 5 – California Plumbing Code, Title 24 Part 6 – California Energy Code, and Title 24 Part 11 – California Green Building Standards (CALGreen Code)). Design features would include energy conservation and water conservation. As it relates to energy conservation, the Project proposes four solar canopies and a solar battery storage system and would include energy-efficient HVAC systems. As it relates to water conservation, the Project would incorporate efficient water management and sustainable landscaping. In addition, in accordance with CALGreen requirements, at least 20 percent of the total onsite parking spaces would be electric vehicle (EV) capable spaces.

#### Off-site Improvements

The Project would also include off-site right-of-way improvements at the project site access points on Amargosa Road. Improvements are anticipated to include a sidewalk along the project site frontage on Amargosa Road, installation of a signalized intersection at driveways 1 and 5 shown in Table 2-1, two left turn lanes to accommodate access to the northern parcel, pavement markings, and decorative pavement at the proposed driveways.

### 2.3.2 Utility Infrastructure

Project implementation would require the construction of new on-site utility infrastructure connections to serve the proposed development. These utilities would be connected to existing utility infrastructure in Amargosa Road with the final sizing and design of on-site facilities to occur during final building design and plan check. Additionally, a solar battery storage system is proposed at the site's northwest corner south of the proposed retention basin.

### 2.3.3 Project Construction Activities and Phasing

Project construction is anticipated to occur in two phases. Phase 1 would involve the construction and operation of the fuel station and carwash on the southern parcel, with an anticipated construction start in 2025 and opening in 2026. Phase 2 would include the construction and operation of the retail center on the northern parcel, with construction starting in 2026 and opening in 2027. Project construction is anticipated to occur in the following sequence:

- Demolition
- Site preparation
- Grading
- Building construction
- Architectural coating
- Paving.

## 2.4 Agreements, Permits, and Approvals

The City, as the Lead Agency, has discretionary authority over the Project. To implement the Project, the Applicant would need to obtain, at a minimum, the following discretionary permits/approvals:

- Conditional Use Permit (CUP) to allow the retail center with alcohol sales, the fuel station, and the carwash
- Certification of the Final Environmental Impact Report
- Approvals and permits necessary to execute the proposed Project, including but not limited to grading permits and building permits.

Additional permits could be required from the California Department of Fish and Wildlife (CDFW), San Bernardino County Flood Control, and/or the U.S. Army Corps of Engineers (USACE) if determined jurisdictional waters or protected species would be impacted as a result of the Project.

# 3.0 ENVIRONMENTAL CHECKLIST FORM

## 3.1 Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by the proposed Project, involving at least one impact that is a "Potentially Significant Impact," as indicated by the checklist on the following pages.

| | | | | | |
|---|---|---|---|---|---|
| X | Aesthetics | | Agricultural and Forestry Resources | X | Air Quality |
| X | Biological Resources | X | Cultural Resources | X | Energy |
| X | Geology and Soils | X | Greenhouse Gas Emissions | X | Hazards and Hazardous Materials |
| X | Hydrology and Water Quality | X | Land Use and Planning | | Mineral Resources |
| X | Noise | X | Population and Housing | X | Public Services |
| X | Recreation | X | Transportation | X | Tribal Cultural Resources |
| X | Utilities and Service Systems | | Wildfire | X | Mandatory Findings of Significance |

## 3.2 Lead Agency Determination

On the basis of this initial evaluation:

| | |
|---|---|
| I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared. | |
| I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared. | |
| I find that the proposed project MAY have a significant effect on the environment and an ENVIRONMENTAL IMPACT REPORT is required. | X |
| I find that the proposed project MAY have a potentially significant or a potentially significant unless mitigated impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed. | |
| I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required. | |

**CITY OF HESPERIA**

Edgar Gonzalez
Senior Planner

10/31/2024
Date

# 4.0 EVALUATION OF ENVIRONMENTAL IMPACTS

The following environmental analysis follows the State CEQA Guidelines Appendix G**.** It includes explanations for all responses except "No Impact." These responses address the entire proposed Project: on-site, off-site, direct, indirect, short-term construction, and long-term operational impacts. Each explanation also includes the significance criteria or threshold used to evaluate the question and any the mitigation identified, if any, to avoid or reduce the impact to less than significant. To each question, there are four possible responses:

- **No Impact.** The Project would not have any measurable environmental impact.
- **Less Than Significant Impact.** The Project would have the potential to impact the environment, although this impact would be below established thresholds that are considered to be significant.
- **Less Than Significant With Mitigation Incorporated.** The Project would have the potential to generate impacts, which may be considered a significant effect on the environment, although mitigation measures or changes to the Project's physical or operational characteristics could reduce these impacts to a less than significant level.
- **Potentially Significant Impact.** The Project could have impacts, which may be considered significant, and therefore additional analysis is required to identify mitigation. A determination that there is a potential for significant effects indicates the need to analyze the Project's impacts and identify mitigation more fully.

## 4.1 Aesthetics

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Except as provided in Public Resources Code Section 21099, would the project:** | | | | |
| a) Have a substantial adverse effect on a scenic vista? | X | | | |
| b) Substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a State Scenic Highway? | | | | X |
| c) If in a non-urbanized area, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality? | X | | | |
| d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? | X | | | |

### IMPACT ANALYSIS

#### 4.1a Would the project have a substantial adverse effect on a scenic vista?

**Potentially Significant Impact.** Under CEQA, a scenic vista is defined as a viewpoint that provides expansive views of a highly-valued landscape for the public's benefit. The Hesperia General Plan (General Plan) and Hesperia 2010 General Plan Update Final EIR (General Plan EIR) identify unique visual resources in the City including the Mojave River and the San Bernardino and San Gabriel Mountains. Additional scenic features in Hesperia include unique topographic features, local flora, and historic buildings. The EIR will analyze the proposed Project's impacts on these scenic vistas.

#### 4.1b Would the project substantially damage scenic resources, including but not limited to trees, rock outcroppings, and historic buildings within a State Scenic Highway?

**No Impact.** There are no State- or County-designated scenic highways in the vicinity of the project site.[1] Therefore, the Project would not damage scenic resources within a State Scenic Highway. This issue will not be further analyzed in the EIR.

[1] California Department of Transportation. (2018). *California State Scenic Highway System Map.* Retrieved from https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aacaa

**4.1c If in a non-urbanized area, would the project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?**

**Potentially Significant Impact.** The project site is within a semi-urban area of the City. The Project would involve the construction of new structures including a new retail center, fuel station, and carwash. This development has the potential to alter the existing visual aesthetics of the site and surrounding area, as it introduces new land uses to an area that was previously vacant. Additionally, the project site is within the Main Street and Freeway Corridor Specific Plan area, which outlines design guidelines and development standards that are relevant to the Project. The EIR will evaluate the Project's compliance with the Specific Plan regulations and assess its impacts on the regulations related to scenic quality. Consistency with regulations governing scenic quality will be analyzed in the EIR.

**4.1d Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?**

**Potentially Significant Impact.** The Project would create lighting using two main sources: light from inside buildings passing through windows and light from external sources such as street lights, parking lot lights, building illumination, security lights, landscape lighting, and signage. The Project would introduce new sources of lighting that could adversely affect day or nighttime views in the area. Therefore, the potential impacts related to light and glare will be analyzed in the EIR.

## 4.2 Agricultural and Forestry Resources

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:** | | | | |
| a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use? | | | | X |
| b) Conflict with existing zoning for agricultural use, or a Williamson Act contract? | | | | X |
| c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code §12220(g)), timberland (as defined by Public Resources Code §4526), or timberland zoned Timberland Production (as defined by Government Code §51104(g))? | | | | X |
| d) Result in the loss of forest land or conversion of forest land to non-forest use? | | | | X |
| e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use? | | | | X |

### IMPACT ANALYSIS

**4.2a Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?**

**4.2b Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?**

**4.2c Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code §12220(g)), timberland (as defined by Public Resources Code §4526), or timberland zoned Timberland Production (as defined by Government Code §51104(g))?**

**4.2d Would the project result in the loss of forest land or conversion of forest land to non-forest use?**

### 4.2e Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

**No Impact.** The project site does not contain any Prime Farmland, Unique Farmland, or Farmland of Statewide or Local Importance. According to the California Department of Conservation, the project site is designated as Grazing Land and does not have any active Williamson Act contracts.[2] The project site is zoned RC, and there is no agricultural, forest land, or timberland zoning on the site. As a result the Project would not have any impact on mapped farmlands, Williamson Act contracts, or agricultural, forest, or timber land zoning. Therefore, the Project would not result in the conversion or loss of farmland, forest land or timberland. The topic of Agricultural and Forestry Resources will not be further analyzed in the EIR.

[2] California Department of Conservation, Williamson Act Enrollment Finder, Available at: https://maps.conservation.ca.gov/dlrp/WilliamsonAct/, accessed June 19, 2024.

## 4.3 Air Quality

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:** | | | | |
| a) Conflict with or obstruct implementation of the applicable air quality plan? | X | | | |
| b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard? | X | | | |
| c) Expose sensitive receptors to substantial pollutant concentrations? | X | | | |
| d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people? | X | | | |

### IMPACT ANALYSIS

**4.3a Would the project conflict with or obstruct implementation of the applicable air quality plan?**

**4.3b Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?**

**4.3c Would the project expose sensitive receptors to substantial pollutant concentrations?**

**4.3d Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?**

**Potentially Significant Impact.** The project site is located within the Mojave Desert Air Basin (MDAB). The Project involves construction and operational activities that would produce short-term and long-term pollutants and other emissions. Localized concentrations of emissions from construction and operational activities could potentially affect sensitive receptors. During construction, emissions from construction equipment, architectural coatings, and paving activities may generate odors while during operations, trucks and vehicles operating at the fuel station and carwash may emit odors. These odors could have negative effects on people near the project site. Further analysis is needed to determine if the Project would significantly impact air quality. An air quality study will be prepared as part of the EIR, and air quality modeling will be based on the latest available version of the California Emissions Estimator Model (CalEEMod). This topic will be analyzed in the EIR.

## 4.4 Biological Resources

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | X | | | |
| b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? | X | | | |
| c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? | X | | | |
| d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? | X | | | |
| e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance? | X | | | |
| f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? | X | | | |

## IMPACT ANALYSIS

**4.4a Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?**

**4.4b Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?**

**4.4c Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?**

**4.4d Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?**

**4.4e Would the project conflict with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?**

**4.4f Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?**

**Potentially Significant Impact.** The 27.25-acre project site is currently undeveloped and vacant. The project site contains various shrubs, trees, and vegetation communities. The project site could contain local, State, or federally protected special status species and/or habitat. Project construction would require site clearing and grading, which could impact existing special status species and habitats. A biological study will be conducted to determine the significance of biological resources on the project site and identify mitigation measures as appropriate to reduce potential impacts. Therefore, this topic will be analyzed in the EIR.

## 4.5 Cultural Resources

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5? | | | | X |
| b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5? | X | | | |
| c) Disturb any human remains, including those interred outside of dedicated cemeteries? | | | X | |

### IMPACT ANALYSIS

**4.5a Would the project cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5?**

**No Impact.** The project site is currently undeveloped and vacant. There are no potentially significant historic resources present onsite. Therefore, the Project would not cause an adverse change in the significance of a historical resource. No impact would occur.

**4.5b Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?**

**Potentially Significant Impact.** The project site is currently undeveloped and vacant. Ground disturbance associated with Project construction could impact cultural resources within the project site. A cultural resource study will be prepared to determine the significance of cultural resources within the project site and identify mitigation measures as appropriate to reduce potential impacts. Therefore, impacts concerning cultural resources will be analyzed in the EIR.

**4.5c Would the project disturb any human remains, including those interred outside of dedicated cemeteries?**

**Less Than Significant Impact.** No dedicated cemeteries or other places of human interment are on or adjacent to the Project site. In the unlikely event that human remains are unearthed during Project construction, State Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to California Public Resources Code Section 5097.98. If human remains of Native American origin are discovered during Project construction, compliance with State laws, which fall within the jurisdiction of the Native American Heritage Commission (Public Resources Code Section 5097), relating to the disposition of Native American burials will be adhered to. Therefore, following compliance with the established regulatory framework described above, the Project's potential impacts concerning disturbance to human remains would be less than significant.

## 4.6 Energy

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation? | X | | | |
| b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency? | X | | | |

### IMPACT ANALYSIS

**4.6a Would the project result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?**

**4.6b Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?**

**Potentially Significant Impact**. Project construction would require the consumption of energy resources for the operation of construction vehicles, equipment, and worker vehicles. Additionally, the operation of the retail center, fuel station, and carwash facility would also consume energy resources to power the proposed uses, as well as fuel trucks and worker vehicles. An energy study will be conducted to assess the Project's energy consumption and to identify appropriate mitigation measures to reduce potential impacts. Therefore, this topic will be analyzed in the EIR.

## 4.7 Geology and Soils

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving: | | | | |
| i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. | | | | X |
| ii) Strong seismic ground shaking? | | | X | |
| iii) Seismic-related ground failure, including liquefaction? | | | X | |
| iv) Landslides? | | | | X |
| b) Result in substantial soil erosion or the loss of topsoil? | | | X | |
| c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? | | | X | |
| d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property? | | | X | |
| e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater? | | | | X |
| f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? | X | | | |

A Geotechnical Engineering Report was prepared for the project site by Terracon Consultants, Inc. in July 2024; see **Appendix A: Geotechnical Engineering Report**.

## IMPACT ANALYSIS

**4.7ai Would the project directly or indirectly cause potential substantial adverse effects, including the risks of loss, or death involving the rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.**

**No Impact.** According to the most recent Alquist-Priolo Fault Zone and Seismic Hazard Zone Map, there are no known earthquake faults located near or known to traverse the project site.[3] Therefore, the proposed Project would not directly, or indirectly, cause potential substantial adverse effects involving rupture of a known earthquake fault. No impact would occur and this issue will not be further evaluated in the EIR.

**4.7aii Would the project directly or indirectly cause potential substantial adverse effects, including the risks of loss, or death involving strong seismic ground shaking?**

**Less Than Significant Impact.** Similar to other areas in seismically active Southern California, the City is susceptible to strong ground shaking during an earthquake. However, the project site is not located within an Alquist-Priolo Earthquake Fault Zone, and the site would not be affected by ground shaking more than any other area in this seismic region. The Project would comply with the most recent version of the California Building Code (CBC), which contains universal standards related to seismic load requirements. Compliance with the CBC would insure the structural integrity in the event that seismic ground shaking is experienced at the project site. Therefore, impacts would be less than significant and this issue will not be further evaluated in the EIR.

**4.7aiii Would the project directly or indirectly cause potential substantial adverse effects, including the risks of loss, or death involving seismic-related ground failure, including liquefaction?**

**Less Than Significant Impact.** Soil liquefaction is a seismically induced form of ground failure that has been a major cause of earthquake damage in Southern California. Liquefaction is a process by which water-saturated granular soils transform from a solid to a liquid state because of a sudden shock or strain such as an earthquake. According to the State's most recent Seismic Hazards Map, the project site is not located within a liquefaction zone.[4] Additionally, any site-specific geologic constraints that may be encountered during Project implementation will be addressed through compliance with the recommendations of the final Geotechnical Investigation(s), and existing City/CBC seismic design regulations, standards, and policies. Therefore, impacts would be less than significant and this issue will not be further evaluated in the EIR.

**4.7aiv Would the project directly or indirectly cause potential substantial adverse effects, including the risks of loss, or death involving landslides?**

**No Impact.** Landslides are mass movements of the ground that include rock falls, relatively shallow slumping and sliding of soil, and deeper rotational or transitional movement of soil or rock. According to the State's most recent Seismic Hazards Map, the project site is not located within a landslide zone.[5] Since the site is relatively flat and no within a landslide hazard zone, no potential for earthquake-induced

[3] California Department of Conservation. (2021). EQ Zapp: California Earthquake Hazards Zone Application. Retrieved from https://maps.conservation.ca.gov/cgs/EQZApp/app/.
[4] Ibid.
[5] Ibid.

landslides would occur. Therefore, the Project would not directly or indirectly cause potential adverse effects involving landslides. This issue will not be further evaluated in the EIR.

### 4.7b Would the project result in substantial soil erosion or the loss of topsoil?

**Less Than Significant Impact.** The Project would involve earthwork and other construction activities that would disturb surface soils and temporarily leave exposed soil on the ground's surface. Common causes of soil erosion from construction sites include storm water, wind, and soil being tracked off site by vehicles. To help address the potential for erosion, Project construction activities must comply with all applicable federal, State, and local regulations for erosion control. Since Project construction activities would disturb one or more acres, the Project must adhere to the provisions of the National Pollutant Discharge Elimination System (NPDES) Construction General Permit. Construction activities subject to this permit include clearing, grading, and ground disturbances such as stockpiling and excavation. The NPDES Construction General Permit requires implementation of a storm water pollution prevention plan, which would include construction features for the project site (i.e., best management practices (BMPs)) designed to prevent erosion and protect the quality of storm water runoff. Sediment-control BMPs may include stabilized construction entrances, straw wattles on earthen embankments, sediment filters on existing inlets, or the equivalent. Therefore, impacts would be less than significant and this issue will not be further evaluated in the EIR.

### 4.7c Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

**Less Than Significant Impact.** Refer to Responses 4.7aiii and 4.7aiv regarding the potential for liquefaction and landslides, respectively. The Geotechnical Engineering Report concluded that the likelihood of lateral spreading would be low due to the site's flat topography. Subsidence occurs when the withdrawal of groundwater, oil, or natural gas vertically displaces a large portion of land. No large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring, or planned, at the project site or in the general vicinity of the project site. Therefore, the likelihood of subsidence is considered low.

The Geotechnical Engineering Report makes recommendations concerning design parameters, foundations, slabs, and general earthwork and grading, among other factors. The City of Hesperia Building and Safety Division would review the Project's grading and construction plans to verify compliance with standard engineering practices, the Hesperia Building Code, the CBC, and the Geotechnical Engineering Report's recommendations, including any concerning landslides, lateral spreading, subsidence, liquefaction, and collapse. Following compliance with standard engineering practices, the established regulatory framework (i.e., the Hesperia Building Code and CBC), and the Geotechnical Engineering Report's recommendations, the Project would not result in on-site or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. Therefore, impacts would be less than significant and these issues will not be further evaluated in the EIR.

### 4.7d Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

**Less Than Significant Impact.** The Geotechnical Engineering Report concluded that provided that the recommendations of the report are implemented, the building pad will be underlain by materials with a low expansion potential. The City of Hesperia Building and Safety Division would review the Project's grading and construction plans to verify compliance with standard engineering practices, the Hesperia Building Code, the CBC, and the Geotechnical Engineering Report's recommendations, including any

concerning expansive soils. Following compliance with standard engineering practices, the established regulatory framework (i.e., the Hesperia Building Code and CBC), and the Geotechnical Engineering Report's recommendations, the Project would not create substantial direct or indirect risks to life or property concerning expansive soils. Therefore, impacts would be less than significant and these issues will not be further evaluated in the EIR.

### 4.7e Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

**No Impact.** The Project would connect to the existing sanitary sewer system for wastewater disposal and would not include the use of septic tanks. Therefore, no impact would occur, and this issue will not be further evaluated in the EIR.

### 4.7f Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

**Potentially Significant Impact**. A Paleontological Resource Assessment will be prepared to determine potential impacts to paleontological resources and identify appropriate mitigation measures. This topic will be discussed in the EIR.

## 4.8 Greenhouse Gas Emissions

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? | X | | | |
| b) Conflict with applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases? | X | | | |

### IMPACT ANALYSIS

**4.8a Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?**

**4.8b Would the project conflict with applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?**

**Potentially Significant Impact.** Project construction and operations would involve activities that would generate both short-term and long-term greenhouse gas (GHG) emissions. Further GHG analysis is required to determine whether the Project could potentially result in any adverse effects related to GHGs. Therefore, these issues will be analyzed in the EIR.

## 4.9 Hazards and Hazardous Materials

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? | X | | | |
| b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment? | X | | | |
| c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? | | | | X |
| d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment? | | | | X |
| e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area? | | | | X |
| f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? | | | X | |
| g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires? | | | | X |

## IMPACT ANALYSIS

**4.9a Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?**

**4.9b Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?**

**Potentially Significant Impact.** Development of the Project would result in the construction of a retail center, fuel station, and carwash facility and associated improvements on currently undeveloped, vacant land. Project implementation could potentially result in impacts related to hazardous materials and wildland fire. Therefore, these issues will be evaluated in the EIR.

**4.9c Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?**

**No Impact.** The schools nearest the project site, Mission Crest Elementary School, located at 13065 Muscatel Street, approximately 1.1 miles south of the project site, and Canyon Ridge High School located at 12850 Muscatel Street, approximately 1.1 miles south of the project site. As such, the closest school is located outside of a 0.25-mile radius around the project site. Therefore, no impacts would occur and this issue will not be evaluated further in the EIR.

**4.9d Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?**

**No Impact.** Government Code Section 65962.5 refers to the Hazardous Waste and Substances Site List, commonly known as the Cortese List, maintained by the State of California Department of Toxic Substances Control (DTSC) and State Water Resources Control Board. The Cortese list contains hazardous waste and substance sites including public drinking water wells with detectable levels of contamination; sites with known underground storage tanks (USTs) having a reportable release; and solid waste disposal facilities from which there is a known migration. The Cortese list also includes hazardous substance sites selected for remedial action; historic Cortese sites; and sites with known toxic material identified through the abandoned site assessment program. A review of the Cortese List online data resources does not identify hazardous materials or waste sites on the project site or immediately surrounding area.[6] Therefore, no impacts would occur and this issue will not be evaluated further in the EIR.

**4.9e For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?**

**No Impact.** There are no public airports or public use airports located within two miles of the project site. Therefore, the Project would not result in an airport-related safety hazard or excessive noise for people residing or working in the area. No impact would occur and this issue will not be evaluated further in the EIR.

[6] Department of Toxic Substances Control. (2024). Envirostor. Retrieved from https://dtsc.ca.gov/dtscs-cortese-list/.

### 4.9f Would the project impair implementation of or physically interfere with an emergency response plan or emergency evacuation plan?

**Less Than Significant Impact.** The Project would not impair the implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. Project construction activities would not require the complete closure of any public or private streets or roadways. Temporary construction activities would not impede road use for emergencies or emergency response vehicle access. According to the Hesperia Local Hazard Mitigation Plan (HMP), the Project would be required to comply with the Hesperia Emergency Operations Plan (EOP).[7] The EOP provides a framework for coordinated response and recovery activities during an emergency. In addition, the Hesperia General Plan designates all freeways and arterial roads as emergency evacuation routes. Project development would not result in changes to the City's circulation patterns or emergency access routes. Therefore, the Project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. A less than significant impact would occur and this issue will not be further evaluated in the EIR.

### 4.9g Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?

**No Impact.** As described below under Response 4.20a, the project site is not within a Very High Fire Hazard Severity Zone. Adjacent areas to the project site are suburban and do not contain hillsides or other factors that could exacerbate wildfire risks. Wildfire risks will not be further evaluated in the EIR.

[7] City of Hesperia. (2017). Hazard Mitigation Plan. Retrieved from https://www.cityofhesperia.us/1307/Hazard-Mitigation.

## 4.10 Hydrology and Water Quality

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality? | X | | | |
| b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the projects may impede sustainable groundwater management of the basin? | X | | | |
| c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would: | X | | | |
| (i) Result in substantial erosion or siltation on or off-site. | X | | | |
| (ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off-site; | X | | | |
| (iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or | X | | | |
| iv) Impede or redirect flood flows? | X | | | |
| d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation? | X | | | |
| e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan? | X | | | |

## IMPACT ANALYSIS

**4.10a Would the project violate water quality or waste discharge requirements or otherwise substantially degrade surface or ground water quality?**

**4.10b Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?**

**4.10c Would the project substantially alter the existing drainage pattern of the site or area, including through the alterations of the course of stream or river or through the addition of impervious surfaces, in a manner which would:**

**(i) Result in substantial erosion or siltation on or off-site?**

**(ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off-site?**

**(iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or**

**(iv) Impede or redirect flood flows?**

**4.10d In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?**

**4.10e Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?**

**Potentially Significant Impact.** Project implementation would result in construction and operational activities on a currently undeveloped and vacant site. Such activities could potentially have an adverse effect on existing drainage patterns, which could subsequently impact surface and groundwater quality, as well as both on-site and local hydrology. Therefore, these issues will be analyzed in the EIR.

## 4.11 Land Use Planning

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Physically divide an established community? | | | | X |
| b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect? | X | | | |

### IMPACT ANALYSIS

#### 4.11a Would the project physically divide an established community?

**No Impact.** The proposed Project would not physically divide an established community, which can happen, for example, when a new freeway or highway cuts through an established neighborhood. The Project is a retail center, fuel station, and carwash facility. The Project would not divide an established community, and no new roadways are proposed as part of the off-site improvements. Therefore, no impact would occur and this topic will not be discussed further in the EIR.

#### 4.11b Would the project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

**Potentially Significant Impact.** The Project may cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. Therefore, impacts related to a conflict with any land use plan, policy, or regulation will be evaluated in the EIR.

## 4.12 Mineral Resources

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state? | | | | X |
| b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan? | | | | X |

### IMPACT ANALYSIS

**4.12a Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?**

**4.12b Would the project result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?**

**No Impact.** The Surface Mining and Reclamation Act of 1975 (SMARA) mandates the categorization of land into mineral resource zones (MRZs) based on the area's known or inferred mineral potential.[8] The Hesperia General Plan EIR states that no known mineral resources with value to the region and its residents have been identified. Further, the Hesperia General Plan does not recognize the project site as a locally important mineral resource recovery site. Consequently, the proposed Project would not impact mineral resources and this topic will not be further analyzed in the EIR.

[8] California Department of Conservation. (2018). *California Statutes and Regulations for the California Geological Survey.* Sacramento, CA: California Geological Survey.

## 4.13 Noise

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? | X | | | |
| b) Generate of excessive ground borne vibration or groundborne noise levels? | X | | | |
| c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? | | | | X |

### IMPACT ANALYSIS

**4.13a Would the project result in generation a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?**

**4.13b Would the project generate excessive groundborne vibration or groundborne noise levels?**

**Potentially Significant Impact.** Project construction and operations would involve activities that would generate both short-term and long-term noise. Further noise analysis is required to determine whether the Project could potentially result in any adverse effects related to increased noise levels. Therefore, these issues will be analyzed in the EIR.

**4.13c Would the project be located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?**

**No Impact.** There are no public airports or public use airports located within two miles of the project site. Therefore, the Project would not expose people residing or working in the project area to excessive noise levels on the project site. No impact would occur and this issue will not be further analyzed in the EIR.

## 4.14 Population and Housing

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)? | | | X | |
| b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere? | | | | X |

### IMPACT ANALYSIS

#### 4.14a Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

**Less than Significant Impact.** A significant impact could occur if a project would locate new development with the effect of substantially inducing growth in the area that would otherwise not have occurred as rapidly or in as great a magnitude. The Project proposes a retail center, fuel station, and carwash facility. Given the scale and nature of the Project, it is assumed that employment associated with these uses would not induce substantial direct population growth in the City. It is assumed the new jobs could be filled by local residents who already reside in the City. Additionally, the Project does not include the extension of roads or other infrastructure to unserved areas, which could induce indirect growth. Therefore, a less than significant impact would occur and no mitigation is required.

#### 4.14b Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

**No Impact.** The project site is currently vacant and undeveloped. There are no habitable structures on the site and there are currently no plans for future residential development. As a result, there would be no impact and this topic will not be addressed further in the EIR.

## 4.15 Public Services

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physical altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:** | | | | |
| a) Fire protection? | X | | | |
| b) Police protection? | X | | | |
| c) Schools? | | | X | |
| d) Parks? | | | | X |
| e) Other public facilities? | | | | X |

### IMPACT ANALYSIS

#### 4.15a Fire Protection?

**Potentially Significant Impact.** The City has a contract with the San Bernardino County Fire Department (SBCFD) for all fire and emergency services. The nearest fire station to the project site is Station 315, which is approximately 1.9 miles to the north and located at 12820 Eucalyptus Street in the City of Victorville. The second closest station is Station 305, which is approximately 2.3 miles to the south and located at 8331 Caliente Road in Hesperia. According to the Hesperia General Plan, average SBCFD response times are approximately seven minutes and sixteen seconds. Construction and operation of the proposed Project would increase the number of structures and employees in the project area; however, as previously addressed in Response 4.14a, the Project would not directly or indirectly induce unplanned population growth in the City. However, the development would incrementally increase the demand for fire protection services at the project site. The EIR will evaluate the Project's potential to cause substantial adverse physical impacts related to the establishment of new or physically altered governmental fire protection facilities.

#### 4.15b Police Protection?

**Potentially Significant Impact.** The City's law enforcement services are provided through a contract with the San Bernardino County Sheriff's Department which operates from one station located at 15840 Smoke Tree Street, approximately four miles east of the project site. Construction and operation of the proposed Project would increase the number of structures and employees in the project area; however, as previously addressed in Response 4.14a, the Project would not directly or indirectly induce unplanned population growth in the City. However, the development would incrementally increase the demand for police protection services at the project site. The EIR will evaluate the Project's potential to cause substantial adverse physical impacts related to the establishment of new or physically altered governmental police protection facilities.

#### 4.15c Schools?

**Less Than Significant Impact.** As previously addressed in Response 4.14a, the Project would not directly or indirectly induce unplanned population growth in the City. Although the Project would require

employees to construct and operate the Project, these short-term and long-term employees would likely already reside within the broader project area. As such, it is not anticipated that many people would relocate to the City as a result of the Project, and an increase in school-age children requiring public education is not expected to occur as a result.

Similar to other development projects in the City, the Project would be subject to Senate Bill 50, which requires payment of mandatory impact fees to offset any impact to school services or facilities. Pursuant to Government Code Section 65995(3)(h), "payment of statutory fees is deemed to be full and complete mitigation of the impacts of any legislative or adjudicative act, or both, involving, but not limited to, the planning, use or development of real property…" The Project would pay developer fees in compliance with the established regulatory framework to support provision of adequate school services. Overall, the Project would not contribute to a significant student population increase and payment of impact fees would ensure that impacts are offset and remain less than significant. Impacts would be less than significant and this issue will not be further evaluated in the EIR.

### 4.15d Parks?

**No Impact.** The Project would construct a retail center, fuel station, and carwash facility. The Project does not propose any residential uses, and would not directly or indirectly induce unplanned population growth in the City. As such, the Project would not increase the use of existing neighborhood parks or regional parks in the City and surrounding area. Therefore, no impacts would occur, and this topic will not be evaluated further in the EIR.

### 4.15e Other public facilities?

**No Impact.** Given the nature of the Project and the lack of population growth that would result from the Project, it is unlikely that the Project would increase the use of libraries and other public facilities. Therefore, no impacts would occur, and this topic will not be evaluated further in the EIR.

## 4.16 Recreation

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated? | | | | X |
| b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment? | | | | X |

### IMPACT ANALYSIS

**4.16a Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?**

**4.16b Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?**

**No Impact.** The Project would allow for the construction and operation of a retail center, fuel station, and carwash facility and associated improvements. The Project does not propose any residential uses, and would not directly or indirectly result in a substantial and unplanned increase in population growth within the project area. As such, the Project would not increase the use of existing neighborhood parks or regional parks in the City and surrounding area. In addition, the Project does not propose recreational facilities or require the construction or expansion of recreational facilities. Therefore, no impacts would occur and this topic will not be evaluated further in the EIR.

## 4.17 Transportation

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycles, and pedestrian facilities? | X | | | |
| b) Conflict or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)? | X | | | |
| c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (for example, farm equipment)? | X | | | |
| d ) Result in inadequate emergency access? | X | | | |

### IMPACT ANALYSIS

**4.17a Would the project conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?**

**Potentially Significant Impact**. The Project would increase pedestrian, bicyclist, and vehicle traffic in the area. The EIR will evaluate whether this increase would conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

**4.17b Would the project conflict or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)?**

**Potentially Significant Impact**. The Project would increase vehicle traffic in the area. A Vehicle Miles Traveled (VMT) study will be prepared to determine if the Project would conflict with or be inconsistent with State CEQA Guidelines Section 15064.3 and identify mitigation measures as appropriate to reduce potential impacts. Therefore, impacts concerning VMT will be analyzed in the EIR.

**4.17c Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (for example, farm equipment)?**

**Potentially Significant Impact**. The Project would develop a vacant property and construct new on-site circulation features, including new access driveways and travelways, which may increase hazards due to a geometric design feature. The EIR will further evaluate the Project's design features for hazards and evaluate the Project's use for incompatibility.

**4.17d Would the project result in inadequate emergency access?**

**Potentially Significant Impact.** The EIR will evaluate emergency access during construction and operation of the Project.

## 4.18 Tribal Cultural Resources

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is | | | | |
| i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k); or | X | | | |
| ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe. | X | | | |

### IMPACT ANALYSIS

**4.18ai Cause a substantial adverse change in the significance of a tribal cultural resource, listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k); or**

**4.18aii Cause a substantial adverse change in the significance of a tribal cultural resource- a resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?**

**Potentially Significant Impact.** The potential exists for accidental discovery of tribal cultural resources during ground-disturbing activities. The EIR will evaluate these potential impacts.

## 4.19 Utilities and Service Systems

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Would the project:** | | | | |
| a) Require or result in the relocation or construction of new or expanded facilities concerning the following, the construction or relocation of which could cause significant environmental effects?<br>i. Water,<br>ii. Wastewater,<br>iii. Wastewater Treatment (see Response 4.19.c below),<br>iv. Stormwater Drainage,<br>v. Electric Power, Natural Gas, and Telecommunications. | X | | | |
| b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years? | X | | | |
| c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project projected demand in addition to the provider's existing commitments? | X | | | |
| d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals? | X | | | |
| e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste? | X | | | |

### IMPACT ANALYSIS

**4.19a Require or result in the relocation or construction of new or expanded facilities concerning the following, the construction or relocation of which could cause significant environmental effects?**

**i. Water,**

**ii. Wastewater,**

**iii. Wastewater Treatment,**

**iv. Stormwater Drainage,**

**v. Electric Power, Natural Gas, and Telecommunications.**

**4.19b Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?**

**4.19c Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project projected demand in addition to the provider's existing commitments?**

**4.19d Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?**

**4.19e Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?**

**Potentially Significant Impact**. Project construction and operations would involve activities that require the use of energy and would generate the need for domestic water, sanitary sewer, storm water, and solid waste disposal. Given the vacant, undeveloped nature of the project site, these, and likely other dry and wet utilities and services would need to be extended onto the project site. Therefore, these issues will be evaluated in the EIR.

## 4.20 Wildfire

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:** | | | | |
| a) Substantially impair an adopted emergency response plan or emergency evacuation plan? | | | X | |
| b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire? | | | | X |
| c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment? | | | | X |
| d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes? | | | | X |

### IMPACT ANALYSIS

#### 4.20a Would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

**Less than Significant Impact.** Based on the CalFire Fire Hazard Severity Zone Map for San Bernardino County and Safety Element Exhibit SF-2, the project site is not within a State Responsibility Area (SRA) or a Very High Fire Hazard Severity Zone (VHFHSZ). Instead, the project site is in a Non-Very High Fire Hazard Severity Zone (Non-VHFHSZ) within a Local Responsibility Area.

The Hesperia General Plan Safety Element designates Main Street as an evacuation route. The proposed Project proposes new driveways along Amargosa Road and Key Pointe Drive. Project construction would not require the complete closure of any public or private streets or roadways. Temporary construction activities would not impede the use of the roads for emergencies or the access of emergency response vehicles. The Project would be reviewed by the City and the San Bernardino County Fire Department to ensure compliance with all relevant codes and ordinances for emergency vehicle access. Therefore, the Project would not substantially impair an adopted emergency response plan or emergency evacuation plan. As a result, no impact would occur and no mitigation is necessary. This topic will not be evaluated in the EIR.

**4.20b Would the project, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?**

**No Impact.** As described under Response 4.20a, the project site is not within a VHFHSZ. Adjacent areas to the project site are suburban and do not contain hillsides or other factors that could exacerbate wildfire risks. Wildfire risks will not be further evaluated in the EIR.

**4.20c Would the project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?**

**No Impact.** As described under Response 4.20a, the project site is not within a VHFHSZ, and the Project does not include infrastructure that could exacerbate fire risks. The Project would require the extension of new utility services; however, the provision or extension of new infrastructure would not exacerbate fire risk. Therefore, no impact would occur and this topic will not be further evaluated in the EIR.

**4.20d Would the project expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?**

**No Impact.** The project site is not within a VHFHSZ. In addition, the project site is located in a flat area that does not contain or is adjacent to large slopes, and the Project would not involve the engineering of large slopes. Further, the Project includes the installation of on-site and off-site drainage facilities. Therefore, the Project would not result in risks related to wildfires or risks related to downslope or downstream flooding or landslides after wildfires. Therefore, wildfire risks will not be further evaluated in the EIR.

## 4.21 Mandatory Findings of Significance

| Environmental Issue | Potentially Significant Impact | Less Than Significant With Mitigation Incorporated | Less Than Significant Impact | No Impact |
|---|---|---|---|---|
| **Does the project:** | | | | |
| a) Have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory? | X | | | |
| b) Have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of the past projects, the effects of other current projects, and the effects of probable future projects.) | X | | | |
| c) Have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? | X | | | |

### IMPACT ANALYSIS

**4.21a Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?**

**4.21b Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of the past projects, the effects of other current projects, and the effects of probable future projects.)**

**4.21c Does the project have environmental effects which will cause substantial adverse effects on human beings, directly or indirectly?**

**Potentially Significant Impact**. The Project has the potential to reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or

animal or eliminate important examples of the major periods of California history or prehistory. The Project would introduce new commercial retail uses on the project site, which could degrade the quality of the environment and result in cumulatively considerable impacts or adverse effects on human beings. The EIR will evaluate these potential impacts.

# 5.0 REFERENCES

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# APPENDIX A

Geotechnical Engineering Report

# Big Box Retailer – Hesperia

## Geotechnical Engineering Report

August 25, 2023 | Terracon Project No. CB235111

**Prepared for:**

Kimley-Horn and Associates Inc.
1100 W Town and County Road,
Suite 700
Orange, California

Terracon
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August 25, 2023

Kimley-Horn and Associates Inc.
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Orange, California

Attn: Mr. Ryan Alvarez
P: (714) 786-6322
E: ryan.alvarez@kimley-horn.com

Re: Geotechnical Engineering Report
Big Box Retailer – Hesperia
North of Amargosa Road and West of Highway I-15
Hesperia, California
Terracon Project No. CB235111

Dear Mr. Alvarez:

We have completed the scope of Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PCB235111 dated June 8, 2023. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

**Terracon**

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# Attachments

## Exploration and Testing Procedures
## Site Location and Exploration Plans
## Exploration and Laboratory Results
## Supporting Information

Refer to each individual Attachment for a listing of contents.

# Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed big box retail store to be located North of Amargosa Road and West of Highway I-15 in Hesperia, California. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions and historic high groundwater
- 2022 California Building Code (CBC) seismic design parameters
- Subgrade preparation/earthwork recommendations
- Foundation design and construction
- Floor slab design and construction
- Preliminary pavement section design
- Infiltration and drainage

The geotechnical engineering Scope of Services for this project included the advancement of forty-six test borings to depths ranging from approximately 5 to 51½ feet below existing site grades (bgs), laboratory testing, engineering analysis, and preparation of this report. Our scope also includes conducting four percolation tests at depths of 5 and 10 feet bgs.

Drawings showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and/or as separate graphs in the **Exploration Results** section.

# Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

| Item | Description |
|---|---|
| **Information Provided** | An email request for proposal was provided by Kimley Horn on June 1, 2023. The request included conceptual plan drawings of the layout of the planned development. |

| Item | Description |
|---|---|
| **Project Description** | The project will consist of a new single-story big box retail store, paved parking and driveway, and a new fuel station with drive-thru canopies and a single-story service building. |
| **Proposed Structure** | The project generally consists of the construction of big box retail building with footprint area of approximately 167,050 square feet (sf). The project will also include car parking, driveways, and utilities. Fuel station with canopies and service building will be constructed. Buried fuel tanks will also be installed.<br><br>We assume that stormwater diversion structures such as culverts, open channels, and storm drains will also be constructed on the site. The development will also include on-site Low Impact Development (LID) infiltration system. |
| **Building Construction** | We anticipate the big box retail building will be a combination of concrete masonry shear walls and steel columns, with a slab-on-grade floor.<br><br>We anticipate the fuel station service building will be a combination of light gauge steel shear walls and steel columns, with a monolithic interior floor slab.<br><br>We anticipate the fuel station canopy will be steel columns with a steel canopy roof. |
| **Finished Floor Elevation** | Anticipated to be within 3 feet of existing grade |
| **Maximum Loads (assumed)** | Structural loads were not provided at the time of this report. We assume that the proposed structures will have the following loads:<br>Big Box Retail Building:<br>▪ Columns: 150 kips<br>▪ Walls: 3 kips per linear foot (klf)<br>▪ Slabs: 250 pounds per square foot (psf)<br><br>Fuel Station Service Building:<br>▪ Columns: 25 kips<br>▪ Walls: 1 kip per linear foot (klf)<br>▪ Slabs: 150 pounds per square foot (psf)<br><br>Fuel Station Canopy:<br>▪ Columns: 40 kips compression, 25 kips uplift |

| Item | Description |
|---|---|
| **Grading/Slopes** | A preliminary grading plan was not available for review at the time this report was prepared. Proposed finished grade elevation for the building pad is expected to be within 2 feet or less of existing grades, excluding remedial grading requirements. Slopes are not planned. |
| **Below-Grade Structures** | We have assumed the proposed fuel tanks will have a maximum depth on the order of 12 feet bgs. |
| **Free-Standing Retaining Walls** | None |
| **Pavements** | Paved driveway and parking will be constructed on approximately 16.7 acres of the parcel.<br>A preferred pavement surfacing has not been identified to us as part of the preliminary information. Asphalt and concrete surfacing are common in the area for projects of this nature and is the assumed preference.<br>Unless information is provided prior to the report, the anticipated ACI traffic categories and daily truck traffic will be assumed to consist of:<br>▪ Category A: Car parking areas and access lanes, 10 truck per day<br>▪ Category B: Entrance and truck service lanes, 25 trucks per day<br>▪ Category C: Buses<br>▪ Category D: Heavy duty trucks, 10 trucks per day<br>▪ Category E: Garbage or fire truck lanes<br>We assume the following traffic indices (TIs) will be used:<br>▪ Auto Parking Areas: TI = 5.0:<br>▪ Auto Road: TI = 5.5<br>▪ Truck Parking Areas: TI = 6.0<br>▪ Truck Ramps and Roads: TI = 8.0<br>▪ The pavement design period is 20 years. |
| **Infiltration Systems** | Based on review of the preliminary site plan, a shallow infiltration system consisting of a retention pond is planned on site. |
| **Building Code** | California Building Code 2022 |

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

# Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

| Item | Description |
|---|---|
| **Parcel Information** | The project is located at North of Amargosa Road and West of Highway I-15 in Hesperia, California. The approximate size of the project area is approximately 20 acres.<br>Approximate coordinates of the center of the site:<br>Latitude: 34.4302°, Longitude: -117.3804°<br>See **Site Location** |
| **Existing Improvements** | Currently consists of an undeveloped tract of land. |
| **Current Ground Cover** | Exposed soils with a light growth of grass and vegetation. |
| **Existing Topography** | Site is relatively flat. |

# Geotechnical Characterization

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following table provides our geotechnical characterization. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results**. The table below summarizes our geotechnical characterization.

| Stratum | Approximate Depth to Bottom of Stratum (feet) | Material Description | Consistency/ Density |
|---|---|---|---|

| Stratum | Approximate Depth to Bottom of Stratum (feet) | Material Description | Consistency/ Density |
|---|---|---|---|
| **Stratum I** | 51 ½ | Interbedded layers of silty sand, silty sand with gravel and poorly graded sand with silt and gravel | medium dense to very dense |

## Groundwater

The borings were advanced using a hollow-stem-auger drilling technique that allows short term groundwater observations to be made while drilling. Groundwater seepage was not encountered within the maximum drilled depth of 51½ feet below ground surface (bgs) at the time of our field exploration. Our review of historical information regarding groundwater levels indicates that historical high groundwater levels are deeper than 50 feet bgs. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed.

## Lab Results

Laboratory tests were conducted on selected soil samples and the test results are presented in the **Exploration Results** section and on the boring logs. An Expansion Index (EI) test conducted on a near-surface sample from boring B-7 resulted in an EI value of 0 (characterized as "very low" potential).

To evaluate the potential deformation that may be caused by the addition of water to subsurface soils, hydroconsolidation testing was performed on selected, representative relatively undisturbed samples. The result is shown in Exploration Results section. The test result indicates collapse potentials of 1.8% (B-6 at 2.5 feet) and 4% (B-9 at 10 feet), boring number and sample depths summarized in parenthesizes. all samples were saturated under an axial pressure of 2,000 psf. The risk of hydro collapse can be mitigated by removal and replacement of the top 4 feet of on-site soil with engineered fill.

The soil sample with collapse potential of 4% was retrieved at a depth of 10 feet bgs (B-9). Based on the laboratory density and field blow counts, it is our opinion that sample disturbance may have contributed to the measured hydro-collapse laboratory results. Furthermore, effective stresses at such depths will be lower than 2,000 psf, which is the axial pressure the sample was tested for at.

# Seismic Site Class

The 2022 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16, and 2022 CBC. The 2022 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped $S_s$ value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were determined using the site coefficients (Fa and Fv) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2022 CBC.

| Description | Value |
|---|---|
| **2019 California Building Code Site Classification (CBC)** [1] | D[2] |
| **Site Latitude (°N)** | 34.4302 |
| **Site Longitude (°W)** | 117.3804 |
| **$S_s$ Spectral Acceleration for a 0.2-Second Period** | 1.5 |
| **$S_1$ Spectral Acceleration for a 1-Second Period** | 0.584 |
| **$F_a$ Site Coefficient for a 0.2-Second Period** | 1.0 |
| **$F_v$ Site Coefficient for a 1-Second Period** | 1.72 |
| **Site Modified Peak Ground Acceleration ($PGA_M$)** | 0.55g |
| **De-aggregated Modal Magnitude** [3] | 8.09 |

| Description | Value |
|---|---|

1. Seismic site classification in general accordance with the *2022 California Building Code*.
2. The 2022 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the 100-foot soil profile determination. Borings were extended to a maximum depth of 51½ feet, and this seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.
3. These values were obtained using on-line Unified Hazard Tool by the USGS (**https://earthquake.usgs.gov/hazards/interactive/**) for return period of 2% in 50 years accessed

In some cases, a site-specific ground motion study may generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

### Faulting and Estimated Ground Motions

The site is located in southern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the San Andreas (San Bernardino N segment), which is considered to have the most significant effect at the site from a design standpoint, has a maximum magnitude of 7.92 and is located approximately 18.6 kilometers from the site. Furthermore, the site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.

## Liquefaction

Liquefaction is a mode of ground failure that results from the generation of high pore-water pressures during earthquake ground shaking, causing loss of shear strength, and is typically a hazard where loose sandy soils exist below groundwater. San Bernardino County has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

According to the County of San Bernardino Geologic Hazard Maps, the site is located within an area having low liquefaction potential. Moreover, historic groundwater levels are deeper than 50 feet. Based on the County mapping and encountered subsurface

conditions, it is our opinion that liquefaction potential/seismic settlement is low for this site.

# Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

On-site soils generally consisted of interbedded layers of silty sand with gravel, poorly graded sand and poorly graded sand with silt and gravel extending to the maximum boring termination depth of about 51½ feet below ground surface (bgs).

Based on the conditions encountered, the proposed buildings can be supported on shallow foundations, such as spread footings, provided the recommendations outlined herein are followed.

Groundwater was not encountered within the maximum depths of exploration during or at the completion of drilling. Groundwater is not expected to affect shallow foundation construction on this site.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

# Earthwork

Earthwork is anticipated to include clearing and grubbing, excavations, and engineered fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

## Site Preparation

Strip and remove existing vegetation, debris, pavements, and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

Although no evidence of underground facilities such as septic tanks, cesspools, or basements were observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

## Subgrade Preparation

We recommend that the proposed structures be supported on engineered fill extending to a minimum depth of 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater. Engineered fill placed beneath the entire footprint of the structures should extend horizontally a minimum distance of 3 feet beyond the outside edge of perimeter footings.

Subgrade soils beneath exterior slabs and pavements should be removed and replaced with engineered compacted fill to a depth of 1 foot below existing grade, or proposed pavement sections, whichever is greater.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report. Compacted fill soils should then be placed to the design elevations per the recommendations of this report. The moisture content and compaction of subgrade soils should be maintained until foundation, slab, or pavement construction.

Based upon the subsurface conditions observed from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

## Excavation

Due to very dense soil encountered near the surface in some areas, excavation may require the use of specialized heavy-duty equipment. Consideration should be given to obtaining a unit price for difficult excavation in the contract documents for the project.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

## Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than 3 inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- foundation backfill
- pavement areas
- exterior slab areas

**Imported Fill Materials:** Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris.

| **Gradation** | **Percent Finer by Weight (ASTM C 136)** |
|---|---|
| 3” | 100 |
| No. 4 Sieve | 50-100 |
| No. 200 Sieve | 10-40 |
| ▪ Liquid Limit | 30 (max) |
| ▪ Plasticity Index | 15 (max) |
| ▪ Maximum expansion index* | 20 (max) |

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

## Fill Placement and Compaction Requirements

Engineered fill should meet the following compaction requirements.

| Material Type and Location | Per the Modified Proctor Test (ASTM D 1557) | | |
|---|---|---|---|
| | Minimum Compaction Requirement (%) | Range of Moisture Contents for Compaction Above Optimum | |
| | | Minimum | Maximum |
| **On-site soils and/or low volume change imported fill:** | | | |
| **Beneath foundations:** | 90 | -2% | +3% |
| **Beneath interior slabs:** | 90 | -2% | +3% |
| **Fill greater than 5 feet in depth:** | 95 | -2% | +3% |
| **Miscellaneous backfill:** | 90 | -2% | +3% |
| **Beneath pavements:** | 95 | -2% | +3% |
| **Utility trenches:** [1] | 90 | -2% | +3% |
| **Bottom of excavation receiving fill:** | 90 | -2% | +3% |
| **Aggregate base (beneath pavements)** | 95 | -2% | +3% |

1. Upper 12 inches should be compacted to 95% within pavement and structural areas.

## Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations or existing utilities without engineering review of shoring requirements and geotechnical observation during construction.

A non-expansive granular material with a sand equivalent greater than 30 should be used for bedding and shading of utilities, unless allowed or specified otherwise by the utility manufacturer. On-site materials are considered suitable for backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

## Exterior Slab Design and Construction

Compacted subgrade composed of on-site clayey or silty soils may expand with increasing moisture content; therefore, exterior concrete slabs may heave, resulting in cracking or vertical offsets. The potential for damage would be greatest where exterior slabs are constructed adjacent to the building or other structural elements. To reduce the potential for damage caused by movement, we recommend:

- exterior slabs should be supported directly on subgrade fill (not ABC) with no, or very low expansion potential;
- strict moisture-density control during placement of subgrade fills;
- maintain proper subgrade moisture until placement of slabs;
- placement of effective control joints on relatively close centers and isolation joints between slabs and other structural elements;
- provision for adequate drainage in areas adjoining the slabs;
- use of designs which allow vertical movement between the exterior slabs and adjoining structural elements.

## Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance

program should be established to effectively seal and maintain joints and prevent surface water infiltration.

## Earthwork Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances

shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

### Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 50 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill. This testing frequency criteria may be adjusted during construction as specified by the geotechnical engineer of record.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

## Shallow Foundations

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for mat foundation.

### Design Parameters

| Item | Description |
|---|---|
| **Foundation Type** | Shallow Spread Footings |
| **Net Allowable Bearing Pressure** [1, 2] | 3,000 psf |

| | |
|---|---|
| **Foundation Support** [3] | Engineered fill extending 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater. |
| **Minimum Foundation Dimensions** | Continuous: 18 inches wide<br>Columns: 24 inches wide |
| **Minimum Embedment below Finished Grade** [4] | 18 inches |
| **Ultimate Passive Resistance**[5] **(Equivalent fluid pressures)** | 375 pcf |
| **Ultimate Coefficient of Sliding Friction** [6] | 0.36 |
| **Estimated Static Settlement from Structural Loads** [2] | About 1 inch |
| **Estimated Differential Settlement** [2, 7] | About ½ of total settlement |

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
2. Values provided are for maximum loads noted in **Project Description**. Additional geotechnical consultation will be necessary if higher loads are anticipated. Does not include seismically induced settlement.
3. Unsuitable or soft soils should be over excavated and replaced per the recommendations presented in **Earthwork**.
4. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
5. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed, and compacted structural fill be placed against the vertical footing face. Assumes no hydrostatic pressure.
6. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations.
7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.

## Shallow Foundations Designed for Uplift Conditions

Reinforced concrete footings or dead-man foundations, cast against undisturbed subsoils, are recommended for resistance to uplift. Footings may be designed using the cone method. The equation for determining the ultimate uplift capacity as a function of footing dimension, foundation depth, and soil weight is:

$$T_u = 0.8 \cdot \gamma \cdot D^2 \cdot (B + L) + W$$

Where:

| Variable | Description | Unit |
|---|---|---|
| $T_u$ | Ultimate uplift capacity | pounds |
| $\gamma$ | Unit weight of soil[1] | pcf |
| $D$ | Depth to base of footing/dead-man foundation below final grade | feet |
| $B$ | Width of footing/dead-man foundation | feet |
| $L$ | Length of footing/dead-man foundation | feet |
| $W$ | Weight of footing/dead-man + weight of soil directly over the top of the footing/block | pounds |

**Notes: [1]A unit weight ($\gamma$) of 120 pounds per cubic foot (pcf) is recommended for soil (either undisturbed or compacted backfill) at this site.**

The design uplift resistance should be calculated by dividing the ultimate resistance obtained from the equation above by an appropriate factor of safety. A factor of safety of at least 2 is recommended for live uplift loads in the analysis.

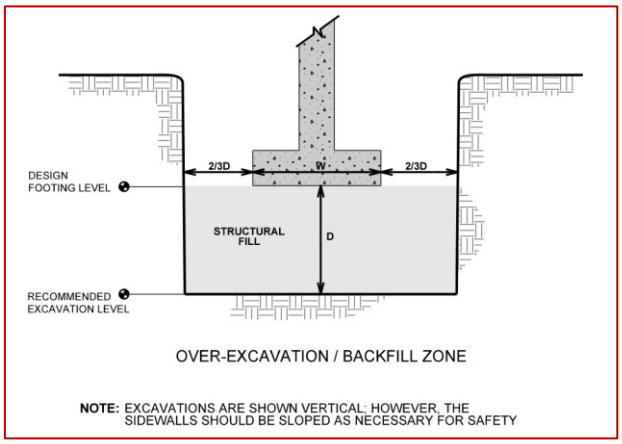
Foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

## Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

Over excavation for engineered fill placement below footings should be conducted as shown below. The over excavation should be backfilled up to the footing base elevation, with low volume change engineered fill placed, as recommended in the **Earthwork** section.




# Floor Slabs

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

## Floor Slab Design Parameters

| Item | Description |
|---|---|
| **Floor Slab Support**[1] | Engineered fill extending 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater. |
| **Subbase** | Minimum 4 inches of Aggregate Base |
| **Estimated Modulus of Subgrade Reaction** [2] | 200 pounds per square inch per inch (psi/in) for point loads. (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas. |

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible

compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

### Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

## Lateral Earth Pressures

### Design Parameters

Lateral earth pressures are provided for below grade structures such as loading docks, and retaining walls with a height of less than 6 feet. For engineered fill comprised of on-site soils above any free water surface, recommended equivalent fluid pressures for unrestrained foundation elements are:

| ITEM | VALUE[a, b] |
|---|---|
| **Active Case** | 40 psf/ft |
| **Passive Case** | 375 psf/ft |
| **At-Rest Case** | 60 psf/ft |

| | |
|---|---|
| **Coefficient of Friction** | 0.36 |

**[a]Note: The values are based on on-site soils used as backfill.**
**[b]Note: Uniform, horizontal backfill, compacted to at least 90% of the ASTM D 1557 maximum dry density, rendering a maximum unit weight of 125 pcf.**

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design.

Fill against foundation and retaining walls should be compacted to densities specified in the Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors.

# Pavements

## General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

## Pavement Design Parameters

Design of asphalt concrete (AC) pavements is based on the procedures outlined in the Caltrans "Highway Design Manual" (Caltrans, 2018). Design of Portland cement concrete (PCC) pavements are based upon American Concrete Institute (ACI) 330R-08; "Guide for Design and Construction of Concrete Parking Lots."

During the field investigation at the site, two samples of the near surface soil taken from our borings were tested in our laboratory to determine the Hveem Stabilometer Value (R-value). The tests produced R-values of 39 and 58. A design R-Value of 35 was used to calculate the AC pavement thickness sections. A modulus of subgrade reaction of 120 pci and a modulus of rupture of 600 psi were used for the PCC pavement designs.

The structural sections are predicated upon proper compaction of the utility trench backfills and the subgrade soils as prescribed by in **Earthwork**, with the upper 12 inches of subgrade soils and all aggregate base material brought to a minimum relative compaction of 95 percent in accordance with ASTM D 1557 prior to paving. The aggregate base should meet Caltrans requirements for Class 2 base.

The pavement designs were based upon the results of preliminary sampling and testing and should be verified by additional sampling and testing during construction when the actual subgrade soils are exposed.

## Pavement Section Thicknesses

The following tables provides our opinion of minimum thickness for AC and PCC sections:

| **Asphalt Concrete Design** | | |
|---|---|---|
| **Usage** | Assumed Traffic Index | Recommended Structural Section |
| **Auto Parking Areas** | 5.0 | 3" HMA[1]/5" Class 2 AB[2] |
| **Auto Roads** | 5.5 | 3" HMA[1]/6" Class 2 AB[2] |
| **Truck Parking Areas** | 6.0 | 3.5" HMA[1]/7" Class 2 AB[2] |
| **Truck Ramps and Roads** | 8.0 | 4" HMA[1]/11" Class 2 AB[2] |

1. **HMA = hot mix asphalt**
2. **AB = aggregate base**

| **Portland Cement Concrete Design** | | | |
|---|---|---|---|
| **Layer** | Thickness (inches) | | |
| | Light Duty[1] | Medium Duty[2] | Dumpster Pad[3] |
| **PCC** | 5.0 | 6.0 | 7.5 |
| **Aggregate Base** | 4.0 | 4.0 | 4.0 |

1. **Car Parking and Access Lanes, Average Daily Truck Traffic (ADTT) = 1 (Category A).**
2. **Truck Parking Areas, Multiple Units, ADTT = 25 (Category B)**
3. **In areas of anticipated heavy traffic, fire trucks, delivery trucks, or concentrated loads (e.g., dumpster pads), and areas with repeated turning or maneuvering of heavy vehicles, ADTT = 700 (Category C).**

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles.

Although not required for structural support, a minimum 4-inch thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign

material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its "green" state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. Islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils are particular areas of concern. The civil design for the pavements with these conditions should include features to restrict or collect and discharge excess water from the islands. Examples of features are edge drains connected to the stormwater collection system, longitudinal subdrains, or other suitable outlets and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

## Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

## Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic upkeep should be anticipated. Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Pavement care consists of both localized (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Additional engineering consultation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

# Storm Water Management

Four in-situ percolation tests (falling head borehole permeability) were performed at approximate depths of 5 and 10 feet bgs within boreholes drilled with an 8-inch diameter auger. The objective of the testing is to provide infiltration rates for designing the proposed infiltration system. A 2-inch thick, 3/4-inch gravel layer was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. Three-inch diameter perforated pipes were installed on top of the gravel layer and gravel was used to backfill between the perforated pipes and the boring sidewall. The borings were then filled with water for a pre-soak period.

At the beginning of each test, the pipes were refilled with water and readings were taken at periodic time intervals as the water level dropped. The soil at the percolation test locations was classified in the field using a visual/manual procedure. The infiltration velocity is presented as the infiltration rate and is summarized in the following table. The infiltration rates provided do not include safety factors.

| Test Location | Boring Depth (ft.) [1] | Test Depth Range (ft.) [1] | Soil Type | Water Head (ft) | Percolation Rate Average (in./hr.) | Infiltration Rate Average (in./hr.) [2] |
|---|---|---|---|---|---|---|
| Perc-1 | 5 | 0 to 5 | SM | 5 | 49.5 | 1.7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Perc-2 | 10 | 5 to 10 | SM | 5 | 171.0 | 6.8 |
| Perc-3 | 5 | 0 to 5 | SM | 5 | 84.5 | 3.5 |
| Perc-4 | 10 | 5 to 10 | SM | 5 | 101.5 | 5.5 |

1. Below existing ground surface.
2. If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. The correlation rate is based on the Porchet Method.

The above infiltration rates determined by the percolation test method are based on field test results utilizing clear water. Infiltration rates can be affected by silt buildup, debris, degree of soil saturation, site variability and other factors. The rate obtained at specific location and depth is representative of the location and depth tested and may not be representative of the entire site. Application of an appropriate safety factor is prudent to account for subsoil inconsistencies, possible compaction related to site grading, and potential silting of the percolating soils, depending on the application.

The design engineer should also check with the local agency for the limitation of the infiltration rate allowed in the design. If the maximum allowable design infiltration rate is lower than the above recommended rate, the maximum allowable design infiltration rate should be used. The designer of the basins should also consider other possible site variability in the design.

The percolation tests were performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content. The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located at least 10 feet from any existing or proposed foundation system.

# Corrosivity

The results of laboratory sulfides, soluble sulfate, chlorides, electrical resistivity, redox

potential, total salts, and pH testing are presented in our appendix within the **Exploration Results** section. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

# General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in the geographic vicinity and at the time these services have been performed. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

# Attachments

# Exploration and Testing Procedures

## Field Exploration

| Number of Borings | Approximate Boring Depth or Refusal (feet) [1,2] | Location |
|---|---|---|
| 10(B-1 to B-6 & B-9 to B-12) | 21 ½ | Building area |
| 2 (B-7 & B-8) | 51 ½ | Building area |
| 3 (B-13 to B-15) | 16 ½ | Fuel Station (Canopy and Tank) |
| 27 (P-1 to P-27) | 5 to 11 ½ | Parking/Driveway area |
| 4 (Perc-1 to Perc-4) | 5 to 10 | Percolation Testing |

1. Below ground surface.

**Boring Layout and Elevations:** Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

**Subsurface Exploration Procedures:** We advanced the borings with a truck-mounted drill rig using continuous flight hollow stem augers. Four samples were generally obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 3-inch O.D. split-barrel sampling spoon with 2.5-inch I.D. ring lined sampler was also used for sampling soils at the project site. Ring-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation

of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

## Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Dry Unit Weight
- Particle-size Distribution (Gradation) of Soils Using Sieve Analysis
- Maximum Dry Density/Optimum Moisture Content
- Expansion Index
- Corrosion Suite
- Consolidation
- R-Value

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

# Site Location and Exploration Plans

**Contents:**

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

## Site Location

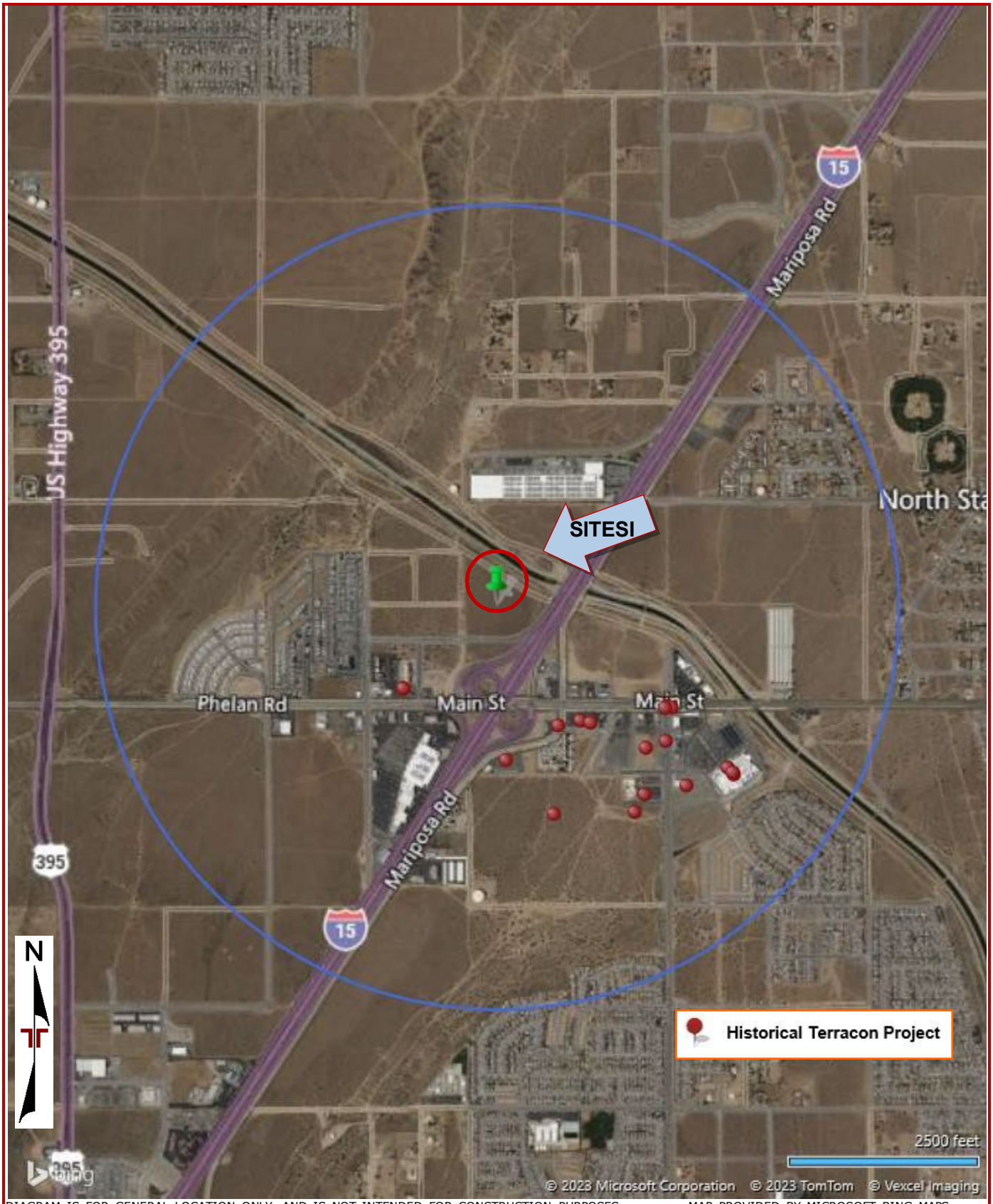
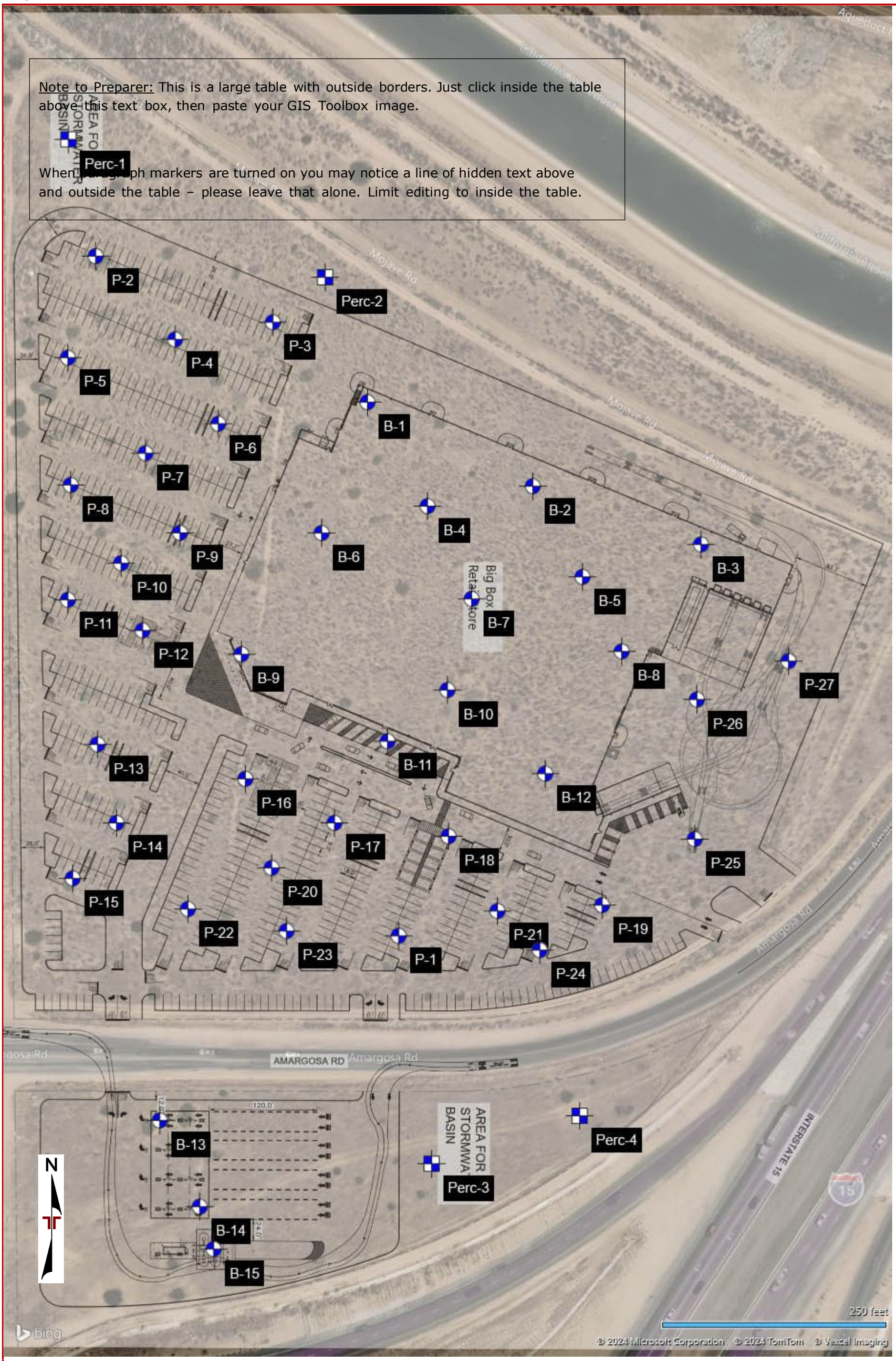



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

## Exploration Plan




Note to Preparer: This is a large table with outside borders. Just click inside the table above this text box, then paste your GIS Toolbox image.

When paragraph markers are turned on you may notice a line of hidden text above and outside the table – please leave that alone. Limit editing to inside the table.

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

# Exploration and Laboratory Results

# BORING LOG NO. B-1



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4310° Longitude: -117.3805°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND WITH GRAVEL (SM)**, brown, very dense | | | | | | | |
| | | | | | 22-50/6" | 2.7 | 122 | 30 |
| 5.0 | | 5 | | | | | | |
| | **SILTY SAND (SM)**, brown, very dense | | | | 26-50/6" | 2.6 | 127 | |
| | | | | | 26-50/6" | 1.7 | 117 | 16 |
| 10.0 | | 10 | | | | | | |
| | **POORLY GRADED SAND (SP)**, reddish brown, very dense | | | | 30-50/6" | | | |
| | brown, medium dense | 15 | | | 6-12-13 N=25 | | | 5 |
| | dense | 20 | | | 17-19-23 N=42 | | | |
| 21.5 | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-1 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-2



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4308° Longitude: -117.3799°

| DEPTH | Description | DEPTH (Ft.) | SAMPLE TYPE | FIELD TEST RESULTS | PERCENT FINES |
|---|---|---|---|---|---|
| | **SILTY SAND (GM)**, light brown, very dense, with trace of gravel | | | | |
| | | | | 50/6" | 23 |
| | | 5 | | 50/6" | |
| | dense | | | 30-37-50 | 16 |
| 10.0 | | | | | |
| | **POORLY GRADED SAND (SP)**, dense | 10 | | 31-38-50 | |
| | medium dense | 15 | | 8-12-17 N=29 | 5 |
| | | 20 | | 15-18-20 N=38 | |
| 21.5 | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-10-2023 | Boring Completed: 07-10-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-2 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-3



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4306° Longitude: -117.3792°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| **SILTY SAND (SM)**, brown, very dense, with trace of gravel | | | | | | | | |
| | | | | | 45-50/6" | | | |
| | | 5 | | | 25-50/6" | | | 16 |
| 6.5 **POORLY GRADED SAND (SP)**, dense | | | | | | | | |
| | | | | | 25-38-50 | | | |
| very dense | | 10 | | | 30-50/6" | | | 6 |
| | | 15 | | | 11-15-19 N=34 | | | |
| | | 20 | | | 12-19-31 N=50 | | | |
| 21.5 ***Boring Terminated at 21.5 Feet*** | | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-10-2023 | Boring Completed: 07-10-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-3 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-4



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4307° Longitude: -117.3802°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, brown, medium dense | | | | | | | |
| | | | | | 15-19-20 | 2.0 | 120 | 21 |
| | | 5 | | | 20-16-17 | 1.4 | 116 | |
| 7.5 | | | | | | | | |
| | **POORLY GRADED SAND (SP)**, brown, dense | | | | 24-34-42 | 2.9 | 122 | |
| | | 10 | | | 34-43-48 | | | 7 |
| | medium dense | 15 | | | 10-10-15 N=25 | | | 7 |
| | | 20 | | | 12-19-21 N=40 | | | |
| 21.5 | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-4 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-5



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4305° Longitude: -117.3797°

| DEPTH | Description | DEPTH (Ft.) | SAMPLE TYPE | FIELD TEST RESULTS | PERCENT FINES |
|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, brown, very dense, with trace of gravel | | | | |
| | | | | 36-55/6" | 28 |
| | | 5 | | 45-50/5" | |
| | dense | | | 21-35-52 | 13 |
| 10.0 | | 10 | | 22-26-28 | |
| | **POORLY GRADED SAND (SM)**, medium dense, with trace of gravel | | | | |
| | dense | 15 | | 12-22-24 N=46 | 7 |
| | dense | 20 | | 13-13-18 N=31 | |
| 21.5 | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-10-2023 | Boring Completed: 07-10-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-5 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-6



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4306° Longitude: -117.3806°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| **SILTY SAND (SM)**, brown, medium dense, with trace of gravel | | | | | | | | |
| | | | | | 23-23-23 | 2.0 | 124 | 20 |
| | | 5 | | | 11-10-17 | | | |
| reddish brown, very dense | | | | | 34-50/4" | 2.5 | 130 | |
| very dense | | 10 | | | 34-50/6" | | | 19 |
| 15.0 | | | | | | | | |
| **POORLY GRADED SAND (SP)**, brown, dense | | 15 | | | 11-17-22 N=39 | | | |
| | | 20 | | | 17-19-19 N=38 | | | |
| 21.5 | | | | | | | | |
| ***Boring Terminated at 21.5 Feet*** | | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-6 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-7



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4304° Longitude: -117.3801°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| **SILTY SAND WITH GRAVEL (SM)**, very dense | | | | | 50/5" | | | 28 |
| | | 5 | | | 50 | | | |
| 7.5 **POORLY GRADED SAND WITH GRAVEL (SP)**, reddish brown, medium dense | | | | | 19-22-25 | 0.7 | | 7 |
| dense 10' to 36.5' | | 10 | | | 15-23-36 | | | |
| | | 15 | | | 10-12-23 N=35 | | | 5 |
| | | 20 | | | 23-18-26 N=44 | | | |
| | | 25 | | | 14-18-21 N=39 | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-10-2023 | Boring Completed: 07-10-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-7 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-7



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4304° Longitude: -117.3801°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| **POORLY GRADED SAND WITH GRAVEL (SP)**, reddish brown, medium dense *(continued)* | | | | | | | | |
| | | 30 | | X | 14-16-16 N=32 | | | |
| | | 35 | | X | 9-17-16 N=33 | | | |
| very dense 40' to 51.5' | | 40 | | X | 17-23-30 N=53 | | | |
| | | 45 | | X | 20-32-32 N=64 | | | |
| | | 50 | | X | 18-31-23 N=54 | | | |
| 51.5 | | | | | | | | |
| ***Boring Terminated at 51.5 Feet*** | | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-10-2023 | Boring Completed: 07-10-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-7 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-8



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4303° Longitude: -117.3795°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, very dense, with trace of gravel | | | | | | | |
| | | | | | 50/6" | | | 20 |
| | brown, dense | 5 | | | 23-25-48 | 1.9 | 123 | 14 |
| 7.5 | | | | | | | | |
| | **POORLY GRADED SAND WITH GRAVEL (SP)**, medium dense | | | | 26-23-23 | | | |
| | dense 10' to 25' | 10 | | | 22-27-40 | | | |
| | | 15 | | | 12-16-18 N=34 | | | |
| | | 20 | | | 13-16-20 N=36 | | | 5 |
| 25.0 | | | | | | | | |
| | **SILTY SAND WITH GRAVEL (SM)**, light brown, dense | 25 | | | 12-18-13 N=31 | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-10-2023 | Boring Completed: 07-10-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-8 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-8



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4303° Longitude: -117.3795°

| DEPTH | GRAPHIC LOG | | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|---|
| | | **SILTY SAND WITH GRAVEL (SM)**, light brown, dense *(continued)* | | | | | | | |
| 30.0 | | **POORLY GRADED SAND WITH GRAVEL (SP)**, dense | 30 | | X | 10-15-25 N=40 | | | 5 |
| 35.0 | | **SILTY SAND WITH GRAVEL (SM)**, dense | 35 | | X | 17-20-15 N=35 | | | |
| | | | 40 | | X | 12-18-27 N=45 | | | |
| | | | 45 | | X | 17-22-27 N=49 | | | |
| 51.5 | | very dense | 50 | | X | 19-23-28 N=51 | | | |
| | | ***Boring Terminated at 51.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-10-2023 | Boring Completed: 07-10-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-8 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-9



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4303° Longitude: -117.3809°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, medium dense, with trace of gravel | | | | | | | |
| | | | | | 13-16-16 | 1.6 | 121 | 16 |
| | | 5 | | | | | | |
| | | | | | 11-16-20 | 1.6 | 119 | |
| | 7.5 | | | | | | | |
| | **SILTY SAND (SM)**, reddish brown, very dense | | | | 34-40-50/5" | | | |
| | | 10 | | | 23-50/5" | | | 13 |
| | dense | 15 | | | 19-23-24 N=47 | | | |
| | 20.0 | 20 | | | | | | |
| | **POORLY GRADED SAND (SP)**, brown, dense | | | | 15-15-17 N=32 | | | |
| | 21.5 | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-9 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-10



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4301° Longitude: -117.3802°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, dark brown, medium dense, with trace of gravel | | | | | | | |
| | | | | | 12-16-20 | 2.4 | | 22 |
| 5.0 | | 5 | | | 50/5" | | | |
| | **SILTY SAND (SM)**, reddish brown, very dense | | | | | | | |
| 7.5 | | | | | | | | |
| | **POORLY GRADED SAND (SP)**, reddish brown, dense | | | | 30-44-45 | 1.5 | 117 | |
| | | 10 | | | 30-42-50 | | | |
| | | 15 | | | 12-14-18 N=32 | | | 4 |
| | | 20 | | | 12-13-17 N=30 | | | |
| 21.5 | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-10 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-11



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4300° Longitude: -117.3804°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND WITH GRAVEL (SM)**, dark brown, very dense | | | | | | | |
| | | | | | 15-50/4" | | | 28 |
| 5.0 | | 5 | | | 50/4" | | | |
| | **SILTY SAND (SM)**, reddish brown, very dense | | | | | | | |
| 7.5 | | | | | | | | |
| | **POORLY GRADED SAND (SP)**, reddish brown, dense | | | | 20-40-50 | 2.1 | 118 | 14 |
| | very dense | 10 | | | 30-50/6" | | | |
| | medium dense | 15 | | | 11-14-14 N=28 | | | |
| | light brown, dense | 20 | | | 19-19-24 N=43 | | | |
| 21.5 | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-11 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-12



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4299° Longitude: -117.3798°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND WITH GRAVEL (SM)**, dark brown | | | | | | | |
| 2.5 | | | | | | | | |
| | **SILTY SAND (SM)**, dark brown, very dense | | | | 32-50/6" | | | 24 |
| | reddish brown | 5 | | | 28-50/6" | | | 22 |
| 7.5 | | | | | | | | |
| | **POORLY GRADED SAND (SP)**, reddish brown, dense | | | | 22-39-50 | 1.7 | 115 | |
| | | 10 | | | 35-40-48 | 1.2 | 118 | |
| | brown | 15 | | | 15-14-19 N=33 | | | |
| | | 20 | | | 11-15-20 N=35 | | | |
| 21.5 | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-12 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-13



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4288° Longitude: -117.3812°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND WITH GRAVEL (SM)**, dark brown, very dense | | | | | | | |
| | | | | | 44-50/4" | | | 30 |
| | | 5 | | | 30-50/6" | | | 25 |
| | | | | | 22-50/6" | | | |
| | | 10 | | | 50/6" | | | 37 |
| | 15.0 | 15 | | | | | | |
| | **SILTY SAND (SM)**, dark brown, medium dense | | | | 7-8-8 N=16 | | | |
| | 16.5 | | | | | | | |
| | ***Boring Terminated at 16.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-13 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-14



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4286° Longitude: -117.3811°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND WITH GRAVEL (SM)**, dark brown, dense | | | | | | | |
| | | | | | 26-37-47 | | | 30 |
| 5.0 | | | | | | | | |
| | **SILTY SAND (SM)**, dark brown, very dense | 5 | | | 26-50/6" | | | 27 |
| | | | | | 50/6" | | | |
| | dense | 10 | | | 26-37-50 | | | |
| 15.0 | | | | | | | | |
| | **POORLY GRADED SAND (SP)**, dark brown, dense | 15 | | | 11-15-17 N=32 | | | |
| 16.5 | | | | | | | | |
| | ***Boring Terminated at 16.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-14 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. B-15



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4284° Longitude: -117.3810°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown, very dense | | | | | | | |
| | | | | | 27-50/6" | | | 30 |
| | | 5 | | | | | | |
| | | | | | 17-27-36/0" | | | 14 |
| | | | | | 50/6" | | | 30 |
| | 10.0 | 10 | | | | | | |
| | **SILTY SAND (SM)**, trace gravel, dark brown, very dense | | | | 35-50/6" | | | |
| | 15.0 | 15 | | | | | | |
| | **POORLY GRADED SAND (SP)**, trace gravel, dark brown, medium dense | | | | 8-8-12 N=20 | | | |
| | 16.5 | | | | | | | |
| | ***Boring Terminated at 16.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-15 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-1



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4294° Longitude: -117.3804°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 15 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-101 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-2



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4315° Longitude: -117.3815°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-102 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-3



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4313° Longitude: -117.3808°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 22 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-103 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-4



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4312° Longitude: -117.3812°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-104 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-5



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4312° Longitude: -117.3816°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 18 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-105 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-6



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4310° Longitude: -117.3810°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 27 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-106 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-7



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4309° Longitude: -117.3813°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-107 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-8



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4308° Longitude: -117.3816°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 24 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-108 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-9



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4306° Longitude: -117.3812°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 25 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-109 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-10



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4305° Longitude: -117.3814°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-110 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-11



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4304° Longitude: -117.3816°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 30 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-111 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-12



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4303° Longitude: -117.3813°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel, brown to reddish brown, very dense | | | | | | | |
| | | | | | 29-34-40 N=74 | | | 7 |
| | | 5 | | | 29-27-34 N=61 | | | 8 |
| | | | | | 24-40-47 N=87 | | | |
| | | 10 | | | 39-50/6" | | | |
| | 11.5 | | | | | | | |
| | ***Boring Terminated at 11.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-112 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-13



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4300° Longitude: -117.3815°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND WITH GRAVEL (SM)**, dark brown, very dense | | | | | | | |
| | | | | | 17-30-38 N=68 | | | 30 |
| | medium dense | 5 | | | 16-15-13 N=28 | | | |
| 7.5 | **SILTY SAND (SM)**, trace gravel, reddish brown, dense | | | | 16-26-22 N=48 | | | |
| 10.0 | **POORLY GRADED SAND WITH GRAVEL (SP)**, reddish brown, dense | 10 | | | 18-18-21 N=39 | | | |
| 11.5 | ***Boring Terminated at 11.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-112 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-14



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4297° Longitude: -117.3814°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND WITH GRAVEL (SM)**, brown, very dense | | | | | | | |
| | | | | | 8-37-50 N=87 | | | 30 |
| | | 5 | | | 17-28-25 N=53 | | | |
| | | | | | 16-26-34 N=60 | | | |
| | | 10 | | | 24-50/6" | | | |
| | 11.5 | | | | | | | |
| | ***Boring Terminated at 11.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-114 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-15



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4296° Longitude: -117.3816°

| DEPTH | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, brown, very dense | | | | | | | |
| | | | | | 28-50/6" | | | 23 |
| | dense | 5 | | | 15-19-27 N=46 | | | |
| 7.5 | | | | | | | | |
| | **POORLY GRADED SAND (SP)**, trace gravel, brown, medium dense | | | | 20-15-13 N=28 | | | 8 |
| | very dense | 10 | | | 15-27-32 N=59 | | | |
| 11.5 | | | | | | | | |
| | ***Boring Terminated at 11.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-115 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-16



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4299° Longitude: -117.3809°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown, dense | | | | 13-20-23 N=43 | | | |
| | medium dense | 5 | | | 9-11-14 N=25 | | | |
| | very dense | | | | 32-50/6" | | | |
| | | 10 | | | 15-24-19 N=43 | | | |
| | 11.5 | | | | | | | |
| | ***Boring Terminated at 11.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-116 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-17



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4297° Longitude: -117.3806°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, dark brown, dense | | | | | | | |
| | | | | | 28-23-26 N=49 | | | 18 |
| | | 5 | | | | | | |
| | very dense | | | | 30-50/5" | | | 29 |
| | 7.5 | | | | | | | |
| | **POORLY GRADED SAND (SP)**, trace gravel, reddish brown, dense | | | | 13-17-18 N=35 | | | |
| | | 10 | | | | | | |
| | 11.5 | | | | 17-17-18 N=35 | | | |
| | ***Boring Terminated at 11.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-117 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-18



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4297° Longitude: -117.3802°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown, very dense | | | | | | | |
| | | | | | 30-37-42 N=79 | | | 25 |
| | medium dense | 5 | | | 7-11-13 N=24 | | | |
| | 7.5 | | | | | | | |
| | **POORLY GRADED SAND (SP)**, trace silt, dark brown, medium dense | | | | 11-13-15 N=28 | | | |
| | | 10 | | | 8-9-7 N=16 | | | |
| | 11.5 | | | | | | | |
| | ***Boring Terminated at 11.5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-118 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-19



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4295° Longitude: -117.3796°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, brown | | | | | | | |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-119 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-20



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4296° Longitude: -117.3808°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, brown | | | | | | | 29 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-120 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-21



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4295° Longitude: -117.3800°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-121 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-22



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4295° Longitude: -117.3811°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, brown | | | | | | | 26 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-122 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-23



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4294° Longitude: -117.3808°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-123 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-24



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4293° Longitude: -117.3798°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 28 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-124 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-25



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4297° Longitude: -117.3793°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, brown to reddish brown, very dense | | | | | | | |
| | | | | | 17-24-28 N=52 | | | |
| | dense | 5 | | | 17-20-25 N=45 | | | |
| | 10.0 | | | | | | | |
| | ***Boring Terminated at 10 Feet*** | 10 | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-125 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-26



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4301° Longitude: -117.3792°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, reddish brown, very dense | | | | 26-50/5" | | | |
| | medium dense | 5 | | | 5-5-5 N=10 | | | |
| | 10.0 | | | | | | | |
| | ***Boring Terminated at 10 Feet*** | 10 | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-126 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. P-27



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4302° Longitude: -117.3789°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, reddish brown to brown, very dense | | | | | | | |
| | | | | | 23-30-30 N=60 | | | 8 |
| | | 5 | | | 26-35-45 N=80 | | | |
| | 10.0 | 10 | | | | | | |
| | ***Boring Terminated at 10 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-13-2023 | Boring Completed: 07-13-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-127 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. Perc-1



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4318° Longitude: -117.3816°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 29 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-201 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. Perc-2



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4314° Longitude: -117.3806°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | 5 | | | | | | |
| | 10.0 | 10 | | | | | | |
| | ***Boring Terminated at 10 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-202 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. Perc-3



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4287° Longitude: -117.3802°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | | | | | | | 18 |
| | 5.0 | 5 | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-203 |

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# BORING LOG NO. Perc-4



**PROJECT:** Big Box Retailer

**CLIENT:** Kimley-Horn and Associates Inc
Orange, CA

**SITE:** North of Amargosa Road & West of Highway I-15
Hesperia, CA

LOCATION See Exhibit A-2

Latitude: 34.4288° Longitude: -117.3797°

| GRAPHIC LOG | DEPTH | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | FIELD TEST RESULTS | WATER CONTENT (%) | DRY UNIT WEIGHT (pcf) | PERCENT FINES |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, trace gravel, dark brown | 5 | | | | | | |
| | 10.0 | 10 | | | | | | |
| | ***Boring Terminated at 10 Feet*** | | | | | | | |

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

**WATER LEVEL OBSERVATIONS**

*Groundwater not encountered*

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

| | |
|---|---|
| Boring Started: 07-14-2023 | Boring Completed: 07-14-2023 |
| Drill Rig: CME 75 | Driller: 2R |
| Project No.: CB235111 | Exhibit: A-204 |

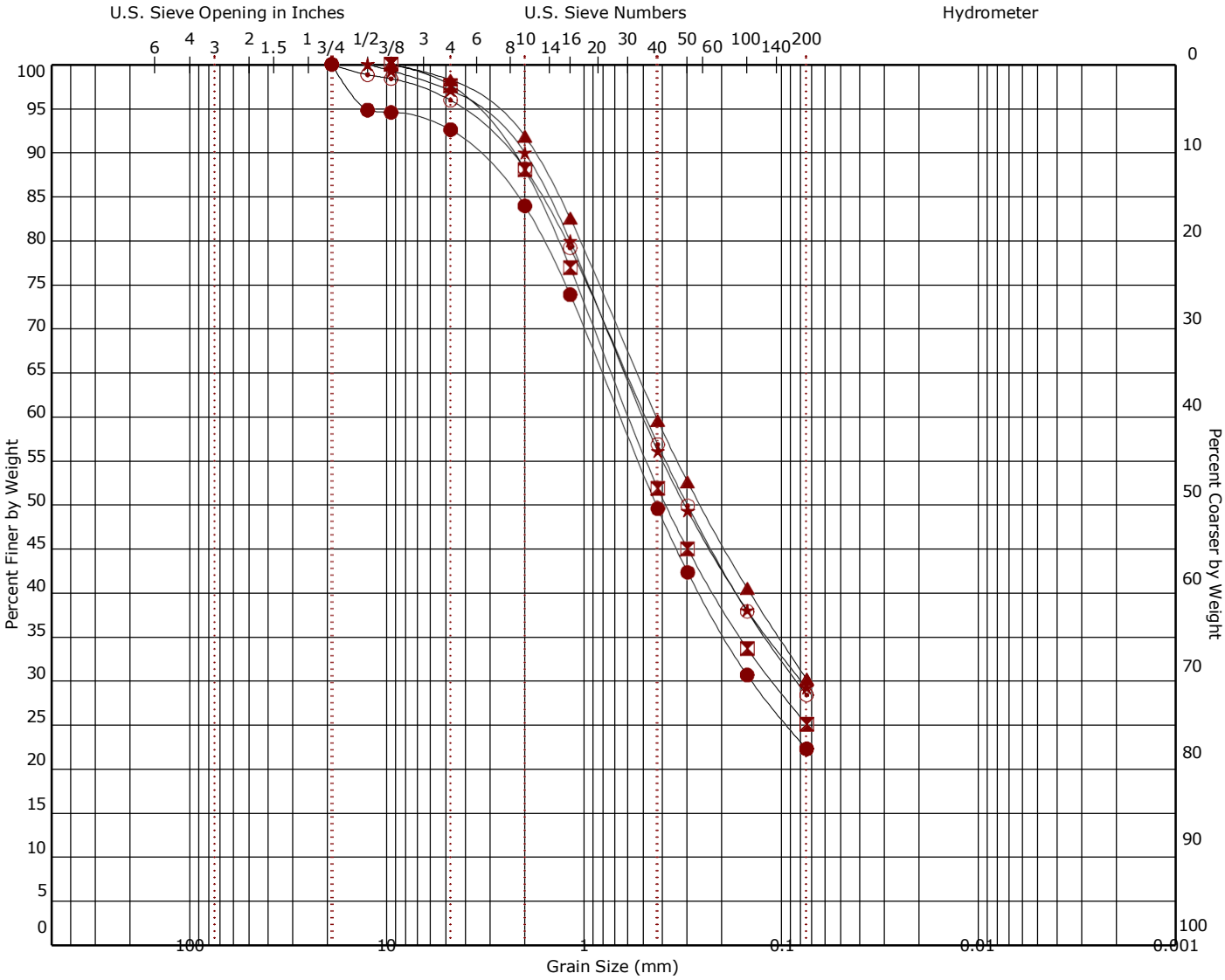
THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

Big Box Retailer
North of Amargosa Road & West of Highway I-15 | Hesperia, CA
Terracon Project No. CB235111

1355 E Cooley Dr, Ste C
Colton, CA

# Grain Size Distribution

## ASTM D422 / ASTM C136




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | Boring ID | Depth (Ft) | USCS Classification | USCS | AASHTO | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | P-3 | 0 - 5 | | | | | | | | |
| ⊠ | P-9 | 0 - 5 | | | | | | | | |
| ▲ | P-13 | 0 - 5 | | | | | | | | |
| ★ | P-20 | 0 - 5 | | | | | | | | |
| ⊙ | Perc-1 | 0 - 5 | | | | | | | | |

| | Boring ID | Depth (Ft) | $D_{100}$ | $D_{60}$ | $D_{30}$ | $D_{10}$ | %Cobbles | %Gravel | %Sand | %Fines | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ● | P-3 | 0 - 5 | 19 | 0.658 | 0.141 | | 0.0 | 7.4 | 70.2 | 22.4 | | |
| ⊠ | P-9 | 0 - 5 | 9.5 | 0.591 | 0.11 | | 0.0 | 2.4 | 72.4 | 25.2 | | |
| ▲ | P-13 | 0 - 5 | 9.5 | 0.432 | | | 0.0 | 1.8 | 67.9 | 30.3 | | |
| ★ | P-20 | 0 - 5 | 12.5 | 0.501 | 0.079 | | 0.0 | 2.9 | 67.7 | 29.4 | | |
| ⊙ | Perc-1 | 0 - 5 | 19 | 0.49 | 0.084 | | 0.0 | 4.1 | 67.4 | 28.5 | | |

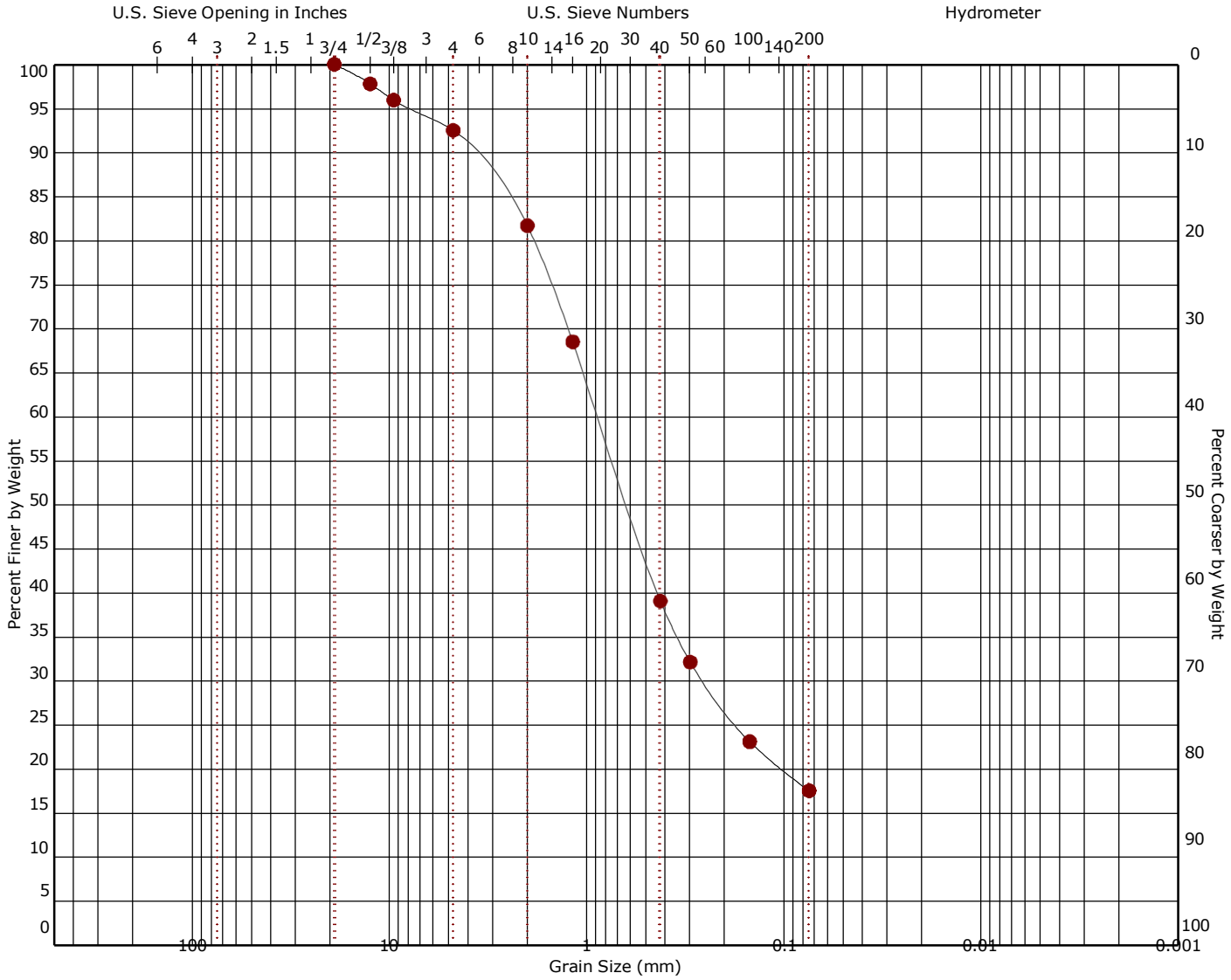
Laboratory tests are not valid if separated from original report.

Big Box Retailer
North of Amargosa Road & West of Highway I-15 | Hesperia, CA
Terracon Project No. CB235111

1355 E Cooley Dr, Ste C
Colton, CA

# Grain Size Distribution

## ASTM D422 / ASTM C136




| Cobbles | Gravel | | Sand | | | Silt or Clay |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Boring ID | Depth (Ft) | USCS Classification | USCS | AASHTO | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| Perc-3 | 0 - 5 | | | | | | | | |

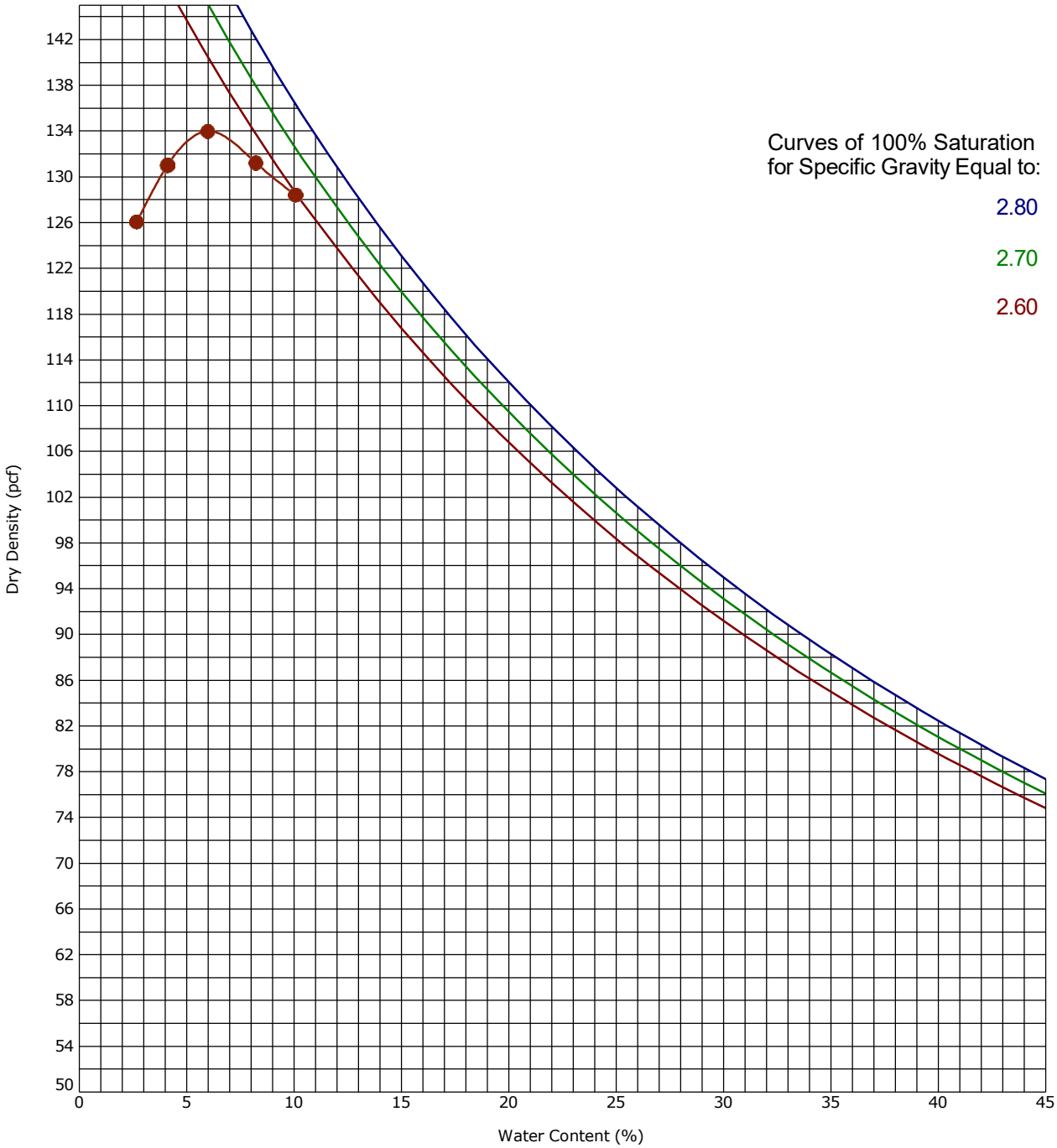
| Boring ID | Depth (Ft) | $D_{100}$ | $D_{60}$ | $D_{30}$ | $D_{10}$ | %Cobbles | %Gravel | %Sand | %Fines | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Perc-3 | 0 - 5 | 19 | 0.878 | 0.254 | | 0.0 | 7.5 | 74.9 | 17.6 | | |

Big Box Retailer
North of Amargosa Road & West of Highway I-15 | Hesperia, CA
Terracon Project No. CB235111

1355 E Cooley Dr, Ste C
Colton, CA

# Moisture-Density Relationship

## ASTM D1557-Method D




| Boring ID | Depth (Ft) | Description of Materials |
|---|---|---|
| B-5 | 0 - 5 | |

| Fines (%) | Fraction > mm size | LL | PL | PI | Test Method | Maximum Dry Density (pcf) | Optimum Water Content (%) |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | ASTM D1557-Method D | 134.0 | 6.0 |

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

**Client**

**Project**
Big Box Retailer

**Sample Submitted By:** Terracon (CB) **Date Received:** 7/28/2023 **Lab No.: 23-0427**

## Results of Corrosion Analysis

| | |
|---|---|
| **Sample Number** | -- |
| **Sample Location** | B-7 |
| **Sample Depth (ft.)** | 0.0-5.0 |
| pH Analysis, ASTM G51 | 7.62 |
| Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg) | 23 |
| Sulfides, AWWA 4500-S D, (mg/Kg) | Nil |
| Chlorides, ASTM D512, (mg/kg) | 45 |
| Red-Ox, ASTM G200, (mV) | +736 |
| Total Salts, AWWA 2540, (mg/Kg) | 47 |
| As-Received Resitivity, ASTM G-57, (ohm-cm) | 271600 |
| Saturated Minimum Resistivity, ASTM G-57, (ohm-cm) | 4850 |

**Analyzed By**_____
Nathan Campo
Engineering Technician III

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

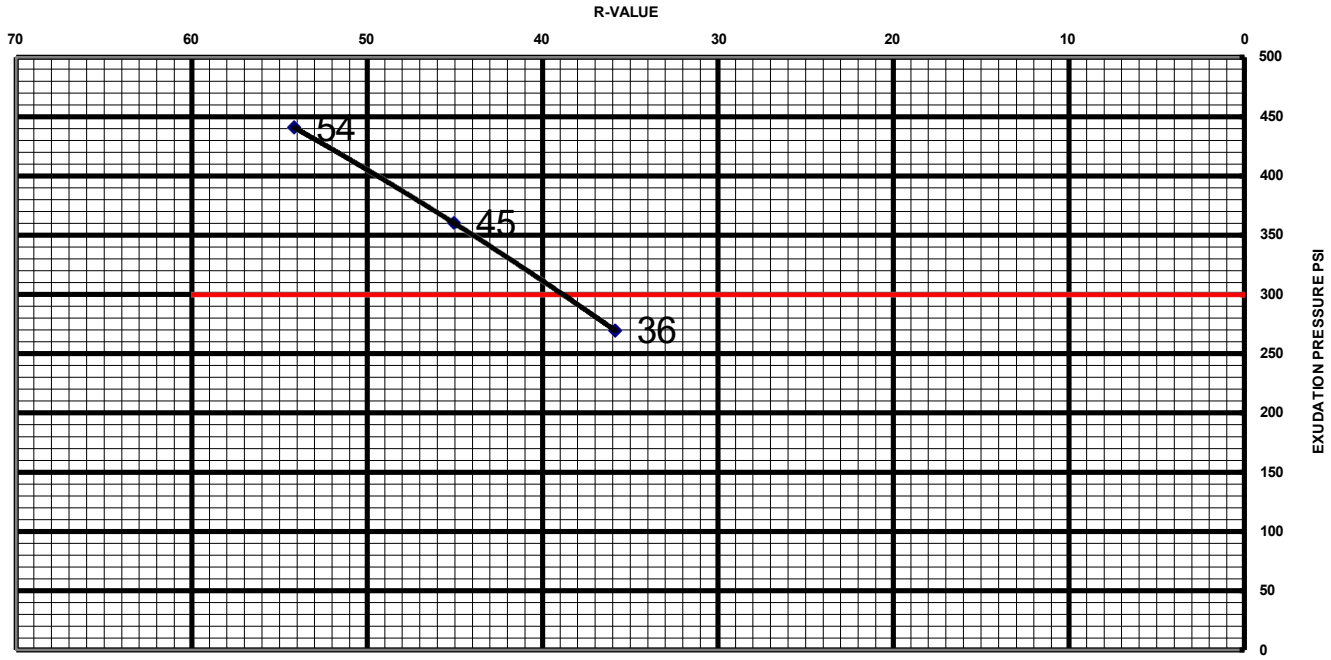
Job No. CB235111
Date. 8/16/2023

**LABORATORY RECORD OF TESTS MADE ON BASE, SUBBASE, AND BASEMENT SOILS**

**CLIENT:** Kimley-Horn and Associate
**PROJECT** Big Box Retailer
**LOCATION:** Hesperia, CA
**R-VALUE # :** P-25
**T.I. :**

| | A | B | C | D |
|---|---|---|---|---|
| COMPACTOR AIR PRESSURE P.S.I. | 350 | 350 | 350 | |
| INITIAL MOISTURE % | 2.2 | 2.2 | 2.2 | |
| WATER ADDED, ML | 75 | 70 | 65 | |
| WATER ADDED % | 6.5 | 6.1 | 5.7 | |
| MOISTURE AT COMPACTION % | 8.7 | 8.3 | 7.9 | |
| HEIGHT OF BRIQUETTE | 2.53 | 2.49 | 2.45 | |
| WET WEIGHT OF BRIQUETTE | 1177 | 1177 | 1157 | |
| DENSITY LB. PER CU.FT. | 129.7 | 132.3 | 132.6 | |
| STABILOMETER PH AT 1000 LBS. | 38 | 32 | 28 | |
| 2000 LBS. | 74 | 63 | 52 | |
| DISPLACEMENT | 5.20 | 4.70 | 4.40 | |
| R-VALUE | 36 | 45 | 54 | |
| EXUDATION PRESSURE | 270 | 360 | 440 | |
| THICK. INDICATED BY STAB. | 0.00 | 0.00 | 0.00 | |
| EXPANSION PRESSURE | 0 | 0 | 4 | |
| THICK. INDICATED BY E.P. | 0.00 | 0.00 | 0.13 | |

**EXUDATION CHART**




**R-Value:** 39

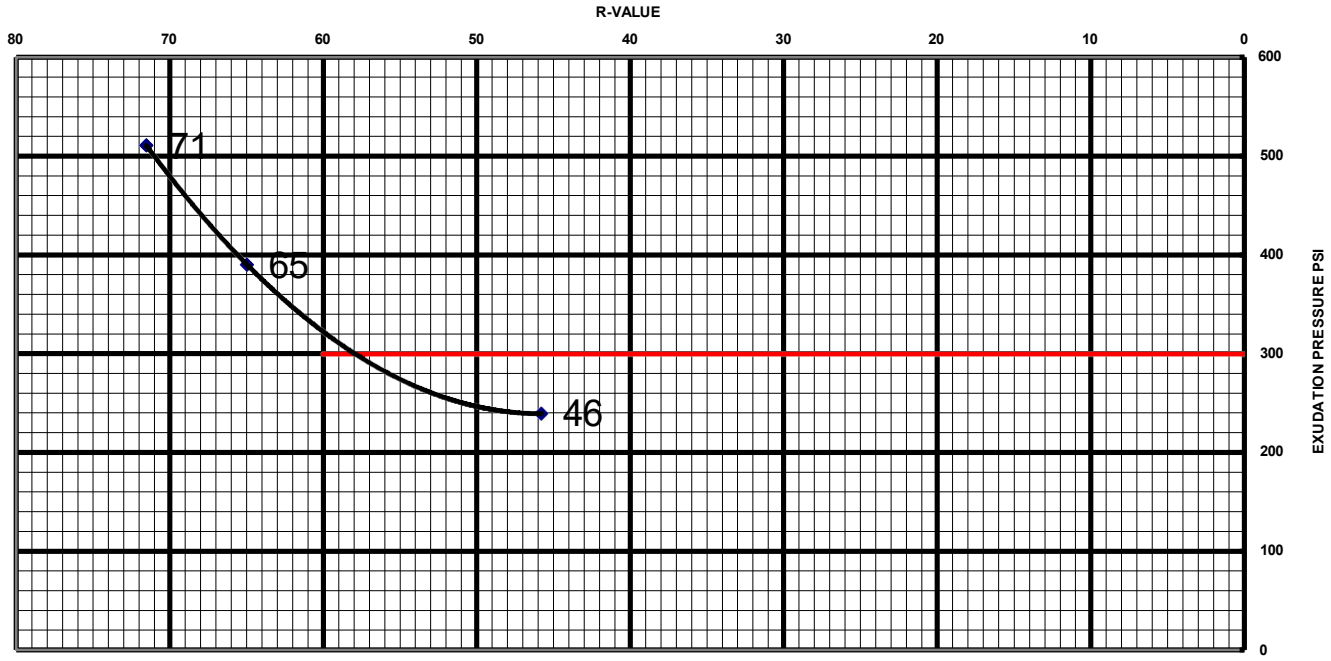
Job No. CB235111
Date. 8/16/2023

**LABORATORY RECORD OF TESTS MADE ON BASE, SUBBASE, AND BASEMENT SOILS**

**CLIENT:** Kimley-Horn and Associate
**PROJECT** Big Box Retailer
**LOCATION:** Hesperia, CA
**R-VALUE # :** P-6
**T.I. :**

| | A | B | C | D |
|---|---|---|---|---|
| COMPACTOR AIR PRESSURE P.S.I. | 350 | 350 | 350 | |
| INITIAL MOISTURE % | 1.5 | 1.5 | 1.5 | |
| WATER ADDED, ML | 85 | 75 | 70 | |
| WATER ADDED % | 7.4 | 6.5 | 6.1 | |
| MOISTURE AT COMPACTION % | 8.9 | 8.0 | 7.6 | |
| HEIGHT OF BRIQUETTE | 2.52 | 2.54 | 2.52 | |
| WET WEIGHT OF BRIQUETTE | 1169 | 1174 | 1167 | |
| DENSITY LB. PER CU.FT. | 129.1 | 129.7 | 130.4 | |
| STABILOMETER PH AT 1000 LBS. | 34 | 20 | 17 | |
| 2000 LBS. | 56 | 32 | 28 | |
| DISPLACEMENT | 5.50 | 5.40 | 4.70 | |
| R-VALUE | 46 | 65 | 71 | |
| EXUDATION PRESSURE | 240 | 390 | 510 | |
| THICK. INDICATED BY STAB. | 0.00 | 0.00 | 0.00 | |
| EXPANSION PRESSURE | 0 | 0 | 0 | |
| THICK. INDICATED BY E.P. | 0.00 | 0.00 | 0.00 | |

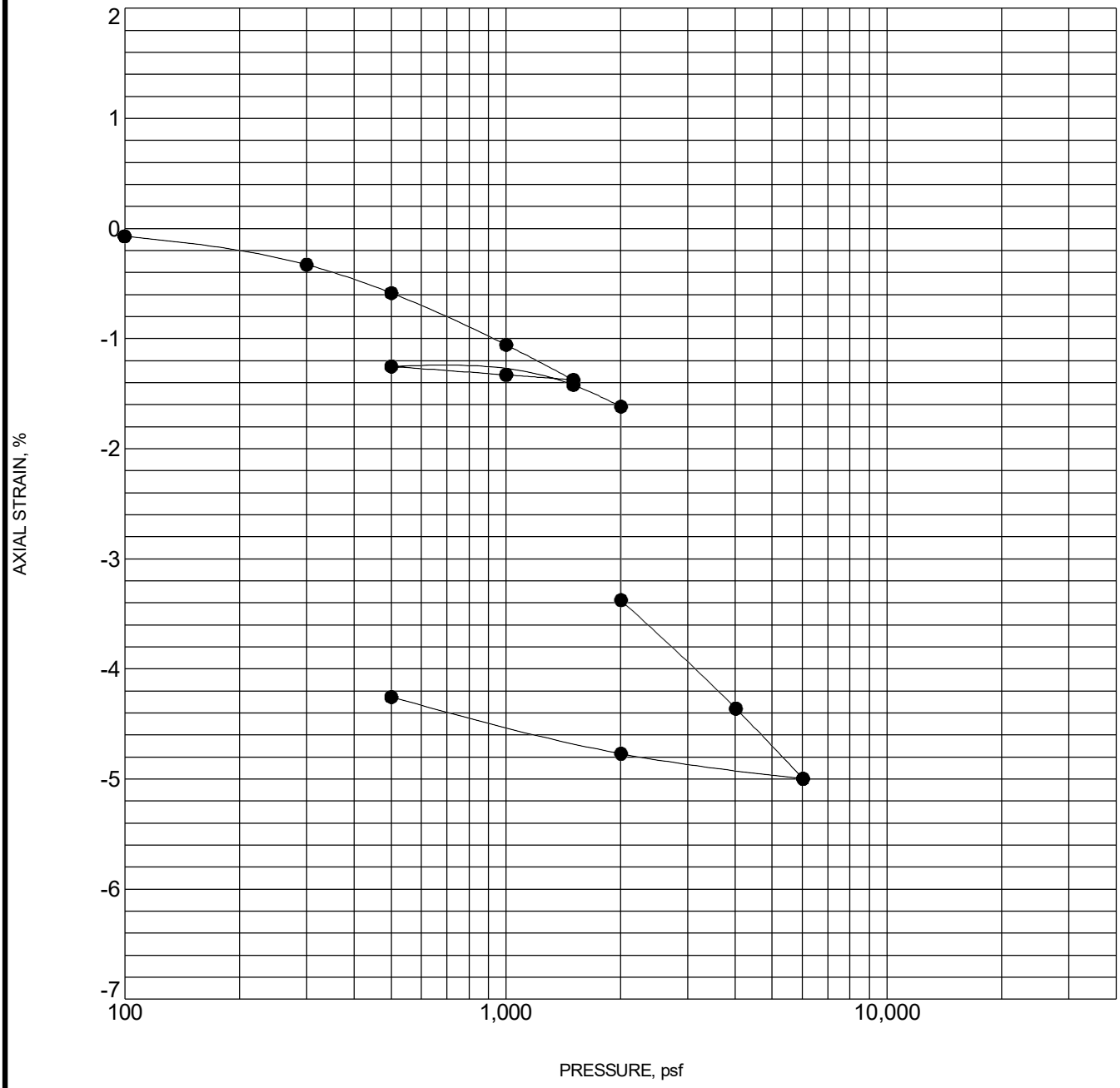
**EXUDATION CHART**




**R-Value:** 58

# SWELL CONSOLIDATION TEST

**ASTM D2435**




| Specimen Identification | | Classification | $\gamma_d$, pcf | WC, % |
|---|---|---|---|---|
| ● | B-6 2.5 - 4 ft | | | |

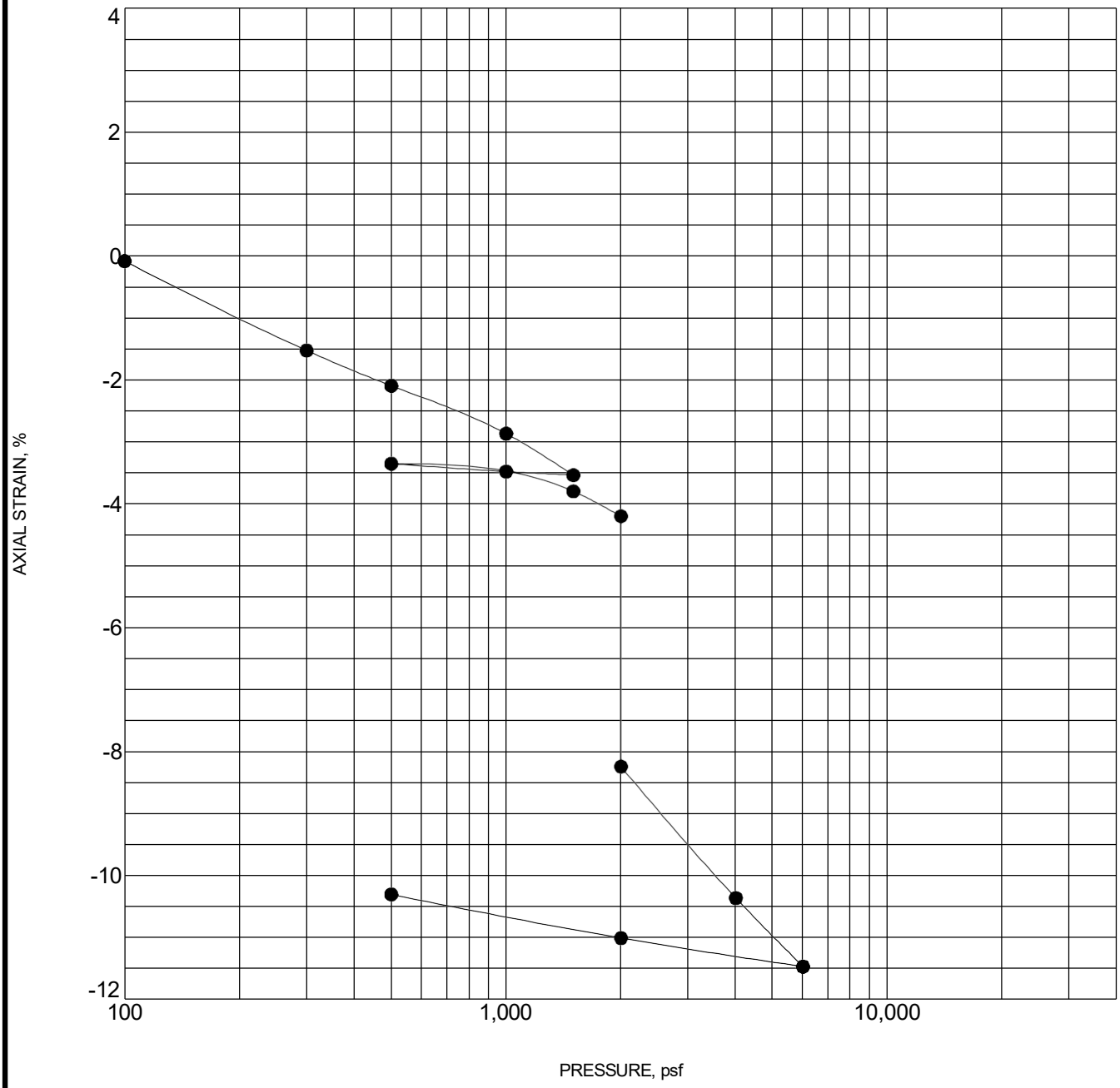
NOTES: sample was saturated at axial pressure of 2,000 psf

| | | |
|---|---|---|
| PROJECT: Big Box Retailer | Terracon<br>1355 E Cooley Dr, Ste C<br>Colton, CA | PROJECT NUMBER: CB235111 |
| SITE: North of Amargosa Road & West of Highway I-15 Hesperia, CA | | CLIENT: Kimley-Horn and Associates Inc Orange, CA |
| | | EXHIBIT: B-1 |

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

# SWELL CONSOLIDATION TEST

**ASTM D2435**




| Specimen Identification | | Classification | $\gamma_d$, pcf | WC, % |
|---|---|---|---|---|
| ● | B-9 10 - 11.4 ft | | | |

NOTES: sample was saturated at axial pressure of 2,000 psf

| | | |
|---|---|---|
| PROJECT: Big Box Retailer | Terracon<br>1355 E Cooley Dr, Ste C<br>Colton, CA | PROJECT NUMBER: CB235111 |
| SITE: North of Amargosa Road & West of Highway I-15 Hesperia, CA | | CLIENT: Kimley-Horn and Associates Inc Orange, CA |
| | | EXHIBIT: B-1 |

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT.

Job No.: CB235111

# PERCOLATION TEST DATA

BORING NUMBER: P-1
LOT No: N/A
TRACT No: N/A

CLIENT: Kimley-Horn and Associates
PROJECT: Big Box Retailer

DATE OF DRILLING:
DATE OF PRESOAK:
DATE OF TEST: July 19, 2023
TESTED BY:

DEPTH BEFORE (ft.): 5.0
DEPTH AFTER (ft.): 5.0
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

| Time Interval (min.) | Total Elapsed Time (min.) | Initial Water Level (in.) | Final Water Level (in.) | Change in Water Level (in.) | Initial Hole Depth (in.) | Final Hole Depth (in.) | Percolation Rate (in/hr) | Infiltration rate (Porchet Method) (in/hr) |
|---|---|---|---|---|---|---|---|---|
| 25 | 25 | 19.0 | 36.0 | 17.0 | 60.0 | 60.0 | 40.8 | 2.37 |
| 25 | 50 | 11.0 | 27.0 | 16.0 | 60.0 | 60.0 | 38.4 | 1.79 |
| 10 | 60 | 7.0 | 21.5 | 14.5 | 60.0 | 60.0 | 87.0 | 3.64 |
| 10 | 70 | 8.0 | 27.5 | 19.5 | 60.0 | 60.0 | 117.0 | 5.29 |
| 10 | 80 | 6.5 | 17.0 | 10.5 | 60.0 | 60.0 | 63.0 | 2.51 |
| 10 | 90 | 3.0 | 11.0 | 8.0 | 60.0 | 60.0 | 48.0 | 1.75 |
| 10 | 100 | 2.0 | 10.5 | 8.5 | 60.0 | 60.0 | 51.0 | 1.83 |
| 10 | 110 | 2.0 | 9.0 | 7.0 | 60.0 | 60.0 | 42.0 | 1.49 |
| | | | | | Final reading: | | 49.50 | 1.79 |

Job No.: CB235111

# PERCOLATION TEST DATA

BORING NUMBER: P-2
LOT No: N/A
TRACT No: N/A

CLIENT: Kimley-Horn and Associates
PROJECT: Big Box Retailer

DATE OF DRILLING:
DATE OF PRESOAK:
DATE OF TEST: July 19, 2023
TESTED BY:

DEPTH BEFORE (ft.): 10.0
DEPTH AFTER (ft.): 10.0
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

| Time Interval (min.) | Total Elapsed Time (min.) | Initial Water Level (in.) | Final Water Level (in.) | Change in Water Level (in.) | Initial Hole Depth (in.) | Final Hole Depth (in.) | Percolation Rate (in/hr) | Infiltration rate (Porchet Method) (in/hr) |
|---|---|---|---|---|---|---|---|---|
| 25 | 25 | 75.0 | 120.0 | 45.0 | 120.0 | 120.0 | 108.0 | 8.82 |
| 25 | 50 | 71.0 | 119.0 | 48.0 | 120.0 | 120.0 | 115.2 | 8.53 |
| 10 | 60 | 73.5 | 106.0 | 32.5 | 120.0 | 120.0 | 195.0 | 12.09 |
| 10 | 70 | 59.0 | 96.5 | 37.5 | 120.0 | 120.0 | 225.0 | 10.17 |
| 10 | 80 | 54.5 | 95.5 | 41.0 | 120.0 | 120.0 | 246.0 | 10.47 |
| 10 | 90 | 55.0 | 90.0 | 35.0 | 120.0 | 120.0 | 210.0 | 8.48 |
| 10 | 100 | 57.5 | 86.0 | 28.5 | 120.0 | 120.0 | 171.0 | 6.81 |
| 10 | 110 | 60.0 | 82.0 | 22.0 | 120.0 | 120.0 | 132.0 | 5.18 |
| | | | | | Final reading: | | 171.00 | 6.82 |

Job No.: CB235111

# PERCOLATION TEST DATA

BORING NUMBER: P-3
LOT No: N/A
TRACT No: N/A

CLIENT: Kimley-Horn and Associates
PROJECT: Big Box Retailer

DATE OF DRILLING:
DATE OF PRESOAK:
DATE OF TEST: July 19, 2023
TESTED BY:

DEPTH BEFORE (ft.): 5.0
DEPTH AFTER (ft.): 5.0
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

| Time Interval (min.) | Total Elapsed Time (min.) | Initial Water Level (in.) | Final Water Level (in.) | Change in Water Level (in.) | Initial Hole Depth (in.) | Final Hole Depth (in.) | Percolation Rate (in/hr) | Infiltration rate (Porchet Method) (in/hr) |
|---|---|---|---|---|---|---|---|---|
| 25 | 25 | 25.0 | 60.0 | 35.0 | 60.0 | 60.0 | 84.0 | 8.62 |
| 25 | 50 | 21.5 | 60.0 | 38.5 | 60.0 | 60.0 | 92.4 | 8.70 |
| 10 | 60 | 18.8 | 38.5 | 19.8 | 60.0 | 60.0 | 118.5 | 7.10 |
| 10 | 70 | 11.0 | 30.0 | 19.0 | 60.0 | 60.0 | 114.0 | 5.49 |
| 10 | 80 | 10.5 | 26.3 | 15.8 | 60.0 | 60.0 | 94.5 | 4.33 |
| 10 | 90 | 8.5 | 23.0 | 14.5 | 60.0 | 60.0 | 87.0 | 3.76 |
| 10 | 100 | 7.0 | 21.3 | 14.3 | 60.0 | 60.0 | 85.5 | 3.57 |
| 10 | 110 | 7.0 | 20.5 | 13.5 | 60.0 | 60.0 | 81.0 | 3.36 |

Final reading: 84.50 3.56

Job No.: CB235111

# PERCOLATION TEST DATA

BORING NUMBER: P-4
LOT No: N/A
TRACT No: N/A

CLIENT: Kimley-Horn and Associates
PROJECT: Big Box Retailer

DATE OF DRILLING:
DATE OF PRESOAK:
DATE OF TEST: July 19, 2023
TESTED BY:

DEPTH BEFORE (ft.): 10.0
DEPTH AFTER (ft.): 10.0
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

| Time Interval (min.) | Total Elapsed Time (min.) | Initial Water Level (in.) | Final Water Level (in.) | Change in Water Level (in.) | Initial Hole Depth (in.) | Final Hole Depth (in.) | Percolation Rate (in/hr) | Infiltration rate (Porchet Method) (in/hr) |
|---|---|---|---|---|---|---|---|---|
| 25 | 25 | 88.0 | 120.0 | 32.0 | 120.0 | 120.0 | 76.8 | 8.53 |
| 25 | 50 | 85.0 | 120.0 | 35.0 | 120.0 | 120.0 | 84.0 | 8.62 |
| 10 | 60 | 84.0 | 108.5 | 24.5 | 120.0 | 120.0 | 147.0 | 11.42 |
| 10 | 70 | 79.3 | 102.8 | 23.5 | 120.0 | 120.0 | 141.0 | 9.10 |
| 10 | 80 | 80.0 | 100.5 | 20.5 | 120.0 | 120.0 | 123.0 | 7.75 |
| 10 | 90 | 77.5 | 95.3 | 17.8 | 120.0 | 120.0 | 106.5 | 5.98 |
| 10 | 100 | 77.0 | 94.0 | 17.0 | 120.0 | 120.0 | 102.0 | 5.59 |
| 10 | 110 | 75.0 | 91.0 | 16.0 | 120.0 | 120.0 | 96.0 | 4.92 |

Final reading: 101.50 5.50

# Supporting Information

**Contents:**

General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.

Terracon
145 W Walnut St
Carson, CA

# General Notes

## Sampling

- Auger Cuttings
- Modified Dames & Moore Ring Sampler
- Standard Penetration Test

## Water Level

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time
- Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

## Field Tests

| | |
|---|---|
| N | Standard Penetration Test Resistance (Blows/Ft.) |
| (HP) | Hand Penetrometer |
| (T) | Torvane |
| (DCP) | Dynamic Cone Penetrometer |
| UC | Unconfined Compressive Strength |
| (PID) | Photo-Ionization Detector |
| (OVA) | Organic Vapor Analyzer |

## Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

## Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

## Strength Terms

| Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance | | | Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance | | | |
|---|---|---|---|---|---|---|
| **Relative Density** | **Standard Penetration or N-Value (Blows/Ft.)** | **Ring Sampler (Blows/Ft.)** | **Consistency** | **Unconfined Compressive Strength Qu (tsf)** | **Standard Penetration or N-Value (Blows/Ft.)** | **Ring Sampler (Blows/Ft.)** |
| Very Loose | 0 - 3 | 0 - 6 | Very Soft | less than 0.25 | 0 - 1 | < 3 |
| Loose | 4 - 9 | 7 - 18 | Soft | 0.25 to 0.50 | 2 - 4 | 3 - 4 |
| Medium Dense | 10 - 29 | 19 - 58 | Medium Stiff | 0.50 to 1.00 | 4 - 8 | 5 - 9 |
| Dense | 30 - 50 | 59 - 98 | Stiff | 1.00 to 2.00 | 8 - 15 | 10 - 18 |
| Very Dense | > 50 | > 99 | Very Stiff | 2.00 to 4.00 | 15 - 30 | 19 - 42 |
| | | | Hard | > 4.00 | > 30 | > 42 |

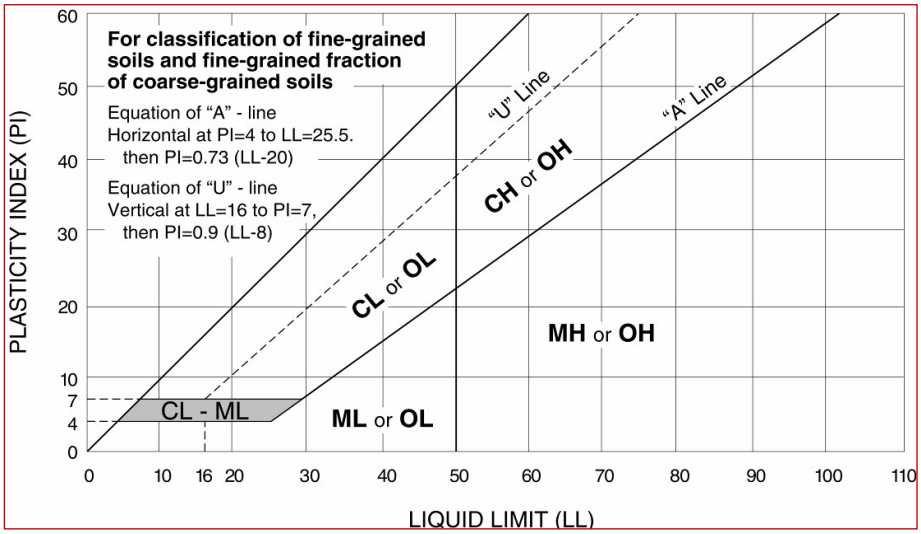
## Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

# Unified Soil Classification System

| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A] | | | | Soil Classification | |
|---|---|---|---|---|---|
| | | | | Group Symbol | Group Name [B] |
| **Coarse-Grained Soils:** More than 50% retained on No. 200 sieve | **Gravels:** More than 50% of coarse fraction retained on No. 4 sieve | **Clean Gravels:** Less than 5% fines [C] | Cu≥4 and 1≤Cc≤3 [E] | GW | Well-graded gravel [F] |
| | | | Cu<4 and/or [Cc<1 or Cc>3.0] [E] | GP | Poorly graded gravel [F] |
| | | **Gravels with Fines:** More than 12% fines [C] | Fines classify as ML or MH | GM | Silty gravel [F, G, H] |
| | | | Fines classify as CL or CH | GC | Clayey gravel [F, G, H] |
| | **Sands:** 50% or more of coarse fraction passes No. 4 sieve | **Clean Sands:** Less than 5% fines [D] | Cu≥6 and 1≤Cc≤3 [E] | SW | Well-graded sand [I] |
| | | | Cu<6 and/or [Cc<1 or Cc>3.0] [E] | SP | Poorly graded sand [I] |
| | | **Sands with Fines:** More than 12% fines [D] | Fines classify as ML or MH | SM | Silty sand [G, H, I] |
| | | | Fines classify as CL or CH | SC | Clayey sand [G, H, I] |
| **Fine-Grained Soils:** 50% or more passes the No. 200 sieve | **Silts and Clays:** Liquid limit less than 50 | **Inorganic:** | PI > 7 and plots above "A" line [J] | CL | Lean clay [K, L, M] |
| | | | PI < 4 or plots below "A" line [J] | ML | Silt [K, L, M] |
| | | **Organic:** | $\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$ | OL | Organic clay [K, L, M, N]<br>Organic silt [K, L, M, O] |
| | **Silts and Clays:** Liquid limit 50 or more | **Inorganic:** | PI plots on or above "A" line | CH | Fat clay [K, L, M] |
| | | | PI plots below "A" line | MH | Elastic silt [K, L, M] |
| | | **Organic:** | $\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$ | OH | Organic clay [K, L, M, P]<br>Organic silt [K, L, M, Q] |
| **Highly organic soils:** | Primarily organic matter, dark in color, and organic odor | | | PT | Peat |

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



# Fuel Station Hesperia

## Geotechnical Engineering Report

July 10, 2024 | Terracon Project No. CB245067

**Prepared for:**

Kimley-Horn and Associates, Inc.
1100 W Town and Country Rd,
Suite 700
Orange, CA 92868

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July 10, 2024

Kimley-Horn and Associates, Inc.
1100 W Town and Country Rd, Suite 700
Orange, CA 92868

Attn: Mr. Ryan Alvarez
P: (714) 786-6322
E: Ryan.Alvarez@kimley-horn.com

Re: Geotechnical Engineering Report
Fuel Station Hesperia
SE corner of Amargosa Road and Key Point Avenue
Hesperia, California
Terracon Project No. CB245067

Dear Mr. Alvarez:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PCB245067 dated May 9, 2024. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, pavements, and infiltration systems for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

**Terracon**

Sean Paroski, E.I.T
Staff Engineer

F. Fred Buhamdan, P.E., PMP
Regional Manager

REGISTERED PROFESSIONAL ENGINEER
F. FRED BUHAMDAN
C 77455
CIVIL
STATE OF CALIFORNIA

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# Attachments

**Exploration and Testing Procedures**
**Site Location and Exploration Plans**
**Exploration and Laboratory Results**
**Supporting Information**

**Note:** This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

# Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed fuel station to be located at the SE corner of Amargosa Road and Key Point Avenue in Hesperia, California. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per 2022 California Building Code (CBC)
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Pavement design and construction
- Stormwater infiltration considerations

The geotechnical engineering Scope of Services for this project included the advancement of test borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and/or as separate graphs in the **Exploration Results** section.

# Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

| Item | Description |
|---|---|
| **Information Provided** | Site plan and project description provided by Ryan Alvarez via email on April 12, 2024. |

| Item | Description |
|---|---|
| **Project Description** | The project consists of the construction of a new Fuel Center, with Fuel Center Building (approximately 64 sf), fuel station canopy, car wash (approximately 385 sf), underground fuel storage tanks, monument signs, paved drive lanes and parking, and associated landscaping and utilities.<br><br>Terracon had previously conducted a geotechnical investigation in 2023 at the adjacent parcels to the north and east for a proposed big box retail store and fuel center (Terracon Project No. CB235111). Since the issuance of that report, the project owner has relocated the proposed fuel center to the current project area. |
| **Building Construction** | We anticipate the Fuel Center Building to be wood or metal frame construction supported on shallow foundations. We anticipate the proposed car wash to be constructed of concrete masonry block, wood and metal frame, supported on a shallow foundation system. The fuel station canopy is anticipated to be metal construction supported on drilled piers. The monument signs are anticipated to be supported on either shallow foundations or drilled piers. |
| **Finished Floor Elevation** | Finished floor elevation is expected to be at or near existing grades. |
| **Maximum Loads** | Based on the structural specifications provided by the project owner, the proposed Fuel Center Building will have the following loads:<br>▪ Columns: 12 to 25 kips<br>▪ Walls: 0.5 to 1 kip per linear foot (klf)<br>▪ Slabs: 100 pounds per square foot (psf)<br><br>The proposed fuel station canopy will have the following loads:<br>▪ Axial: 20 to 40 kips<br>▪ Uplift: 25 kips<br>▪ Shear: 8 kips<br>▪ Overturning Moment: 120 kip-feet<br><br>The proposed car wash is anticipated to have the following loads:<br>▪ Columns: 20 to 40 kips<br>▪ Walls: 1 to 3 klf<br>▪ Slabs: 150 psf |

| Item | Description |
|---|---|
| **Grading/Slopes** | Minimal, excluding requirements for remedial grading. Excavations required for the proposed underground storage tanks may be on the order of 20 feet. |
| **Below-Grade Structures** | Underground fuel storage tanks will be constructed as part of the fuel station. |
| **Free-Standing Retaining Walls** | None anticipated |
| **Pavements** | Paved driveway and parking will be constructed on site.<br>Flexible (asphalt) and rigid (concrete) pavement sections should be considered in areas where traffic is on subgrade.<br>Based on geotechnical specifications provided by the project owner, anticipated 18-kip Equivalent Single-Axle Loads (ESAL) for a 20-year design period are as follows for pavements:<br>▪ Standard Duty: 2,200<br>▪ Heavy Duty: 18,000 |
| **Infiltration Systems** | A Low Impact Development (LID) stormwater management system is planned on site. The type and depth of the LID system was not available at the time of preparation of this report. |
| **Building Code** | 2022 CBC |

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

# Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

| Item | Description |
|---|---|
| **Parcel Information** | The project is located at the SE corner of Amargosa Road and Key Point Avenue in Hesperia, California. The approximate size of the project area is 5.7 acres.<br>Latitude/Longitude (approximate) 34.4282° N, 117.3826° W (See **Site Location**) |
| **Existing Improvements** | The project site is currently undeveloped. |
| **Current Ground Cover** | The project site is covered in grass and brush. |

# Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** attachment of this report.

Subsurface materials encountered in our exploratory borings consisted of very loose to very dense non-plastic sands with varying amounts of silt extending to the maximum depths of our borings of 31½ feet below ground surface (bgs).

## Groundwater

The borings were advanced using a hollow-stem auger drilling technique that allow short-term groundwater observations to be made while drilling. Groundwater seepage was not encountered within the maximum drilled depth of 31½ feet below ground surface at the time of our field exploration. Groundwater data collected from a nearby monitoring well State Well No. 04N05W15P001S, located approximately 0.7 miles west of the site,

recorded historical groundwater greater than 100 feet bgs between May of 2006 and October of 2023.[1]

Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Long-term groundwater monitoring was outside the scope of services for this project.

### Laboratory Results

Laboratory tests were conducted on selected soil samples and the test results are presented in the **Exploration Results** section and on the borieeng logs.

Atterberg limit test results indicate that the near-surface soils generally are non-plastic. A Modified Proctor test conducted on on-site near surface soils indicated a maximum dry density of 134.0 pounds per cubic foot (pcf) and corresponding optimum moisture content of 7.0 percent.

Collapse/swell testing indicated slight collapse potential for the sample collected from boring B-1 at 2.5 feet bgs and moderate collapse potential from B-4 at 2.5 feet. However, laboratory testing from the same sample resulted in a dry unit weight of 121 pcf, and correlated SPT blow counts from the field exploration were recorded as N=31. Therefore, it is our opinion that the sample subjected to consolidation testing was likely disturbed.

Direct shear tests conducted on ring samples collected from borings B-2 at a depth of 2.5 feet, B-3 at a depth of 5 feet, B-5 at a depth of 10 feet, and B-6 at a depth of 30 feet resulted in friction angles of 32.6, 32.7, 32.5, and 35.1 degrees, respectively.

## Seismic Characterization

### Seismic Site Class

Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our opinion that the Seismic Site Class is D. The 2022 California Building Code (CBC) Seismic Design Parameters have been generated using the ASCE 7

[1] California State Groundwater Management Agency Data Viewer website (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels)

Hazard Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2022 CBC. The 2022 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped $S_1$ value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients ($F_a$ and $F_v$) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2022 CBC.

| Description | Value |
|---|---|
| **2022 California Building Code Site Classification (CBC)**[1] | D[2] |
| **Site Latitude (°N)** | 34.4282 |
| **Site Longitude (°W)** | 117.3826 |
| **$S_s$ Spectral Acceleration for a 0.2-Second Period** | 1.5 |
| **$S_1$ Spectral Acceleration for a 1-Second Period** | 0.589 |
| **$F_a$ Site Coefficient for a 0.2-Second Period** | 1.0 |
| **$F_v$ Site Coefficient for a 1-Second Period** | 1.711 |

1. Seismic site classification in general accordance with the *2022 California Building Code*.
2. The 2022 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the 100-foot soil profile determination. Borings were extended to a maximum depth of 21½ feet, and this seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

A site-specific ground motion study may generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

### Faulting and Estimated Ground Motions

The site is located in southern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the San Andreas (San Bernardino N) fault is considered to have the most significant effect at the site from a design standpoint with a magnitude of 7.92 at a distance of approximately 18.3 kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the design peak ground acceleration ($PGA_M$) for the project site is 0.55g. Based on the USGS Unified Hazard Tool, the project site seismicity for the 2% chance of exceedance hazard in 50 years is defined by a modal magnitude of 8.09.

The site is not located within an Alquist-Priolo Earthquake Fault Zone for fault rupture hazard based on our review of the State Fault Hazard Maps.[2]

## Liquefaction

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The County of San Bernardino has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

The project site is not located within a liquefaction hazard zone as designated by the County of San Bernardino. Based on county maps and the depth to groundwater, liquefaction hazard potential at the site is considered low. Other geologic hazards related to liquefaction, such as lateral spreading, are therefore also considered low.

[2] California Geological Survey. https://maps.conservation.ca.gov/cgs/informationwarehouse.

# Stormwater Management

Two shallow in-situ infiltration tests (falling head borehole permeability) were performed at approximate depths of 5 and 10 feet bgs within a borehole drilled with a 8-inch diameter auger. The objective of the testing is to provide infiltration rates for designing the proposed infiltration system. A 2-inch thick, 3/4-inch gravel layer was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A three-inch diameter perforated pipe was installed on top of the gravel layer and gravel was used to backfill between the perforated pipes and the boring sidewall. The borings were then filled with water for a pre-soak period.

At the beginning of each test, the pipes were refilled with water and readings were taken at periodic time intervals as the water level dropped. The soil at the percolation test locations was classified in the field using a visual/manual procedure. The infiltration velocity is presented as the infiltration rate and is summarized in the following table. The infiltration rates provided do not include safety factors.

| Test Location | Boring Depth (ft.)[1] | Test Depth Range (ft.) [1] | Soil Type | Percolation Rate Average (in./hr.) | Infiltration Rate Average (in.hr.) [2] |
|---|---|---|---|---|---|
| P-1 | 5 | 0 to 5 | SM | 60.9 | 2.49 |
| P-2 | 10 | 5 to 10 | SM | 14.4 | 0.62 |

1. Below existing ground surface.
2. If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. Correlation was based on the Porchet method.

Near-surface soils encountered in our subsurface explorations tended to be loose to medium dense in the upper 5 feet, underlain by dense or very dense sands after 5 feet. The relative density of the sands may account for the difference in infiltration rates measured at 5 and 10 feet bgs. We recommend additional study of the infiltration area and depths once a final stormwater management plan is designed in order to characterize the infiltration rate at the design depths.

The field test results are not intended to be design rates. They represent the result of our tests, at the depths and locations indicated, as described above. The design rate should be determined by the designer by applying an appropriate factor of safety.

With time, the bottoms of infiltration systems tend to plug with organics, sediments, and other debris. Long term maintenance will likely be required to remove these deleterious materials to help reduce decreases in actual percolation rates.

The percolation tests were performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content. The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located a minimum of 10 feet from any existing or proposed foundation system.

# Corrosivity

The results of laboratory sulfides, soluble sulfate, chlorides, electrical resistivity, redox potential, total salts, and pH testing are presented in our appendix within the **Exploration Results** section. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

# Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

Foundations and floor slabs for the proposed Fuel Center Building, and car wash should bear on engineered fill extending to a minimum depth of 3 feet below the bottom of foundations, or 5 feet below existing grades, whichever is greater.

Fuel station canopies and monument signs may be supported on drilled piers bearing on undisturbed native soils.

Our opinion of pavement section design has been developed based on our understanding of the intended use, assumed traffic, and subgrade preparation recommended herein using the AASHTO 1993 methodology. The **Pavements** section includes minimum pavement component thickness.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

# Earthwork

Earthwork is anticipated to include demolition, clearing and grubbing, excavations, and engineered fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

An on-site, pre-job meeting with the owner, the contractor and the Geotechnical Engineer should occur prior to all grading-related operations. Observation, testing, documentation, and reporting of the grading operation should be performed by the Geotechnical Engineer of Record. A final compaction report should be issued by the Geotechnical Engineer of Record at the completion of the grading operation. Interim reports may be issued according to project requirements. Operations undertaken at the site without the Geotechnical Engineer present may result in exclusions of affected areas from compaction reports for the project.

Grading of the subject site should be performed, at a minimum, in accordance with these recommendations and with applicable portions of the current version of CBC. The following recommendations are presented for your assistance in establishing proper grading criteria.

## Site Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded

to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

Evidence of utilities such as manhole covers, or utility markings was not observed onsite. Although no evidence underground facilities such as septic tanks, cesspools, or basements was observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

## Subgrade Preparation

Due to the low bearing capacity of the near surface soils, foundations and floor slabs for the proposed Fuel Center Building and car wash should bear on engineered fill extending to a minimum depth of 3 feet below the bottom of foundations, or 5 feet below existing grade, whichever is greater. Engineered fill placed beneath the proposed foundations should extend horizontally a minimum distance of 3 feet beyond the outside edge of perimeter footings.

Subgrade soils beneath exterior slabs and pavements should be scarified, moisture conditioned, and compacted to a minimum depth of 10 inches. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report.

## Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Onsite soils consist of cohesionless sandy soils. Such soils have the tendency to cave and slough during excavations. Therefore, formwork may be needed for foundation excavations.

We recommend that the underground storage tanks be over-excavated by about 2 feet in plan area to provide adequate access around the excavation for underground storage tanks construction. The walls of the proposed excavation should be shored or sloped in conformance with OSHA excavation and trench safety standards. If any excavation is extended to a depth of more than 20 feet, it will be necessary to have the side slopes designed by a professional engineer.

Soils from the excavation should not be stockpiled higher than six 6 feet or within ten 10 feet of the edge of an open trench. Construction of open cuts adjacent to existing structures, including underground pipes, is not recommended within a 1½ H:1V plane

extending beyond and down from the perimeter of the structure. Cuts that are proposed within five 5 feet of light standards, other utilities, underground structures, and pavement should be provided with temporary shoring.

It may be necessary for the contractor to retain a geotechnical engineer to monitor the soils exposed in all excavations and provide engineering services for slopes. This will provide an opportunity to monitor the soils encountered and to modify the excavation slopes as necessary. It also offers an opportunity to verify the stability of the excavation slopes during construction.

The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction. Onsite soils consist of cohesionless sandy soils. Such soils have the tendency to cave and slough during excavations. Therefore, formwork may be needed for foundation excavations.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench saf ety standards.

## Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than 6 inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- foundation backfill
- pavement areas
- exterior slab areas

**Imported Fill Materials:** Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris.

| Gradation | Percent Finer by Weight (ASTM C 136) |
|---|---|
| 3” | 100 |
| No. 4 Sieve | 50-100 |
| No. 200 Sieve | 10-40 |

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum expansion index* ..... 20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

## Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements:

| Material Type and Location | Per the Modified Proctor Test (ASTM D 1557) | | |
|---|---|---|---|
| | Minimum Compaction Requirement | Range of Moisture Contents for Compaction Above Optimum | |
| | | Minimum | Maximum |
| **On-site soils or low-volume change imported fill:** | | | |
| Beneath foundations: | 90% | -1% | +3% |
| Beneath slabs: | 90% | -1% | +3% |
| Fill greater than 5 feet in depth: | 95% | -1% | +3% |
| Utility trenches[1]: | 90% | -1% | +3% |
| Beneath pavements: | 95% | -1% | +3% |
| Miscellaneous backfill: | 90% | -1% | +3% |
| Bottom of excavation receiving fill: | 90% | -1% | +3% |
| **Aggregate base** (beneath pavements): | 95% | -1% | +3% |

1. Upper 12 inches should be compacted to 95% within pavement and structural areas; low-volume change imported soils should be used in structural areas.

## Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations or existing utilities without engineering review of shoring requirements and geotechnical observation during construction.

On-site materials are considered suitable for backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

## Exterior Slab Design and Construction

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill;
- controlling moisture-density during placement of backfill;
- using designs which allow vertical movement between the exterior features and adjoining structural elements;
- placing effective control joints on relatively close centers.

## Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 5 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verifie d to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Trees or other vegetation whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the structure. Trees and shrubbery should be kept away from the exterior of the structure a distance at least equal to their expected mature height.

We recommend a minimum horizontal setback distance of 10 feet from the perimeter of any building and the high-water elevation of the nearest storm-water retention basin.

We recommend construction activities minimize soil compaction at the bottom of infiltration systems. Soil compaction damages soil structure, reduces infiltration rates, limits root growth and plant survivability, and destroys soil organisms. For these reasons

site planning, design, and execution, where appropriate, should restrict compaction to infiltration areas.

## Earthwork Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

## Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift

of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 50 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill. This testing frequency criteria may be adjusted during construction as specified by the geotechnical engineer of record.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

# Shallow Foundations

Shallow foundation recommendations are provided for the proposed Fuel Center Building. If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

## Design Parameters

| Item | Description |
|---|---|
| **Foundation Type** | Conventional Shallow Spread Footings |
| **Maximum Net Allowable Bearing Pressure** [1, 2] | 2,500 psf |
| **Required Bearing Stratum** [3] | Engineered fill extending to a minimum depth of 3 feet below the bottom of foundations, or 5 feet below existing grades, whichever is greater. |
| **Minimum Foundation Dimensions** | Walls: 18 inches wide<br>Columns: 24 inches wide |
| **Minimum Embedment below Finished Grade** [4] | 24 inches |
| **Ultimate Passive Resistance** [5] | 450 pcf |

| Item | Description |
|---|---|
| **Ultimate Coefficient of Sliding Friction** [6] | 0.42 |
| **Estimated Total Static Settlement from Structural Loads** [2] | Less than 1 inch |
| **Estimated Static Differential Settlement** [2, 7] | About 1/2 of total settlement |

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
2. Values provided are for maximum loads noted in **Project Description**. Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. Unsuitable or soft soils should be overexcavated and replaced per the recommendations presented in **Earthwork**.
4. Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
5. Use of passive earth pressures requires the footing forms be removed and compacted structural fill be placed against the vertical footing face. A factor of safety of 2.0 is recommended.
6. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions. A factor of safety of 1.5 is recommended.
7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 40 feet.

### Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

## Deep Foundations

Drilled pier recommendations are provided for the proposed fuel station canopy and monument signs. We recommend drilled piers be designed and constructed as presented below.

## Drilled Shaft Axial Loading

Axial compressive loads may be supported on straight-sided drilled piers. Allowable compressive side friction capacity is provided for different pile diameters (1.5 feet to 4.0 feet) in the **Attachments** of this report. The axial capacity within the upper 2 feet should neglected. The allowable uplift capacities should only be based on two-thirds of the allowable side friction of the shaft; however, the weight of the foundation should be added to these values to obtain the actual allowable uplift capacities for drilled shafts. The allowable skin friction and end bearing values are based on factors of safety of 2.5 and 3, respectively.

## Drilled Shaft Lateral Loading

The following table lists input values for use in LPILE or GROUP analyses of proposed light pole foundations. Since deflection or a service limit criterion will most likely control lateral capacity design, no safety/resistance factor is included with the parameters.

| LPILE Input Soil Parameters[1, 2] | | | | | | |
|---|---|---|---|---|---|---|
| **Layer** | **Depth Below Finished Grade Surface (feet)** | | **LPILE Soil Type** | **Effective Unit Weight (pcf)** | **Friction Angle (degrees)** | **Cohesion (psf)** |
| | **Top** | **Bottom** | | | | |
| 1 | 2[3] | 7.5 | Reese (Sand) | 110 | 32 | -- |
| 2 | 7.5 | 15 | Reese (Sand) | 130 | 33 | -- |
| 3 | 15 | 20 | Reese (Sand) | 120 | 31 | -- |
| 4 | 20 | 30 | Reese (Sand) | 115 | 36 | -- |

1. Default K and $E_{50}$ values may be utilized.
2. LPILE input parameters are based on field and laboratory test data from borings B-1, and B-2.

| LPILE Input Soil Parameters[1, 2] | | | | | | |
|---|---|---|---|---|---|---|
| Layer | Depth Below Finished Grade Surface (feet) | | LPILE Soil Type | Effective Unit Weight (pcf) | Friction Angle (degrees) | Cohesion (psf) |
| | Top | Bottom | | | | |

3. The lateral capacity from the upper 2 feet should be neglected due to potential utility trenches and disturbance.

LPILE default soil modulus values can be used. The load capacities provided herein are based on the stresses induced in the supporting soil strata. The structural capacity of the shafts/piles should be checked to assure they can safely accommodate the combined stresses induced by axial and lateral forces. Lateral deflections of shafts/piles should be evaluated using an appropriate analysis method, and will depend upon the pile's diameter, length, configuration, stiffness and "fixed head" or "free head" condition. We can provide additional analyses and estimates of lateral deflections for specific loading conditions upon request. The load-carrying capacity of shafts/piles may be increased by increasing the diameter and/or length.

## Drilled Shaft Construction Considerations

Drilling for the proposed drilled shafts to design depths should be possible with conventional single flight power augers. For drilled shaft depths above the depth of groundwater, temporary steel casing will likely be required to properly drill and clean shafts prior to concrete placement.

We do not anticipate drilled shafts to extend below the depth of groundwater. However, if foundation concrete cannot be placed in dry conditions, a tremie should be used for concrete placement.

In the event drilled hole walls slough during drilling, we recommend the use of slurry drilling methods with polymers to keep the solids in suspension during the drilling. Drilled shaft foundation concrete should be placed within 6 inches of the shaft base of the slurry-filled excavation immediately after completion of drilling and cleaning. The tremie should remain inserted several feet into the fresh concrete as it displaces the slurry upward and until placement is complete. The slurry should have a sand content no greater than 1% at the time concrete placement commences. The maximum unit weight of the slurry should be established in consultation with Terracon. Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes.

If casing is used for drilled shaft construction, it should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent infiltration of water or the creation of voids in shaft concrete. Shaft concrete should have a relatively high fluidity when placed in cased shaft holes or through a tremie. Shaft concrete with slump in the range of 6 to 8 inches is recommended.

Formation of mushrooms or enlargements at the tops of shafts should be avoided during shaft drilling. If mushrooms develop at the tops of the shafts during drilling, sono-tubes should be placed at the shaft tops to help isolate the shafts.

Free-fall concrete placement in drilled shafts will only be acceptable if provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. The use of a bottom-dump hopper, or an elephant's trunk discharging near the bottom of the hole where concrete segregation will be minimized, is recommended.

The contractor should check for gas and/or oxygen deficiency prior to any workers entering the excavation for observation and manual cleanup. All necessary monitoring and safety precautions as required by OSHA, State or local codes should be strictly enforced.

We recommend that all drilled shaft installations be observed on a full-time basis by an experienced geotechnical engineer in order to evaluate that the soils encountered are consistent with the recommended design parameters. If the subsurface soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

Temporary steel casing may be required to properly drill and clean drilled piers prior to concrete placement. A water and polymer displacement method may also be considered as a means of maintaining pier integrity during construction. Foundation concrete should be placed immediately after completion of drilling and cleaning.

Drilled pier bearing surfaces must be thoroughly cleaned prior to concrete placement. A representative of the Geotechnical Engineer should inspect the bearing surface and foundation pier configuration. If the subsurface soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

The installation of drilled straight-shafts may likely require the use of the slurry displacement method and/or temporary steel casing with water pumps, if groundwater encountered. If drilled straight-shaft installation is attempted without utilizing slurry displacement method or temporary casing, zones of sloughing soils and/or groundwater inflow may occur during construction. Therefore, we recommend that provisions be incorporated into the plans and specifications to utilize slurry or casing to control sloughing and/or groundwater seepage during shaft construction.

Closely spaced piers should be drilled and filled alternately, allowing the concrete to set at least eight hours before drilling the adjacent pier. All excavations should be filled with concrete as soon after drilling as possible. In no event should pier holes be left open overnight. To prevent concrete from striking the walls of the pier and causing caving, the concrete should be placed with appropriate equipment so that the concrete is not allowed to fall freely more than 5 feet. All loose materials should be thoroughly cleaned from the bottom of the pier excavation.

# Floor Slabs

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

## Floor Slab Design Parameters

| Item | Description |
|---|---|
| **Floor Slab Support** | Engineered fill extending to a minimum depth of 3 feet below the bottom of foundations, or 5 feet below existing grades, whichever is greater. |
| **Subbase** | Minimum 4 inches of Aggregate Base |
| **Estimated Modulus of Subgrade Reaction** | 200 pounds per square inch per inch (psi/in) for point loads. (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas. |

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks

beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

### Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

## Lateral Earth Pressures

### Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction, and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top.

The recommended design lateral earth pressures are ultimate values and do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls. These values are for horizontal backfill only. Lateral earth pressures should be adjusted as necessary for surcharge loads, sloping backfill, hydrostatic pressures, live loads near the wall (including compaction equipment), and/or seismic loads as appropriate.

| PARAMETER | VALUE[1, 2] |
|---|---|
| Active Pressure | 36 psf/ft |
| Passive Pressure | 450 psf/ft |
| At-Rest Pressure | 56 psf/ft |
| Coefficient of Friction | 0.42 |

1. The values are based on engineered fill materials used as backfill.
2. Assumes a uniform, horizontal backfill, compacted to at least 90% of the ASTM D 1557 maximum dry density of 134 pcf and optimum moisture content of 7.0%.

The design of retaining structures and shoring systems should consider surcharge loads imposed on the foundations. In addition, the design should take into consideration new and existing footing loads and anticipated vehicular loads in the vicinity of the proposed basement walls. In general, surcharge loads should be considered where they are located within a horizontal distance behind the wall equal to the height of the wall.

Surcharge loads acting at the top of the wall should be applied to the wall over the backfill as a uniform pressure over the entire wall height, and should be added to the static earth pressures. Surcharge stresses due to point loads, line loads, and those of limited extent, such as compaction equipment, should be evaluated using elastic theory.

For the design of braced shoring, we recommend such shoring be designed using a rectangular-shaped distribution of lateral earth pressure of 25H psf, where H (in units of feet) is the height of the braced shoring. Surcharge loads from the drive lanes should be also considered in the design of the shoring.

Fill against foundation and retaining walls should be compacted to densities specified in the Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Over-compaction may cause excessive lateral earth pressures on the wall.

The design of the shored excavation should be performed by an engineer knowledgeable and experienced with the on-site soil conditions. The contractor should be aware that slope height, slope inclination or excavation depths should in no case exceed those specified in local, state or federal safety regulations, e.g., OSHA Health and Safety Standards for Excavation, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if not followed, the owner or the contractor could be liable for substantial penalties.

# Pavements

## General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

## Pavement Design Parameters

Laboratory testing conducted on a bulk soil sample taken from the site resulted in an R-value of 52. A design R-Value of 50 was used to calculate the asphalt concrete pavement thickness sections and the Portland cement concrete pavement sections. R-value testing should be completed prior to pavement construction to verify the design R-value.

The structural sections are predicated upon proper compaction of the utility trench backfills and the subgrade soils as prescribed by in **Earthwork**, with the upper 12 inches of subgrade soils and all aggregate base material brought to a minimum relative compaction of 95 percent in accordance with ASTM D 1557 prior to paving. The aggregate base should meet Caltrans requirements for Class 2 base.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic loading listed in the table below.

Pavement calculations are based on geotechnical specifications provided by the project owner using the AASHTO 1993 method. Design criteria for both standard and heavy duty pavements is based on 18-kip Equivalent Single Axle Load (ESAL) values as shown in the tables below, using a terminal serviceability of 2.0, reliability of 85%, initial serviceability of 4.2, and a standard deviation of 0.45 for flexible pavements and 0.35 for rigid pavements. If more specific traffic information becomes available for the site, we should be contacted to reevaluate the pavement calculations.

## Pavement Section Thicknesses

The following table provides our opinion of minimum thickness for AC sections:

**Asphaltic Concrete Design**

| Layer | Thickness (inches) | |
|---|---|---|
| | Standard Duty [2] | Heavy Duty [3] |
| Asphalt Concrete [1, 4] | 3 | 3 |
| Aggregate Base[1] | 4 | 6 |

1. All materials should meet the Caltrans Standard Specifications for Highway Construction.
2. 2,200 ESAL
3. 18,000 ESAL
4. Flexible pavement structural sections were calculated utilizing the AASHTO 1993 method.

The following table provides our estimated minimum thickness of PCC pavements.

**Portland Cement Concrete Design**

| Layer | Thickness (inches) | |
|---|---|---|
| | Standard Duty [2] | Heavy Duty [3] |
| PCC [1] | 5 | 6 |
| Aggregate Base[1] | 4 | 4 |

1. All materials should meet the Caltrans Standard Specifications for Highway Construction.
2. 2,200 ESAL
3. 18,000 ESAL

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles.

A minimum 4-inch thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its "green" state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. Islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils are particular areas of concern. The civil design for the pavements with these conditions should include features to restrict or collect and discharge excess water from the islands. Examples of features are edge drains connected to the stormwater collection system, longitudinal subdrains, or other suitable outlets and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

## Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

## Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic upkeep should be anticipated. Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Pavement care consists of both localized (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Additional engineering consultation is recommended to determine the type and extent of a cost -effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.

- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.

Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

# General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in the geographic vicinity and at the time these services have been performed. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that

could significantly effect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

# Attachments

# Exploration and Testing Procedures

## Field Exploration

| Boring Designation | Approximate Boring Depth or Refusal (feet) | Location |
|---|---|---|
| B-1 | 21½ | Fuel Center Building |
| B-2 | 21½ | Fuel Station Canopy |
| B-3 | 21½ | Fuel Station Canopy |
| B-4 | 21½ | Car Wash Building |
| B-5 | 21½ | Fuel Storage Tanks |
| B-6 | 31½ | Monument Sign |
| B-7 | 31½ | Monument Sign |
| B-8 | 31½ | Monument Sign |
| B-9 | 6½ | Pavement Area |
| B-10 | 6½ | Pavement Area |
| B-11 | 6½ | Pavement Area |
| P-1 | 5 | Infiltration Area |
| P-2 | 10 | Infiltration Area |

**Boring Layout and Elevations:** Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

**Subsurface Exploration Procedures:** We advanced the borings with a truck-mounted drill rig using continuous flight hollow stem augers. Four samples were generally obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 3-inch O.D. split-barrel sampling spoon with 2.5-inch I.D. ring lined sampler was also used for sampling soils at the project site. Ring-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

## Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Dry Unit Weight
- Atterberg Limits
- Particle-size Distribution (Gradation) of Soils Using Sieve Analysis
- One-dimensional Consolidation
- Direct Shear
- Modified Proctor (ASTM D 1557)
- R-value
- Corrosion Suite

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

# Site Location and Exploration Plans

**Contents:**

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

## Site Location

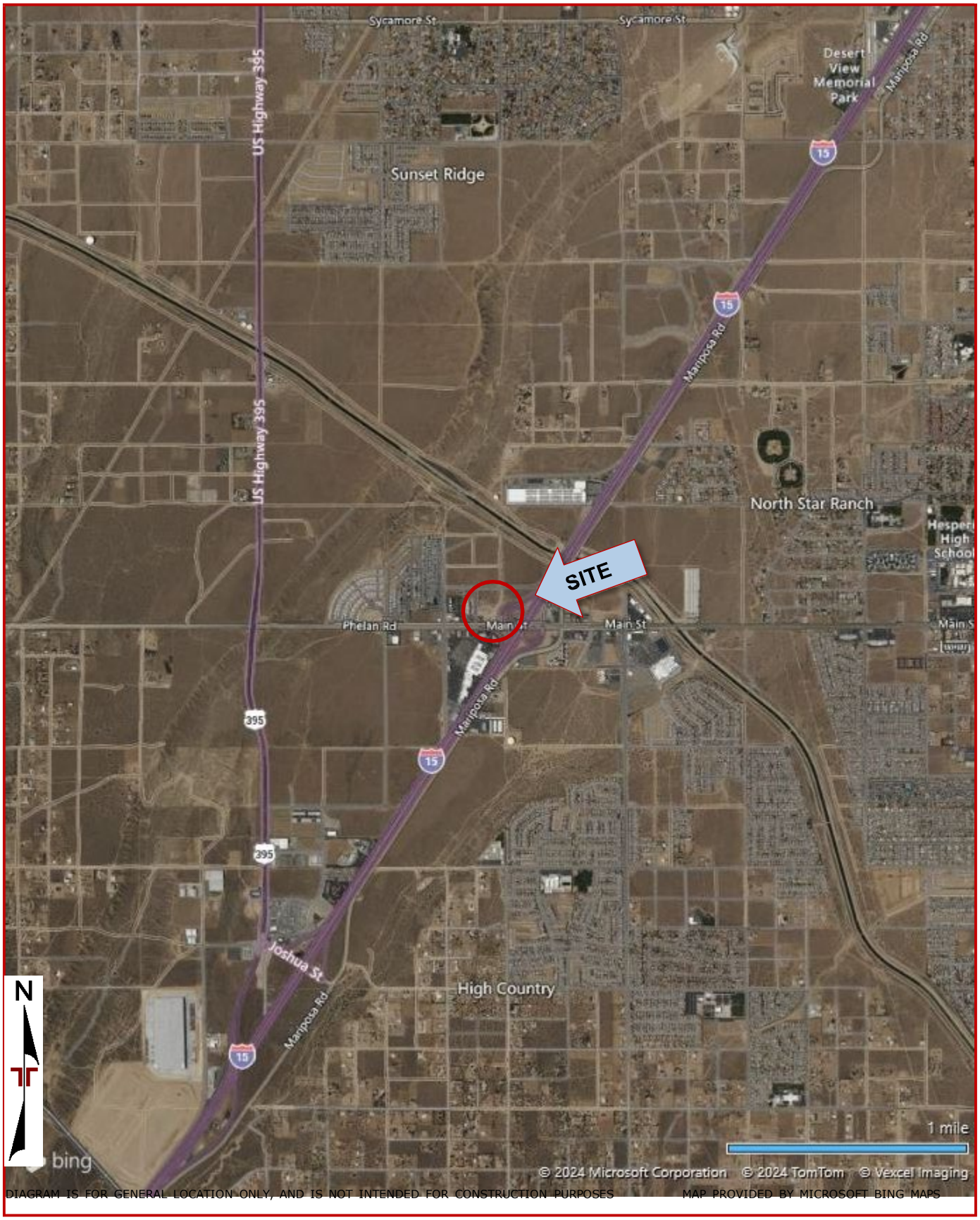



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES MAP PROVIDED BY MICROSOFT BING MAPS

## Exploration Plan

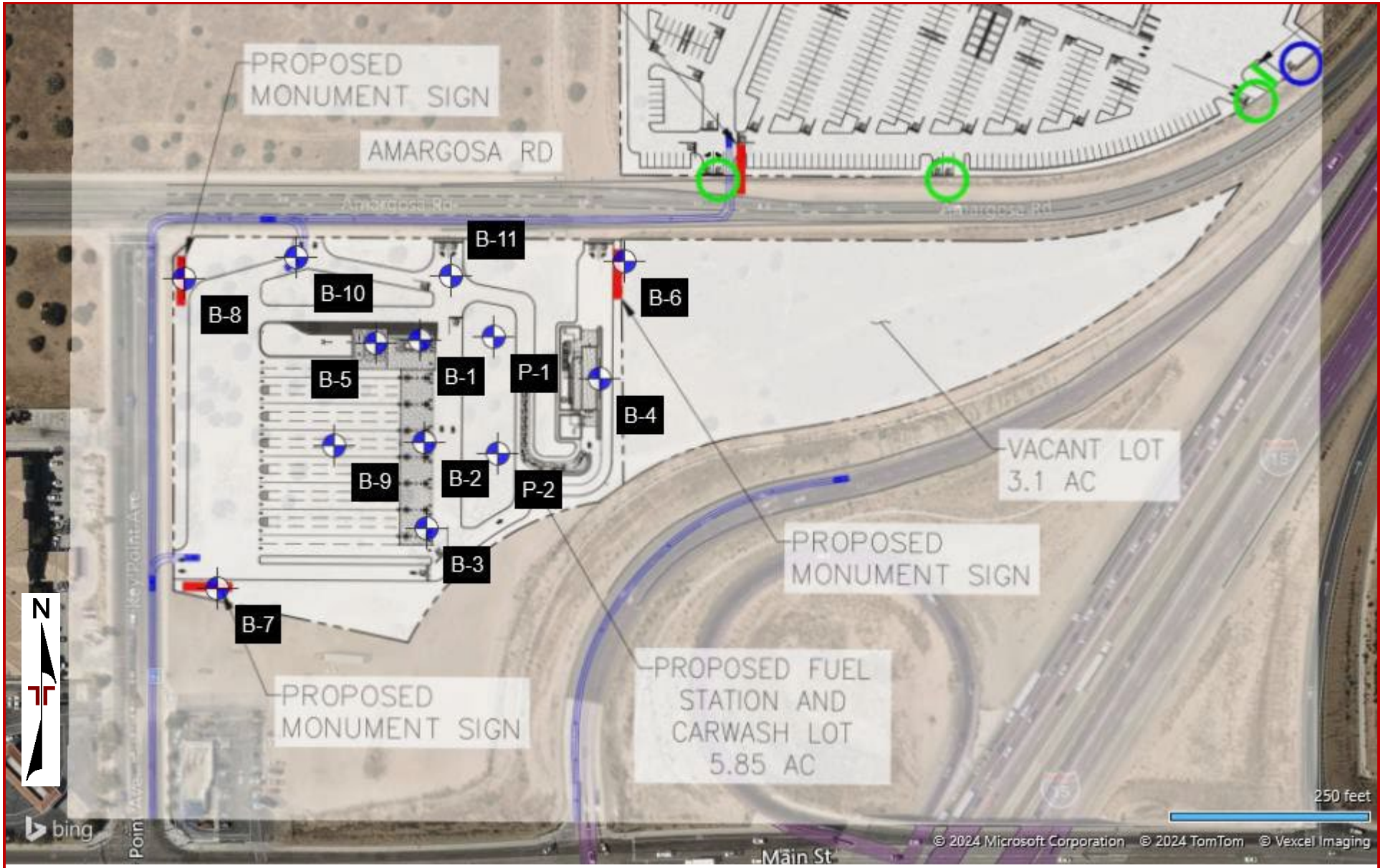



DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

# Exploration and Laboratory Results

**Contents:**

Boring Logs (B-1 through P-2)
Atterberg Limits
Consolidation/Swell
Direct Shear
Moisture Density Relationship
R-value
Corrosivity

Note: All attachments are one page unless noted above.

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-1

Location: See Exploration Plan

Latitude: 34.4286° Longitude: -117.3826°

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, brown | | | | | | | |
| | medium dense | | | 7-14-17 | 2.4 | 114 | NP | 21 |
| | 5 very dense | | | 28-50/5" | 6.0 | 111 | | |
| | coarse grained, reddish brown | | | 37-45-50/6" | 4.4 | 112 | | |
| | 10 dense | | | 20-30-32 | 2.9 | 105 | | 50 |
| | 15 fine to medium grained, brown, medium dense | | | 7-9-11 N=20 | | | | |
| | 20 | | | 7-8-11 N=19 | | | | |
| | 21.5 | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-2

Location: See Exploration Plan

Latitude: 34.4282° Longitude: -117.3826°

| Graphic Log | Depth (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine to medium grained, brown | | | | | | | | |
| | medium dense | | | | 6-12-16 | 1.9 | 116 | | |
| | | 5 | | | | | | | |
| | dense | | | | 6-22-22 N=44 | | | | 27 |
| | very dense | | | | 50/5" | 4.3 | 110 | | |
| | | 10 | | | | | | | |
| | reddish brown, dense | | | | 24-13-19 N=32 | | | | |
| | | 15 | | | | | | | |
| | | | | | 24-34-44 | 6.4 | 110 | | |
| | 20.0 | 20 | | | | | | | |
| | **POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, brown, medium dense | | | | 6-9-12 N=21 | | | | |
| | 21.5 | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-3

Location: See Exploration Plan

Latitude: 34.4279° Longitude: -117.3826°

| Depth (Ft.) | Graphic Log | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, medium grained, brown | | | | | | | |
| | very loose | | | 1-1-2 N=3 | | | | |
| 5 | coarse grained, loose | | | 3-5-5 | 5.4 | 105 | | |
| | medium dense | | | 6-7-13 N=20 | | | | 20 |
| 10 | | | | 13-21-21 | 5.9 | 123 | | |
| | fine to medium grained | | | | | | | |
| 15 | | | | 3-6-8 N=14 | | | | |
| 19.5 | **POORLY GRADED SAND WITH SILT (SP-SM)**, coarse grained, light gray, medium dense | | | | | | | |
| 20 | | | | 12-19-29 | 5.0 | 112 | | |
| 21.5 | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-4

Location: See Exploration Plan

Latitude: 34.4284° Longitude: -117.3819°

| Depth (Ft.) | Graphic Log | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, coarse grained, brown | | | | | | | |
| | medium dense | | | 20-24-26 | 3.0 | 121 | | |
| 5 | | | | | | | | |
| | | | | 11-15-21 | 3.2 | 114 | | 18 |
| | | | | 12-22-30 | 3.1 | 112 | | |
| 10 | | | | | | | | |
| | dense | | | 17-22-37 | 4.2 | 124 | | |
| 15 | | | | | | | | |
| | fine to medium grained | | | 9-15-18 N=33 | | | | |
| 20 | | | | | | | | |
| | medium dense | | | 4-6-9 N=15 | | | | |
| 21.5 | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-5

Location: See Exploration Plan

Latitude: 34.4286° Longitude: -117.3828°

| Depth (Ft.) | Description | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, brown | | | | | | | | |
| | medium dense | | | | 4-5-15 | 1.8 | 111 | | |
| | | 5 | | | | | | | |
| | dense | | | | 24-34-47 | 2.1 | 115 | | |
| | coarse grained, very dense | | | | 34-50/5" | 3.4 | 116 | | |
| | | 10 | | | 37-50/5" | 3.3 | 112 | | |
| | | 15 | | | | | | | |
| | fine grained | | | | 32-50/5" | 3.5 | 112 | | |
| 20.0 | | 20 | | | | | | | |
| | **POORLY GRADED SAND WITH SILT (SP-SM)**, coarse grained, light gray, dense | | | | 10-30-40 | 1.2 | 113 | | |
| 21.5 | | | | | | | | | |
| | ***Boring Terminated at 21.5 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-6

Location: See Exploration Plan

Latitude: 34.4288° Longitude: -117.3818°

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, light brown | | | | | | | |
| | medium dense | | | 2-5-6 N=11 | | | | |
| | 5 | | | | | | | |
| | coarse grained, reddish brown, very dense | | | 14-40-50/6" | 5.1 | 121 | | |
| | | | | 14-24-32 N=56 | | | | |
| | 10 | | | | | | | |
| | medium dense | | | 13-16-18 | 2.0 | 111 | | |
| | 15 | | | | | | | |
| | | | | 5-6-8 N=14 | | | | |
| | 20.0 | | | | | | | |
| | **POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, light brown, medium dense | | | 9-19-25 | 1.3 | 109 | | |
| | fine to coarse grained, gray and brown | | | | | | | |
| | 25 | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-6

Location: See Exploration Plan

Latitude: 34.4288° Longitude: -117.3818°

| Graphic Log | Depth (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, light brown, medium dense *(continued)* coarse grained, grayish brown | | | | 4-12-15 N=27 | | | | 7 |
| | | 30 | | | | | | | |
| | dense | | | | 13-29-39 | 2.2 | 113 | | |
| | 31.5 | | | | | | | | |
| | ***Boring Terminated at 31.5 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-7

Location: See Exploration Plan

Latitude: 34.4277° Longitude: -117.3835°

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine to medium grained, brown | | | | | | | |
| | loose | | | 2-3-4 N=7 | | | NP | 26 |
| | 5 | | | 5-7-9 | 4.8 | 111 | | |
| | medium dense | | | 2-5-9 N=14 | | | | |
| | 10 medium to coarse grained | | | 10-14-20 | 4.2 | 107 | | |
| | 15 fine to medium grained | | | 5-7-10 N=17 | | | | |
| | 18.0 **POORLY GRADED SAND WITH SILT (SP-SM)**, coarse grained, grayish brown | | | | | | | |
| | 20 medium dense | | | 9-18-30 | 4.6 | 109 | | |
| | 25 | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-7

Location: See Exploration Plan

Latitude: 34.4277° Longitude: -117.3835°

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| | **POORLY GRADED SAND WITH SILT (SP-SM)**, coarse grained, grayish brown *(continued)* | | | 11-11-13 N=24 | | | | |
| | 30 | | | | | | | |
| | dense | | | 20-31-45 | 4.6 | 113 | | |
| | 31.5 | | | | | | | |
| | ***Boring Terminated at 31.5 Feet*** | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-8

Location: See Exploration Plan

Latitude: 34.4288° Longitude: -117.3836°

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| **SILTY SAND (SM)**, fine grained, brown | | | | | | | | |
| medium dense | | | | 4-8-15 N=23 | | | | |
| very dense | 5 | | | 50/5" | 4.1 | 113 | | |
| dense | | | | 7-12-18 N=30 | | | | |
| medium to coarse grained, brown, very dense | 10 | | | 50/5" | 3.4 | 105 | | |
| dense | 15 | | | 14-24-21 N=45 | | | | |
| medium to coarse grained, light brown, very dense | 20 | | | 25-42-50/5" | 6.3 | 110 | | |
| | 25 | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-8

Location: See Exploration Plan

Latitude: 34.4288° Longitude: -117.3836°

| Graphic Log | Depth (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, brown *(continued)* fine grained, brown | | | | 9-16-24 N=40 | | | | |
| | 28.0 | | | | | | | | |
| | **SILTY SAND WITH GRAVEL (SM)**, brown, fine to coarse very dense | 30 | | | 50/5" | 1.0 | | | 12 |
| | 31.5 | | | | | | | | |
| | ***Boring Terminated at 31.5 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Logged by**
JL

**Boring Started**
05-13-2024

**Abandonment Method**
Boring backfilled with Auger Cutting

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-9

Location: See Exploration Plan

Latitude: 34.4282° Longitude: -117.3830°

| Graphic Log | Depth (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine to medium grained, brown | | | | | | | | |
| | medium dense | | | | 11-13-25 | 3.5 | 117 | | 28 |
| | | 5 | | | | | | | |
| | dense | | | | 25-38-40 | 2.1 | 113 | | |
| | 6.5 | | | | | | | | |
| | ***Boring Terminated at 6.5 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Logged by**
JL

**Boring Started**
05-13-2024

**Abandonment Method**
Boring backfilled with Auger Cutting

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-10

Location: See Exploration Plan

Latitude: 34.4289° Longitude: -117.3831°

| Graphic Log | Depth (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, brown | | | | | | | | |
| | very dense | | | | 18-46-50/5" | 2.9 | 111 | | |
| | | 5 | | | | | | | |
| | medium to coarse grained, light brown, dense | | | | 28-40-43 | 2.1 | 116 | | |
| | 6.5 | | | | | | | | |
| | ***Boring Terminated at 6.5 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. B-11

Location: See Exploration Plan

Latitude: 34.4288° Longitude: -117.3825°

| Graphic Log | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, brown | | | | | | | |
| | medium dense | | | 6-8-11 | 5.6 | 128 | | |
| | 5 | | | | | | | |
| | fine to coarse grained, reddish brown, very dense | | | 25-45-50/5" | 2.1 | 109 | | |
| | 6.5 | | | | | | | |
| | ***Boring Terminated at 6.5 Feet*** | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. P-1

| Graphic Log | Location: See Exploration Plan<br>Latitude: 34.4286° Longitude: -117.3823°<br>Depth (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, brown | | | | | | | | 23 |
| | 5.0 | 5 | | | | | | | |
| | ***Boring Terminated at 5 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Boring Log No. P-2

| Graphic Log | Location: See Exploration Plan<br>Latitude: 34.4282° Longitude: -117.3823°<br>Depth (Ft.) | Depth (Ft.) | Water Level Observations | Sample Type | Field Test Results | Water Content (%) | Dry Unit Weight (pcf) | Atterberg Limits LL-PL-PI | Percent Fines |
|---|---|---|---|---|---|---|---|---|---|
| | **SILTY SAND (SM)**, fine grained, brown | 5 | | | | | | | 30 |
| | 10.0 | 10 | | | | | | | |
| | ***Boring Terminated at 10 Feet*** | | | | | | | | |

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information for explanation of symbols and abbreviations.

**Water Level Observations**
Groundwater not encountered

**Drill Rig**
CME-55

**Hammer Type**
Automatic

**Driller**
2R Drilling

**Notes**

**Advancement Method**
Hollow stem auger

**Abandonment Method**
Boring backfilled with Auger Cutting

**Logged by**
JL

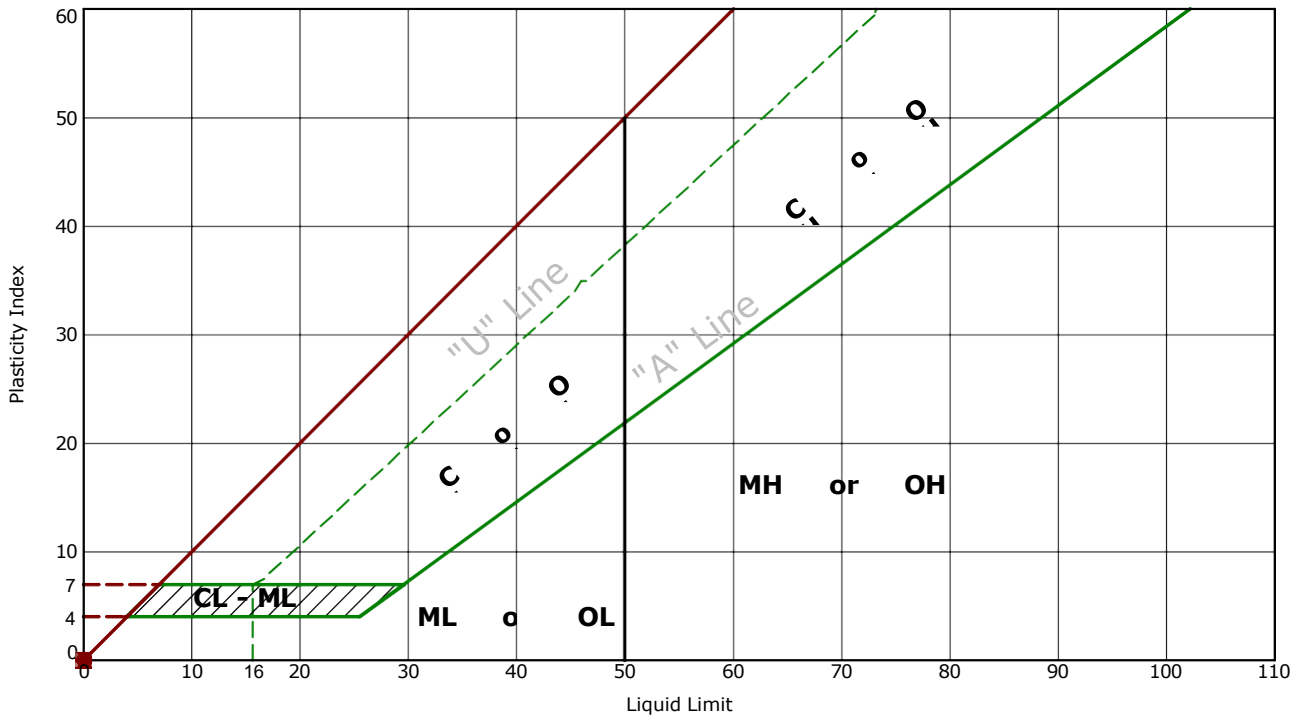
**Boring Started**
05-13-2024

**Boring Completed**
05-13-2024

Terracon
1355 E Cooley Dr
Colton, CA

# Atterberg Limit Results

## ASTM D4318




| | Boring ID | Depth (Ft) | LL | PL | PI | Fines | USCS | Description |
|---|---|---|---|---|---|---|---|---|
| ● | B-1 | 0 - 5 | NP | NP | NP | 21.4 | SM | SILTY SAND |
| ⊠ | B-7 | 2.5 - 4 | NP | NP | NP | 26.1 | SM | SILTY SAND |

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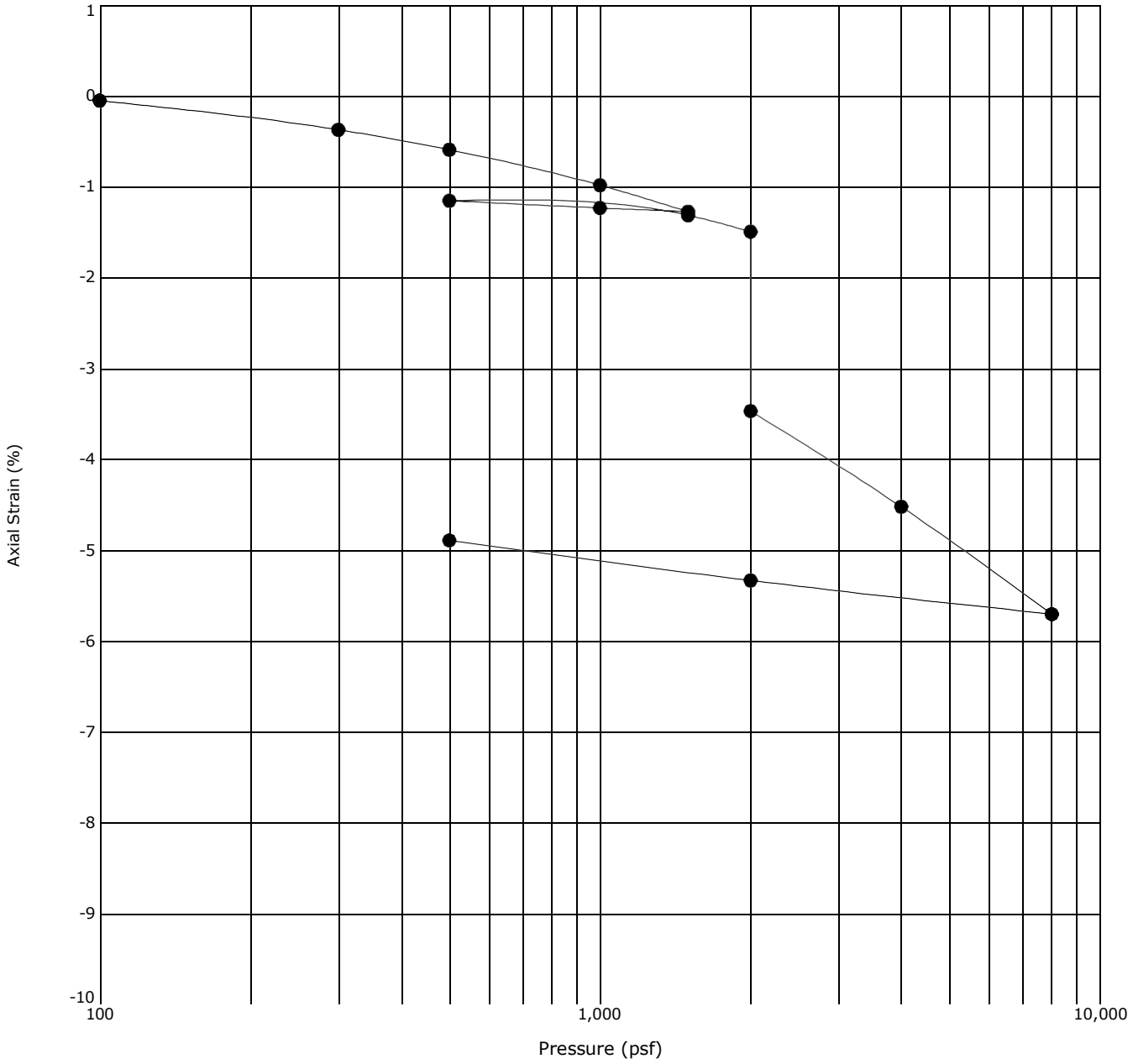
# One-Dimensional Swell or Collapse

## ASTM D4546




| Boring ID | | Depth (Ft) | Description | USCS | $\gamma_d$ (pcf) | WC (%) |
|---|---|---|---|---|---|---|
| ● | B-1 | 2.5 - 4 | SILTY SAND | SM | 114 | 2.4 |

Notes: Sample saturated at 2,000 psf

Terracon
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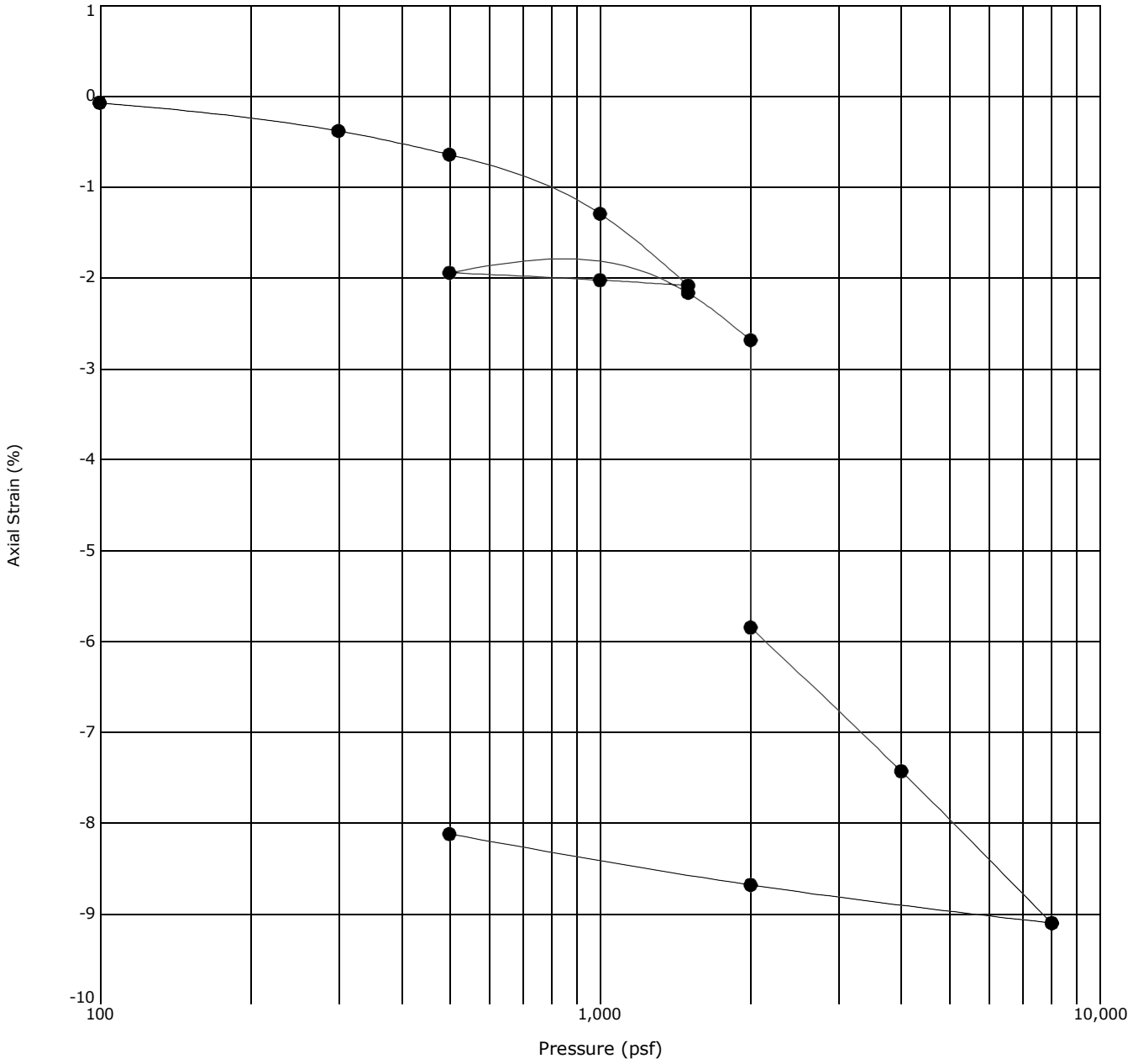
Colton, CA

# One-Dimensional Swell or Collapse

## ASTM D4546




| Boring ID | | Depth (Ft) | Description | USCS | $\gamma_d$ (pcf) | WC (%) |
|---|---|---|---|---|---|---|
| ● | B-4 | 2.5 - 4 | SILTY SAND | SM | 121 | 3.0 |

Notes: Sample saturated at 2,000 psf

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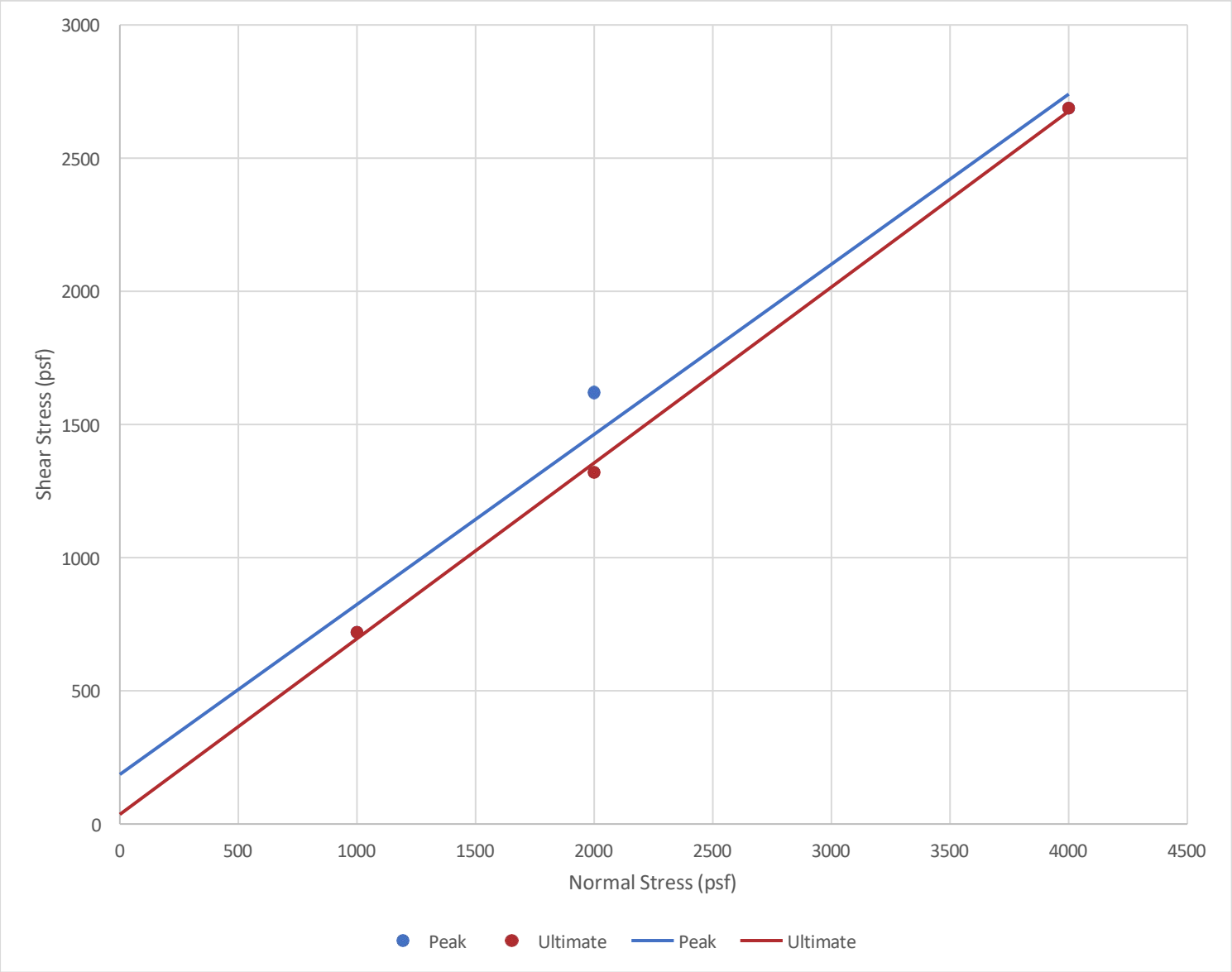
Colton, CA

# Direct Shear Test

## ASTM D3080

| Boring ID | Depth | Description | USCS | $\gamma_d$ (pcf) | W(%) |
|---|---|---|---|---|---|
| B-2 | 2.5-4' | Silty Sand | SM | 116 | 1.9 |

| Normal Stress (psf) | Peak Shear Stress (psf) | Ultimate Shear Stress (psf) | Peak | | Ultimate | |
|---|---|---|---|---|---|---|
| | | | φ° | C (psf) | φ° | C (psf) |
| 1000 | 720 | 720 | **32.6** | **186** | **33.4** | **36** |
| 2000 | 1620 | 1320 | | | | |
| 4000 | 2688 | 2688 | | | | |



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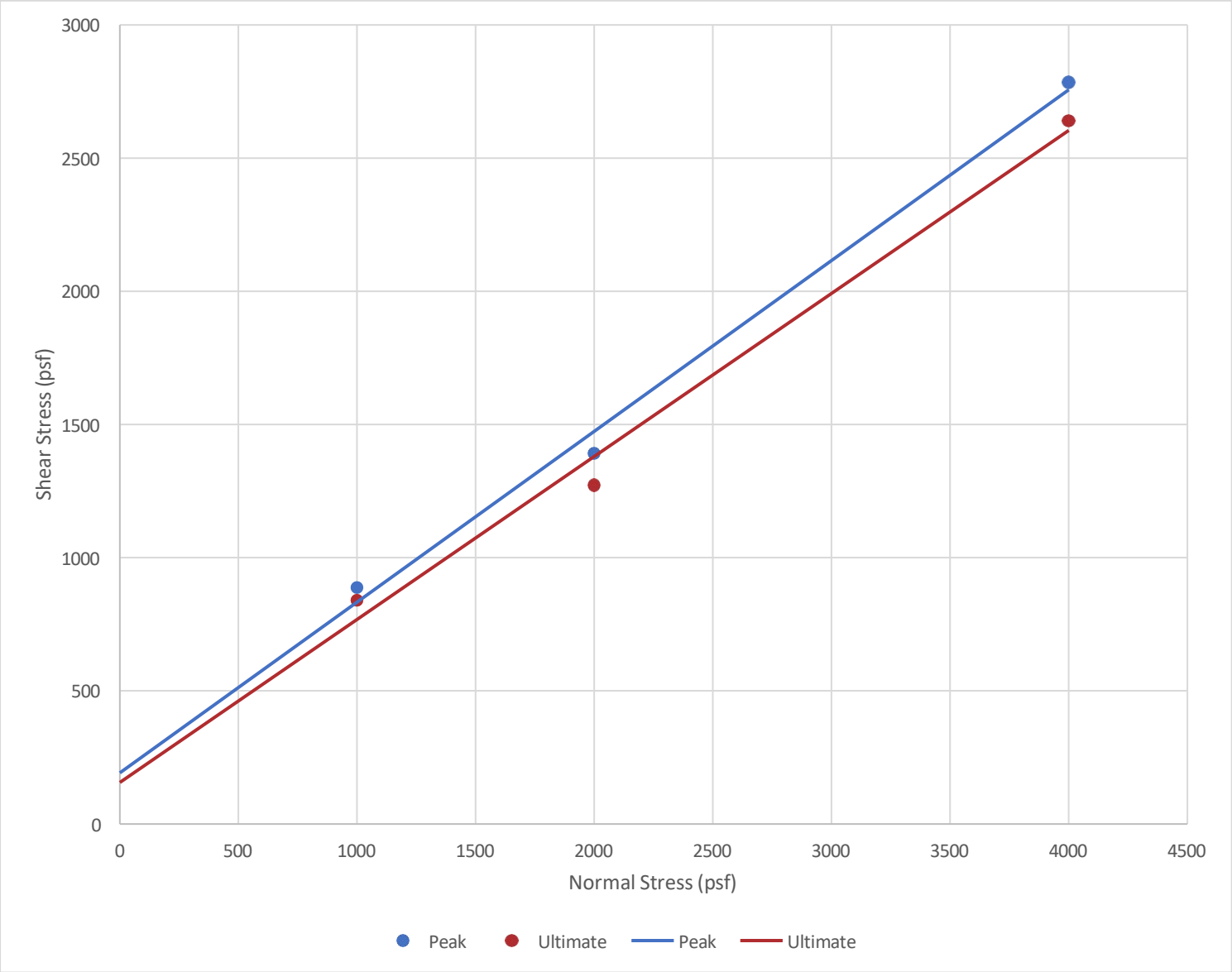
Colton, CA

# Direct Shear Test

## ASTM D3080

| Boring ID | Depth | Description | USCS | $\gamma_d$ (pcf) | W(%) |
|---|---|---|---|---|---|
| B-3 | 5-6.5' | Silty Sand | SM | 105 | 5.4 |

| Normal Stress (psf) | Peak Shear Stress (psf) | Ultimate Shear Stress (psf) | Peak | | Ultimate | |
|---|---|---|---|---|---|---|
| | | | φ° | C (psf) | φ° | C (psf) |
| 1000 | 888 | 840 | **32.7** | **192** | **31.5** | **156** |
| 2000 | 1392 | 1272 | | | | |
| 4000 | 2784 | 2640 | | | | |



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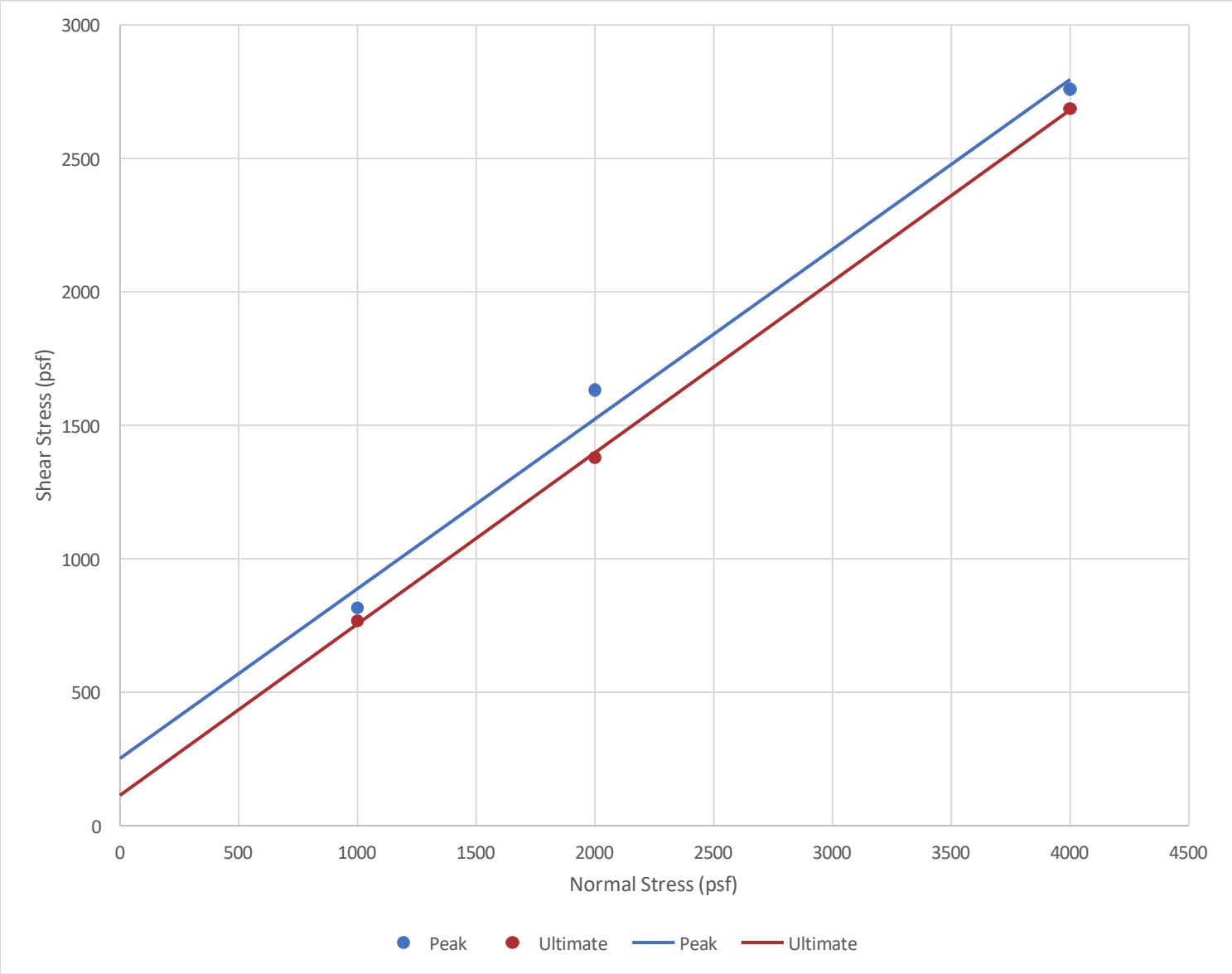
1355 E Cooley Dr
Colton, CA

# Direct Shear Test

## ASTM D3080

| Boring ID | Depth | Description | USCS | $\gamma_d$ (pcf) | W(%) |
|---|---|---|---|---|---|
| B-5 | 10-11.5' | Poorly Graded Sand | SP | 112 | 3.3 |

| Normal Stress (psf) | Peak Shear Stress (psf) | Ultimate Shear Stress (psf) | Peak | | Ultimate | |
|---|---|---|---|---|---|---|
| | | | φ° | C (psf) | φ° | C (psf) |
| 1000 | 816 | 768 | | | | |
| 2000 | 1632 | 1380 | **32.5** | **252** | **32.7** | **114** |
| 4000 | 2760 | 2688 | | | | |



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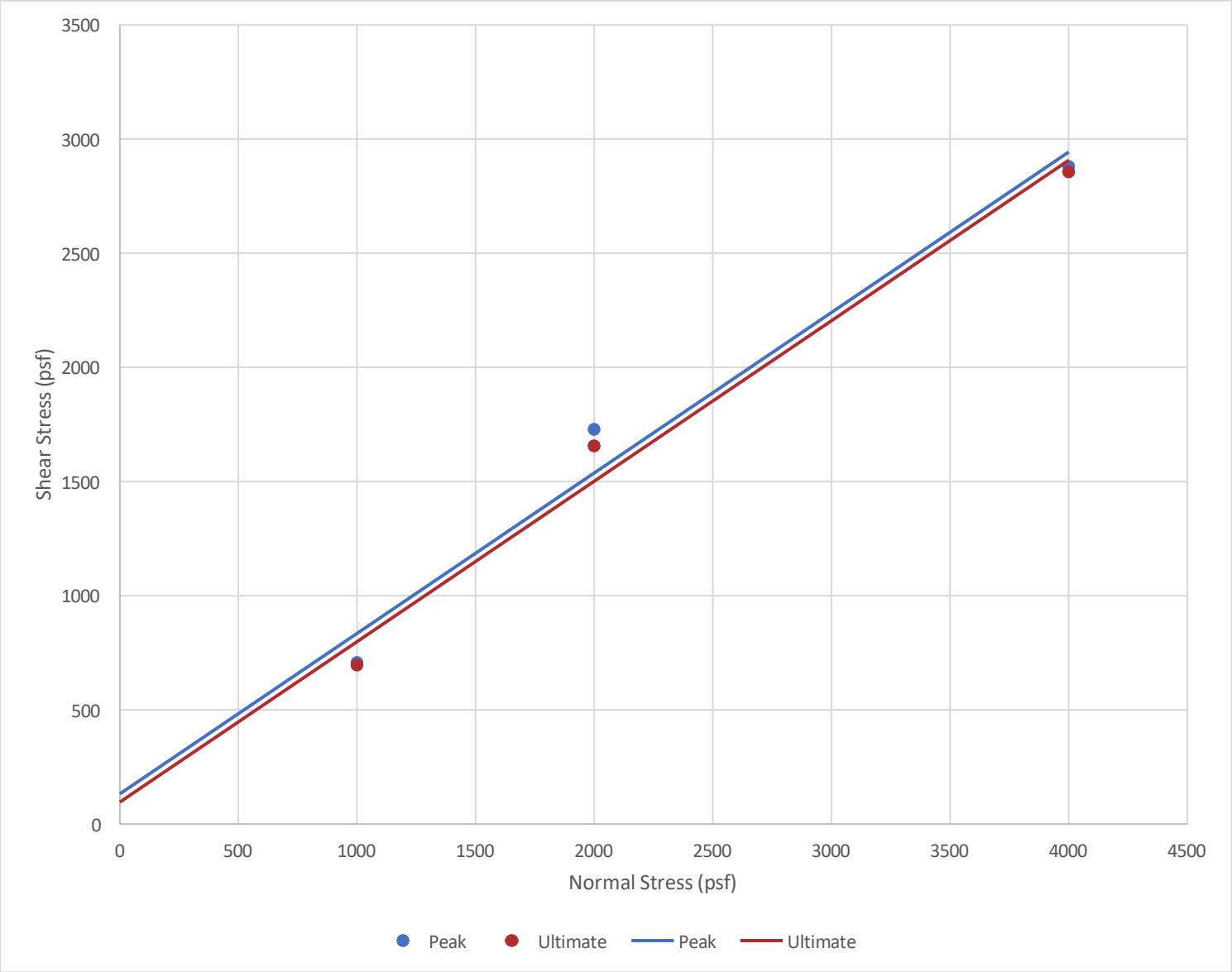
Colton, CA

# Direct Shear Test

## ASTM D3080

| Boring ID | Depth | Description | USCS | $\gamma_d$ (pcf) | W(%) |
|---|---|---|---|---|---|
| B-6 | 30-31.5' | Poorly Graded Sand with Silt | SP-SM | 113 | 2.2 |

| Normal Stress (psf) | Peak Shear Stress (psf) | Ultimate Shear Stress (psf) | Peak | | Ultimate | |
|---|---|---|---|---|---|---|
| | | | φ° | C (psf) | φ° | C (psf) |
| 1000 | 708 | 696 | | | | |
| 2000 | 1728 | 1656 | **35.1** | **132** | **35.1** | **96** |
| 4000 | 2880 | 2856 | | | | |



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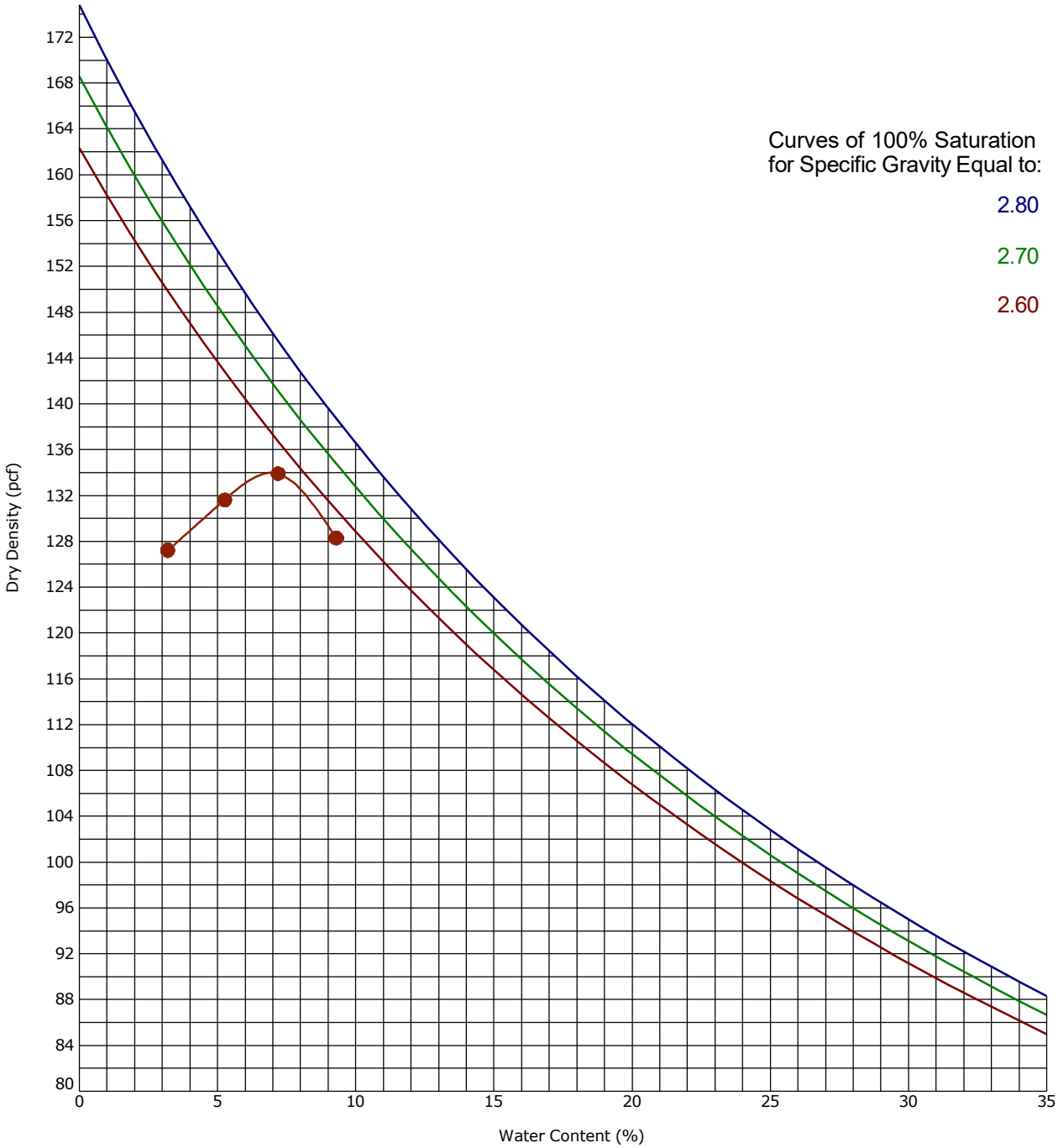
Colton, CA

# Moisture-Density Relationship

## ASTM D1557-Method A




| Boring ID | Depth (Ft) | Description of Materials |
|---|---|---|
| B-1 | 0 - 5 | SILTY SAND |

| Fines (%) | Fraction > mm size | LL | PL | PI | Test Method | Maximum Dry Density (pcf) | Optimum Water Content (%) |
|---|---|---|---|---|---|---|---|
| 21 | 0.0 | NP | NP | NP | ASTM D1557-Method A | 134.0 | 7.0 |

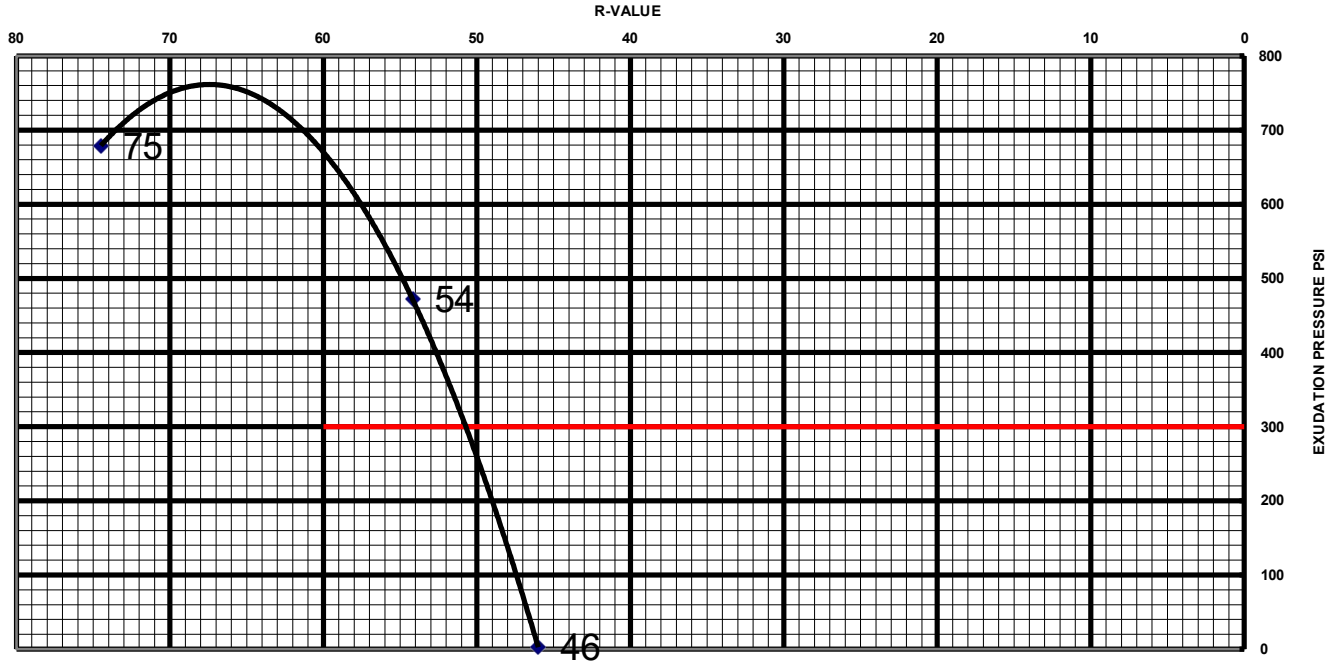
Job No. CB245067
Date. 6/7/2024

**LABORATORY RECORD OF TESTS MADE ON BASE, SUBBASE, AND BASEMENT SOILS**

**CLIENT:** Kimley-Horn and Associates
**PROJECT** Fuel Station
**LOCATION:** Hesperia, CA
**R-VALUE # :** B-9
**T.I. :**

| | A | B | C | D |
|---|---|---|---|---|
| COMPACTOR AIR PRESSURE P.S.I. | 350 | 350 | 350 | |
| INITIAL MOISTURE % | 3.7 | 3.7 | 3.7 | |
| WATER ADDED, ML | 63 | 55 | 40 | |
| WATER ADDED % | 5.6 | 4.9 | 3.6 | |
| MOISTURE AT COMPACTION % | 9.3 | 8.6 | 7.3 | |
| HEIGHT OF BRIQUETTE | 2.46 | 2.45 | 2.48 | |
| WET WEIGHT OF BRIQUETTE | 1158 | 1156 | 1157 | |
| DENSITY LB. PER CU.FT. | 130.4 | 131.6 | 131.8 | |
| STABILOMETER PH AT 1000 LBS. | 35 | 28 | 17 | |
| 2000 LBS. | 56 | 47 | 26 | |
| DISPLACEMENT | 5.45 | 5.08 | 4.41 | |
| R-VALUE | 46 | 54 | 75 | |
| EXUDATION PRESSURE | 2.54 | 472 | 679 | |
| THICK. INDICATED BY STAB. | 0.00 | 0.00 | 0.00 | |
| EXPANSION PRESSURE | 0 | 0 | 0 | |
| THICK. INDICATED BY E.P. | 0.00 | 0.00 | 0.00 | |

**EXUDATION CHART**




**R-Value:** **52**

9123 Chesapeake Dr
San Diego, CA 92123
(619) 821-3630

Terracon
Explore with us

**Client**
Kimley-Horn and Associates Inc.

**Project**
Fuel Station Hesperia

**Sample Submitted By:** Sean **Date Tested:** 6/5/2024 **Project Number:** CB245067

## Results of Corrosion Analysis

| | |
|---|---|
| **Sample Type** | Grab |
| **Sample Location** | B1 |
| **Sample Depth (ft.)** | 0'-5' |
| pH Analysis, ASTM G 51 | 7.37 |
| Water Soluble Sulfate (SO4), ASTM D516 (mg/kg) | 19.1 |
| Sulfides, AWWA 4500-$S^{2-}$ D, (mg/kg) | Nil |
| Chlorides, ASTM D512, (mg/kg) | 8.4 |
| Red-Ox, ASTM G 200, (mV) | +227 |
| Total Salts, AWWA 2520 B, (mg/kg) | 84 |
| Saturated Minimum Resistivity, ASTM G 57, (ohm-cm) | 9,000 |

**Reviewed By:**
Tom Remmel
Laboratory Manager

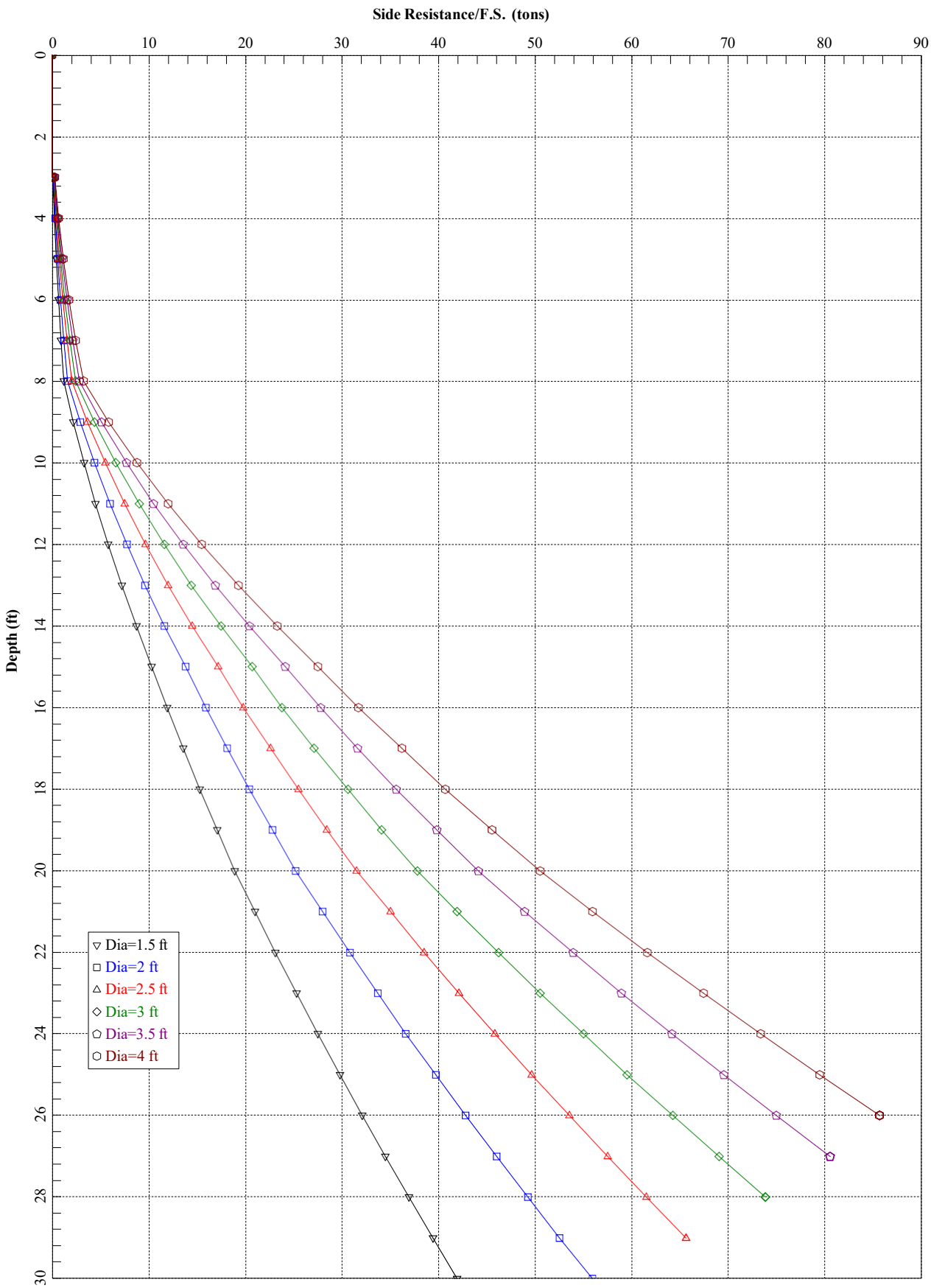
The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

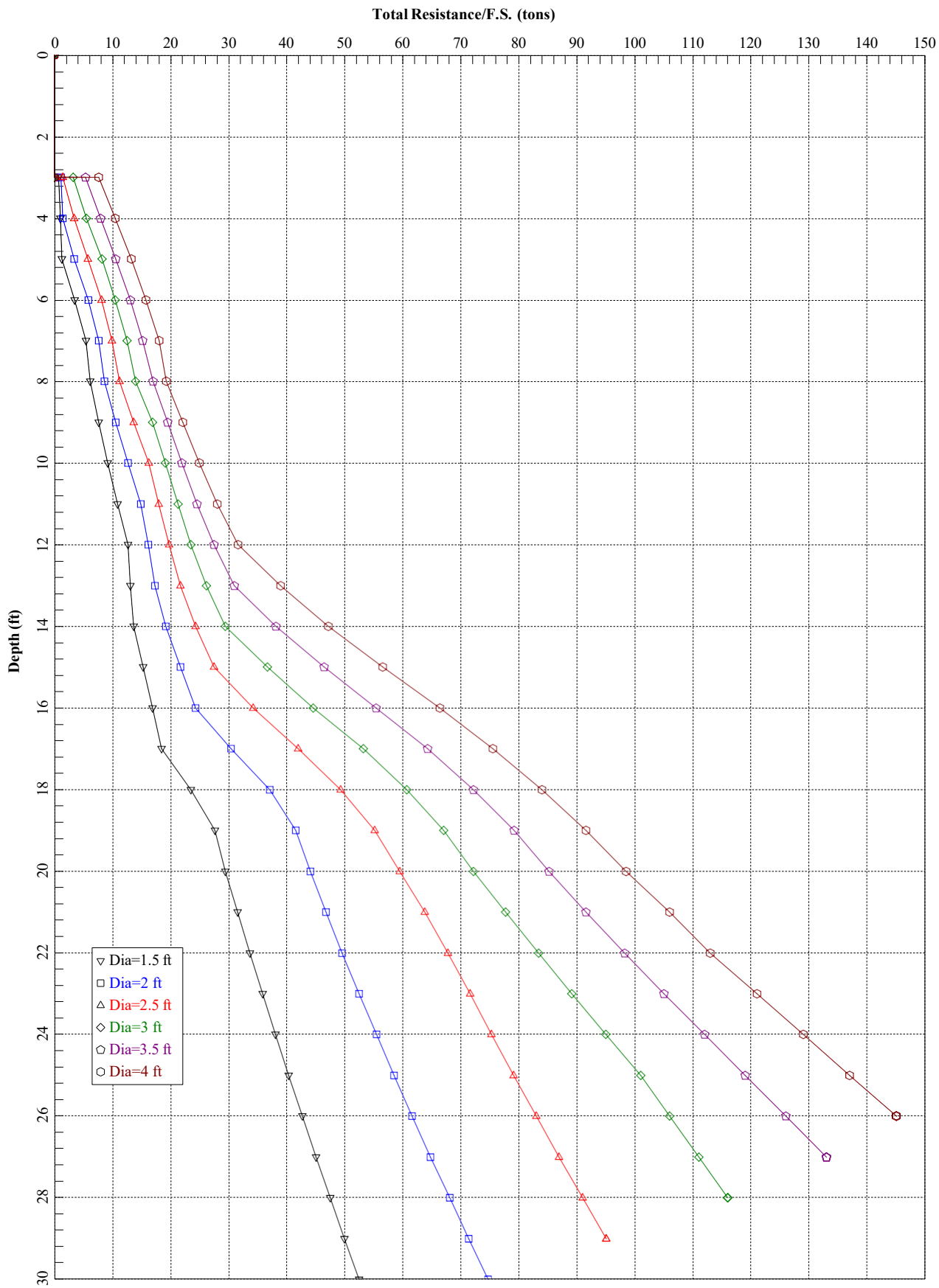
# Supporting Information

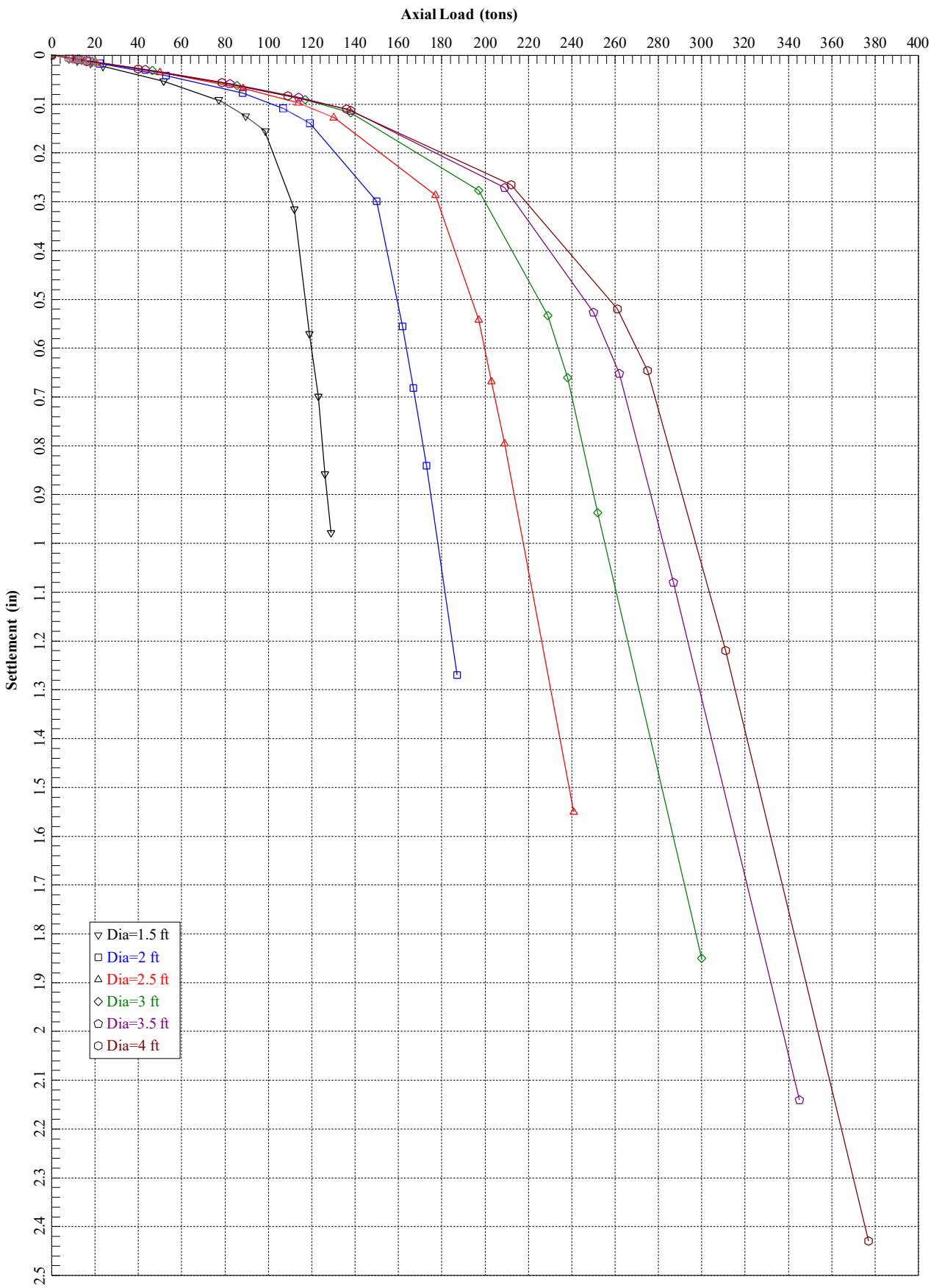
**Contents:**

SHAFT Analysis
Geotechnical Investigation Fact Sheet
Foundation Design Criteria
Foundation Subsurface Preparation Memo
General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.


Side Resistance/F.S. (tons)
0
10
20
30
40
50
60
70
80
90
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Dia=1.5 ft
Dia=2 ft
Dia=2.5 ft
Dia=3 ft
Dia=3.5 ft
Dia=4 ft


Total Resistance/F.S. (tons)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Dia=1.5 ft
Dia=2 ft
Dia=2.5 ft
Dia=3 ft
Dia=3.5 ft
Dia=4 ft


Axial Load (tons)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
Settlement (in)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4
2.5
Dia=1.5 ft
Dia=2 ft
Dia=2.5 ft
Dia=3 ft
Dia=3.5 ft
Dia=4 ft

# GEOTECHNICAL INVESTIGATION FACT SHEET

PROJECT LOCATION: SE corner of Amargosa Road and Key Point Avenue, Hesperia, CA

Engineer: F. Fred Buhamdan_____Phone #: 949-864-2070 _____

Geotechnical Engineering Co.: Terracon Consultants, Inc_____Report Date: 07/10/2024_____

Ground Water Elevation: Greater than 100 feet____

Fill Soils Characteristics: Silty Sand with Gravel

Date Groundwater Measured: N/A_____

Maximum Liquid Limit: 0_____

Topsoil/Stripping Depth: 10 inches (AC+AB)_____

Maximum Plasticity Index: 0_____

Undercut (If Required): 3 feet below footings, or 5 feet below existing grade, whichever is greater.

Specified Compaction: 95%_____

Standard Proctor Results: 134.0 pcf max dry density

Moisture Content Range: -1%/+3%_____

pH: 7.37_____

Corrective actions required for construction based on pH level noted: None required_____

Resistivity: 9,000_____

Corrective actions required for construction based on resistivity level noted:
None required_____

Cement Type: Type 1_____

Recommended local DOT subbase/base material (reference section plan in Foundation Subsurface Preparation):

No subbase/Caltrans Class 2 Aggregate Base_____

Recommended Compaction Control Tests:

1 Test for Each 5,000 Sq. Ft. each Lift (bldg. area)
1 Test for Each 10,000 Sq. Ft. each Lift (parking area)

Structural Fill Maximum Lift Thickness ___8 in. (Measured loose)

Subgrade Design R value = 40.

| COMPONENT | ASPHALT | | CONCRETE | |
|---|---|---|---|---|
| | Standard | heavy | standard | heavy |
| Stabilized Subgrade (If Applicable) | 12 in | 12 in | 12 in | 12 in |
| Base Material (Stone, Sand/Shell, etc.) | 4 in | 6 in | 4 in | 4 in |
| Asphalt Base Course | 1.5 in | 1.5 in | | |
| Leveling Binder Course | _____ | _____ | | |
| Surface Course | 1.5 in | 1.5 in | 5 in | 6 in |

**NOTE:** This information shall not be used separately from the geotechnical report.

September 25, 2018

# FOUNDATION DESIGN CRITERIA

PROJECT LOCATION: SE corner of Amargosa Road and Key Point Avenue, Hesperia, CA

Engineer: F. Fred Buhamdan_____Phone #: 949-864-2070 _____

Geotechnical Engineering Co.: Terracon Consultants, Inc_____Report Date: 07/10/2024_____

Foundation type: Conventional spread/continuous footings

Allowable bearing pressure: 2,500 psf

Factor of Safety: 3.0

Minimum footing dimensions: Individual: 24 inches Continuous: 18 inches

Minimum footing embedment: Exterior: 24 inches Interior: 24 inches

Frost depth: Not applicable

Maximum foundation settlements: Total: 1 inch Differential: 0.5 inch over 40 feet

Slab: Potential vertical rise: Provided that the recommendations of the geotechnical report are implemented, the building pad will be underlain by materials with a low expansion potential

Capillary Break (not a vapor barrier) describe: 4 inches of Caltrans Class 2 Aggregate Base

Subgrade reaction modulus: 200 psi/in Method obtained: Estimated based on soil type and remedial grading recommendations

Active Equivalent Fluid Pressures _Not applicable

Passive Equivalent Fluid Pressures 450 pcf

Perimeter Drains (describe): Building: none
Retaining Walls : none

Retaining Wall: At rest pressure: 56 pcf
Coefficient of friction: 0.42

COMMENTS:
_____
_____
_____
_____

FUEL STATION FOUNDATION SUBSURFACE PREPARATION
FUEL STATION
HESPERIA, CALIFORNIA
07/10/2024

UNLESS SPECIFICALLY INDICATED OTHERWISE IN THE DRAWINGS AND/OR SPECIFICATIONS, THE LIMITS OF THIS SUBSURFACE PREPARATION ARE CONSIDERED TO BE THAT PORTION OF THE SITE DIRECTLY BENEATH AND 3.0 FOOT BEYOND THE FUEL STATION SERVICE BUILDING, DIRECTLY BENEATH AND 3.0 FOOT BEYOND CANOPY AND SERVICE BUILDING SLABS, AND DIRECTLY BENEATH AND 1.0 FOOT BEYOND CANOPY FOUNDATIONS. AT THE SERVICE BUILDING, THE EXTENTS OF SUBSURFACE PREPARATION SHALL BE SLOPED AWAY FROM THE 1.0 FOOT PERIMETER AT A MINIMUM 1:1 SLOPE.

APPURTENANCES ARE THOSE ITEMS ATTACHED TO THE BUILDING PROPER (REFER TO DRAWING SHEET SP1), TYPICALLY INCLUDING, BUT NOT LIMITED TO, THE BUILDING SIDEWALKS, GREENHOUSE CANOPIES, PORCHES, RAMPS, STOOPS, TRUCK WELLS/DOCKS, CONCRETE APRONS AT THE AUTOMOTIVE CENTER, COMPACTOR PAD, ETC. APPURTENANCES SHALL ALSO INCLUDE SCREENWALLS AT THE COMPACTOR, TRUCK DOCK AND THE BALE/PALLET STORAGE AREA(S). THE INTERIOR SLAB-ON-GRADE BASE AND THE VAPOR BARRIER, WHERE REQUIRED, DO NOT EXTEND BEYOND THE LIMITS OF THE ACTUAL BUILDING.

ESTABLISH THE FINAL SUBGRADE ELEVATION TO ALLOW FOR THE CONCRETE SLAB AND BASE. REFERENCE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR REQUIRED SLAB THICKNESS. FOR THE BUILDING INTERIOR SLAB-ON-GRADE, THE _MINIMUM 4" THICK BASE MATERIAL SHALL CONFORM TO **SECTION 26, AGGREGATE BASES OF THE CALIFORNIA DEPARTMENT OF TRANSPORTATION.** FOR FLATWORK SLABS, THE BASE MATERIAL SHALL CONFORM TO **SECTION 26, AGGREGATE BASES OF THE CALIFORNIA DEPARTMENT OF TRANSPORTATION**

THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ACCURATE MEASUREMENTS FOR ALL CUT AND FILL DEPTHS REQUIRED. ANY PROPOSED EQUIVALENT ALTERNATIVE BASE OR SUBBASE MATERIAL MUST BE SUBMITTED FOR APPROVAL WITHIN 30 DAYS AFTER AWARD OF CONTRACT. ANY EQUIVALENT ALTERNATIVE SHALL ONLY BE USED IF APPROVED IN WRITING BY THE CEC AND AOR.

REMOVE SURFACE VEGETATIONS, TOPSOIL, ROOT SYSTEMS, ORGANIC MATERIAL, EXISTING FILL, AND SOFT OR OTHERWISE UNSATISFACTORY MATERIAL FROM THE CANOPY AND SERVICE BUILDING AREA.

EXPOSED SUBGRADE SHOULD BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED TO A MINIMUM DEPTH OF 12 INCHES. REMOVE AND REPLACE UNSATISFACTORY AREAS WITH SATISFACTORY MATERIAL. FOUNDATIONS SHOULD BEAR ON ENGINEERED FILL EXTENDING TO A MINIMUM DEPTH OF 3 FEET BELOW THE BOTTOM OF FOUNDATIONS, OR 5 FEET BELOW EXISTING GRADES, WHICHEVER IS GREATER. ONSITE OR IMPORTED LOW VOLUME CHANGE MATERIALS SHOULD BE USED AS ENGINEERED FILL FOR AREAS SUPORTING INTERIOR FLOOR SLABS, FOUNDATION, FOUNDATION BACKFILL, AND EXTERIOR SLABS. IMPORTED SOILS FOR USE AS FILL MATERIAL WITHIN PROPOSED BUILDING AND STRUCTURE AREAS SHOULD CONFORM TO LOW VOLUME CHANGE MATERIALS AS INDICATED IN THE FOLLOWING SPECIFICATIONS:

| **Gradation** | **Percent Finer by Weight (ASTM C 136)** |
|---|---|
| 3" | 100 |
| No. 4 Sieve | 50 - 100 |
| No. 200 Sieve | 20 - 50 |

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum Expansive Index* ..... 20 (max)

*ASTM D 4829

SUBGRADE MATERIAL SHALL BE PLACED IN LOOSE LIFTS NOT EXCEEDING 8 INCHES IN THICKNESS AND THE UPPER 12 INCHES SHALL BE COMPACTED TO AT LEAST 95 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D1557) AT A MOISTURE CONTENT WITHIN 0 PERCENT BELOW TO 3 PERCENT ABOVE THE OPTIMUM **IN PAVEMENT AREAS**. 90 PERCENT COMPACTION IS ACCEPTABLE IN ALL OTHER AREAS.

THE FOUNDATION SYSTEM SHALL BE ISOLATED SPREAD FOOTINGS AT COLUMNS AND CONTINUOUS SPREAD FOOTINGS AT WALLS, UNDERLAIN BY ENGINEERED FILL.

THIS FOUNDATION SUBSURFACE PREPARATION DOES NOT CONSTITUTE A COMPLETE SITE WORK SPECIFICATION. IN CASE OF CONFLICT, INFORMATION COVERED IN THIS PREPARATION SHALL TAKE PRECEDENCE OVER THE SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR SPECIFIC INFORMATION NOT COVERED IN THIS PREPARATION. THIS INFORMATION WAS TAKEN FROM A GEOTECHNICAL REPORT PREPARED BY TERRACON CONSULTANTS, DATED JULY 10, 2024 (GEOTECHNICAL REPORT IS FOR INFORMATION ONLY AND IS NOT A CONSTRUCTION SPECIFICATION).

SUBGRADE SOILS BENEATH EXTERIOR SLABS AND PAVEMENTS SHOULD BE SCARIFIED, MOISTURE CONDITIONED, AND COMPACTED 12 INCHES BELOW EXISTING GRADE OR BOTTOM OF PAVEMENT SECTION, WHICHEVER IS DEEPER. EVEN WITH THE RECOMMENDED CONSTRUCTION TESTING SERVICES, THERE IS AN INHERENT RISK FOR THE OWNER THAT COMPRESSIBLE FILL OR UNSUITABLE MATERIAL WITHIN OR BURIED BY THE FILL WILL NOT BE DISCOVERED. THIS RISK OF UNFORESEEN CONDITIONS CANNOT BE ELIMINATED WITHOUT COMPLETELY REMOVING THE EXISTING FILL BUT CAN BE REDUCED BY PERFORMING ADDITIONAL TESTING AND EVALUATION. THE UPPER 12 INCHES OF SUBGRADE SOILS AND ALL AGGREGATE BASE MATERIAL SHOULD BE BROUGHT TO A MINIMUM RELATIVE COMPACTION OF 95 PERCENT IN ACCORDANCE WITH ASTM D 1557 PRIOR TO PAVING.

Terracon
145 W Walnut St
Carson, CA

# General Notes

| Sampling | Water Level | Field Tests |
|---|---|---|
| Auger Cuttings<br>Modified Dames & Moore Ring Sampler<br>Standard Penetration Test | Water Initially Encountered<br>Water Level After a Specified Period of Time<br>Water Level After a Specified Period of Time<br>Cave In Encountered<br><br>Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations. | N Standard Penetration Test Resistance (Blows/Ft.)<br>(HP) Hand Penetrometer<br>(T) Torvane<br>(DCP) Dynamic Cone Penetrometer<br>UC Unconfined Compressive Strength<br>(PID) Photo-Ionization Detector<br>(OVA) Organic Vapor Analyzer |

## Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

## Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

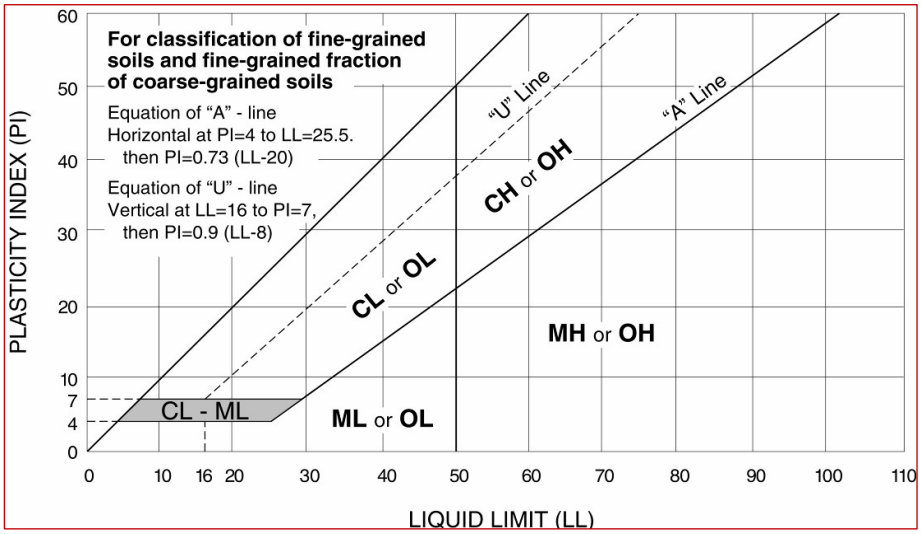
## Strength Terms

| Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance | | | Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance | | | |
|---|---|---|---|---|---|---|
| **Relative Density** | **Standard Penetration or N-Value (Blows/Ft.)** | **Ring Sampler (Blows/Ft.)** | **Consistency** | **Unconfined Compressive Strength Qu (tsf)** | **Standard Penetration or N-Value (Blows/Ft.)** | **Ring Sampler (Blows/Ft.)** |
| Very Loose | 0 - 3 | 0 - 6 | Very Soft | less than 0.25 | 0 - 1 | < 3 |
| Loose | 4 - 9 | 7 - 18 | Soft | 0.25 to 0.50 | 2 - 4 | 3 - 4 |
| Medium Dense | 10 - 29 | 19 - 58 | Medium Stiff | 0.50 to 1.00 | 4 - 8 | 5 - 9 |
| Dense | 30 - 50 | 59 - 98 | Stiff | 1.00 to 2.00 | 8 - 15 | 10 - 18 |
| Very Dense | > 50 | > 99 | Very Stiff | 2.00 to 4.00 | 15 - 30 | 19 - 42 |
| | | | Hard | > 4.00 | > 30 | > 42 |

## Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

# Unified Soil Classification System

| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A] | | | | Soil Classification | |
|---|---|---|---|---|---|
| | | | | Group Symbol | Group Name [B] |
| **Coarse-Grained Soils:** More than 50% retained on No. 200 sieve | **Gravels:** More than 50% of coarse fraction retained on No. 4 sieve | **Clean Gravels:** Less than 5% fines [C] | Cu≥4 and 1≤Cc≤3 [E] | GW | Well-graded gravel [F] |
| | | | Cu<4 and/or [Cc<1 or Cc>3.0] [E] | GP | Poorly graded gravel [F] |
| | | **Gravels with Fines:** More than 12% fines [C] | Fines classify as ML or MH | GM | Silty gravel [F, G, H] |
| | | | Fines classify as CL or CH | GC | Clayey gravel [F, G, H] |
| | **Sands:** 50% or more of coarse fraction passes No. 4 sieve | **Clean Sands:** Less than 5% fines [D] | Cu≥6 and 1≤Cc≤3 [E] | SW | Well-graded sand [I] |
| | | | Cu<6 and/or [Cc<1 or Cc>3.0] [E] | SP | Poorly graded sand [I] |
| | | **Sands with Fines:** More than 12% fines [D] | Fines classify as ML or MH | SM | Silty sand [G, H, I] |
| | | | Fines classify as CL or CH | SC | Clayey sand [G, H, I] |
| **Fine-Grained Soils:** 50% or more passes the No. 200 sieve | **Silts and Clays:** Liquid limit less than 50 | **Inorganic:** | PI > 7 and plots above "A" line [J] | CL | Lean clay [K, L, M] |
| | | | PI < 4 or plots below "A" line [J] | ML | Silt [K, L, M] |
| | | **Organic:** | $\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$ | OL | Organic clay [K, L, M, N]<br>Organic silt [K, L, M, O] |
| | **Silts and Clays:** Liquid limit 50 or more | **Inorganic:** | PI plots on or above "A" line | CH | Fat clay [K, L, M] |
| | | | PI plots below "A" line | MH | Elastic silt [K, L, M] |
| | | **Organic:** | $\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$ | OH | Organic clay [K, L, M, P]<br>Organic silt [K, L, M, Q] |
| **Highly organic soils:** | Primarily organic matter, dark in color, and organic odor | | | PT | Peat |

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.