

*Initial Study* PROJ-2024-00004

*Vernaci Properties*

APNs 0230-101-012, 0230-101-013, 0230-101-014, 0230-101-034

*April 2026*

# Appendix D: Geological Report

**GEOTECHNICAL AND INFILTRATION EVALUATION  
PROPOSED TRUCK TRAILER FACILITY  
ASSESSOR'S PARCEL NUMBERS (APNs) 0230-101-12, -13, -14 AND -34  
14044 WHITTRAM AVENUE  
FONTANA, SAN BERNARDINO COUNTY, CALIFORNIA**

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November 15, 2023  
Project No. 3697-CR

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Subject: **Geotechnical and Infiltration Evaluation**  
Proposed Truck Trailer Facility  
Assessor's Parcel Numbers (APNs) 0230-101-12, -13, -14 and -34  
14044 Whittram Avenue  
Fontana, San Bernardino County, California

Dear Mr. Beers:

GeoTek, Inc. (GeoTek) is pleased to provide the results of this Geotechnical and Infiltration Evaluation for a proposed truck trailer facility that will be constructed at 14044 Whittram Avenue, in the City of Fontana, San Bernardino County, California. This report presents a discussion of GeoTek's evaluation and provides preliminary geotechnical recommendations for site preparation, foundation design, infiltration rates and construction of the proposed site improvements.

Based upon review and evaluation, site development appears feasible from a geotechnical viewpoint provided that the recommendations included in this report are incorporated into the design and construction phases of site development.

The opportunity to be of service is sincerely appreciated. If you have any questions, please do not hesitate to contact GeoTek.

Respectfully submitted,  
**GeoTek, Inc.**



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Figure 1 – Site Location Map

Figure 2 – Boring Location Map

Appendix A – Logs of Exploratory Borings

Appendix B – Laboratory Test Results

Appendix C – Percolation Test Data and Porchet Calculations

Appendix D – General Grading Guidelines

## **I. PURPOSE AND SCOPE OF SERVICES**

The purpose of this study was to evaluate the geotechnical conditions for a proposed truck trailer facility to be constructed at 14044 Whittram Avenue, in the City of Fontana, San Bernardino County, California, as outlined in GeoTek's proposal P-1006323-CR dated October 20, 2023. Services provided for this study included the following:

- Research and review of available geologic and geotechnical data and general information pertinent to the site,
- A site reconnaissance,
- Excavation of six (6) exploratory borings for the geotechnical portion of the evaluation to a maximum depth of about 51.5 feet below existing grades,
- Infiltration testing of five (5) additional test borings at depths of about five (5) feet below existing grades, within the areas of proposed stormwater facilities,
- Collection of soil samples in the test borings,
- Laboratory testing of selected soil samples,
- Review and evaluation of site seismicity, and
- Compilation of this geotechnical report which presents preliminary recommendations for site development.

The intent of this report is to aid in the evaluation of the site for future proposed development from a geotechnical perspective. The professional opinions and geotechnical information contained in this report may need to be updated based upon review of the final site development plans. These plans should be provided to GeoTek, Inc. for review when available.

## **2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT**

### **2.1 SITE DESCRIPTION**

The irregular-shaped subject project site is comprised of four (4) parcels (APNs 0230-101-12, -13, -14 and -34) which totals approximately 5.35-acres in size, and is located at 14044 Whittram



Avenue in the City of Fontana, San Bernardino County, California (see Figure 1). Access to the site is available from Whittram Avenue, a paved, improved street located adjacent to the southern boundary of the site.

The site can be considered as having a relatively flat topography (see Figure 1). Elevations across the site range from approximately 1,156 feet above mean sea level (amsl) in the northeast to 1,148 feet amsl in the southwestern area of the site. Drainage is generally directed to the south-southwest.

The portion of the site encompassed by APN 0230-101-34 is currently vacant, undeveloped land; however, a review of historical aerial imagery suggests a single-family residence previously existed at this parcel until at least 1994. The parcel is vegetated with a moderate covering of native grasses/brush. An existing masonry wall, approximately 6 feet in height and a single-family residence, are located adjacent to the northern and western boundaries of this parcel, respectively.

Residential structures occupy APNs 0230-101-12 and -14 and are addressed as 13932 Whittram Avenue and 8721 Calabash Avenue, respectively. Additionally, APN 0230-101-13 is located to the west of the existing residence, at the northeastern corner of Whittram and Calabash Avenues, and is comprised of vacant land (addressed ad 8733 Calabash Avenue).

## **2.2 PROPOSED DEVELOPMENT**

Based upon review of the “*Grading Plan*” prepared by RMB Consulting, dated April 6, 2025, it is proposed to construct a truck trailer storage yard with an office and shop building, along with associated drive aisles, stormwater management facilities located along the southern site boundary, site utilities and adjacent street pavement improvements (see Figure 2). The existing residential structures shall be removed as part of the truck trailer parking development. Masonry walls up to 6 feet in height are understood to be developed along the areas of the property line that do not currently have block walls.

It is anticipated that the proposed office and shop building structures will be one to two stories in height and of wood frame, light metal frame or masonry construction. It is anticipated that the structures will be supported by shallow spread foundations (continuous and pad) and most likely will include a conventional slab-on-grade floor. Although structural loading information was not provided, GeoTek has assumed maximum column and wall loads on the order of 50 kips and 3.0 kips per foot, respectively. Once actual loads are known, that information should be provided to

GeoTek to determine if modifications to the recommendations presented in this report are warranted.

On-site storm water disposal is proposed by means of stormwater management facilities (i.e., basins) located along the southern edge of the site. The approximate depths of the planned basins are on the order of five feet below existing/proposed grades.

Based upon review of the referenced Site Plans, grading of the site will involve cuts and fills of up to approximately 3 feet, not including any recommended remedial grading. Sewage disposal is anticipated to be provided by a septic tank and a conventional on-site wastewater disposal system. Investigation and reporting related to on-site wastewater disposal system design is not contained within this report. If site development differs from the assumptions made herein, the recommendations included in this report should be subject to further review and evaluation.

### **3. FIELD EXPLORATION AND LABORATORY TESTING**

#### **3.1 FIELD EXPLORATION**

The field exploration for this project was conducted on November 1 and November 2, 2023. For the geotechnical portion of the investigation, six (6) exploratory borings (Borings B-1 through B-6) were excavated with a hollow-stem auger drill rig to depths of about 15 to 51.5 feet below the existing ground surface at the boring locations. For the infiltration portion of the study, five (5) test borings were excavated to depths of approximately five (5) feet below the existing ground location within the proposed stormwater facility locations. A hollow-stem auger with an outside diameter of approximately 8.5 inches was utilized to conduct the borings. The inside diameter of the auger was approximately 4.5 inches. A geologist from GeoTek, Inc. logged the exploratory borings and obtained soil samples from within the borings. The boring locations are presented on Figure 2, Boring Location Map. The logs of the exploratory borings are included in Appendix A.

The exploration logs show subsurface conditions at the dates and locations indicated and may not be representative of other locations and times. The stratification lines presented on the logs represent the approximate boundaries between soil types, and the transitions may be gradual.

In the geotechnical borings, relatively undisturbed soil samples were recovered at various intervals with a California sampler. The California sampler is a 2.9-inch outside diameter, 2.5-



inch inside diameter, split barrel sampler lined with brass rings. The sampler is approximately 18 inches in length. The sampler conformed to the requirements of ASTM D 3550. A 140-pound automatic trip hammer was utilized, dropping approximately 30 inches for each blow. The relatively undisturbed samples, together with bulk samples of representative soil types, were returned to the laboratory for testing and evaluation.

In Boring B-1 standard penetration tests (SPT) were performed with a 2.0-inch outside diameter, 1.5-inch inside diameter, split-barrel sampler. The sampler was approximately 18 inches in length. The inside diameter of the sampler shoe was 1.4 inches. The sampler was unlined. The sampler conformed to the requirements of ASTM D 1586. A 140-pound automatic trip hammer was utilized, dropping approximately 30 inches for each blow. The sampler penetration test data are presented on the Log for Boring for Boring B-1.

#### Infiltration Testing

Five (5) borings (Borings I-1 and I-5) were excavated on the project site to evaluate preliminary infiltration rates for the proposed stormwater management basin located in the southwestern portion of the parcel. Infiltration testing was conducted in these borings in general accordance County of San Bernardino guidelines. The infiltration tests consisted of drilling eight-inch diameter test holes to the desired depth and installing approximately two inches of gravel in the bottom of the holes. A three-inch diameter perforated PVC pipe, wrapped in a filter sock, was placed in the excavations and the annular space was filled with gravel to prevent caving within the borings. Water was then placed in the borings to presoak the holes and percolation testing was performed following the pre-soak period. Following presoaking, the percolation tests were performed which consisted of adding water to each test hole and measuring the water drop over a 10-minute period. The water drop was recorded for six test intervals. Water was added to the test holes after each test interval. The field percolation rates were then converted to an infiltration rate using the Porchet Method. The infiltration rates calculated using the Porchet Method are presented in the following table:

<b>SUMMARY OF INFILTRATION RATES</b>		
Boring	Depth of Test (Feet)	Infiltration Rate (Inches per hour)
I-1	5.0	5.89
I-2	5.0	11.40
I-3	5.0	6.25
I-4	5.0	14.70
I-5	5.0	3.43



Copies of the percolation data sheets and the Porchet infiltration rate conversion calculations are presented in Appendix C. No factors of safety were applied to the rates provided. Over the lifetime of the infiltration areas, the infiltration rates may be affected by sediment build up and biological activities, as well as local variations in near surface soil conditions. A suitable factor of safety should be applied to the field rate in designing the infiltration system.

It should be noted that the infiltration rates provided above were performed in relatively undisturbed on-site soils. Infiltration rates will vary and are mostly dependent on the underlying consistency of the site soils and relative density. Infiltration rates may be impacted by weight of equipment travelling over the soils, placement of engineered fill and other various factors. GeoTek assumes no responsibility or liability for the ultimate design or performance of the storm water facility.

### **3.2 LABORATORY TESTING**

Laboratory testing was performed on selected soil samples obtained during the field exploration. The purpose of the laboratory testing was to confirm the field classification of the soils encountered and to evaluate the physical properties of the soils for use in engineering design and analysis.

Included in the laboratory testing were moisture-density determinations on relatively undisturbed samples. An optimum moisture content-maximum dry density relationship performed according to ASTM D 1557 was established for a typical soil type so that the relative compaction of the subsurface soils could be determined. A direct shear test was performed in accordance with ASTM D 3080 to help determine soil strength characteristics. Collapse testing was performed in accordance with ASTM D 4546 on selected samples to evaluate the hydroconsolidation potential of the soils to help determine remedial grading recommendations. Expansion index testing was performed in accordance with ASTM D 4829 on a selected sample to evaluate the expansion potential of the near-surface on-site soils. Chemical testing comprised of pH, soluble sulfate, chloride and resistivity testing was conducted on a selected sample. Materials finer than the No. 200 sieve were determined for one (1) selected sample representative of a percolation test boring. The moisture-density and gradation analysis results are presented on the exploration logs presented in Appendix A. Additionally, an R-Value test in accordance with California Test Method 301 was performed to evaluate the pavement support capacity of the near-surface on-site soils, and to aid in structural pavement section determinations. The maximum density, direct shear, collapse, expansion index, R-Value, and chemical test data are presented in Appendix B.

## 4. GEOLOGIC AND SOILS CONDITIONS

### 4.1 REGIONAL SETTING

The subject property is situated in the Peninsular Ranges geomorphic province. The Peninsular Ranges province is one of the largest geomorphic units in western North America. It extends approximately 975 miles south of the Transverse Ranges geomorphic province to the tip of Baja California. This province varies in width from about 30 to 100 miles. It is bounded on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province.

The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks. Several major fault zones are found in this province. The Elsinore Fault zone and the San Jacinto Fault zone trend northwest-southeast and are found near the middle of the province. The San Andreas Fault zone borders the northeasterly margin of the province.

More specific to the subject property, the site is located in an area geologically mapped to be underlain by young alluvial-fan deposits of Etiwanda Creek (Morton, D.M., 2003). No active faults are shown in the immediate site vicinity on the maps reviewed for the area.

### 4.2 GENERAL SOIL/GEOLOGIC CONDITIONS

A brief description of the soils encountered on the site is presented in the following sections. Based on the field exploration and observations, the area investigated is locally underlain by artificial fill soils and alluvium.

#### 4.2.1 Artificial Fill

Artificial fill soils, consisting of loose to medium dense silty sands (SM soil type based upon the Unified Soil Classification System), were encountered in all borings to depths ranging from about 2 to 6.5 feet below existing grades. Depths of fill encountered near the proposed building areas ranged from about 4 to 4.5 feet below existing grades, and contained minor amounts of debris. The central and western portions of the site were found to be underlain by approximately 2 feet of artificial fill soils. Scattered areas of stockpiled fill soils were found to be present at the site, concentrated near the eastern site area. Deeper or other deposits of fill soils may be present in areas of the site that were not explored. Artificial fill soils present at the site were likely placed during construction of previously existing structures located at the eastern portion of the site.

#### **4.2.2 Alluvium**

Alluvium, consisting of medium dense to very dense silty sands, poorly graded sands, and very stiff to hard silts (SM, SP, and ML soil types based upon the Unified Soil Classification System), were encountered below the artificial fill soils up to the maximum depths explored (51.5 feet in Boring B-1).

Based on the laboratory test results, the near surface soils have a “very low” expansion potential (ASTM D 4829). Based on the chemical laboratory test results, the near surface soils have a soluble sulfate content of less than 0.1 percent (ASTM D 4327). Based upon the collapse test results, the upper site soils tested indicate a very low potential for hydroconsolidation (settlement upon wetting with or without additional loading). Based on the R-Value test results, the upper site soils, when recompacted, have a good to very good pavement support capacity. The test results are provided in Appendix B.

### **4.3 SURFACE AND GROUNDWATER**

#### **4.3.1 Surface Water**

Surface water was not observed during the site exploration. If encountered during earthwork construction, surface water on this site is the result of precipitation or possibly some minor surface run-off from surrounding areas. Overall site drainage is generally in a south/southwest direction, as directed by site topography. Provisions for surface drainage will need to be accounted for by the project civil engineer.

#### **4.3.2 Groundwater**

Groundwater was not encountered in any of the borings excavated, up to the maximum depth explored (51.5 feet below the existing ground surface at Boring B-1), at the time of drilling. The California Department of Water Resources, Water Data Library indicates that Well 340935N1174885W001 is located approximately 0.5 miles southeast of the site. Records for this well shows most recent depths to groundwater in excess of 300 feet. Based on the above, groundwater is not anticipated to be a factor during the site grading. However, seasonal perched groundwater may be encountered during grading within portions of the site.

### **4.4 FAULTING AND SEISMICITY**

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region.

No active or potentially active fault is known to exist at this site nor is the site situated within an “Alquist-Priolo” Earthquake Fault Zone. The subject property is not located within a State of California Seismic Hazard Zone for earthquake induced liquefaction or landsliding.

The nearest known active fault is the Sierra Madre fault zone (Cucamonga section) located approximately 4.9 miles to the north of the subject site.

#### **4.4.1 Seismic Design Parameters**

The site is located at approximately 34.0953 degrees Latitude and -117.4998 degrees Longitude. Based on the site soil conditions a Site Class “D” is considered appropriate for this project. Site spectral accelerations ( $S_a$  and  $S_1$ ), for 0.2 and 1.0 second periods for a Class “D” site, was determined from the SEAOC/OSHPD web interface that utilizes the USGS web services and retrieves the seismic design data and presents that information in a report format. Using the ASCE 7-16 option on the SEAOC/OSHPD website results in the values for  $S_{M1}$  and  $S_{D1}$  reported as “null-See Section 11.4.8” (of ASCE 7-16). As noted in ASCE 7-16, Section 11.4.8, a site-specific ground motion procedure is recommended for Site Class D when the value  $S_1$  exceeds 0.2. The value  $S_1$  for the subject site exceeds 0.2.

For a site Class D, an exception to performing a site-specific ground motion analysis is allowed in ASCE 7-16 where  $S_1$  exceeds 0.2 provided the value of the seismic response coefficient,  $C_s$ , is conservatively calculated by Eq 12.8-2 of ASCE 7-16 for values of  $T \leq 1.5T_L$  and taken as equal to 1.5 times the value computed in accordance with either Eq. 12.8-3 for  $T_L \geq T > 1.5T_L$  or Eq. 12.8-4 for  $T > T_L$ .

The results, based on the 2015 NEHRP and the 2022 CBC, are presented in the following table as it is assumed that the exception as allowed in ASCE 7-16 is applicable. If the exception is deemed not appropriate, a site-specific ground motion analysis will be required.

Final selection of the appropriate seismic design coefficients should be made by the project structural engineer based upon the local practices and ordinances, expected building response and desired level of conservatism.

<b>SITE SEISMIC PARAMETERS</b>	
Mapped 0.2 sec Period Spectral Acceleration, $S_s$	1.843g
Mapped 1.0 sec Period Spectral Acceleration, $S_1$	0.692g
Site Coefficient for Site Class "D", $F_a$	1.0
Site Coefficient for Site Class "D", $F_v$	1.7
Maximum Considered Earthquake Spectral Response Acceleration for 0.2 Second, $S_{MS}$	1.843g
Maximum Considered Earthquake Spectral Response Acceleration for 1.0 Second, $S_{M1}$	1.176g
5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, $S_{DS}$	1.228g
5% Damped Design Spectral Response Acceleration Parameter at 1 second, $S_{D1}$	0.784g
Site Modified Peak Ground Acceleration, $PGA_M$	0.867g

Final selection of the appropriate seismic design coefficients should be made by the project structural engineer based upon the local practices and ordinances, expected building response and desired level of conservatism.

#### **4.5 LIQUEFACTION AND LATERAL SPREAD**

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may acquire a high degree of mobility which can lead to lateral movement, sliding, settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but, after liquefaction has developed, the effects can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures.

The project site is not located within an area mapped by the State of California for liquefaction potential. Based on the current mapping, and relatively dense character of the subsurface soils and the absence of relatively shallow groundwater across the site, it is GeoTek's opinion that the liquefaction potential at the site is very low.

## **4.6 OTHER SEISMIC HAZARDS**

Based on regional mapping reported by the USGS, the site is located in an area not considered to be susceptible to groundwater withdrawal related subsidence. Any subsidence in the area would likely be regional and not adversely affect the subject development specifically.

The potential for seismic densification (“dry sand” seismic settlement) resulting from seismic activity was reviewed. Due to the relatively dense character of the subsurface soils, and anticipated site grading, the seismic settlement of the site is estimated to be minimal.

Evidence of ancient landslides or slope instability at this site was not observed during the field investigation and the project site is relatively flat. Thus, the potential for landslides is considered negligible for design purposes.

## **5. CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 GENERAL**

The anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations, and those provided by this firm at a later date are incorporated into the design and construction phases of development. Site development, grading and foundation plans should be reviewed by GeoTek, Inc. when they become available so the recommendations contained in this report can be confirmed.

The on-site soils exhibit a “very low” expansion potential. Expansion index testing should be conducted at the completion of earthwork operations to verify this soil parameter.

Deposits of artificial fill and/or disturbed soils were encountered in all of the explorations. In addition, the upper site soils were found to non-uniform, relatively loose and anticipated to be subject to hydroconsolidation. Deeper deposits of undocumented fill may be present in areas that were not explored. Remedial grading, consisting of overexcavation and recompaction of the upper site soils, is recommended to provide a uniform bearing for the proposed structures.

## **5.2 EARTHWORK CONSIDERATIONS**

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Fontana, County of San Bernardino, the 2022 California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix D outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix D.

### **5.2.1 Site Clearing and Demolition**

In areas of planned grading and improvements, the locations of existing utilities should be determined. Existing utilities should be relocated or abandoned. The site should be cleared of existing structures, pavements, slabs, trees, vegetation and other deleterious materials. Debris should be properly disposed of off-site. Voids resulting from site clearing should be backfilled with engineered fill.

### **5.2.2 Site Preparation**

Due to the presence of artificial fill soils, it is recommended that the soils be removed beneath the planned building footprint to a depth of at least five (5) feet below existing grades, or three (3) feet below the base of the proposed foundations, whichever is greater. The lateral extent of this recommended over-excavation should extend at least 5 feet beyond the building limits, where obtainable. Removal bottoms should be relatively uniform in soil type and is not adversely porous and having an in-place density of at least 85 percent of the soil's maximum dry density as determined by ASTM D 1557 test procedures.

Following site clearing operations, over-excavation and lowering of site grades, where necessary, it is recommended that the exposed subgrade soils beneath all surface improvements be proof rolled with a heavy rubber-tired piece of construction equipment approved by and in the presence of the geotechnical engineering representative. The proof rolling equipment should include at least 4 passes, two in each perpendicular direction. All soil that ruts or excessively deflects during proof rolling should be removed as recommended by the GeoTek representative.

Following proof rolling and removal of any unsuitable bearing soil, the exposed subgrade should be scarified to a depth of about 12 inches, be moisture conditioned to slightly above the soil's optimum moisture content and then be compacted to at least 90 percent of the soil's maximum dry density as determined by ASTM D-1557 test procedures.

### **5.2.3 Pavement Areas**

Undocumented fill should be removed below proposed pavement areas. If no undocumented fill is encountered or is relatively shallow, the natural soils should be overexcavated to a depth of 12 inches below existing grade or 12 inches below proposed finished grade, whichever is deeper. Finished grade is defined as the top of the subgrade. The exposed soils in these areas and in cut areas should be scarified to a depth of approximately eight inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures.

### **5.2.4 Hardscape Areas**

Undocumented fill should be removed below hardscape areas. The exposed soils in these areas and in cut areas should be scarified to a depth of approximately eight inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures.

### **5.2.5 Preparation of Excavation Bottoms**

A representative of this firm should observe the bottom of all excavations. Upon approval, the exposed soils should be scarified to a depth of approximately eight inches, moistened to at least the optimum moisture content and compacted to a minimum relative compaction of at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures.

### **5.2.6 Engineered Fills**

The on-site soils are generally considered suitable for reuse as engineered fill provided they are free from vegetation, debris and other deleterious material. Portland cement concrete that is to be removed from the site may be pulverized into fragments not exceeding three inches in greatest dimension and incorporated into the fill at all levels. Engineered fill should be placed in loose lifts with a thickness of eight inches or less and moisture conditioned to at least two percent above the optimum moisture content.

Below and within the proposed building area, engineered fill should be moisture conditioned to at least optimum moisture content and be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures if a shallow foundation system is used.

Below other structural elements, such as hardscape areas and walls independent of the building, engineered fill should be moisture conditioned to at least optimum moisture content and be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures.

### **5.2.7 Excavation Characteristics**

Excavation of the on-site alluvial soils is expected to be feasible utilizing heavy-duty grading equipment in good operating condition. All temporary excavations for grading purposes and installation of underground utilities should be constructed in accordance with local and Cal-OSHA guidelines. Temporary excavations within the on-site materials should be stable at 1.5:1 (horizontal: vertical) inclinations for cuts less than five feet in height.

### **5.2.8 Shrinkage and Subsidence**

Several factors will impact earthwork balancing on the site, including shrinkage, subsidence, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage and subsidence are primarily dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 10 to 15 percent may be considered for the materials requiring removal and/or recompaction. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of earthwork. Subsidence on the order of up to 0.2 foot may be anticipated for the underlying soils.

## **5.3 DESIGN RECOMMENDATIONS**

### **5.3.1 Foundation Design Criteria**

Foundation design criteria for a conventional foundation system, in general conformance with the 2022 CBC, are presented below. Based on laboratory test results, subsequent to earthwork operations it is anticipated that the near-surface soils will have a “very low” expansion potential. Additional expansion index and soluble sulfate testing of the soils should be performed during construction to evaluate the as-graded conditions. Final recommendations should be based upon the as-graded soils conditions.

A summary of the foundation design recommendations is presented in the following table:

<b>DESIGN PARAMETER</b>	<b>“VERY LOW” EXPANSION INDEX</b>
Building Foundation Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent grade)	12
Minimum Foundation Width (Inches)	12
Minimum Slab Thickness (actual)	4 inches
Minimum Slab Reinforcing	6” x 6” – W1.4 x W1.4 welded wire fabric or No. 3 bars at 24-inch centers placed in middle of slab
Minimum Footing Reinforcement	Two No. 4 reinforcing bars, one placed near the top and one near the bottom of the footing
Presaturation of Subgrade Soil (Percent of Optimum)	Minimum of 100 percent of the optimum moisture content to a depth of at least 12 inches prior to placing concrete

It should be noted that the criteria provided are based on soil support characteristics only. The structural engineer should design the slab and foundation reinforcement based on actual loading conditions.

The following criteria for design of foundations are preliminary and should be re-evaluated based on the results of additional laboratory testing of samples obtained near finish pad grade.

The building footings should have a minimum embedment depth of 12 inches. An allowable bearing capacity of 2,500 pounds per square foot (psf) may be used for the design of isolated and continuous building footings.

An allowable bearing capacity of 2,500 psf may be used for design of footings supporting retaining walls and site walls independent of the building. The footings supporting these walls should have an embedment depth of at least 18 inches.

An increase of one-third of the allowable bearing capacity may be applied when considering short-term seismic and/or wind loads.

Structural foundations may be designed in accordance with the 2022 CBC, and to withstand a total settlement of 1-inch and maximum differential settlement of one-half of the total settlement over a horizontal distance of 40 feet.

The passive earth pressure may be computed as an equivalent fluid having a density of 400 psf per foot of depth, to a maximum earth pressure of 3,500 psf for footings founded on engineered fill. A coefficient of friction between soil and concrete of 0.40 may be used with dead load forces.



When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2022 California Green Building Standards Code (CALGreen) Section 4.505.2, the 2022 CBC Section 1907.1 and ACI 360R-10. The vapor retarder design and construction should also meet the requirements of ASTM E 1643. A portion of the vapor retarder design should be the implementation of a moisture vapor retardant membrane.

The effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures. These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6-mil vapor retarder membrane, a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional. The membrane should consist of Stego wrap or the equivalent.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties such as thickness, composition, strength, and permeability to achieve the desired performance level.

Moisture retarders can reduce, but not eliminate, moisture vapor rise from the underlying soils up through the slab. Moisture retarder systems should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Concrete Institute, ASTM and California Building Code requirements and guidelines.

GeoTek recommends that a qualified person, such as a flooring contractor, structural engineer, architect, and/or other experts specializing in moisture control within buildings be consulted to evaluate the general and specific moisture and vapor transmission paths and associated potential impact on the proposed construction. That person should provide recommendations relative to the slab moisture and vapor retarder systems and for migration of potential adverse impact of moisture vapor transmission on various components of the structures, as deemed appropriate.

In addition, the recommendations in this report and GeoTek's services in general are not intended to address mold prevention, since GeoTek, along with geotechnical consultants in general, do not practice in the area of mold prevention. If specific recommendations addressing potential mold issues are desired, then a professional mold prevention consultant should be contacted. It is recommended that control joints be placed in two directions spaced approximately 24 to 36 times the thickness of the slab in inches. These joints are a widely accepted means to control cracks and should be reviewed by the project structural engineer.

### **5.3.2 Miscellaneous Foundation Recommendations**

To minimize moisture penetration beneath the slab-on-grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.

Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

### **5.3.3 Foundation Set Backs**

Minimum setbacks for all foundations should comply with the 2022 CBC, City of Fontana, or County of San Bernardino requirements, whichever is more stringent. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movement and/or differential settlement. If large enough, these movements can compromise the integrity of the improvements.

- The outside top edge of all footings should be set back a minimum of  $H/3$ , where  $H$  is the slope height, from the face of any descending slope. The setback should be at least five feet and need not exceed 40 feet.
- The bottom of any proposed foundations should be deepened so as to extend below a 1:1 upward projection from the bottom edge of the nearest excavation and the bottom edge of the closest footing.

### **5.3.4 Retaining and Screen Wall Design and Construction**

#### **5.3.4.1 General Design Criteria**

Retaining wall foundations independent of the building should be embedded a minimum of 12 inches into engineered fill. Retaining wall foundations should be designed in accordance with

Section 5.3.1 of this report. Structural requirements may govern and should be evaluated by the project structural engineer.

All earth retention structure plans should be reviewed by this office prior to finalization.

Site clearing and remedial earthwork for all earth retention structures should meet the requirements of this report, unless specifically provided otherwise, or more stringent requirements or recommendations are made by the wall designer. The soil used as backfill behind retaining walls should have a “very low” expansion potential and should be densified to at least 90 percent relative compaction (ASTM D 1557).

In general, cantilever retaining walls which are designed to yield at least  $0.001H$ , where  $H$  is equal to the height of the wall to the base of the footing may be designed using the active condition. Rigid earth retention structures (including but not limited to rigid walls, and walls braced at the top, such as typical basement walls) should be designed using the at-rest condition.

In addition to the design lateral forces due to retained earth, surcharges due to improvements, such as an adjacent structure, should be considered in the design of the retaining walls. Loads applied within a 1:1 (h:v) projection from the surcharging structure on the stem of the retaining wall should be considered in the design.

Final selection of the appropriate design parameters should be made by the retaining wall designer based upon the local practices and ordinances, expected structure response, and desired level of conservatism.

#### **5.3.4.2 Cantilevered Walls**

The recommendations presented below are for cantilevered retaining walls up to six feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, seismic events, or adverse geologic conditions.

ACTIVE EARTH PRESSURES	
Surface Slope of Retained Materials (h:v)	Equivalent Fluid Pressure* (pcf)
Level	37
2:1	53

\*The design pressures assume the backfill materials have an expansion index less than or equal to 20. Backfill zone includes the area between the back of the wall to a plane (1:1, h:v) up from the bottom of the wall foundation to the adjacent ground surface.

### 5.3.4.3 Retaining Wall Backfill and Drainage

Wall backfill should include a minimum one foot wide section of ¾- to one-inch clean crushed rock or approved equivalent. The rock should be placed immediately adjacent to the back of the wall and extend up from a backdrain to within approximately 12 inches of finish grade. The portion of the rock opposite the back of the wall adjacent to the soil backfill should be covered with a layer of filter fabric comprised of Mirafi 140N or the equivalent. The upper 12 inches of backfill should consist of compacted on-site soil. Backfill placed within the active zone as defined by a 1:1 (H:V) projection from the back of the retaining wall footing up to the retained surface behind the wall should consist of very low expansive soil. The presence of other soils placed within the 1:1 projection will necessitate revision to the parameters provided and modification of wall designs.

The backfill soil should be placed in lifts no greater than eight inches in thickness, moisture conditioned to at least optimum moisture content and compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557 test procedures. Proper surface drainage needs to be provided and maintained. Water should not be allowed to pond behind retaining walls. Waterproofing of site walls should be performed where moisture migration through the walls is undesirable.

Retaining walls should be provided with an adequate pipe and gravel back drain system to reduce the potential for hydrostatic pressures to develop. A 4-inch diameter perforated collector pipe (Schedule 40 PVC or approved equivalent) in a minimum of one cubic foot per linear foot of ¾-inch or one inch clean crushed rock or equivalent, wrapped in filter fabric should be placed near the bottom of the backfill and the water should be directed to an appropriate disposal area.

As an alternative to the drain, rock and fabric, a pre-manufactured wall drainage product (example: Mira Drain 6000 or approved equivalent) may be used behind the retaining wall. The

wall drainage product should extend from the base of the wall to within two (2) feet of the ground surface. The subdrain should be placed in direct contact with the wall drainage product.

Walls from two to four feet in height may be drained using localized gravel packs (e.g., approximately 1.5 cubic feet of gravel in a woven plastic bag) behind weep holes at 10 feet maximum spacing. Weep holes should be provided or the head joints omitted in the first course of block extended above the ground surface. However, nuisance water may still collect in front of the wall.

Drain outlets should be maintained over the life of the project and should not be obstructed or plugged by adjacent improvements.

#### **5.3.4.4 Restrained Retaining Walls**

Retaining walls that will be restrained prior to placing and compacting backfill material or that have reentrant or male corners, should be designed for an at-rest equivalent fluid pressure of 58 pcf, plus any applicable surcharge loading. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the project structural engineer.

#### **5.3.4.5 Other Design Considerations**

- Retaining and screen wall foundation elements should be designed in accordance with building code setback requirements. A minimum horizontal setback distance of five feet as measured from the top outside edge of the footing to an adjacent slope face is recommended.
- Wall design should consider the additional surcharge loads from superjacent slopes and/or footings, where appropriate.
- No backfill should be placed against concrete until minimum design strengths are evident by compression tests of cylinders.
- The retaining wall footing excavations, backcuts, and backfill materials should be approved the project geotechnical engineer or their authorized representative.
- Positive separations should be provided in screen walls at horizontal distances not exceeding 20 feet.

#### **5.3.5 Soil Corrosivity**

Based on the chemical test results presented in Appendix B, the corrosivity test results indicate that the on-site soils are “mildly corrosive” (7,370 ohm-cm) to buried ferrous metal. This

corrosion classification is obtained from “Corrosion Basics: An Introduction,” by Pierre R. Roberge, 2<sup>nd</sup> Edition, 2005. Recommendations for protection of buried ferrous metal should be provided by a corrosion engineer.

### **5.3.6 Soil Sulfate Content**

Based on the chemical test results presented in Appendix B, the sulfate test results on a sample obtained from the project site indicate a soluble sulfate content of less than 0.1% by weight. Soluble sulfate contents of this level would be in the range of “not applicable” (i.e., negligible) in accordance with ACI 318-19. Based on the test results and Table 19.3.1.1 of ACI 318-19, no special recommendations for concrete are required for this project due to soil sulfate exposure.

### **5.3.7 Import Soils**

Import soils should have a “very low” expansion potential. GeoTek, Inc. also recommends that the proposed import soils be tested for expansion and corrosivity potential. GeoTek, Inc. should be notified a minimum of 72 hours prior to importing so that appropriate sampling and laboratory testing can be performed.

### **5.3.8 Concrete Flatwork**

#### **5.3.8.1 Exterior Concrete Slabs, Sidewalks and Driveways**

Exterior concrete slabs, sidewalks and driveways should be designed using a four-inch minimum thickness. Some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices utilized in construction.

Sidewalks may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria will apply, if more restrictive than the recommendations presented in this report.

Subgrade soils should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs and sidewalks should be pre-saturated to a minimum of 100 percent of the optimum moisture content to a depth of 12 inches.

All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of Fontana, County of San Bernardino specifications, and under the observation and testing of GeoTek, Inc. and a City or County inspector, if necessary.

### **5.3.8.2 Concrete Performance**

Concrete cracks should be expected. These cracks can vary from sizes that are hairline to more than 1/8 inch in width. Most cracks in concrete, while unsightly, do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete undergoes chemical processes that are dependent on a wide range of variables which are difficult, at best, to control. Concrete, while seemingly a stable material, is subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek, Inc. suggests that control joints be placed in two directions and located a distance apart approximately equal to 24 to 36 times the slab thickness.

### **5.3.9 Pavement Design**

#### **5.3.9.1 Asphaltic Concrete Pavement**

Although planned final grades beneath the proposed parking, access roads and adjacent street improvements within the site are not yet known, the following preliminary pavement design recommendations are based on assumed Traffic Indexes of 5.5 for automobile and light truck parking areas, 7.0 for truck parking/access lanes. Preliminary pavement thickness design is based on the Caltrans Highway Design Manual (2022). An R-value of 79 was obtained in accordance with California Test Method 301 on a disturbed bulk sample from Boring B-6. A maximum design R-Value of 50 was used for the determination of preliminary pavement sections for this report. Once the traffic loading information becomes more defined, revision to the pavement design recommendations may be warranted. It is recommended that the final pavement design be based on R-value testing of the as-graded subgrade soils within the pavement areas.

Based on the assumptions noted above, the following preliminary pavement recommendations are provided for the site:

<b>PRELIMINARY MINIMUM PAVEMENT SECTION</b>		
Traffic Index	Thickness of Asphalt Concrete (inches)	Thickness of Aggregate Base (inches)
5.5 (Car/Light Truck Parking Areas)	4.0*	4.0
7.0 (Truck Parking and Access Lanes)	4.0*	5.0

\*City of Fontana Minimum

Traffic Indices (TIs) used in the pavement design are considered reasonable values for the proposed pavement areas indicated and should provide a pavement life of approximately 20 years with a normal amount of flexible pavement maintenance. Irrigation adjacent to pavements, without a deep curb or other cutoff to separate landscaping from the paving may result in premature pavement failure. Traffic parameters used for design were selected based upon engineering judgment and not upon information furnished to us such as an equivalent wheel load analysis or a traffic study.

The recommended pavement sections provided are intended as a minimum guideline and final selection of pavement cross section parameters should be made by the project civil engineer, based upon the local laws and ordinances, expected subgrade and pavement response, and desired level of conservatism. If thinner or highly variable pavement sections are constructed, increased maintenance and repair could be expected. Final pavement design should be checked by testing of soils exposed at subgrade (the upper five feet) after final grading has been completed.

Asphalt concrete and aggregate base should conform to current Caltrans Standard Specifications Section 39 and 26-1.02, respectively. As an alternative, asphalt concrete can conform to Section 203-6 of the current Standard Specifications for Public Work (Green Book). Crushed aggregate base or crushed miscellaneous base can conform to Section 200-2.2 and 200-2.4 of the Green Book, respectively. Pavement base should be compacted to at least 95 percent of the ASTM D1557 laboratory maximum dry density (modified proctor).

All pavement installation, including preparation and compaction of subgrade, compaction of base material, placement and rolling of asphaltic concrete should be done in accordance with the City of Fontana or County of San Bernardino specifications, and under the observation and testing of GeoTek and a City or County Inspector where required. Jurisdictional minimum compaction requirements in excess of the aforementioned minimums may govern.



Deleterious material, excessive wet or dry pockets, oversized rock fragments, and other unsuitable yielding materials encountered during grading should be removed. Once existing compacted fill are brought to the proposed pavement subgrade elevations, the subgrade should be proof-rolled in order to check for a uniform and unyielding surface. The upper 12 inches of pavement subgrade soils should be scarified, moisture conditioned at or near optimum moisture content, and recompacted to at least 95 percent of the laboratory maximum dry density (ASTM D1557). If loose or yielding materials are encountered during construction, additional evaluation of these areas should be carried out by GeoTek. All pavement section changes should be properly transitioned.

### **5.3.9.2 Permeable Interlocking Concrete Pavers**

Interlocking concrete pavers can be used for this project. The pavers are assumed to be approximately 3.2 inches (80 millimeters) in thickness. Concrete pavers should be underlain by 1.0 inch to 1.5 inches of bedding sand overlying four inches of aggregate base founded on compacted subgrade soils. The aggregate base should be compacted to at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures.

Where possible, the aggregate base should extend beyond the perimeter of the pavers a minimum distance of four inches.

The bedding sand should be placed and lightly moistened and compacted. Since this compaction cannot be tested it should be observed by a representative of this firm.

Historically, paver systems have experienced failures in areas where water has degraded the support characteristics of the underlying base and/or subgrade soils. Since paver systems are permeable and allow transmission of water into the underlying materials, it may be prudent to discuss with the paver designer/manufacturer what methods may be employed to address the issue of potential water introduction into the underlying materials. Underdrain systems, local subgrade reinforcement, or additional structural elements such as geotextiles can be considered, particularly in high traffic areas and/or low areas where water will tend to collect. The recommendations of the designer/manufacturer should then be implemented into the design and construction of the paver system.

### **5.3.9.3 Portland Cement Concrete (PCC) Pavement**

For the proposed automobile and light truck parking and access lanes, it is recommended that a minimum of 5.0 inches of PCC pavement over 12 inches subgrade compacted to at least 95 percent of maximum dry density as determined by ASTM D 1557 test procedures be utilized.

For truck parking and emergency vehicle drives, it is recommended that a minimum of six inches of PCC pavement over 12 inches subgrade compacted to at least 95 percent of maximum dry density be utilized. This section should also be used in truck traffic areas such as fire lanes, trash dumpster pads and approaches.

Requirements of Section 90 of Caltrans Standard Specifications, and various ACI and ASTM standards regarding mixing and placing concrete should be followed. The PCC pavement should have a minimum modulus of rupture of 500 pounds per square inch, and a minimum 28-day compressive strength of 4,000 pounds per square inch. Concrete should incorporate 1-inch maximum size aggregate and should be proportioned to achieve a maximum slump of four inches. Instead of increasing the water content, a plasticizing admixture may be utilized to increase the workability of the concrete. The concrete should be properly cured after placement. Concrete should not be placed during hot and windy weather.

Crack control joints should be provided in the transverse direction spaced at horizontal intervals ranging from 24 to 36 times the thickness of the concrete.

## **5.4 POST CONSTRUCTION CONSIDERATIONS**

### **5.4.1 Landscape Maintenance and Planting**

Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff, and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.

Overwatering should be avoided. An abatement program to control ground-burrowing rodents should be implemented and maintained. Burrowing rodents can decrease the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundations. This type of landscaping should be avoided.

### **5.4.2 Drainage**

Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground adjacent to the footings and floor-slabs. Pad drainage should be directed toward approved areas and not be blocked by other improvements.

Roof gutters should be installed that will direct the collected water at least 20 feet from the buildings.

## **5.5 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS**

It is recommended that specifications and foundation and grading plans be reviewed by GeoTek prior to construction to check for conformance with the recommendations of this report. It is also recommended that GeoTek, Inc. representatives be present during site grading and foundation construction to observe and document proper implementation of the geotechnical recommendations. The owner/developer should verify that GeoTek, Inc. representatives perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of on-site and import materials for fill placement and collect soil samples for laboratory testing where necessary.
- Observe the fill for uniformity during placement, including utility trench backfill. Perform field density testing of the fill materials.
- Observe and probe foundation excavations to confirm suitability of bearing materials with respect to density.

If requested, a construction observation and compaction report can be provided by GeoTek, Inc. which can comply with the requirements of the governmental agencies having jurisdiction over the project. It is recommended that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

## **6. INTENT**

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in this report is intended to reduce risk associated with



construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of this evaluation is limited to the boundaries of the subject property. This review does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to us by the client. Further, no evaluation of any existing site improvements is included. The scope of this evaluation is based on GeoTek's understanding of the project and geotechnical engineering standards normally used on similar projects in this locality.

## **7. LIMITATIONS**

GeoTek's findings are based on site conditions observed and the stated sources. Thus, GeoTek's comments are professional opinions that are limited to the extent of the available data.

GeoTek has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report.

Since GeoTek's recommendations are based on the site conditions observed and encountered, and laboratory testing, GeoTek's conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty of any kind is expressed or implied. Standards of care/practice are subject to change with time.

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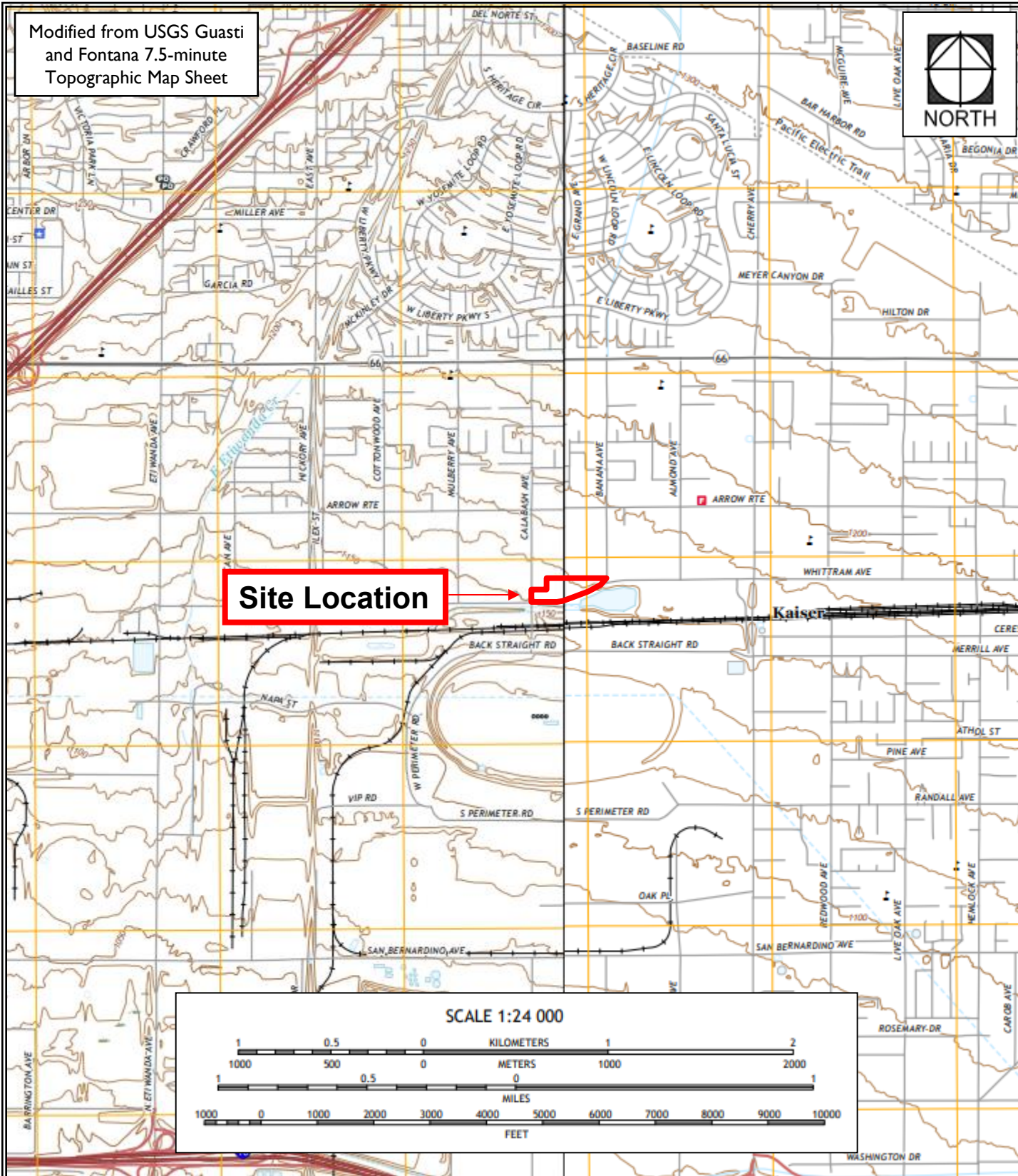
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Topographic Map Sheet

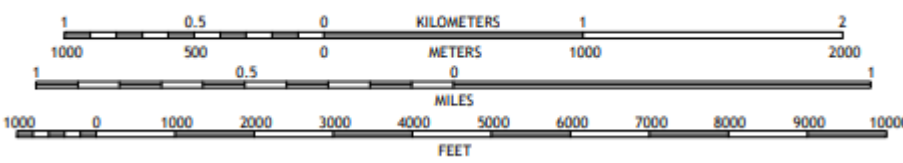


NORTH



Site Location

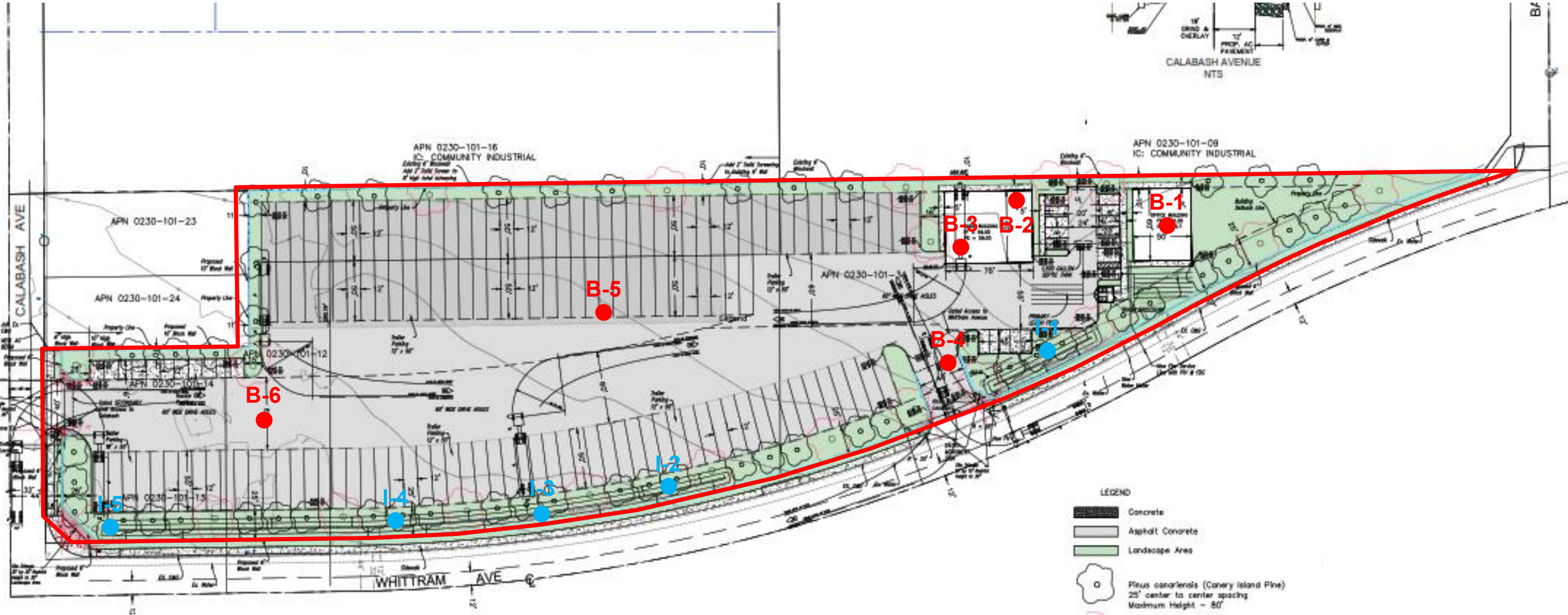
SCALE 1:24 000






**Mr. Robert Beers**  
Assessor's Parcel Numbers 0230-101-12, -13, -14 and -34  
14044 Whittram Avenue  
Fontana, San Bernardino County, California  
Project No. 3697-CR

**Figure I**  
Site Location  
Map





**Legend**

-  Site Boundary
-  B-6 Hollow-stem Boring Location
-  I-5 Infiltration Test Location

**Mr. Robert Beers**  
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 14044 Whittram Avenue  
 Fontana, San Bernardino County, California

Project No. 3697-CR



**Figure 2**  
 Boring Location Map

# **APPENDIX A**

## **LOGS OF EXPLORATORY BORINGS**

**Assessor's Parcel Numbers (APNs) 0230-101-12, -13, -14 and -34**

**Proposed Truck Trailer Parking Facility**

**Fontana, San Bernardino County, California**

**Project No. 3697-CR**



## A - FIELD TESTING AND SAMPLING PROCEDURES

### The Modified Split-Barrel Sampler (Ring)

The Ring sampler is driven into the ground at various depths in accordance with ASTM D 3550 test procedures. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

### The Standard Penetration Test (SPT) Sampler

Standard penetration tests (SPT) were performed with a 2.0-inch outside diameter, 1.5-inch inside diameter, split-barrel sampler. The sampler was 18 inches long. The inside diameter of the sampler shoe was 1.4 inches. The sampler was unlined. The sampler conformed to the requirements of ASTM D 1586. A 140-pound automatic trip hammer was utilized, dropping 30 inches for each blow. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. Disturbed samples are removed from the sample barrel, sealed in a plastic bag, and transported to the laboratory for testing.

### Bulk Samples (Large)

These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

### Bulk Samples (Small)

These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

## B – BORING/TRENCH LOG LEGEND

The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings/trenches:

### SOILS

USCS	Unified Soil Classification System
f-c	Fine to coarse
f-m	Fine to medium

### GEOLOGIC

B: Attitudes	Bedding: strike/dip
J: Attitudes	Joint: strike/dip
C: Contact line	
.....	Dashed line denotes USCS material change
_____	Solid Line denotes unit / formational change
————	Thick solid line denotes end of boring/trench

(Additional denotations and symbols are provided on the log of borings/trenches)

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-1	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
MATERIAL DESCRIPTION AND COMMENTS								
5		5		SM	<b>Artificial Fill:</b> Silty f-c SAND, dark grayish brown, slightly moist, some asphaltic concrete debris, few gravel	5.8	110.1	MD, SH, EI EI = 0
		6						
10		4		SM	<b>Alluvium:</b> Silty f-c SAND, light brown to brown, moist, medium dense, few gravel	10.4	119.1	
		8						
15		15		SM/SP	Silty f-c SAND to f-c SAND, grayish brown, slightly moist, medium dense, some gravel	2.0	122.1	
		20						
20		24		SP	Gravelly f-c SAND, gray, slightly moist to moist, very dense	3.1	119.5	Collapse
		26						
25		50/6"				1.9	123.1	
		30						
30		36			<b>BORING TERMINATED AT 20.0 FEET</b>			
		42						

<b>LEGEND</b>	<b>Sample type:</b>	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	SR = Sulfate/Resistivity Test	EI = Expansion Index	SH = Shear Test	SA = Sieve Analysis	HC = Consolidation	RV = R-Value Test

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-2	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
MATERIAL DESCRIPTION AND COMMENTS								
4	SM	4		SM	<b>Artificial Fill:</b> Silty f-c SAND, dark grayish brown, slightly moist, some asphaltic concrete debris, few gravel	5.2	113.0	
5	SM	14		SM	<b>Alluvium:</b> Silty f-c SAND, brown, moist, medium dense, some gravel	2.6	117.2	
6	SM/SP	24		SM/SP	Silty f SAND to f SAND, light brown, slightly moist, medium dense, trace gravel			
7	SM	18		SM	Silty f-m SAND, grayish brown, slightly moist, medium dense, few gravel	2.1	119.8	Collapse
10	SP	12		SP	F-m SAND, slightly moist, dense, some fine gravel	1.8	115.1	
15	SM/SP	25		SM/SP	Silty/gravelly f-c SAND, grayish brown, slightly moist, very dense			
20	SM/SP	35		SM/SP	Silty/gravelly f-c SAND, grayish brown, slightly moist, very dense	1.4	119.1	
25	SM	25		SM	Silty f-c SAND, gray, slightly moist to moist, very dense, few gravel			
30	SM	33		SM	Silty f-c SAND, gray, slightly moist to moist, very dense, few gravel			
31	SM	28		SM	Silty f-c SAND, gray, slightly moist to moist, very dense, few gravel			

<b>LEGEND</b>	<b>Sample type:</b>	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC = Consolidation

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-2 CONTINUED  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
35	18 24 34			SM/SP	Silty f-c SAND to f-c SAND, brown, slightly moist to moist, very dense, few gravel			
40	17 19 20			SM	Silty f-c SAND, grayish brown, slightly moist to moist, dense, trace gravel	4.9		
45	10 14 15			ML	Clayey SILT, brown, moist, very stiff, trace fine gravel, trace fine grained sand			
50	7 13 16				F sandy/clayey SILT, brown, moist, very stiff	19.0		
55					<b>BORING TERMINATED AT 51.5 FEET</b>  No groundwater encountered Boring backfilled with soil cuttings			
60								

<b>LEGEND</b>	<b>Sample type:</b>	■ ---Ring	■ ---SPT	▨ ---Small Bulk	⊠ ---Large Bulk	□ ---No Recovery	▽ ---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	El = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC = Consolidation

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-3  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing			
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others	
5	10 12 12			SM	<b>Artificial Fill:</b> Silty f-c SAND, brown, moist, medium dense, few asphaltic concrete debris, few concrete fragments	4.9	115.9		
	10 11 13			SM	<b>Alluvium:</b> Silty f-c SAND, light grayish brown, slightly moist, medium dense, some gravel	2.3	120.4	Collapse	
	10 20 30					1.8			
10	13 16 19			SM/SP	Silty f-c SAND to f-c SAND, grayish brown, slightly moist, medium dense, some gravel				
	30 50/5"					2.0			
15					<b>BORING TERMINATED AT 14.5 FEET (REFUSAL)</b>  No groundwater encountered Boring backfilled with soil cuttings				
20									
25									
30									
<b>LEGEND</b>	<b>Sample type:</b> <span style="display: inline-block; width: 15px; height: 10px; background-color: gray; border: 1px solid black;"></span> ---Ring <span style="display: inline-block; width: 15px; height: 10px; background-color: lightgray; border: 1px solid black;"></span> ---SPT <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-style: dashed;"></span> ---Small Bulk <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-style: dotted;"></span> ---Large Bulk <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black;"></span> ---No Recovery <span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-style: dashed;"></span> ---Water Table								
	<b>Lab testing:</b> AL = Atterberg Limits    EI = Expansion Index    SA = Sieve Analysis    RV = R-Value Test SR = Sulfate/Resistivity Test    SH = Shear Test    HC = Consolidation    MD = Maximum Density								

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-4  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
5	X	5 5 5		SM	<b>Artificial Fill:</b> Silty f-c SAND, brown, moist, medium dense, few asphaltic concrete debris, few concrete fragments  Silty f SAND, brown, moist, loose, trace gravel	6.5	118.5	SR
		4 5 5				6.6	111.5	
10		23 33 30		SM	<b>Alluvium:</b> Silty f-c SAND, grayish brown, slightly moist, dense, some gravel	1.7	127.6	
		14 28 31				2.2	110.3	
15		32 50/2"		SP	Gravelly f-c SAND, grayish brown, slightly moist, very dense			
20					<b>BORING TERMINATED AT 15.5 FEET (REFUSAL)</b>  No groundwater encountered Boring backfilled with soil cuttings			
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>		---Ring		---SPT		---Small Bulk		---Large Bulk		---No Recovery		---Water Table
	<b>Lab testing:</b>	AL = Atterberg Limits	SR = Sulfate/Resistivity Test	EI = Expansion Index	SH = Shear Test	SA = Sieve Analysis	HC = Consolidation	RV = R-Value Test	MD = Maximum Density				

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-5  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
5		5		SM	<b>Artificial Fill:</b> Silty f-m SAND, brown, moist, loose	3.7	111.9	
		8						
		16		SM	<b>Alluvium:</b> Silty f-c SAND, gray, slightly moist, medium dense, some gravel			
		22		SP	Gravelly f-c SAND, gray, slightly moist, dense	1.8	120.8	
		26						
	26							
10		20				1.9	132.8	
		33						
		36						
	16		ML/SM	F sandy SILT to silty f SAND, brown, slightly moist to moist, stiff/medium dense, trace fine gravel	2.2	122.3		
	15							
	12							
15		20		SP	Gravelly f-c SAND, gray, slightly moist, dense			
		29						
		42						
<b>BORING TERMINATED AT 15.0 FEET</b>								
No groundwater encountered Boring backfilled with soil cuttings								
20								
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC = Consolidation

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: B-6 MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
5				SM	<b>Artificial Fill:</b> Silty f-c SAND, grayish brown, slightly moist, medium dense			RV R-Value = 79
10		12 14 16		SP	<b>Alluvium:</b> Gravelly f-c SAND, gray, slightly moist, medium dense	1.0	122.0	
		9 12 12		SM	Silty f SAND, brown, moist, medium dense, trace gravel	1.8		
		21 33 33		SP	Gravelly f-c SAND, gray, slightly moist, medium dense	2.0		
15		16 25 29				1.4	128.7	
				ML	F sandy SILT, brown, very moist, stiff			
		6 15 40		SM	Silty f-c SAND, grayish brown, slightly moist, dense, few gravel	2.0	116.6	
20	<b>BORING TERMINATED AT 15.5 FEET (REFUSAL)</b>							
	No groundwater encountered Boring backfilled with soil cuttings							
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>		---Ring		---SPT		---Small Bulk		---Large Bulk		---No Recovery		---Water Table
	<b>Lab testing:</b>	AL = Atterberg Limits	SR = Sulfate/Resistivity Test	EI = Expansion Index	SH = Shear Test	SA = Sieve Analysis	HC = Consolidation	RV = R-Value Test	MD = Maximum Density				

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: I-1  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
5				SM	<b>Artificial Fill:</b> Silty f-c SAND, grayish brown, slightly moist, medium dense, trace asphaltic concrete debris			200 Wash 22.9% passing No. 200
				SM	<b>Alluvium:</b> Silty f-c SAND, grayish brown, slightly moist, trace gravel			
10					<b>BORING TERMINATED AT 5.0 FEET</b>  No groundwater encountered Boring set with poerforated pipe and gravel for infiltration testing			
15								
20								
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC= Consolidation

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: I-2  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
5				SM	<b>Artificial Fill:</b> Silty f-c SAND, grayish brown, slightly moist, medium dense, trace asphaltic concrete debris			
				SM	<b>Alluvium:</b> Silty f-c SAND, grayish brown, slightly moist, some gravel			
10					<b>BORING TERMINATED AT 5.0 FEET</b>  No groundwater encountered Boring set with poerforated pipe and gravel for infiltration testing			
15								
20								
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC= Consolidation

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: I-3  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
0				SM	<b>Artificial Fill:</b> Silty f-c SAND, grayish brown, slightly moist, medium dense			
5				SM	<b>Alluvium:</b> Silty f-c SAND, grayish brown, slightly moist, some gravel			
5.0					<b>BORING TERMINATED AT 5.0 FEET</b>  No groundwater encountered Boring set with poerforated pipe and gravel for infiltration testing			
10								
15								
20								
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC= Consolidation

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: I-4  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
5				SM	<b>Artificial Fill:</b> Silty f-c SAND, grayish brown, slightly moist, medium dense			
				SM	<b>Alluvium:</b> Silty f-c SAND, grayish brown, slightly moist, trace gravel			
10					<b>BORING TERMINATED AT 5.0 FEET</b>  No groundwater encountered Boring set with poerforated pipe and gravel for infiltration testing			
15								
20								
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>	---Ring	---SPT	---Small Bulk	---Large Bulk	---No Recovery	---Water Table	
	<b>Lab testing:</b>	AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC= Consolidation

**GeoTek, Inc.**  
**LOG OF EXPLORATORY BORING**

<b>CLIENT:</b> Mr. Robert Beers	<b>DRILLER:</b> 2R Drilling Inc.	<b>LOGGED BY:</b> DRW
<b>PROJECT NAME:</b> 14044 Whittram Avenue	<b>DRILL METHOD:</b> Hollow-Stem Auger	<b>OPERATOR:</b> Victor
<b>PROJECT NO.:</b> 3697-CR	<b>HAMMER:</b> 140 lbs, 30 in.	<b>RIG TYPE:</b> Track GT-16
<b>LOCATION:</b> See Exploration Location Map	<b>Approx. Elev.:</b> 1358 msl	<b>DATE:</b> 11/1/2023

Depth (ft)	SAMPLES			USCS Symbol	BORING NO.: I-5  MATERIAL DESCRIPTION AND COMMENTS	Laboratory Testing		
	Sample Type	Blows/ 6 in	Sample Number			Water Content (%)	Dry Density (pcf)	Others
0				SM	<b>Artificial Fill:</b> Silty f-c SAND, grayish brown, slightly moist, medium dense			
5				SM	<b>Alluvium:</b> Silty f SAND, grayish brown, slightly moist, trace gravel  Silty f-m SAND, brown, slightly moist, trace gravel			
5.0					<b>BORING TERMINATED AT 5.0 FEET</b>  No groundwater encountered Boring set with poerforated pipe and gravel for infiltration testing			
10								
15								
20								
25								
30								

<b>LEGEND</b>	<b>Sample type:</b>		---Ring		---SPT		---Small Bulk		---Large Bulk		---No Recovery		---Water Table
	<b>Lab testing:</b>	AL = Atterberg Limits	EI = Expansion Index	SA = Sieve Analysis	RV = R-Value Test	SR = Sulfate/Resistivity Test	SH = Shear Test	HC = Consolidation	MD = Maximum Density				

# **APPENDIX B**

## **LABORATORY TEST RESULTS**

**Assessor's Parcel Numbers (APNs) 0230-101-12, -13, -14 and -34**

**Proposed Truck Trailer Parking Facility**

**Fontana, San Bernardino County, California**

**Project No. 3697-CR**



## SUMMARY OF LABORATORY TESTING

### Classification

Soils were classified visually in general accordance with the Unified Soil Classification System (ASTM Test Method D 2487). The soil classifications are shown on the boring logs in Appendix A.

### Collapse Test

Collapse tests were performed on selected samples of the site soils in general accordance with ASTM D 5333 test procedures. The results of this test are presented graphically in Appendix B.

### Direct Shear

Shear testing was performed on a remolded sample in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080. The rate of deformation is approximately 0.035 inch per minute. The samples were sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. The results of the testing are presented graphically in Appendix B.

### Expansion Index

The expansion potential of the soils was determined by performing expansion index testing on a sample in general accordance with ASTM D 4829. The results of the testing are provided below and in Appendix B:

Boring No.	Depth (ft.)	Soil Type	Expansion Index	Classification
B-1	0-5	Silty Sand (SM)	0	Very Low

### In-Situ Moisture and Density

The natural water content was determined (ASTM D 2216) on samples of the materials recovered from the subsurface exploration. In addition, in-place dry density determinations (ASTM D 2937) were performed on relatively undisturbed samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the logs at the appropriate sample depths in Appendix A.

### Materials Finer Than the No. 200 Sieve

A #200 sieve wash was performed on a selected sample of the subsurface soil, in accordance with ASTM Test Method D 1140. The results of this testing are presented on the boring logs in Appendix A.

### Moisture-Density Relationship

Laboratory testing consisting of a moisture-density relationship was performed on a sample obtained during the subsurface exploration. The laboratory maximum dry density and optimum moisture content was determined in general accordance with ASTM D 1557 test procedures.

### R-Value

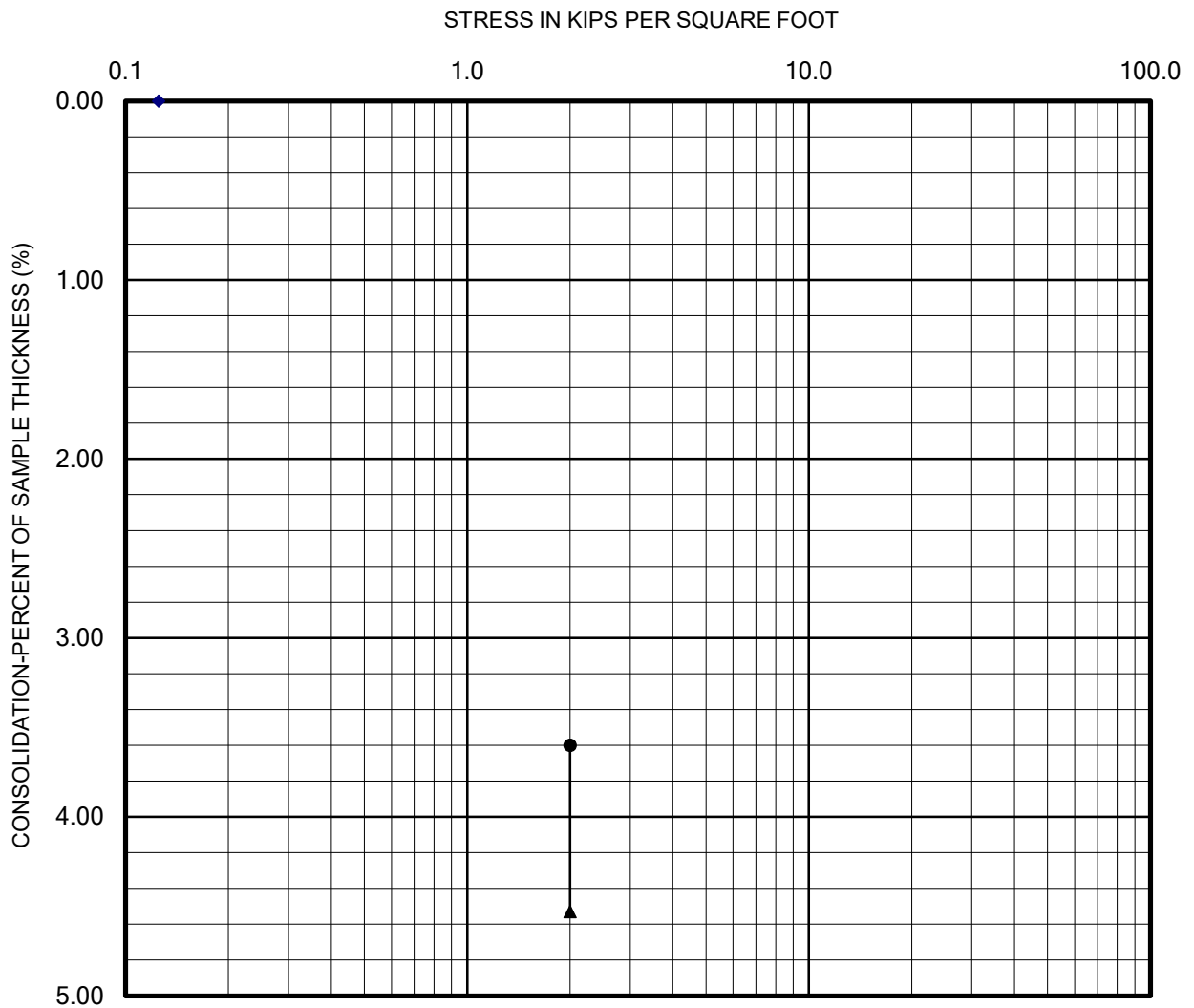
Laboratory testing was performed in general accordance with Caltrans Test Method CT 301. The results of the testing are presented herein.

**Sulfate Content, Resistivity and Chloride Content**

Laboratory testing was performed by others in general accordance with ASTM procedures. The testing included pH and water-soluble sulfate content determinations, and resistivity and chloride content testing. The results of the testing are provided below:

Boring No.	Depth (ft.)	pH ASTM G 51	Chloride ASTM D 512B(ppm)	Sulfate ASTM D 516 (% by weight)	Resistivity ASTM G 187 (ohm-cm)
B-4	0 - 5	7.3	13.9	0.0022	7,370





- Seating Cycle
- Loading Prior to Inundation
- ▲— Loading After Inundation
- ▲--- Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546



## COLLAPSE REPORT

Sample: B-2 @ 7 feet

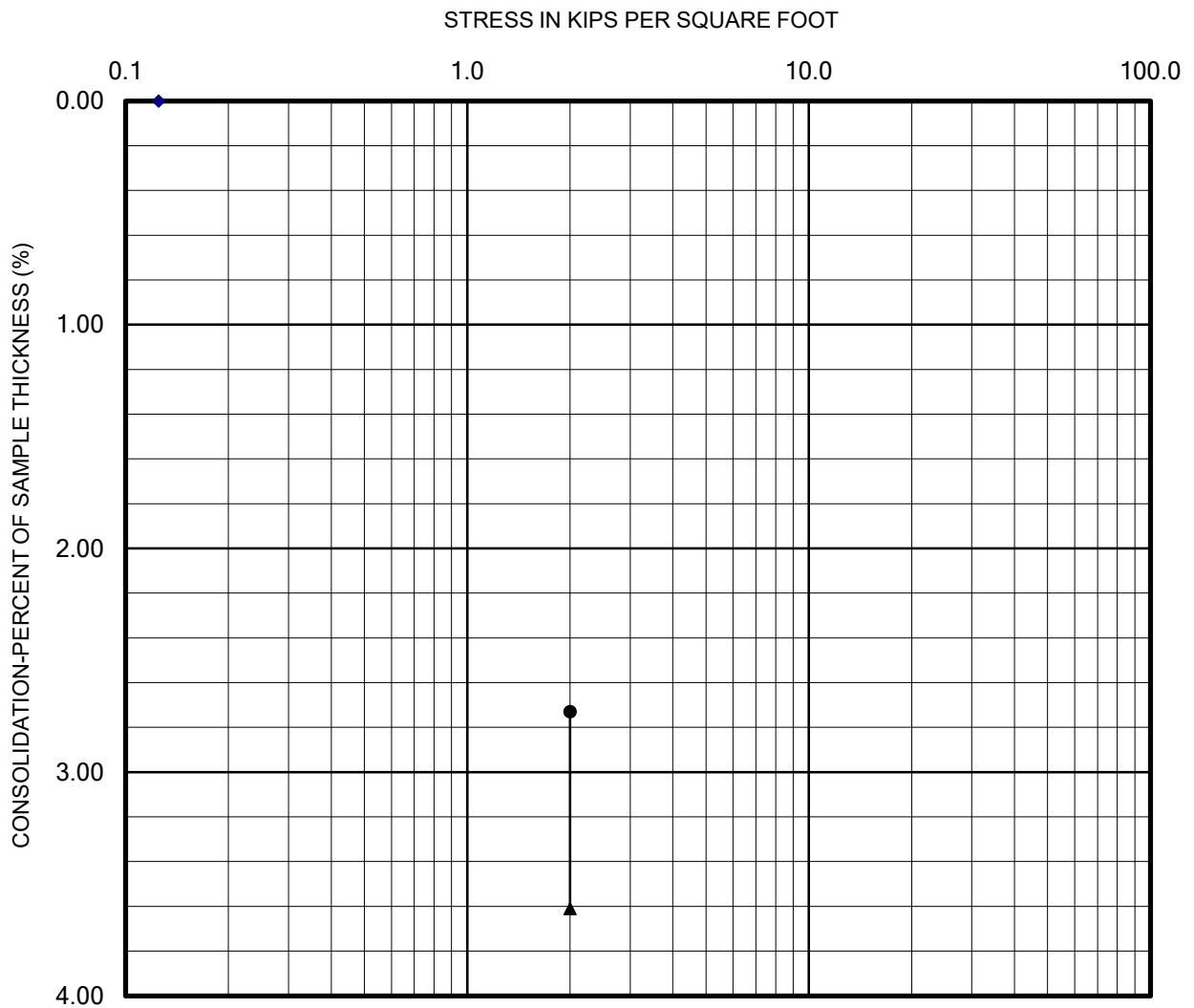
Plate B-2

CHECKED BY: JB

Lab: Corona

PROJECT NO.: 3697-CR

Date: 11/7/2023



- Seating Cycle
- Loading Prior to Inundation
- ▲— Loading After Inundation
- ▲--- Rebound Cycle

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546



## COLLAPSE REPORT

Sample: B-3 @ 4 feet

Plate B-3

CHECKED BY: JB

Lab: Corona

PROJECT NO.: 3697-CR

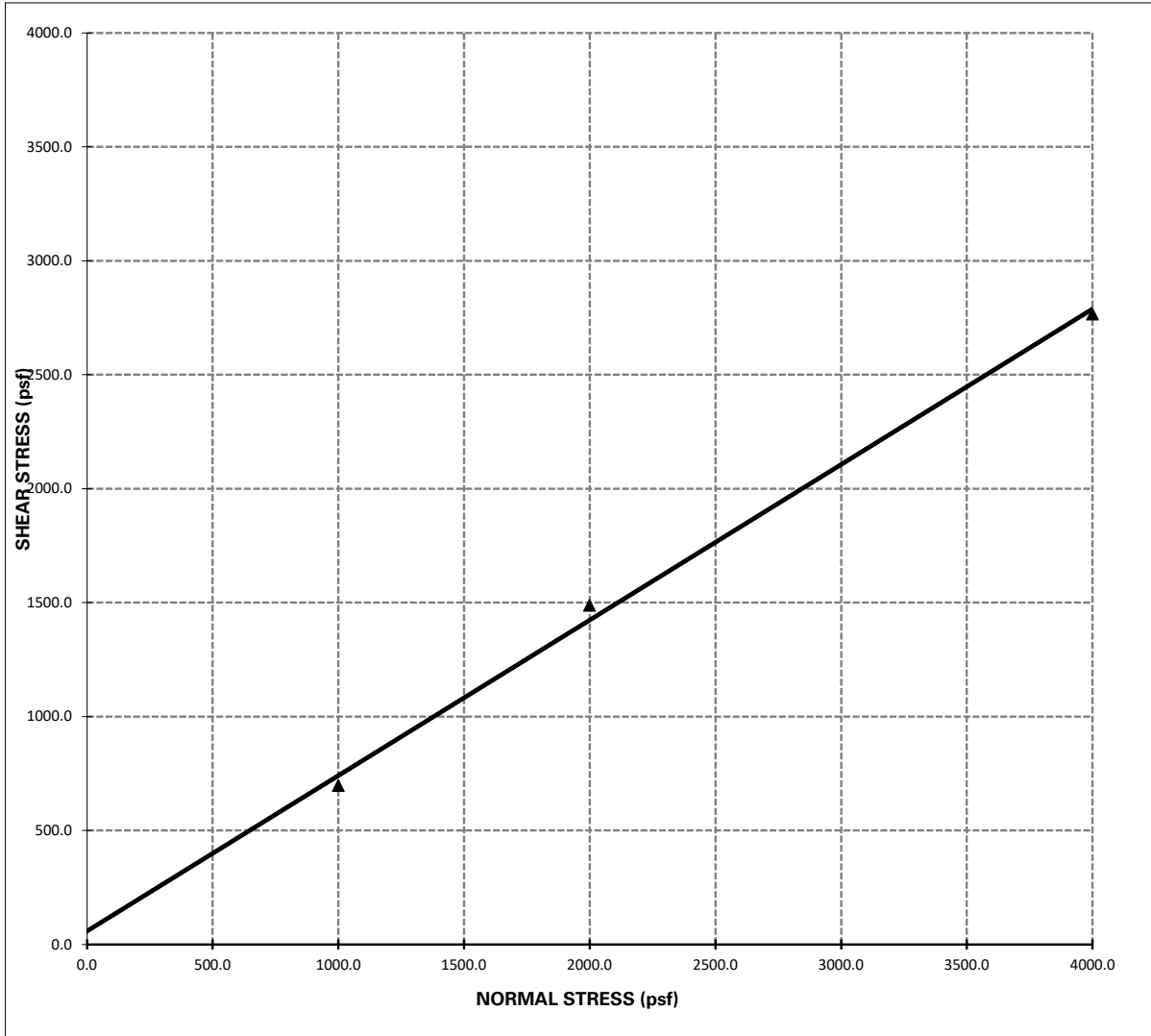
Date: 11/7/2023



## DIRECT SHEAR TEST

**Project Name:** 14044 Whittram Avenue  
**Project Number:** 3697-CR

**Sample Location:** B-1 @ 0-5 feet  
**Date Tested:** 11/9/2023



**Shear Strength:**  $\Phi = 34^{\circ}$  ; **C = 58 psf**

- Notes:**
- 1 - The soil specimen used in the shear box was a ring sample remolded to approximately 90% relative compaction from a bulk sample collected during the field investigation.
  - 2 - The above reflect direct shear strength at saturated conditions.
  - 3 - The tests were run at a shear rate of 0.01 in/min.



Report No: PTR:23-00230-S01

# Proctor Report

**Client:** Mr. Robert Beers  
 8175 Limonite Avenue  
 Jurupa Valley CA 92509

**CC:**

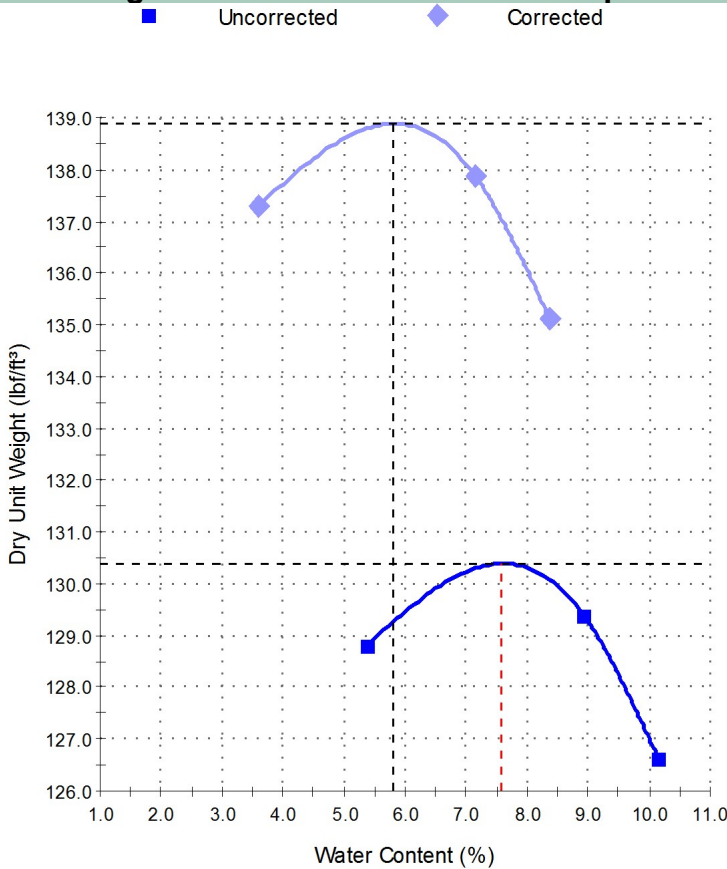
**Project:** 3697-CR  
 14044 Whittram Avenue, Fontana

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

## Sample Details

**Sample ID:** 23-00230-S01 **Date Sampled:** 11/3/2023  
**Sampled By:** Daniel Whitmer  
**Location:** B-1 @ 0-5 feet / Silty fine to coarse sand with gravel

## Dry Unit Weight - Water Content Relationship



## Test Results

ASTM D 1557

**Maximum Dry Unit Weight (lb/ft³): 130.4**  
**Optimum Water Content (%): 7.6**  
 Method: B  
 Preparation Method: Moist  
 Retained Sieve 3/8" (9.5mm) (%): 27  
 Passing Sieve 3/8" (9.5mm) (%): 73  
 Tested By: Mycheal Phillips  
 Date Tested: 11/3/2023

ASTM D 4718

**Corrected Maximum Dry Unit Weight (lb/ft³): 138.9**  
**Corrected Optimum Water Content (%): 5.8**  
 Specific Gravity (Oversize): 2.70  
 Sieve Size (Oversize): 3/8  
 Oversize Particles (%): 27

## Comments



## EXPANSION INDEX TEST

(ASTM D4829)

**Client:** Mr. Robert Beers  
**Project Number:** 3697-CR  
**Project Location:** 14044 Whittram Avenue

**Tested/ Checked By:** MP Lab No Corona  
**Date Tested:** 11/3/2023  
**Sample Source:** B-1 @ 0-5 feet  
**Sample Description:**

Ring #: \_\_\_\_\_ Ring Dia. : 4.01" Ring Ht. 1"

### DENSITY DETERMINATION

Weight of compacted sample & ring (gm)	789.3
Weight of ring (gm)	363.7
Net weight of sample (gm)	<b>425.6</b>
Wet Density, lb / ft3 (C*0.3016)	<b>128.4</b>
Dry Density, lb / ft3 (D/1.F)	<b>118.9</b>

### SATURATION DETERMINATION

Moisture Content, %	8.0
Specific Gravity, assumed	<b>2.70</b>
Unit Wt. of Water @ 20 °C, (pcf)	<b>62.4</b>
% Saturation	<b>51.7</b>

READINGS		
DATE	TIME	READING
11/3/2023		0.2730
11/3/2023		0.2730
11/4/2023		0.2730

Initial  
10 min/Dry  
  
  
  
Final

### FINAL MOISTURE

Final Weight of wet sample & tare	% Moisture
802.7	<b>11.1</b>

**EXPANSION INDEX = 0**



**Report No: RV:23-00230-S02**

# R Value Report

**Client:** Mr. Robert Beers  
 8175 Limonite Avenue  
 Jurupa Valley CA 92509

**Project:** 3697-CR  
 14044 Whittram Avenue, Fontana

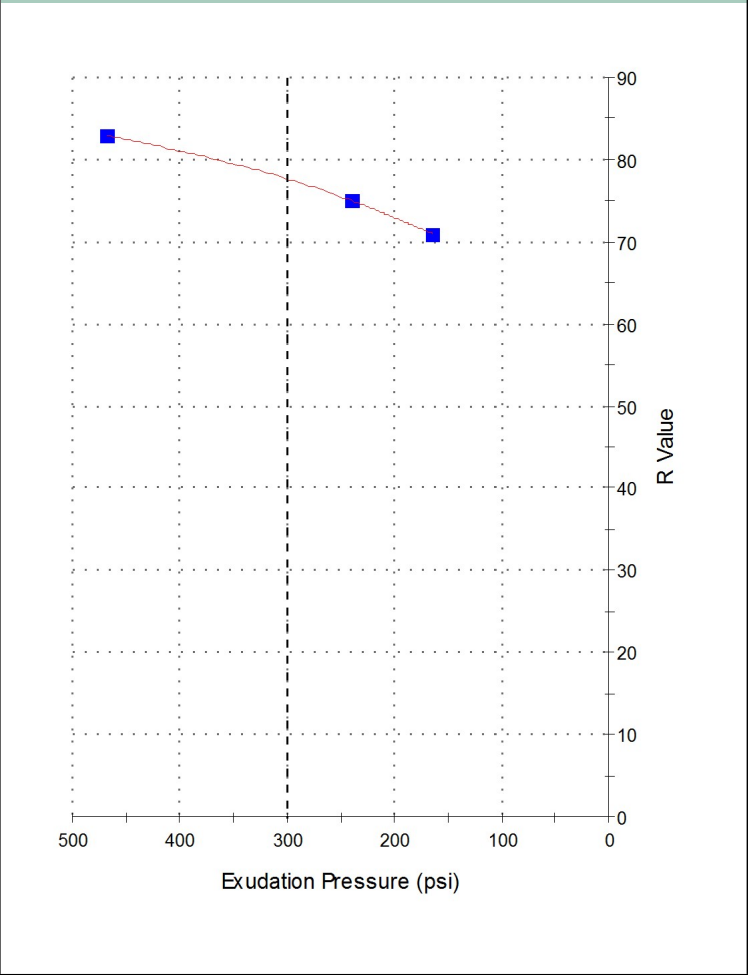
**CC:**

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

## Sample Details

**Sample ID:** 23-00230-S02      **Date Sampled:** 11/3/2023  
**Sampling Method:**      **Source:**  
**Material:** Silty fine to coarse sand with gravel      **Specification:**  
**Location:** B-6 @ 0-5 feet      **Tested By:** Jordan Brucelas  
**Date Tested:** 11/7/2023

## R Value



## Test Results

ASTM D 2844  
**R Value at 300 psi Exudation: 78**

## Specimen Results

<b>Moisture Content (%)</b>	8.7	8.2	8.1
<b>Dry Density (lb/ft³)</b>	120.6	123.0	120.8
<b>Exudation Pressure (psi)</b>	164	239	469
<b>R Value</b>	71	75	83
<b>Expansion Pressure (psi)</b>	0.0	0.0	0.1



## Comments

8.0% Retained on the 3/4" Sieve



## -200 WASH

Date: 11/7/2023  
W.O.: 3697-CR sample ID I-1  
Client: Mr. Robert Beers depth 0-5 feet  
Project: 14044 Whittram Avenue

Sieve Size	Particle Diameter		Wt. Retained	Wt. Passing	% Passing	Specs
	in.	mm.				
#200	0.0029	0.074	377	111.7	22.9%	
Dry Weight	<u>488.7</u>					
Soak Time	<u>1440</u> Minutes					



# Results Only Soil Testing for 14044 Whittram

**November 6, 2023**

**Prepared for:**

**Jordan Brucelas**  
**Geotek USA**  
**1548 North Maple Street**  
**Corona, CA 92280**  
**jbrucelas@geotekusa.com**

**Project X Job#: S231103G**  
**Client Job or PO#: 3697-CR Mr. Beers**

Respectfully Submitted,

Eduardo Hernandez, M.Sc., P.E.  
Sr. Corrosion Consultant  
NACE Corrosion Technologist #16592  
Professional Engineer  
California No. M37102  
[ehernandez@projectxcorrosion.com](mailto:ehernandez@projectxcorrosion.com)





## Soil Analysis Lab Results

Client: Geotek USA  
 Job Name: 14044 Whittram  
 Client Job Number: 3697-CR Mr. Beers  
 Project X Job Number: S231103G  
 November 6, 2023

Bore# / Description	Method Depth	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327	
		Sulfates SO <sub>4</sub> <sup>2-</sup>		Chlorides Cl <sup>-</sup>		Resistivity As Rec'd   Minimum		pH	Redox	Sulfide S <sup>2-</sup>	Nitrate NO <sub>3</sub> <sup>-</sup>	Ammonium NH <sub>4</sub> <sup>+</sup>	Lithium Li <sup>+</sup>	Sodium Na <sup>+</sup>	Potassium K <sup>+</sup>	Magnesium Mg <sup>2+</sup>	Calcium Ca <sup>2+</sup>	Fluoride F <sub>2</sub> <sup>-</sup>	Phosphate PO <sub>4</sub> <sup>3-</sup>
		(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
B-4	0-5	21.8	0.0022	13.9	0.0014	24,790	7,370	7.3	124	ND	33.5	0.1	ND	20.1	5.8	15.4	83.4	10.5	3.8

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography  
 mg/kg = milligrams per kilogram (parts per million) of dry soil weight  
 ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown  
 Chemical Analysis performed on 1:3 Soil-To-Water extract  
 PPM = mg/kg (soil) = mg/L (Liquid)

**Note:** Sometimes a bad sulfate hit is a contaminated spot. Typical fertilizers are Potassium chloride, ammonium sulfate or ammonium sulfate nitrate (ASN). So this is another reason why testing full corrosion series is good because we then have the data to see if those other ingredients are present meaning the soil sample is just fertilizer-contaminated soil. This can happen often when the soil samples collected are simply surface scoops which is why it's best to dig in a foot, throw away the top and test the deeper stuff. Dairy farms are also notorious for these items.

# **APPENDIX C**

## **PERCOLATION TEST DATA AND PORCHET CALCULATIONS**

**Assessor's Parcel Numbers (APNs) 0230-101-12, -13, -14 and -34  
Proposed Truck Trailer Parking Facility  
Fontana, San Bernardino County, California  
Project No. 3697-CR**



**PERCOLATION DATA SHEET**

**Project:** Mr. Robert Beers - 14044 Whittram Avenue, Fontana

**Job No.:** 3697-CR

**Test Hole No.:** I-I **Tested By:** DRW

**Date:** 11/2/2023

**Depth of Hole As Drilled:** 60" **Before Test:** 60"

**After Test:** 60"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Rate (Minutes per Inch)	Comments
1	7:37 AM		60	24			1.04	
	8:02 AM	25			0	24		
2	8:04 AM		60	24			1.04	
	8:29 AM	25			0	24		
1	8:31 AM		60	24			0.87	
	8:41 AM	10			12 1/2	11 1/2		
2	8:43 AM		60	24			0.91	
	8:53 AM	10			13	11		
3	8:55 AM		60	24			0.95	
	9:05 AM	10			13 1/2	10 1/2		
4	9:07 AM		60	24			0.95	
	9:17 AM	10			13 1/2	10 1/2		
5	9:19 AM		60	24			0.98	
	9:29 AM	10			13 3/4	10 1/4		
6	9:31 AM		60	24			0.98	
	9:41 AM	10			13 3/4	10 1/4		



**PERCOLATION DATA SHEET**

**Project:** Mr. Robert Beers - 14044 Whittram Avenue, Fontana

**Job No.:** 3697-CR

**Test Hole No.:** I-2 **Tested By:** DRW

**Date:** 11/2/2023

**Depth of Hole As Drilled:** 60" **Before Test:** 60"

**After Test:** 60"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Rate (Minutes per Inch)	Comments
1	10:11 AM		60	24			1.04	
	10:36 AM	25			0	24		
2	10:38 AM		60	24			1.04	
	11:03 AM	25			0	24		
1	11:05 AM		60	24			0.57	
	11:15 AM	10			6 1/2	17 1/2		
2	11:17 AM		60	24			0.58	
	11:27 AM	10			6 3/4	17 1/4		
3	11:29 AM		60	24			0.59	
	11:39 AM	10			7	17		
4	11:41 AM		60	24			0.60	
	11:51 AM	10			7 1/4	16 3/4		
5	11:53 AM		60	24			0.60	
	12:03 PM	10			7 1/4	16 3/4		
6	12:05 PM		60	24			0.60	
	12:15 PM	10			7 1/4	16 3/4		



**PERCOLATION DATA SHEET**

**Project:** Mr. Robert Beers - 14044 Whittram Avenue, Fontana

**Job No.:** 3697-CR

**Test Hole No.:** I-3 **Tested By:** CD

**Date:** 11/2/2023

**Depth of Hole As Drilled:** 60" **Before Test:** 60"

**After Test:** 60"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Rate (Minutes per Inch)	Comments
1	12:21 PM		60	24			1.04	
	12:46 PM	25			0	24		
2	12:48 PM		60	24			1.04	
	1:13 PM	25			0	24		
1	1:15 PM		60	24			0.82	
	1:25 PM	10			11 3/4	12 1/4		
2	1:27 PM		60	24			0.83	
	1:37 PM	10			12	12		
3	1:39 PM		60	24			0.91	
	1:49 PM	10			13	11		
4	1:51 PM		60	24			0.93	
	2:01 PM	10			13 1/4	10 3/4		
5	2:03 PM		60	24			0.93	
	2:13 PM	10			13 1/4	10 3/4		
6	2:15 PM		60	24			0.93	
	2:25 PM	10			13 1/4	10 3/4		



**PERCOLATION DATA SHEET**

**Project:** Mr. Robert Beers - 14044 Whittram Avenue, Fontana

**Job No.:** 3697-CR

**Test Hole No.:** I-4      **Tested By:** CD

**Date:** 11/2/2023

**Depth of Hole As Drilled:** 60"      **Before Test:** 60"

**After Test:** 60"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Rate (Minutes per Inch)	Comments
1	10:17 AM		60	24			1.04	
	10:42 AM	25			0	24		
2	10:44 AM		60	24			1.04	
	11:09 AM	25			0	24		
1	11:11 AM		60	24			0.49	
	11:21 AM	10			3 3/4	20 1/4		
2	11:23 AM		60	24			0.49	
	11:33 AM	10			3 3/4	20 1/4		
3	11:35 AM		60	24			0.50	
	11:45 AM	10			4	20		
4	11:47 AM		60	24			0.50	
	11:57 AM	10			4	20		
5	11:59 AM		60	24			0.51	
	12:09 PM	10			4 1/2	19 1/2		
6	12:11 PM		60	24			0.51	
	12:21 PM	10			4 1/4	19 3/4		



**PERCOLATION DATA SHEET**

**Project:** Mr. Robert Beers - 14044 Whittram Avenue, Fontana

**Job No.:** 3697-CR

**Test Hole No.:** I-5      **Tested By:** CD

**Date:** 11/2/2023

**Depth of Hole As Drilled:** 60"      **Before Test:** 60"

**After Test:** 60"

Reading No.	Time	Time Interval (Min)	Total Depth of Hole (Inches)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Rate (Minutes per Inch)	Comments
1	7:09 AM		60	24			1.16	
	7:34 AM	25			2 1/2	21 1/2		
2	7:36 AM		60	24			1.32	
	8:01 AM	25			5	19		
1	8:03 AM		60	24			1.48	
	8:13 AM	10			17 1/4	6 3/4		
2	8:15 AM		60	24			1.48	
	8:25 AM	10			17 1/4	6 3/4		
3	8:27 AM		60	24			1.48	
	8:37 AM	10			17 1/4	6 3/4		
4	8:39 AM		60	24			1.54	
	8:49 AM	10			17 1/2	6 1/2		
5	8:51 AM		60	24			1.54	
	9:01 AM	10			17 1/2	6 1/2		
6	9:03 AM		60	24			1.54	
	9:13 AM	10			17 1/2	6 1/2		



**Client:** Mr. Robert Beers  
**Project:** 14044 Whittram Avenue, Fontana  
**Project No:** 3697-CR  
**Date:** 11/2/2023

**Boring No.** I-1

**Percolation to Infiltration Rate (Porchet Method)**

Time Interval,  $\Delta t =$  10  
 Final Depth to Water,  $D_F =$  46.25  
 Test Hole Radius,  $r =$  4  
 Initial Depth to Water,  $D_O =$  36  
 Total Test Hole Depth,  $D_T =$  60

Equation -  $I_t = \frac{\Delta H (60r)}{\Delta t (r+2H_{avg})}$

$H_O = D_T - D_O =$  24  
 $H_F = D_T - D_F =$  13.75  
 $\Delta H = \Delta D = H_O - H_F =$  10.25  
 $H_{avg} = (H_O + H_F) / 2 =$  18.875

$I_t =$  5.89 Inches per Hour



**Client:** Mr. Robert Beers  
**Project:** 14044 Whittram Avenue, Fontana  
**Project No:** 3697-CR  
**Date:** 11/2/2023

**Boring No.** I-2

**Percolation to Infiltration Rate (Porchet Method)**

Time Interval,  $\Delta t =$  10  
 Final Depth to Water,  $D_F =$  52.75  
 Test Hole Radius,  $r =$  4  
 Initial Depth to Water,  $D_O =$  36  
 Total Test Hole Depth,  $D_T =$  60

Equation - 
$$I_t = \frac{\Delta H (60r)}{\Delta t (r+2H_{avg})}$$

$H_O = D_T - D_O =$  24  
 $H_F = D_T - D_F =$  7.25  
 $\Delta H = \Delta D = H_O - H_F =$  16.75  
 $H_{avg} = (H_O + H_F) / 2 =$  15.625

$I_t =$  11.40 Inches per Hour



**Client:** Mr. Robert Beers  
**Project:** 14044 Whittram Avenue, Fontana  
**Project No:** 3697-CR  
**Date:** 11/2/2023

**Boring No.** I-3

**Percolation to Infiltration Rate (Porchet Method)**

Time Interval,  $\Delta t =$  10  
 Final Depth to Water,  $D_F =$  46.75  
 Test Hole Radius,  $r =$  4  
 Initial Depth to Water,  $D_O =$  36  
 Total Test Hole Depth,  $D_T =$  60

Equation -  $I_t = \frac{\Delta H (60r)}{\Delta t (r+2H_{avg})}$

$H_O = D_T - D_O =$  24  
 $H_F = D_T - D_F =$  13.25  
 $\Delta H = \Delta D = H_O - H_F =$  10.75  
 $H_{avg} = (H_O + H_F) / 2 =$  18.625

$I_t =$  6.25 Inches per Hour



**Client:** Mr. Robert Beers  
**Project:** 14044 Whittram Avenue, Fontana  
**Project No:** 3697-CR  
**Date:** 11/2/2023

**Boring No.** I-4

**Percolation to Infiltration Rate (Porchet Method)**

Time Interval,  $\Delta t =$  10  
 Final Depth to Water,  $D_F =$  55.75  
 Test Hole Radius,  $r =$  4  
 Initial Depth to Water,  $D_O =$  36  
 Total Test Hole Depth,  $D_T =$  60

Equation - 
$$I_t = \frac{\Delta H (60r)}{\Delta t (r+2H_{avg})}$$

$H_O = D_T - D_O =$  24  
 $H_F = D_T - D_F =$  4.25  
 $\Delta H = \Delta D = H_O - H_F =$  19.75  
 $H_{avg} = (H_O + H_F) / 2 =$  14.125

$I_t =$  14.70 Inches per Hour



**Client:** Mr. Robert Beers  
**Project:** 14044 Whittram Avenue, Fontana  
**Project No:** 3697-CR  
**Date:** 11/2/2023

**Boring No.** I-5

**Percolation to Infiltration Rate (Porchet Method)**

Time Interval,  $\Delta t =$  10  
 Final Depth to Water,  $D_F =$  42.5  
 Test Hole Radius,  $r =$  4  
 Initial Depth to Water,  $D_O =$  36  
 Total Test Hole Depth,  $D_T =$  60

Equation -  $I_t = \frac{\Delta H (60r)}{\Delta t (r+2H_{avg})}$

$H_O = D_T - D_O =$  24  
 $H_F = D_T - D_F =$  17.5  
 $\Delta H = \Delta D = H_O - H_F =$  6.5  
 $H_{avg} = (H_O + H_F) / 2 =$  20.75

$I_t =$  3.43 Inches per Hour



# **APPENDIX D**

## **GENERAL GRADING GUIDELINES**

**Assessor's Parcel Numbers (APNs) 0230-101-12, -13, -14 and -34**

**Proposed Truck Trailer Parking Facility**

**Fontana, San Bernardino County, California**

**Project No. 3697-CR**



## **GENERAL GRADING GUIDELINES**

The guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

### **General**

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code, CBC (2022) and the guidelines presented below.

### **Preconstruction Meeting**

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

### **Grading Observation and Testing**

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.
2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.
3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.

4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.
5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.
6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause in delays and some soils may require a **minimum of 48 to 72 hours to complete test procedures**. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.
7. Procedures for testing of fill slopes are as follows:
  - a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
  - b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.
8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

### Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.
2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.
3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative.

**Treatment of Existing Ground**

1. Following site clearing, all surficial deposits of alluvium, and/or weathered bedrock be removed unless otherwise specifically indicated in the text of this report.
2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.
3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.
4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.
5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

**Fill Placement**

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).
2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.
3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:
  - a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.
  - b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.
4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
  - a) They are not placed in concentrated pockets;
  - b) There is a sufficient percentage of fine-grained material to surround the rocks;
  - c) The distribution of the rocks is observed by, and acceptable to, our representative.
5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated

suitable for rock disposal. On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversized materials are encountered during construction, these guidelines should be requested.

6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

### **Slope Construction**

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.
2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.
3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.
4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.
5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

### **UTILITY TRENCH CONSTRUCTION AND BACKFILL**

Utility trench excavation and backfill is the contractor's responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractor's methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.

Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that "worked" on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss

them **prior** to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.
2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
  - a) shallow (12 + inches) under slab interior trenches and,
  - b) as bedding in pipe zone.

The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.

3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.
4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.
5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

## **JOB SAFETY**

### **General**

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.

In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.



1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.
2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.
3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

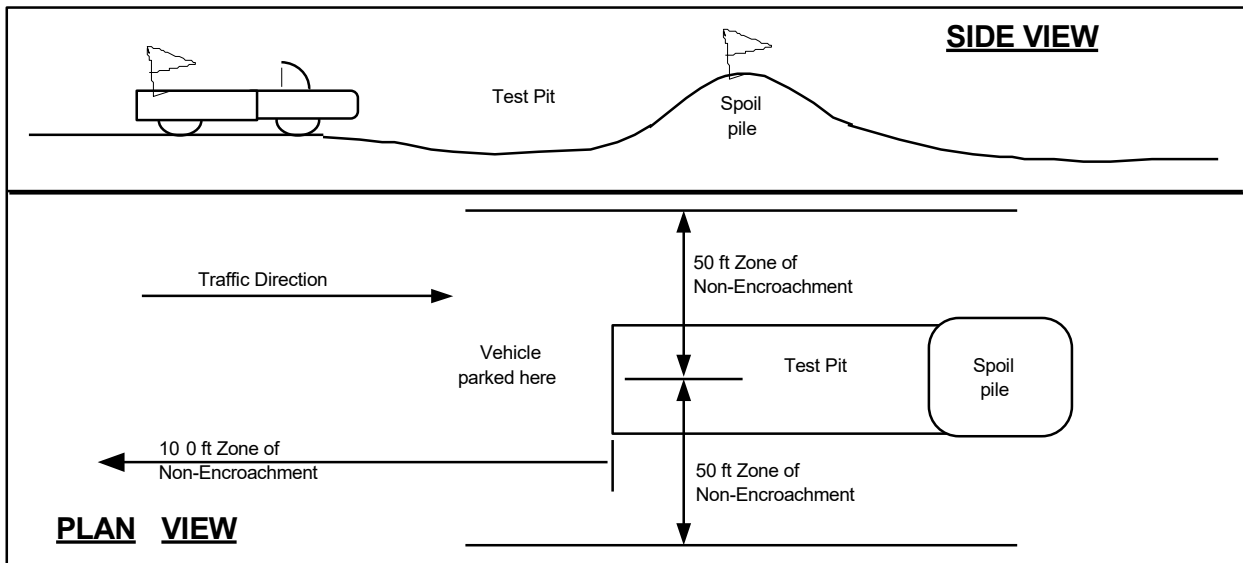
### **Test Pits Location, Orientation and Clearance**

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g. dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.

**TEST PIT SAFETY PLAN**



**Slope Tests**

When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should effectively keep all equipment at a safe operation distance (e.g. 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

**Trench Safety**

It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which;

1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or

4. displays any other evidence of any unsafe conditions regardless of depth.

If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

### **Procedures**

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians attention and notify our project manager or office. Effective communication and coordination between the contractor's representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

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