APPENDIX E1

GEOTECHNICAL EVALUATION REPORT

SOILS SOUTHWEST, INC.

SOILS, MATERIALS AND ENVIRONMENTAL ENGINEERING CONSULTANTS

897 VIA LATA, SUITE N • COLTON, CA 92324 • (909) 370-0474 • (909) 370-0481 • FAX (909) 370-3156

Report of Geotechnical ~~Evaluations~~ and
Soils' Infiltration Rates for WQMP-BMP Stormwater Disposal System Design

Planned Industrial Warehouse to Existing Conco Company
13052 Dahlia Street
Fontana, CA 91761
APN: 023-811-216

Project No. 23044-F/BMP

February 13,2024

Prepared for:

Mr. Darren Ratekin
c/o The Conco Companies
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Established 1984

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February 13, 2024 Project No.23044-F/BMP

The Conco Companies
5141 Commercial Circle
Concord, CA 94520

Attention: Mr. Darren Ratekin

Subject: Report of Geotechnical Evaluations and
Soils' Infiltration Rates for WQMP-BMP Stormwater Disposal System Design
Planned Industrial Warehouse to Existing Conco Company
13052 Dahlia Street, Fontana, CA 91761
APN: 023-811-216

Reference: Conceptual Grading Plan Prepared by Allard Engineering

Dear Mr. Ratekin,

Presented herewith is the report of (i) Geotechnical Evaluations and (ii) Soils' Infiltration Rates for WQMP-BMP Stormwater Disposal System Design proposed for the site of the planned industrial warehouse to be located in the equipment yard of the existing Conco Co. facility located at 13052 Dahlia Street in City of Fontana, California. In absence of detailed development plans review, the opinions and recommendations included should be considered as "preliminary". Revised and/or updated recommendations may be warranted following precise grading and detailed development plans review.

Based on the referenced conceptual grading plan, it is understood that the subject development will primarily include one near grade industrial warehouse structure. Construction of concrete tilt-up or concrete framed or concrete block construction with concrete slabs-on-grade is assumed. Supplemental construction is to include on-site driveways and parking and paving for auto/heavy-duty truck traffic, and the installation of two underground WQMP-BMP stormwater disposal chambers. Moderate site preparations and grading should be expected. For estimation purposes, the anticipated structural loadings of 80 kips and 8 klf are assumed for isolated column and conventional wall spread foundations, respectively.

Based on the test explorations and laboratory testing completed at this time, it is our opinion that the soils encountered primarily consist of upper 5 feet of medium dense dry fine to medium coarse silty sands overlying deposits of dry to damp, medium dense to dense poorly graded fine to medium coarse sands with some silts overlying gravels and gravelly medium to coarse sands with rock fragments, rocks, and cobbles to the maximum depth of 31 feet explored. Descriptions of the soils encountered are provided in the attached Log of Borings.

No shallow-depth groundwater or bedrock was encountered. Historical and shallow-depth groundwater is reported at approximately 277 feet below grade as measured at the nearest water well, 01S06W29H001S. Based on such and as described in the Special Publication 117, published by the State of California Department of Conservation, Division of Mines and Geology, it is our opinion that the site is considered non-susceptible to seismically induced soils liquefaction thereby requiring no special geotechnical design recommendations other than those as recommended herein.

Based on review of the available USGS (California Geologic Survey) publication, it is understood that the site is not situated within an A-P Special Studies Zone where a known seismic fault passes through the site or its adjacent. Supplemental information is provided in Appendix C.

Following review of the online FEMA National Flood Hazard Layer Mapping, it is understood that the project site is classified as a Zone X, Area of Minimal Flood Hazard.

Based on the evaluations completed at this time, it is our opinion that from a geotechnical viewpoint, the site should be considered suitable for the proposed development provided that the recommendations and opinions included are considered in design and construction.

Final grading and detailed development plan review is suggested to verify the applicability of the certain assumptions as used in preparing this report.

This report has been substantiated by subsurface explorations and mathematical analysis made in accordance with the generally accepted engineering principles, including those field and laboratory testing considered necessary in the circumstances.

We offer no other warranty, expressed or implied.

Respectfully submitted,
Soils Southwest, Inc.

Moloy Gupta, RCE 31708



John Flippin
Project Coordinator

1.0 Introduction

1.1 Purpose and Scope of Work

This report presents the results of (i) Geotechnical Evaluations and (ii) Soils Infiltration Rates for WQMP-BMP Stormwater Disposal Design proposed for the site of the planned industrial warehouse to be located in the rear equipment yard of the existing Conco Co. facility located of 13052 Dahlia Street, Fontana , California . In absence of precise grading and/or detailed development plans, the recommendations and opinions included may require updating and revisions recommendations following detailed development plans review.

The soils encountered as described herein are based on visual observations made during test explorations, supplemented by the necessary laboratory testing completed at this time. Being beyond scope of work, no geologic investigations or Phase I Environmental Site Assessment (ESA) are included. Reports of such will be supplied upon request.

The recommendations contained reflect our best estimate of the soils' conditions as encountered during field explorations as conducted for the site. It is not to be considered as a warranty of the soils' conditions for other areas or for the depth beyond the explorations advanced at this time.

The recommendations supplied should be considered valid and applicable following review of the final grading and development plans when supplied and when the following conditions are observed:

i. Pre-grade meeting with the contractor, public agency, and the geotechnical engineer,
ii. Excavated bottom inspections and verifications by the geotechnical engineer prior to backfill placement,
iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Plumbing trenches backfill placement prior to concrete slab-on-grade placement,
vi. On and off-site utility trenches backfill testing and verifications, and
vii. Consultations as required during construction or upon your request.

1.2 Site Description

The rectangular shaped subject parcel of 7.8 acres is currently occupied by an existing Conco Co. office structure adjacent to Dahlia Street, equipment yard, and trucking parking adjacent to Santa Ana Avenue. In general, the site is bounded by Santa Ana Avenue to the north, by Dahlia Street on the south, by an industrial yard on the east, and by a warehouse complex on the west. Following review of the available site drawings, overall vertical relief within the property is approximately 10 feet. Based on site reconnaissance sheetflow from incidental rainfall is estimated to flow towards the south. Other than stored equipment stockpiles, industrial machinery, tractor trailer parking, and a modular office, presence of no other significant features were noted.

1.3 Proposed Development

No precise grading and/or detailed development plans are available for review; however, it is understood that the subject development will primarily include one 107, 670 square foot industrial warehouse structure near existing grade. Use of concrete tilt-up or concrete framed, concrete block or metal framed construction with concrete slabs-on-grade is assumed. Supplemental construction is anticipated to include on-site driveways, parking and paving, off-site street improvements, along with the installation of two (2) underground WQMP-BMP stormwater disposal chambers near the southwest corner of the project area.

Moderate site preparations and grading are anticipated as described in the following sections.

1.4 Subsurface Investigation

The geotechnical evaluations include subsurface explorations, soil sampling, necessary laboratory testing, engineering analyses, and preparation of this report. Being beyond scope of work, no geologic investigations or Phase I Environmental Site Assessments are included. Reports on such will be supplied on request.

In general, our scope of work included the following: review of the referenced site plan supplied along with five (5) test borings (B-1 to B-5) explored by using a Hollow-Stem Auger (HSA) drill rig advanced to maximum depth of 31 feet below grade along with two (2) infiltration test borings to maximum depth of 10 feet (P-1 and P-2) for WQMP-BMP Stormwater Disposal Design. During explorations, the soils encountered were continuously logged, bulked, and undisturbed samples were procured and recorded. Collected samples were subsequently transferred to our laboratory for necessary geotechnical testing.

Descriptions of the soils encountered are provided on the attached Log of Borings. Approximate test locations are shown on the attached Plate A.

- Laboratory testing conducted on the selected bulk and undisturbed samples were programmed according to the project requirements. The laboratory testing included determinations of:

    - Moisture Density Determination (ASTM D2216),
    - Maximum Dry Density and Optimum Moisture Content (ASTM D1557),
    - Soils' Peak and Residual Shear Strengths (ASTM D3080),
    - Soils' Consolidation Characteristics (ASTM D2435),
    - Soils' Sieve Analysis (ASTM D422),
    - Soils' R-value (ASTM D2844),
    - Soils' Sand Equivalent, SE (ASTM D2419), and
    - Soils' Chemical Analyses.

- Based on the field investigation and laboratory testing completed the necessary engineering analyses and evaluations were made on which to base our preliminary recommendations for foundation design, slab-on-grade, site preparations and grading, utility trenches backfill, and

- Preparation of this report for initial use by the project design professionals.

The recommendations supplied should be considered "tentative" and may require revisions and/or upgrading following final grading and detailed development plans review.

2.0 Geotechnical Evaluations

2.1 Site Soils Description

The soils encountered primarily consist of upper 5 feet of medium dense dry fine to medium coarse silty sands overlying deposits of dry to damp, medium dense to dense poorly graded fine to medium coarse sands with some silts overlying gravels and gravely medium to coarse sands with rock fragments, rocks, and cobbles to the maximum depth of 31 feet explored. Descriptions of the soils encountered are provided in the attached Log of Borings.

Based on review of the USDA Natural Resources Conservation Service: Web Soil Survey for the subject area, it is our understanding that the soil classification for the subject area is identified as being TuB-Tujunga loamy sand, 0 to 5 percent slopes with the upper 60 inches consisting of loamy sand below existing grade as well as TvC-Tujunga gravely, loamy sand, 0 to 9 percent slopes consisting of gravely loamy sands and gravely sands within the upper five feet below existing natural grade.

Based on review of the available USGS (California Geologic Survey) publications, it is understood that the site is not situated within an A-P Special Studies Zone where seismic fault passes through the site or its adjacent.

No groundwater or bedrock was encountered within the maximum depth of 31 feet explored. According to California Department of Water Resources, the current water level is at a depth of approximately 282 feet which is in excess of 50 feet below grade as measured at the nearest water well (01S05W29H001S) . Based on such and as described in the Special Publication 117, published by the State of California Department of Conservation, Division of Mines and Geology, it is our opinion that the site is considered non-susceptible to seismically induced soils liquefaction.

Laboratory shear tests conducted on the upper soils remolded to 90% indicate "moderate" shear strengths under increased moisture conditions. Results of the laboratory shear tests are provided on Plate B.

Consolidation tests conducted on remolded samples indicate "low" potential for compressibility under anticipated static structural loadings with potential for "tolerable" settlements to footings and concrete slabs-on-grade. Results of the laboratory determined soils consolidation potential are shown in Appendix B.

Fine to coarse gravely silty sands with rocks and cobbles encountered are considered "low" in expansion potential requiring no special construction requirements other than those as recommended herein. Supplemental soil expansion testing, however, is recommended following mass grading completion to provide supplemental/revised foundation recommendations, if warranted.

2.2 Subsurface Variations

During site preparations and grading, buried utilities, debris, organic and others may be encountered. In addition, variations in soil strata, their continuity and orientations may be expected. Due to the deposition characteristics of the soils encountered, care should be exercised in interpolating or extrapolating the subsurface soils conditions existing in between and beyond the test explorations conducted.

2.3 Excavatibility

It is our opinion that the grading required for the project may be accomplished by using conventional heavy-duty construction equipment. No blasting or jackhammering should be warranted.

2.4 Soil Corrosivity

Soil Sample B-1 @ 5 feet below grade

1. Chloride concentration equal to 23 mg/Kg not exceeding 10,000 ppm is considered non-corrosive to ferrous metals,
2. pH equal to 8.39 units exceeding 4.0 units is considered non-corrosive to buried metals,
3. Sulfate concentration equal to 40 mg/Kg not exceeding 2000 ppm is considered non-corrosive to concrete, and
4. Resistivity equal to 4,950 ohms/cm is considered moderately corrosive to buried metals.

The "preliminary" soils' chemical test results are provided in Appendix B.

It is suggested that following mass grading completion, the soils' corrosivity potential evaluations should be made to determine, at a minimum, concentrations of pH, sulfate, chloride, and resistivity. Further corrective recommendations should be provided by the Corrosion Engineer.

2.5 Groundwater

No groundwater or bedrock was encountered within the maximum depth of 31 feet explored. However, following review of the available recorded groundwater well data as shown in the table below, historical groundwater was measured at approximately 388 feet below the existing well grade. The following table describes the historical and the current groundwater level as recorded in the nearest well as listed by the local reporting agency.

GROUNDWATER TABLE	
Reporting Agency	California Department of Water Resources Marcelo Montagna 2008 Maps http://wdl.water.ca.gov/waterdatalibrary/
Well Number	01S/06W-29H001S Chino 1002254
Well Monitoring Agency	Chino Basin Watermaster
Well Location: Township/Range/Section	T1S-R6W-Section 29
Well Elevation:	938.300
Current Depth to Water (Measured in feet)	282
Current Date Water was Measured	June 1, 2019
Depth to Water (Measured in feet) (Shallowest)	277
Date Water was Measured (Shallowest)	April 1, 2019

Fluctuations in groundwater levels, however, can occur due to seasonal variations in the amount of rainfall, runoff, altered natural drainage paths, and other factors not evident at the time the test borings completed. Accordingly, for the planned development, it is our opinion that provisions should be maintained to dispose incidental surface runoff away from the individual structural pads, once constructed.

3.0 Faulting and Seismicity

3.1 Faulting and Seismicity

Based on the information published by the USGS (currently known as California Geologic Survey) Department of Conservation, State of California, it is understood that the site is not situated within an A-P Special Study Zone where earthquake fault(s) runs through or adjacent to the subject site. In the absence of shallow (less than 50 feet) depth groundwater, the site is considered non-susceptible to soils' liquefaction in the event of a strong motion earthquake. However, the site being within Southern California where potentials for seismically induced structural hazards could not be ignored, it is our opinion that implementation of the current CBC seismic design parameters in structural design as described herein may reduce the potential for seismically induced structural distress to some "acceptable" tolerable limits.

Seismically induced site-specific potential hazards are discussed in the following sections.

3.2 Direct or Primary Seismic Hazards

Surface ground rupture along with active fault zones and ground shaking represent primary or direct seismic hazards to structures. There are no known active or potentially active faults that pass through or towards the subject site and the site is not situated within an A-P Special Studies Zone. According to the current 2022 CBC, the site is considered situated within Seismic Zone 4. As a result, it is likely that during the life expectancy of the structures built, moderate to severe ground shaking may have some adverse effects to the structures built.

3.3 Induced or Secondary Seismic Hazards

In addition to ground shaking, effects of seismic activity may include surface rupture, flooding, land-sliding, lateral spreading, settlements, and subsidence. Potential effects of such are as described below.

3.3.1 Liquefaction

Liquefaction is caused by the build-up of excess hydrostatic pressure in saturated cohesionless soils due to cyclic stress generated by ground shaking during an earthquake. The significant factors on which liquefaction potential of a soil deposit depends, among others include, soil type, relative soil density, intensity of earthquake, duration of ground shaking, and depth of ground water.

No groundwater was encountered within the maximum depth of 31 feet explored. In absence of groundwater within 50 feet below grade, based on the Special Publication 117, published by the State of California Department of Conservation, Division of Mines and Geology, it is our opinion that the site is considered non-susceptible to seismically induced soils liquefaction thereby requiring no special geotechnical design recommendations other than those as recommended herein.

3.3.2 Shallow Depth Ground Rupture

The site is not situated within an A-P Special Studies Zone. Based on review of the existing geologic information, no major fault is noted to cross through or extend towards the site. The potential for surface rupture resulting from nearby fault movement is not known for certainty; however, in our opinion it is considered "remote" due to the distance of the site to the recorded nearby earthquake fault.

3.3.3 Flooding

Flooding hazards include tsunamis (seismic sea waves), Seiches, or failure of manmade reservoirs, tanks, and aqueducts. The potential for these hazards is considered "remote" considering the inland site location and in absence of nearby known bodies of water. Based on review of the FEMA National Flood Hazard Layer FIRMette map, it is our understanding that the subject area is delineated as Zone X, Area of Minimal Flood Hazard as shown in the attached Appendix C.

3.3.4 Landslides

Seismically induced landslides and other slope failures are common occurrences during or soon after an earthquake. Considering the site and its adjacent being relatively flat, it is our opinion that potential for seismically induced landslides should be considered "remote".

3.3.5 Lateral Spreading

Seismically induced lateral spreading involves lateral movement of soils due to ground shaking. Lateral spreading is demonstrated by near vertical cracks with predominantly horizontal movement of the soil mass involved. The topography of the site being near level, it is our opinion that the potential for seismically induced lateral spreading should be considered "remote".

3.3.6 Seismically Induced Settlement

The site is situated at approximately 7.86 miles from the Cucamonga Fault capable of generating an earthquake magnitude, M of 6.7 and Peak Horizontal Ground Acceleration, PGA of 0.713g and PGA_M of 0.784g at 10% probability of exceedance in a 50-year return period. Considering the proximity of the earthquake fault as described, it is our opinion that potential for some total and differential settlements due to ground shaking may be anticipated as described herein.

3.4 Seismic Design Parameters

The design spectrum was developed on the 2022 CBC. Site Coordinates of 34.054175°N, -117.520585°W were used to establish the seismic parameters presented below.

3.4.1 Seismic Design Coefficients

For foundation and structural design use of the following seismic parameters are suggested as based on the current 2022 CBC:

Recommended values are based upon the online review of ASCE 7-22 Hazard Tool coefficient parameters as provided in Appendix A of this report. The following presents the seismic design parameters evaluated based on the available publications published by California Geological Survey (CGS), 2022 CBC, and ASCE Standard 7-16.

The following presents the seismic design parameters evaluated based on the currently published California Geological Survey and 2022 CBC.

TABLE 3.4.1 A1: Seismic Design Parameters

Seismic Source Type

Based on California Geological Survey-Probabilistic Seismic Hazard Assessment Peak Horizontal Ground Acceleration (PGA) having a 10% probability of exceedance in a 50-year period is described as below:

Seismic Source Type / Appendix C	
Nearest Maximum Fault Magnitude	M ≥ 7.86
Peak Horizontal Ground Acceleration (PGA) (PGA_M)	0.713g 0.784g

In design, vertical acceleration may be assumed to approximately 1/3 to 2/3 of the estimated horizontal ground accelerations (PGA) described.

TABLE 3.4.1 A2: Seismic Design Coefficients

CBC Chapter 16	2022 ASCE 7-16 Standard Seismic Design Parameters	Recommended Values
1613A.5.2	Site Class	D
1613.5.1	The mapped spectral accelerations at short period	S_s
1613.5.1	The mapped spectral accelerations at 1.0-second period	S_1
1613A5.3(1)	Seismic Coefficient, S_s	1.686g
1613A5.3(2)	Seismic Coefficient, S_1	0.622g
1613A5.3(1)	Site Class D / Seismic Coefficient, F_a	1g
1613A5.3(2)	Site Class D / Seismic Coefficient, F_v	n/a
16A-37 Equation	Spectral Response Accelerations, $S_{Ms} = F_a S_s$	1.686g
16A-38 Equation	Spectral Response Accelerations, $S_{M1} = F_v S_1$	n/a
16A-39 Equation	Design Spectral Response Accelerations, $S_{Ds} = 2/3 \times S_{Ms}$	1.124g
16A-40 Equation	Design Spectral Response Accelerations, $S_{D1} = 2/3 \times S_{Ms}$	n/a

It should be noted that lateral force requirement in design should be intended to resist total structural collapse due to the described PGA of 0.830g or greater. However, during the lifetime use of the structure built, it is our opinion that some structural damage may be anticipated requiring structural repairs and/or replacement. Use of flexible lifeline connections are suggested.

4.0 Evaluations and Recommendations

4.1 General Evaluations

Based on field explorations, laboratory testing, and subsequent engineering analyses, the following tentative conclusions and recommendations are presented for initial study:

(I) From a geotechnical viewpoint, the site is considered grossly stable for the proposed development, provided that the recommendations supplied herein are incorporated in design and construction. Foundation design should reflect considerations of the seismically induced PGA as described.

(II) Based on the dry, fine to medium, silty, variable consistency nature of the upper soils existing as encountered, it is our opinion that for structural support the load bearing soils should be reworked in the form of subexcavations, followed by scarification, moisturization, and their replacement as engineered fills compacted to minimum 95%. In the event that new fill soils are required over the current grade surface such should be placed on the original grades when prepared as described.

(III) The subexcavation depths during mass grading as described in the following section should be considered as "minimum". During grading, localized deeper subexcavations may be required within areas underlain by buried debris, utilities, localized fills or soft soils and others. It will be the responsibility of the grading contractor to inform the project geotechnical engineer of the presence of such prior to further site preparations and grading.

(IV) In order to minimize potential for differential settlements, it is recommended that structural footings should be established exclusively into engineered fills of local soils compacted to the minimum as recommended in this report. Construction of footings and slabs straddling over cut and fill transition conditions shall be avoided.

(V) Structural design consideration should include probability for "moderate" peak ground acceleration from relatively active nearby earthquake faults. Implementing the seismic design parameters and procedures as outlined in the current CBC and as described earlier, however, may minimize the adverse effects for the structures proposed.

(VI) Although no groundwater was encountered, provisions should be maintained during construction to divert incidental rainfall away from the structural pads constructed.

(VII) It is our opinion that, if site preparations and grading are performed as recommended and as per the generally accepted construction practices and current CBC, the proposed development will not adversely affect the stability of the site or its adjacent.

4.1.1 Recommendations for Site Preparations and Grading for Structural Support

In absence of detailed development plans review, the planned structural pad grades are assumed at/or near the existing grade surface. For adequate structural support, it is our opinion that moderate site preparations and grading should be included in the form of subexcavations of the near grade dry, silty, gravelly, variable consistency soils and their replacement as engineered fills compacted to minimum 95%.

In general, site preparations and grading should include subexcavations of the near surface soils to about:

(i) minimum 5 feet below the current grade surface or
(ii) to the depth as required to expose the underlying moist and dense natu
ral subgrades or
(iii) to the depth as required to maintain a 24-inch-thick compacted fill mat blanket below foundation bottoms, whichever is greater.

The site preparations and grading described should encompass, at a minimum, the proposed structural footprint areas and minimum 5 feet beyond or as suggested by the geotechnical engineer during grading. No cut and fill transition conditions should be allowed.

Within areas requiring fill soils, if any, such may be placed following sufficient subexcavations to expose the underlying dense subgrades as approved by the project geotechnical engineer. During grading, the engineered fills placed should be compacted to near Optimum Moisture and with minimum 95% compaction of soils' Maximum Dry Density as determined by ASTM D1557.

The subexcavation depths described should be considered as "preliminary". Localized additional subexcavations may be required within areas underlain by undocumented old fills, buried utilities and abandoned sewer and/or buried septic systems. It is recommended that the excavated subgrades should be verified and approved by the geotechnical engineer prior to structural fill soil placement. Supplemental recommendations may be warranted following detailed development plans review.

Mass grading required for the project is recommended to encompass, at a minimum, the entire individual structural pads and beyond.

For reference, supplemental general mass grading recommendations are included Section 5 of this report.

4.2 Structural Fill Material Requirements

The local and/or imported fills, if required, should be gravelly sand, free of organics, roots, debris, and rocks larger than 6 to 8-inch in diameter.

Although no significant variations in soil conditions are anticipated, actual soils conditions may vary during grading. It will be the contractor's responsibility to notify Soils Southwest, Inc. about such variations for revised/updated geotechnical recommendations.

Non-expansive in nature, the on-site soils free of organic, debris, and rocks larger than 8-inch in load bearing structural backfills placed should be compacted to minimum 95% of the soils' Maximum Dry Density as determined by ASTM D1557 test method. Import soils, if required, should be non-expansive, gravelly sand and meeting the following criteria:

Liquid Limit	<35
Plasticity Index	<15
Expansion Index	<20

4.2.1 Structural Fill Soils Placement

Within the areas of structural loadings, it is our opinion that the near grade soils should be subexcavated to minimum 5 feet depth. For adequate structural bearing, it is our opinion that the excavated soils may be placed in 6 to 8-inch lifts with near Optimum Moisture Conditions compacted to minimum 95%. No structural fills should be placed during unfavorable weather conditions.

4.2.2 Cut and Fill Transition Conditions Pad Preparations (if applicable)

Use of cut and fill transition conditions should be avoided to minimize potential for differential settlements to footings and concrete slabs-on-grade. Within cut and fill transition areas, if it becomes essential, it is suggested that following the necessary cut, the entire structural pad should be prepared to establish a uniform bearing compacted fill mat prepared in conformance to the general guidelines as described below.

Pad Preparation Guidelines for Cut and Fill Transition Condition Areas

Fill Depth Required for Finish Grade (Within low-lying areas)	Overexcavation Depth below Finish Grade (Within cut areas)
Up to 5 feet	Equal Depth
5 to 10 feet	5 feet
Greater than 10 feet	One-half the maximum thickness of fills placed on the "fill" portion (20 feet maximum)

Cut portions should be overexcavated beyond the structural perimeter lines for a horizontal distance equal to the depth of overexcavation or to a minimum distance of 5 feet, whichever is greater. Actual subexcavation depths should be determined by the geotechnical engineer during grading.

4.3 Structural Foundation Design Parameters

In the absence of detailed development plans review, it is assumed that for load bearing support conventional continuous wall foundations and isolated spread footings will be used bearing directly on the engineered graded fills placed as described earlier in this report.

It is assumed that the subject development will include concrete tilt-up or concrete framed, concrete block construction with concrete slabs-on-grade and concrete footings in the form of isolated pier foundations or continuous wall foundations. Use of load bearing concrete wall and/or isolated spread footings are assumed to be used underlain by at least 24-inch-thick engineered fill mat of local soils compacted to minimum 95% as recommended earlier.

Structural foundations, in the form of exterior load bearing wall foundations and isolated pier foundations, may be considered in design based on the following equations:

Continuous Wall Footing: $q_{allowable} = 2000 + 350d + 250b$
Isolated Square Footing: $q_{allowable} = 2400 + 350d + 100b$, where

$q_{allowable}$ = allowable soil vertical bearing capacity, in psf
d = footing depth, minimum 24-inch,
b = footing width, minimum 24-inch.

The above soil bearing capacities may be increased for each additional depth in footing and width in excess of the minimum recommended. Under static loading conditions, with a Factor of Safety, FS = 3.0, the total maximum vertical bearing capacity is recommended not to exceed 4000 psf for continuous wall footings and isolated square footings. If normal code requirements are applied, the above capacities may further be increased by an additional 1/3 for short duration of loading which includes the effect of wind and seismic forces. The load bearing footings should be reinforced with minimum 2-#5 near the near the top and 2-#5 rebar near bottom of continuous wall footings. For isolated foundations reinforcing requirements shall be determined by the project structural engineer. Actual foundation dimensions (b & d) and reinforcement requirements should be provided by the project structural engineer based on anticipated structural dead loadings, soil bearing capacity, and Peak Ground Acceleration (PGA) described.

The footing depths described should be measured vertically from the lowest adjacent outside grade and not from the finished pad grade or from finished floor surface. Footing depths and dimensions shall be verified by the geotechnical engineer prior to footing-forming, rebar, and concrete placement. It will be the contractor's responsibility to arrange such verifications by the geotechnical engineer.

Based on the laboratory determined soils' consolidation characteristics, settlements to properly designed and constructed foundations supported exclusively into engineered fills of site soils or its equivalent or better, and carrying maximum assumed structural loadings, are expected to be within "tolerable" limits.

Under static loading conditions, over a 40-foot-span, the estimated total and differential settlements should be about 1 and 1/2-inch, respectively, provided the foundations being supported by engineered fills of local soils compacted to minimum 95% as described. Most of the elastic deformations, however, are expected to occur during construction.

4.4 Concrete Slabs-on-Grade

No concrete slabs, sidewalks and flatworks should be placed bearing directly on the surface soils currently existing. The prepared subgrades to receive footings should be adequate for concrete slab-on-grade placement. The following is provided for reference only.

Building Pad Warehouse/ Truck Traffic:

1. Suggested 5-inch-thick (net) slab thickness,
2. 2500 psi concrete with water/cement ratio of 0.64 maximum,
3. #4 rebar @ 18-inch o/c using chairs or as required by the project structural engineer,
4. Within moisture sensitive areas, it is suggested to use 10-mil-thick commercially available StegoWrap, Visqueen or other approved coverings,
5. Two (2) inches of sand with SE>30 over the installed Stego Wrap System,
6. Saw cuts requirements shall be as per the structural engineer.

Driveways:

1. 6-inch-thick net slab,
2. 2500 psi concrete with water/cement ratio of 0.64 maximum,
3. Over native grade compacted to a maximum of 95%.

Flatwork:

1. 3 ½-inch-thick net concrete,
2. 2500 psi concrete with water/cement ratio of 0.64 maximum,
3. Over native grade compacted to a minimum 90%,
4. Tooled joints per the structural engineer.

It is recommended that, prior to concrete pours, utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with sandy gravelly soils, mechanically compacted to the minimum compaction requirements as described.

Within moisture sensitive areas, concrete slabs should be underlain by 2-inch of compacted clean sands, followed by 10-mil-thick vapor barrier, such as commercially available StegoWrap, Visqueen or other approved coverings, overlying an additional 2-inch-thick layer of sands. Sands used should have a Sand Equivalent, SE of 30 or greater.

Subgrades to receive concrete foundations and slab-on-grade should be "'dampened" as would be expected in any such concrete placement. Use of low-slump concrete is recommended. In addition, it is recommended that utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with gravelly sandy soils mechanically compacted to minimum 95%. Concrete construction joint requirements should be determined by the project structural engineer.

No concrete should be placed during extreme weather conditions, such as during high outside temperature and/or during high Santa Ana wind conditions. Use of excess water on finished grade is not recommended to prevent post-placement concrete "warping".

4.4.1 Concrete Curing and Crack Control

The recommendations presented in this report are intended to reduce potentials for cracking of concrete slabs-on-grade due to concrete curing or settlement. However, even when the following recommendations have been implemented, foundations, stucco walls and concrete slabs-on-grade may display some minor cracking due to minor soil movement and/or concrete shrinkage.

The occurrence of concrete cracking may also be reduced and/or controlled by limiting the slump of the concrete used, proper concrete placement, and curing along with using crack control joints at reasonable intervals where re-entrant slab corners occur. For standard crack control, maximum expansion/construction joint spacing is recommended not to exceed 24 to 30 x the concrete thickness. Shorter distance between joint spacing would provide greater crack control. Joints at curves and angle points are suggested as determined by the project structural engineer.

To minimize potentials for "warping", subgrades to receive concrete shall be free of excess water. Concrete placements during adverse weather conditions should not be allowed.

4.5 Resistance to Lateral Loads

Resistance to foundation lateral displacement can be achieved by friction acting at the base of foundation and by passive earth pressures. A coefficient friction of 0.40 may be assumed with normal dead load forces for footing established on engineered compacted fills of local soils.

An allowable passive lateral earth resistance of 300 psf per foot of depth may be assumed for the sides of foundations poured against compacted fills. The maximum lateral passive earth pressure is recommended not to exceed 3000 lbs.

For design, active lateral pressures from local soils when used as backfills may be estimated from the following equivalent fluid density:

CONDITIONS	EQUIVALENT FLUID DENITY, pcf	
	Level Backfill	2:1 Backfill Sloping Upwards
Active	40	55
At Rest	55	70
Seismic	75% of active earth pressures	75% of active earth pressures

4.6 Shrinkage and Subsidence

It is our opinion that during grading the upper soils may be subjected to a volume change. Assuming a 95% relative compaction for structural fills and assuming an overexcavation and recompaction depth as described earlier, such volume change due to shrinkage may be on the order of 10% to 15%. Further volume change may be expected due to supplemental shrinkage during preparation of subgrade soils. For estimation purpose, such may be approximated to about 2-inch when conventional construction equipment is used.

4.7 Construction Considerations

4.7.1 Unsupported Excavation

Gravelly sandy site soils encountered are considered highly susceptible to caving. Temporary excavations up to 4 feet in depth may be made without rigorous lateral support. Excavated surface should be "'wetted" during construction to minimize potential surface soil raveling. No surcharge loading should be allowed within an imaginary 1:1 line drawn upward from the toe of the temporary excavations.

4.7.2 Supported Excavations

If vertical excavations exceeding 4 feet in depth become warranted, such should be achieved using shoring to support sidewalls.

4.8 Soil Caving

Considering the gravelly sandy site soils encountered as described, it is our opinion that some caving may be expected during deep excavations. Temporary excavations in excess of 5 feet should be made at a slope ratio of 2 to 1 (h:v) or flatter, or as per the construction guidelines as provided by Cal-Osha.

4.9 Site Preparations for Driveways/Parking/Paving

Assuming concrete paving for use by conventional traffic, it is suggested that prior to concrete placement, the subgrades to receive paving should be subexcavated to minimum 18 inches, followed by the local excavated soils replacement in 6 to 8-inch-thick lifts, compacted to minimum 95%. Use of vibratory sheepsfoot roller is suggested during grading.

4.10 Pavement Thickness Design

Alternative I - Rigid Concrete Paving

Rigid paving, if selected, should be at least 6-inch-thick concrete placed directly over the local sandy gravelly soils compacted to minimum 95%. Alternatively, 5-inch-thick concrete can be considered over 4-inch class II base material compacted to 95%. Actual paving thickness and reinforcement requirements should be supplied by the project structural engineer using soils' Subgrade Reaction Modulus, kcf of 350.

Rigid concrete driveways should have thickened edges to prevent potential for lateral sliding under auto and truck traffic loading.

Alternative II - Asphalt Paving

Flexural asphalt paving, if selected, based on the estimated Traffic Indices (TIs) as described and a laboratory determined soils' R-value of 75 and laboratory determined soils' Sand Equivalent, SE of 58.33, the following flexible (a.c.) pavement sections are provided for initial use:

Service Vehicle	Traffic Index, TIs	Pavement Type	Paving Thickness (inch)
Auto/ Truck Traffic	6	a.c. over Class II base or CMB	3.0 over 3.0
	8		3.0 over 3.5
	10		4.0 over 4.0

Within paving areas, subgrade soils should be subexcavated to minimum 18 inches, moisture conditioned to near Optimum Moisture Content, followed by the excavated soils replacement as engineered fills compacted to at least 95% of the soils' maximum Dry Density as determined by the method ASTM D1557. Class II base or CMB used to receive asphalt concretes should be placed directly over the prepared subgrades and compacted to minimum 95%. Use of thicker/deepened paving edges are recommended to minimize potential for edge movement and paving distress.

The pavement evaluations are based on estimated Traffic Index (TI) as shown and on the soils' R-value as described. It is recommended that following mass grading completion, representative site soils should be laboratory tested to determine soils' R-value and to provide updated paving thickness.

4.11 Retaining Wall (if planned)

Retaining walls, if planned, should be designed using the following equivalent active pressures in the form of fluid density:

Slope Surface of Retained Material (horz. to vert.)	Equivalent Fluid Density (pcf) Imported Clean Sand	Local Site Soil
Level	30	45
2:1	35	45

Retaining wall foundation design may be based on soil vertical bearing capacity of 2000 psf for footing base materials compacted to minimum 90%.

The recommended lateral pressures do not include any surface surcharge load. Use of heavy equipment near retaining wall may develop lateral pressure in excess of the parameters described above. Installation of "French-drain" behind retaining walls is recommended to minimize water pressure build-up. Use of impervious material is preferred within the upper 18 inches of the wall backfills placed.

Backfill behind retaining wall should be compacted to a minimum 90% relative laboratory Maximum Dry Density as determined by ASTM D1557. Flooding and/or jetting behind wall should not be permitted. Local sandy soils may be used as backfill. Supplemental detailed retaining wall design and construction requirements will be supplied upon request.

4.12 Utility Trenches Backfills

Utility trenches backfills at depths in excess of 2 feet should be placed in thin lifts and compacted to the minimum requirements described. As an alternative, clean granular sand may be used having Sand Equivalent, SE of minimum 30. Jetting is not recommended in lieu of mechanical compaction. Trench excavations should conform to the requirements and safety as specified by Cal-Osha.

4.13 Seasonal Limitations

No fill shall be placed, spread or rolled during unfavorable weather conditions. Where the work is interrupted by heavy rains, fill operations shall not be resumed until moisture conditions are considered favorable by the geotechnical engineer.

4.14 Planters (if applicable)

To minimize potential differential settlement to foundations, planters requiring heavy irrigation should be restricted from using adjacent to footings. In the event that such becomes unavoidable, planter boxes with sealed bottoms should be considered.

4.15 Landscape Maintenance

Only the amount of irrigation necessary to sustain plant life should be provided. Pad drainage should be directed towards streets and to other approved areas away from foundations. Slope areas should be planted with draught resistant vegetation. Over watering landscape areas could adversely affect the proposed site development during its lifetime use.

4.16 Observations and Testing During Site Preparations and Grading

Recommendations provided assume that structural footings and slabs-on-grade be established exclusively into compacted fills. Excavated footings should be inspected, verified, and certified by the geotechnical engineer prior to steel and concrete placement to ensure their sufficient embedment and proper bearing as recommended. Structural backfills discussed should be placed under direct observation and testing by Soils Southwest, Inc. Excess soils generated from footing excavations should be removed from pad areas.

In general, geotechnical inspections should include, at a minimum, the following:

- Subexcavation depth during grading,
- Fill compaction testing,
- Retaining wall backfill compaction,
- Excavated foundation depth,
- Paving subgrade verification, and
- Utility trenches backfill compaction.

4.17 Plans Review

No precise grading or detailed development plans are prepared and none such are available for review. Prior to the actual mass grading, grading and foundation plans should be available to ensure applicability of the assumptions made in preparing this report. If during construction, conditions are observed different from those as presented, revised and/or supplemental recommendations will be required.

4.18 Pre-Construction Meeting

It is recommended that no clearing of the site or any grading operations be performed without the presence of a representative of this office. An on-site pre-grading meeting should be arranged between the geotechnical engineer and the grading contractor prior to the start of construction. Two days' advance notice for such meeting is required.

5.0 Earth Work/General Grading Recommendations

It is our opinion that the soils encountered primarily consist of upper 5 feet of medium dense dry fine to medium coarse silty sands overlying deposits of dry to damp, medium dense to dense poorly graded fine to medium coarse sands with some silts overlying gravels and gravelly medium to coarse sands with rock fragments, rocks, and cobbles to the maximum depth of 31 feet explored. Descriptions of the soils encountered are provided in the attached Log of Borings.

Prior to grading commencement, it is suggested that all debris and loose stockpiles should be cleared and disposed off-site to the satisfaction of the geotechnical engineer. In general, site preparations and grading for the project should include, at a minimum, the following:

Structural Backfill

Local soils free of organics, debris, and rocks smaller than 6-inch in overall diameter should be considered suitable for reuse as structural backfill. Loose soils, formwork, and debris should be removed prior to backfilling retaining walls. Local soils backfill should be placed and compacted in accordance with the recommendations provided below. Where space limitations do not allow conventional backfilling operations, special backfill materials, and procedures may be required. Pea gravel or other select backfill can be used within limited space areas. Additional recommendations on such will be provided during construction.

Percentage Compaction During Mass Grading

With the presence of silty fine to medium coarse gravelly sandy soils with isolated cobbles and rocks existing as described and assuming moderately high dead loads and seismic peak ground acceleration described, it is our opinion that structural fills placed should be compacted to the minimum 95% compaction requirements described. During grading, use of vibratory sheepsfoot roller is recommended.

Site Drainage

Adequate positive drainage should be maintained away from the structural pad in order to prevent water from ponding and to reduce potential percolation into backfill. A desirable slope for surface drainage is 2% in landscape areas and 1% in paved areas. Planters and landscaped areas adjacent to building perimeter should be adequately designed to minimize water filtration into subsoils. Considerations should be given to the use of closed planter bottoms, concrete slabs, and perimeter subdrains where applicable.

Utility Trenches

Buried utility conduits should be bedded and backfilled around the conduit in accordance with the project specifications. Buried utilities in excess of 2 feet should be backfilled with local gravelly sandy soils and compacted to at least 90%. Remaining near surface backfills should be compacted to 95%.

General Grading Recommendations:

Recommended general specifications for surface preparation to receive compacted engineered fills for structural support and utility trench backfill and others are presented below:

1. Areas to be graded, backfilled or paved, shall be grubbed, stripped, and cleaned of all buried and undetected debris, structures, concrete, vegetation and other deleterious materials prior to grading.

2. During grading, the estimated subexcavation depths within building pad areas and 5 feet beyond should be minimum 5 feet below the current grade surface.

3. Where compacted fill is used to provide vertical support for foundations, all loose, soft, and other incompetent soils should be removed to full depth as approved by the geotechnical engineer.

4. Compaction for structural fills shall be determined relative to the Maximum Dry Density as determined by ASTM D1557 compaction methods. All in-situ field density of compacted fill shall be determined by the ASTM D1556 standard methods or by other approved procedures.

5. All new imported soils, if required, shall be clean, granular, and non-expansive material requiring prior approval by the geotechnical engineer.

6. During grading, fill soils shall be placed as thin layers, thickness of which following compaction shall not exceed 6 inches.

7. In accordance with the CBC: rock sizes greater than 12 inches (305 mm) and up to 24 inches (610 mm) in maximum dimension shall be three feet (914 mm) or more below grade, measured vertically. Rock sizes greater than 24 inches (610 mm) in maximum dimension shall be 10 feet (3048 mm) or more below grade, measured vertically.

8. No jetting and/or water tampering be considered for backfill compaction for utility trenches without prior approval of the geotechnical engineer. For such backfill, hand tampering with fill layers of 8 to 12 inches in thickness or as approved by the geotechnical engineer is recommended.

9. Any and all utility trenches at depth as well as cesspool and abandoned septic tank within building pad area and beyond, should either be completely excavated and removed from the site or should be backfilled with gravel, slurry or by other material, as approved by the geotechnical engineer.

10. Any and all import soils required during grading should be equivalent to the site soils or better. The geotechnical engineer prior to their use should approve such.

11. Any and all grading required for pavement, sidewalks or other facilities to be used by general public, should be constructed under direct observation of the geotechnical engineer or as required by the local public agencies.

12. A site meeting should be held between the grading contractor and the geotechnical engineer prior to actual site preparations and grading. Two days advance notice will be required for such meeting.

6.0 WQMP-BMP Infiltration Rates Using Porchet Method for Stormwater Disposal Design

In general, two (2) infiltration tests were performed at the depth and locations as suggested by the project design engineer. The tests were performed using the standardized "falling-head" test converted using the Porchet method. Test locations and test data are shown in the attached Appendix D.

Method of infiltration rate as per the guidelines in accordance with Table 1, Infiltration Basin Option 2 of Appendix A of the Riverside County-Low Impact Development (LID) BMP Design Handbook as well as per the Appendices Section VII.3.8.2, Appendix VII: Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations of the San Bernardino County Technical Guidance Document for Water Quality Management Plans Handbook.

Approximate test locations are shown on the attached Plate 1. The test results should be considered tentative given the potential for changes to site finish grades or changes in soil conditions as exposed during site preparations and grading.

The soils encountered within the proposed chambers area consist, in general, of upper dry silty fine to medium sand overlying layers of dry and fine to medium coarse sands with some silts, pebbles, rock fragments, rocks, and cobbles along with gravely medium coarse sands with fragments, rocks to the maximum depth of 10 feet explored and proposed chambers bottoms as described (test borings P-1 and P-2). Additional deeper soil sample borings to the maximum depths of 20 and 30 feet did not expose the presence of shallow-depth groundwater or layers considered impermeable to water. Descriptions of the soils encountered are provided in the attached Log of Borings.

Based on the field infiltration testing completed, it is our opinion that for the infiltration system design proposed at about 10 feet below grade as suggested by the project civil engineer, the observed soils infiltration rates are 15.62 inches/hour and 15.00 inches/hour for test locations P-1 and P-2, respectively.

For design, it is suggested that use of an appropriate factor of safety as determined by the design engineer should be considered to the observed rate to account for long-term saturation, inconsistencies in subsoil conditions, potential for silting, and lack of maintenance. The observed soils' percolation rates are provided in Section 6.3 of this report.

6.1 METHODOLOGY AND TEST PROCEDURES

EQUIPMENT SET-UP (POST EXCAVATION) PROCEDURES:

Following test boring completion, each of the test holes were fitted with perforated PVC pipes backfilled with 2-inch-thick crushed rock at the bottom to minimize potentials for scouring and caving. For testing, each test hole was initially filled using water supplied by water jugs.

Prior to actual testing, to determine test intervals, as per the Section 2.3 for deep percolation testing of the referenced handbook guideline, two consecutive readings were performed to determine if 6 or more inches of water seeped in 25 minutes. Since 6 inches or more of water seeped away in less than 25 minutes for test locations P-1 and P-2, subsequent percolation testing was performed at 10-minute time intervals for at least minimum one hour or until the rates were uniform. Testing included water placement at about 8 feet below existing grade surface (inlet depth of 24 inches above infiltration system bottom).

The final 10-minute recorded percolation test rates were converted into an Infiltration Rate (I_t) for inches per hour using the "Porchet Method" equation as described in the Reference 2, Riverside County Low Impact Development BMP Design Handbook, as well as per the Appendices Section VII.3.8.2, Appendix VII: Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations on the San Bernardino County Technical Guidance Document for Water Quality Management Plans Handbook.

6.2 INFILTRATION TEST RESULTS

Based on the soils infiltration testing completed at the test locations and at the test depth as described, the observed soils' percolation rates are 15.62 inches/hour and 15.00 inches/hour for test locations P-1 and P-2, respectively.

Calculations to convert the percolation test rate to infiltration test rates in accordance with Section 2.3 of the County Handbook are presented in Table I and II below. For design, it is suggested that an appropriate Factor of Safety as selected by the design engineer should be considered to the observed field percolation rate described.

5. SUMMARY & CONVERSION CALCULATIONS

For WQMP-BMP design, based on the soils infiltration testing completed and, on the calculations as described, the following infiltration rates may be considered. Actual field test data are attached.

TABLE I
Observed Infiltration Rate for Design

Test Location (7-28-23)	Test Depth Below Grade, feet	Porchet Method Observed Rate, inches/hour
P-1	10	15.62
P-2	10	15.00

TABLE II
Conversion Table (Porchet Method)

Test No.	Depth Test Hole, inches	Time Interval, minutes	Initial Depth, inches	Final Depth, inches	Initial Water Height, inches	Final Water Height, inches	Change in Height/ Time	Average Head Height/Time
	Dt	ΔT	D_O	D_f	$H_o=D_t-D_o$	$H_f=D_t-D_f$	$\Delta H= H_f-H_O$	$H_{avg} = (H_o+H_f)/2$
P-1	120	10	96	116.5	24.0	3.5	20.5	13.75
P-2	120	10	96	116.0	24.0	4.0	20.0	14.00

	Infiltration Rate (It)=ΔH60r/Δt(r+2Havg)		
	A	B	C
Test No.	ΔH60r	Δt(r+2Havg)	A/B=inches/hour
P-1	4920	315	15.62
P-2	4800	320	15.00

Use of a safety factor should be considered to account for long-term saturation, inconsistencies in subsoil conditions along with the potential for silting of percolating soils.

The infiltration rates described are based on the in-situ testing completed at the locations as suggested by the project civil engineer. In the event that the final chambers' locations and depth vary considerably from those described herein, supplemental soils infiltration testing may be warranted.

It should be noted that over prolonged use and lack of maintenance the detention/infiltration basins or deep chambers constructed based on the suggested design rates may experience much lower infiltration rates due to the accumulation of silts, fines, soils, and others. Regular maintenance of the chambers in the form of removal of debris, oil, and fines are strongly recommended. A maintenance record of such is suggested for future use.

Suggested Requirements for Standard Stormwater BMP installation (where applicable)
The invert of stormwater infiltration should be set at least 10 feet above the groundwater elevation and should not be placed on steep slopes to create conditions for slopes instability.

When adequately installed, it is our opinion that the Stormwater infiltration systems installed should not increase the potential for static or seismic settlement of structures.

Stormwater infiltration installed should not place an increased surcharge on structures or foundations on or its adjacent. The pore water pressure should not increase the soils retained by retaining structures.

The invert of stormwater infiltration should be set back at least 15 feet and outside a 1:1 plan drawn up from the bottom of adjacent foundations.

Stormwater infiltration should not be located near utility lines **or adjacent to any building footings** where the intrution of stormwater could cause damage to utilities or settlement of trench backfill.

Stormwater infiltration systems should not be allowed within 100 feet of any potable groundwater production well.

Once installed, regular maintenance of the detention systems is recommended.

7.0 Closure

The conclusions and recommendations presented are based upon the findings and observations as made during subsurface test excavations and subsequent laboratory testing and engineering evaluations as currently used in the Geotechnical industry. The recommendations supplied should be considered "preliminary" since they are based on soil samples only. If during construction, the subsoil conditions appear different from those as disclosed during field investigation this office should be notified to consider any possible need for modification by the geotechnical recommendations as provided in this report.

Recommendations provided are based on the assumptions that structural footings will be established exclusively into compacted fill. No footings and/or slabs should be allowed straddling over cut and fill transition interface.

Site grading observations and testing must be performed by a representative of this office. Further, it is recommended that excavated footings should be verified and approved by geotechnical engineer prior to steel and concrete placement to ensure that foundations are founded into satisfactory soils and excavations are free of loose and disturbed materials.

A pre-grading meeting between grading contractor and geotechnical engineer is recommended prior to construction, preferably at the site, to discuss the grading procedures to be implemented and other requirements described in this report to be fulfilled.

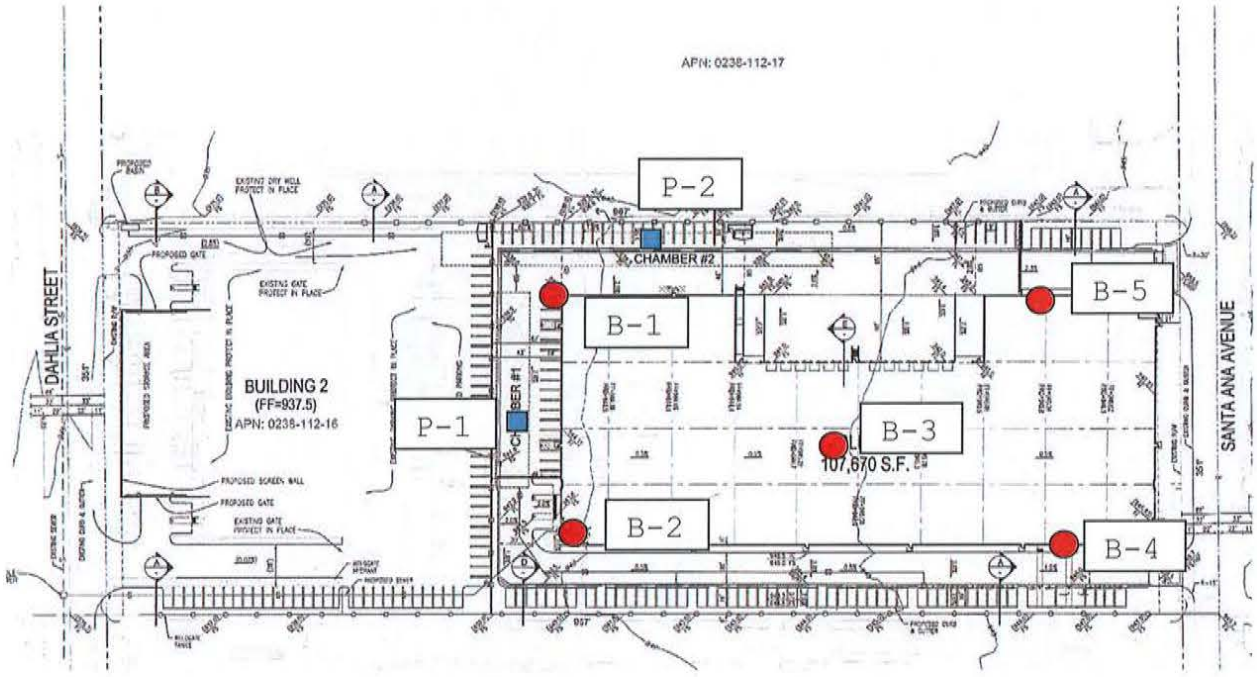
This report has been prepared exclusively for the use of the addressee for the project referenced in the context. It shall not be transferred or be used by other parties without written consent of Soils Southwest, Inc.

Should the project be delayed beyond one year after the date of this report, the recommendations presented shall be reviewed to consider any possible change in site conditions.

The recommendations presented are on the assumption that the necessary geotechnical observations and testing during construction will be performed by a representative of this office. The field observations are considered a continuation of the geotechnical investigation performed.

If another firm is retained for geotechnical observations and testing, our professional liability and responsibility shall be limited to the extent that Soils Southwest, Inc. would not be the geotechnical engineer of record. Use of the geotechnical recommendations by others will relieve Soils Southwest, Inc. of any liability that may arise during the lifetime use of the structure constructed.

PLOT PLAN AND TEST LOCATIONS
Planned Industrial Warehouse and Associated Paving/Parking
13052 Dahlia Street
Fontana, CA 91761
APN: 023-811-216
Not to Scale



Legend:
B-1 Approximate Location of Test Borings for Geotechnical Evaluations
P-1 Approximate Location of Test Pit for BMP Soils' Infiltration

List of Appendices

Appendix A - Log of Borings

Appendix B - Laboratory Test Results

Table I: In-Situ Moisture-Density (ASTM D2216 and D2937)

Table II: Max. Density/Optimum Moisture Content (ASTM D1557)

Table III: Direct Shear (ASTM D3080)

Table IV: Consolidation (ASTM D2435)

Table V: Sand Equivalent, SE (ASTM D2419)

Table VI: Sieve Analysis (ASTM D422)

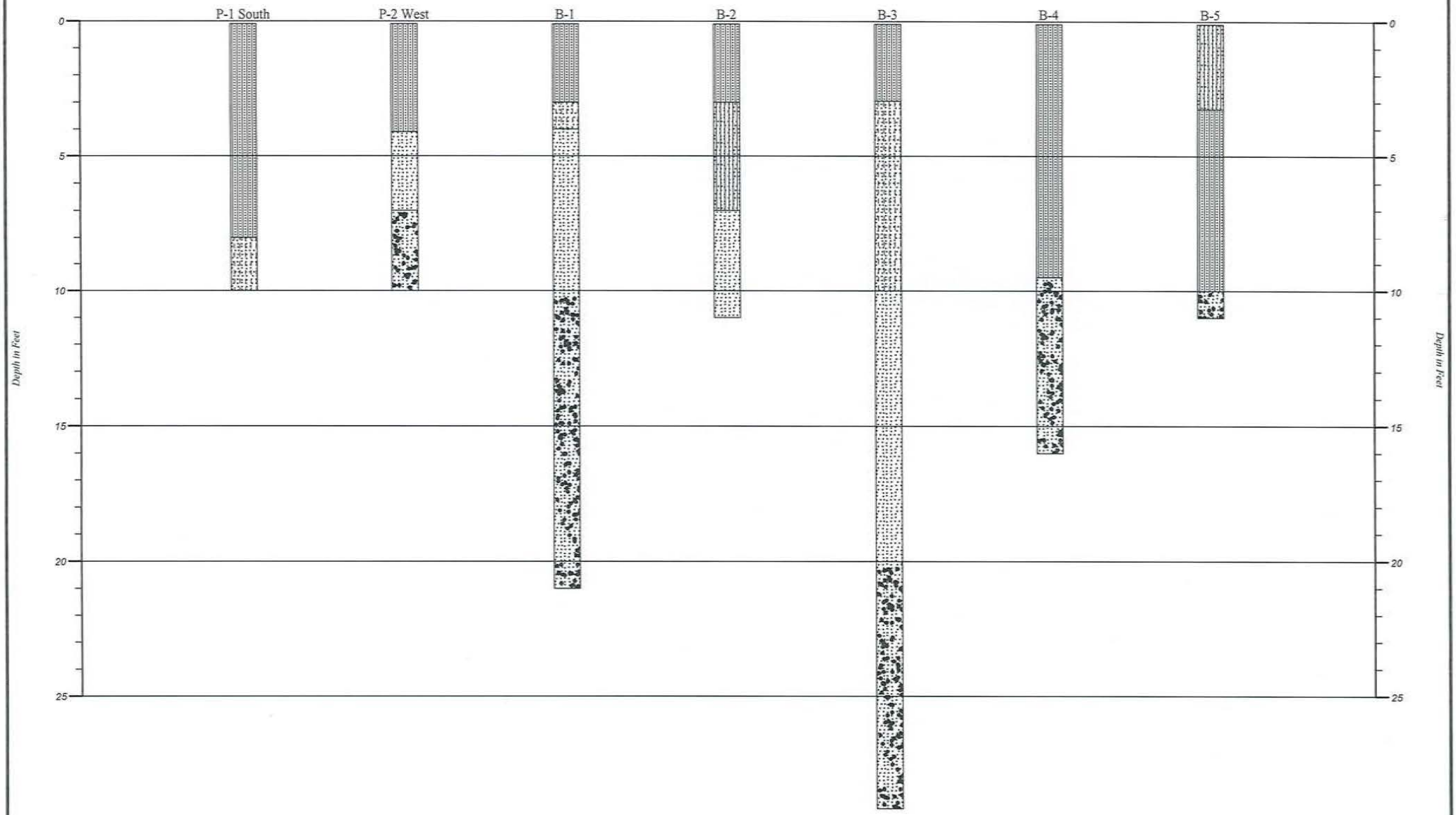
Table VII: Soils' Chemical Analyses Test Results

Table VIII: Soils' Density Correlation to SPT Blow Counts

APPENDIX C – Supplemental Seismic Design Parameters &
FEMA National Flood Hazard Layer Map

APPENDIX D - Field Infiltration Test Data Porchet Method Calculation Summary

LOG OF BORINGS



Plan View

Strata symbols

- Silty sand
- Poorly graded sand with silt
- Poorly graded sand
- Poorly graded gravel and sand
- Poorly graded silty fine sand

SOILS SOUTHWEST, INC.

GENERALIZED SOIL PROFILE

HORIZONTAL SCALE:	DRAWN BY/APPROVED BY	DATE DRAWN
VERTICAL SCALE: 1"=5'		8/10/2023

The Conco Co./Darren Ratekin

PROJECT NO. 23044-F/BMP

FIGURE NUMBER

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING P-1 South

Project: The Conco Co./Darren Ratekin	**Job No.:** 23044-F/BMP
Logged By: John Flippin	**Boring Diam.:** 8" HSA
	Date: July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			Disturbed surface gravels and soils
								SAND - tannish light brown, silty, fine to medium pebbles, occasional rock fragments, scattered rock 1/2-1"
							5	
					SP-SM			- color change to light brown, gravely, slightly silty, fine to medium coarse, pebbles, rock fragments, rocks, scattered cobbles
							10	- End of infiltration test boring @ 10.0 ft. - no bedrock - no groundwater - 3" perforated socked pvc pipe with gravel at bottom
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Office/Warehouse and Parking 13052 Dahlia Street Fontana, California	**Plate #**

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING P-2 West

Project: The Conco Co./Darren Ratekin	**Job No.:** 23044-F/BMP
Logged By: John Flippin	**Boring Diam.:** 8" HSA
	Date: July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			Disturbed surface gravels and soils SAND - light brown, silty, fine to medium pebbles, occasional rock fragments, scattered rock 1/2-1",dry
					SP		5	- traces of silt, fine to medium coarse, rock fragments, rocks 1/2"-2"
					GP-SP			- gravely, medium coarse, rock fragments rocks, dry
							10	- gravely, medium to coarse, rock fragments rock, scattered cobbles, dry
								- End of infiltration test boring @ 10.0 ft. - no bedrock - no groundwater - 3" perforated socked pvc pipe with gravel at bottom
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Office/Warehouse and Parking 13052 Dahlia Street Fontana, California	**Plate #**

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-1

Project: The Conco Co./Darren Ratekin | **Job No.:** 23044-F/BMP
Logged By: John Flippin | **Boring Diam.:** 8" HSA | **Date:** July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			Disturbed surface gravels and soils
								SAND - light brown, silty, fine to medium, pebbles, scattered rock fragments, dry
		5.3	109.5	90.5	SP-SM			- traces of silt, fine to medium, pebbles, rock fragments, dry to damp
					SP		5	
19								- fine to medium coarse, pebbles, rock fragments - color change to grayish light brown, gravely, medium to coarse, rock fragments rock, medium dense, dry
		2.3	109.1	90.2				
							10	- SPT blow counts (6 inch intervals) = 4,8,11
15					GP-SP			- color change to tannish light brown, traces of silt, fine to medium coarse, pebbles, rock fragments, rocks, dense, dry
								- color change to grayish tan, gravely, medium to medium coarse, pebbles, rock fragments scattered rocks and cobbles
							15	- SPT blow counts (6 inch intervals) = 6,7,8
							20	
72								- gravely, medium to medium coarse, rock fragments, rocks 1"-2", very dense, dry
								- SPT blow counts (6 inch intervals) = 14,28,44
							25	- End of test boring @ 21.0 ft. - no bedrock - no groundwater
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Office/Warehouse and Parking
13052 Dahlia Street
Fontana, California

Plate #

Bulk/Grab sample | California sampler | Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-2

Project: The Conco Co./Darren Ratekin | **Job No.:** 23044-F/BMP
Logged By: John Flippin | **Boring Diam.:** 8" HSA | **Date:** July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			disturbed surface gravels and soils SAND - light brown, silty, fine to medium, pebbles, scattered rock fragments,dry
50					SM-ML		5	- silty, fine, pebbles, occasional rock fragments, scattered rock, very dense, dry - SPT blow counts (6 inc intervals) = 15,24,26
		1.2	118.3	97.7	SP			- occasional rock 1"-2", scattered cobbles - traces of silt, gravely, fine to coarse, rock fragments, rock 1"-1.5", very dense, dry
18							10	- gravely, medium to coarse - SPT blow counts (6 inch intervals) = 7,9,9
							15	- End of test boring @ 11.0 ft. - no bedrock - no groundwater
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Office/Warehouse and Parking
13052 Dahlia Street
Fontana, California

Plate #

Bulk/Grab sample | California sampler | Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-3

Project: The Conco Co./Darren Ratekin		**Job No.:** 23044-F/BMP
Logged By: John Flippin	**Boring Diam.:** 8" HSA	**Date:** July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM			disturbed surface gravels and soils
								SAND - tannish light brown, silty, fine to medium, pebbles
					SP-SM			- (Max Dry Density = 121 pcf @ 10.75 %)
		2.9	111.2	91.9			5	- color change to brown, slightly silty, fine to medium, pebbles, rock fragments, occasional 1" rock, dry
								- color change to light brown,slightly silty fine to medium coarse, pebbles, rock fragments, scattered small rock, dry
							10	
17					SP			- color change to light brown, gravely, traces of silt, fine to coarse, rock fragments, rocks, dry
								- SPT blow counts (6 inch intervals) = 5,8,9
							15	
							20	
50					GP-SP			- color change to gray-brown, gravely medium coarse, rock fragments, rocks 1"-2" dry
								- SPT blow counts (6 inch intervals) = 26,30,50/5"
							25	GRAVELS - rocks and cobbles with medium to coarse sands
							30	
50					GP			- with little to no soils, rocks, cobbles
								- SPT blow counts (6 inch intervals) = 50/6"
								- End of test boring @ 31.0 ft.

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Office/Warehouse and Parking
13052 Dahlia Street
Fontana, California

Plate #

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-3

Project: The Conco Co./Darren Ratekin		**Job No.:** 23044-F/BMP
Logged By: John Flippin	**Boring Diam.:** 8" HSA	**Date:** July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
								- no bedrock - no groundwater
							40	
							45	
							50	
							55	
							60	
							65	
							70	

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897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-4

Project: The Conco Co./Darren Ratekin		**Job No.:** 23044-F/BMP
Logged By: John Flippin	**Boring Diam.:** 8" HSA	**Date:** July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
								disturbed surface gravels and soils
					SM			SAND - light brown, silty, fine to medium, pebbles, damp
16								- with rock fragments, and rock 1/2"-1",dry to damp
								- SPT blow counts (6 inch intervals) = 5,7,9
		3.9	108.3	89.5			5	- traces of silt, fine to medium, pebbles, rock fragments, rocks, 1/2", dry, dense
					GP-SP		10	- color change to gray tan, gravely, medium to coarse, rock fragments, rocks
12								- SPT blow counts (6 inch intervals) = 3,5,7
								- color change to light brown, silty, fine to medium coarse, pebbles, rock fragments scattered rock, low to medium dense, dry to damp
							15	
32								- gravely, medium to medium coarse, rock fragments, rocks 1", occasional cobbles, dry to damp
							20	- SPT blow counts (6 inch intervals) = 8, 12, 20
								- End of test boring @ 16.0 ft.
								- no bedrock
								- no groundwater
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Office/Warehouse and Parking
13052 Dahlia Street
Fontana, California

Plate #

Bulk/Grab sample California sampler Standard penetration test

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Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-5

Project: The Conco Co./Darren Ratekin		**Job No.:**	23044-F/BMP
Logged By: John Flippin	**Boring Diam.:** 8" HSA	**Date:**	July 28,2023

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SM-ML			disturbed soils and gravels with scattered debric
								SAND - light brown, silty, fine, pebbles, occasional rock fragments, dry
					SM			- silty, fine to medium coarse, pebbles, occasional rock fragments and rocks 1"
							5	damp
13								- SPT blow counts (6 inch intervals) = 4,5,8
							10	
21					GP-SP			- gravely, medium coarse to coarse, rock fragments, rocks, medium dense, dry to damp
								- SPT blow counts (6 inc intervals) = 7,9,12
							15	- End of test boring @ 11.0 ft.
								- no bedrock
								- no groundwater
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Office/Warehouse and Parking
13052 Dahlia Street
Fontana, California

Plate #

Bulk/Grab sample California sampler Standard penetration test

KEY TO SYMBOLS

Symbol Description

Strata symbols



Silty sand



Poorly graded sand with silt



Poorly graded sand



Poorly graded gravel and sand



Poorly graded silty fine sand



Poorly graded gravel

Soil Samplers



Bulk/Grab sample



California sampler



Standard penetration test

Notes:

1. Exploratory borings were drilled on July 28,2023 using a 4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or when re-checked the following day.

3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.

KEY TO SYMBOLS

Symbol	Description
Strata symbols	
	Silty sand
	Poorly graded sand with silt
	Poorly graded sand
	Poorly graded gravel and sand
	Poorly graded silty fine sand

Notes:

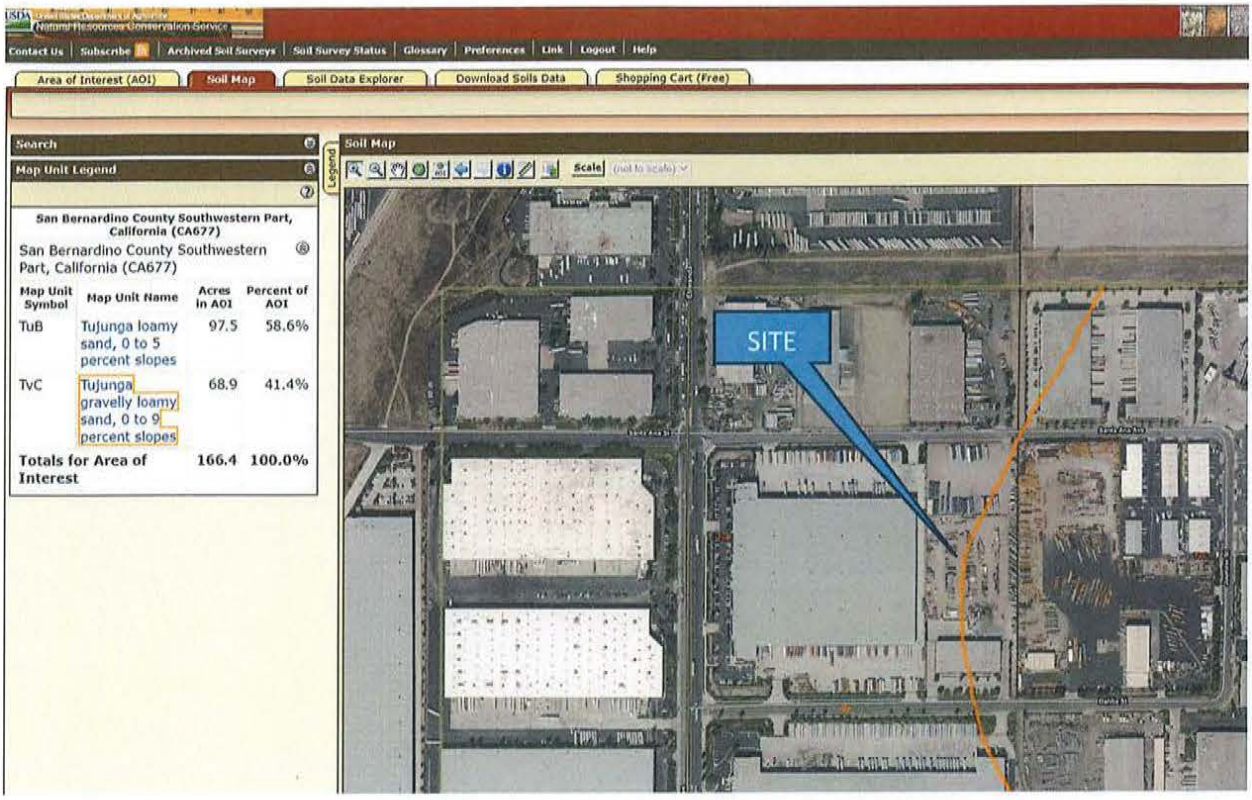
1. Exploratory borings were drilled on July 28,2023 using a 4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or when re-checked the following day.

3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.


Natural Resources Conservation Service
Contact Us | Subscribe | Archived Soil Surveys | Soil Survey Status | Glossary | Preferences | Link | Logout | Help
Area of Interest (AOI) | Soil Map | Soil Data Explorer | Download Soils Data | Shopping Cart (Free)
Search
Map Unit Legend
San Bernardino County Southwestern Part, California (CA677)
San Bernardino County Southwestern Part, California (CA677)
Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI
TuB | Tujunga loamy sand, 0 to 5 percent slopes | 97.5 | 58.6%
TvC | Tujunga gravelly loamy sand, 0 to 9 percent slopes | 68.9 | 41.4%
Totals for Area of Interest | 166.4 | 100.0%
Soil Map
Legend
Scale
SITE

San Bernardino County Southwestern Part, California

TuB—Tujunga loamy sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2sx6y
Elevation: 650 to 3,110 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 325 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Tujunga, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga, Loamy Sand

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

A - 0 to 6 inches: loamy sand
C1 - 6 to 18 inches: loamy sand
C2 - 18 to 60 inches: loamy sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XG912CA - Sandy Fan
Hydric soil rating: No

Minor Components

Tujunga, gravelly loamy sand

Percent of map unit: 10 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hanford, sandy loam

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 14, Sep 6, 2022

San Bernardino County Southwestern Part, California

TvC—Tujunga gravelly loamy sand, 0 to 9 percent slopes

Map Unit Setting

National map unit symbol: hcl2
Elevation: 10 to 1,500 feet
Mean annual precipitation: 10 to 25 inches
Mean annual air temperature: 59 to 64 degrees F
Frost-free period: 250 to 350 days
Farmland classification: Not prime farmland

Map Unit Composition

Tujunga and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tujunga

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 36 inches: gravelly loamy sand
H2 - 36 to 60 inches: gravelly sand

Properties and qualities

Slope: 0 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: R019XG912CA - Sandy Fan
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 5 percent
Landform: Drainageways
Hydric soil rating: Yes

Soboba, gravelly loamy sand

Percent of map unit: 5 percent
Hydric soil rating: No

Delhi, fine sand

Percent of map unit: 5 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 14, Sep 6, 2022

APPENDIX B

Laboratory Test Programs

Laboratory tests were conducted on representative soils for the purpose of classification and for the determination of the physical properties and engineering characteristics. The number and selection of the types of testing for a given study are based on the geotechnical conditions of the site. A summary of the various laboratory tests performed for the project is presented below.

Moisture Content and Dry Density (D2937):

Data obtained from these tests, performed on undisturbed samples are used to aid in the classification and correlation of the soils and to provide qualitative information regarding soil strength and compressibility.

Direct Shear (D3080):

Data obtained from this test performed at increased and field moisture conditions on relatively remolded soil sample is used to evaluate soil shear strengths. Samples contained in brass sampler rings, placed directly on test apparatus are sheared at a constant strain rate of 0.002 inch per minute under saturated conditions and under varying loads appropriate to represent anticipated structural loadings. Shearing deformations are recorded to failure. Peak and/or residual shear strengths are obtained from the measured shearing load versus deflection curve. Test results, plotted on graphical form, are presented on Plate B-1 of this section.

Consolidation (D2835):

Drive-tube samples are tested at their field moisture contents and at increased moisture conditions since the soils may become saturated during lifetime use of the planned structure.

Data obtained from this test performed on relatively undisturbed and/or remolded samples, were used to evaluate the consolidation characteristics of foundation soils under anticipated foundation loadings. Preparation for this test involved trimming the sample, placing it in a one-inch-high brass ring, and loading it into the test apparatus which contained porous stones to accommodate drainage during testing. Normal axial loads are applied at a load increment ratio, successive loads being generally twice the preceding.

Soil samples are usually under light normal load conditions to accommodate seating of the apparatus. Samples were tested at the field moisture conditions at a predetermined normal load. Potentially moisture sensitive soil typically demonstrated significant volume change with the introduction of free water. The results of the consolidation tests are presented on Plate B-2.

Laboratory Test Results

Table I: Moisture-Density Determinations (ASTM D2216)

Sample Boring Location & Sample Depth, feet	Dry Density, pcf	Moisture Content, %	Laboratory Maximum Dry Density, pcf	Percent Compaction, %
B-1 @ 3	109.5	5.3	121	90.5
B-1 @ 8	109.1	2.3	121	90.2
B-2 @ 7	118.3	1.9	121	97.7
B-3 @ 5	111.2	2.9	121	91.9
B-4 @ 5	108.3	3.9	121	89.5

Table II: Max. Density/Optimum Moisture Content (ASTM D1557)

Sample Location @ Depth, feet	Max. Dry Density, pcf	Optimum Moisture Content, %
B-3 @ 0-5 SAND – SP-SM light brown, slightly silty, fine to medium, pebbles, occasional rock fragments and rock 1"-2", dry to damp	121	10.75

Table III: Direct Shear (ASTM D3080)

Test Boring No. @ Sample Depth, feet	Test Condition	Cohesion, psf	Friction, degrees
B-3 @ 0-5	Remolded to 90%	300	39
B-4 @ 5	Undisturbed	100	38

Table IV: Consolidation (ASTM D2435)

Boring No., B	Depth, feet	Consolidation prior to saturation, % @ 2 kips	Hydro Collapse, % @ 2 kips	Total Consolidation, % @ 8 kips (saturated)
3 (remolded)	0-5	0.6	0.1	1.7
4 (undisturbed)	5.0	0.5	0.3	2.2
2 (undisturbed)	7.0	0.1	0.7	3.7

Table V: Sand Equivalent, SE (ASTM D2419)

Sample Location @ depth, feet	**Sand Equivalent Average, SE**
B-1 @ 0-5	58.33
B-5 @ 0-5	33.57

Table VI: Sieve Analysis (ASTM D422)

SAMPLE: B-1 @ 0-5 feet

Grain Size	**% Retained**
Gravels	8
Medium to Coarse	29
Fines	50
Silts	13

Table VII: Soils' Chemical Test Results at Sample Location B-1 @ 5 feet

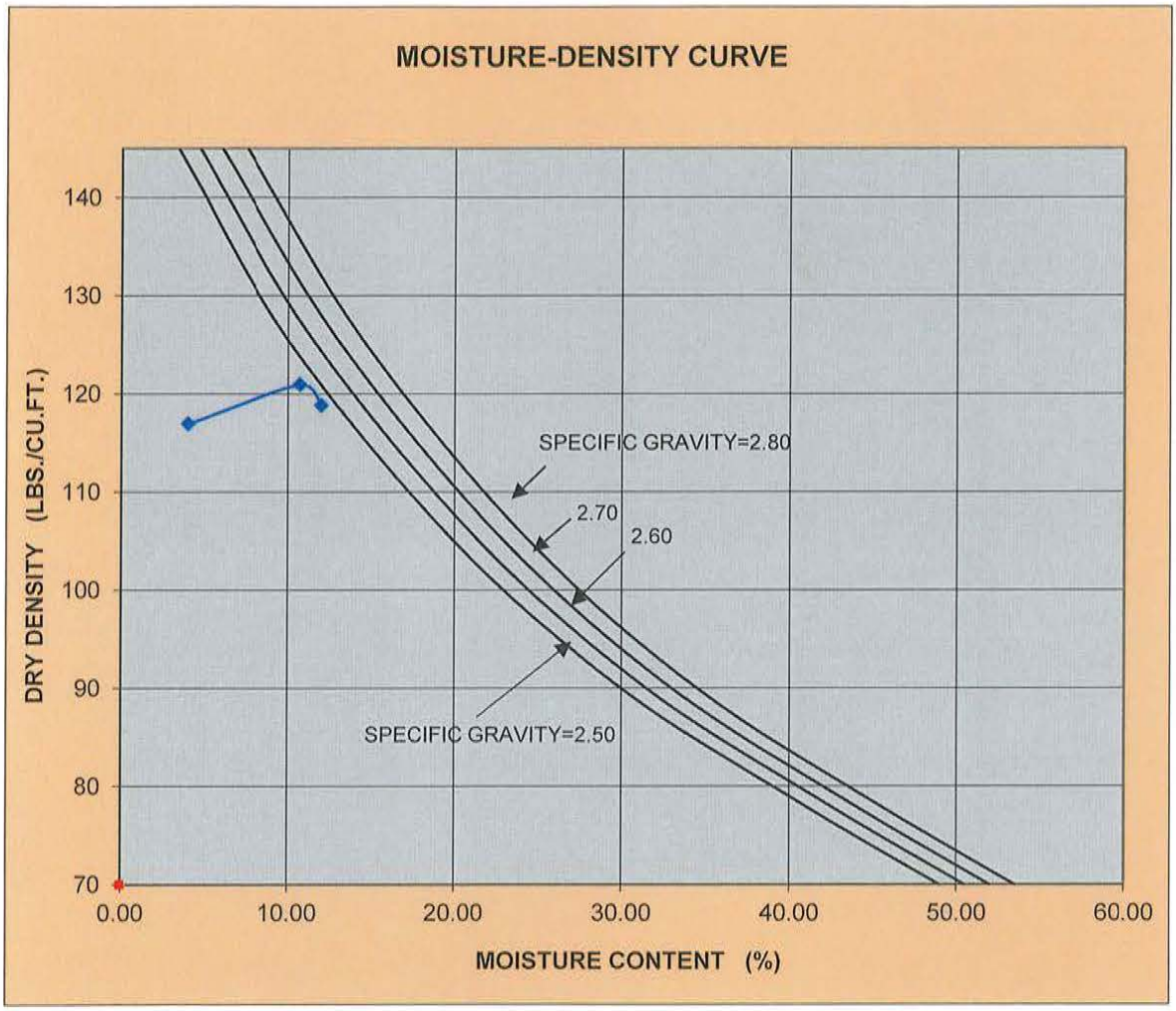
Sample	**Method**	**Result**	**Units**	**Remarks**
pH	EPA 9040 B	8.39	units	Non- corrosive
Resistivity	SM 2510B	4,950	ohms-cm	Moderately corrosive
Chloride	EPA 300.0	23	mg/kg	Non-corrosive
Sulfate	EPA 300.0	40	mg/kg	Non-corrosive

Table VIII: Soils' Density Correlation to SPT Blow Counts

Density/Consistency		1" Soil Tube -- Blows Per Foot			Standard Penetration Blows Per Foot
Granular	Cohesive	Sand and Gravel	Silt	Clay	
Very Loose	Very Soft	0-50	0-50	0-60	0-5
Loose	Soft	50-100	50-180	60-250	5-10
Slightly Compact	Stiff	100-350	180-1000	250-1000	10-20
Compact	Very Stiff	350-525	1000-2000	1000-4000	20-35
Dense	Hard	525-1500	2000-5000	4000-5000	35-70
Very Dense	Very Hard	1500+	5000+	5000+	70+

MODIFIED PROCTOR COMPACTION TEST (ASTM STD. 1557)

MOISTURE % (g)	4.04	10.75	12.03	12.03
DRY DENSITY (pcf)	117	121	118.9	118.9



CURVE NO.	SOIL DESCRIPTION	OPT MOIST. CONTENT(%)	MAX DRY DENSITY (P.C.F.)
B-3 0-5 ft	The Conco Co./Darren Ratekin 13052 Dahlia Street Fontana, California	10.75	121
SOIL DESCRIPTION: SP-SM - light brown, slightly silty, fine to medium sand pebbles, occasional rock fragments and rock 1"-2", dry to damp			PROJECT NO. 23044-F PLATE: A-1

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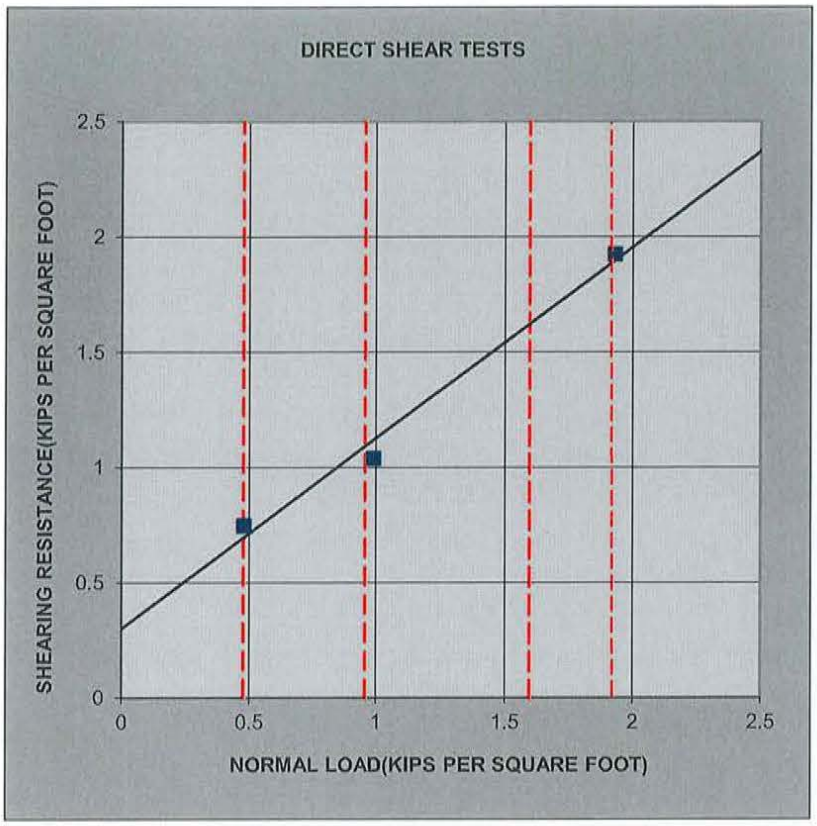
Consulting Foundation Engineers



SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-3	0 to 5	Remolded to 90%	300.17	39.61

Proposed Warehouse and Parking 13052 Dahlia Street Fontana, California	PROJECT NO.	23044-F
	PLATE	B-1

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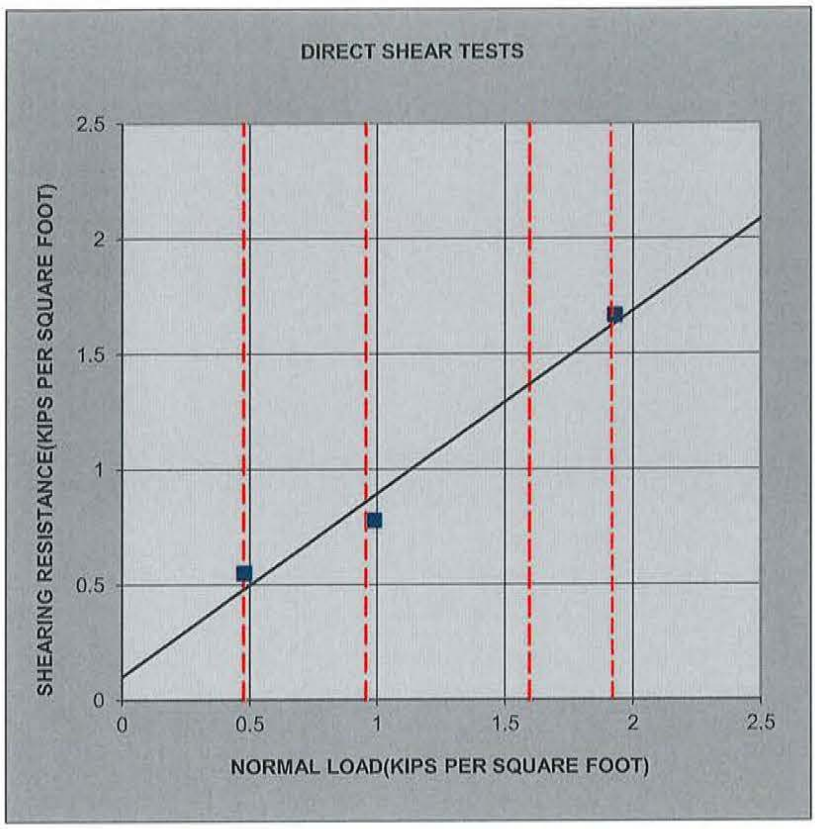

SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-4	5.0	Undisturbed	100.49	38.43

Proposed Warehouse and Parking
13052 Dahlia Street
Fontana, California

PROJECT NO.	23044-F
PLATE	B-1-1

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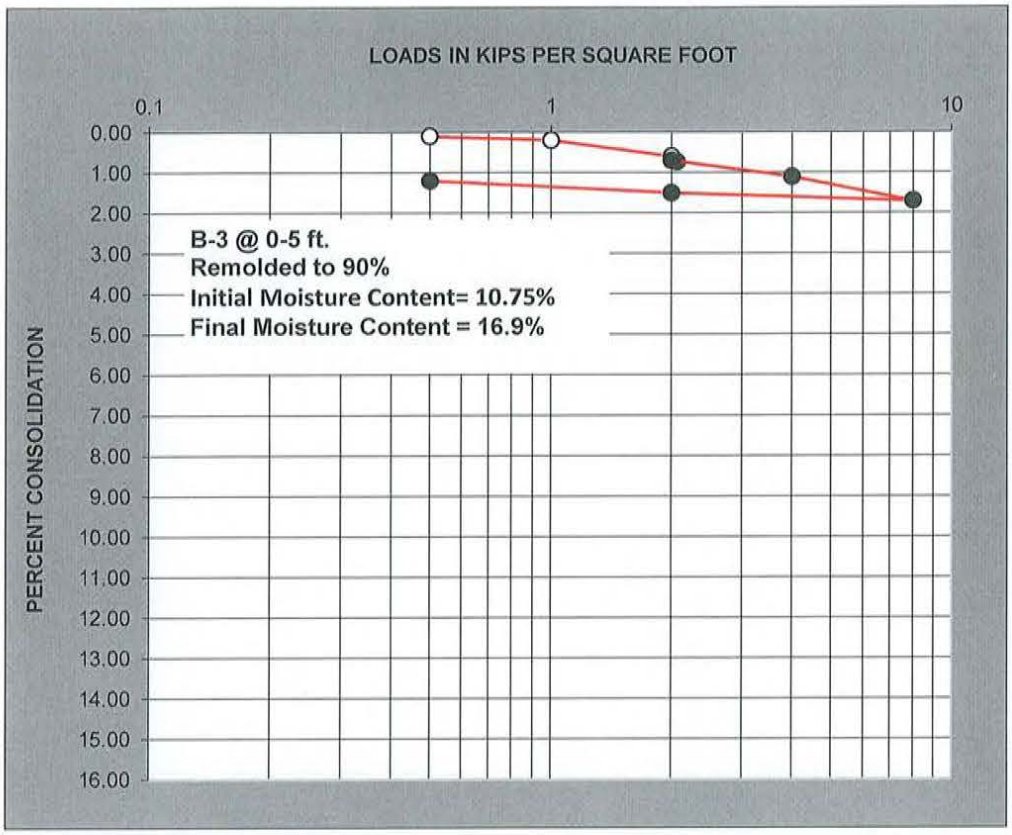
CONSOLIDATION TESTS



- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Warehouse and Parking 13052 Dahlia Street, Fontana		
	PROJECT NO.	23044-F	PLATE	B-2

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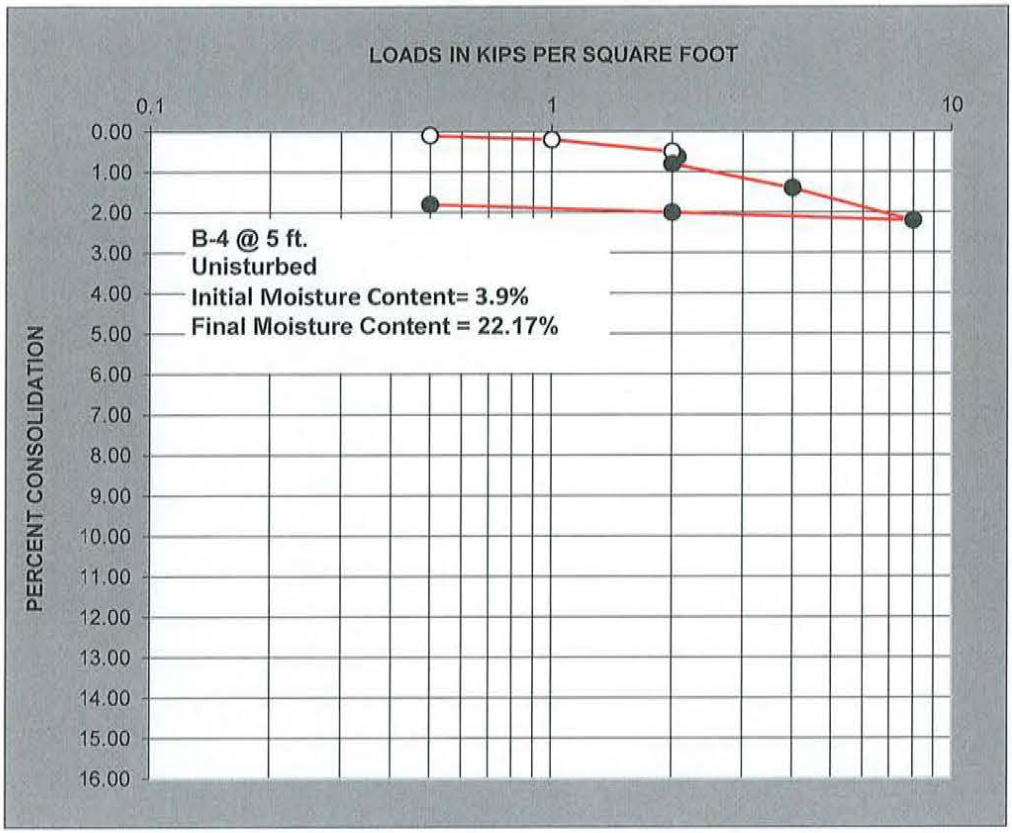
CONSOLIDATION TESTS



- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Warehouse and Parking 13052 Dahlia Street, Fontana		
	PROJECT NO.	23044-F	PLATE	B-2-1

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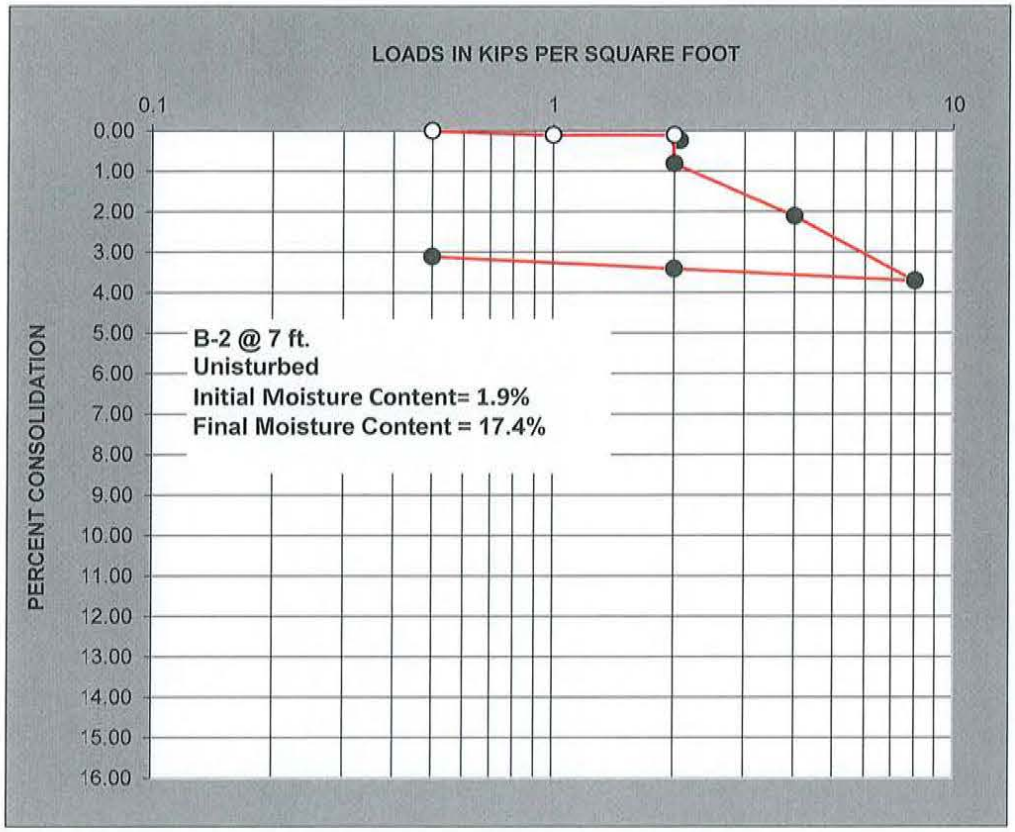
CONSOLIDATION TESTS



- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Warehouse and Parking 13052 Dahlia Street, Fontana		
	PROJECT NO.	23044-F	PLATE	B-2-2

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SAND EQUIVALENT TEST

Test Date: August 10,2023

Project No.: 23044-PV

Job Name: Conco Co. /Ratekin
13052 Dahlia Street, Fontana
Sampel Location: B-1 @ 0-5'

Sample by: JF Tested by: RM

LABORATORY DATA

SAMPLE NO.	1	2	3	4
TIME START	2:45	2:50	2:55	
TIME SOAK (10 min.)	2:55	3:00	3:05	
TIME AT LEVEL 15ML	2:58	3:02	3:08	
TIME of READING (20-min)	3:18	3:22	3:28	
FINE, ML	4.8	4.8	4.8	
COARSE, ML	3.0	2.7	2.7	
SE = 100x (coarse/fine)	62.5	56.25	56.25	
SE Average	58.33			

Soil Description: SM-SP/SM fine to medium with some silts, pebbles, rock fragments

SAND EQUIVALENT TEST

Test Date: August 11,2023

Project No.: 23044-PV

Job Name: Conco Co. /Ratekin
13052 Dahlia Street, Fontana
Sampel Location: B-5 @ 0-5'

Sample by: JF Tested by: RM

LABORATORY DATA

SAMPLE NO.	1	2	3	4
TIME START	11:23	11:28	11:33	
TIME SOAK (10 min.)	11:33	11:38	11:43	
TIME AT LEVEL 15ML	11:35	11:40	11:45	
TIME of READING (20-min)	11:55	12:00	12:05	
FINE, ML	5.0	5.0	4.9	
COARSE, ML	1.7	1.6	1.7	
SE = 100x (coarse/fine)	34	32	34.7	
SE Average	33.57			

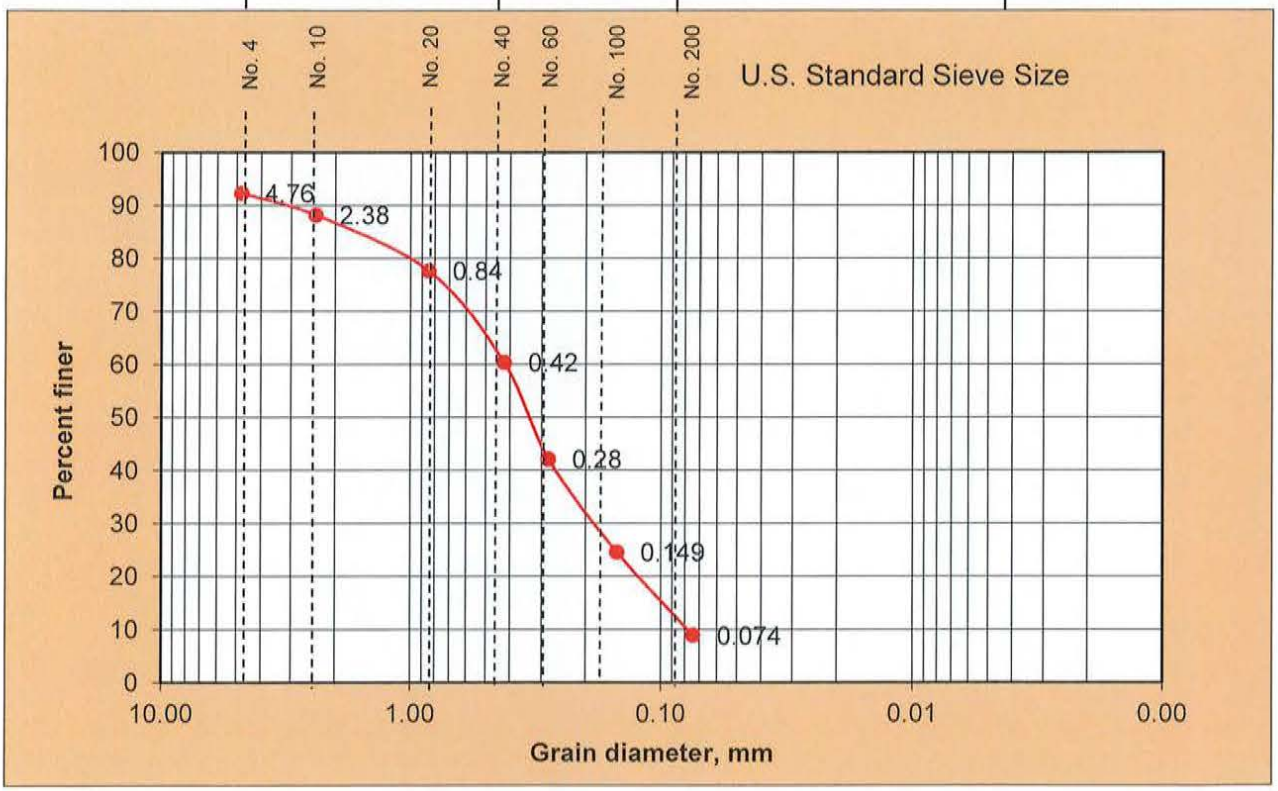
Soil Description: SM/SM-ML silty fine sand, pebbles, occasional rock fragments, dry

GRAIN SIZE DISTRIBUTION

Project: The Conco Co./Ratekin **Job #** 23044-F
Location: 13052 Dahlia St., Fontana **Boring No:** B-1@ 0-5' **Sample No:** 1
Description of Soil: SP-SM
Date of Sample: 7/28/2023
Tested By: JF **Date of Testing:** 8/10/2023

Sieve No.	Sieve Openings in mm	Percent Finer	Grain Size	% Retained
4	4.76	92.36	Gravel	8
10	2.38	88.24	Med. to Crs	29
20	0.84	77.70	Fines	50
40	0.42	60.42	Silts/Clays	13
60	0.28	42.16		
100	0.149	24.60		
200	0.074	8.92		

Gravel	Sand			
	Coarse to Medium	Fine	Silt	Clay



Visual Soil Description : SAND - poorly graded fine to medium coarse, slightly silty sands with pebbles, occasional rock fragments, and scattered rocks 1-2"

Soil Classification: SP-SM

System: USC

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

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CASE NARRATIVE

Authorized Signature Name / Title (print)	Ken Zheng, President
Signature / Date	Ken Zheng Ken Zheng, President 08/14/2023 9:16:06
Laboratory Job No. (Certificate of Analysis No.)	2308-00087
Project Name / No.	23044-F / THE CONCO CO.
Dates Sampled (from/to)	07/28/23 To 07/28/23
Dates Received (from/to)	08/10/23 To 08/10/23
Dates Reported (from/to)	08/14/23 To 8/14/2023
Chains of Custody Received	Yes

Comments:

Subcontracting

Inorganic Analyses

No analyses sub-contracted

Other Analyses

No analyses sub-contracted

Sample Condition(s)

All samples intact

Positive Results (Organic Compounds)

None

The data and information on this, and other accompanying documents, represent only the sample(s) analyzed and is rendered upon condition that it is not to be reproduced, wholly or in part, for advertising or other purposes without approval from the laboratory.

A & R Laboratories, Inc.

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ONTARIO, CA 91761
909-781-6335
www.arlaboratories.com office@arlaboratories.com

CHEMISTRY · MICROBIOLOGY · FOOD SAFETY · MOBILE LABORATORIES
FOOD · COSMETICS · WATER · SOIL · SOIL VAPOR · WASTES

CERTIFICATE OF ANALYSIS

2308-00087

SOILS SOUTHWEST INC
MOLOY GUPTA
897 VIA LATA SUITE N
COLTON, CA 92324

Date Reported	08/14/23
Date Received	08/10/23
Invoice No.	98958
Cust #	S192
Permit Number	
Customer P.O.	

Project: 23044-F / THE CONCO CO.

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 **B-1@5 ft.** Sample Matrix: **Soil**					Date & Time Sampled:		07/28/23 @	8:00
pH@25C-as Dissolved in Wtr	**8.39**		units	EPA 9040 B	1.0	0	08/10/23	DV
Resistivity	**4950**		ohms/cm	SM 2510B	1.0	1.0	08/10/23	DV
Chloride	**23**		mg/Kg	EPA 300.0 (1993 Rev 2.:	1.0	5.0	08/10/23	TLB
Sulfate	**40**		mg/Kg	EPA 300.0 (1993 Rev 2.:	1.0	5.0	08/10/23	TLB

Respectfully Submitted: Ken Zheng

Ken Zheng - Lab Director

QUALIFIERS

B = Detected in the associated Method Blank at a concentration above the routine RL.
B1 = BOD dilution water is over specifications . The reported result may be biased high.
D = Surrogate recoveries are not calculated due to sample dilution.
E = Estimated value; Value exceeds calibration level of instrument.
H = Analyte was prepared and/or analyzed outside of the analytical method holding time
I = Matrix Interference.
J = Analyte concentration detected between RL and MDL.
Q = One or more quality control criteria did not meet specifications. See Comments for further explanation.
S = Customer provided specification limit exceeded.

ABBREVIATIONS

DF = Dilution Factor
RL = Reporting Limit, Adjusted by DF
MDL = Method Detection Limit, Adjusted by DF
Qual = Qualifier
Tech = Technician

The data and information on this, and other accompanying documents, represent only the sample(s) analyzed and is rendered upon condition that it is not to be reproduced, wholly or in part, for advertising or other purposes without approval from the laboratory.
USDA-EPA-NIOSH Testing Food Sanitation Consulting Chemical and Microbiological Analyses and Research

ARL

A & R Laboratories
1650 S. Grove Ave., Ste C, Ontario, CA 91761
Tel: 951-779-0310 / 909-781-6335 Fax: 951-779-0344
E-mail: office@arlaboratories.com

CHAIN OF CUSTODY

A & R Work Order #: 2308-87

Page 1 of 1

Client Name: Soils Southwest, Inc.
E-mail: soilssouthwest@aol.com
Address: 897 Vig Lata, # N, Colton
Report Attention: Moloy G. | Phone # 909-370-0474 Fax: # | Sampled By: John Flippin
Project No./ Name: The Conco Co. 2504-F | Project Site: 13052 Dahlia St. Fontana, CA

☒ Chilled ☒ Intact ☐ Seal

Turn Around Time Requested: ☐ Rush 8 12 24 48 Hours ☒ Normal

Lab # (Lab use)	Client Sample ID	Sample Collection Date	Sample Collection Time	Matrix Type	Sample Preserve	No., type* & size of container	EPA8260B (VOCs & Oxygenates)	EPA8260B(BTEX & Oxygenates)	8260B / 8015 (Gasoline)	8015 (Diesel)	EPA8081A (Organochlorine Pesticides)	EPA 8082 (PCBs)	EPA 8015M (Carbon Chain C4-C40)	EPA 6010B/7000 (CAM 17 Metals)	Micro: Plate Cnt., Coliform, E-Coli	Resistivity	pH	Chloride	Sulfate			Remarks
1	B-1 @ 5ft	7/27/23	8:00 AM	Soil	Jar	4 ounce										✓	✓	✓	✓			

Relinquished By	Company	Date	Time	Received By	Company	Date	Time
[signature]	SSW	8/10/23	11:35	[signature]		8/10/23	11:35
Relinquished By	Company	Date	Time	Received By	Company	Date	Time

Note: Samples are discarded 30 days after results are reported unless other arrangements are made.

Matrix Code: DW=Drinking Water; GW=Ground Water; WW=Waste Water; SD=Solid Waste; SL=Sludge; SS=Soil/Sediment; AR=Air; PP=Pure Product

Preservative Code: IC=Ice; HC=HCl; HN=HNO_3; SH=NaOH; ST=$Na_2S_2O_3$; HS=H_2SO_4

* Sample Container Types: T=Tedlar Air Bag; G=Glass Container; ST= Steel Tube; B= Brass Tube; P=Plastic Bottle; V=VOA Vial; E= EnCore

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

SOILS SOUTHWEST, INC.
897 VIA LATA # N
COLTON, CA. 92324

DATE: 8/17/2023

P.O. NO.: Verbal

LAB NO.: C-7253

SPECIFICATION: CA 301

MATERIAL: Brown, Silty Sand w. trace Gravel

Project No.: 23044-F
Project: The Conco Co./Ratekin
13052 Dahlia Street, Fontana
Sample ID: B-1 @ 0-5'
Sample Date: 7/28/2023

ANALYTICAL REPORT
"R" VALUE

BY EXUDATION	BY EXPANSION
75	N/A

RESPECTFULLY SUBMITTED

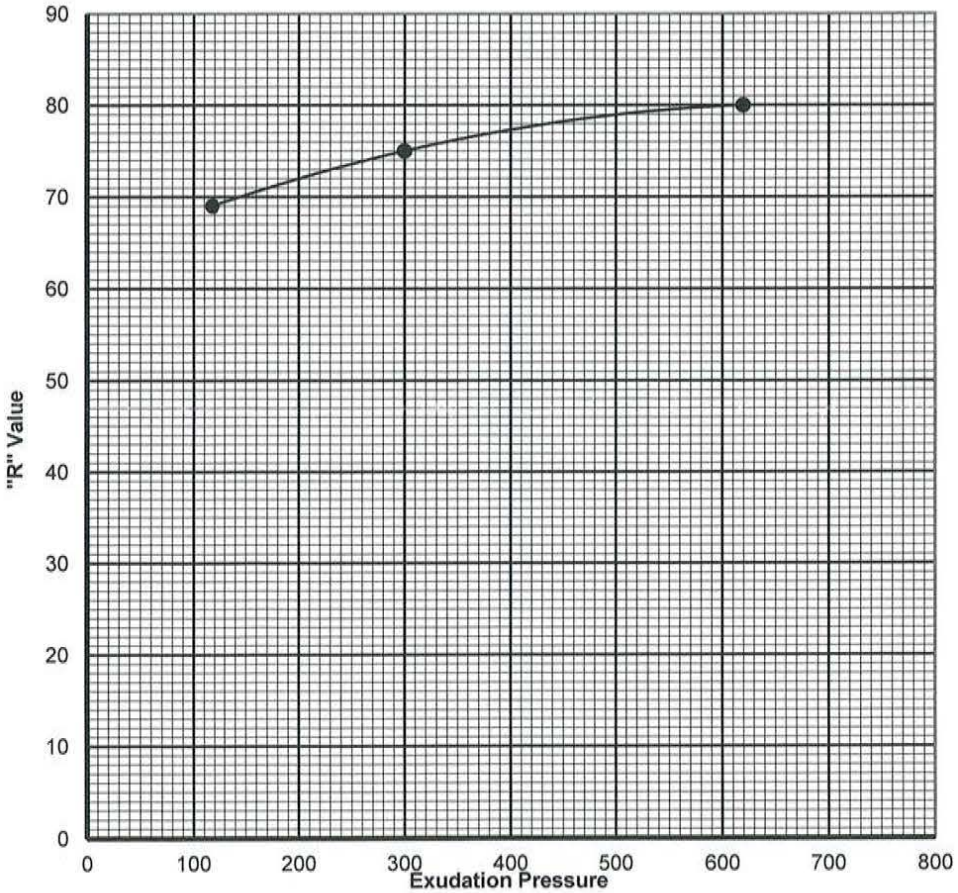
WES BRIDGER LAB MANAGER

"R" VALUE CA 301

Client: Soils Southwest, Inc. **ATL No.:** C 7253 **Date:** 8/17/2023
Client Reference No.: 23044-F
Sample: B-1 @ 0-5' **Soil Type:** Brown, Silty Sand w. trace Gravel

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	350	350	350	
Initial Moisture Content	%	4.8	4.8	4.8	
Moisture at Compaction	%	10.9	10.0	9.6	
Briquette Height	in.	2.53	2.49	2.47	
Dry Density	pcf	121.2	122.3	123.8	
EXUDATION PRESSURE	psi	118	300	619	
EXPANSION PRESSURE	psf	0	13	26	
Ph at 1000 pounds	psi	19	17	14	
Ph at 2000 pounds	psi	34	27	23	
Displacement	turns	4.24	4.04	3.77	
"R" Value		69	75	80	
CORRECTED "R" VALUE		69	75	80	

Final "R" Value	
BY EXUDATION: @ 300 psi	**75**
BY EXPANSION: TI = 5.0	**N/A**

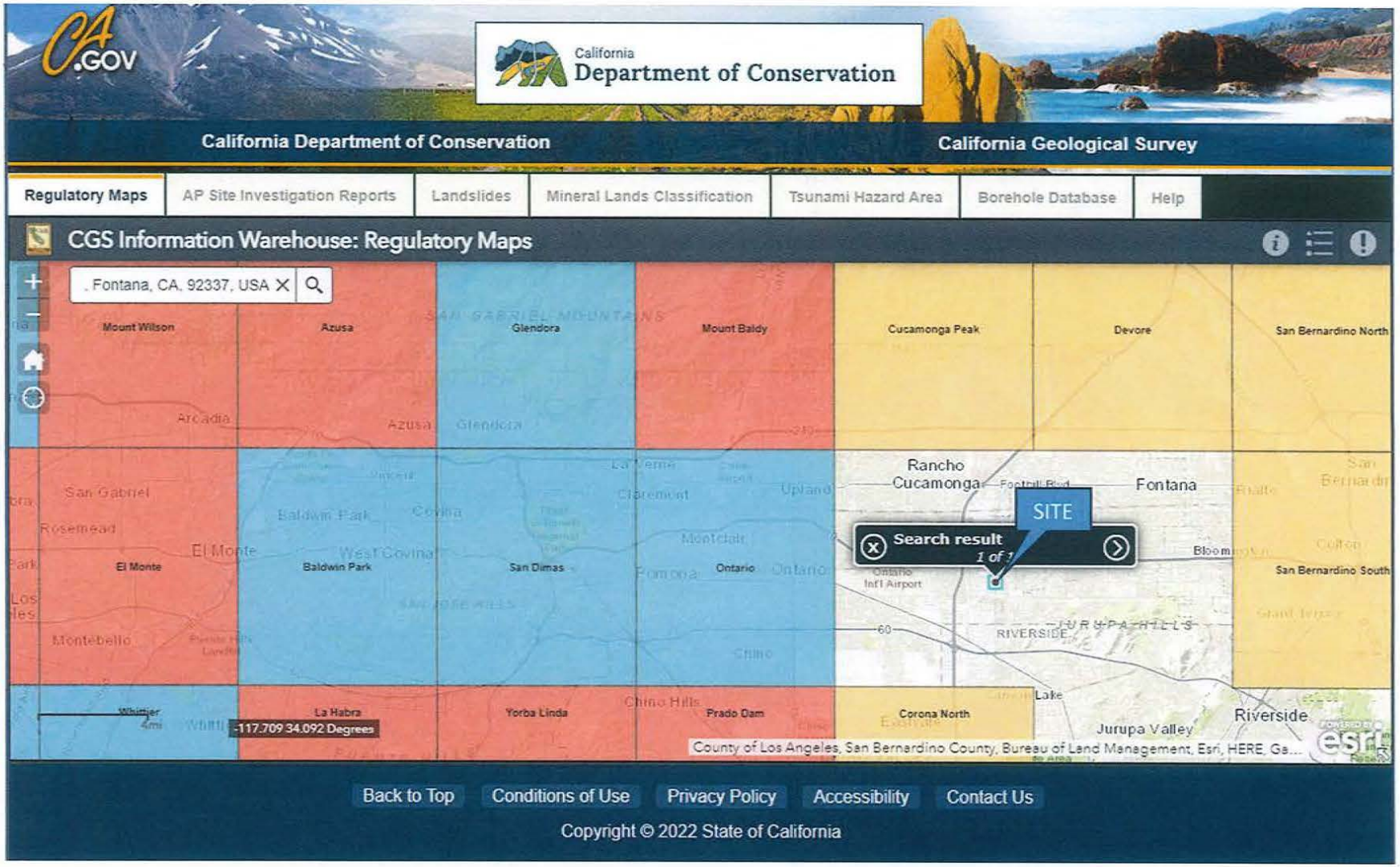


APPENDIX C

Supplemental Seismic Design Parameters

&

FEMA National Flood Hazard Layer Map



Based on review CGS and USGS data, the project site is recording being approximately 7.86 miles from the nearest (Cucamonga) fault along with not being within a colored mapped area with recorded fault information as shown above.

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Miles	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)	Length (km)
7.86	Cucamonga	CA	5	45	N	thrust	0	8	28
10.60	San Jose	CA	0.5	74	NW	strike slip	0	15	20
11.07	San Jacinto;SBV	CA	6	90	V	strike slip	0	16	45
11.07	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17	181
11.07	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16	181
11.07	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	215
11.07	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	241
11.07	San Jacinto;SBV+SJV	CA	n/a	90	V	strike slip	0	16	88
11.07	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16	134
12.08	Chino, alt 2	CA	1	65	SW	strike slip	0	14	29
12.18	Chino, alt 1	CA	1	50	SW	strike slip	0	9	24
13.50	Sierra Madre	CA	2	53	N	reverse	0	14	57
13.50	Sierra Madre Connected	CA	2	51		reverse	0	14	76
14.43	S. San Andreas;NM+SM+NSB+SSB+BG+CO	CA	n/a	84		strike slip	0.1	13	340
14.43	S. San Andreas;NSB	CA	22	90	V	strike slip	0	13	35
14.43	S. San Andreas;NSB+SSB	CA	n/a	90	V	strike slip	0	13	79
14.43	S. San Andreas;NSB+SSB+BG	CA	n/a	75		strike slip	0	14	136

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Fault Name	State
Cucamonga	**California**

GEOMETRY	
Dip (degrees)	45
Dip direction	N
Sense of slip	thrust
Rupture top (km)	0
Rupture bottom (km)	8
Rake (degrees)	90
Length (km)	28

MODEL VALUES		
Slip Rate	5	
Probability of activity	1	
	ELLSWORTH	HANKS
Minimum magnitude	6.5	6.5
Maximum magnitude	6.70	6.50
b-value	0.8	0.8

Fault Model	Deformation Model	Char Rate[1]	GR-a-value[1]	Weight
Stitched	2.1	3.31e-03 / 6.61e-03	2.648 / NA	0.50
UnStitched	2.1	3.31e-03 / 6.61e-03	2.648 / NA	0.50
Stitched	2.4	3.31e-03 / 6.61e-03	2.648 / NA	0.50
UnStitched	2.4	3.31e-03 / 6.61e-03	2.648 / NA	0.50

[1] 1st Value is based on Ellsworth relation and 2nd value is based on Hanks and Bakun relation

Comments

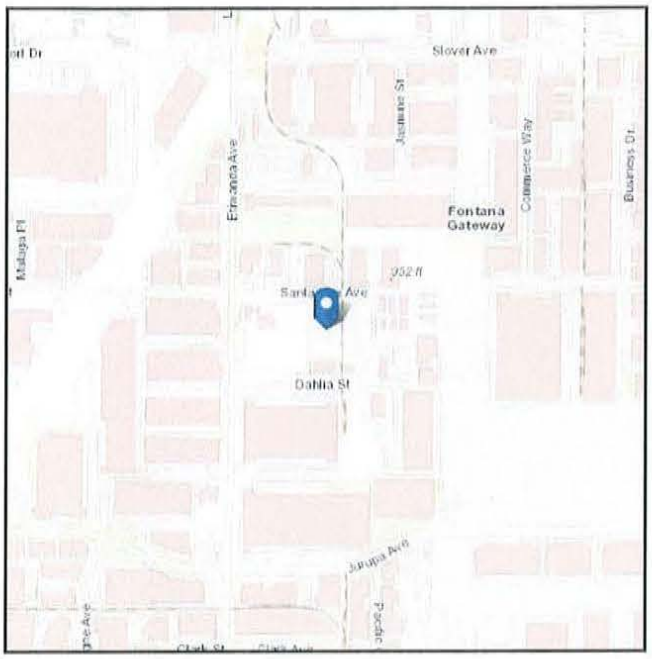
Slip rate based on cumulative vertical displacement across three strands reported by Morton and Matti (1987, 1991).

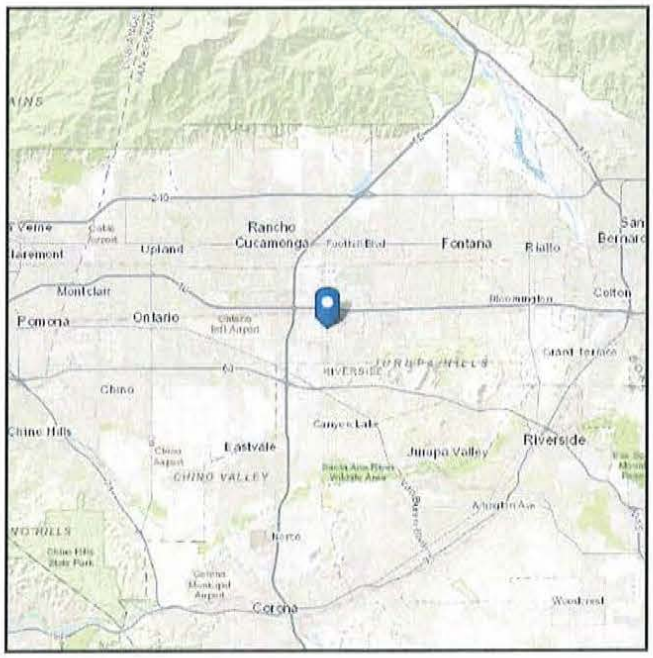
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: III
Soil Class: D - Stiff Soil

Latitude: 34.054175
Longitude: -117.520585
Elevation: 942.7715212710499 ft (NAVD 88)





ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.686	S_{D1} :	N/A
S_1 :	0.622	T_L :	12
F_a :	1	PGA :	0.713
F_v :	N/A	PGA_M :	0.784
S_{MS} :	1.686	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1.25
S_{DS} :	1.124	C_v :	1.437

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

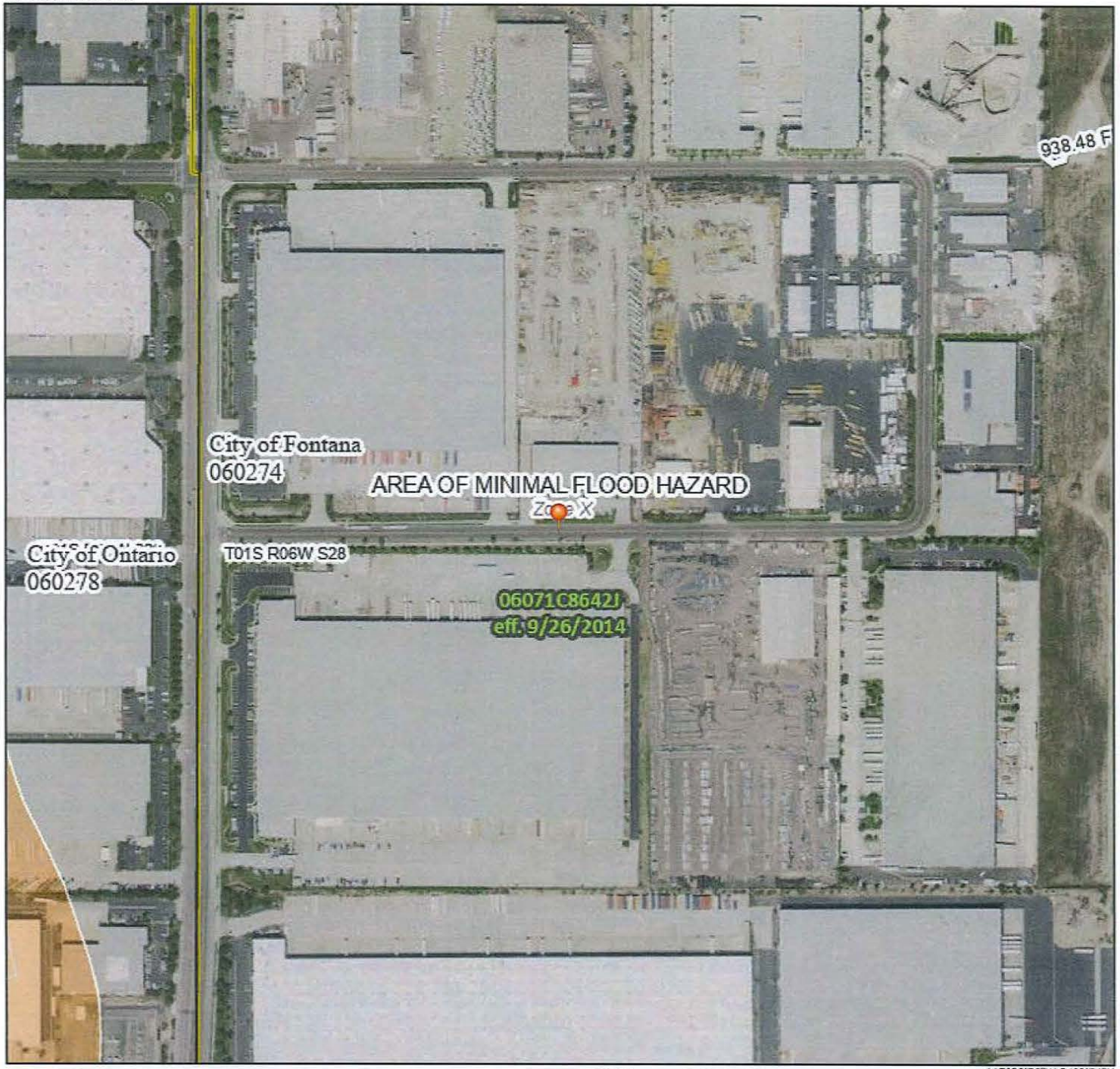
Data Accessed: Tue Jul 11 2023

Date Source: USGS Seismic Design Maps

National Flood Hazard Layer FIRMette

FEMA

117°31'33"W 34°3'24"N



Feet

0 250 500 1,000 1,500 2,000

1:6,000

117°30'56"W 34°2'54"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zon*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximat point selected by the user and does not represe an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/11/2023 at 6:49 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX D

Field Infiltration Test Data
Porchet Method Calculation Summary

Conversion Table (Porchet Method)
Conco Companies
13052 Dahlia Street, Fontana
Project No. 23044-BMP

Test N no.	Test Hole Depth (inches) D_T	Time Interval Δ_T	Initial Depth (inches) D_O (in)	Final Depth (inches) D_f (in)	Initial Water Height (inches $H_O=D_T-D_O$	Final Water Height (inches) $H_f = D_T-D_f$	Change Height/Time $\Delta H / \Delta D = H_O-H_f$	Average Head Height/Time H_{avg} = $(H_O+H_f)/2$
P-1	120	10	96	116.5	24	3.5	20.5	13.75
P-2	120	10	96	116	24	4	20	14

	Observed Infiltration Rate (It) = ΔH60r/Δt (r+2Havg)		
	A	B	C
	ΔH60r	Δt (r+2H_{avg})	A/B= inc/hr
P-1	4920	315	**15.62**
P-2	4800	320	**15.00**

Legend

Δ H /ΔD = Observed Field Rate

H_O = inches of water filled from bottom

D_O = initial height of water (inches) from bottom

D_f = final heigh of water (inches) from bottom

Columns A-B-C : Porchet Conversion Calculations

Column C: Observed Rate following Porchet Conversion

D_t = depth of test hole bottom (inches)

Project: THE CONTO CO 1902 DAHLIA FONTANA			Project No. 23044-BMP
Test Hole No:	P-1	Tested By: JF/RM	Date: 7-28-23
Depth of Test Hole, D_T	120	USCS Soil Classification SP-SM	
Test Hole Dimensions (inches)		Length	Width
Diameter (if round)=	8.0 in.	Sides (if rectangular)=	

Sandy Soil Criteria Test *

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Greater Than or Equal to 6.0 inches??? (Y/N)
1	10:07	10:32	25	96	120	24	Y
2	10:33	10:58	25	96	120	24	Y

* If two consective measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fiill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25."

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	ΔT/ΔD Percolation Rate (min./in.)
1	11:00	11:10	10	96	119.25	23.25	0.43
2	11:11	11:21	10	96	119.00	23.00	0.43
3	11:22	11:32	10	96	118.50	22.50	0.44
4	11:33	11:43	10	96	118.50	22.50	0.44
5	11:44	11:54	10	96	117.75	21.75	0.46
6	11:55	12:05	10	96	117.25	21.25	0.47
7	12:06	12:16	10	96	116.50	20.50	0.49
8	12:17	12:27	10	96	116.50	20.50	0.49
9	12:27	12:37	10	96	116.50	20.50	0.49
10							
11							
12							
13							
14							
15							
16							
17							
18							

Comments

Project: THE CONTO CO. [illegible] FONTANA				Project No. 23044-BMP	
Test Hole No:	P-2		Tested By: JF/RM		Date: 7-28-23
Depth of Test Hole, D_T	120		USCS Soil Classification GP-SP		
Test Hole Dimensions (inches)				Length	Width
Diameter (if round)=	8.0 in.	Sides (if rectangular)=			

Sandy Soil Criteria Test *

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Greater Than or Equal to 6.0 inches??? (Y/N)
1	10:09	10:34	25	96	116	24	Y
2	10:35	11:00	25	96	116	24	Y

* If two consective measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fiill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25."

Trial No.	Start Time	Stop Time	Δt Time Interval (min)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	ΔT/ΔD Percolation Rate (min./in.)
1	11:02	11:12	10	96	117.0	21.00	0.48
2	11:13	11:23	10	96	117.0	21.00	0.48
3	11:24	11:34	10	96	117.0	21.00	0.48
4	11:35	11:45	10	96	117.0	21.00	0.48
5	11:46	11:56	10	96	116.25	20.25	0.49
6	11:56	12:06	10	96	116.0	20.0	0.50
7	12:06	12:16	10	96	116.0	20.0	0.50
8	12:16	12:26	10	96	116.0	20.0	0.50
9	12:26	12:36	10	96	116.0	20.0	0.50
10							
11							
12							
13							
14							
15							
16							
17							
18							

Comments

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	15.62	15.00	
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*			
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*			
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*			
8 Infiltrating surface area, *SA_{BMP}* (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*			
9 Amended soil depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity			
11 Gravel depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*			
12 Gravel porosity			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*			
16 Total Retention Volume from LID Infiltration BMPs: *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: % *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☐ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

PROFESSIONAL LIMITATIONS

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances by other reputable geotechnical engineers practicing in these general or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The investigations are based on soil samples only, consequently the recommendations provided shall be considered 'preliminary'. The samples taken and used for testing and the observations made are believed representative of site conditions; however, soil and geologic conditions can vary significantly between boring. As in most major projects, conditions revealed by excavations may vary with preliminary findings. If this occurs, the changed conditions must be evaluated by the project geotechnical engineer and designs adjusted as required or alternate design recommended.

The report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the project architect and engineers. Appropriate recommendations should be incorporated into structural plans. The necessary steps should be taken to see that out such recommendations in field.

The findings of this report are valid as of this present date. However, changes in the conditions of a property can occur with the passage of time, whether they due to natural process or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur from legislation or broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside of our control. Therefore, this report is subject to review and should be updated after a period of one year.

RECOMMENDED SERVICES

The review of grading plans and specifications, field observations and testing by a geotechnical representative of this office is an integral part of the conclusions and recommendations made in this report. If Soils Southwest, Inc. (SSW) is not retained for these services, the Client agrees to assume SSW's responsibility for any potential claims that may arise during and after construction or during the lifetime use of the structure and its appurtenant.

The recommendations supplied should be considered valid and applicable, provided the following conditions, at a minimum, are met:

i. Pre-grade meeting with the contractor, public agency, and the geotechnical engineer,
ii. Excavated bottom inspections and verifications by the greotechnical engineer prior to backfill placement,
iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Subgrade verifications including plumbing trench backfills prior to concrete slab-on-grade placement,
vi. On and off-site utility trench backfill testing and verifications,
vii. Precise-grading plan review, and
viii. Consultations as required during construction or upon request.

In the event that the above conditions are not strictly fulfilled, Soils Southwest, Inc. will assume no responsibility for any structural distresses during the lifetime use of the development planned.