SOIL
EXPLORATION
COMPANY, INC.

Soil Engineering, Environmental Engineering, Materials Testing, Geology

July 5, 2021

Project No. 21146-01

TO: Roger Hobbs
1428 E. Chapman Ave.
Orange, CA 92866

SUBJECT: Soil Investigation, Infiltration Tests and Liquefaction Evaluation Report, Proposed Residential Development Site (32 Lots), Riverview Drive (19.42 Acres/APN 186-160-021), City of Jurupa Valley, California

Introduction

In accordance with your authorization, Soil Exploration Co., Inc. has performed a soil investigation, infiltration tests and liquefaction evaluation for the subject site. The accompanying report presents a summary of our findings, conclusions, recommendations, and limitations of our work for proposed 32 lots, one-story wood frame residential development.

Scope of Work

- Review soils, geologic, seismic, groundwater data and maps in our files.
- Perform exploration of the site by means of five 8" diameter borings, 15 to 50 feet deep, at readily accessible locations.
- Field engineer (California Registered RCE) for logging of the excavations, sampling of select soils, observation of excavation resistance, record SPT blow counts and water seepage (if any).
- Perform basic laboratory testing of select soil samples, including moisture, density, expansion potential, sieve analysis, and corrosion potential (pH, chlorides, resistivity and water soluble sulfates).
- Perform digitized search of known faults within a 50-mile radius of the site.
- Determine CBC (2019) seismic parameters.
- Consult with civil/structural design consultants.
- Perform two shallow infiltration tests at locations suggested by civil design engineer for WQMP design purposes.
- Prepare a report of our findings, conclusions and recommendations for site preparation, including overexcavation/removal depth, allowable bearing value, foundation/slab-on-grade depth /thickness /reinforcement recommendations, excavation characteristics of earth materials, lateral earth pressures for retaining walls design, pavement thickness estimates, suitability of onsite soils for compacted fills, liquefaction/dynamic settlement evaluation, general earthwork and grading specifications, California Building Code (2019) seismic design coefficients, Cal/OSHA classification of soils and infiltration rate (inches/hour).

Site Conditions

The 19.42 acres, vacant, relatively flat site is located on the west side of Riverview Drive, south of Maverick Lane, in the City of Jurupa Valley, Riverside County, California. Riverview Drive is a paved road. Elevations at the site range from approximately 780 to 924 feet above mean sea level (msl), for a difference of about 144± feet across the entire site. Drainage within the subject property generally flows to the southeast at an average gradient of 8 percent. A chain link fence borders around the site. Existing

houses are located on adjacent property to the north, south and west. Vegetation consists of dense dry weeds.

The approximate locations of the above and other features are shown on Exploratory Boring and Infiltration Test Location Map, Plate 1. The base map is Tentative Tract Map No. 38171, prepared by Robert Beers of Jurupa Valley, California.

Proposed Development

We understand that the site is proposed for a single family, 32 lot residential development and associated improvements. The structures will be light, one-story wood frame construction with concrete floor slabs supported on prepared subgrade. Based on the Tentative Tract Map No. 38171, modest cut or fill grading and no significant cut or fill slopes are proposed.

Field Work

Five exploratory borings were drilled on June 23, 2021, to a maximum depth of 50 feet below existing ground surface utilizing a B-53 mobile drill rig equipped with 8-inch diameter hollow stem augers. Refer to Plate 1 for boring locations. The borings were logged by a California Registered Civil Engineer. Standard Penetration Tests (SPT) blow counts were recorded for the earth materials. Relatively undisturbed samples of the soils were also obtained by utilizing California Ring Sampler.

In general, these borings revealed that the site alluvial soils consist of medium dense to very dense silty sand (USCS “SM”) underlain with very dense Quartz Diorite (tonalite) bedrock at depths of 2 to 16 feet. Detailed descriptions of the earth materials encountered are presented in the form of Geotechnical Boring Logs in Appendix B.

USGS Geologic Map of the Riverside West Quadrangle shows the site area is underlain with old alluvial-fan deposits and young eolian deposits (see Figure 2).

Laboratory Testing

Basic laboratory tests were performed for select soil samples. The tests consisted primarily of natural moisture contents, dry densities, sieve analysis, and corrosion potential (pH, chlorides, resistivity and water soluble sulfates). Laboratory test results are presented in Appendix C and with Geotechnical Boring Logs in Appendix B.

Groundwater

Groundwater, seepage or wet soils were not encountered in our exploratory borings, drilled to a maximum depth of 50 feet, at the time this work was performed. Based on referenced Carson and Matti map, groundwater in the vicinity of the site is 30± feet below ground surface. Groundwater data from well in the vicinity of the site is tabulated below (see Figure 1, Site Location Map, for location of well):

Well No.	WSE* (ft)	Date Measured	Distance/Location Relative to Site	Depth of Water (ft)
02S05W17K001S	746.94	10/31/2011	0.8miles/NE	67.18
	743.67	4/17/2019		70.45

* WSE = Water Surface Elevation

Liquefaction Evaluation

The term liquefaction describes a phenomenon in which saturated, cohesionless or low-plasticity soils temporarily lose shear strength (liquefy) due to increased pore water pressures induced by strong, cyclic ground motions during an earthquake. Structures founded on or above potentially liquefiable soils may experience bearing capacity failures due to the temporary loss of foundation support, vertical settlements

(both total and differential), and/or undergo lateral spreading. The factors known to influence liquefaction potential include soil type, relative density, grain size, confining pressure, depth to groundwater (i.e., less than 50 feet bgs), and the intensity and duration of the seismic ground shaking. Liquefaction is most prevalent in loose to medium dense, silty, sandy, and gravelly soils below the groundwater table.

Based on Riverside County GIS map and Riverside County Liquefaction map, the site is located within an area of high liquefaction potential (see Figures 3).

Liquefaction Analysis/Dynamic Settlement: LiquefyPro

Liquefaction susceptibility using Standard Penetration Test data and laboratory Gain size test results were analyzed using LiquefyPro software (Version 5.5g). A predominant earthquake magnitude of 6.75 (USGS Interactive Deaggregation, 10% probability of exceedance in 50 years) was used. An associated ground acceleration of 0.367g (equivalent to two-thirds of PGAM), and a historic high depth to groundwater of 30 feet below the existing ground surface were used in our liquefaction evaluation. The software output is presented in Appendix G.

The main observations of the results are as follows:

Boring No.	Total settlement (inch)	Differential Settlement (inch)
B-3	0.03	0.013 to 0.017

- Onsite soils at the site in general have a Safety Factor of 5.0 against liquefaction.

Seismicity/Faulting

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone or County of Riverside Fault zone.

A computer search of all known Quarternary major faults within 50 miles of the site from USGS Earthquake Hazards Program is presented in Appendix D. Please note that it is probable that not all active or potentially active faults in the region have been identified. Furthermore, seismic potential of the smaller and less notable faults is not sufficiently developed for assignment of maximum magnitudes and associated levels of ground shaking that might occur at the site due to these faults.

Conclusions and Recommendations

Conclusions

- All vegetable matter, old fills, buried utilities/irrigation lines, etc. and deleterious materials would require removal from the proposed building/grading areas.

- Overexcavation and recompaction of the surficial soils (4 feet deep) should be anticipated to provide adequate and uniform support for the proposed structures. All surficial earth materials encountered during our investigation can be excavated with normal grading equipment in good working condition.

- Onsite earth materials, cleansed of oversize cobbles and boulders (over 6 inches, if any), should be suitable for engineered/compacted fills.

- Based on observation and soil classification, the expansion potential of onsite near surface silty sands is expected to be very low (EI<20).

- Subsequent to site preparation, the use of shallow spread and/or continuous footing foundations appears feasible for the proposed construction.

- Flooding potential of the site should be determined by the design civil engineer and considered in planning and construction.

- Site is located approximately 9.74 miles from the San Jacinto fault. The site is located in a region of generally high seismicity, as is all of Southern California. During its design life, the site is expected to experience moderate to strong ground motions from earthquakes on regional and/or nearby causative faults.

- There is a 2 percent probability in 50 years (2475 year return period) that site modified peak ground acceleration at the site (PGA_m) will exceed 0.55g (see Appendix D).

- Groundwater was not encountered during subsurface investigation. Our experience indicates that surface or near-surface groundwater conditions can develop in areas where groundwater conditions did not exist prior to site development, especially in areas where a substantial increase in surface water infiltration results from landscape irrigation.

Recommendations

Site Preparation/Overexcavation

Grading and backfills should be performed in accordance with the City of Jurupa Valley Grading Ordinance and attached General Earthwork and Grading Specifications (Appendix E), except as modified in the text of this report.

Structures should be provided with a compacted fill mat that extends to at least 5 feet beyond the structure lines in plan and to a depth of at least 4 feet below existing or proposed grade, whichever is deeper. The excavated bottom should be cleaned from roots, soft spots, wet spots, porous soils, old foundations, seepage pits and deleterious materials, etc. As a result, deeper excavations should not be precluded and this should be determined by observations and testing of excavated bottoms during grading.

After cleaning of the excavated bottom, the exposed surfaces should be further scarified to a depth of at least 6-inches, moisture conditioned/thoroughly watered and recompacted by utilizing heavy vibratory rollers to at least 90 percent of the maximum dry density, as determined by ASTM D1557-12 Test Method, prior to placement of fill. Oversize material (larger than 6-inch size, if any) should not be utilized for structural fills. All fills should be placed on underlying medium dense native soils and compacted to at least 90 percent of the maximum dry density.

Compacted Fills/Imported Soils

Any soil to be placed as fill, whether presently onsite or import, should be approved by the soil engineer or his representative prior to its placement. All onsite soils to be used as fill should be cleansed of any roots or other deleterious materials. Cobbles larger than 3 inches in diameter should not be placed in the vicinity of foundations and utility lines. All fills should be placed in 6 to 8 inch loose lifts, thoroughly watered, mixed and compacted to at least 90 percent relative compaction. This is relative to the maximum dry density determined by ASTM 1557-12 Test Method.

Foundation Design/Footings

Following site preparation, the use of shallow spread footings is feasible. An allowable bearing value of 1800 psf is recommended. This bearing pressure has been established based on the assumption that the footings will be embedded into compacted fill mat. Isolated column footings should be at least 18 inches wide and embedded at least 18 inches below lowest adjacent firm grade.

The above bearing value may be increased by one third for temporary (wind or seismic) loads. We recommend footings reinforcement should be at least two No. 4 bars at top and two at the bottom of

footings. Conventional foundation should be in accordance with current California Building Code (CBC) 2019, with design by a qualified structural engineer. Additional recommendations for conventional foundations of one and two-story residential structures are presented on Plate 2. Please note that foundation design is under the purview of the structural engineer and structural engineer may have more restrictive requirements which will govern.

Conventional Residential Slabs-On-Grade

Residential slabs-on-grade should be at least 4 inches thick and should be reinforced with at least No. 3 bars at 18-inches on-center both ways, properly centered in mid-thickness of slabs (structural recommendations govern). Slabs-on-grade should be underlain with 10-mil Visqueen moisture barrier. The moisture barrier should be underlain by two inches of clean rolled sand.

Tentative Pavement Design

Based on the granular nature of the onsite soils, we have assigned an R-value of 45. The recommended sections are outlined as follows:

Street Type	Traffic Index (TI)	Asphalt Concrete (inches)	Aggregate Base (CAB) (inches)
Interior Street	5.5 to 6	3	6

The upper at least 18 inches of the subgrade soils below new pavements should be compacted to at least 90 percent relative compaction. Minimum relative compaction requirements for aggregated base should be 95 percent of the maximum laboratory dry density as determined by ASTM D1557-12.

Final pavement design shall be based on R-value testing of the subgrade soils at the completion of grading.

Hardscape Areas/Compaction/Concrete Joints

The upper at least 12 inches of subgrade soils for hardscape areas should be scarified and compacted to at least 90 percent.

The joints spacing for concrete slabs should be determined by the project architect. Joints should be laid out to form approximately square panels (equal transverse and longitudinal joint spacing). Rectangular panels, with the long dimension no more than one-and-one-half times the short, may be used when square panels are not feasible. The depth of longitudinal and transverse joints should be one-fourth the depth of the slab thickness.

Joint layout should be adjusted so that the joints will line up with the corners of structures, small foundations, and other built-in structures. Acute angles or small pieces of slab curves as a result of joints layout should not be permitted.

Concrete Curing

Fresh concrete should be cured by protecting it against loss of moisture, rapid temperature change and mechanical injury for at least 3 days after placement. Moist curing, waterproof paper, white polyethylene sheeting, white liquid membrane compound, or a combination thereof may be used. After finishing operations have been completed, the entire surface of the newly place concrete should be covered by whatever curing medium is applicable to local conditions and approved by the engineer. The edges of concrete slabs exposed by the removal of forms should be protected immediately to provide these surfaces with continuous curing treatment equal to the method selected for curing the slab surfaces. The contractor should have at hand, and ready to install before actual placement begins, the equipment needed for adequate curing of the concrete.

In hot or windy weather (80°F or 15 mph), the contractor must take appropriate curing precautions after the placement of concrete. The use of mechanically compacted low slump concrete (not exceeding 4 inches at the time of placement) is recommended. We recommend that a slipsheet (or equivalent) be utilized if grouted tiles or other crack sensitive flooring is planned directly on concrete slabs.

Special Considerations/Excess Soils from Foundation Excavations

Excess soils generated from foundation excavations should not be placed on slabs and driveways subgrade without proper moisture and compaction. Slab subgrade should be verified to contain 1.2 times the soil optimum moisture content to a depth of 6 inches prior to placement of slab building materials. Moisture content should be tested in the field by the soil engineer. The addition of fiber mesh in the concrete and careful control of water/cement ratios may lessen the potential for slab cracking.

Lateral Earth Pressures/Retaining Walls

The following lateral earth pressures and soil parameters, in conjunction with the above-recommended bearing value (1800 psf), may be used for design of retaining walls with free draining compacted backfills. If passive earth pressure and friction are combined to provide required resistance to lateral forces, the value of the passive pressure should be reduced to two-thirds the following recommendations:

Active Earth Pressure with level backfill (P_a)	35 pcf (EFP), drained, yielding
At Rest Pressure (P_0)	55 pcf (EFP), drained, non-yielding (part of building wall)
Passive Earth Pressure (P_p)	250 pcf (EFP), drained, maximum of 2500 psf
Horizontal Coefficient of Friction (μ)	0.30
Unit Soil Weight (γ_t)	120 pcf

We recommend drainage for retaining walls to be provided in accordance with Plate 3 of this report. Maximum precautions should be taken when placing drainage materials and during backfilling. All wall backfills should be properly compacted to at least 90 percent relative compaction.

Seismic Considerations

The site is located approximately 9.74 miles from the San Jacinto fault. Moderate to strong ground shaking can be expected at the site and there is a 2 percent probability in 50 years (2475 year return period) that site modified peak ground acceleration at the site (PGA_m) will exceed 0.55g. The site soil profile is Class D. The structural engineer must consider City/County local codes, California Building Code (CBC) 2019 seismic data presented in this report (Appendix D), the latest requirements of the Structural Engineers Association, and any other pertinent data in selecting design parameters.

Expansion Index and Corrosion/Soluble Sulfates

Based on observation and soil classification, the expansion potential of the near surface sandy soils is anticipated to be very low (EI<20).

Results of tests performed by Enviro - Chem, Inc. of Pomona, California on a select soil samples are summarized as below:

Sample Location	Sample Depth (ft)	PH	Resistivity (ohm-cm)	Sulfate Content (%)	Chloride Content (ppm)
B-3	0-5.0	7.25	6850	0.00352	55.0

Based on test results, soil indicates negligible soluble sulfate exposure (less than 0.1 percent water soluble sulfates by weight). Therefore, there is no restriction on cement type. Based on resistivity test results, soil is moderately corrosive and ferrous metals/pipes/reinforcement should be protected. Concrete, mix, placement and curing for concrete should comply with ACI guidelines. If critical, these should be further verified by your structural or a corrosion engineer.

Drainage

Positive drainage must be provided and maintained for the life of the project around the perimeter of the structures and all foundations toward streets or approved drainage devices to minimize water infiltration into the underlying soils. In addition, finish subgrade adjacent to exterior footings should be sloped down and away to facilitate surface drainage. Roof drainage should be collected and directed away from foundations and slopes via nonerosive devices. Water, either natural or by irrigation, should not be permitted to pond or saturate the foundation soils.

Cal/OSHA Classification/Trench Excavations/Backfills

In general Cal/OSHA classification of onsite soils appears to be Type C.

Temporary trench excavations deeper than 5 feet should be shored or sloped at 1.5:1 in compliance with Cal/OSHA requirements:

a.) The shoring should be designed by a qualified engineer experienced in the shoring design.

b.) The tops of any temporary unshored excavations should be barricaded to prevent vehicle and storage loads. If the temporary construction embankments, including shored excavations, are to be maintained during the rainy season, berms are suggested along the tops of the excavations where necessary to prevent runoff from entering the excavation and eroding the slope faces.

c.) The soils exposed in the excavations should be inspected during excavation by the soils engineer so that modifications can be made if variations in the soil conditions occur.

d.) All unshored excavations should be stabilized within 30 days of initial excavation.

Foundation Plan Review/Additional Observations and/or Testing

The recommendations provided in this report are based on preliminary design information and subsurface conditions as interpreted from limited exploratory work. Our conclusions and recommendations should be reviewed and verified during construction and revised if necessary.

Soil Exploration Co., Inc. should review the foundation plans and observe and/or test at the following stages of construction:

- During all overexcavations and fill placement.
- Following footing excavations and prior to placement of footing materials.
- During wetting of slab subgrade (1.2X optimum to a depth of at least 6”) and prior to placement of slab materials.
- During all trench and retaining wall backfills.
- During subgrade preparation/compaction, prior to paving.
- When any unusual conditions are encountered.

Final Compaction Report

A final report of compaction control should be prepared subsequent to the completion of rough grading. The report should include a summary of work performed, laboratory test results, and the results, locations and elevations of field density tests performed during grading.

Limitation of Investigation

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

The field and laboratory test data are believed representative of the project site; however, soil conditions can vary significantly. As in most projects, conditions revealed during grading may be at variance with preliminary findings. If this condition occurs, the possible variations must be evaluated by the Project Geotechnical Engineer and adjusted as required or alternate design recommended.

This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractor carry out such recommendations in the field.

This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any of the recommended actions presented herein to be unsafe.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In additions, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge.

This report was prepared for the client based on client's needs, directions and requirements at the time. This report is not authorized for use by and is not to be relied upon by any party except the client with whom Soil Exploration Co., Inc. contracted for the work. Use of, or reliance on, this report by any other party is at that party's risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Soil Exploration Co., Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Soil Exploration Co., Inc.

Closure

If you should have any questions or concerns regarding this report, please do not hesitate to call our office. We appreciate this opportunity to be of service.

Very truly yours,
Soil Exploration Co., Inc.

Gene K. Luu, PE 53417
Project Engineer\

Distribution: [1] Addressee (rch@rchobbs.com)
[1] Robert Beers (rmbeers777@hotmail.com)

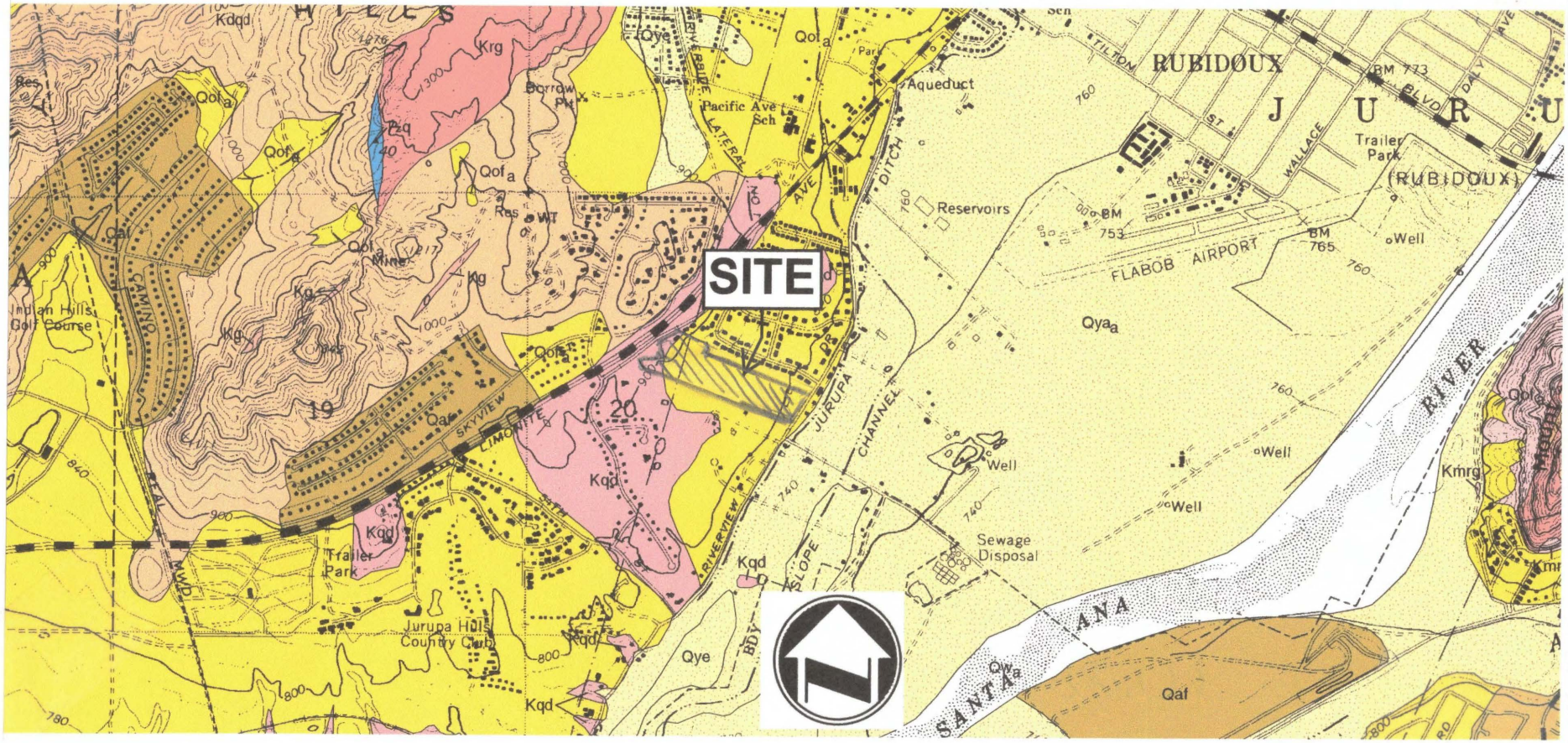
Attachments:

Figure 1	Site Location Map
Figure 2	USGS Geologic Map
Figure 3	Riverside County GIS Map
Figure 4	U.S. Geological Survey Quaternary Faults Map
Plate 1	Exploratory Boring and Infiltration Test Location Map
Plate 2	Minimum Foundation and Slab Recommendations for Expansive Soils
Plate 3	Retaining Wall Backfill and Subdrain Backfill

Appendix A	References
Appendix B	Geotechnical Boring Logs
Appendix C	Laboratory Test Results
Appendix D	USGS National Seismic Hazard Maps-Source Parameters and CBC (2019) Seismic Parameters
Appendix E	General Earthwork and Grading Specifications
Appendix F	Infiltration Test Procedures and Test Results
Appendix G	Liquefaction Analysis Summary

Site Location Map

Figure 1



Base Map: USGS Geologic Map of the Riverside West 7.5' Quadrangle, Riverside County, California.

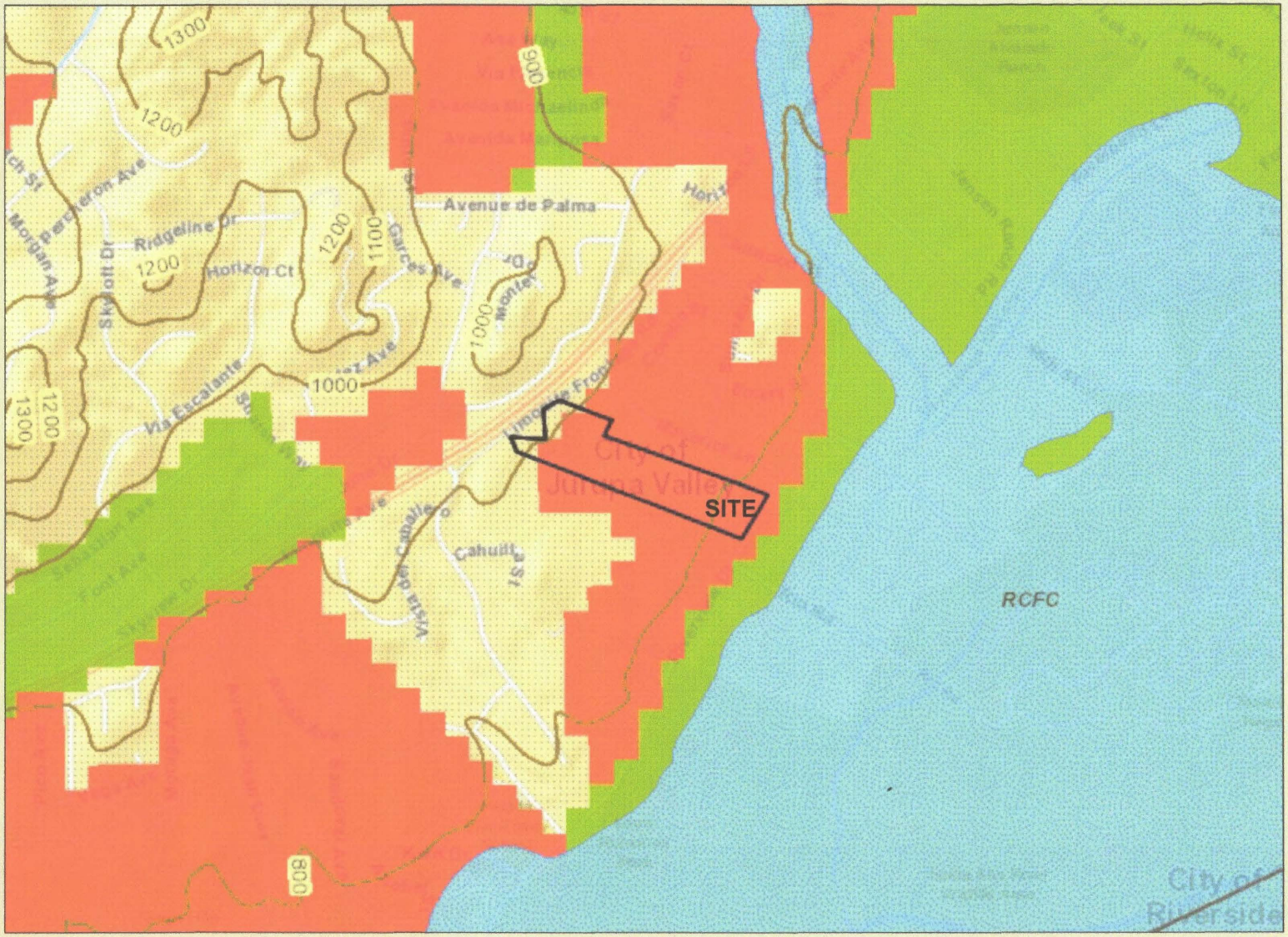
LEGEND:

Qofa: Old alluvial fan deposits (late to middle Pleistocene) – Indurated to slightly indurated, sandy, alluvial fan deposits.
a: arenaceous (very coarse sand through very fine sand)

Riverview Dr. **City of Jurupa Valley, California**	**Soil Exploration Co., Inc.** **Project No.: 21146-01** **Date: July 5, 2021** **Figure: 2**

Map My County Map

APN 186-160-021



Legend

- Contours100 ft interval (with 1(
- Faults
  - OTHER AUTHORITY
  - ALQUIST-PRIOLO
  - RIVERSIDE COUNTY
- Fault Zones
  - OTHER FAULT ZONE
  - COUNTY FAULT ZONE
  - ELSINORE FAULT ZONE
  - SAN ANDREAS FAULT ZONE
  - SAN JACINTO FAULT ZONE
- Flood
- Liquefaction
  - Other Susceptibility
  - High
  - Low
  - Moderate
  - Very High
  - Very low
- Blueline Streams
- City Areas
- World Street Map

RCIT

0 1,505 3,009 Feet

Notes

Figure 3

U.S. Geological Survey Quaternary Faults

6/22/2021, 9:28:37 PM

Fault Areas

- Class B
- historic
- late Quaternary
- latest Quaternary
- middle and late Quaternary

National Database

- Historic (< 150 years), well constrained location

0 5 10 20 mi

0 12.5 25 50 km

Figure 4

TENTATIVE TRACT MAP NO. 38171

CITY OF JURUPA VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

DEVELOPER

RC HOBBS COMPANIES, INC.
1428 E. CHAPMAN AVENUE
ORANGE, CA 92866
ATTN: ROGER HOBBS
714-633-8100

OWNERS

JAMES H. MARTINDALE AND LYNETTE ANN MARTINDALE, TRUSTEES OF THE JAMES H. MARTINDALE AND LYNETTE ANN MARTINDALE LIVING TRUST DATED NOVEMBER 23, 1998.

UTILITY PURVEYORS

WATER:	RUBIDOUX COMMUNITY SERVICES DISTRICT
SEWER:	RUBIDOUX COMMUNITY SERVICES DISTRICT
GAS:	SOUTHERN CALIFORNIA GAS COMPANY
ELECTRICITY:	SOUTHERN CALIFORNIA EDISON
TELEPHONE:	AT&T
SCHOOL:	JURUPA VALLEY UNIFIED SCHOOL DISTRICT
CATV:	SPECTRUM
SOLID WASTE:	BURRTEC

GENERAL PLAN/ZONING/LANDUSE

EXISTING GENERAL PLAN:	A-1
PROPOSED GENERAL PLAN:	TO BE DETERMINED
EXISTING ZONING:	ED(RR - RANCH
PROPOSED ZONING:	TO BE DETERMINED
EXISTING LANDUSE:	Vacant

PROJECT NOTES

TOTAL GROSS PROJECT SIZE: 843,542 sf (19.36± ACRES)
TOPOGRAPHY SOURCE: Aerial Topographic Mapping
NUMBER OF RESIDENTIAL LOTS: 32
MINIMUM LOT AREA: 20,000 S.F.
MINIMUM LOT DEPTH: 150'
MINIMUM LOT WIDTH: 100'
LOT SIZE: AS SHOWN ON MAP
DENSITY: 1.65 DU/ACRE

LEGEND

T.C.	TOP OF CURB
F.L.	FLOWLINE
F.S.	FINISHED SURFACE
P.E.	PAD ELEVATION
C.B.	CATCH BASIN
H.P.	HIGH POINT
(XX)	EXIST. LAND USAGE
[X]	EXIST. ZONING

LEGAL DESCRIPTION:

REAL PROPERTY IN THE CITY OF JURUPA VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCEL 2 AS SHOWN ON LOT LINE ADJUSTMENT NO. 4091, AS EVIDENCED BY A NOTICE OF LOT LINE ADJUSTMENT RECORDED JULY 8, 1999 AS INSTRUMENT NO. 1999-364308 OF OFFICIAL RECORDS.
BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THAT PORTION OF LOT 2 OF AMENDED MAP OF THE RIVERVIEW TRACT, AS SHOWN BY MAP ON FILE IN BOOK 4 OF MAPS AT PAGE 58 THEREOF, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE INTERSECTION OF THE SOUTHERLY LINE OF SAID LOT 2 WITH THE NORTHWESTERLY RIGHT-OF-WAY LINE OF RIVERVIEW DRIVE (FORMERLY COUNTY ROAD) AS SHOWN BY RECORD OF SURVEY ON FILE IN BOOK 5, PAGE 20 OF RECORDS OF SURVEY;

THENCE NORTH 69° 32' 00" WEST ALONG THE SOUTHWESTERLY LINE OF SAID LOT 2, A DISTANCE OF 1975.18 FEET TO A POINT WHICH LIES NORTH 69° 32' 00" WEST 525.60 FEET FROM THE NORTHWEST CORNER OF LOT A OF SAID RECORD OF SURVEY;

THENCE NORTH 09° 26' 39" WEST, A DISTANCE OF 124.67 FEET TO A POINT ON THE SOUTH LINE OF PARCEL MAP 12969, AS SHOWN BY MAP ON FILE IN BOOK 83 OF PARCEL MAPS AT PAGE 71 THEREOF, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA;

THENCE NORTH 89° 58' 00" EAST ALONG SAID SOUTH LINE, A DISTANCE OF 256.88 FEET TO THE SOUTHEAST CORNER OF SAID PARCEL MAP 12969;

THENCE NORTH 00° 32' 00" WEST ALONG THE EAST LINE OF SAID PARCEL MAP 12969, A DISTANCE OF 217.28 FEET TO THE MOST NORTHERLY CORNER THEREOF, SAID CORNER BEING ON THE SOUTHEASTERLY RIGHT-OF-WAY LINE OF LIMONITE AVENUE FRONTAGE ROAD, AS SHOWN ON SAID PARCEL MAP 12969, SAID CORNER ALSO BEING ON A CURVE, CONCAVE TO THE SOUTHEAST, HAVING A RADIUS OF 1576.00 FEET, THE RADIAL LINE FROM SAID POINT BEARS SOUTH 35° 43' 00" EAST;

THENCE NORTHEASTERLY ALONG SAID SOUTHEASTERLY RIGHT-OF-WAY LINE AND ALONG SAID CURVE, TO THE RIGHT, THROUGH A CENTRAL ANGLE OF 04° 26' 44", AN ARC DISTANCE OF 122.28 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 1640.00 FEET, THE RADIAL LINE FROM SAID CURVE HAVING A RADIUS OF 1576.00 FEET BEARS NORTH 31° 16' 16" WEST, THE RADIAL LINE FROM SAID CURVE HAVING A RADIUS OF 1640.00 FEET BEARS NORTH 15° 50' 00" WEST;

THENCE NORTHEASTERLY ALONG SAID LAST MENTIONED CURVE, TO THE LEFT, THROUGH A CENTRAL ANGLE OF 01° 20' 45", AN ARC DISTANCE OF 38.48 FEET, THE RADIAL LINE FROM SAID POINT BEARS NORTH 18° 29' 26" WEST;

THENCE SOUTH 69° 35' 00" EAST, A DISTANCE OF 464.30 FEET;

THENCE SOUTH 40° 03' 00" WEST, A DISTANCE OF 24.63 FEET;

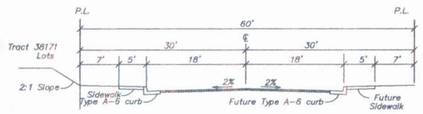
THENCE SOUTH 25° 32' 00" WEST, A DISTANCE OF 116.75 FEET;

THENCE SOUTH 70° 59' 20" EAST, A DISTANCE OF 1412.73 FEET TO A POINT ON SAID NORTHWESTERLY RIGHT-OF-WAY LINE OF RIVERVIEW DRIVE;

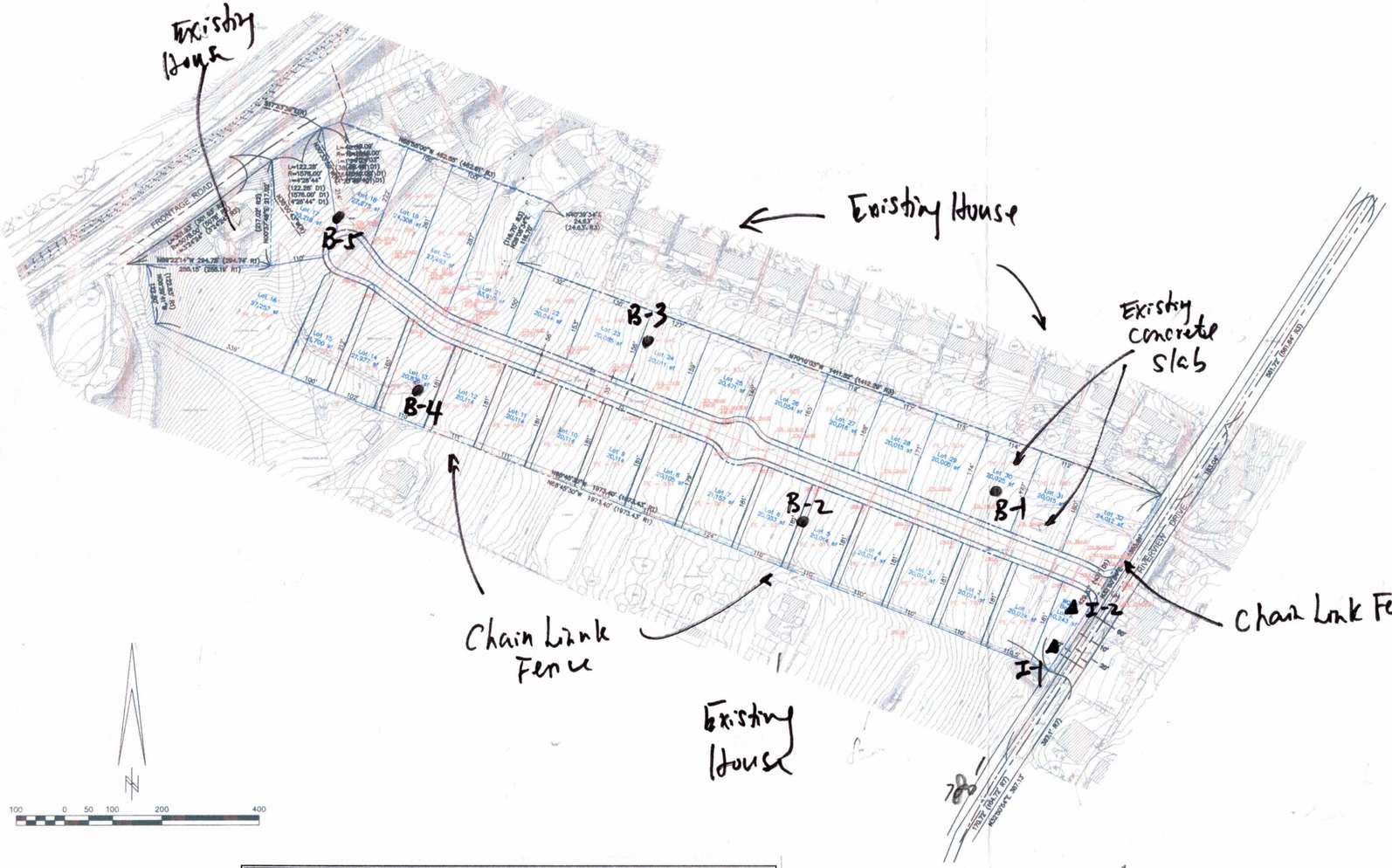
THENCE SOUTH 32° 06' 00" WEST ALONG THE NORTHWESTERLY RIGHT-OF-WAY LINE OF SAID RIVERVIEW DRIVE, A DISTANCE OF 431.00 FEET TO THE POINT OF BEGINNING.

APN: 186-160-021

TYPICAL SECTION
STREET "A"
N.T.S.



TYPICAL SECTION
RIVERVIEW DRIVE
N.T.S.



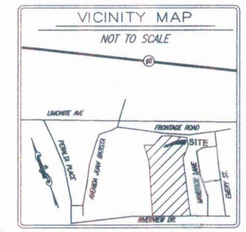
EXPLORATORY BORING & INFILTRATION TEST LOCATION MAP
PLATE 1

LEGEND

B-5 ● Approximate Location of Boring
I-2 ▲ Approximate Location of Infiltration Test

Soil Exploration Co., Inc.

Project No. 21146-01 | **July 5, 2021**



ROBERT BEERS
8175 Limonite Avenue, Suite E
Jurupa Valley, CA 92509
Ph. (951) 317-2041 Fax (909) 360-2070

Date Robert M. Beers R.C.E. 39405 Expires 12-31-21

FIELD BOOK REF.

MARK REVISIONS APPR. DATE

PREPARED FOR:
RC Hobbs Companies
1428 E. Chapman Avenue
Orange, CA 92866
PHONE: (714) 633-8100

TTM 38171
SADDLEHORN RANCH
City of Jurupa Valley
California

DATE May 12, 2021
JOB NO.
DRAWN BY R.A.H.
CHECKED BY R.M.B.
SHEET 1 OF 1

	EXPANSION INDEX (ASTM D 4829) 0-20 VERY LOW EXPANSION
1-Story Footings (See Note 1)	All footings at least 12" deep. Reinforcement for continuous footings: Two No. 4 bars top and two No. 4 bars at bottom
2-Story Footings (See Note 1)	All footings at least 18" deep. Reinforcement for continuous footings: Two No. 4 bars top and two No. 4 bars at bottom.
Minimum Footing Width	Continuous: 12" for 1-story Continuous: 15" for 2-story
Pad Footings	Isolated column: 18" wide and 18" deep, tied to continuous footings in two directions
Garage Door Grade Beam (See Note 2)	A grade beam 18" deep by 15" wide for 1-story and 2-story should be provided across the garage entrance and other large openings
Living Area Floor Slabs (See Notes 3, 4 and 5)	4" thick slab. No. 3 rebar at 18 inches on-center reinforcement at mid-height, 10-mil Visqueen moisture barrier above 2" sand base
Garage Floor Slabs* (See Notes 4 and 6)	4" thick slab. No. 3 rebar at 18 inches on-center with 2" sand base below a 10-mil Visqueen moisture barrier. Garage slabs should be quarter-sawn
Presoaking of Living Areas & Garage Slabs Subgrade**	(1.2) times optimum moisture to a depth of 6"

The Above Are Minimum Recommendations.
All Work Should Comply with Applicable/Governing Agency Codes and Requirements

* Based on California Green Code, a 4" thick base of ½ inch or larger clean aggregate shall be used below the Visqueen.
**Presoaking of living areas and garage slabs should be observed and tested by the project geotechnical engineer.

NOTES:
1. Depth of interior or exterior footings to be measured from lowest adjacent finish grade.
2. The base of the grade beam should be at the same elevation as that of the adjoining footings.
3. Living areas slabs may be tied to the footings as directed by the structural engineer.
4. We recommend the use of at least No. 3 bars at 18 inches on-center, each way, for all slabs.
5. 10-mil Visqueen sheeting welded at laps has proved successful. Equivalents are acceptable.
6. Garage slabs should be isolated from stem wall footings with a minimum 3/8" felt expansion joint.
7. Sand base should have a Sand Equivalent (SE) of 30 or greater (e.g., washed concrete sand).

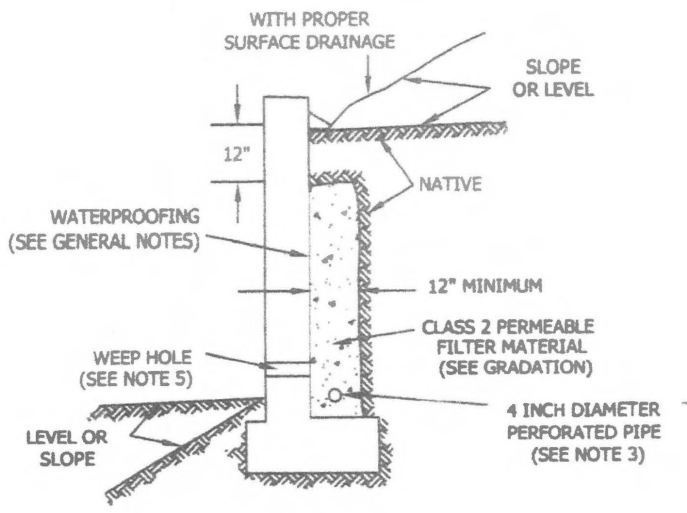
Post-Tensioned Slabs

As an alternative to conventional foundations, building may be supported on post-tensioned slabs, to be designed by a structure engineer in consultation with the geotechnical consultant. In addition, a post-tensioned slab is also recommended for VERY HIGH expansion potential (Expansion Index greater than 130), if encountered. Post-tensioned slabs should have perimeter footings embedded a minimum of 12 inches below the adjacent grade. The slabs should be designed such that they can be deformed approximately 1-inch vertically over a width of 30 feet without distress in the event of shrinkage or swelling of the supporting soils. Living area slabs should be underlain by a 10-mil Visqueen moisture barrier covered by a 2-inch layer of sand. Presoaking is recommended for post tensioned slabs: (1.2) x optimum to a depth of 12 inches, (1.3) x optimum to a depth of 18 inches, and (1.4) x optimum to a depth of 24 inches for LOW, MEDIUM, and HIGH expansion potential soils, respectively. LOW and MEDIUM expansive soil lots using conventional foundation should comply with 2019 CBC. For very high expansion potential (Expansion Index greater than 130), specific recommendations by the geotechnical consultant will be required. Placement of 4 inches of sand base is also suggested for post-tensioned slab systems. Unless stated in the attached report, for EI=21-50 use PI-25, and EI=51-90 use PI=35.

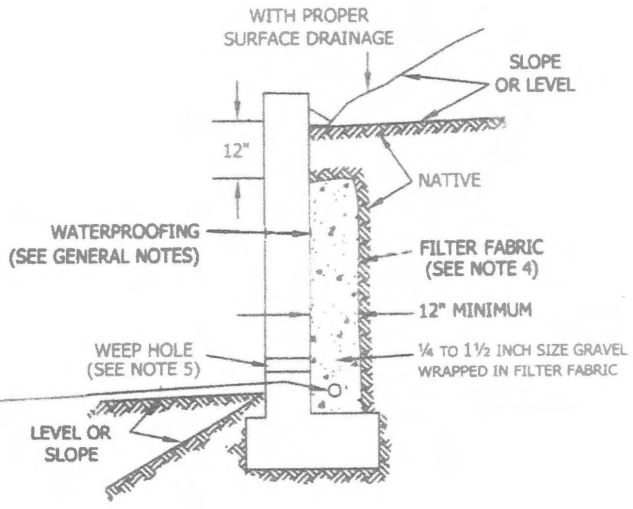
Minimum Foundation and Slab Recommendations For Expansive Soils **ONE- & TWO-STORY RESIDENTIAL BUILDINGS**	**Soil Exploration Co., Inc.** **Plate: 2**

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF <50

OPTION 1: PIPE SURROUNDED WITH CLASS 2 PERMEABLE MATERIAL



OPTION 2: GRAVEL WRAPPED IN FILTER FABRIC



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum
*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)
*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:

1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL

SOIL EXPLORATION COMPANY, INC.

Plate 3

APPENDIX A

REFERENCES

- USGS Geologic Map of the Riverside West 7.5' Quadrangle, Riverside County, California.
- Riverside County GIS Liquefaction Map.
- Department of the Interior, U.S. Geological Survey, Contour Map Showing Minimum Depth to Ground Water, Upper Santa Ana River Valley, California 1973-1979 (Sheet 2 of 2), By Scott E. Carson and Jonathan C. Matti, Dated 1985.
- U.S. Geological Survey – Earthquake Hazards Program, 2008 National Seismic Hazard Maps – Source Parameters.
- U.S. Geological Survey Quaternary Faults.

APPENDIX B

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures

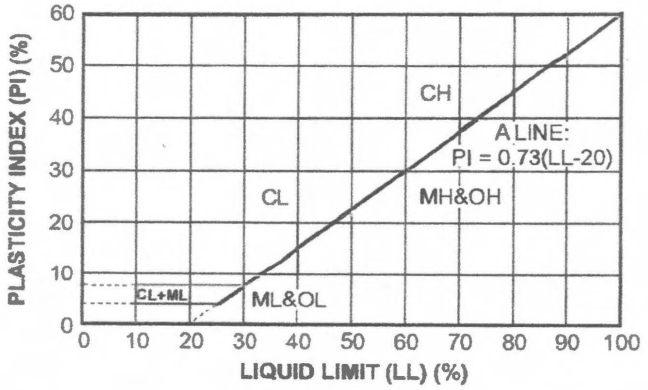
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)		
SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

CLASSIFICATION CHART

GRAIN SIZE CHART

Classification		RANGE OF GRAIN SIZES	
		U.S Standard Sieve Size	Grain Size In Millimeters
Boulder Size		Above 12"	> 300 mm
Cobbles		3" – 12"	80 – 300 mm
Gravel	Coarse	3" – ¾"	20 – 80 mm
	Fine	¾" – No. 4	4.75 – 20 mm
Sand	Coarse	No. 4 – No. 10	2 – 4.75 mm
	Medium	No. 10 – No. 40	0.425 – 2 mm
	Fine	No. 40 – No. 200	0.075 – 0.425 mm
Silt & Clay		< No. 200	< 0.075 mm

PLASTICITY CHART



SPT Sample	Bag Sample	NR No Recovery	Classification in accordance with ASTM D2487 Description and visual observation in accordance with ASTM D2488
Ring Sample	Seepage		All Sieve Sizes shown are US Standard 10 Blows for no apparent displacement 50 Blows for less than 6 inches advancement 100 Blows for 6 to 18 inches advancement

GEOTECHNICAL BORING LOGS

Drill Hole No. B-1

Date: 6/23/21 **Project No.** 21146-01

Drilling Company: Larry Harklerode **Type of Rig:** B-53

Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30" **Elevation:** 795 ±

DEPTH (feet)	EARTH MATERIAL	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Alluvium					SM	Qof_a: Old alluvial fan deposits **SILTY SAND:** Light brown, fine to medium grained, dry, medium dense
2							
3	Bedrock	X	14/11/19		5.5	Kqd	**QUARTZ DIORITE:** Light brown, fine to coarse grained, dense
4							
5							
6		X	18/25/50/ 4"		6.6		Very Dense % Passing #200 Sieve = 13
7							
8							
9							
10							
11		X	50/4"				Black, yellow, fine to coarse grained, very dense
12							
13							
14							
15		X	50/3"				Dark gray, very dense
16							TOTAL DEPTH = 15' NO GROUNDWATER NO CAVING BORING BACKFILLED
17							
18							
19							
20							
21							
22							
23							
24							
25							

GEOTECHNICAL BORING LOGS

Drill Hole No. B-2

Date: 6/23/21 **Project No.** 21146-01

Drilling Company: Larry Harklerode **Type of Rig:** B-53

Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30" **Elevation:** 818 ±

DEPTH (feet)	EARTH MATERIAL	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Alluvium					SM	Qof_a: Old alluvial fan deposits **SILTY SAND:** Strong brown, fine to medium grained, dry, loose on top 1'
2							
3		■	10/17/35	98.1	3.7		Dense
4							
5							
6		☒	19/24/35		6.5		Slightly moist, very dense
7							
8							
9							
10							
11		☒	15/24/24				Slightly moist, dense
12							
13	Bedrock					Kqd	**QUARTZ DIORITE:** Light brown, fine to coarse grained, very dense
14							
15		☒	50/4"				
16							TOTAL DEPTH = 15' NO GROUNDWATER NO CAVING BORING BACKFILLED
17							
18							
19							
20							
21							
22							
23							
24							
25							

Soil Exploration Co., Inc.

GEOTECHNICAL BORING LOGS

Drill Hole No. B-3

Date: 6/23/21 **Project No.** 21146-01

Drilling Company: Larry Harklerode **Type of Rig:** B-53

Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30" **Elevation:** 844 ±

DEPTH (feet)	EARTH MATERIAL	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Alluvium					SM	Qof_a: Old alluvial fan deposits **SILTY SAND:** Yellowish light brown, fine to coarse grained, slightly moist, very dense
2							
3		X	31/32/42		6.8		
4							
5							
6		X	45/50/4"		9.2		Brown, fine to medium grained, slightly moist, very dense % Passing #200 Sieve = 22
7							
8							
9							
10							
11		X	11/11/14		3.5	SP-SM	**SAND WITH SILT:** Brown, fine to coarse grained, dry, medium dense
12							% Passing #200 Sieve = 9
13							
14			50/5"		10.4	SM	**SILTY SAND:** Yellowish light brown, fine to coarse grained, slightly moist, very dense % Passing #200 Sieve = 16
15							
16							
17	Bedrock	X	50/5"			Kqd	**QUARTZ DIORITE:** Yellowish light brown, fine to coarse grained, very dense
18							
19							
20							
21							
22							
23							
24							
25							

GEOTECHNICAL BORING LOGS

Drill Hole No. B-3

Date: 6/23/21 **Project No.** 21146-01

Drilling Company: Larry Harklerode **Type of Rig:** B-53

Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30" **Elevation:** 844 ±

DEPTH (feet)	EARTH MATERIAL	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
26	Bedrock	X	50			Kqd	**QUARTZ DIORITE:** Yellowish light brown, fine to coarse grained, very dense
27							
28							
29							
30							
31		X	50/3"				
32							
33							
34							
35							
36		X	50/4"				
37							
38							
39							
40							
41		X	50/2"				
42							
43							
44							
45							
46		X	50				
47							
48							
49							TOTAL DEPTH = 50' NO GROUNDWATER NO CAVING BORING BACKFILLED
50		X	50				

Soil Exploration Co., Inc.

GEOTECHNICAL BORING LOGS

Drill Hole No. B-4

Date: 6/23/21 **Project No.** 21146-01

Drilling Company: Larry Harklerode **Type of Rig:** B-53

Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30" **Elevation:** 868 ±

DEPTH (feet)	EARTH MATERIAL	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Alluvium					SM	Qof_a: Old alluvial fan deposits **SILTY SAND:** Light brown, fine to coarse grained, slight moist, medium dense
2							
3			13/17/36	108.4	5.2		
4							
5							
6			33/54/4"		7.3		Very dense
7							
8							
9							
10	Bedrock		50			Kqd	**QUARTZ DIORITE:** Yellowish black, fine to coarse grained, very dense
11							
12							
13							
14							
15							
16							TOTAL DEPTH = 15' NO GROUNDWATER NO CAVING BORING BACKFILLED
17							
18							
19							
20							
21							
22							
23							
24							
25							

GEOTECHNICAL BORING LOGS

Drill Hole No. B-5

Date: 6/23/21 **Project No.** 21146-01

Drilling Company: Larry Harklerode **Type of Rig:** B-53

Hole Diameter: 8" **Drive Weight:** 140 lbs. **Drop:** 30" **Elevation:** 900 ±

DEPTH (feet)	EARTH MATERIAL	SAMPLE TEST	BLOWS PER 6 INCH	DRY DENSITY (%)	MOISTURE (%)	SOIL CLASSIFICATION USCS	GEOTECHNICAL DESCRIPTION LOGGED BY: GL SAMPLED BY: GL
1	Alluvium					SM	Qof_a: Old alluvial fan deposits **SILTY SAND:** Light brown, fine to medium grained, dry, medium dense
2							
3		X	7/9/17		6.4		Slightly moist, medium dense
4							
5							
6		X	20/19/15		4.0		Dense
7							
8							
9							
10							
11		X	20/40/45				Yellowish light brown, fine to medium grained, slightly moist, very dense
12							
13							
14							
15	Bedrock	X	40/50/3"			Kqd	**QUARTZ DIORITE:** Yellowish light brown, fine to coarse grained, very dense
16							
17							
18							
19							
20							
21							TOTAL DEPTH = 20' NO GROUNDWATER NO CAVING BORING BACKFILLED
22							
23							
24							
25							

Soil Exploration Co., Inc.

APPENDIX C

Project: **RC Hobbs**

Project No. **21146-01**

LABORATORY TEST RESULTS

Sieve Analysis

SIEVE SIZE	B-1 @ 5' % PASSING	B-3 @ 5' % PASSING	B-3 @ 10' % PASSING	B-3 @ 15' % PASSING
3/8"	100	100	100	100
No. 4	90	91	97	98
No. 8	74	83	87	93
No. 16	61	72	73	83
No. 30	45	59	55	68
No. 50	31	46	36	52
No. 100	20	35	19	32
No. 200	13	22	9	16
SIEVE ANALYSIS TEST DATA				

Enviro – Chem, Inc.
1214 E. Lexington Avenue, Pomona, CA 91766 Tel (909) 590-5905 Fax (909) 590-5907

LABORATORY REPORT

CUSTOMER: **Soil Exploration Company**
7535 Jurupa Ave., Suite C
Riverside, CA 92504
Tel: (909) 374-5429 **E-Mail: SoilExploration@yahoo.com**

PROJECT: **RC Hubbs / 21146-01**
MATRIX: SOIL
SAMPLING DATE: 06/23/21
REPORT TO: Mr. GENE K. LUU
DATE RECEIVED: 06/28/21
DATE ANALYZED: 06/28&30/21
DATE REPORTED: 07/01/21

SAMPLE I.D.: **B-3 @ 0~5'** LAB I.D.: 210628-5

PARAMETER	SAMPLE RESULT	UNIT	PQL	DF	TEST METHOD
RESISTIVITY	6850	OHMS-CM	100000*	--	CALTRANS
SULFATE	35.2	mg/Kg	10	1	EPA 9038
CHLORIDE	55.0	mg/Kg	10	1	EPA 9253
pH	7.25	pH/UNIT	--	--	EPA 9045C

COMMENTS
DF = DILUTION FACTOR
PQL = PRACTICAL QUANTITATION LIMIT
ACTUAL DETECTION LIMIT = DF X PQL
ND = NON-DETECTED OR BELOW THE ACTUAL DETECTION LIMIT
mg/Kg = MILLIGRAM PER KILOGRAM = PPM
OHMS-CM = OHMS-CENTIMETER
RESISTIVITY = 1/CONDUCTIVITY
* = HIGH LIMIT
pH ANALYSIS CONDUCTED ON 1:1 SOIL/DEIONIZED WATER EXTRACTION

DATA REVIEWED AND APPROVED BY: _____
CAL-DHS ELAP CERTIFICATE No.: 1555

APPENDIX D

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)
9.74	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16	181
9.74	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	215
9.74	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	241
9.74	San Jacinto;SBV	CA	6	90	V	strike slip	0	16	45
9.74	San Jacinto;SBV+SJV	CA	n/a	90	V	strike slip	0	16	88
9.74	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16	134
9.74	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17	181
11.17	San Jacinto;SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	196
11.17	San Jacinto;SJV+A	CA	n/a	90	V	strike slip	0	17	89
11.17	San Jacinto;SJV+A+C	CA	n/a	90	V	strike slip	0	17	136
11.17	San Jacinto;SJV+A+CC	CA	n/a	90	V	strike slip	0	16	136
11.17	San Jacinto;SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	170
11.17	San Jacinto;SJV	CA	18	90	V	strike slip	0	16	43
12.93	Cucamonga	CA	5	45	N	thrust	0	8	28
13.19	Chino, alt 2	CA	1	65	SW	strike slip	0	14	29
13.27	Chino, alt 1	CA	1	50	SW	strike slip	0	9	24
13.68	Elsinore;W+GI+T+J	CA	n/a	84	NE	strike slip	0	16	199
13.68	Elsinore;GI+T+J+CM	CA	n/a	86	NE	strike	0	16	195

						slip			
13.68	Elsinore;GI+T+J	CA	n/a	86	NE	strike slip	0	17	153
13.68	Elsinore;GI+T	CA	5	90	V	strike slip	0	14	78
13.68	Elsinore;W+GI	CA	n/a	81	NE	strike slip	0	14	83
13.68	Elsinore;GI	CA	5	90	V	strike slip	0	13	37
13.68	Elsinore;W+GI+T	CA	n/a	84	NE	strike slip	0	14	124
13.68	Elsinore;W+GI+T+J+CM	CA	n/a	84	NE	strike slip	0	16	241
14.20	Elsinore;W	CA	2.5	75	NE	strike slip	0	14	46
15.72	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	449
15.72	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	384
15.72	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0	14	442
15.72	S. San Andreas;NM+SM+NSB	CA	n/a	90	V	strike slip	0	13	170
15.72	S. San Andreas;SM+NSB+SSB+BG+CO	CA	n/a	83		strike slip	0.1	13	303
15.72	S. San Andreas;SM+NSB+SSB+BG	CA	n/a	81		strike slip	0	13	234
15.72	S. San Andreas;SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13	176
15.72	S. San Andreas;SM+NSB	CA	n/a	90	V	strike slip	0	13	133
15.72	S. San Andreas;BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	220
15.72	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	548
15.72	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0.1	13	479
15.72	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0.1	13	421
15.72	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0.1	13	377
15.72	S. San Andreas;NSB+SSB+BG	CA	n/a	75		strike slip	0	14	136

15.72	S. San Andreas;NSB+SSB	CA	n/a	90	V	strike slip	0	13	79
15.72	S. San Andreas;NSB	CA	22	90	V	strike slip	0	13	35
15.72	S. San Andreas;NM+SM+NSB+SSB+BG+CO	CA	n/a	84		strike slip	0.1	13	340
15.72	S. San Andreas;BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	85		strike slip	0.1	13	390
15.72	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	512
15.72	S. San Andreas;BB+NM+SM+NSB+SSB+BG	CA	n/a	84		strike slip	0	14	321
15.72	S. San Andreas;NSB+SSB+BG+CO	CA	n/a	79		strike slip	0.2	12	206
15.72	S. San Andreas;NM+SM+NSB+SSB+BG	CA	n/a	83		strike slip	0	14	271
15.72	S. San Andreas;NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13	213
15.72	S. San Andreas;BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	263
15.72	S. San Andreas;CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	279
15.72	S. San Andreas;CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	322
15.72	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	85		strike slip	0	14	380
15.72	S. San Andreas;CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	341
16.42	S. San Andreas;SSB+BG+CO	CA	n/a	77		strike slip	0.2	12	170
16.42	S. San Andreas;SSB	CA	16	90	V	strike slip	0	13	43
16.42	S. San Andreas;SSB+BG	CA	n/a	71		strike slip	0	13	101
17.53	San Jose	CA	0.5	74	NW	strike slip	0	15	20
19.43	San Jacinto;A+CC	CA	n/a	90	V	strike slip	0	16	118
19.43	San Jacinto;A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	178
19.43	San Jacinto;A+C	CA	n/a	90	V	strike slip	0	17	118

19.43	San Jacinto;A	CA	9	90	V	strike slip	0	17	71
19.43	San Jacinto;A+CC+B	CA	n/a	90	V	strike slip	0.1	15	152
20.33	Sierra Madre	CA	2	53	N	reverse	0	14	57
20.33	Sierra Madre Connected	CA	2	51		reverse	0	14	76
20.92	Cleghorn	CA	3	90	V	strike slip	0	16	25
21.92	Elsinore;T	CA	5	90	V	strike slip	0	14	52
21.92	Elsinore;T+J	CA	n/a	86	NE	strike slip	0	17	127
21.92	Elsinore;T+J+CM	CA	n/a	85	NE	strike slip	0	16	169
23.93	S. San Andreas;NM+SM	CA	n/a	90	V	strike slip	0	14	134
23.93	S. San Andreas;CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14	306
23.93	S. San Andreas;SM	CA	29	90	V	strike slip	0	13	98
23.93	S. San Andreas;CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14	243
23.93	S. San Andreas;BB+NM+SM	CA	n/a	90	V	strike slip	0	14	184
23.93	S. San Andreas;PK+CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0.1	13	342
24.68	North Frontal (West)	CA	1	49	S	reverse	0	16	50
25.96	Puente Hills (Coyote Hills)	CA	0.7	26	N	thrust	2.8	15	17
29.23	San Joaquin Hills	CA	0.5	23	SW	thrust	2	13	27
29.78	Clamshell-Sawpit	CA	0.5	50	NW	reverse	0	14	16
34.11	Puente Hills (Santa Fe Springs)	CA	0.7	29	N	thrust	2.8	15	11
34.54	Raymond	CA	1.5	79	N	strike slip	0	16	22
36.02	S. San Andreas;BG	CA	n/a	58		strike slip	0	13	56
36.02	S. San Andreas;BG+CO	CA	n/a	72		strike slip	0.3	12	125
38.63	Newport Inglewood Connected alt 2	CA	1.3	90	V	strike slip	0	11	208
38.74	Newport Inglewood Connected alt 1	CA	1.3	89		strike slip	0	11	208

38.74	Newport-Inglewood, alt 1	CA	1	88		strike slip	0	15	65
38.81	Newport-Inglewood (Offshore)	CA	1.5	90	V	strike slip	0	10	66
39.02	Elysian Park (Upper)	CA	1.3	50	NE	reverse	3	15	20
40.13	Puente Hills (LA)	CA	0.7	27	N	thrust	2.1	15	22
40.87	Pinto Mtn	CA	2.5	90	V	strike slip	0	16	74
41.90	Helendale-So Lockhart	CA	0.6	90	V	strike slip	0	13	114
42.87	Verdugo	CA	0.5	55	NE	reverse	0	15	29
43.41	North Frontal (East)	CA	0.5	41	S	thrust	0	16	27
46.98	Hollywood	CA	1	70	N	strike slip	0	17	17
49.72	Palos Verdes Connected	CA	3	90	V	strike slip	0	10	285
49.72	Palos Verdes	CA	3	90	V	strike slip	0	14	99
49.90	Santa Monica Connected alt 2	CA	2.4	44		strike slip	0.8	11	93

CBC (2019) Seismic Parameters

The CBC 2019 update is tabulated as follows:

2019 CBC – SEISMIC PARAMETERS		
Site Coordinates	**Latitude**	**Longitude**
	33.98412	**-117.42832**
Mapped Spectral Response Acceleration	S_s = 1.5	S_1 = 0.598
Site Coefficients (Class "D")	F_a = 1.0	F_v = 1.7
Maximum Considered Earthquake (MCE) Spectral Response Acceleration	S_{MS} = 1.5	S_{M1} = 1.017
Design Spectral Response Acceleration Parameters	S_{DS} =1.0	S_{D1} = 0.678
Seismic Design Category	D	
Peak Ground Acceleration (PGA)	0.5	
Site amplification factor at PGA	1.1	
Site modified peak ground acceleration (PGAM)	0.55	

- Earthquake.usgs.gov/research/hazmaps/design
- 2019 California Building Code, California Code of Regulations, Title 24, Part 2, Volume 2 of 2, Section 1613, Earthquake Loads

APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL INTENT

These specifications present general procedures and requirements for grading and earthwork as shown on the approved grading plans, including preparation of areas to be filled, placement of fill, installations of subdrains, and excavations. The recommendations contained in the geotechnical report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new recommendations which could supersede these specifications or the recommendations of the geotechnical report.

2.0 EARTHWORK OBSERVATIONS AND TESTING

Prior to the commencement of grading, a qualified geotechnical consultant (soils engineer and engineering geologist, and their representatives) shall be employed for the purpose of observing earthwork procedures and testing the fills for conformance with the recommendations of the geotechnical report and these specifications. It will be necessary that the consultant provide adequate testing and observations so that he may determine that the work was accomplished as specified. It shall be the responsibility of the contractor to assist the consultant and keep him apprised of work schedules and changes so that he may schedule his personnel accordingly.

It shall be the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and approved grading plans. If, in the opinion of the consultant, unsatisfactory conditions, such as questionable soil, poor moisture conditions, inadequate compaction, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the consultant will be empowered to reject the work and recommend that construction be stopped until the unsatisfactory conditions are rectified.

Maximum dry density tests used to determine the degree of compaction will be performed in accordance with the American Society of Testing and Materials, test method ASTM D1557-09.

3.0 PREPARATION OF AREAS TO BE FILLED

3.1 Clearing and Grubbing

All brush, vegetation, and debris shall be removed or piled and otherwise disposed of.

3.2 Processing

The existing ground which is determined to be satisfactory for support of fill shall be scarified to a minimum depth of 6 inches. Existing ground which is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until the soils are broken down and free of large clay lumps or clods and until the working surface is reasonably uniform and free of uneven features which would inhibit uniform compaction.

3.3 Overexcavation

Soft, dry, spongy, highly fractured or otherwise unsuitable ground, extending to such depth that surface processing cannot adequately improve the condition, shall be overexcavated down to firm ground, approved by the consultant.

3.4 Moisture Conditioning

Overexcavated and processed soils shall be watered, dried-back, blended, and/or mixed, as required to attain a uniform moisture content near optimum.

3.5 Recompaction

Overexcavation and processed soils which have been properly mixed and moisture-conditioned shall be recompacted to a minimum relative compaction of 90 percent.

3.6 *Benching*

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal : vertical), the ground shall be stepped or benched. The lowest bench shall be a minimum of 15 feet wide, shall be at least 2 feet deep, shall expose firm materials, and shall be approved by the consultant. Other benches shall be excavated in firm materials for a minimum width of 4 feet. Ground sloping flatter than 5:1 (horizontal : vertical) shall be benched or otherwise overexcavated when considered necessary by the consultant.

3.7 *Approval*

All areas to receive fill, including processed areas, removal areas and toe-of-fill benches shall be approved by the consultant prior to fill placement.

4.0 FILL MATERIAL

4.1 *General*

Material to be placed as fill shall be free of organic matter and other deleterious substances, and shall be approved by the consultant. Soils of poor gradation, expansion, or strength characteristics shall be placed in areas designated by consultant or shall be mixed with other soils to serve as satisfactory fill material.

4.2 *Oversize*

Oversize materials defined as rock, or other irreducible material with maximum dimension greater than 12 inches, shall not be buried or placed in fills, unless the location, materials, and disposal methods are specifically approved by the consultant. Oversize disposal operations shall be such that nesting of oversize material does not occur, and such that the oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 feet vertically of finish grade or within the range of future utilities or underground construction, unless specifically approved by the consultant.

4.3 *Import*

If importing of fill material is required for grading, the import material shall meet the requirements of Section 4.1.

5.0 FILL PLACEMENT and COMPACTION

5.1 *Fill Lifts*

Approved fill material shall be placed in areas prepared to receive fill in near-horizontal layers not exceeding 6 inches in compacted thickness. The consultant may approve thicker lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to attain uniformity of material and moisture in each layer.

5.2 *Fill Moisture*

Fill layers at a moisture content less than optimum shall be watered and mixed, and wet fill layers shall be aerated by scarification or shall be blended with drier material. Moisture conditioning and mixing of fill layers shall continue until the fill material is at a uniform moisture content at or near optimum.

5.3 *Compaction of Fill*

After each layer has been evenly spread, moisture-conditioned, and mixed, it shall be uniformly compacted to not less than 90 percent of maximum dry density. Compaction equipment shall be adequately sized and shall be either specifically designed for soil compaction or of proven reliability, to efficiently achieve the specified degree of compaction.

5.4 Fill Slopes

Compacting of slopes shall be accomplished, in addition to normal compacting procedures, by backrolling of slopes with sheepsfoot rollers at frequent increments of 2 to 3 feet in fill elevation gain, or by other methods producing satisfactory results. At the completion of grading, the relative compaction of the slope out to the slope face shall be at least 90 percent.

5.5 Compaction Testing

Field-tests to check the fill moisture and degree of compaction will be performed by the consultant. The location and frequency of tests shall be at the consultant's discretion. In general, the tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of embankment.

6.0 SUBDRAIN INSTALLATION

Subdrain systems, if required, shall be installed in approved ground to conform to the approximate alignment and details shown on the plans or herein. The subdrain location or materials shall not be changed or modified without the approval of the consultant. The consultant, however, may recommend and upon approval, direct changes in subdrain line, grade or material. All subdrains should be surveyed for line and grade after installation and sufficient time shall be allowed for the surveys, prior to commencement of filling over the subdrain.

7.0 EXCAVATION

Excavations and cut slopes will be examined during grading. If directed by the consultant, further excavation or overexcavation and refilling of cut areas shall be performed, and/or remedial grading of cut slopes shall be performed. Where fill-over-cut slopes are to be graded, unless otherwise approved, the cut portion of the slope shall be made and approved by the consultant prior to placement of materials for construction of the fill portion of the slope.

8.0 TRENCH BACKFILLS

Trench excavations for utility pipes shall be backfilled under engineering supervision.

After the utility pipe has been laid, the space under and around the pipe shall be backfilled with clean sand or approved granular soil to a depth of at least one foot over the top of the pipe. The sand backfill shall be uniformly jetted into place before the controlled backfill is placed over the sand.

The onsite materials, or other soils approved by the soil engineer, shall be watered and mixed as necessary prior to placement in lifts over the sand backfill.

The controlled backfill shall be compacted to at least 90 percent of the maximum dry density as determined by the ASTM D1557-09 test method.

Field density tests and inspection of the backfill procedures shall be made by the soil engineer during backfilling to see that proper moisture content and uniform compaction is being maintained. The contractor shall provide test holes and exploratory pits as required by the soil engineer to enable sampling and testing.

APPENDIX F

Infiltration Test (Boring Percolation Test Procedure)

The percolation test data from I-1 and I-2 was used to estimate infiltration rates using the Porchet Inverse Borehole Method, in accordance with Riverside County, Low-impact development BMP design handbook, Appendix A-Infiltration Testing, June 2018.

Two 9-inch diameter, 6 feet deep test holes (I-1 and I-2) were performed at the suggested area. To mitigate any possible caving or sloughing of the test hole, a 6-inch diameter perforated PVC pipe was placed in the hole. The bottom of the test hole was covered with 2 inches of gravel.

The testing was conducted after presoaking with water. Water level was adjusted to 20 inches above the bottom of the test hole after each measurement. Two consecutive measurements showed that 6 inches of water seeped away in less than 25 minutes. The test was run for an additional one hour with measurements taken at 10 minute intervals. The drop that occurred during the final reading was used for design purposes.

Tabulated Test Results/Boring Percolation Test Procedure)

Test No.	Depth of Test (feet)	Earth Material	Measured Infiltration Rate (in/hr)
I-1	6	Silty Sand ("SM")	1.45
I-2	6	Silty Sand ("SM")	1.68

- We recommend that a suitable factor of safety should be applied to the rate in design of the system
- The distance between the infiltration facility and the adjacent private property, any building and walls shall be a minimum of 10 feet

Percolation Test Data Sheet

Project:	RC Hobbs	Project No:	#21146-01	Date:	6/28/21
Test Hole No:	I-1	Tested By:	[redacted] Ed		
Depth of Test Hole, D_T:	6'	USCS Soil Classification:	SM		
Test Hole Dimensions (inches)				Length	Width
Diameter (if round)=	8"	Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	12:05:20	12:30:20	25	52	59	7	Y
2	12:31:15	12:56:15	25	52	58.125	6.125	Y

*If two consecutive 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. Other wise, pre-soak (fill) 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.)	Percolation Rate (min./in.)
1	1:02:06	1:12:06	10	52	54.875	2.875	
2	1:13:40	1:23:40	10	52	54.5	2.5	
3	1:24:01	1:34:01	10	52	54.5	2.5	
4	1:35:12	1:45:12	10	52	54.5	2.5	
5	1:46:23	1:56:23	10	52	54.5	2.5	
6	1:57:34	2:07:34	10	52	54.5	2.5	4.0
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:
$H_o = D_T - D_o = 72 - 52 = 20$
$H_f = D_T - D_f = 72 - 54.5 = 17.5$
$H_{avg} = H_o + H_f / 2 = 18.75$
$I_t = \frac{4 \times 60 \times 2.5}{10(4 + 2(18.75))} = 1.45 in/hr.$

Table 5 – Sample Test Data Form for Percolation Test

Percolation Test Data Sheet

Project:	RC Hobbs	Project No:	#21146-01	Date:	6/28/21
Test Hole No:	I-2	Tested By:	TD		
Depth of Test Hole, D_T:	6'	USCS Soil Classification:	SM		
Test Hole Dimensions (inches)				Length	Width
Diameter (if round)=	8"	Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	12:02:20	12:25:20	25	52	58.875	6.875	Y
2	12:33:43	12:58:43	25	52	58.5	6.5	Y

*If two consecutive 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. Other wise, pre-soak (fill) 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.)	Percolation Rate (min./in.)
1	12:59:05	1:09:05	10	52	55.25	3.25	
2	1:10:03	1:20:03	10	52	54.875	2.875	
3	1:20:59	1:30:59	10	52	54.875	2.875	
4	1:31:09	1:41:09	10	52	54.875	2.875	
5	1:42:20	1:52:20	10	52	54.875	2.875	
6	1:53:31	2:03:31	10	52	54.875	2.875	3.48
7							
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:
$H_o = D_T - D_o = 72 - 52 = 20$
$H_f = D_T - D_f = 72 - 54.875 = 17.125$
$H_{avg} = H_o + H_f / 2 = 20 + 17.125 / 2 = 18.5625$

$$I_t = \frac{4 \times 60 \times 2.875}{10(4 + 2(18.5625))} = 1.68 \text{ in/hr}$$ ✓

Table 5 – Sample Test Data Form for Percolation Test

APPENDIX G

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LIQUEFACTION ANALYSIS SUMMARY

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Font: Courier New, Regular, Size 8 is recommended for this report.
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Input File Name: UNTITLED
Title: PROJECT NAME: RC Hobbs
Subtitle: Proj No.: 21446-01

Surface Elev.=844
Hole No.=B-3
Depth of Hole= 50.00 ft
Water Table during Earthquake= 30.00 ft
Water Table during In-Situ Testing= 30.00 ft
Max. Acceleration= 0.25 g
Earthquake Magnitude= 6.75

Input Data:
Surface Elev.=844
Hole No.=B-3
Depth of Hole=50.00 ft
Water Table during Earthquake= 30.00 ft
Water Table during In-Situ Testing= 30.00 ft
Max. Acceleration=0.25 g
Earthquake Magnitude=6.75

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine
3. Fines Correction for Liquefaction: Idriss/Seed
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 0.89
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1
   Plot two CSR (fs1=1, fs2=User)
10. Use Curve Smoothing: Yes*
* Recommended Options

In-Situ Test Data:

Depth	SPT	gamma	Fines

ft		pcf	%
0.00	64.00	120.00	22.00
5.00	100.00	120.00	22.00
10.00	25.00	120.00	9.00
15.00	100.00	120.00	16.00
20.00	100.00	120.00	13.00
25.00	100.00	120.00	13.00
30.00	100.00	120.00	13.00
35.00	100.00	120.00	13.00
40.00	100.00	120.00	13.00
45.00	100.00	120.00	13.00
50.00	100.00	120.00	13.00

Output Results:

Settlement of Saturated Sands=0.00 in.
Settlement of Unsaturated Sands=0.03 in.
Total Settlement of Saturated and Unsaturated Sands=0.03 in.
Differential Settlement=0.013 to 0.017 in.

Depth ft	CRRm	CSRfs	F.S.	S_sat. in.	S_dry in.	S_all in.
0.00	2.62	0.16	5.00	0.00	0.03	0.03
5.00	2.62	0.16	5.00	0.00	0.02	0.02
10.00	0.38	0.16	5.00	0.00	0.02	0.02
15.00	2.62	0.16	5.00	0.00	0.02	0.02
20.00	2.62	0.15	5.00	0.00	0.01	0.01
25.00	2.62	0.15	5.00	0.00	0.01	0.01
30.00	2.57	0.15	5.00	0.00	0.00	0.00
35.00	2.53	0.16	5.00	0.00	0.00	0.00
40.00	2.49	0.16	5.00	0.00	0.00	0.00
45.00	2.46	0.16	5.00	0.00	0.00	0.00
50.00	2.43	0.16	5.00	0.00	0.00	0.00

* F.S.<1, Liquefaction Potential Zone
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

Units: Depth = ft, Stress or Pressure = atm (tsf), Unit Weight = pcf, Settlement = in.

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1 atm (atmosphere) = 1 tsf (ton/ft2)
CRRm Cyclic resistance ratio from soils
CSRsf Cyclic stress ratio induced by a given earthquake (with user request factor of safety)
F.S. Factor of Safety against liquefaction, F.S.=CRRm/CSRsf
S_sat Settlement from saturated sands
S_dry Settlement from Unsaturated Sands

S_all	Total Settlement from Saturated and Unsaturated Sands
NoLiq	No-Liquefy Soils