



Kassab Travel Center Project

Appendix E

Geotechnical Investigation Report

**GEOTECHNICAL INVESTIGATION REPORT
PROPOSED KASSAB TRAVEL CENTER
29301 RIVERSIDE DRIVE**

Lake Elsinore, California

Prepared for:

MR. RON KASSAB

Prepared by:

GEOBODEN INC.

Irvine, CA 92620

December 30, 2017

Project No. Lake Elsinore-1-01

GEOBODEN INC.

**GEOTECHNICAL INVESTIGATION REPORT
PROPOSED KASSAB TRAVEL CENTER
29301 RIVERSIDE DRIVE
LAKE ELSINORE, CALIFORNIA**

MR. RON KASSAB

Prepared by:

GEOBODEN INC.
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Irvine, California 92620

December 30, 2017

JOB NO. Lake Elsinore-1-01

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Project No. Lake Elsinore-1-01

Attention: Mr. Ron Kassab

**Subject: Geotechnical Investigation Report
Proposed Kassab Travel Center
29301 Riverside Drive
Lake Elsinore, California**

GeoBoden, Inc. (GeoBoden) is pleased to submit herewith our geotechnical investigation report for the Proposed Kassab Travel Center to be constructed at 29301 Riverside Drive in the city of Lake Elsinore, California.

This report presents the results of our field investigation, laboratory testing and our engineering judgment, opinions, conclusions and recommendations pertaining to geotechnical design aspects of the proposed development.

It has been a pleasure to be of service to you on this project. Should you have any questions regarding the contents of this report, or should you require additional information, please do not hesitate to contact us.

Respectfully submitted,
GEOBODEN, INC.



Cyrus Radvar,
Principal Engineer, G.E. 2742



Copies: 4/Addressee

GEOTECHNICAL INVESTIGATION REPORT

**PROPOSED KASSAB TRAVEL CENTER
29301 RIVERSIDE DRIVE
LAKE ELSINORE, CALIFORNIA**

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GEOTECHNICAL INVESTIGATION REPORT
PROPOSED KASSAB TRAVEL CENTER
29301 RIVERSIDE DRIVE
Lake Elsinore, California

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation performed by GeoBoden, Inc. (GeoBoden) for the Proposed Kassab Travel Center to be located at 29301 Riverside Drive in Lake Elsinore, California. The general location of the project is shown on Figure 1.

The purposes of this investigation were to determine the geotechnical properties of subsurface soil conditions, to evaluate their in-place characteristics, evaluate site seismicity, and to provide geotechnical recommendations with respect to site grading and for design and construction of proposed foundations and other site improvements.

The scope of the authorized investigation included performing a site reconnaissance, conducting field exploration and laboratory testing programs, performing engineering analyses, and preparing this Geotechnical Investigation Report. Evaluation of environmental issues or the potential presence of hazardous materials was not within the scope of services provided.

This report has been prepared for RON KASSAB and their other project team members, to be used solely in the development of facilities described herein. This report may not contain sufficient information for other uses or the purposes of other parties.

2.0 SITE LOCATION AND PROJECT DESCRIPTION

The site is located at 29301 Riverside Drive in Lake Elsinore, California. The site is bounded by Collier Avenue on the east, by an existing building on the north, by a vacant land on the west, and by Riverside Drive on the south. The subject property is presently occupied by a vacant land.

The maximum column load for the new building will be about 75 kips, and the line load will be about 3 kips per lineal feet. Currently, it is our understanding that the proposed building will consist of masonry construction with slab on-grade.

3.0 GEOTECHNICAL INVESTIGATION

Our geotechnical investigation included a field exploration program and a laboratory testing programs. These programs were performed in accordance with our scope of services. The field exploration and laboratory testing programs are briefly described below. A more detailed description of the field exploration and laboratory testing programs is provided in Appendix A and Appendix B, respectively.

3.1 FIELD EXPLORATION PROGRAM

The field exploration program was initiated on December 18, 2017 under the supervision of an engineer. Eight (8) exploratory borings were drilled using a truck-mounted drilling rig equipped with 8-inch diameter hollow stem augers. The borings were advanced to depths of ranging from 11.5 to 31.5 feet (below ground surface). The approximate locations of exploratory borings are shown on Figure 2.

Logs of subsurface conditions encountered in the borings were prepared in the field by a representative of our firm. Soil samples consisting of relatively undisturbed brass ring samples and Standard Penetration Tests (SPT) samples were collected at approximately 5-foot depth intervals and were returned to the laboratory for testing. The SPTs were performed in accordance with ASTM D 1586. Final boring logs were prepared from the field logs and are presented in Appendix A.

3.2 LABORATORY TESTING

Selected samples collected during drilling activities were tested in the laboratory to assist in evaluating controlling engineering properties of subsurface materials at the site. Physical tests performed included moisture and density determination, consolidation, expansion index, No. 200 Sieve, Atterberg limits, and corrosion. The results of laboratory are presented in Appendix B.

4.0 DISCUSSION OF FINDINGS

The following discussion of findings for the site is based on the results of the field exploration and laboratory testing programs.

4.1 SITE AND SUBSURFACE CONDITIONS

Observed subsurface native soils consisted of sandy clay, clay, clay with sand, sand and sand with silt to the maximum explored depth of 31.5 feet below ground surface (bgs).

Based on blow counts recorded during sampling, the clayey soils encountered within borings were found to be firm to stiff. The sandy soil was found to be medium dense. For a more detailed description of the subsurface materials refer to the boring logs included in Appendix A of this report.

4.2 GROUNDWATER CONDITIONS

Groundwater was encountered within our exploratory boring B-1 through B-5 at 15 feet bgs. Based on information from the nearby wells (<http://www.water.ca.gov/waterdatalibrary/>), the historic high ground water level in the site vicinity is at a depth of greater than 50 feet beneath the existing ground surface.

Fluctuations of the groundwater table, localized zones of perched water, and rise in soil moisture content should be anticipated during the rainy season. Irrigation of landscaped areas can also lead to an increase in soil moisture content and fluctuations of intermittent shallow perched groundwater levels.

4.3 SOIL ENGINEERING PROPERTIES

Physical tests were performed on the relatively undisturbed samples to characterize the engineering properties of the native soils. Moisture content determination was performed on the samples to evaluate the in-situ moisture content. Moisture content and dry unit weight results are included in Appendix B.

4.4 CONSOLIDATION CHARACTERISTICS

Consolidation tests were performed on samples of the existing fill and native overburden soils recovered from the boring. Results of the consolidation tests indicate that the overburden material will have moderate compressibility under the anticipated loads. These characteristics are compatible with the allowable bearing capacity values and corresponding settlement estimates presented in Foundations Section of our report.

4.5 COLLAPSE POTENTIALS

Results of consolidation tests on samples of native soil indicate that the native soils will have low collapse potential. Removal and recompaction of the surficial soils is expected to reduce the anticipated amount of total differential settlement within the site.

4.6 EXPANSIVE SOILS

Preliminary laboratory testing of representative sample of onsite soils indicate that these materials exhibit LOW expansion potential. We anticipate that the design and performance of the proposed new building will not be affected by expansion of onsite soils.

5.0 STRONG GROUND MOTION POTENTIAL

The project site is located in a seismically active area typical of Southern California and likely to be subjected to a strong ground shaking due to earthquakes on nearby faults.

The Elsinore (Glen Ivy) rev fault is the closest known active fault, located 1.91-km of the site with an anticipated maximum moment magnitude (M_w) of 7.7.

5.1 CBC DESIGN PARAMETERS

To accommodate effects of ground shaking produced by regional seismic events, seismic design can, at the discretion of the designing Structural Engineer, be performed in accordance with the 2016 edition of the California Building Code (CBC). Table below, 2016 CBC Seismic Parameters, lists (next) seismic design parameters based on the 2016 CBC methodology, which is based on ASCE/SEI 7-10:

2016 CBC Seismic Design Parameters	Value
Site Latitude (decimal degrees)	33.6947
Site Longitude (decimal degrees)	-117.3471
Site Class Definition (ASCE 7 Table 20.3-1)	D
Mapped Spectral Response Acceleration at 0.2s Period, S_s (Figure 1613.3.1(1))	2.293
Mapped Spectral Response Acceleration at 1s Period, S_l (Figure 1613.3.1(2))	0.915
Short Period Site Coefficient at 0.2s Period, F_a (Table 1613.3.3(1))	1.0
Long Period Site Coefficient at 1s Period, F_v (Table 1613.3.3(2))	1.5
Adjusted Spectral Response Acceleration at 0.2s Period, S_{MS} (Eq. 16-37)	2.293
Adjusted Spectral Response Acceleration at 1s Period, S_{MI} (Eq. 16-38)	1.372
Design Spectral Response Acceleration at 0.2s Period, S_{DS} (Eq. 16-39)	1.528
Design Spectral Response Acceleration at 1s Period, S_{DI} (Eq. 16-40)	0.915

6.0 LIQUEFACTION POTENTIAL

For liquefaction to occur, all of three key ingredients are required: liquefaction-susceptible soils, groundwater within a depth of 50 feet or less, and strong earthquake shaking. Soils susceptible to liquefaction are generally saturated loose to medium dense sands and non-plastic silt deposits below the water table.

Groundwater was encountered within our borings B-1 through B-5 at 15 feet. Historic high groundwater at the site is as deep as 50 feet. Soil materials encountered within our borings are clayey soil. It is our opinion that potential for liquefaction at the site is low.

7.0 DESIGN RECOMMENDATIONS

Based upon the results of our investigation, the proposed development is considered geotechnically feasible provided the recommendations presented herein are incorporated into the design and construction. If changes in the design of the structure are made or variations or changed conditions are encountered during construction, GeoBoden should be contacted to evaluate their effects on these recommendations. The following geotechnical engineering recommendations for the proposed buildings are based on observations from the field investigation program and the physical test results.

7.1 EARTHWORK

All earthworks, including excavation, backfill and preparation of subgrade, should be performed in accordance with the geotechnical recommendations presented in this report and applicable portions of the grading code of local regulatory agencies. All earthwork should be performed under the observation and testing of a qualified geotechnical engineer.

7.2 SITE AND FOUNDATION PREPARATION

All site preparation should be observed by experienced personnel reporting to the project Geotechnical Engineer. Our field monitoring services are an essential continuation of our prior studies to confirm and correlate the findings and our prior recommendations with the actual subsurface conditions exposed during construction, and to confirm that suitable fill soils are placed and properly compacted.

Clearing operations should include the removal of all surface vegetation. Large shrubs, when removed, should be grubbed out to include their stumps and major root systems.

In general, all fill soils within the proposed building footprints should be overexcavated and replaced with engineered fill. As a minimum, removals should extend to competent native soils. At least 3 feet of compacted fill should be provided underneath all spread footings and floor slabs. The compacted fill should extend laterally a minimum of 5 feet beyond the foundation footprints, where possible. All existing low-density, near-surface soils will require removal to competent material from areas to receive newly compacted fill. The basis for establishing a competent exposed surface on which to place fill should consist of competent materials exhibiting an in-place relative compaction of at least 85 percent. Prior to placing structural fill, exposed bottom surfaces in each removal area approved for fill should first be scarified to a depth of at least 6 inches, water or air dried as necessary to achieve 3 percent above optimum moisture conditions, and then recompacted in place to a minimum relative compaction of 90 percent.

Based on the observations made in our borings and the results of pertinent laboratory tests, anticipated depths of removal of unsuitable soils will range from 4 to 5 feet. However, actual removal depths will have to be determined during grading on the basis of in-grading observations and testing performed by a representative of geotechnical consultants.

To provide support for foundations for minor structures and for at-grade concrete walks and slabs, all existing fill and disturbed natural soils should be excavated and replaced with properly compacted fill. Any required fill should be properly compacted as specified below.

At least the upper six (6) inches of all excavated surfaces should be scarified and moisture conditioned to 3 percent above optimum moisture, if necessary, and compacted to at least 90 percent relative compaction as per ASTM Standard D1557 test method, prior to placing any fill and/or structures.

7.3 FILL PLACEMENT AND COMPACTION REQUIREMENTS

Material for engineered fill should be select free of organic material, debris, and other deleterious substances, and should not contain fragments greater than 3 inches in maximum dimension. On-site excavated soils that meet these requirements may be used to backfill the excavated building pad area.

All fill should be placed in 6-inch-thick maximum lifts, watered or air dried as necessary to 3 percent above optimum moisture content, and then compacted in place to a maximum relative compaction of 90 percent. The laboratory maximum dry density and optimum moisture content for each change in soil type should be determined in accordance with Test Method ASTM D 1557. A representative of the project consultant should be present on-site during grading operations to verify proper placement and compaction of all fill, as well as to verify compliance with the other geotechnical recommendations presented herein.

Imported soils, if any, should consist of clean materials exhibiting a VERY LOW expansion potential (Expansion Index less than 20). Soils to be imported should be approved by the project geotechnical consultant prior to importation.

7.4 GEOTECHNICAL OBSERVATIONS

Exposed bottom surfaces in each removal area should be observed and approved by the project geotechnical consultant prior to placing fill. No fill should be placed without prior approval from the geotechnical consultant.

The project geotechnical consultant should be present on site during grading operations to verify proper placement and compaction of fill, as well as to verify compliance with the recommendations presented herein.

7.5 UTILITY TRENCH BACKFIL

All utility trench backfill should be compacted to a minimum relative compaction of 90 percent. Trench backfill materials should be placed in lifts no greater than approximately 6 inches in thickness, watered or air-dried as necessary to 3 percent above optimum moisture content, and then mechanically compacted in place to a minimum relative compaction of 90 percent. A representative of the project geotechnical consultant should probe and test the backfills to verify adequate compaction.

As an alternative for shallow trenches where pipe or utility lines may be damaged by mechanical compaction equipment, such as under floor slabs, imported clean sand exhibiting a sand equivalent (SE) value of 30 or greater may be utilized. The sand backfill materials should be watered to achieve 3 percent above optimum moisture conditions and then tamped into place. No specific relative compaction will be required; however, observation, probing, and if deemed necessary, testing should be performed by a representative of the project geotechnical consultant to verify an adequate degree of compaction and that the backfill will not be subject to settlement.

Where utility trenches enter the footprint of the floor slabs, they should be backfilled through their entire depths with on-site fill materials, sand-cement slurry, or concrete rather than with any sand or gravel shading. This “Plug” of less- or non-permeable materials will mitigate the potential for water to migrate through the backfilled trenches from outside to the areas beneath the foundations and floor slabs.

7.6 SHALLOW FOUNDATIONS

Following the site and foundation preparation recommended above, foundation for load bearing walls and interior columns may be designed as discussed below.

7.6.1 Bearing Capacity and Settlement

Load bearing walls and interior columns may be supported on continuous spread footings and isolated spread footings, respectively, and should bear entirely upon undisturbed native or properly engineered fill. Continuous and isolated footings should have a minimum width of 18 inches and 24 inches, respectively. All footings should be embedded a minimum depth of 24 inches measured from the lowest adjacent finish grade. Continuous and isolated footings placed on such materials may be designed using an allowable (net) bearing capacity of 1,800 pounds per square foot (psf) respectively. Allowable increases of 200 psf for each additional 1 foot in width and 200 psf for each additional 6 inches in depth may be utilized, if desired. The maximum allowable bearing pressure should be 2,500 psf. The maximum bearing value applies to combined dead and sustained live loads. The allowable bearing pressure may be increased by one-third when considering transient live loads, including seismic and wind forces.

Based on the allowable bearing value recommended above, total settlement of the shallow footings are anticipated to be less than one inch, provided foundation preparations conform to the recommendations described in this report. Differential settlement is anticipated to be approximately half the total settlement for similarly loaded footings spaced up to approximately 30 feet apart.

7.6.2 Lateral Load Resistance

Lateral load resistance for the spread footings will be developed by passive soil pressure against sides of footings below grade and by friction acting at the base of the concrete footings bearing on compacted fill. An allowable passive pressure of 200 psf per foot of depth may be used for design purposes. An allowable coefficient of friction 0.30 may be used for dead and sustained live load forces to compute the frictional resistance of the footings constructed directly on compacted fill. Safety factors of 2.0 and 1.5 have been incorporated in development of allowable passive and frictional resistance values, respectively. Under seismic and wind loading conditions, the passive pressure and frictional resistance may be increased by one-third.

7.6.3 Footing Reinforcement

Reinforcement for footings should be designed by the structural engineer based on the anticipated loading conditions. Footings for structures that are supported in low expansive soils should have No. 4 bars, two top and two bottom.

7.7 CONCRETE SLAB ON-GRADE

Concrete slabs will be placed on undisturbed natural soils or properly compacted fill as outlined in Section 7.2. Moisture content of subgrade soils should be maintained 3 percent above the optimum moisture content.

At the time of the concrete pour, subgrade soils should be firm and relatively unyielding. Any disturbed soils should be excavated and then replaced and compacted to a minimum of 90 percent relative compaction. Slabs should be designed to accommodate low expansive fill soils. The structural engineer should determine the minimum slab thickness and reinforcing depending upon the expansive soil condition intended use. Slabs placed on low expansive soils should be at least 4 inches thick and have minimum reinforcement of No. 3 bars placed at mid-height of the slabs and spaced 18 inches on centers, in both directions. The structural engineer may require thicker slabs with more reinforcement depending on the anticipated slab loading conditions.

If moisture-sensitive floor covering is planned, a layer of open-graded gravel, at least 4 inches thick, should be placed below the concrete slab to form a capillary break. Alternately, moisture-proof membrane (such as 10-mil) may be utilized. The vapor barrier should be placed between sand layers (2 inches above and below) to protect the membrane from damage during construction. Gravel for use under a concrete floor slab should be clean, crushed rock that meets the gradation requirements presented below.

<u>Sieve Size</u>	<u>Percentage</u>
1 inch	100
¾ inch	90-100

7.8 PRELIMINARY PAVEMENT DESIGN

Pavement design should be confirmed at the completion of site grading when the subgrade soils are in-place. This should include sampling and R-Value testing of the actual subgrade soils and an analysis based upon the anticipated traffic loading.

For a preliminary pavement design, recommendations for pavement design section of asphalt parking areas are provided below. These values are based on an assumed R-value of 25.

For pavement design, Traffic indexes (TI) of 4.0 and 5.5 were used for the parking areas and auto driveways, respectively. The preliminary flexible pavement layer thickness is as follows:

RECOMMENDED ASPHALT PAVEMENT SECTION LAYER THICKNESS

Pavement Material	Recommended Thickness	
	TI = 4.0	TI = 5.5
Asphalt Concrete Surface Course	3 inches	4 inches
Class II Aggregate Base Course	6 inches	8 inches
Compacted Subgrade Soils	12 inches	12 inches

Asphalt concrete should conform to Sections 203 and 302 of the latest edition of the Standard Specifications for Public Works Construction (“Greenbook”).

Class II aggregate base should conform to Section 26 of the Caltrans Standard Specifications, latest edition. The aggregate base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Method D 1557.

Portland cement concrete paving sections were determined in accordance with procedures developed by the Portland Cement Association. Concrete paving sections for three Traffic Indices are presented below. We have assumed that the portland cement concrete will have a compressive strength of at least 3,000 pounds per square inch.

Assumed Traffic Index	PCC Paving (Inches)	Base Course (Inches)
4½ (Automobile Parking)	7	4
5½ (Driveways and Light Track Traffic)	7½	4
6½ (Roadways and Heavy Truck Traffic)	8	4

7.9 SOLUBLE SULFATES AND SOIL CORROSIVITY

Concrete subject to exposure to sulfates shall comply with the requirements set forth in ACI 318, Section 4.3. Based on the available water soluble sulfate results the corrosion potential to buried concrete should be considered “low”, i.e., exposure Class S₀, per ACI 318, Table 4.2.1. Consequently, injurious sulfate attack is not a concern with a minimum 28-day compressive strength of 2,500 psi.

Per CBC 2016, Section 1904.4, concrete reinforcement should be protected from corrosion and exposure to chlorides in accordance with ACI 318, Section 4.4.

The corrosion potential of the on-site materials to buried steel was evaluated in accordance with Caltrans corrosive environment evaluation criteria. Caltrans considers a site corrosive, if at least one of the following conditions exists:

- Chloride content ≥ 500 ppm;
- Soluble sulphate content $\geq 2,000$ ppm;
- $\text{pH} \leq 5.5$.

Observations and laboratory tests indicate that based on the Caltrans’ criteria the soils at the site are considered non-corrosive. If additional recommendations are desired, it is recommended that a corrosion specialist be consulted regarding suitable types of piping and necessary protection for underground metal conduits.

8.0 CONSTRUCTION CONSIDERATIONS

Based on our field exploration program, earthwork can be performed with conventional construction equipment.

8.1 TEMPORARY DEWATERING

Groundwater was encountered within our borings at 15 feet below ground surface. Based on the anticipated excavation depths, the need for temporary dewatering is considered low.

8.2 CONSTRUCTION SLOPES

Excavations during construction should be conducted so that slope failure and excessive ground movement will not occur. The short-term stability of excavation depends on many factors, including slope angle, engineering characteristics of the subsoils, height of the excavation and length of time the excavation remains unsupported and exposed to equipment vibrations, rainfall and desiccation.

Where space permits, and providing that adjacent facilities are adequately supported, open excavations may be considered. In general, unsupported slopes for temporary construction excavations should not be expected to stand at an inclination steeper than 1:1 (horizontal:vertical). The temporary excavation side walls may be cut vertically to a height of 3 feet and then laid back at a 1:1 slope ratio above a height of 3 feet.

Surcharge loads should be kept away from the top of temporary excavations a horizontal distance equal to at least one-half the depth of excavation. Surface drainage should be controlled along the top of temporary excavations to preclude wetting of the soils and erosion of the excavation faces. Even with the implementation of the above recommendations, sloughing of the surface of the temporary excavations may still occur, and workmen should be adequately protected from such sloughing.

If site conditions do not provide sufficient space for sloped excavations at the project site, slot cutting techniques in a repeating “ABC” sequence may be required. First, all the slots designated as “A” should be excavated, backfilled and recompacted. The procedure should continue with the “B” slots and end with the “C” slots. The width of each slot should not exceed 6 feet. If any evidence of potential instability is observed, revised recommendations such as narrower slot cuts may be necessary. All slot excavation and backfilling procedures should be performed under the observation and testing of a qualified geotechnical engineer.

9.0 POST INVESTIGATION SERVICES

Final project plans and specifications should be reviewed prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. Following review of plans and specifications, observation should be performed by the geotechnical engineer during construction to document that foundation elements are founded on/or penetrate onto the recommended soils, and that suitable backfill soils are placed upon competent materials and properly compacted at the recommended moisture content.

10.0 CLOSURE

The conclusions, recommendations, and opinions presented herein are: (1) based upon our evaluation and interpretation of the limited data obtained from our field and laboratory programs; (2) based upon an interpolation of soil conditions between and beyond the borings; (3) are subject to confirmation of the actual conditions encountered during construction; and, (4) are based upon the assumption that sufficient observation and testing will be provided during construction.

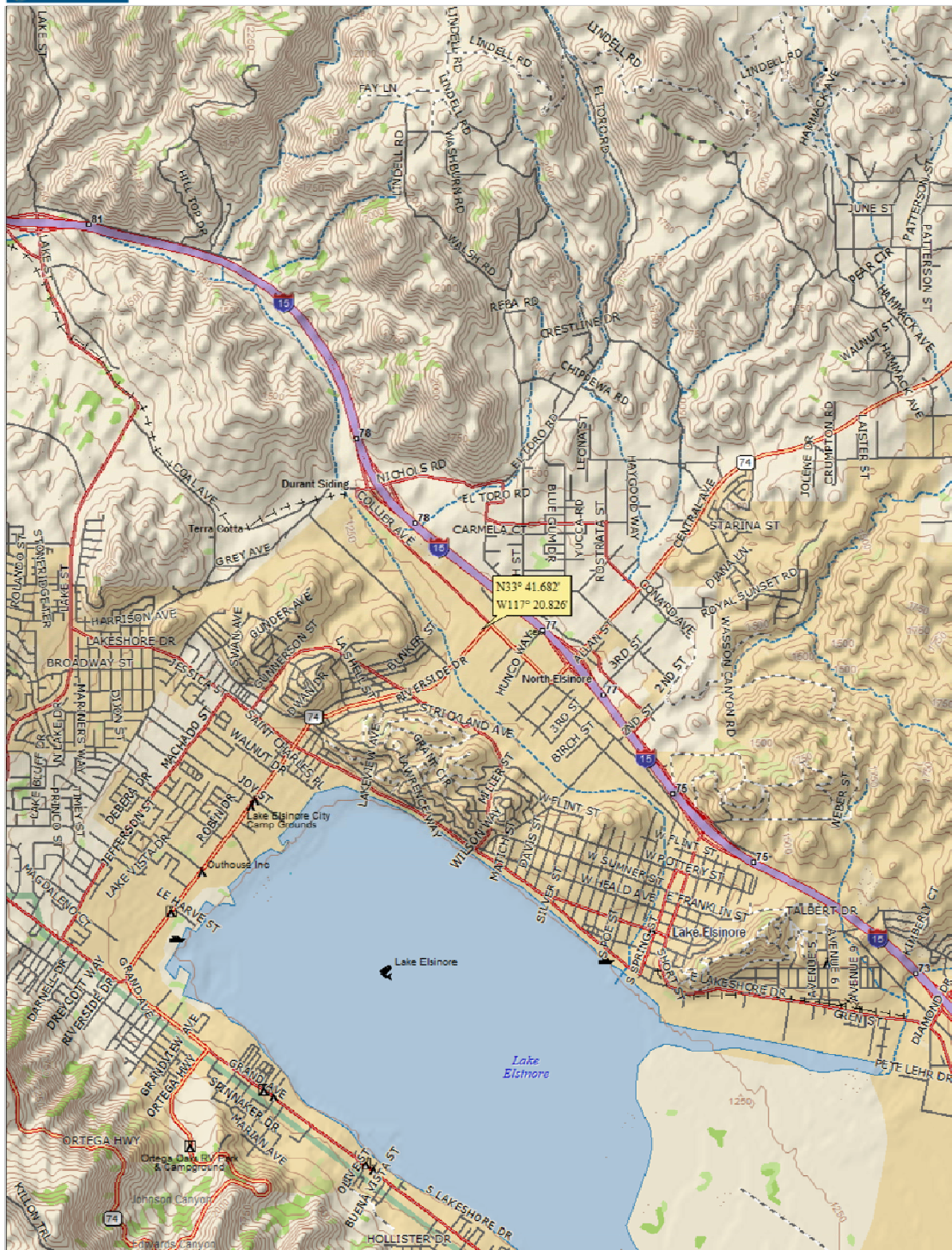
If parties other than GeoBoden are engaged to provide construction geotechnical services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the findings and recommendations in this report or providing alternate recommendations.

If pertinent changes are made in the project plans or conditions are encountered during construction that appear to be different than indicated by this report, please contact this office. Significant variations may necessitate a re-evaluation of the recommendations presented in this report.

11.0 REFERENCES

California Building Code, 2016 Volume 2.

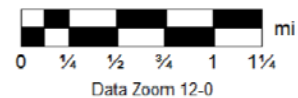
FIGURES



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Geotechnical Consultants

SITE VICINITY MAP
Proposed Kassab Travel Center
29301 Riverside Drive
Lake Elsinore, California

Figure By
S.R.

Map No.
XX

Date
12-30-17

Project No.

Lake Elsinore

Figure No.

1

APPENDIX A

BORING LOGS

APPENDIX A
SUBSURFACE EXPLORATION PROGRAM

PROPOSED KASSAB TRAVEL CENTER
29301 RIVERSIDE DRIVE
LAKE ELSINORE, CALIFORNIA

Prior to drilling, the proposed borings were located in the field by measuring from existing site features.

A total of 8 exploratory borings (B-1 through B-8) were drilled using a hollow-stem auger drill rig equipped with 8-inch outside diameter (O.D.) augers and hand-auger equipment. GeoBoden, Inc. of Irvine, California performed the drilling on December 18, 2017. The borings locations are shown on Figure 2.

Depth-discrete soil samples were collected at selected intervals from the exploratory borings using a 2 ½ -inch inside diameter (I.D.) modified California Split-barrel sampler fitted with 12 brass ring of 2 ½ inches in O.D. and 1-inch in height and one brass liner (2 ½ -inch O.D. by 6 inches long) above the brass rings. The sampler was lowered to the bottom of the boreholes and driven 18 inches into the soil with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler the lower 12 inches is shown on the blow count column of the boring logs.

After removing the sampler from the boreholes, the sampler was opened and the brass rings and liner containing the soil were removed and observed for soil classification. Brass rings containing the soil were sealed in plastic canisters to preserve the natural moisture content of the soil. Soil samples collected from exploratory borings were labeled, and were transported for physical testing.

Standard Penetration Tests (SPTs) were also performed. The SPT consists of driving a standard sampler, as described in the ASTM 1586 Standard Method, using a 140-pound hammer falling 30 inches. The number of blows required to drive the SPT sampler the lower 12 inches of the sampling interval is recorded on the blow count column of the boring logs.

The soil classifications and descriptions on field logs were performed using the Unified Soil Classification System as described by the American Society for Testing and Materials (ASTM) D 2488, “Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).” The final boring logs were prepared from the field logs and are presented in this Appendix.

At the completion of the sampling and logging, the exploratory borings were backfilled with the drilled cuttings.

GEOBODEN, INC.

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT <u>Mr. Ron Kassab</u>	PROJECT NAME <u>Proposed Kassab Travel Center</u>
PROJECT NUMBER <u>Lake Elsinore-1-01</u>	PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>	GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>HSA</u>	▽ AT TIME OF DRILLING <u>15.00 ft</u>
LOGGED BY <u>C.R.</u> CHECKED BY _____	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
5		SANDY CLAY (CL): yellowish brown, moist, ~30% sand, ~70% fines	MC R-1		12		97	24	49	18	31	69
10		SANDY CLAY (CL): strong brown, moist, ~30% fine sand, ~70% fines	SS S-2		14			28				70
15	▽	light brown, wet	MC R-3		12							
20			SS S-4		14							
25		brown, wet	SS S-5		12							
30		SAND (SP): yellowish brown, wet, coarse sand	SS S-6		16							
Bottom of borehole at 31.5 feet below ground surface. Ground water was encountered at 15 feet. Boring was backfilled with cuttings. Bottom of borehole at 31.5 feet.												

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GEOBODEN, INC.

BORING NUMBER B-2

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CLIENT <u>Mr. Ron Kassab</u>	PROJECT NAME <u>Proposed Kassab Travel Center</u>
PROJECT NUMBER <u>Lake Elsinore-1-01</u>	PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>	GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>HSA</u>	<u>▽</u> AT TIME OF DRILLING <u>15.00 ft</u>
LOGGED BY <u>C.R.</u> CHECKED BY _____	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SANDY CLAY (CL): brown, moist, fine sand										
5			MC R-1		16		99	25				
10			SS S-2		11							
15	▽	SANDY CLAY (CL): yellowish brown, moist, ~30% fine sand, ~70% fines	MC R-3		12							
20		SAND (SP): light yellowish brown, wet, coarse sand	SS S-4		15							
25		SANDY CLAY (CL): brown, moist, ~30% fine sand, ~70% fines	SS S-5		21							
30			SS S-6		26							
Bottom of borehole at 31.5 feet below ground surface. Ground water was encountered at 15 feet. Boring was backfilled with cuttings. Bottom of borehole at 31.5 feet.												

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GEOBODEN, INC.

BORING NUMBER B-3

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CLIENT <u>Mr. Ron Kassab</u>	PROJECT NAME <u>Proposed Kassab Travel Center</u>
PROJECT NUMBER <u>Lake Elsinore-1-01</u>	PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>	GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>HSA</u>	<u>▽</u> AT TIME OF DRILLING <u>15.00 ft</u>
LOGGED BY <u>C.R.</u> CHECKED BY _____	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
5		SANDY CLAY (CL): brown, moist, ~30% sand, ~70% fines										
			MC R-1		13		100	26				
10			SS S-2		16							
		SANDY CLAY (CL): brown, moist, ~30% fine sand, ~70% fines										
15			MC R-3		19							
20			SS S-4		14							
25		wet	SS S-5		12							
		SAND w. SILT (SP-SM): yellowish brown, wet										
30			SS S-6		16							
Bottom of borehole at 31.5 feet below ground surface. Ground water was encountered at 15 feet. Boring was backfilled with cuttings. Bottom of borehole at 31.5 feet.												

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CLIENT <u>Mr. Ron Kassab</u>	PROJECT NAME <u>Proposed Kassab Travel Center</u>
PROJECT NUMBER <u>Lake Elsinore-1-01</u>	PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>	GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>HSA</u>	▽ AT TIME OF DRILLING <u>15.00 ft</u>
LOGGED BY <u>C.R.</u> CHECKED BY _____	AT END OF DRILLING <u>---</u>
NOTES _____	AFTER DRILLING <u>---</u>

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		CLAY (CL): grayish brown, moist										
5												
		CLAY w. SAND (CL): yellowish brown, moist, ~20% fine sand, ~80% fines [NATIVE]	MC R-1		19		103	27				
10			SS S-2		26							
15	▽		MC R-3		36							
20			SS S-4		29							
Bottom of borehole at 21.5 feet below ground surface. Ground water was encountered at 15 feet. Boring was backfilled with cuttings. Bottom of borehole at 21.5 feet.												

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GEOBODEN, INC.

BORING NUMBER B-5

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CLIENT <u>Mr. Ron Kassab</u>		PROJECT NAME <u>Proposed Kassab Travel Center</u>	
PROJECT NUMBER <u>Lake Elsinore-1-01</u>		PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>	
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>		GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>	
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>		GROUND WATER LEVELS:	
DRILLING METHOD <u>HSA</u>		▽ AT TIME OF DRILLING <u>15.00 ft</u>	
LOGGED BY <u>C.R.</u> CHECKED BY _____		AT END OF DRILLING ---	
NOTES _____		AFTER DRILLING ---	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		SANDY CLAY (CL): brown, moist, ~30% sand, ~70% fines										
5			MC R-1		14		104	27				
10		CLAY (CL): brown, moist, ~10% fine sand, ~90% fines	SS S-2		11							
15	▽		MC R-3		14							
20			SS S-4		18							
Bottom of borehole at 21.5 feet below ground surface. Ground water was encountered at 15 feet. Boring was backfilled with cuttings. Bottom of borehole at 21.5 feet.												

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GEOBODEN, INC.

BORING NUMBER B-6

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CLIENT <u>Mr. Ron Kassab</u>	PROJECT NAME <u>Proposed Kassab Travel Center</u>
PROJECT NUMBER <u>Lake Elsinore-1-01</u>	PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>	GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>HSA</u>	AT TIME OF DRILLING ---
LOGGED BY <u>C.R.</u> CHECKED BY _____	AT END OF DRILLING ---
NOTES _____	AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0													
5		SANDY CLAY (CL): brown, moist, ~30% sand, ~70% fines	MC R-1		11		103	26					
10		SANDY CLAY (CL): light brown, moist, ~30% fine sand, ~70% fines	MC R-2		14								
		Bottom of borehole at 11.5 feet below ground surface. Ground water was not encountered. Boring was backfilled with cuttings. Bottom of borehole at 11.5 feet.											

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GEOBODEN, INC.

BORING NUMBER B-7

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CLIENT <u>Mr. Ron Kassab</u>	PROJECT NAME <u>Proposed Kassab Travel Center</u>
PROJECT NUMBER <u>Lake Elsinore-1-01</u>	PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>	GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>HSA</u>	AT TIME OF DRILLING ---
LOGGED BY <u>C.R.</u> CHECKED BY _____	AT END OF DRILLING ---
NOTES _____	AFTER DRILLING ---

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DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0												
5		SANDY CLAY (CL): brown, moist, ~30% sand, ~70% fines	MC R-1		12							
10		SANDY CLAY (CL): brown, moist, ~30% fine sand, ~70% fines	MC R-2		16							
Bottom of borehole at 11.5 feet below ground surface. Ground water was not encountered. Boring was backfilled with cuttings. Bottom of borehole at 11.5 feet.												




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GEOBODEN, INC.

BORING NUMBER B-8

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CLIENT <u>Mr. Ron Kassab</u>	PROJECT NAME <u>Proposed Kassab Travel Center</u>
PROJECT NUMBER <u>Lake Elsinore-1-01</u>	PROJECT LOCATION <u>29301 Riverside Drive, Lake Elsinore, CA</u>
DATE STARTED <u>12/18/17</u> COMPLETED <u>12/18/17</u>	GROUND ELEVATION _____ HOLE SIZE <u>8 inches</u>
DRILLING CONTRACTOR <u>GeoBoden Inc.</u>	GROUND WATER LEVELS:
DRILLING METHOD <u>HSA</u>	AT TIME OF DRILLING ---
LOGGED BY <u>C.R.</u> CHECKED BY _____	AT END OF DRILLING ---
NOTES _____	AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0													
5		SANDY CLAY (CL): brown, moist, ~30% sand, ~70% fines	 MC R-1		16								
10		SANDY CLAY (CL): light brown, moist, ~30% fine sand, ~70% fines	 MC R-2		18								
Bottom of borehole at 11.5 feet below ground surface. Ground water was not encountered. Boring was backfilled with cuttings. Bottom of borehole at 11.5 feet.													

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APPENDIX B

LABORATORY TESTING

APPENDIX B
LABORATORY TESTING
PROPOSED KASSAB TRAVEL CENTER
29301 RIVERSIDE DRIVE
LAKE ELSINORE, CALIFORNIA

Laboratory tests were performed on selected samples to assess the engineering properties and physical characteristics of soils at the site. The following tests were performed:

- moisture content and dry density
- No. 200 Wash sieve
- Atterberg limits
- consolidation
- expansion potential
- corrosion

Test results are summarized on laboratory data sheets or presented in tabular form in this appendix.

Moisture Density Tests

The field moisture contents, as a percentage of the dry weight of the soils, were determined by weighing samples before and after oven drying. The dry density, in pounds per cubic foot, was also determined for all relatively undisturbed ring samples collected. These analyses were performed in accordance with ASTM D 2937. The results of these determinations are shown on the boring logs in Appendix A.

No. 200 Wash Sieve

A quantitative determination of the percentage of soil finer than 0.075 mm was performed on a selected soil sample by washing the soil through the No. 200 sieve. Test procedures were performed in accordance with ASTM Method D1140. The results of the tests are shown on the boring logs.

Atterberg Limits

Liquid limit, plastic limit, and plasticity index were determined for selected soil sample in accordance with ASTM D 4318. The soil sample was air-dried and passed through a No. 40 sieve and moisturized. The liquid and plastic limit tests were performed on the fraction passing the No. 40 sieve. Results of the Atterberg limits tests are shown graphically and presented in this Appendix.

Consolidation

The test was performed in accordance with ASTM Test method D 2345. The compression curve from the consolidation test is presented in this Appendix.

Expansion Potential

Expansion index test was performed on a representative sample of the on-site soils in accordance with ASTM D4829. The result of the expansion test is summarized in Table B-1.

TABLE B-1 (Expansion Index Test Data)

Boring Designation	Depth (ft)	Expansion Index (EI)
B-1	0-5	22

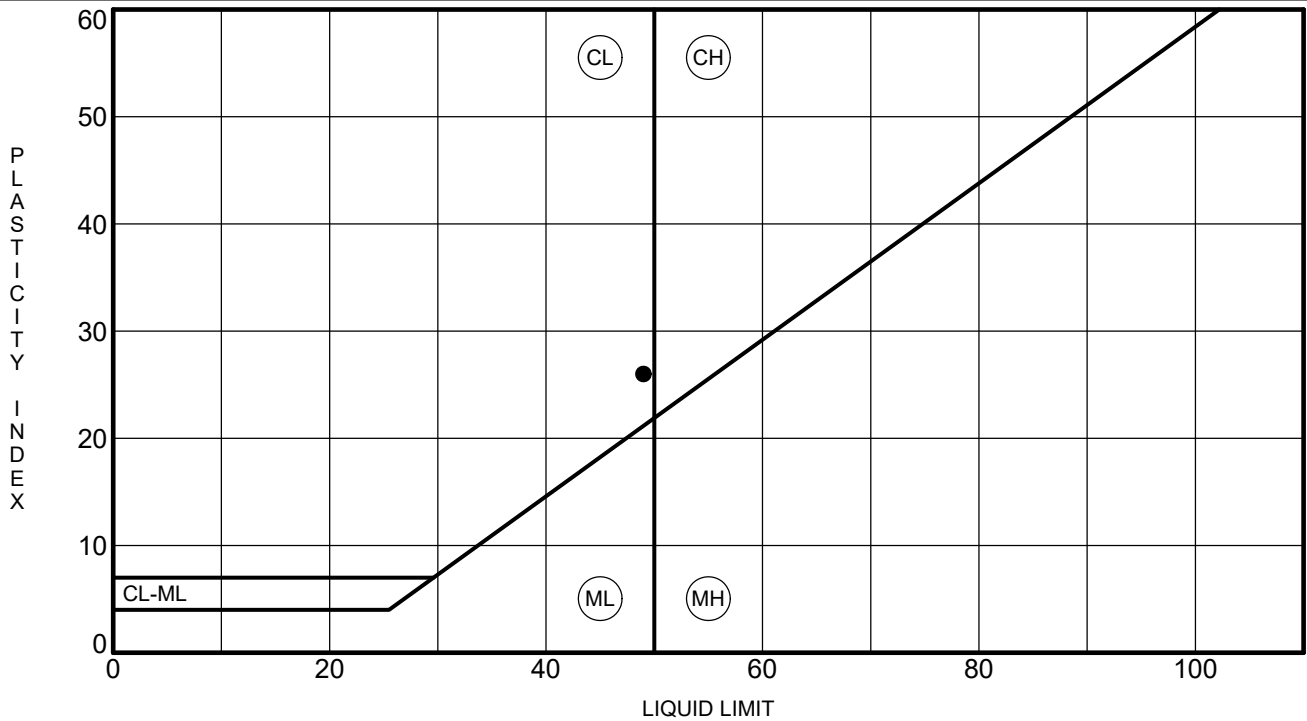
Corrosion Potential

A selected soil sample was tested to determine the corrosivity of the site soil to steel and concrete. The soil sample was tested for soluble sulfate (Caltrans 417), soluble chloride (Caltrans 422), and pH and minimum resistivity (Caltrans 643). The results of corrosion tests are summarized in Table B-2.

TABLE B-2 (Corrosion Test Results)

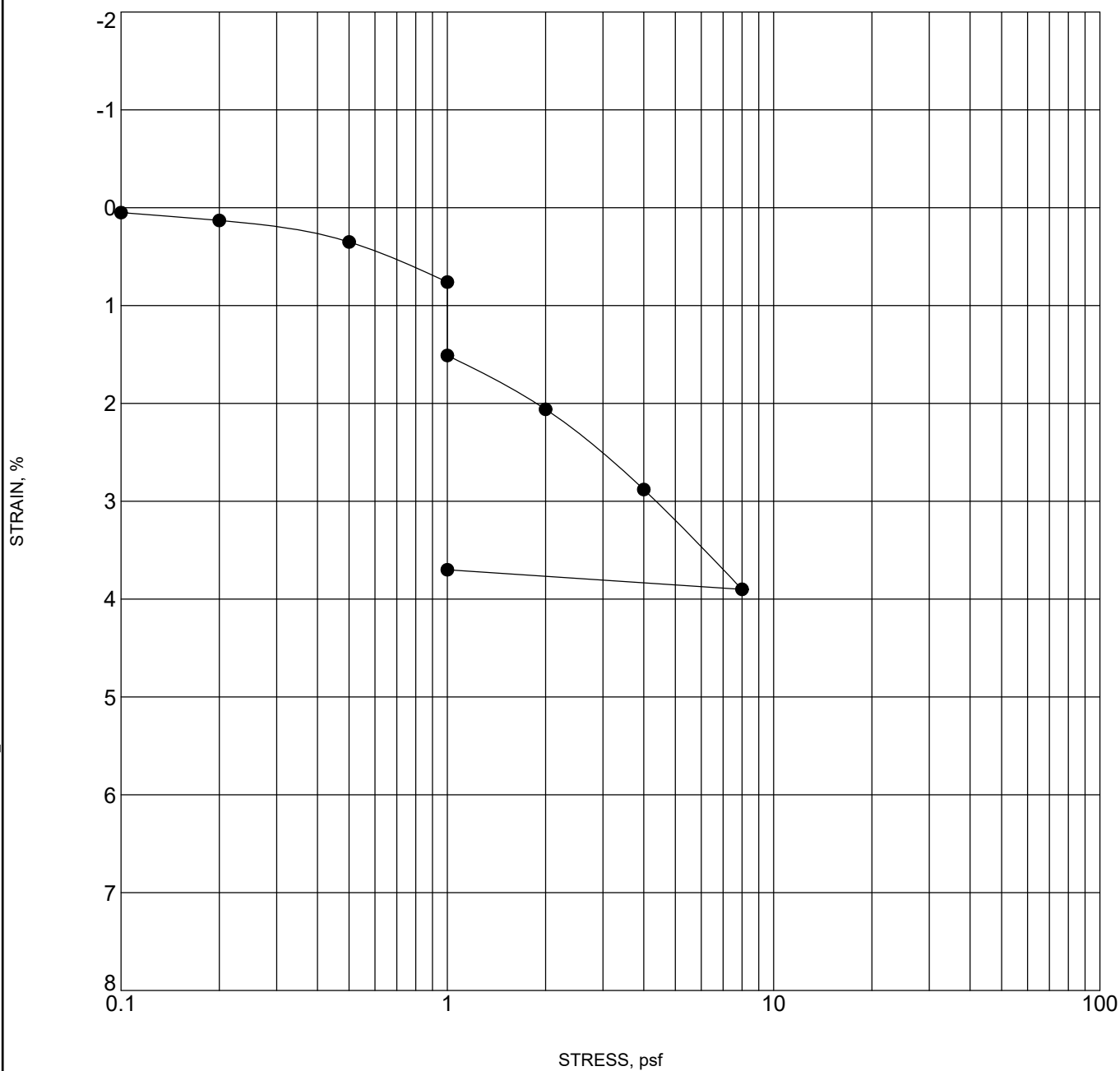
Boring No.	Depth (ft)	Chloride Content (Calif. 422) ppm	Sulfate Content (Calif. 417) % by Weight	pH (Calif. 643)	Resistivity (Calif. 643) Ohm*cm
B-1	0-5	89	0.0178	7.6	1,058

PROJECT NUMBER Lake Elsinore-1-01	PROJECT LOCATION 29301 Riverside Drive, Lake Elsinore, CA
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CLIENT Mr. Ron KassabPROJECT NAME Proposed Kassab Travel CenterPROJECT NUMBER Lake Elsinore-1-01PROJECT LOCATION 29301 Riverside Drive, Lake Elsinore, CA

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Specimen Identification		Classification	γ_d	MC%
● B-1	5.0	SANDY LEAN CLAY(CL)	97	24