REPORT OF
GEOTECHNICAL INVESTIGATION AND PERCOLATION TESTING
PROPOSED COMMERCIAL PLAZA PROJECT
PIN/APN: 963070018
SOUTHWEST CORNER OF BENTON ROAD AND PANFIELD LANE
WINCHESTER (RIVERSIDE COUNTY), CALIFORNIA 92596

FOR

CROSS ENGINEERING SERVICES, LLC

PROJECT NO. 20-679-02

JANUARY 25, 2021

January 25, 2021 20-679-02

Cross Engineering Services, LLC
203 West Main Street, Ste. F3
Lexington, SC 29072

Attention: Mr. Joseph Cross

Subject: Report of Geotechnical Investigation And Percolation Testing
Proposed Commercial Plaza Project
PIN/APN: 963070018
Southwest Corner of Benton Road and Panfield Lane
Winchester (Riverside County), California 92596

Gentlemen:

INTRODUCTION

This report presents the results of a geotechnical investigation and percolation testing for the subject project. During the course of this investigation, the engineering properties of the subsurface materials were evaluated in order to provide recommendations for design and construction of foundations, parking pavement and on-site storm water infiltration. The investigation included subsurface exploration, soil sampling, in-situ percolation testing, laboratory testing, engineering evaluation and analysis, consultation, and preparation of this report.

During the course of our investigation, the provided site plan was used as reference.

The enclosed Site Plan; Drawing No. 1, shows the approximate locations of the exploratory borings in relation to the site boundaries, proposed building. This drawing also shows the approximate locations of the Perc-1 and Perc-2 within which the percolation tests were performed.

Figure No. 1 shows the Site Vicinity Map. Figure No. 2 shows the Regional Topographic Map. Figure No. 3 shows the Regional Geologic Map. Figure No. 4 shows the Historically Highest Groundwater (Contour Map).

The attached Appendix I, describes the method of field exploration. Figure Nos. I-1 through I-5 present summaries of the materials encountered at the location of our borings. Figure No. I-6 presents the Uniform Soil Classification System Chart; a guide to the Log of Exploratory Borings.

The attached Appendix II describes the laboratory testing procedures. Figure Nos. II-1 and II-2 present the results of direct shear and consolidation tests performed on selected undisturbed soil samples.

Appendix III contains the outside laboratory test results that include “R” value and corrosivity tests.

PROJECT CONSIDERATIONS

It is our understanding that the proposed project will consist of construction of a new commercial plaza. The plaza will contain a car wash and two fast food restaurants. See the enclosed Site Plan; Drawing No. 1.

The proposed buildings are expected to be one-story high made of metal and wood. The flooring systems of the proposed buildings are expected to be in forms of concrete grade slabs established at or near the present grade. No basement is planned.

Parking for the proposed plaza will be provided in a form of open space parking lot. Some 38 parking spaces will be provided. The proposed car wash will have drive through access and possibly underground storage tanks. The approximate locations of the proposed buildings and parking spaces with respect to the site boundaries are shown on the enclosed Site Plan; Drawing No. 1.

Structural loading data was not available during the course of this investigation. For the purpose of this report, it is assumed that the maximum collected loads would be on the order of 60 kips, combined dead plus frequently applied live loads. Continuous (wall) footings are expected to exert loads of on the order of 3 kips per lineal foot.

ANTICIPATED SITE GRADING WORK

The major portion of the site grading work in the areas of the proposed buildings will involve removal and recompaction of the existing surficial fill and upper portion of the native soils which were found to be locally porous (a total thickness of 5 feet).

Within the areas of the parking lot, only the surficial fill (found to be on the order of 2 feet) should be removed and recompacted.

It is anticipated that as part of the proposed car wash complex, some underground storage tanks will be installed. As part of the site grading work, excavations will be made to create the cavities for installation of the new underground storage tanks.

The recompacted soils will be used for support of new grade slabs and foundations in the areas of the proposed buildings. The recompacted fill in the parking will be used for support of parking pavement sections.

The zone of removal should be extended beyond the exterior walls of the proposed buildings a horizontal distance equal to the thickness of fill which is 5 feet in most areas. Some 10 percent shrinkage should be considered when reusing the excavated materials in the areas of new fill which will be denser. Imported soils may be required to accomplish the site grading work. All imported soils should be non-expansive and granular in nature and be free of decomposable materials and rocks larger than 4 inches in diameter.

The clayey soils, found locally in our borings, are considered to be potentially expansive. These soils, when reused in the areas of new fill, should be placed back at some 3 percent higher than the optimum moisture content.

SITE CONDITIONS

SURFACE CONDITIONS

The subject site is located on the southwest corner of Benton Road & Panfield Lane, Winchester, Riverside County, California. The site is rectangular in shape covering a plan area of about 2.5 acres.

At the time of our investigation, the site was vacant. The ground surface was noted to be generally level. No significant slope occurs within or in close proximity of the subject property.

SUBSURFACE CONDITIONS

Correlation of the subsoil between the test holes was considered to be fair. Generally, the site, to the depths explored, was found to be covered with surficial fill consisting of silty sand underlain by natural deposits of silty sand, clean sand, sandy clay, and sandy silt soils. Thickness of the existing fill was found to be on the order of 2 feet in our borings. Deeper fill, however, may be present between and beyond our borings and beneath the old utilities.

The surficial fill should not be used for support of new fill, structural foundations, and grade slabs at their present state. The fill, however, may be excavated and reused in the areas of new compacted fill.

The upper 3 feet of the native soils were found to be locally porous and subject to hydroconsolidation. Within the areas of the proposed buildings, the top 3 feet of the native soils should also be removed and recompacted along with the surficial fill to support structural foundations and grade slabs.

The underlying native soils below a depth of about 5 feet were found to be generally dense and stiff and free of visual porosity. Such soils are considered to be adequate to receive new fill for support of grade slabs, and structural foundations. The results of our laboratory testing indicated that the site native soils below a depth of about 5 feet extending down to within the influence zone of foundation pressure were of moderate strengths and moderately compressible.

While the surficial fill were found to be granular in nature, the clayey soils found locally below the fill were found to be potentially expansive. During the course of site grading work, it would be desirable to mix the clay and sand to reduce the degree of expansion of the new compacted fill blanket.

During the course of our field investigation, no groundwater was encountered in our borings extended to a maximum depth of 21 feet. Due to the method of drilling (use of continuous auger) caving was not detected in our borings. Because the upper soils have significant amounts of fines, forming is expected not to be required during foundation construction.

SEISMIC DESIGN CONSIDERATIONS

In accordance with the California Building Code (CBC 2019), the project site can be classified as site "D". The seismic design parameters are obtained using ASCE7-16. The mapped spectral accelerations of S_S= 1.396 (short period) and S_1 =0.519 (1-second period) can be used for this project. These parameters correspond to site Coefficients values of F_a =1.0 and F_V = null (see the Note below), respectively.

The seismic design parameters would be as follows:

$\mathbf{S_{MS}}$= F_a (S_S) = 1.0 (1.396) = 1.396	$\mathbf{S_{M1}}$=F_v (S_1) = null (see Note below)
$\mathbf{S_{DS}}$=2/3 (S_{MS}) = 2/3 (1.396) = 0.931	$\mathbf{S_{D1}}$=2/3 (S_{M1}) = null (see Note below)

Note: Since the seismic factor S_1 is greater than 0.2 site-specific ground motion hazard analyses may be required. The project structural engineer shall determine if an exemption can be applied in accordance with ASCE7-16 Section 11.4.8. If an exemption applies, a long period coefficient (F_v) of 1.7 may be utilized for calculation of the seismic parameters $\mathbf{S_{M1}}$ and $\mathbf{S_{D1}}$ in the above Table.

EVALUATION OF LIQUEFACTION POTENTIAL

During the course of our investigation, no water was found our boring. The available maps show the historically highest groundwater level in the vicinity of the subject site may be close to 30 feet (see the enclosed Figure No. 4). However, the State of California Seismic Hazard Zone Map has placed the subject site outside the zone of potential liquefaction. On this basis, therefore, it is our opinion that soil liquefaction will not occur at the subject site.

STATEMENT 111

For the purpose of the subject project, it is our opinion that when the proposed grading and construction is made as planned, following the recommendations of this report, the site will be safe against the hazards of landsliding, settlement or slippage. The proposed construction and grading will not have adverse effect on the geologic stability of the existing properties outside the boundaries of the subject site.

SOIL CHEMICAL IMPURITIES AND CORROSION CONSIDERATIONS

After the proposed finished grades are established, samples of the subgrade materials in contact with foundations and utility lines, should be tested for chemical impurity (soil corrosivity). For the purpose of this report, however, it should be assumed that the site soils are corrosive. Subject to the results of chemical testing during construction, the design may be changed.

EVALUATION AND RECOMMENDATIONS

GENERAL

Based on the geotechnical engineering data derived from this investigation, the site can be developed as planned. The existing fill and upper 3 feet of the locally porous native soils (a total depth of about 5 feet) are considered to be inadequate for support of new fill, structural foundations, grade slabs at their present state. Within the areas of the proposed buildings, such soils should be excavated and recompacted to create a 5-foot thick blanket of compacted fill for support of grade slabs and structural foundations. Within the areas of the parking lot, only the surficial fill (some 2 feet thick) should be removed and recompacted to support parking pavement section.

The zone of removal should be extended beyond the exterior walls of the proposed buildings a horizontal distance equal to the thickness of removal. Some 10 percent shrinkage should be considered when reusing the excavated materials in the areas of new fill which will be denser. Imported soils may be required to accomplish the site grading work. All imported soils should be non-expansive and granular in nature and be free of decomposable materials and rocks larger than 4 inches in diameter.

After proper site grading work, conventional spread footing foundation system can be used for support of the proposed building. The foundation bearing materials should consist of properly compacted/engineered fill soils.

Grade slabs can be supported on the finished grades which would be properly compacted fill soils. The fine grained soils should be placed back to a relative compaction of at least 90 percent at some 3 percent higher than the optimum moisture content. Due to possible expansive character of compacted fill, the grade slabs for this

project should be at least 5 inches thick and be reinforced with # 4 bars placed at every 16 inches on center, each way.

The following sections present our specific recommendations for temporary excavations, foundations, lateral design, grade slabs, grading, surface drainage, and observations during construction.

TEMPORARY EXCAVATION

As part of the proposed project, temporary excavation will be made during installation of the tanks and site grading work. The cuts are expected to expose minor fill and native soils. Maximum vertical height of excavation is expected to be on the order of 12 feet.

Where space limitations permit, unshored temporary excavation slopes can be used. Based upon the engineering characteristics of the site materials, it is our opinion that temporary excavation slopes in accordance with the following table can safely be used:

Maximum Depth of Cut (Ft)	Maximum Slope Ratio (Horizontal: Vertical)
0-4	Vertical
>4	1:1

Water should not be allowed to flow over the top of the excavation in an uncontrolled manner. No surcharge should be allowed within a 45-degree line drawn from the bottom of the excavation. Excavation surfaces should be kept moist but not saturated to retard raveling and sloughing during construction.

It would be advantageous, particularly during wet season construction, to place polyethylene plastic sheeting over the slopes. This will reduce the chances of moisture changes within the soil banks and material wash into the excavation.

It should be noted that the recommendations presented in this section are for use in design and for cost estimating purposes prior to construction. The contractor is solely responsible for safety during construction.

GRADING RECOMMENDATIONS

The major portion of the site grading work in the areas of the proposed buildings will involve removal and recompaction of the existing surficial fill and upper portion of the native soils which were found to be locally porous (a total thickness of 5 feet). Within the areas of the parking lot, only the surficial fill (found to be on the order of 2 feet) should be removed and recompacted.

It is anticipated that as part of the proposed car wash complex, some underground storage tanks will be installed. As part of the site grading work, excavations will be made to create the cavities for installation of the new underground storage tanks.

The recompacted soils will be used for support of new grade slabs and foundations in the areas of the proposed buildings. The recompacted fill in the parking will be used for support of parking pavement sections.

The zone of removal should be extended beyond the exterior walls of the proposed buildings a horizontal distance equal to the thickness of fill which is 5 feet in most areas. Some 10 percent shrinkage should be considered when reusing the excavated materials in the areas of new fill which will be denser. Imported soils may be required to accomplish the site grading work. All imported soils should be non-expansive and granular in nature and be free of decomposable materials and rocks larger than 4 inches in diameter.

The clayey soils, found locally in our borings, are considered to be potentially expansive. These soils, when reused in the areas of new fill, should be placed back at some 3 percent higher than the optimum moisture content.

Prior to placement of any fill on the site, the Soil Engineer should observe the excavation bottoms. The areas to receive compacted fill should be scarified to a depth of about 8 inches, moistened as required to bring to near optimum moisture content and compacted to at least 90 percent of the maximum dry density as determined by the ASTM Designation D 1557 Compaction Method.

All imported soils should be granular in nature and be free of organic and rocks larger than 4 inches in diameter). Before import soils are brought to the site, a 20-pound sample of the proposed import soils should be submitted to the Soil Engineer (at least

48 hours in advance) so that the maximum density and expansion character of the import materials can be determined.

General guidelines regarding site grading are presented below in an itemized form which may be included in the grading plan. It is recommended that all fill be placed under engineering observation and in accordance with the following guidelines:

1. All vegetation and debris should be collected and hauled off-site. In the areas of proposed buildings, the existing fill and top 3 feet of porous native soils should be excavated until non-porous native soils are exposed.
2. In the areas of the surface parking, only the surficial fill should be removed and recompacted.
3. The excavated areas should be observed and approved by the Soil Engineer prior to placing any fill.
4. The excavated materials from the site are considered to be satisfactory for reuse in the compacted fill areas.
5. Fill material, approved by the Soil Engineer, should be placed in controlled layers. Each layer should be compacted to at least 90 percent of the maximum unit weight as determined by ASTM designation D 1557 for the material used.
6. The fill material shall be placed in controlled layers of not to exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to insure uniformity of material in each layer.
7. When moisture content of the fill material is too low to obtain adequate compaction, water shall be added and thoroughly dispersed until the moisture content is near optimum.
8. When the moisture content of the fill material is too high to obtain adequate compaction, the fill material shall be aerated by blading or other satisfactory methods until near optimum moisture condition is achieved.
9. Inspection and field density tests should be conducted by the Soil Engineer during grading work to assure that adequate compaction is attained. Where compaction of less than 90 percent is indicated, additional compactive effort should be made with adjustment of the moisture content or layer thickness, as necessary, until at least 90 percent compaction is obtained.

SITE DRAINAGE

Site drainage should be provided to divert roof and surface waters from the property through nonerodible drainage devices to the street. In no case should the surface waters be allowed to pond adjacent to building. A minimum slope of one and two percent are recommended for paved and unpaved areas, respectively.

The site drainage recommendations should also include the following:

1. Having positive slope away from the buildings, as recommended above;
2. Installation of roof drains, area drains and catch basins with appropriate connecting lines;
3. Managing landscape watering;
4. Regular maintenance of the drainage devices;
5. Damp proofing of the concrete bottoms;
6. The owners should be familiar with the general maintenance guidelines of the local jurisdiction requirements.

FOUNDATIONS

Conventional spread footings can be used for support of the proposed buildings. The foundation bearing materials should consist of properly compacted fill soils.

New footings should be at least 18 inches wide and be placed at a minimum depth of 24 inches below the lowest adjacent final grades. Properly designed and constructed spread footings may be based on an allowable maximum bearing pressure of 2,000 pounds per square foot. This value can be increased at a rate of 100 and 200 pounds per square for each additional foot of footing width and depth, to a maximum value of 2,700 pounds per square foot.

The above given values are for the total of dead and frequently applied live loads. For short duration transient loading, such as wind or seismic forces, these values may be increased by one-third.

Under the allowable maximum soil pressure, footings with assumed collected loads of 60 kips is expected to settle less than 7/8 of one inch. Wall footings, with loads of about 3 kips per lineal foot are expected to settle on the order of 5/8 of one inch.

Maximum differential settlements are expected to be on the order of 1/4 of an inch. The major portions of the settlements are expected to occur during construction.

LATERAL DESIGN

Lateral resistance at the base of footings in contact with properly compacted fill soils can be assumed to be the product of the dead load forces and a coefficient of friction of 0.4. Passive pressure on the face of footings may also be used to resist lateral forces. A passive pressure of zero at the finished grades and increasing at a rate of 250 pounds per square foot per foot of depth to a maximum value of 2,500 pounds per square foot may be used for footings poured against properly compacted fill soils.

CONCRETE SLABS

Grade slabs can be supported on the finished grades which would be properly compacted fill soils. The fine grained soils should be placed back to a relative compaction of at least 90 percent at some 3 percent higher than the optimum moisture content. Due to possible expansive character of compacted fill, the grade slabs for this project should be at least 5 inches thick and be reinforced with # 4 bars placed at every 16 inches on center, each way.

In the areas where moisture sensitive floor covering is used and slab dampness cannot be tolerated, a vapor-barrier should be used beneath the slabs. This normally consists of a 10-mil polyethylene film covered with 2 inches of clean sand.

MINOR RETAINING WALLS

Static design of minor, cantilevered retaining walls associated with landscaping that are structurally separate from the main building and support properly compacted granular backfill may be designed based on an equivalent fluid pressure of 30 pounds per square foot per foot of depth. This assumes that no hydrostatic pressure will occur behind the retaining walls. Therefore, retaining walls should be equipped with proper subdrain which normally consists of 4-inch diameter perforated pipes encased in gravel (at least one cubic foot per lineal foot of the pipes). In order to reduce the chances of

siltation and drain clogging, the free-draining gravel should be wrapped in filter fabric proper for the site soils.

In addition to the lateral earth pressure, the walls should also be designed for any applicable uniform surcharge loads imposed on the adjacent grounds. For cantilevered retaining walls, the uniform surcharge effects may be computed using a coefficient of 0.30 times the assumed uniform loads.

PAVEMENT DESIGN

It is our understanding that both automotive and truck traffic will use the proposed parking lot. Two bulk samples of the upper site soils from Borings B-3 and B-5 between depths of 1 to 5 feet from the subject site was obtained. The sample was transported to the offices of EGLAB to determination of the “R” value. The approximate location of the test holes within which bag samples were taken is shown on the enclosed Site Plan; Drawing No.1.

Using an “R” value of 11, the minimum pavement section alternatives for Traffic Index (TI) values ranging from 4 to 7 were calculated. The results are shown on the enclosed Calculation Sheet No. 1.

The lower TI value of 4 is normally used for passenger cars, including pickup trucks. The higher TI value of 7 is normally used for heavier traffic (trucks, including garbage trucks).

The R-value used for this project was for the upper soils. If, during site grading, imported fill should be used, the “R” value of the imported soils should be determined, and the recommended designed pavement section be modified.

Before pavement sections are placed, the surficial fill should be removed and recompacted. The new fill should be placed under engineering observation and testing, as presented in the preceding sections of this report.

This office should be notified if increased traffic loading condition is expected so that modification to the above given recommendations can be made. A Traffic Engineer should be consulted for design and use of proper pavement sections in the alley and roadway leading to parking entrances.

The base course should be compacted to a relative compaction of 95 percent per relative compaction. The soil engineer should verify the compaction degree of the pavement section subgrade and base course.

ON-SITE PERCOLATION TESTING

It is our understanding that, as part of the site development, it is required to provide an on-site storm water infiltration system. This normally consists of diversion of the storm water into a system that will allow infiltration into the ground. The infiltration zone should normally be kept away from existing and proposed building foundations and private property lines by at least 10 feet.

Where space is available, a horizontal system “trench drain” is used. For this project, we have only tested for horizontal drain system. The testing for horizontal system were conducted in Test Pits (Perc-1&2). The enclosed Site Plan; Drawing No. 1, shows the approximate location of the test pits, and within which the percolation testing was conducted.

The procedure for trench system design included performing the following tasks at the subject site:

1. Excavating each test pit to a depth of about 2.5 feet;
2. Extending a one cubic foot (1’ X 1 ’X 1’) hole at the base of the test pits;
3. Pre-saturating the one cubic foot holes overnight;
4. Conducting in-situ percolation testing the following day;
5. Making engineering evaluation/analysis/calculations;

The test pit diameter was at least 4 feet to allow entry and water level measurements. One cubic foot holes (1’ X1’ X 1’) were excavated at the bottom of the test pits on December 2, 2020 and presoaked for percolation test.

Next day, on the day of percolation test, there was freestanding water in the test pits. The water used to presoak the test pits did not percolate. Our close examination indicated that the upper soils are fine grained (silt and clay). As a result, the percolation test was not performed.

On the basis of the above, therefore, the subject site is considered to be a poor candidate for infiltration in a form of horizontal (trench drain) system. As such, the storm water can be diverted to the areas of planters and landscape. Any excess water, after going through the required filtration, will be carried to the curb line after going through the required on-site filtration process.

Alternatively, onsite soils consist of sand or silty sand soils at depths greater than 10 feet. Therefore, infiltration in a form of vertical (drywell) system could be suitable. However, additional testing is required to quantify the infiltration rate for such a system.

OBSERVATION DURING CONSTRUCTION

The presented recommendations in this report assume that all foundations will be established in properly compacted fill. All footing excavations should be observed and accepted by a representative of this office before reinforcing is placed.

Site grading work should be conducted under observation and testing by a representative of this firm. For proper scheduling, please notify this office at least 24 hours before any observation work is required.

CLOSURE

The findings and recommendations presented in this report were based on the results of our field and laboratory investigations combined with professional engineering experience and judgment. The report was prepared in accordance with generally accepted engineering principles and practice. We make no other warranty, either express or implied.

It is noted that the conclusions and recommendations presented are based on exploration "window" borings and excavations which is in conformance with accepted engineering practice. Some variations of subsurface conditions are common between "windows" and major variations are possible.

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The following Figures and Appendices are attached and complete this report:

Engineering Calculations
Drawing No. 1 - Site Plan
Figure No. 1 - Site Vicinity Map
Figure No. 2 - Regional Topographic Map
Figure No. 3 - Regional Geologic Map
Figure No. 4 - Historically Highest Groundwater Map
Appendix I-Method of Field Exploration
Figure Nos. I-1 through I-5
Unified Soil Classification System Figure No. I-6
Appendix II-Methods of Laboratory Testing
Figure Nos. II-1 and II-2
Appendix III – Outside Laboratory Test Results For “R” Value and Corrosivity by the Offices of EGLAB

Respectfully Submitted,

APPLIED EARTH SCIENCES

Fereidoun “Fred” Jahani
Project Engineer
RE62875

Caro J. Minas, President
Geotechnical Engineer
GE 601

FJ/CJM/se

Distribution: (4) Addressee

R-Value (From Lab Testing)
11

Traffic Index (TI)	Gravel Equivelence Factor (G_f)	Gravel Equivelence (GE)	Factor of Safety
4	2.50	0.456	1.1
5	2.50	0.570	1.1
6	2.32	0.737	1.1
7	2.14	0.932	1.1

Pavement Section Thickness (inches)						
Traffic Index (TI)	Full Tac*		Alternative No. 1		Alternative No. 2	
	Tac*(in)	Tbc** (in)	Tac*(in)	Tbc** (in)	Tac*(in)	Tbc** (in)
4	6	0	4	5	3	7 2/4
5	7 2/4	0	5	6 1/4	4	8 3/4
6	9 3/4	0	7	6 1/4	6	8 3/4
7	12 1/4	0	8	9 1/4	7	11 1/4

* Tac=Thickness of Asphalt Concrete (2" Minimum)

**Tbc= Thickness of Base Course (Class III) with R-Value of 78 or Better (3" Minimum)

Flexible Pavement Design Data

FOR: Benton Rd.&Panfield Ln, Winchester	**DATE**: 1/19/21	**PROJECT NO.:** 20-679-02
APPLIED EARTH SCIENCES GEOTECHNICAL . GEOLOGY . ENVIRONMENTAL ENGINEERING CONSULTANTS		**CALC SHEET No. 1**

C.M. APPLIED EARTH SCIENCES
a division of Applied Soil Technology, Inc.

SLOT CUT ANALYSIS

JN: **20-679-02** CONSULT: **AES**
CLIENT: **Benton Rd & Panfield Ln, Winchester**

CALCULATION SHEET # **2**

CALCULATE THE FACTOR OF SAFETY OF SLOT CUT EXCAVATIONS. ASSUME COHESIVE AND FRICTIONAL RESISTANCE ALONG THE SIDES OF SLOTS AS WELL AS THE FAILURE SURFACE. THE HORIZONTAL PRESSURE ON THE SIDES OF THE SLOTS IS THE AT-REST PRESSURE (1-SIN(phi)).

CALCULATION PARAMETERS

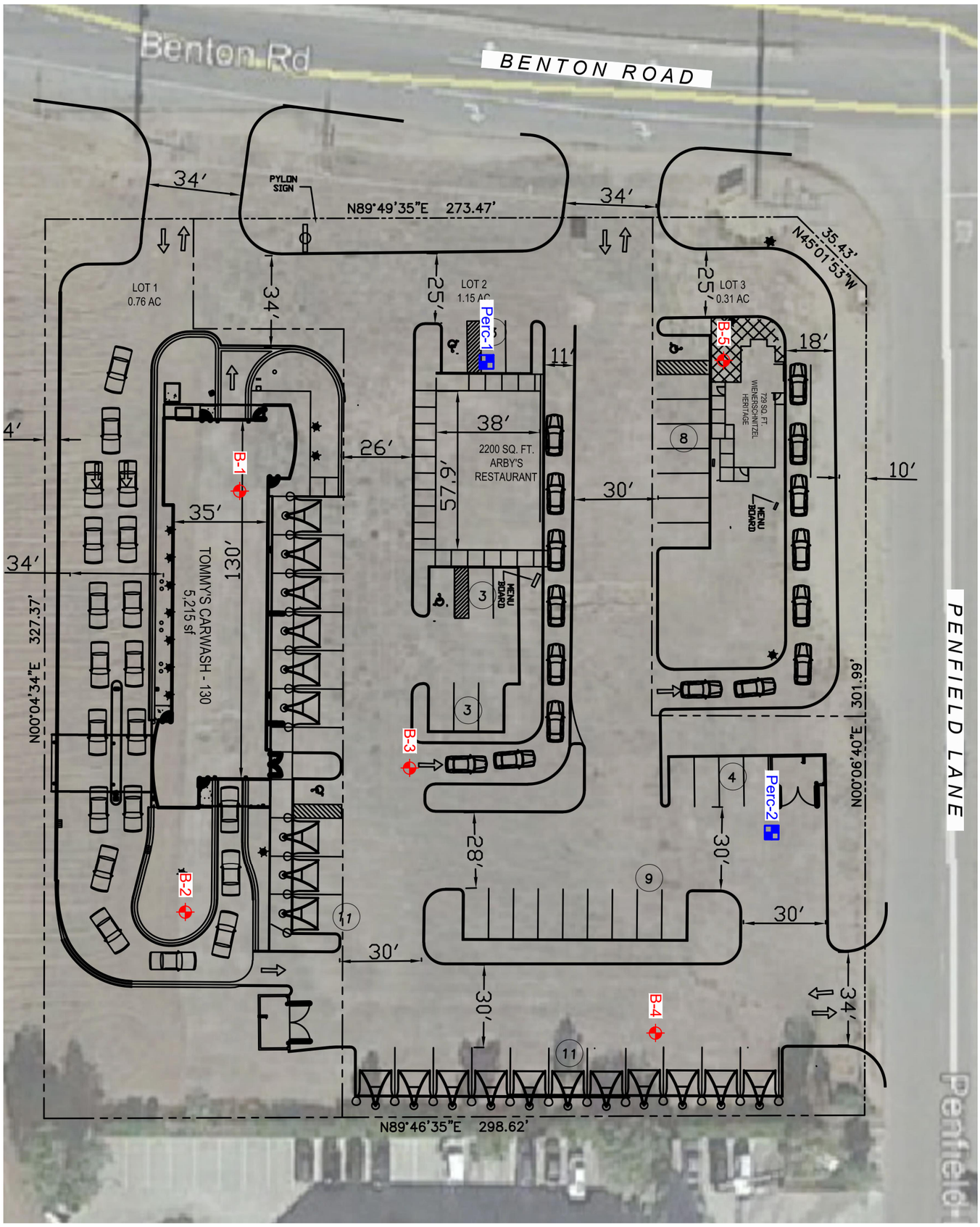
EARTH MATERIAL:	FILL and Native Soils	EXCAVATION HEIGHT:	5 feet
SHEAR DIAGRAM:	B-1, B-4, and B-5	BACKSLOPE ANGLE:	0 degrees
COHESION:	225 psf	SURCHARGE:	0 pounds
PHI ANGLE:	29 degrees	SURCHARGE TYPE:	P Point
DENSITY:	126 pcf	INITIAL FAILURE ANGLE:	17 degrees
SLOT BOUNDARY CONDITIONS		FINAL FAILURE ANGLE:	70 degrees
SLOT CUT WIDTH:	8 feet	INITIAL TENSION CRACK:	5 feet
COHESION:	225 psf	FINAL TENSION CRACK:	20 feet
PHI ANGLE:	29 degrees		

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	42	degrees
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	5.0	feet
DEPTH OF TENSION CRACK	0.5	feet
TOTAL EXTERNAL SURCHARGE	0.0	pounds
VOLUME OF FAILURE WEDGE	110.0	ft^3
WEIGHT OF FAILURE WEDGE	13854.9	pounds
LENGTH OF FAILURE PLANE	6.7	feet
SURFACE AREA OF FAILURE PLANE	54	ft^2
SURFACE AREA OF SIDES OF SLOTS	13.7	ft^2
NUMBER OF TRIAL WEDGES ANALYZED	14850	trials
TOTAL RESISTING FORCE ALONG WEDGE BASE (FrB)	4675.9	pounds
TOTAL RESISTING FORCE ALONG WEDGE SIDES (FrS)	2446.7	pounds
RESULTANT HORIZONTAL COMPONENT OF FORCE	**-62.6**	**pounds**
CALCULATED FACTOR OF SAFETY	**2.59**	

CONCLUSIONS:

THE CALCULATION INDICATES THAT SLOTS CUTS UP TO 8 FEET WIDE AND 5 FEET HIGH HAVE A SAFETY FACTOR GREATER THAN 1.25 AND ARE TEMPORARILY STABLE.



Scale: 1" = 40'

N

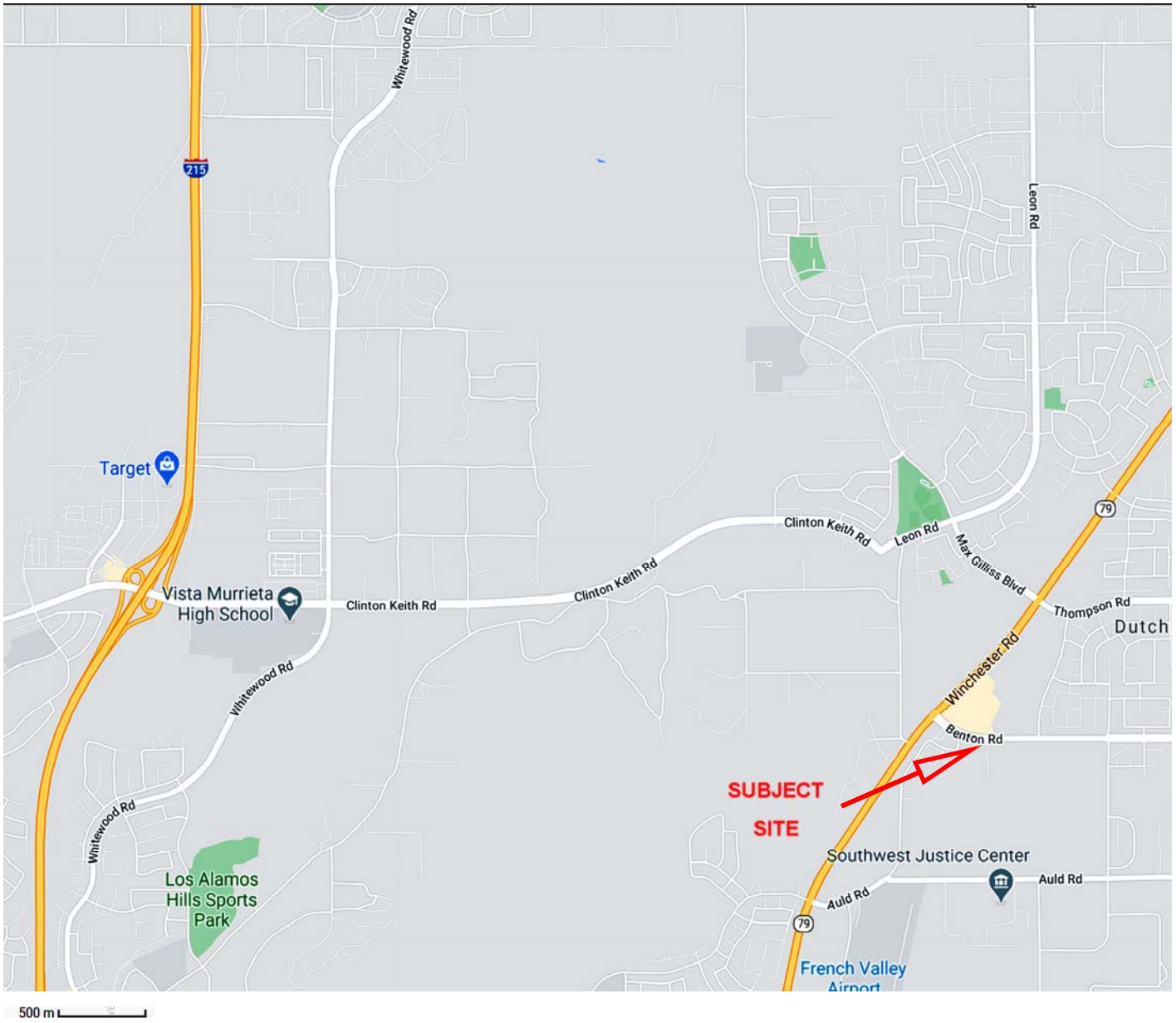
Perc-2 = Percolation Test, Shallow Trench System

B-5 = Location & Number of Boring

Note:
Site plan prepared by using a plan provided by the client

SITE PLAN		PROJECT No:	20-679-02
DESCRIPTION:	Proposed Commercial Plaza Project	DATE:	01 / 25 / 2021
FOR:	Cross Engineering Services, LLC	DRAWN BY:	VM
ADDRESS:	Southwest Corner of Benton Road & Panfield Lane, Winchester (Riverside County), CA 92596	CHECKED BY:	CM
Applied Earth Sciences	GEOTECHNICAL . GEOLOGY . ENVIRONMENTAL ENGINEERING CONSULTANTS	DRAWING No:	1

www.aessoil.com
(818) 552-6000



Reference: Portion of Google Maps

SITE VICINITY MAP

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

APPLIED EARTH SCIENCES
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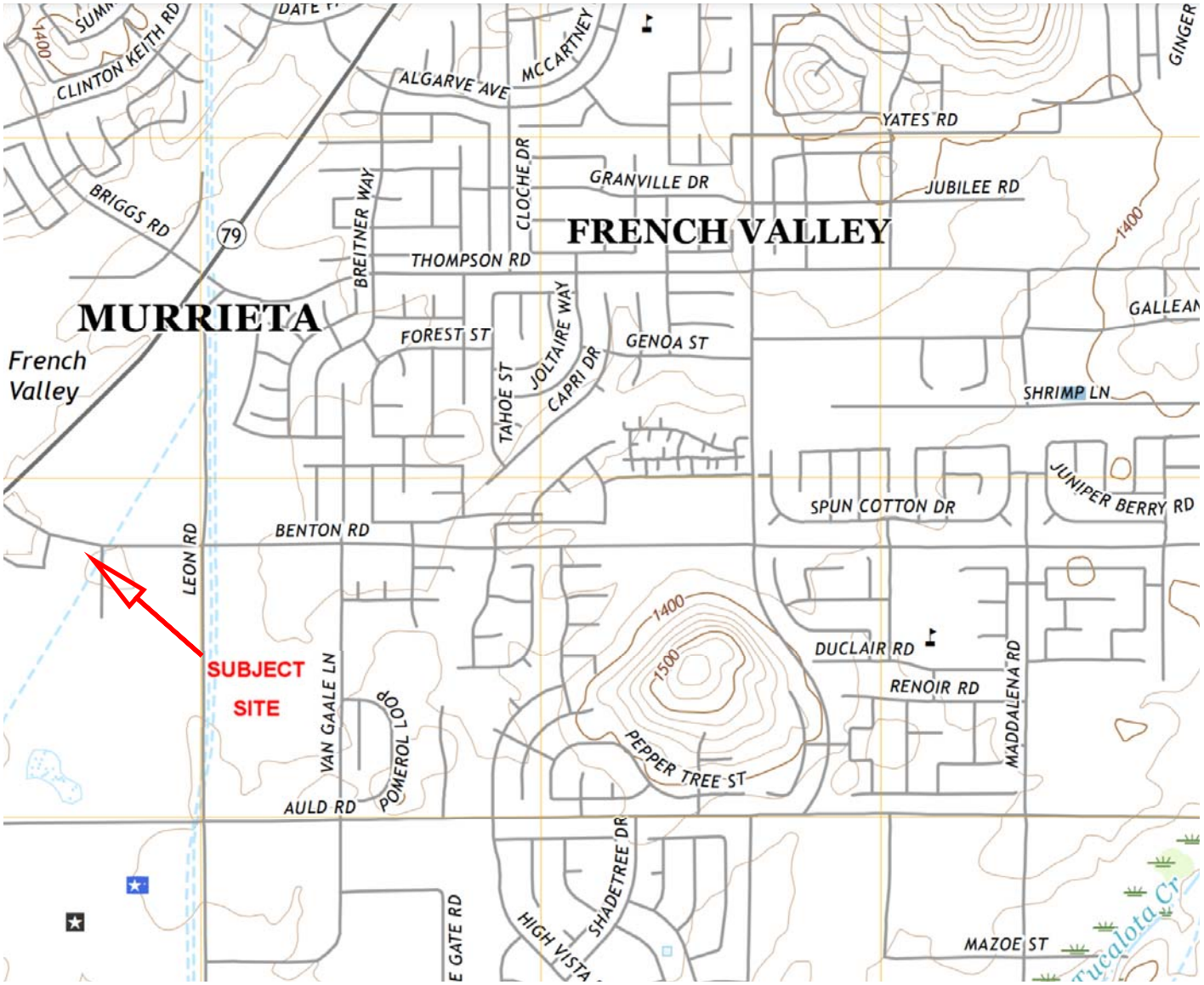
FIGURE No. 1



Reference: USGS Topo Map

REGIONAL TOPOGRAPHIC MAP

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

APPLIED EARTH SCIENCES
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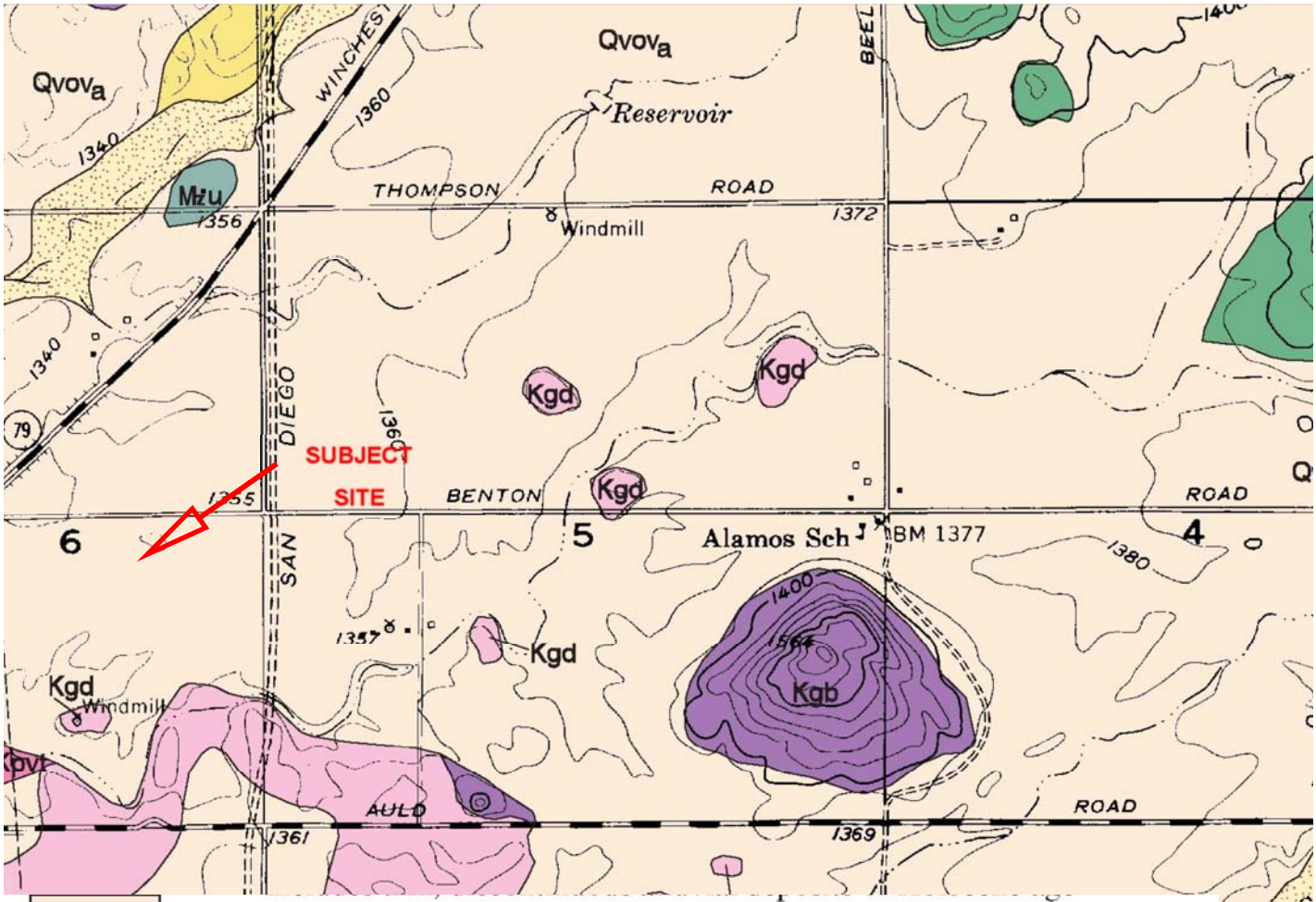
FIGURE No. 2



Qvov

Very old alluvial valley deposits (middle to early Pleistocene)—Fluvial sediments deposited on broad canyon floors. Consists of moderately to well-indurated, reddish-brown, mostly very dissected gravel, sand, silt, and clay-bearing alluvium. In places, includes thin, discontinuous alluvial deposits of Holocene age

N

1 ½ 0 1 MIL

Reference: Dibblee Geologic Map of the Bachelor Mountain Quadrangle

REGIONAL GEOLOGIC MAP

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

APPLIED EARTH SCIENCES
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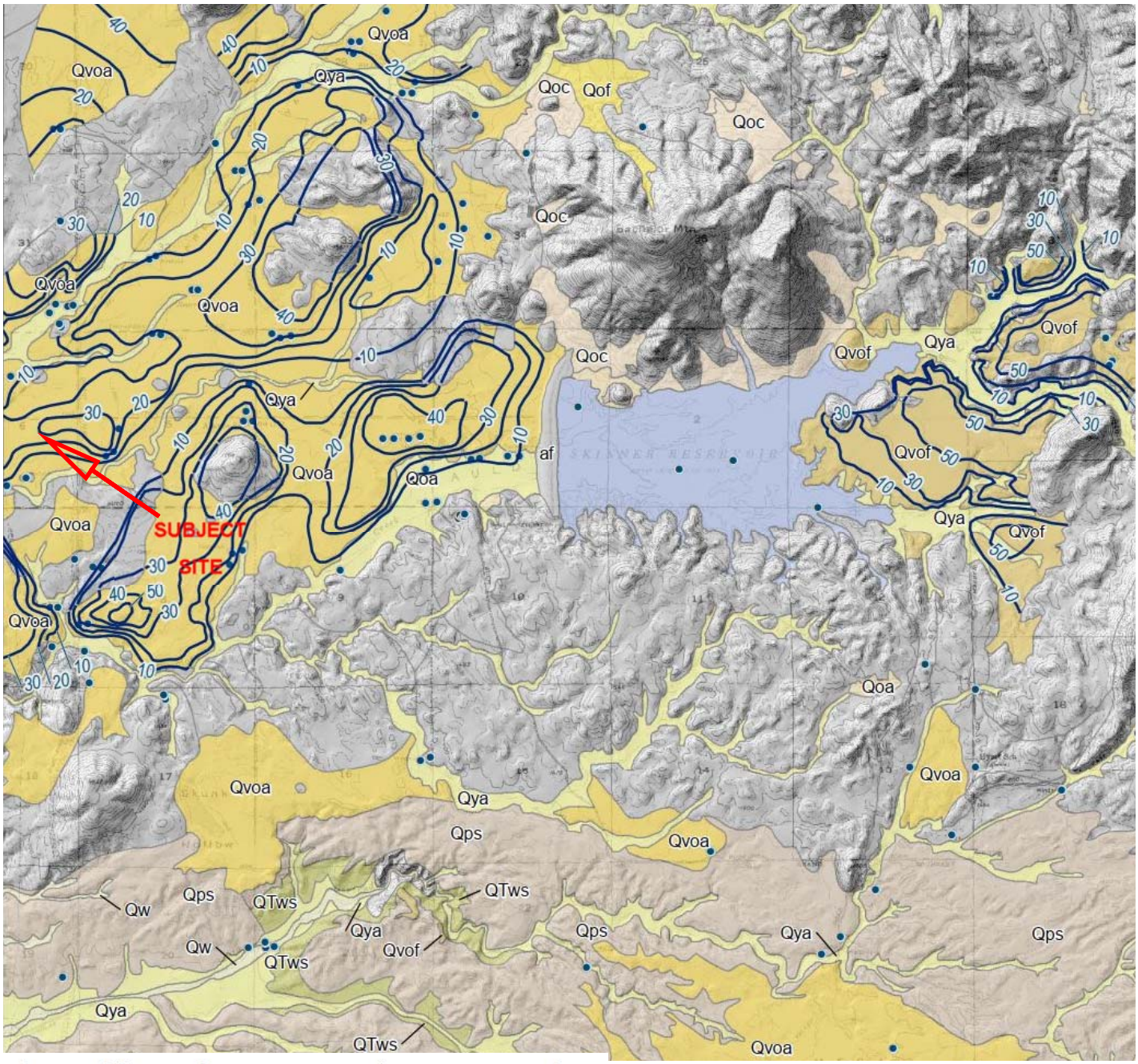
FIGURE No. 3



Reference: Bachelor Mountain 7.5 Minute Quadrangle

HISTORICALLY HIGHEST GROUNDWATER (Contour Map)

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

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FIGURE No. 4

APPENDIX I
METHOD OF FIELD EXPLORATION

In order to define the subsurface conditions, five borings were drilled using a hollow stem drilling machine at the subject site. The approximate locations of the boring and test pits are shown on the enclosed Site Plan; Drawing No. 1.

Logs of the subsurface materials, as encountered in the borings, were recorded in the field and are presented Figure Nos. I-1 through I-5 within Appendix I. These figures also show the number and approximate depths of each of the recovered soil samples.

Relatively undisturbed samples of the subsoil were obtained by driving a steel sampler with successive drops of a 140-pound standard sampling hammer free-falling a vertical distance of about 30 inches. The number of blows required for one foot of sampler penetration was recorded at the time of drilling and are shown on the log of exploratory borings. The relatively undisturbed soil samples were retained in brass liner rings 2.5 inches in diameter and 1.0 inch in height.

Field investigation for this project was performed on December 2, 2020. The materials excavated from the test borings were placed back and compacted upon completion of the field work. Such materials may settle. The owner should periodically inspect these areas and notify this office if the settlements create a hazard to person or property.

LOG OF BORING NO.1

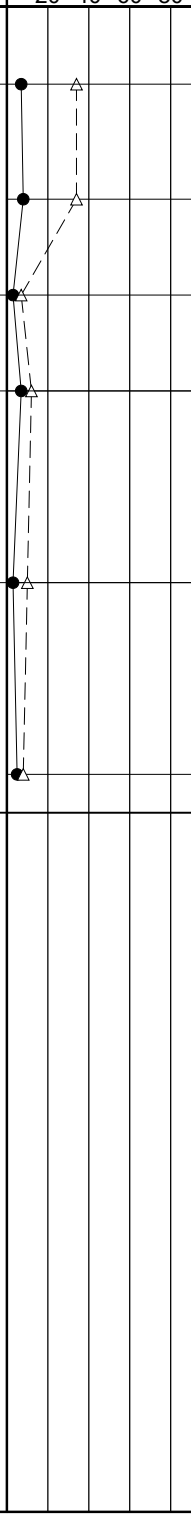
20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.					
			(SM) SAND: Dense, slightly moist to moist, brown to light brown, silty fine to medium grained sand.		32	7	120	34
5			(SM) Grades to dense to very dense, yellowish brown.		50	8	111	34
			(SP) Grades to slightly moist, light brown, fine to medium grained sand, little to no silt.		48	3	116	7
10			(SP/SM) Grades to slightly moist to moist, some silt.		55	7	114	12
15			(SP) Grades to slightly moist, grayish white, fine to coarse grained sand with gravel.		50	3	122	10
20			(SP) Grades to slightly moist to moist, grayish brown.		52	5	121	8
			End of Boring @ 21' No Groundwater Encountered Hole Backfilled.					
25								
30								
35								



COMPLETION DEPTH: 21
DATE: December 2, 2020

DEPTH TO WATER> INITIAL:
FINAL:

LOG OF BORING NO.2

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
		■	(SM) SAND: Very dense, slightly moist to moist, brown, silty fine to medium grained sand.		50	5	127		
5		■	(CL) CLAY: Very stiff, moist, dark brown, sandy clay.		50/10"	13	133		
10		■	(SP-SM) SAND: Very dense, slightly moist to moist, light brown, gravelly fine to coarse grained sand with silt.		50	7	117		
15		■	(SP-SM) Grades to grayish brown to grayish white, more gravelly.		50/11"	5	128		
			End of Boring @ 16' No Groundwater Encountered Hole Backfilled.						
20									
25									
30									
35									

COMPLETION DEPTH: 16 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

LOG OF BORING NO.3

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
			(CL) CLAY: Very stiff, slightly moist to moist, brown, sandy clay.		50	7	118		
5			(SM-ML) SAND: Dense to very dense, moist, light brown, fine to medium grained sand-silt mixture.		42	13	110		
10			(SP/SM) Grades to slightly moist light brown, fine to medium grained sand with silt.		48	4	107		
			End of Boring @ 11' No Groundwater Encountered Hole Backfilled.						
15									
20									
25									
30									
35									

COMPLETION DEPTH: 11 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

LOG OF BORING NO.4

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
			(SM) SAND: Dense, slightly moist to moist, brown, silty fine grained sand.		32	10	108		
5			(SM) Grades to very dense, slightly moist, light brown, silty fine to medium grained sand.		50	6	107		
			(SP) Grades to slightly moist, light brown to grayish white, gravelly fine to coarse grained sand.		51	3	123		
10			(SP-SM) Grades to light brown, slightly less gravelly.		42	3	117		
15			(SM) Grades to dense, moist, olive, silty fine grained sand.		36	13	117		
			End of Boring @ 16' No Groundwater Encountered Hole Backfilled.						
20									
25									
30									
35									

COMPLETION DEPTH: 16 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

LOG OF BORING NO.5

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
			(CL) CLAY: Very stiff, moist, dark brown, sandy clay.		36	12	129		
5			(ML) SILT: Firm, moist, yellowish brown, slightly sandy silt.		20	14	91		
10			(SP-SM) SAND: Very dense, slightly moist, light brown, fine to medium grained sand with silt.		50/7"	5	115		
15			(SP) Grades to slightly moist to moist, grayish white, gravelly fine to coarse grained sand, little to no silt.		50/8"	11	116		
			End of Boring @ 16' No Groundwater Encountered Hole Backfilled.						
20									
25									
30									
35									

COMPLETION DEPTH: 16 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAME
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Organic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Organic clay 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 GREATER than 50)		MH	Organic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Organic 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.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

UNIFIED SOIL CLASSIFICATION SYSTEM

JOB NAME : Propose Commercial Building Within the Confines of a New Commercial Plaza
South West Corner of Benton Road and Panfield Lane,
Winchester (Riverside County), CA 92596

JOB No. 20-679-02

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FIGURE No. I-6

APPENDIX II

LABORATORY TESTING PROCEDURES

Moisture Density

The moisture-density information provides a summary of soil consistency for each stratum and can also provide a correlation between soils found on this site and other nearby sites. The tests were performed using ASTM D 2216-04 Laboratory Determination of water content Test Method. The dry unit weight and field moisture content were determined for each undisturbed sample, and the results are shown on log of exploratory borings.

Shear Tests

Shear tests were made with a direct shear machine at a constant rate of strain. The machine is designed to test the materials without completely removing the samples from the brass rings. The rate of shear was determined through determination of the rate of consolidation of the foundation bearing materials.

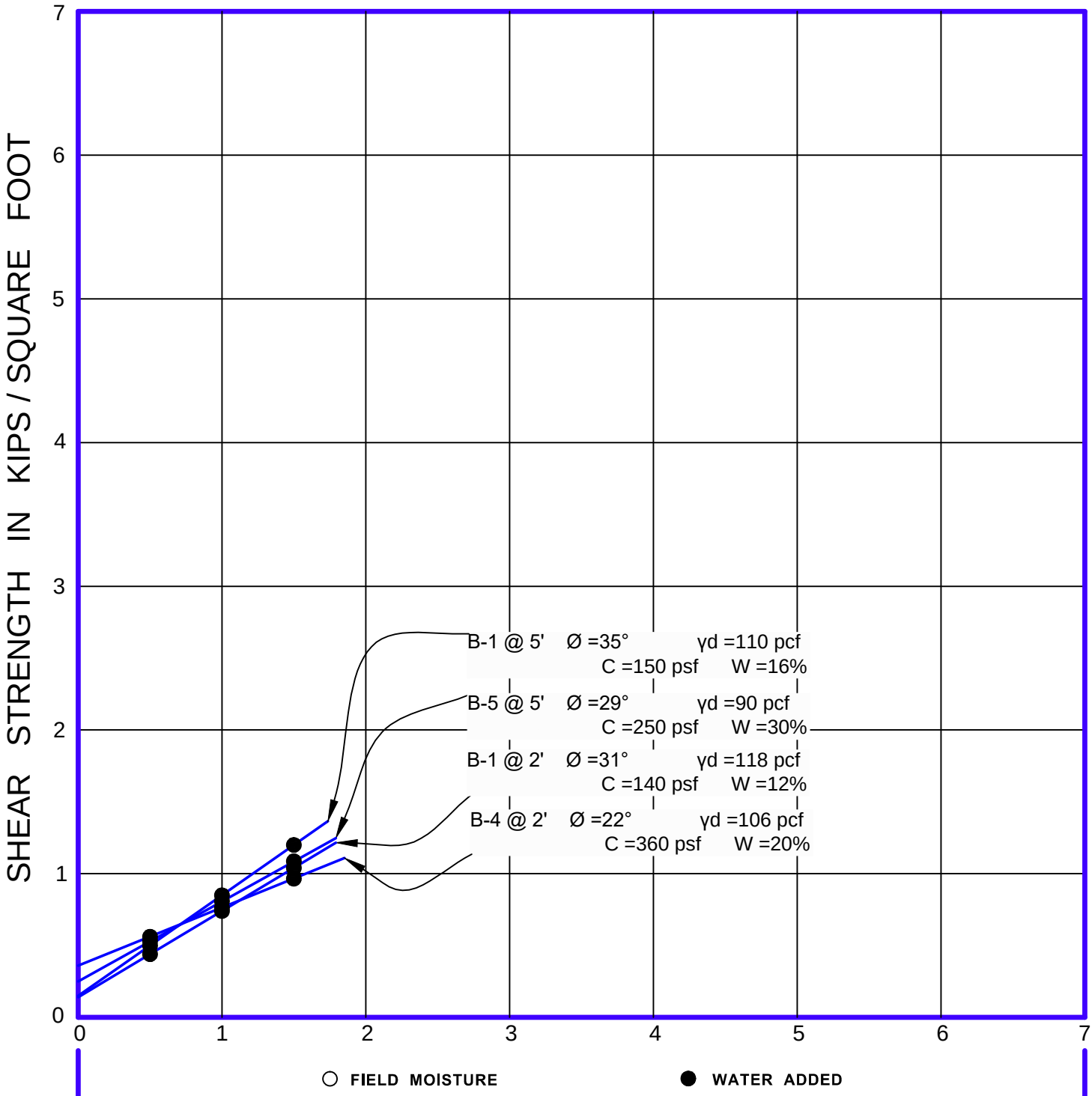
A range of normal stresses was applied vertically, and the shear strength was progressively determined at each load in order to determine the internal angle of friction and the cohesion. The tests were performed using ASTM D 3080-04 Laboratory Direct Shear Test Method. The Ultimate shear strength results of direct shear tests are presented on Figure No. II-1 within this Appendix.

Consolidation

The apparatus used for the consolidation tests is designed to receive the undisturbed brass ring of soil as it comes from the field. Loads were applied to the test specimen in several increments, and the resulting deformations were recorded at time intervals. Porous stones were placed in contact with the top and bottom of the specimen to permit the ready addition or release of water. ASTM D 2435-04 Laboratory Consolidation Test Method.

Undisturbed specimens were tested at the field and added water conditions. The test results are shown on Figure No. II-2 within this Appendix.

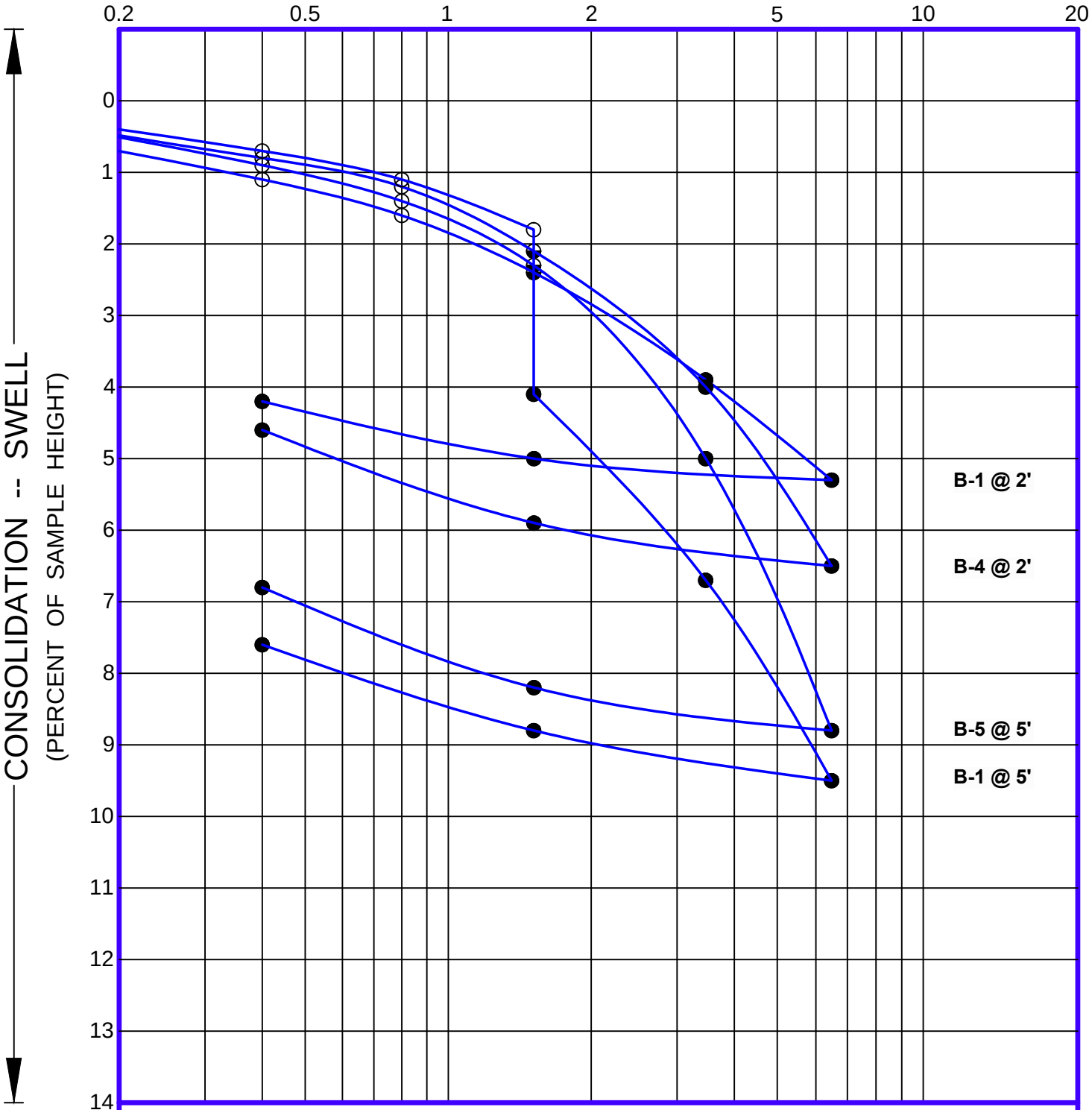
NORMAL STRESS IN KIPS / SQUARE FOOT



DIRECT SHEAR TESTS

JOB NAME : Propose Commercial Building Within the Confines of a New Commercial Plaza South West Corner of Benton Road and Panfield Lane, Winchester (Riverside County), CA 92596	JOB No. 20-679-02
Applied Earth Sciences GEOTECHNICAL . GEOLOGY . ENVIRONMENTAL ENGINEERING CONSULTANTS www.aessoil.com (818) 552-6000	FIGURE No. II - 1

PRESSURE IN KIPS PER SQUARE FOOT



SWELL - CONSOLIDATION TESTS

JOB NAME : Propose Commercial Building Within the Confines of a New Commercial Plaza
South West Corner of Benton Road and Panfield Lane,
Winchester (Riverside County), CA 92596

JOB No. 20-679-02

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FIGURE No. II - 2

Appendix III

Outside Laboratory Test Results For “R” Value

By The Offices of EGLAB

Resistance R - Value Testing Results

(Cal Test 301)

Project Name:	Proposed Commercial Buildings
Job No.:	20-679-02
Client:	Applied Earth Sciences
EGLAB Project No.:	20-044-005
Test Date:	12/17/2020
Boring No.:	B-3
Sample No.:	N/A
Depth: (ft)	2.0-5.0
Sample Type:	Bulk
Sample Description:	Sandy clay (CL), brown, trace of fine gravel and vegetation
Tested by:	JT
Checked by:	RJ

Test Specimen Number	1	2	3
Compaction Pressure (psi)	100	150	250
Wet Weight (gms)	1285	1270	1260
Dry Weight (gms)	1123	1123	1123
Tare Weight (gms)	0	0	0
Exudation Load (lbs.)	3028	5016	6399
Total Weight (gms)	2878	3023	2992
Mold Weight (gms)	1782	1919	1871
Sample Weight (gms)	1096	1104	1121
Sample Height (in)	2.48	2.45	2.42
Initial Expansion (in)	0.0000	0.0000	0.0000
Final Expansion (in)	0.0000	0.0000	0.0015
Expansion Pressure (psi)	0.0000	0.0000	0.4545
Ph @ 2000 lbs	140	128	117
D turns	3.71	3.33	3.09
R-Value from Exudation	9	16	23
Density (pcf)	117.1	120.7	125.1
Moisture (%)	14.4	13.1	12.2
Exudation Pressure (psi)	241	399	509
Corrected R-Value from Exudation:	9	16	22
Exudation Pressure (psi)	241	399	509

R-Value at 300 psi exudation pressure = **11**

Note:
0.00% Retained on 3/4-inch Sieve

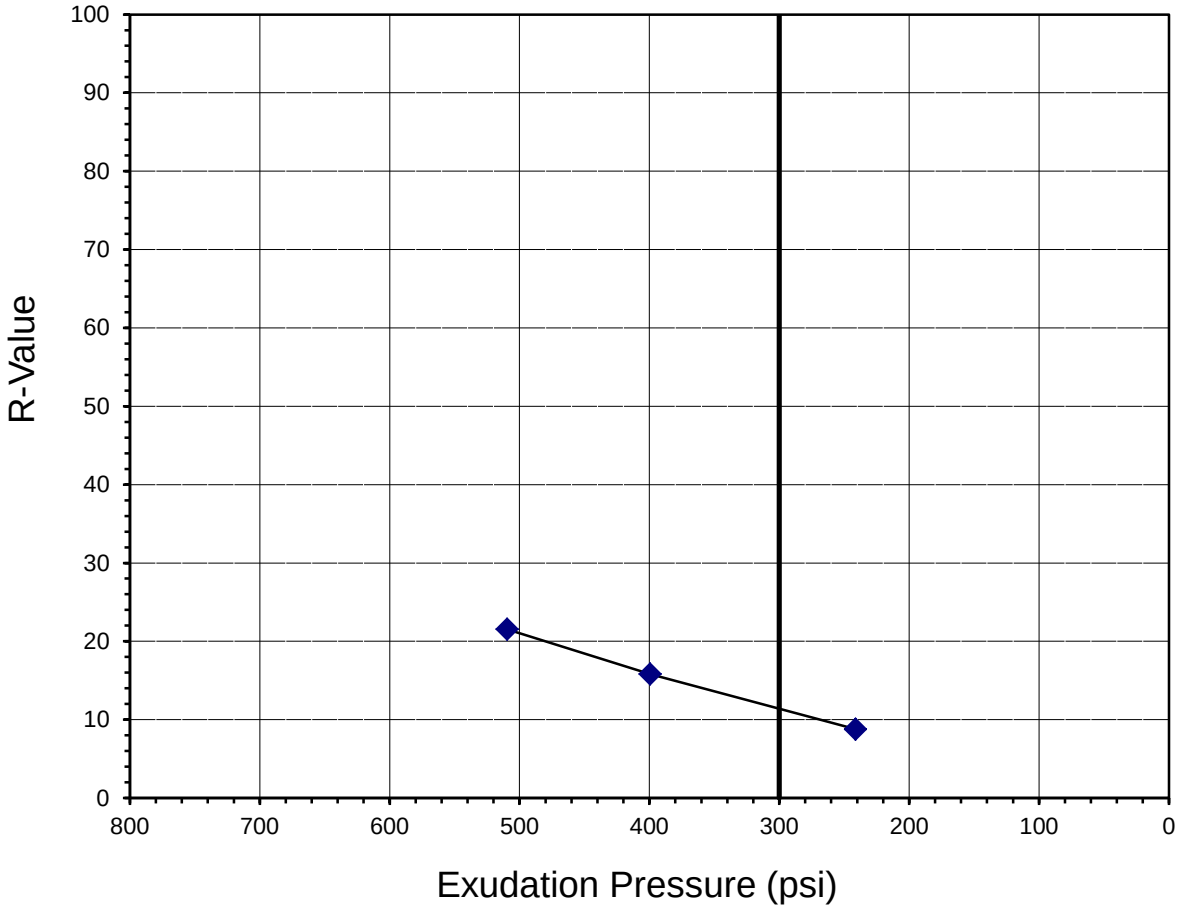
EGLAB, INC.

Project Name: Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

R-VALUE TEST RESULTS

12/22/20

FIGURE 2



Test No.	Compaction Pressure (psi)	Density (pcf)	Moisture (%)	Expansion Pressure (psi)	Horizontal Pressure (psi) @ 160 psi	Sample Height (in)	Exudation Pressure (psi)	R-Value	R-Value Correction
1	100	117.1	14.4	0.00	140	2.48	241	9	9
2	150	120.7	13.1	0.00	128	2.45	399	16	16
3	250	125.1	12.2	0.45	117	2.42	509	23	22

Test Name and Method:
Resistance R-Value and Expansion Pressure - Cal Test 301

Boring No.: B-3
Sample No.: N/A
Depth: (ft) 2.0-5.0
Sample Type: Bulk
Sample Description: Sandy clay (CL)
Test Date: 12/17/2020

EGLAB, INC.

Project Name:
Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

Test Results: R-Value at 300 psi
Exudation Pressure: **11**

R-VALUE TEST REPORT

12/22/20

FIGURE 1

Resistance R - Value Testing Results

(Cal Test 301)

Project Name:	Proposed Commercial Buildings
Job No.:	20-679-02
Client:	Applied Earth Sciences
EGLAB Project No.:	20-044-005
Test Date:	12/17/2020
Boring No.:	B-5
Sample No.:	N/A
Depth: (ft)	2.0-5.0
Sample Type:	Bulk
Sample Description:	Sandy clay (CL), brown, trace of fine gravel and vegetation
Tested by:	JT
Checked by:	RJ

Test Specimen Number	1	2	3
Compaction Pressure (psi)	150	125	75
Wet Weight (gms)	1280	1295	1310
Dry Weight (gms)	1120	1120	1120
Tare Weight (gms)	0	0	0
Exudation Load (lbs.)	6905	4230	1497
Total Weight (gms)	2977	3084	3063
Mold Weight (gms)	1850	1954	1976
Sample Weight (gms)	1128	1131	1087
Sample Height (in)	2.53	2.60	2.53
Initial Expansion (in)	0.0000	0.0000	0.0000
Final Expansion (in)	0.0012	0.0004	0.0001
Expansion Pressure (psi)	0.3636	0.1212	0.0303
Ph @ 2000 lbs	125	134	141
D turns	3.16	3.56	3.93
R-Value from Exudation	18	12	8
Density (pcf)	118.2	113.9	111.3
Moisture (%)	14.3	15.6	17.0
Exudation Pressure (psi)	550	337	119
Corrected R-Value from Exudation:	18	13	8
Exudation Pressure (psi)	550	337	119

R-Value at 300 psi exudation pressure = **12**

Note:
0.00% Retained on 3/4-inch Sieve

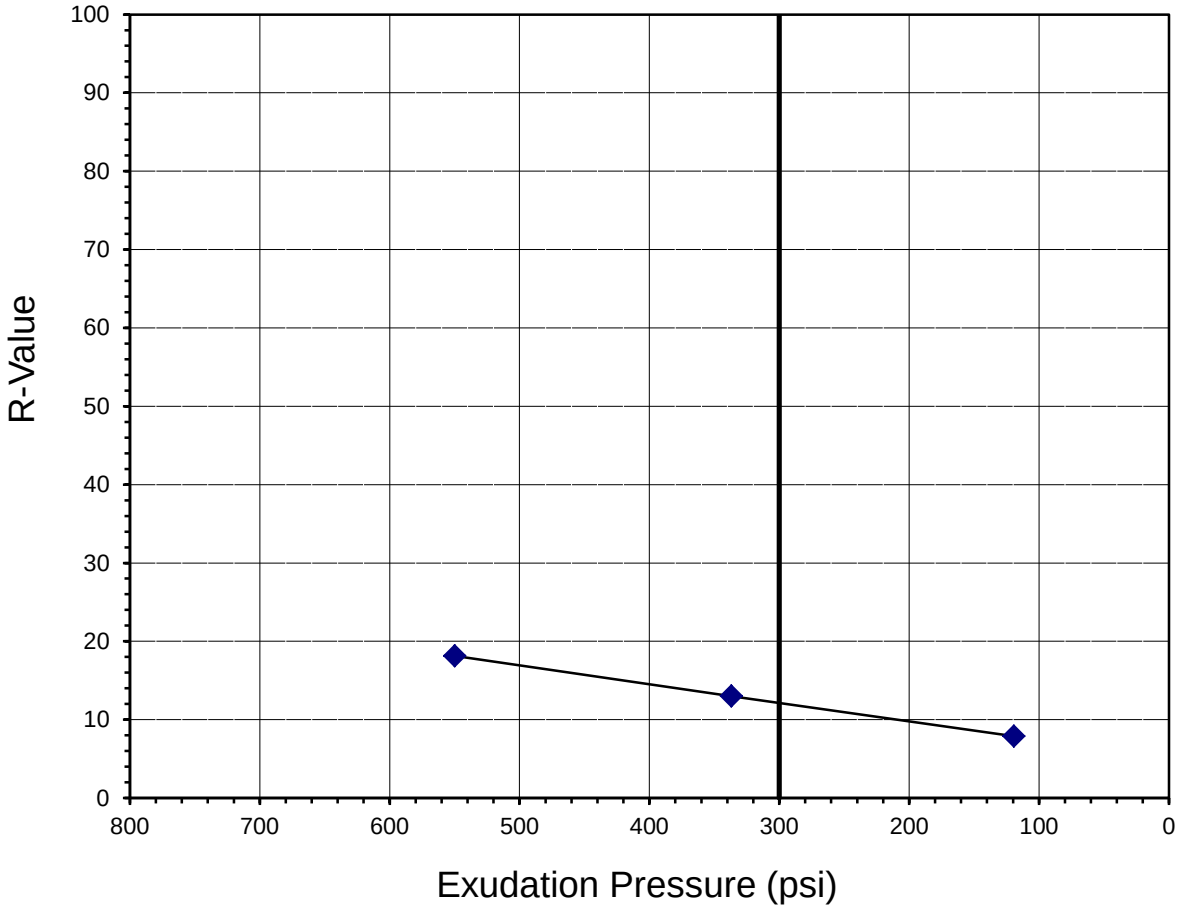
EGLAB, INC.

Project Name: Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

R-VALUE TEST RESULTS

12/22/20

FIGURE 2



Test No.	Compaction Pressure (psi)	Density (pcf)	Moisture (%)	Expansion Pressure (psi)	Horizontal Pressure (psi) @ 160 psi	Sample Height (in)	Exudation Pressure (psi)	R-Value	R-Value Correction
1	150	118.2	14.3	0.36	125	2.53	550	18	18
2	125	113.9	15.6	0.12	134	2.60	337	12	13
3	75	111.3	17.0	0.03	141	2.53	119	8	8

Test Name and Method:
Resistance R-Value and Expansion Pressure - Cal Test 301

Boring No.: B-5
Sample No.: N/A
Depth: (ft) 2.0-5.0
Sample Type: Bulk
Sample Description: Sandy clay (CL)
Test Date: 12/17/2020

EGLAB, INC.

Project Name:
Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

Test Results: R-Value at 300 psi
Exudation Pressure: **12**

R-VALUE TEST REPORT

12/22/20

FIGURE 1