LODI UNIFIED SCHOOL DISTRICT

PROJECT NUMBER: 0826-8426
DSA # 02-118150
LPA # 19160.11
“VALLEY ROBOTICS EXTENSION ROAD”

ADDENDUM NO. 1

April 21, 2020

Owner:	Lodi Unified School District 1305 E. Vine Street Lodi, CA 95240
Architect :	LPA, Inc. 431 I Street, Suite 107 Sacramento, CA 95814

This addendum forms a part of the contract and modifies the original DSA approved documents dated **2/13/2020.** It is intended that all work affected by the following modifications shall conform to related provisions and general conditions of the Contract of the original drawings and specifications. Modify the following items wherever appearing in any drawings or sections of the specifications. Acknowledge receipt of **Addendum No. 1** in the space provided on the Bid Form. Failure to do so may subject to disqualification. All addenda items refer to the plans and specifications unless specifically noted otherwise.

TOTAL PAGES IN THIS ADDENDUM (including attachments): **81**

PART A - BIDDING / CONTRACT REQUIREMENTS, AND TECHNICAL REQUIREMENTS

1.1 **The bid date has changed.** Sealed bids are now due Friday, April 24, 2020 by 2:00 p.m. at the LUSD District Facilities and Planning Office, 1305 E. Vine Street, Lodi, California 95240.

1.2 Delete specification Section 321216 Asphalt Paving. Replace with Addendum 1 Section 321216 Asphalt Paving.

PART B - DRAWINGS

1.3 Delete drawing sheet C1.01 Demolition Plan. Replace with Addendum 1 drawing sheet C1.01 Demolition Plan.

1.4 Delete drawing sheet C2.01 Site Improvement Plan. Replace with Addendum 1 drawing sheet C2.01 Site Improvement Plan.

1.5 Delete drawing sheet C4.02 Details. Replace with Addendum 1 drawing sheet C4.02 Details.

1.6 Geotechnical and geohazard report attached.

1.7 Pre-bid mandatory site conference sign-in sheet attached.

PART C – RESPONSES TO CONTRACTOR QUESTIONS

1.8 **Question:** The plans mention an asphalt slurry, but the specs talk about a seal coat. Which are we to figure? We recommend an asphalt seal coat as it would be better suited for this application.
Response: Provide seal coat on all existing asphalt.

1.9 **Question:** Asphalt slurry/seal coat is recommended to be placed 30 days after new asphalt has been installed to allow the material to cure. This could not be accomplished within the allowable working days. Will the slurry seal or seal coat (which ever we are to place) be allowed to be placed outside of the contract working days, granted all other items would be complete?
Response: Provide the seal coat on new asphalt and it can be done outside of the contracted working days.

1.10 **Question:** Is temporary striping required before we place the asphalt slurry or seal coat to ensure the parking lot is striped while we wait for the new asphalt to cure?
Response: Provide also temporary striping in scope of work.

1.11 **Question:** Please confirm storage containers will be moved by LUSD prior to contract work starting. There was mention at the pre-bid that LUSD will be moving the containers even though the plans indicate we are to move them. If we are to move them, please specify the location.
Response: Containers to be moved by contractor as indicated, the location is now shown on civil sheets.

1.12 **Question:** Please confirm the existing water storage will be moved by LUSD prior to contract work starting. There was mention at the pre-bid that LUSD will be moving the containers even though the plans indicate we are to move them. If we are to move them, please specify the location.
Response: The water tank will be removed by the district.

1.13 **Question:** Is there a geotechnical report available?
Response: Yes, it is part of addendum # 1 documents.

1.14 **Question:** The plans make no mention of a header board or mow band at the edge of asphalt paving. Please confirm there will be no installation of header board or mow band concrete to give the edges of asphalt a clean edge. We would recommend a redwood header board to give the pavement a clean finished edge.
Response: Asphalt pavement perimeter redwood header board detail is part of addendum # 1 documents.

1.15 **Question:** During the pre-bid walk, it was found that irrigation lies within the area of the new fire access road. Please address how we are to quantify these irrigation repairs so all bidders are bidding the same amount of work involved. We would recommend running this work through the allowance that has already been setup for unforeseen conditions.
Response: If irrigation lines are encountered, the repair scope will be covered by the Owner's allowance and tracked on time and materials.

LODI UNIFIED SCHOOL DISTRICT

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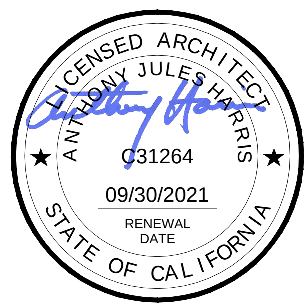
ADDENDUM NO. 1

1.16 **Question:** Trees are located in a very close proximity to the proposed location of the new fire access road. If we are required to cut roots for the new improvements, the combination of the amount of roots we may have to cut and them being in such close proximity to the base of the trees could result in the potential loss of the trees. Please confirm we will not be responsible for any tree replacement and/or tree relocation. If we are to be held responsible, please indicate which trees are to be removed/ relocated. If trees are to be removed, please confirm we will not be responsible for any permits needed to take out a tree.
Response: The two trees affected by the new fire lane road will need to be demolished, they are part of addendum # 1 documents. No permits needed.

1.17 **Question:** Will LUSD be providing the arborist for tree pruning or are we to account for obtaining one in our bid?
Response: The two trees affected by the new fire lane road will need to be demolished, they are part of addendum # 1 documents. No arborist.

1.18 **Question:** Please confirm the allowance is to be calculated into our base bid total.
Response: Base bid plus Owner's allowance.

End of Addendum



SECTION 32 1216
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single course bituminous concrete paving.

B. Surface sealer.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of site for paving and base.

B. Section 31 2323 - Fill: Compacted subgrade for paving.

C. Section 32 1123 - Aggregate Base Courses: Aggregate base course.

D. Section 32 1313 - Concrete Paving

1.03 REFERENCE STANDARDS

A. AI MS-2 - Asphalt Mix Design Methods.

B. AI MS-19 - Basic Asphalt Emulsion Manual.

C. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.

D. Standard Specifications of the State of California (Caltrans), latest edition.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with Standard Specifications of the State of California (Caltrans), latest edition.

B. Mixing Plant: Conform to Standard Specifications of the State of California (Caltrans), latest edition.

C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

1.06 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1.07 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 50 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees (8 C degrees) below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Concrete: Standard Specifications of the State of California (Caltrans), Section 39, Type A, 1/2 inch hot mix.

B. Tack Coat: Emulsified asphalt.

C. Seal Coat: Parking Area Seal in accordance with the Standard Specifications of the State of California (Caltrans), Section 37-5.

D. Slurry Seal: Slurry Seal in accordance with the Standard Specificatons of the State of California (Caltrans), Section 37-3.02.

E. Soil Sterilizer: Pramatol 25-E by CIBA CEIGY.

F. Pavement Epoxy: Ktepx-590 by K-Lite.

G. Crack Filler:

1. Cracks up to 1/2": CAR08 by QPR
2. Cracks 1/4" to 1": Docal 1100 Viscolastic by Conoco Inc.
3. Cracks greater than 1": Hot Mix by Topeka

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

A. Test mix design and samples shall be in accordance with ASTM D2172, Caltrans Test Method 382, or ASTM D 4125.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
B. Verify gradients and elevations of base are correct.

3.02 **PREPARATION - TACK COAT**

A. Apply tack coat in accordance with manufacturer's instructions.
B. Apply tack coat in accordance with the Standard Specifications of the State of California (Caltrans), Section 39-2.01C(3)(f).
C. Apply tack coat to contact surfaces of curbs, gutters and existing pavements.

3.03 **PLACING ASPHALT PAVEMENT - SINGLE COURSE**

A. Install Work in accordance with the Standard Specifications of the State of California (Caltrans), latest edition.
B. Place asphalt within 24 hours of applying primer or tack coat.
C. Place to a maximum thickness of 4 inches.
D. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.04 **SEAL COAT**

A. Apply seal coat to surface course and asphalt curbs in accordance with the Standard Specifications of the State of California (Caltrans), Section 37.

3.05 **TOLERANCES**

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.
C. Variation from Tru Elevation: Within 1/4 inch (6 mm).

3.06 **FIELD QUALITY CONTROL**

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.
B. Provide field inspection and testing. Take samples and perform tests in accordance with California Test Method 308.

3.07 **PROTECTION**

A. Immediately after placement, protect pavement from mechanical injury for 14 days or until surface temperature is less than 140 degrees F.

END OF SECTION

Geological Hazards and Geotechnical Engineering Report

Valley Robotics Academy
Lodi, California
December 19, 2019
Terracon Project No. NA195099

Prepared for:
Lodi Unified School District
Lodi, CA

Prepared by:
Terracon Consultants, Inc.
Lodi, California

December 19, 2019

Lodi Unified School District
1305 E. Vine Street
Lodi, CA 95240

Attn: Vickie Brum
P: (916) 287 2338
E: vbrum@lodiusd.net

Re: Geological Hazards and Geotechnical Engineering Report
Valley Robotics Academy
13451 N Extension Road
Lodi, California
Terracon Project No. NA195099

Dear Vickie:

We have completed the Geological Hazards and Geotechnical Engineering report for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PNA195099 dated July 19, 2019, revised July 25, 2019. This report presents the findings of the subsurface exploration and provides results of the geologic hazards investigation and geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project. We also performed additional services which included double ring infiltrometer testing for onsite storm water planning and geophysical surveys for the purpose of helping determine where the existing septic systems leach fields are located. California Geologic Survey (CGS) Note 48 was referenced in preparation of this report.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Christopher B. Congrave, EIT 15...
Senior Staff Engineer

Ryan L. Coe, C.E.G. 2705
Project Geologist

Garret S.H. Hubbart, G.E. 2588
Principal Engineer, Office Manager

Reviewed by:
Patrick C. Dell, G.E. 2186

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

REPORT SUMMARY

Topic [1]	Overview Statement [2]
Project Description	The project consists of demolishing and moving existing school buildings (with exception of one building at Henderson Middle School which will be utilized as a future administrative building), paved parking and driveways, hardscape, and landscape. Four new buildings will be constructed with new paved parking and driveways including a fire lane, and hardscape. The existing sports field will be utilized. Development may include construction of new feature/screen walls. The project includes a two-story classroom building with a footprint of about 18,800 square feet, a single-story campus and student support building with footprint of about 10,700 square feet, a single-story robotics building with a footprint of about 16,060 square feet, and a single-story kinder building with a footprint of about 3,000 square feet.
Geotechnical Characterization	The soils encountered generally consisted of interbedded layers of sand and silt to the maximum depths explored and were fairly consistent across the site. Groundwater was not encountered within our borings.
Earthwork	Support the foundations on 12 inches of recompacted native soil or engineered fill. Support the floor slabs on a minimum of 12 inches of compacted native soil or non-expansive engineered fill.
Shallow Foundations	Shallow foundations will be sufficient Allowable bearing pressure = 2,500 lbs/sq ft Expected settlements: < 1 inch total, < ½ inch differential
Deep Foundations	Deep foundations are not necessary for this site.
Below-Grade Structures	None anticipated.
Pavements	See Pavement Section for descriptions of pavement thicknesses.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Geological Hazards and Geotechnical Engineering Report

Valley Robotics Academy
13451 N Extension Road
Lodi, California
Terracon Project No. NA195099
December 19, 2019

INTRODUCTION

This report presents the results of our geological hazards review, subsurface exploration and geotechnical engineering services performed for the proposed Valley Robotics Academy to be located at 13451 N Extension Road in Lodi, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Demolition considerations
- Excavation considerations
- Synthetic turf field considerations
- Pavement design and construction
- Foundation design and construction
- Floor slab design and construction
- Seismic site classification per 2016 CBC
- Lateral earth pressures
- Bioretention considerations
- Geologic Hazards per CGS Note 48
- Geophysical Survey of existing on site septic system

The geotechnical engineering Scope of Services for this project included the advancement of 18 test borings to depths ranging from approximately 6½ to 51½ feet below existing site grades (bgs). In addition, a geophysical survey was performed to try and locate the existing septic system. Two of the three double ring infiltrometer tests were also performed for the purpose of assisting the civil engineer with on site storm water planning. One of the planned double ring infiltrometer tests was moved approximately 150 feet to the west given the significant underground utilities located in and around the area of the initially proposed location. Many of the exploratory borings also needed to be adjusted some in the field given existing structures and significant underground utility conflicts. Geophysics was also used to clear proposed boring locations and test pit locations used for double ring infiltrometer testing.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 13451 N Extension Road in Lodi, California. 38.0999, -121.3118 (Approximate) See **Site Location**
Existing Improvements	The site is currently developed with a middle school (Henderson Middle School) and a high school (Independence High School) including multiple single-story buildings, paved parking and driveways, sports field, hardscape, and landscape.
Current Ground Cover	Pavement, concrete, grass, and bare soil.
Existing Topography	The site is relatively flat with an average elevation of about 30 feet above Mean Sea Level (MSL).

SITE GEOLOGY

Site Description

The general topography of the subject site consists of relatively flat-lying valley terrain with low relief. The site is situated on the Henderson Middle/High School Campus. Development at the campus includes buildings, parking lots and associated hardscapes. The campus is surrounded by agricultural land and residential tract development. A topographic map and aerial photograph of the subject property are presented on Exhibits 1 and 2, respectively in the **Supporting Information** section of this report.

Review of Geologic Literature

Terracon reviewed available published geologic literature, including publications by the United States Geologic Survey, the California Geological Survey, and Marchand, D.E., and Atwater, B.F. (1979) that include the area of the site.

Site Geology

The site is situated within the Great Valley Geomorphic Province. The Great Valley is an alluvial plain that lies within central California. The region is a trough into which sediments have been deposited since Jurassic[1] time.

The geology of the site is mapped as Pleistocene age Modesto Formation (Qm_2) which is composed chiefly of eolian and fluvial sands, gravels, and clays[2,3]. The unit Qm_2 is described as arkosic alluvium forming Mokelumne River alluvial fan; chiefly sand, becoming finer-grained toward fan toe; probably glacial outwash[4]. State general geology maps describe/depict the geology at the site as marine and non-marine sediments (Q) that consist of Alluvium, lake, playa, and terrace deposits; unconsolidated and semi-consolidated[5]. In general, the material encountered in our borings is consistent with the mapped geology in the area. A Geologic Map of the project site is presented in the **Supporting Information** section of this report.

Groundwater

Groundwater was not encountered in our geotechnical study at the time the borings were conducted. Groundwater wells in the area show groundwater ranging in depth from approximately 45 to 70 feet below ground surface[6].

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

[1] California Geologic Survey, Note 36, "California Geomorphic Provinces

[2] Atwater, B.F., 1982, Geologic maps of the Sacramento-San Joaquin Delta, California: U.S. Geological Survey, Miscellaneous Field Studies Map MF-1401, scale 1:24,000.

[3] *Marchand, D.E., and Atwater, B.F., 1979, Preliminary geologic map showing Quaternary deposits of the Lodi quadrangle, California: U.S. Geological Survey, Open-File Report OF-79-933, scale 1:62,500*

[4] Marchand, D.E., and Atwater, B.F., 1979, Preliminary geologic map showing Quaternary deposits of the Lodi quadrangle, California: U.S. Geological Survey, Open-File Report OF-79-933, scale 1:62,500

[5] California Geologic Survey, Geologic Map of California, 2010

[6] http://geotracker.waterboards.ca.gov/gama/gamamap/public/ and https://gis.water.ca.gov/app/gicima/

Item	Description
Information Provided	The following documents were provided by LPA via email: ■ An aerial image with overlay of future development plan ■ An aerial image with an overlay showing existing futures to remain or to be removed ■ An aerial image showing boring and infiltration test locations with planned depth List of information/recommendations to be included in the geotechnical report
Project Description	The project consists of demolishing and moving existing school buildings (with exception of one building at Henderson Middle School which will be utilized as a future administrative building), paved parking and driveways, hardscape, and landscape. Four new buildings will be constructed with new paved parking and driveways including a fire lane, and hardscape. The existing sports field will be utilized. Development may include construction of new feature or screen walls.
Proposed Structures	The project includes a two-story classroom building with a footprint of about 18,800 square feet, a single-story campus and student support building with footprint of about 10,700 square feet, a single-story robotics building with a footprint of about 16,060 square feet, and a single-story kinder building with a footprint of about 3,000 square feet.
Building Construction	The buildings will consist of wood-frame construction with concrete slab-on-grade floors.
Finished Floor Elevation	Unknown
Maximum Loads (Assumed)	■ Columns: 60 to 80 kips ■ Walls: 3 to 4 kips per linear foot (klf)
Grading/Slopes	Given the relatively flat topography of the site, we anticipate grading to be less than 2 feet in vertical extent.
Below-Grade Structures	None anticipated
Free-Standing Retaining Walls	May include feature/screen walls
Pavements	Paved drives and parking will be constructed as part of development. We have assumed both rigid (concrete) and flexible (asphalt) pavement sections will be considered. Anticipated traffic indices (TIs) are as follows: ■ Auto Parking Areas: TI = 4.0 ■ Entrance and Exit-Autos only; TI = 5.0 ■ Bus Areas and Fire Truck Lane: TI = 6.0 Average Daily Truck Traffic for rigid pavements ■ Auto Parking and Entrance/Exit Lanes: ADTT = 1 (Category A) ■ Bus Areas and Fire Truck Lane: ADTT = 25 (Category B) ■ Dumpster Pads: Per Category C The pavement design period is 20 years.

Item	Description
Estimated Start of Construction	Unknown

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project.

The soils encountered generally consisted of interbedded layers of sand and silt to the maximum depths explored. Groundwater was not encountered in any of our borings.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

OTHER GEOLOGIC HAZARDS

The following categories were considered in addition to the topics mentioned within our geotechnical report.

SLOPE STABILITY

The site is relatively flat. Therefore, we do not consider slope instability to be a hazard at the site.

NATURALLY OCCURING RADON GAS

The site lies within an Environmental Protection Agency (EPA) Zone 3 Radon area. Zone 3 Radon areas contain less than 2Pci/L of predicted average indoor radon. The site is within an area of unknow radon potential according the CGS indoor radon maps[7]. Due to the low anticipated radon levels at the site, we do not consider naturally occurring radon gas to be a hazard at the site.

[7]https://www.epa.gov/radon/find-information-about-local-radon-zones-and-state-contact-information#radonmap

FLOODING

According FEMA flood hazard mapping, the site is within area designated as a 0.2% annual chance flood hazard zone[8]. Therefore, we consider flood potential at the site to be low.

OIL AND GAS EXPLORATION

One abandoned oil and gas well is mapped approximately 0.5 mile from the site[9]. The well is listed as being abandoned in 1978. We do not consider oil- and gas-related hazards to be potential hazards at the site.

In addition to the hazards discussed above and within our report, we do not consider the additional conditional geologic hazards (Hazardous Materials, Volcanic Eruption, Tsunami/Seiche Inundation, Naturally Occurring Asbestos, Hydrocollapse, Regional Subsidence, and/or Cyclic Softening of Clay) identified in Item 31 of Note 48 to be potential hazards.

GEOTECHNICAL OVERVIEW

Due to some variability of the relative density of the near surface silty sands within the proposed building footprints, the foundations should be supported on a minimum of 12 inches of compacted native soil or engineered fill in order to provide uniform support for the foundations. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

The soils which form the bearing stratum for shallow foundations are loose to dense in relative density. The **Shallow Foundations** section addresses support of the buildings bearing on engineered fill. The **Floor Slabs** section addresses slab-on-grade support of the building.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include clearing and grubbing of vegetation and potential remnants of post demolition debris, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations

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[8]FEMA, Flood Insurance Rate Map, San Joaquin County, CA, Panel 306 of 950

[9]https://maps.conservation.ca.gov/doggr/wellfinder/#close/-121.28471/38.10993/17

include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

Prior to placing fill, strip and remove pavements, concrete, vegetation, any remnants of post demolition debris, irrigation pipes, old foundations, and other deleterious materials within the area of the proposed construction. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. All materials derived from the removal of existing vegetation and deleterious materials should be removed from the site and not be allowed for use as on-site fill.

A significant amount of underground utilities were observed during our field explorations. When underground facilities are encountered, such materials and features should be completely removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Once cuts have been made and prior to placing any engineered fill, the subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck or water truck. The proofrolling should be performed under the direction of the Geotechnical Engineer. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or moisture conditioned and recompacted. Such areas may also be modified by stabilizing with lime/cement or aggregate base with geogrids. These specific recommendations depend on the soil conditions at the time of construction and shall be specifically provided by the Geotechnical Engineer at that time.

The exposed subgrade soil should be scarified, moisture conditioned, and compacted. The depth of scarification of subgrade soils and moisture conditioning of the subgrade is highly dependent upon the time of year of construction and the site conditions that exist immediately prior to construction. If construction occurs during the winter or spring, when the subgrade soils are typically already in a moist condition, scarification and compaction may only be 8 inches. If construction occurs during the summer or fall when the subgrade soils have been allowed to dry out deeper, the depth of scarification and moisture conditioning may be as much as 18 inches. A representative of our office should be present to observe the exposed subgrade and specify the depth of scarification and moisture conditioning required subsequent to grading cuts and prior to placing fill.

Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than three inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Imported earth materials for use as engineered fill should be pre-approved by our representative prior to construction. Imported non-expansive soils may be used as fill material for the following:

- general site grading
- foundation areas
- slab-on-grade floor
- foundation backfill
- trench backfill
- exterior slabs-on-grade

Soils for use as compacted engineered fill material within the proposed building areas should conform to non-expansive materials as indicated in the following recommendations:

Gradation	**Percent Finer by Weight (ASTM C 136)**
3"	100
No. 4 Sieve	50 - 100
No. 200 Sieve	15 - 50

- Liquid Limit 30 (max)
- Plasticity Index 10 (max)
- Maximum Expansive Index* 20 (max)

*ASTM D 4829

The on-site silty sands should meet the specifications above. Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed ten inches in loose thickness.

Fill Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction above Optimum	
		Minimum	Maximum
On-site sandy soils and Low volume change (non-expansive) imported fill:			
Beneath foundations:	90	0%	+3%
Beneath slabs	90	0%	+3%

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction above Optimum	
		Minimum	Maximum
Miscellaneous backfill:	90	0%	+3%
Utility Trenches*:	90	0%	+3%
Bottom of native soil excavation receiving fill:	90	0%	+3%
Aggregate base for pavements:	95	0%	+3%
Beneath pavements:	95	0%	+3%

* The upper 12 inches of subgrade beneath pavements should be compacted to 95% of the maximum dry density as determined in the ASTM D1557 test method.

We recommend that compacted native soil or any engineered fill be tested for moisture content and relative compaction during placement. Should the results of the in-place density tests indicate the specified moisture content or compaction requirements have not been met, the area represented by the test should be reworked and retested as required until the specified moisture content and relative compaction requirements are achieved.

Utility Trench Backfill, Bedding and Support

Utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the buildings should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the buildings. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exteriors. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Based on the near surface soils encountered in our exploratory borings, the native soils classify as Class III embedment/bedding material according to City of Lodi Standard Plan 501A, Pipe Bedding and Backfill Flexible Pipe Trench Section. The following horizontal spring modulus (k_h) for horizontal thrust block design of underground utilities may be used for the near surface native soils.

$k_h = 10 * Z$ tons per square foot (tsf)

Z = depth in feet.

Grading and Drainage

All grades must provide effective drainage away from the buildings during and after construction and should be maintained throughout the life of the structures. Water retained next to the buildings can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roofs should have gutters/drains with downspouts that discharge onto pavement or are tied into the on-site storm drainage system.

Exposed ground should be sloped and maintained at a minimum 5% away from the buildings for at least 10 feet beyond the perimeter of the buildings. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structures should also be periodically inspected and adjusted, as necessary, as part of the structures' maintenance program. Where paving or flatwork abuts the structures, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations for the proposed structures are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of floor slabs. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and topsoil, any remnants of demolition debris, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and every 5,000 square feet in pavement areas. One density and water content test should be performed for each 12-inch thick lift for every 50 linear feet of compacted utility trench backfill. The frequency may be modified by the geotechnical engineer during construction.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations used for the proposed buildings any feature/screen walls, and light poles,

Design Parameters

Item	Description
Maximum Net Allowable Bearing pressure [1, 2]	2,500 psf
Required Bearing Stratum [3]	Minimum 12 inches of compacted native soil or engineered fill
Minimum Foundation Dimensions	Columns: 2 feet Continuous: 1 foot
Maximum Foundation Dimensions	Columns: 6 feet Continuous: 3 feet
Ultimate Passive Resistance [4] **(equivalent fluid pressures)**	350 pcf
Ultimate Coefficient of Sliding Friction [5]	0.40

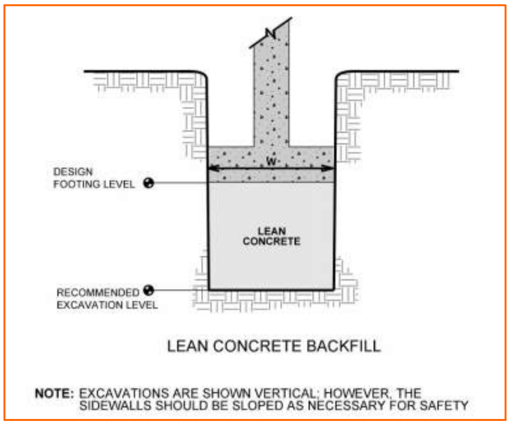
Item	Description
Minimum Embedment below Finished Grade [6]	12 inches for single story structures; 18 inches for two-story structures, feature/screen walls, and light poles.
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 7]	About ½ of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. Values assume that exterior grades are no steeper than 20% within 10 feet of the structure.
2. Values provided are for maximum loads noted in **Project Description**.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions. If passive resistance is combined with base friction to resist lateral movement, the coefficient of sliding friction should be reduced by 25 percent.
6. Embedment depth is depth below lowest adjacent exterior grade within 5 horizontal feet of foundations.
7. Differential settlements are as measured over a span of 40 feet.

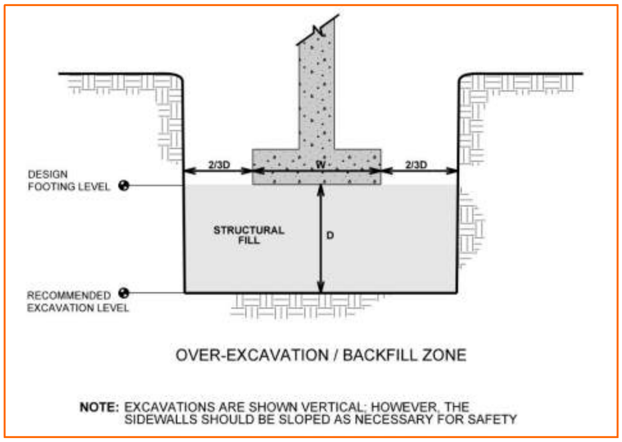
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation, with engineered fill placed as recommended in the **Earthwork** section.



To ensure foundations have adequate support, special care should be taken when footings are located adjacent to trenches. The bottom of such footings should be at least 1 foot below an imaginary plane with an inclination of 1.5 horizontal to 1.0 vertical extending upward from the nearest edge of the adjacent trench.

SEISMIC CONSIDERATIONS

The seismic design requirements for the project are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-10.

Description	Value
2016 California Building Code Site Classification (CBC) [1]	D [2]
Site Latitude	38.0999° N
Site Longitude	121.3118° W
S_s Spectral Acceleration for a Short Period	0.796g
S_1 Spectral Acceleration for a 1-Second Period	0.312g
F_a Site Coefficient for a Short Period	1.182
F_v Site Coefficient for a 1-Second Period	1.776
S_{Ms} Maximum Considered Spectral Response Acceleration for a Short Period	0.941g
S_{M1} Maximum Considered Spectral Response Acceleration for a 1-Second Period	0.554g
S_{DS} Design Spectral Acceleration for a Short Period [3]	0.627g
S_{D1} Spectral Acceleration for a 1-Second Period [3]	0.369g
PGA_M Peak Ground Acceleration	0.345g

1. Seismic site classification in general accordance with the *2019 California Building Code*, which refers to ASCE 7-10 with March 2013 errata.
2. The 2016 California Building Code (CBC) uses a site profile extending to a depth of 100 feet for seismic site classification. Borings at this site were extended to a maximum depth of 51½ feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.
3. These values were obtained using online seismic design maps and tools provided by the USGS (http://earthquake.usgs.gov/hazards/designmaps/).

Faulting and Seismicity

The subject site does not lie within an Alquist-Priolo (AP) fault zone. The closest AP zone, established for the Greenville fault, is located approximately 34 miles southwest of the site. Based on the site location outside of established AP zones and lack of faults in proximity to the school campus, surface rupture from faulting is not anticipated at the site.

Central Valley Faults

The site is located 32 miles northeast of the Coast Range-Central Valley (CRCV) geomorphic boundary. The CRCV boundary is underlain by the Central Valley Thrust Fault System, a segmented 310-mile (500-km) long seismically active fold and thrust belt (Wakabayashi and Smith, 1994). The Central Valley Thrust Fault System is largely a blind thrust system. Notable earthquakes associated with the Central Valley Thrust Fault System are the 1866 Patterson earthquake (Mw 5.9), and the 1983 Coalinga earthquake (Mw 6.5). The 1983 Coalinga earthquake caused considerable damage to the Coalinga area.

The Greenville Fault system is the closest active Holocene fault to the site. The system accommodates right lateral motion and is consistent with the larger tectonic regime of the Bay Area. The Greenville Fault is composed of four segments along its approximately 57-mile length that strike approximately northwest along the eastern foothills of the Coast Range and Mount Diablo. The four sections are the Arroyo Mocho, Clayton, Marsh Creek-Greenville, and the San Antonio Valley. The Arroyo Mocho and Marsh Creek-Greenville are the most active segments, accommodating approximately 1 to 5 millimeters per year of creep[10]. The most recent rupture was a 5.8 magnitude event that occurred along the Marsh Creek-Greenville segment of the fault in January of 1980 near Livermore, California. The main earthquake event was followed by four aftershock events that ranged in magnitude from 4.6 to 5.4. The earthquake events caused surface rupture in several areas along the Marsh Creek-Greenville segment[11].

Due to distance from causative faults, and the limited earthquake activity in the vicinity of the site, we consider the overall seismic hazard to be low.

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils or non-plastic fine-grained soils exist below groundwater. The California Geologic Survey (CGS) has designated certain areas within California as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table. The project site is not located within a liquefaction hazard zone mapped by the CGS.

Due to the relative density of the Pleistocene age soils encountered in our deep boring B1 and the historical depth to groundwater ranging from 45 to 70 feet below the existing grade, in our opinion the potential for liquefaction to occur at this site is low. Accordingly, potential other effects of liquefaction, such as lateral spreading, etc. are low.

Given the relative density of the soils encountered in our borings, the potential for dry sand settlement to occur and negatively affect the buildings is considered low and not a concern in the design of these buildings.

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[10]USGS, Quaternary Fault and Fold Database of the United States, 6/25/2002

[11]M.G Bonilla, et. al., 1980, Surface Faulting near Livermmore, California associated with the January 1980 earthquakes

FLOOR SLABS

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor Slab Support [1]	Minimum 4 inches of free-draining (less than 5% passing the U.S. No. 200 sieve) crushed aggregate. Floor slabs should be supported on a minimum of 12 inches of compacted native soils or non-expansive engineered fill.
Estimated Modulus of Subgrade Reaction [2]	150 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

The use of a vapor retarder should be considered beneath concrete slabs-on-grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

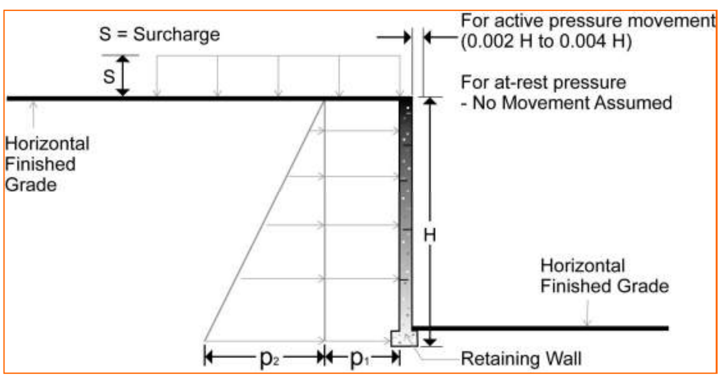
Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



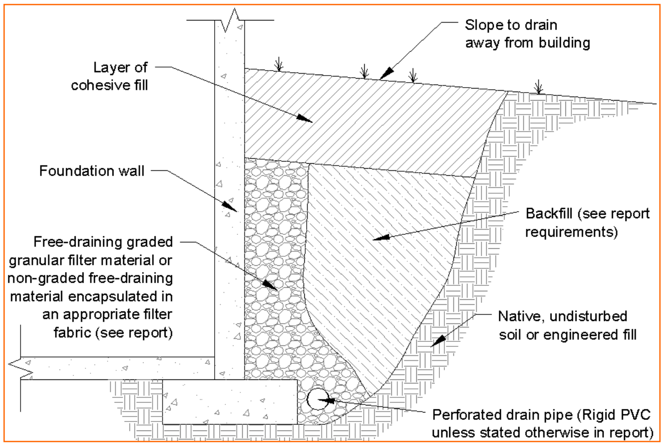
Lateral Earth Pressure Design Parameters			
Earth Pressure Condition [1]	**Coefficient for Backfill Type** [2]	**Surcharge Pressure** [3, 4, 5] **p_1 (psf)**	**Effective Fluid Pressures (psf)** [2, 4, 5] **Unsaturated** [6]
Active (Ka)	Granular - 0.27	(0.27)S	(33)H
At-Rest (Ko)	Granular - 0.42	(0.42)S	(50)H
Passive (Kp)		---	(390)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 90% of the ASTM D 1557 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. To achieve “Unsaturated” conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. “Submerged” conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

PAVEMENTS

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Design of Asphaltic Concrete (AC) pavements are based on the procedures in the Caltrans Highway Design Manual, 2018 edition. Design of Portland Cement Concrete (PCC) pavements are based upon American Concrete Institute (ACI) 330R-01; Guide for Design and Construction of Concrete Parking Lots.

Two samples of the near surface soil were obtained and classified at our laboratory by an engineer. The samples were tested to determine the Resistance Value (R-value). The location of the R-value samples are identified on the exploration plan. The tests produced R-values of 39 and 41. A design R-value of 39 was used for the AC and PCC pavement designs. We have provided pavement sections for traffic indices (TI) of 4.0, 5.0, and 6.0. The project civil engineer should choose which pavement sections are applicable to the various streets within the development. If additional pavement sections are required based on different traffic indices (TI), Terracon should be contacted to provide them.

Pavement Section Thicknesses

The following tables provide options for the AC and PCC pavement sections:

Asphaltic Concrete Design			
Layer	**Thickness (inches)**		
	TI=4.0	**TI= 5.0**	**TI= 6.0**
AC [1]	2.5	3.0	3.5
Aggregate Base	4.0	4.0	4.5

[1] All materials should meet the current Caltrans Standard Specifications, latest edition

Portland Cement Concrete Design			
Layer	**Thickness (inches)**		
	Auto Parking	**Entrances/Exits**	**Bus/Fire Lane/Dumpster Pad**
PCC [1]	5.0	5.0	5.5
Aggregate Base	4.0	4.0	4.0

[1] All materials should meet the current Caltrans Standard Specifications, latest edition.

We understand that permeable pavers and/or turf block (i.e. Grasspave) may be used in areas of the project. Once specific manufacturers are confirmed or selected, our office shall be notified to provide specific recommendations. All manufacturers' specification and installation guidelines shall be followed. In general, permeable paver thickness shall match the minimum flexible asphalt sections above. In general, turf block (i.e. Grasspave) shall be supported on a base course consisting of Caltrans Class 2 aggregate road base. According to the Grasspave2 technical specifications, the base course should have a near neutral pH range from 6.5 to 7.2. If needed, we can perform a pH test once a source is identified by the contractor. The subgrade and the base course shall be moisture conditioned, as needed, and compacted as specified in our geotechnical engineering report, minimum 95 percent relative compaction as determine by ASTM D1557. The base course shall be a minimum of 9 inches thick for the occasional fire truck (TI=6).

The estimated pavement sections provided in this report are minimums for the assumed design criteria, and as such, periodic maintenance should be expected. Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles. A maintenance program including surface sealing, joint cleaning and sealing, and timely repair of cracks and deteriorated areas will increase the pavement's service life. As an option, thicker sections could be constructed to decrease future maintenance.

Concrete for rigid pavements should have a minimum 28-day compressive strength of 4,000 psi, a modulus of rupture of 500 psi, and be placed with a maximum slump of 4 inches. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its "green" state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Pavement design methods are intended to provide structural sections with adequate thickness over a subgrade such that wheel loads are reduced to a level the subgrade can support.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. This is especially applicable for islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils. The civil design for the pavements with these conditions should include features to restrict or to collect and discharge excess water from the islands. Examples of features are edge drains connected to the storm water collection system, longitudinal subdrains, or other suitable outlet and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

Dishing in parking lots surfaced with AC is usually observed in frequently-used parking stalls (such as near the front of buildings) and occurs under the wheel footprint in these stalls. The use of higher-grade asphaltic cement, or surfacing these areas with PCC, should be considered. The dishing is exacerbated by factors such as irrigated islands or planter areas, sheet surface drainage to the front of structures, and placing the ACC directly on a compacted clay subgrade.

Rigid PCC pavements will perform better than AC in areas where short-radii turning and braking are expected (i.e. entrance/exit aprons) due to better resistance to rutting and shoving. In addition, PCC pavement will perform better in areas subject to large or sustained loads. An adequate number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI and/or AASHTO requirements. Expansion (isolation) joints must be full depth and should only be used to isolate fixed objects abutting or within the paved area.

PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with American Concrete Institute (ACI 330R-01 and ACI 325R.9-91). PCC pavements should be provided with mechanically reinforced joints (doweled or keyed) in accordance with ACI 330R-01.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

The pavement surfacing and adjacent sidewalks should be sloped to provide rapid drainage of surface water. Water should not be allowed to pond on or adjacent to slabs, since it could saturate the subgrade and contribute to premature pavement or slab deterioration.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore, preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.

If unpaved gravel is used, annual maintenance shall be performed to ensure proper drainage is maintained and to ensure no ponding of surface water occurs.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

1. Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
2. Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
3. Install below pavement drainage systems surrounding areas anticipated for frequent wetting.

4. Install joint sealant and seal cracks immediately.
5. Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
6. Place compacted, low permeability backfill against the exterior side of curb and gutter.
7. Place curb, gutter and/or sidewalk directly on subgrade soils rather than on unbound granular base course materials.

INFILTRATION TESTS

Three (3) double-ring infiltrometer tests were performed within the proposed bio-swale areas as located by the project civil engineer. As indicated, double ring infiltrometer test (DR1), needed to be moved approximately 150 feet west of the original proposed location due to the congestion of underground utilities. The results of the double-ring infiltrometer tests are presented in the following table:

Test ID	Depth of test, ft.	Infiltration rate, inches per hour	Infiltration rate, centimeters per second
DR1	5	0.5	0.0004
DR2	5	1.3	0.0009
DR3	5	0.5	0.0004

Since our tests were performed using clean water, the storm water runoff will likely contain materials such as silt, leaves, oil residues, and other matter that may reduce the infiltration characteristics of the soils, we therefore recommend that an appropriate safety factor be applied to the estimated infiltration rates for use in design. The safety factor should consider the level of filtration the system can provide. All intakes should be cleaned regularly following significant rains and prior to the beginning of the rainy season.

We have provided the following considerations for the design and construction of the storm water collection system. The long-term infiltration rates will depend on many factors, and can be reduced if the following conditions are present:

- Variability of site soils.
- Fine layering of soils, or
- Maintenance and pre-treatment (filtration) of the influent are not performed regularly.

Subsurface Soil Variations: Variations in subsurface soil conditions and the presence of fine layering can affect the infiltration rate of the receptor soils. Some low permeability and finely layered, fine-grained alluvial soil (silt) was encountered over the project site. These mixtures impede vertical infiltration of storm water.

Construction Considerations: The infiltration rates of the receptor soils will be reduced in the event that fine sediment, organic materials, and/or oil residue are allowed to settle in bio-swale areas. The use of a filtration system is highly recommended as well as a maintenance program.

Operation of heavy equipment during construction may densify the receptor soils in the bottom of the storm drain system. The soils exposed in the bottom of the system should not be compacted and should remain in their native condition.

Maintenance of Facilities: Satisfactory long-term performance of the bio-swale system will require some degree of maintenance.

CORROSIVITY

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary						
Boring	**Sample Depth (feet)**	**Soil Description**	**Soluble Sulfate (%)**	**Soluble Chloride (%)**	**Electrical Resistivity (Ω-cm)**	**pH**
B2	2.5	Silty Sand	0.01	<0.01	2,716	8.48

Results of soluble sulfate testing indicate samples of the on-site soils tested classify as Class S0 when classified in accordance with Table 19.3.1 of the ACI Design Manual. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

The chloride test results indicate that the soils have a relatively low chloride content present. According to Table 19.3.1.1 of ACI 318-14, the soil should not be considered an external source of chloride (i.e. sea water, etc.) to concrete foundations. Consequently, chloride classes of C0 and C1 should be used where applicable. C0 is defined as, “Concrete dry or protected from moisture” and C1 is defined as, “Concrete exposed to moisture but not to an external source of chlorides”. For the amount of chlorides allowed in concrete mix designs, Table 19.3.2.1 of ACI 318-14 shall be adhered to as appropriate.

Based on the results of the sulfate content test results, ACI 318-14, Section 19.3 does not specify the type of cement or a maximum water-cement ratio for concrete for sulfate Class S0. For further information, see ACI 318-14, Section 19.3.

GEOPHYSICAL SURVEY OF SEPTIC SYSTEM LEACH FIELDS

A geophysical investigation was performed by NORCAL Geophysical Consultants: A Terracon Company (NORCAL) on a portion of the Valley Robotics Academy site on the Henderson School grounds. This survey is discussed and described in the **Supporting Information** section of this report. The purpose of this geophysical investigation was to try and locate the existing septic system leach fields.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
1	51½	Planned building area
9	16½	Planned building area
4	11½	Planned building area
1	6½	Planned building area
2	4½	Planned parking/driveway area

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from Google Earth™. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted, rotary drill rig using continuous flight hollow stem augers. Samples were obtained depths of 1 and 5 feet in each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 2.5-inch O.D. Modified California split-barrel sampling spoon with 2.0-inch I.D. tube-lined sampler was also used for sampling. Tube-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are not the same as the N-values obtained with the SPT sampler. We observed and recorded groundwater levels during drilling and sampling. For safety purposes and as required by the San Joaquin County Environmental Health Department, all borings were backfilled with neat cement grout after their completion. Pavements were patched with cold-mix asphalt.

Due to restricted site access, boring B15 was advanced with a hand auger to the depth explored of 6½ feet bgs. Bulk samples were obtained from the boring and transported to our laboratory for testing. In addition, a Dynamic Cone Penetrometer (DCP) was used to determine relative density of the soil encountered. The penetration test is made through the augered hole. After seating, the cone point is then driven 1¾ inches using the 15-pound hammer dropping a distance of 20 inches. The number of blows required to drive the cone point the 1¾ inch distance is recorded.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Double-ring infiltrometer Testing: As requested, three double-ring infiltrometer tests were performed within the location of the proposed bio-swale areas. The location and depth of the infiltration tests were provided to us by the project civil engineer. Three test pits were excavated with a rubber-tired backhoe to a depth of approximately 5 feet below ground surface to provide a test location within each proposed bio swale location. The infiltration tests were performed in the bottom of the test pits. Following completion of the tests, the test pit was backfilled by the backhoe, using the soil excavated from the test pits. The test pits were not backfilled to standards typical of engineered fill.

The infiltration tests were performed utilizing a double ring infiltrometer in general accordance with the ASTM D3385 test method. The calculations are based on the volume of water displaced over the measured time interval of 30 minutes. In this method, both the inner and outer rings were driven into the excavated soil layer approximately 2 to 3 inches. A reference point was marked to ensure the water was refilled in the inner and outer ring to the same level after each reading. Measurements using a steel tape measure was used to measure the volume displaced.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D1140 Standard Test Method for Determining the Amount of Material Finer than No. 200 Sieve by Soil Washing
- Soil Corrosivity

The laboratory testing program included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

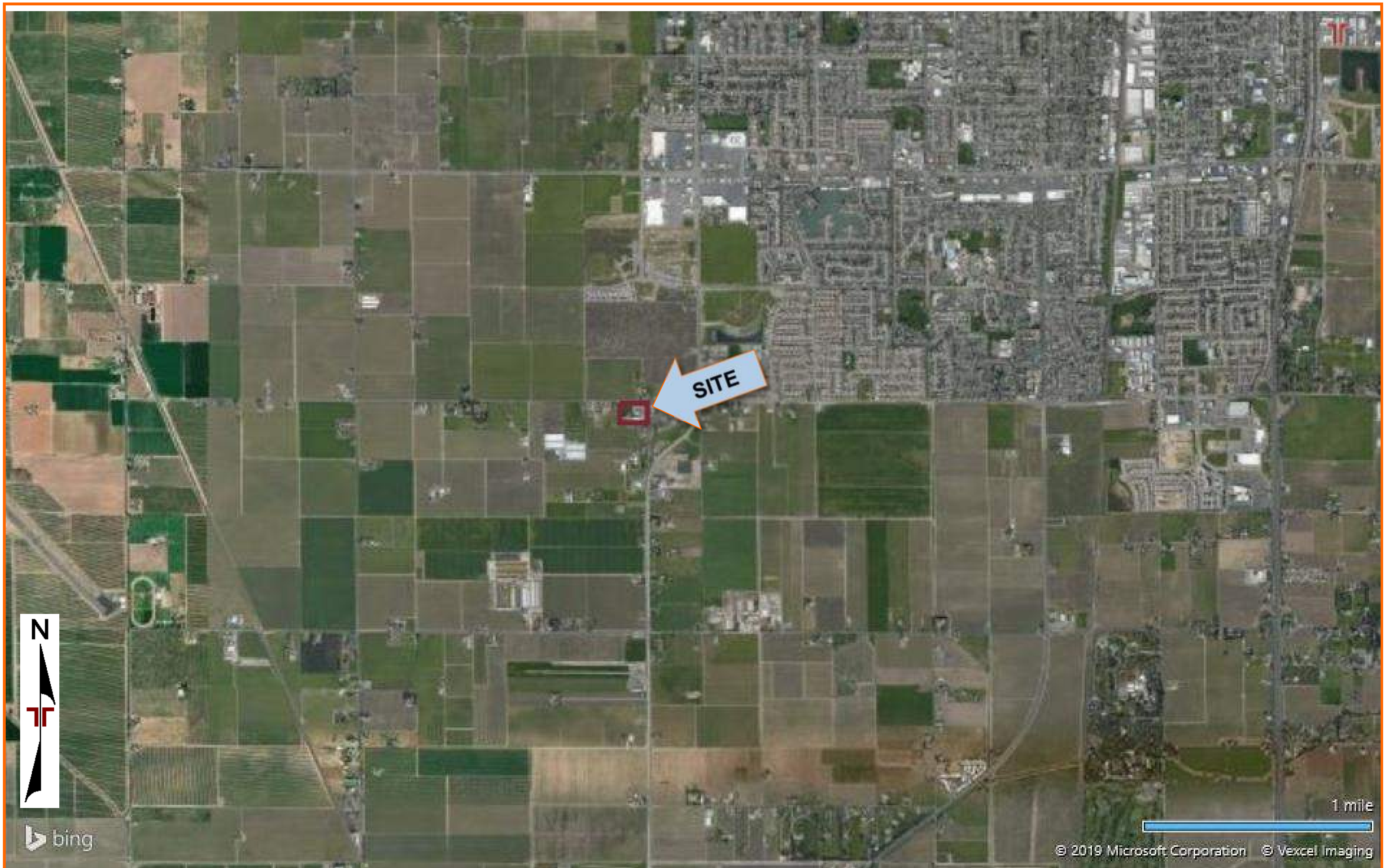
Contents:

Note: All attachments are one page unless noted above.

SITE LOCATION

Valley Robotics Academy ■ Lodi, California

December 19, 2019 ■ Terracon Project No. NA195099



EXPLORATION PLAN

Valley Robotics Academy ■ Lodi, California

December 19, 2019 ■ Terracon Project No. NA195099

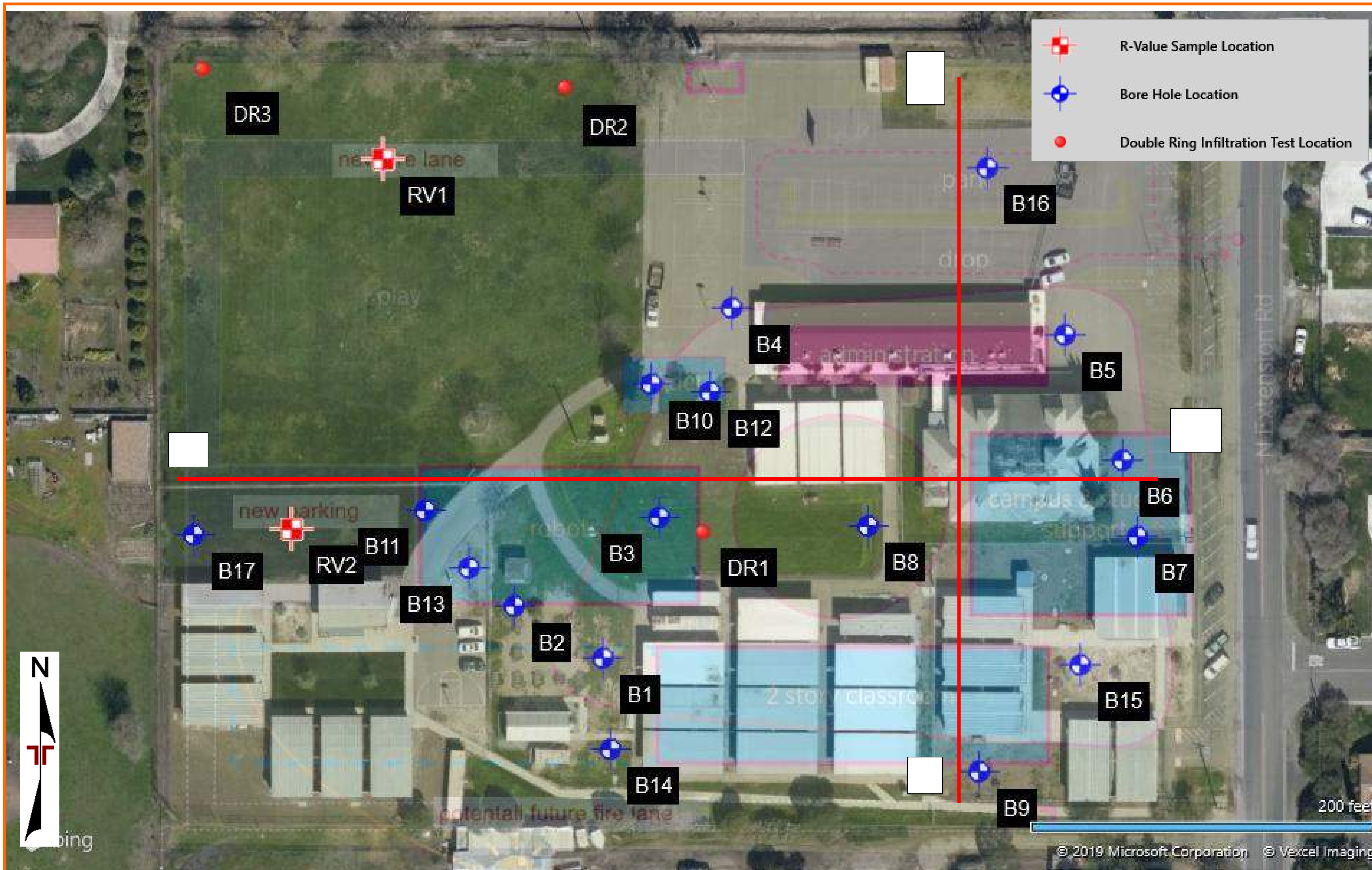


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

GEOLOGIC MAP

Valley Robotics Academy ■ Lodi, CA
December 5, 2019 ■ Terracon Project No. NA195099

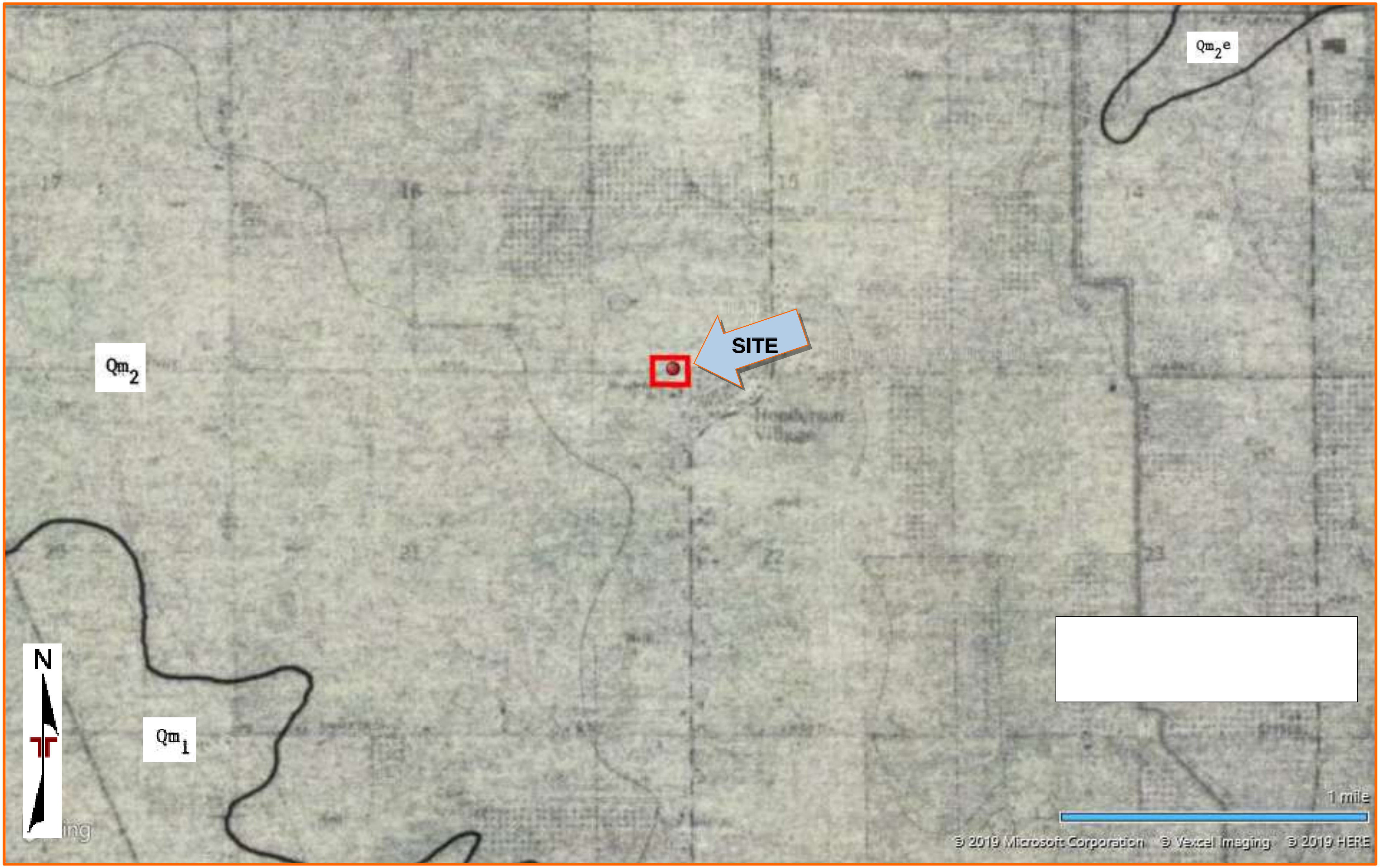


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Marchand, D.E., and Atwater, B.F., 1979, Preliminary geologic map showing Quaternary deposits of the Lodi quadrangle, California: U.S. Geological Survey, Open-File Report OF-79-933, scale 1:62,500

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

FAULT ACTIVITY MAP
Valley Robotics Academy ■ Lodi, CA
December 5, 2019 ■ Terracon Project No. NA195099

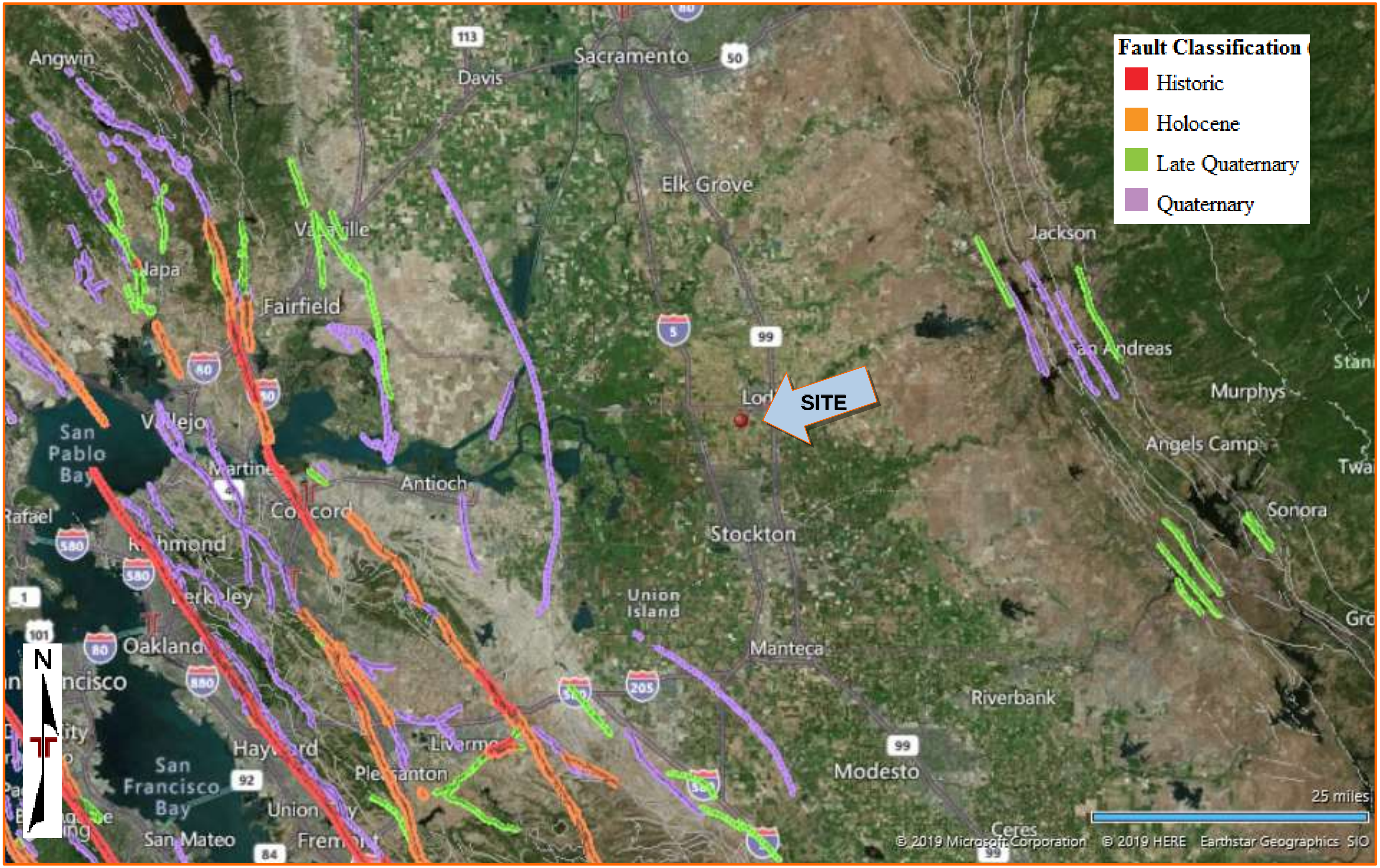


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Note: All attachments are one page unless noted above.

BORING LOG NO. B1

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd, Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1° Longitude: -121.3118°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, medium dense									
					X	4-6-7 N=13		5		
	light reddish brown very dense		5		X	7-28-36 N=64		10		
	light brown, dense				X	8-14-24 N=38		15		
	medium dense		10		X	10-12-10 N=22		16		
	fine grained, tan light brown		15		X	5-9-11 N=20		18		
18.0	**SILT WITH SAND (ML)**, fine grained, tan, hard	12+/-								
			20		X	9-13-18 N=31		21		72
23.0	**SILTY SAND (SM)**, tan, medium dense	7+/-								
			25		X	2-4-7 N=11	1.5 (HP)	24		

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-20-2019	Boring Completed: 08-20-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B1

PROJECT: Valley Robotics Academy

**CLIENT: Lodi Unified School District
Lodi, CA**

**SITE: 13451 N Extension Rd,
Lodi, CA**

LOCATION See Exploration Plan

Latitude: 38.1° Longitude: -121.3118°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), tan, medium dense *(continued)*									
29.0		1+/-								
	POORLY GRADED SAND WITH SILT (SP-SM), fine to medium grained, brown, medium dense		30		X	9-9-12 N=21		4		
33.0		-3+/-								
	SILTY SAND (SM), light brown, dense		35		X	11-21-22 N=43		14		
38.0		-8+/-								
	POORLY GRADED SAND WITH SILT (SP-SM), fine to medium grained, tan, medium dense		40		X	10-12-12 N=24		5		
			45		X	8-10-10 N=20		22		
49.0		-19+/-								
	SILT (ML), tan, very stiff		50		X	10-12-13 N=25	2.0 (HP)	29		
51.5		-21.5+/-								
	Boring Terminated at 51.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-20-2019	Boring Completed: 08-20-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B2

PROJECT: Valley Robotics Academy

**CLIENT: Lodi Unified School District
Lodi, CA**

**SITE: 13451 N Extension Rd,
Lodi, CA**

LOCATION See Exploration Plan

Latitude: 38.1001° Longitude: -121.312°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	Description	ELEVATION (Ft.)
	SANDY SILT (ML), fine to medium grained, brown, very stiff	
4.5		25.5+/-
	SILTY SAND (SM), fine to medium grained, brown to light brown, very dense	
	medium dense	
15.5	dense	14.5+/-
	SILT (ML), tan, very stiff	
16.5		13.5+/-
	Boring Terminated at 16.5 Feet	

FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
12-19-20		9	106	50
13-35-39		9	109	
25-32-50/4"		11	109	
15-13-12		8	105	
21-27-15		18	85	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-07-2019 | Boring Completed: 08-07-2019

Drill Rig: D-90 | Driller: B. Bradberry

Project No.: NA195099

BORING LOG NO. B3

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1002° Longitude: -121.3117°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, dense				Grab			3		
					Grab			4		
					Grab			11		
			5		Split spoon	9-16-33		15	116	
8.5	very dense	21.5+/-			Split spoon	18-34-50/5"		13	104	
	SANDY SILT (ML), fine grained, light brown with rust mottling, hard		10		Split spoon	9-14-35	4.5+ (HP)	24	99	
14.0		16+/-								
	SILT WITH SAND (ML), fine grained, tan, hard		15		Split spoon	10-24-27		21	99	
16.5		13.5+/-								

Boring Terminated at 16.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-19-2019	Boring Completed: 08-19-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL NA195099 VALLEY ROBOTIC.GPJ TERRACON_DATATEMPLATE.GDT 12/19/19

BORING LOG NO. B4

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District Lodi, CA

SITE: 13451 N Extension Rd, Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1005° Longitude: -121.3116°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3	**ASPHALT CONCRETE**	29.5+/-								
	SILTY SAND (SM), fine to medium grained, brown, medium dense									
						5-8-12		10	126	46
			5			5-7-9		10	110	
	very dense					22-37-50/5"		11	112	
	dense		10			15-20-18		16	99	
14.0	**SILT WITH SAND (ML)**, fine grained, tan, very stiff	16+/-								
16.5		13.5+/-	15			11-12-22		23	98	

Boring Terminated at 16.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-19-2019

Boring Completed: 08-19-2019

Drill Rig: D-50

Driller: R. Anderson

Project No.: NA195099

BORING LOG NO. B5

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1005° Longitude: -121.3109°

Approximate Surface Elev.: 31 (Ft.) +/-

DEPTH / Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
SILTY SAND (SM), fine to medium grained, brown, medium dense					5-13-17		11	113	
dense		5			10-22-26		16	104	13
					13-22-23		19	110	
tan, medium dense, white mottling		10			5-8-9		14	89	
fine grained, dense		15			9-18-26		16	96	
16.5	14.5+/-								

Boring Terminated at 16.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-21-2019	Boring Completed: 08-21-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B6

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1003° Longitude: -121.3108°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, dark brown, medium dense				Grab			7		
					Grab			6		
	brown		5		Split spoon	7-6-8		6	108	
7.0	**SANDY SILT (ML)**, fine to medium grained, light brown, hard	23+/-			Split spoon	10-28-46		17	104	
10.0	**SILTY SAND (SM)**, fine grained, light brown, medium dense	20+/-	10		Split spoon	8-12-20		18	106	
16.5		13.5+/-	15		Split spoon	6-14-16		30	91	
	Boring Terminated at 16.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-21-2019	Boring Completed: 08-21-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B7

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1002° Longitude: -121.3107°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)
	SILTY SAND (SM), fine to medium grained, dark brown, medium dense	
	brown	
	light brown, very dense	
	dense	
16.0		14+/-
16.5	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to medium grained, tan, dense	13.5+/-
	Boring Terminated at 16.5 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
1		Grab					
2.5		Grab			10		
5		Split spoon	7-10-15		13	120	
7.5		Split spoon	11-28-50/5"		16	112	
10		Split spoon	12-16-25		15	115	
15		Split spoon	11-18-20		17	94	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-21-2019	Boring Completed: 08-21-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B8

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1002° Longitude: -121.3113°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown				Hand auger			3		
					Hand auger			5		
5.0	**SANDY SILT (ML)**, fine to medium grained, brown, hard	25+/-	5		Split spoon	13-21-31		14		
6.0	**SILTY SAND (SM)**, fine to medium grained, brown, dense	24+/-								
	brown, white mottling				Split spoon	17-25-27		15		
	medium dense		10		Split spoon	4-7-15		13		
14.0	**SILT WITH SAND (ML)**, fine to medium grained, tan, very stiff	16+/-	15		Split spoon	9-15-20		24		
16.0	**POORLY GRADED SAND (SP)**, fine to coarse grained, tan, medium dense	14+/-								
16.5	***Boring Terminated at 16.5 Feet***	13.5+/-								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-21-2019	Boring Completed: 08-21-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B9

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District, Lodi, CA

SITE: 13451 N Extension Rd, Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.0997° Longitude: -121.3113°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, medium dense									
						3-4-6		7	105	
			5			5-11-15		9	124	
	reddish brown to tan, very dense					18-31-49		14	116	
10.0		20+/-	10							
	SILT WITH SAND (ML), fine grained, very stiff					11-18-24		20	106	
14.0		16+/-								
	SILTY SAND (SM), fine grained, tan, dense		15			11-18-20		15	105	
16.5		13.5+/-								
	Boring Terminated at 16.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-19-2019	Boring Completed: 08-19-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B10

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District Lodi, CA

SITE: 13451 N Extension Rd, Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1005° Longitude: -121.3117°

Approximate Surface Elev.: 29 (Ft.) +/-

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), brown, medium dense									
						7-14-19		12	111	
	fine grained, brown		5			7-10-17		13	96	
	dense, weak cementation					12-20-28		12	115	
			10			11-20-30		15	108	
	11.5	17.5+/-								

Boring Terminated at 11.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon

902 Industrial Way
Lodi, CA

Boring Started: 08-19-2019	Boring Completed: 08-19-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B11

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1002° Longitude: -121.3122°

Approximate Surface Elev.: 29 (Ft.) +/-

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, medium dense								
				X	7-8-10		12	100	
		5		X	4-7-8		14	111	
	very dense			X	19-33-50/4"		12	120	
	fine to coarse grained, dense	10		X	22-24-27		10	115	
	11.5 / 17.5+/-								

Boring Terminated at 11.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-07-2019	Boring Completed: 08-07-2019
Drill Rig: D-90	Driller: B. Bradberry
Project No.: NA195099	

BORING LOG NO. B12

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1005° Longitude: -121.3117°

Approximate Surface Elev.: 29 (Ft.) +/-

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, medium dense								
				X	6-10-11		11	110	47
	fine grained, brown, very dense, weak cementation	5		X	13-22-40		11	95	
				X	14-27-35		13	117	
	fine grained, light brown, dense	10		X	9-12-27		14	102	
	11.5 — 17.5+/-								
	Boring Terminated at 11.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-19-2019	Boring Completed: 08-19-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B13

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1001° Longitude: -121.3121°

Approximate Surface Elev.: 29 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, light brown, dense									
					Hand			5		
	brown				Hand			13		
			5		Sampler	15-23-35		14	111	
					Sampler	10-19-27		13	110	
			10		Sampler	7-15-27		16	113	
	fine grained, light brown, medium dense		15		Sampler	11-15-20		27	94	
16.0		13+/-								
16.5	**SILT WITH SAND**, tan/grey, very stiff	12.5+/-								
	Boring Terminated at 16.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-21-2019	Boring Completed: 08-21-2019
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA195099	

BORING LOG NO. B14

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.0999° Longitude: -121.3118°

Approximate Surface Elev.: 30 (Ft.) +/-

DEPTH	Material Description	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, loose					4-4-3		6	106	
			5			2-2-3		13	111	
7.0		23+/-								
	SANDY SILT (ML), brown to light brown, very hard, Rust mottling					7-19-28		19	97	
	very stiff		10			14-14-16		23	92	
11.5		18.5+/-								
	Boring Terminated at 11.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid Stem

Abandonment Method:
Boring backfilled with cement upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-07-2019	Boring Completed: 08-07-2019
Drill Rig: D-90	Driller: B. Bradberry
Project No.: NA195099	

BORING LOG NO. B15

PROJECT: Valley Robotics Academy

**CLIENT: Lodi Unified School District
Lodi, CA**

**SITE: 13451 N Extension Rd,
Lodi, CA**

LOCATION See Exploration Plan

Latitude: 38.1° Longitude: -121.3109°

Approximate Surface Elev.: 31 (Ft.) +/-

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, medium dense to dense								
	brown			Hand sample	84 blows/1.75" DCP		3		
	yellowish brown, very dense	5		Hand sample	142 blows/1.75" DCP		7		
	6.5 / 24.5+/-								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Boring was hand augered since the location was unable to be accessed with drill rig.

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-22-2019	Boring Completed: 08-22-2019
Drill Rig: Hand Auger	Driller: E. McArthur
Project No.: NA195099	

BORING LOG NO. B16

PROJECT: Valley Robotics Academy

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 13451 N Extension Rd,
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1008° Longitude: -121.311°

Approximate Surface Elev.: 30 (Ft.) +/-

GRAPHIC LOG	DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, medium dense				16-16-11		7	98	
					7-10-11		11	117	
	6.5 ... 23.5+/-	5			8-12-12		10	92	
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid Stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

902 Industrial Way
Lodi, CA

Boring Started: 08-07-2019	Boring Completed: 08-07-2019
Drill Rig: D-90	Driller: B. Bradberry
Project No.: NA195099	

BORING LOG NO. B17

PROJECT: Valley Robotics Academy

**CLIENT: Lodi Unified School District
Lodi, CA**

**SITE: 13451 N Extension Rd,
Lodi, CA**

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 38.1002° Longitude: -121.3127° Approximate Surface Elev.: 30 (Ft.) +/- DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, brown, very loose				1-1-3		14		
	medium dense				4-7-9		11		
		5			7-6-8		18		
	6.5 — 23.5+/-								
	Boring Terminated at 6.5 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid Stem

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were estimated using Google Earth.

Notes:

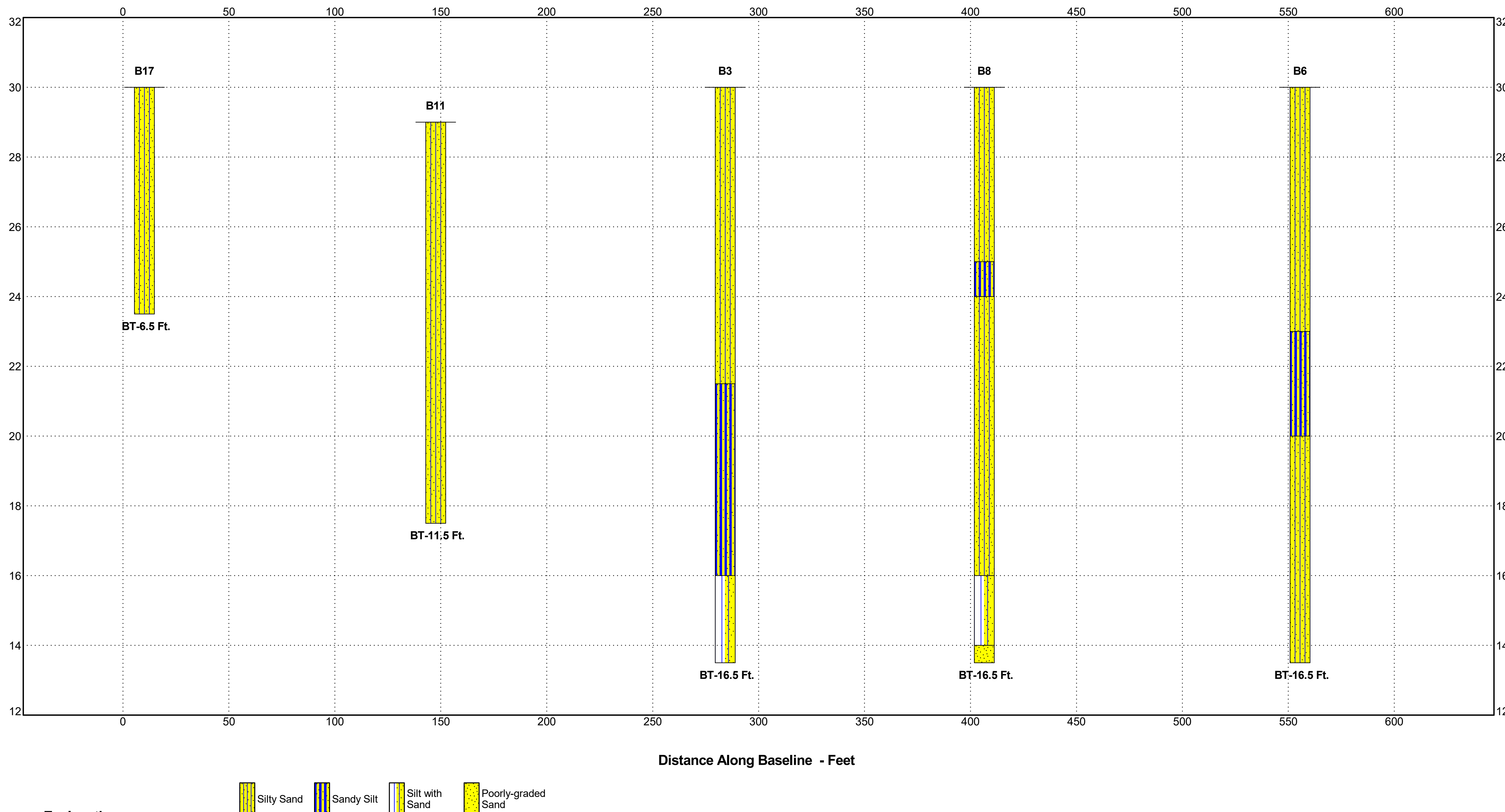
WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 08-07-2019	Boring Completed: 08-07-2019
Drill Rig: D-90	Driller: B. Bradberry
Project No.: NA195099	

WEST EAST



THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART FENCE NA195099 VALLEY ROBOTICS.GPJ TERRACON_DATATEMPLATE.GDT 11/7/19

Explanation

B3 — Borehole Number
Moisture Content — %w
LL PL — Liquid and Plastic Limits
Sampling (See General Notes)
Borehole Lithology
AR BT — Borehole Termination Type
Water Level Reading at time of drilling.
Water Level Reading after drilling.

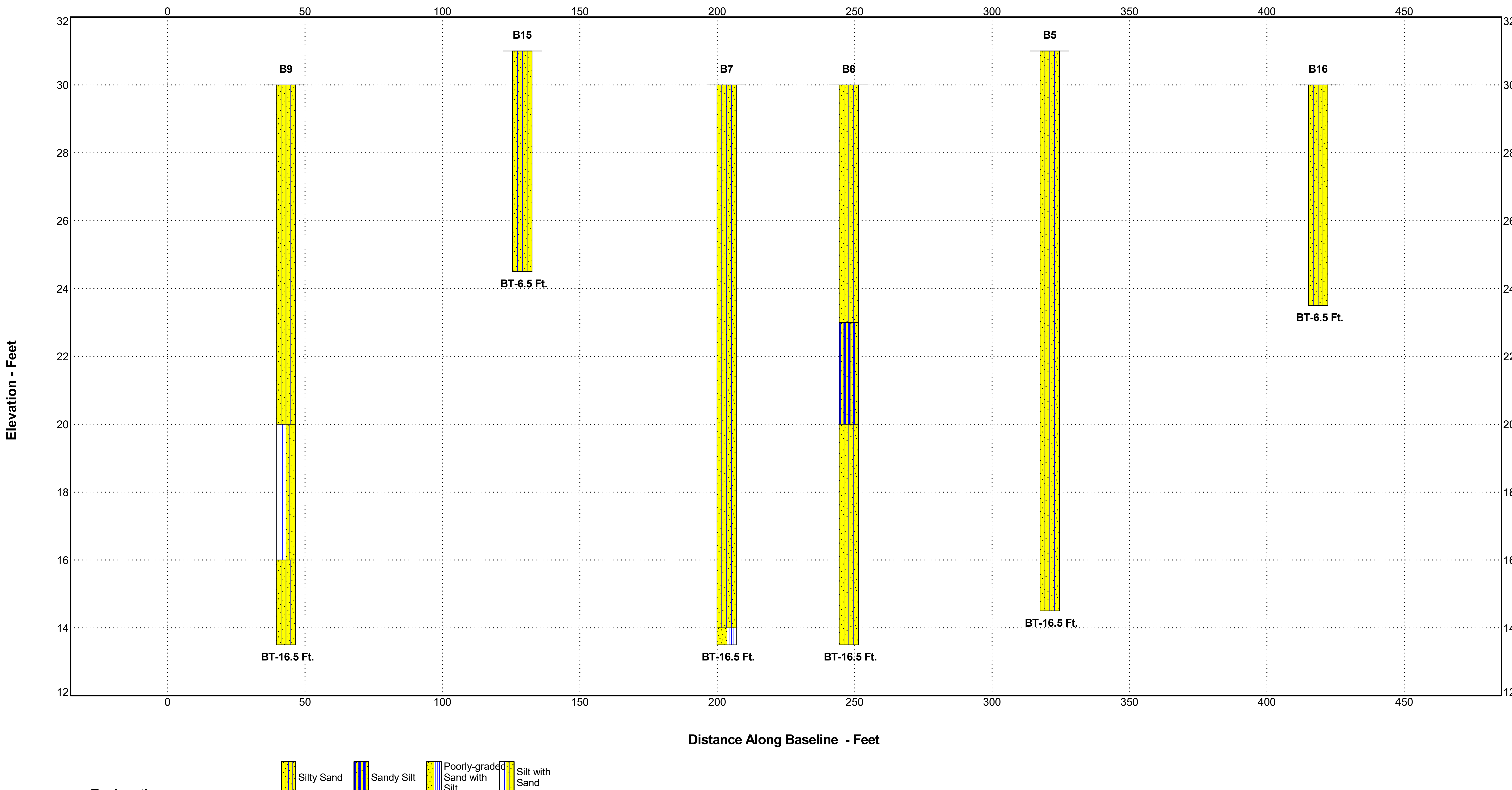
NOTES:
See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: NA195099
Date: 11/7/2019
Scale: As Shown

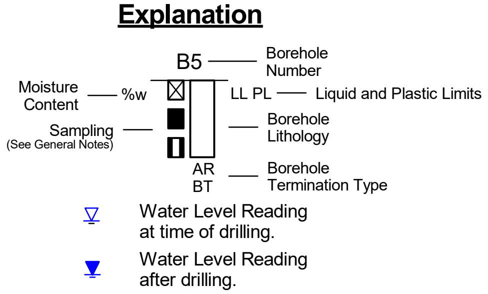
Terracon
902 Industrial Way
Lodi, CA

SUBSURFACE PROFILE
A-A'
VALLEY ROBOTICS ACADEMY
13451 N EXTENSION RD,
LODI, CA

◄ SOUTH NORTH ►



Explanation

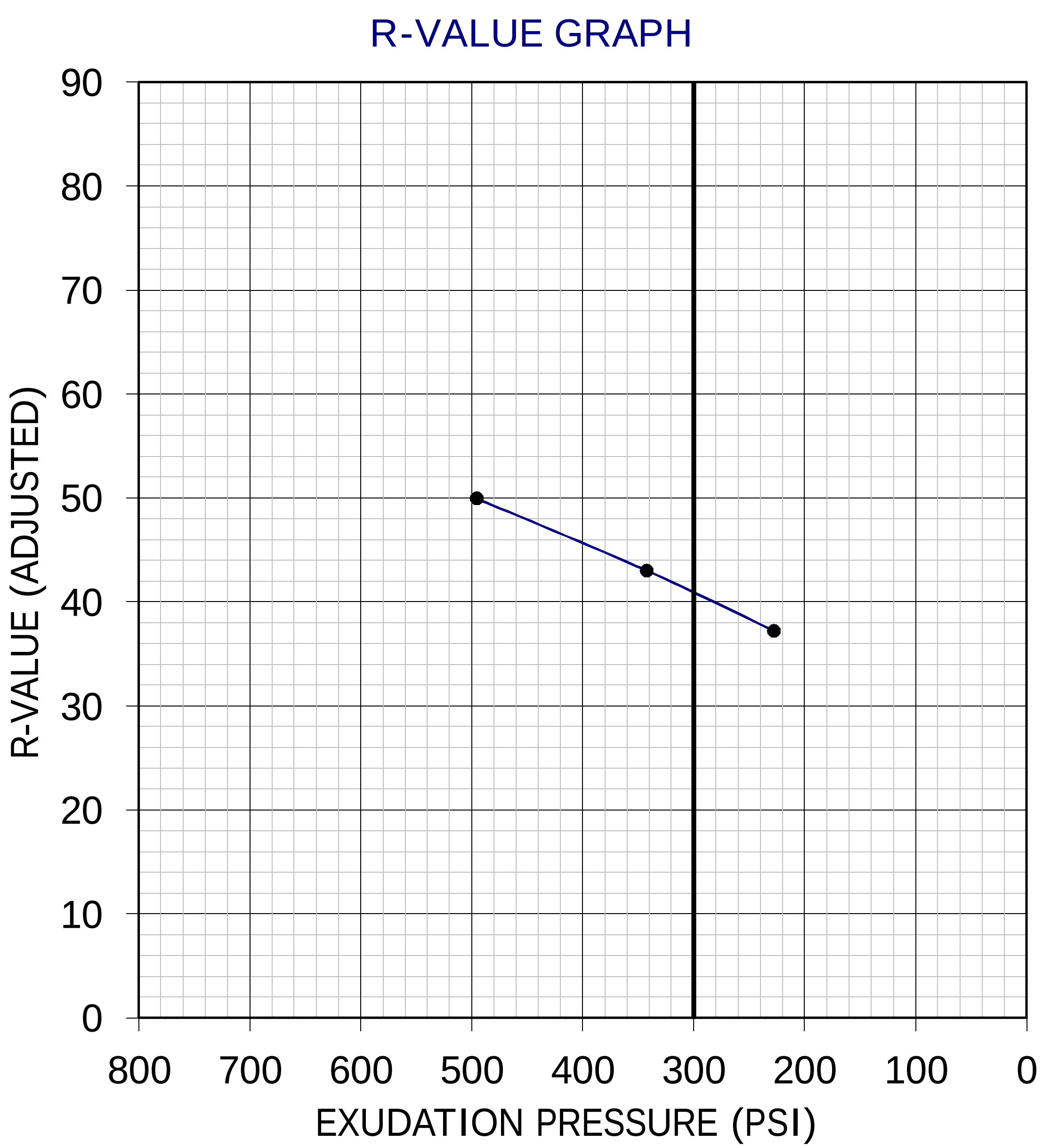


NOTES:

See Exploration Plan for orientation of soil profile.
See General Notes in Supporting Information for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ
AR - Auger Refusal
BT - Boring Termination

Project No.: NA195099	Terracon 902 Industrial Way Lodi, CA	**SUBSURFACE PROFILE** B-B' VALLEY ROBOTICS ACADEMY 13451 N EXTENSION RD, LODI, CA
Date: 11/7/2019		
Scale: As Shown		

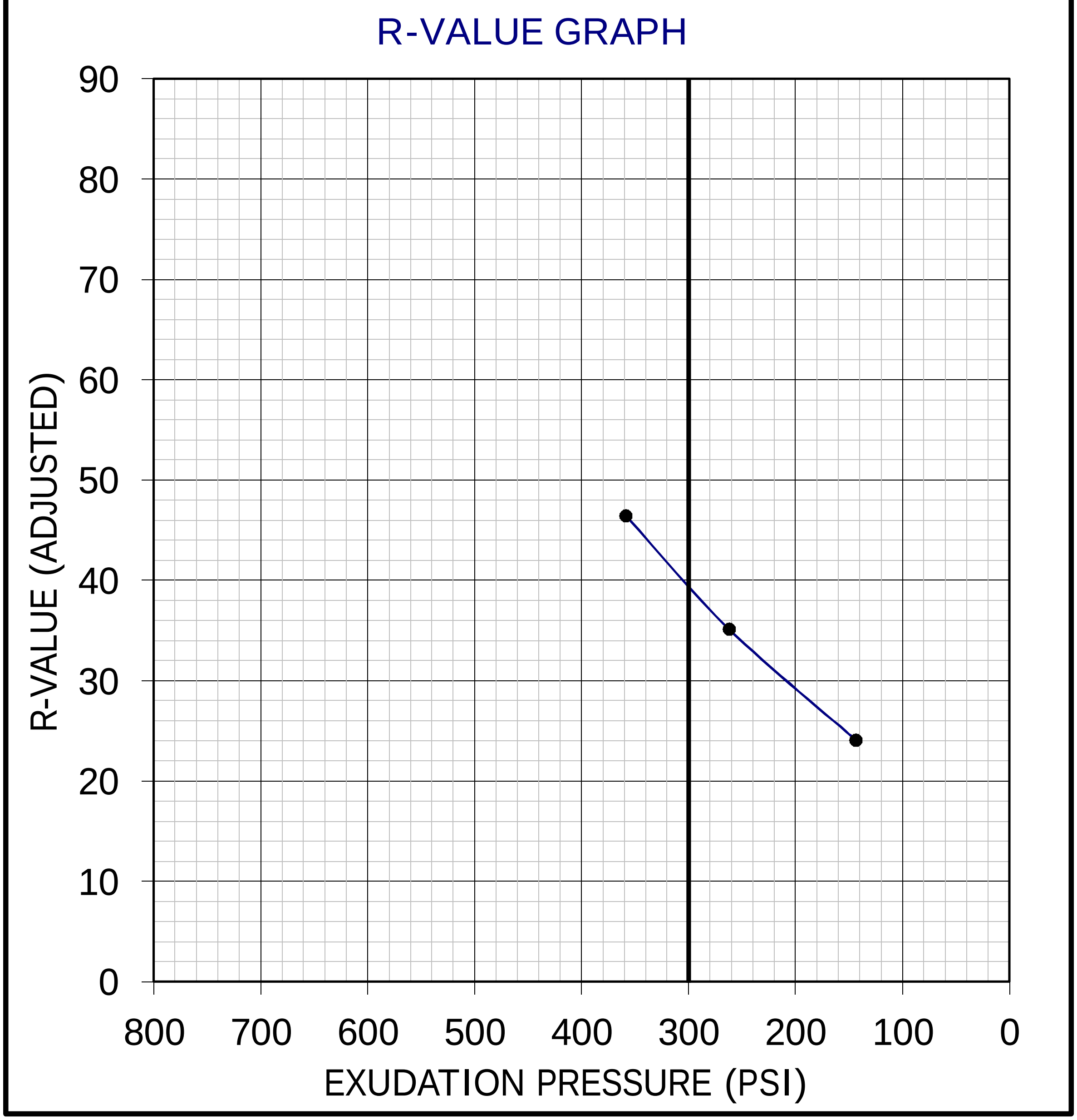
JOB NAME: Valley Robotics Academy
JOB #: NA195099
SAMPLE NUMBER: Bulk Sample
Location: RV-1
SAMPLE CLASSIFICATION: Silty Sand



R-VALUE AT 300 PSI EXUDATION PRESSURE: 41

NOTES:

JOB NAME:	Valley Robotics	JOB #:	NA195099
SAMPLE NUMBER:	Bulk Sample	Location:	RV-2
SAMPLE CLASSIFICATION:	Silty Sand		



R-VALUE AT 300 PSI EXUDATION PRESSURE: 39

NOTES:

CHEMICAL LABORATORY TEST REPORT

Project Number: NA195099
Service Date: 08/26/19
Report Date: 08/30/19
Task:

Terracon
750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client

Lodi Unified School District
Lodi, CA

Project

Valley Robotics Academy

Sample Submitted By: Terracon (NA) **Date Received:** 8/22/2019 **Lab No.: 19-0949**

Results of Corrosion Analysis

Sample Number	1
Sample Location	B2
Sample Depth (ft.)	2.5-4.0
pH Analysis, AWWA 4500 H	8.48
Water Soluble Sulfate (SO4), ASTM C 1580 (percent %)	0.01
Sulfides, AWWA 4500-S D, (mg/kg)	Nil
Chlorides, ASTM D 512, (percent %)	<0.01
Red-Ox, AWWA 2580, (mV)	+680
Total Salts, AWWA 2540, (mg/kg)	520
Resistivity, ASTM G 57, (ohm-cm)	2716

Analyzed By: [signature]
Trisha Campo
Chemist

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Valley Robotics Academy ■ Lodi, CA

December 6, 2019 ■ Terracon Project No. NA195099

Terracon GeoReport

SAMPLING

Modified California Ring Sampler

Grab Sample

Standard Penetration Test

WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
UC	**Unconfined Compressive Strength**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25		< 3
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00		5 - 9
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
		Hard	> 4.00	> 30	> 42

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification: Group Symbol	Soil Classification: Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu 4 and 1 Cc 3 [E]	GW	Well-graded gravel [F]
			Cu < 4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu 6 and 1 Cc 3 [E]	SW	Well-graded sand [I]
			Cu < 6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried < 0.75	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains 30% plus No. 200 predominantly sand, add "sandy" to group name.

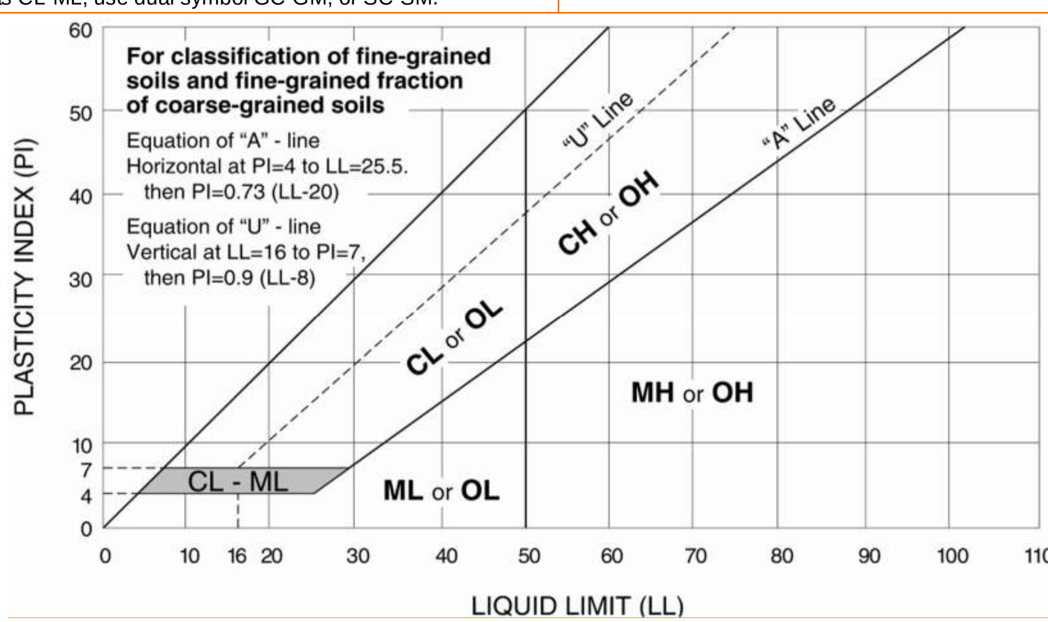
[M] If soil contains 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



October 15, 2019

Lodi Unified School District
1305 E. Vine St.
Lodi, CA 95240

Subject: Geophysical Investigation
Valley Robotics Academy
Henderson School
Lodi, California

NORCAL Job # NS195054

Attention: Ms. Vickie Brum

This report presents the findings of a geophysical investigation performed by NORCAL Geophysical Consultants on a portion of the Valley Robotics Academy site on the Henderson School grounds. The fieldwork was conducted in two phases: Phase 1 was conducted on August 16, 2019 and Phase 2 was conducted on September 18, 2019 by NORCAL Professional Geophysicist David Bissiri (PGp No. 1009). He was assisted on the first day by NORCAL Professional Geophysicist David Hagin and by Staff Geophysicist Kris Powell on the second day. Site background information, logistical support and additional field assistance were provided on both days by Mr. Chris Congrave of Terracon's Lodi office.

1.0 SITE DESCRIPTION AND PURPOSE

The Valley Robotics Academy is located on the campus of Henderson Elementary School. Based on our observation, it appears that the campus has building structures from at least three stages of development: A shuttered wood-clad school house estimated to date from the late 1800's; several classroom buildings from the 1960's, and several portable classrooms of more recent vintage. Based on information supplied to NORCAL one, or more, septic system drainage fields associated with each stage of development may be located in the northwest portion of the campus, in the vicinity of the current grassy athletic field south of East Harney Lane.

As specified by the District the area of investigation consists of an approximately 280- by 250-foot portion of the athletic field, as shown on Plate 1. The athletic field is bordered by chain-link fences on the northern, western, and southern sides and by an asphalt playground on the east. A large shade tree surrounded by four metal benches are in the southeast portion of the survey area. An irrigation system consisting of regularly spaced pop-up sprinklers were also evident within the survey area

The purpose of this geophysical investigation was to explore accessible portions of the survey area for evidence of one or more septic drainage fields and, if possible, the leach lines within said septic drainage fields

2.0 GEOPHYSICAL METHODS

We conducted the investigation using a combination of the terrain conductivity (TC), ground penetrating radar (GPR) and metal detection (MD) methods. The TC method was used to delineate variations in the electrical conductivity of the shallow subsurface to a depth of approximately 5- to 8-ft. These variations can be affected by both metallic and nonmetallic features, such as leach fields, back-filled excavations, and (under favorable conditions) underground utility alignments. The GPR and MD were used as a follow-up to further characterize identified TC anomalies.

3.0 GEOPHYSICAL SURVEY

3.1 Phase 1

We established an approximately 280- by 250- survey grid in the accessible portions of the designated survey area. The grid consisted of a series of east-south lines parallel to East Harney Lane spaced approximately 4-feet apart. We then collected TC data at stations spaced approximately 2-feet along the lines. Following data collection, the TC data were computer processed on-site to produce a preliminary TC data maps and evaluated for TC variations suggestive of buried features and disturbed soil. Further post-processing of the data was done later in our office to refine our preliminary field evaluations.

Based on the preliminary field evaluations of the TC results, we conducted some preliminary reconnaissance GPR work in the central portion of the survey area to determine if the GPR method would likely be successful in characterizing targets during the Phase 2 survey.

3.2 Phase 2

Based on the refined post-processing of the TC results we obtained in our office, we then returned to the field and conducted more localized GPR work in two suspect areas: 1) an approximately 80- by 40-foot area west of the shade tree; and 2) an approximately 50- by 30-foot area northeast of the shade tree, as shown on Plate 2. These GPR surveys both consisted of a series of parallel GPR traverses spaced approximately 1-2 feet apart. The radar data obtained from the traverses were reviewed in the field for reflection patterns suggestive of septic leach lines and the possible sand/gravel pack of a septic field. Additional GPR data processing was done later in our office.

We also conducted a reconnaissance survey of these two areas with the MD. This MD survey consisted of walking along a series of loosely spaced traverses spaced 5-10 feet apart in order determine if there were any metallic lines within the areas that might affect the TC and GPR results.

4.0 RESULTS

4.1 Phase 1

The results of the Phase 1 geophysical investigation are shown on the TC map presented on the right half of Plate 1. This map depicts the variation in electrical conductivity within the survey area, with the variations expressed in units of milliSiemens/meter. As can be seen, most of the survey area is depicted shades of light tan to brownish-orange, which corresponds to values in the 25- to 55-milliSiemens/meter range. We attribute this range of TC values to those produced by predominantly undisturbed soil.

However, in the southern portion of the survey area, in the vicinity of the shade tree, we identified two distinct zones having TC values noticeably lower than the surrounding areas. The noticeably lower areas are depicted in shades of light blue and are attributed to zones of sub-surface material having a different mineral or moisture composition than surrounding areas. The interpreted limits of these zones are depicted by the dark blue dashed lines. Based on these results, we conducted the Phase 2 work.

4.1 Phase 2

The results of the Phase 2 geophysical investigation are presented on Plates 2 through 4. These plates present the interpreted findings of the field work and post-processing that the NORCAL office did and some subsequent historical document investigation conducted by the Terracon Lodi office. The relevant historical document (a building permit dating from February 2012) discovered by the Lodi office is present in Appendix A.

Plate 2 presents the limits of the two follow-up GPR survey areas, the alignments of two sample GPR traverses, and the interpreted location of detected leach lines and septic pits documented on the building permit dating from February 2012. All of these depicted features are shown as an overly on a May 2012 Google satellite image.

Based on the field investigation, the GPR results for the area northeast of the shade tree were inconclusive. However, we were able to document the existence of probable leach lines in the GPR area west of the shade tree. Sample 2D GPR profiles obtained from Traverses A- A' and B-B' showing these suspect leach lines are presented on Plate 3. The leach lines alignment as determined with the GPR coincide very closely with the locations of such piping documented on the historic building permit and with linear features that appear to be recently backfilled trenches evident on the 2012 Google image. In addition to the suspected leach lines, the GPR profiles also show a distinct horizontal difference in reflections that we attribute to a transition from native soil to suspected gravel/sand pack and the bottom of the overlying sod layer.

5.0 DISCUSSION

Based on our geophysical results and the available historical document, we can delineate two probable septic system infiltration zones. Both zones are somewhat irregular in shape and are depicted on Plate 4 by the dashed orange lines. One zone is located west of the shade tree in the southeast corner of the survey area. This zone is designated as the "*interpreted infiltration zone of known 2012 septic system*" since it coincides with the documented leach lines and septic pits noted on the 2012 building permit and corroborated with the TC and GPR geophysical results. The second infiltration zone is located northeast of the shade tree and is designated as the "*interpreted infiltration zone of pre-2012 septic system*". This zone is inferred based on its similar range of TC values associated with the other zone and its somewhat more rectangular outline, which is suggestive of an engineered leach field.

6.0 STANDARD CARE

The scope of NORCAL's services for this project consisted of using geophysical methods to characterize the shallow subsurface. The accuracy of our findings is subject to specific site conditions and limitations inherent to the techniques used. We performed our services in a manner consistent with the standard of care ordinarily exercised by members of the profession currently employing similar methods. No warranty, with respect to the performance of services or products delivered under this agreement, expressed or implied, is made by NORCAL.

We appreciate having the opportunity to provide our services for this investigation. Please do not hesitate to call if you are in need of further geophysical consulting services.

Respectfully,

NORCAL Geophysical Consultants, Inc.

PROFESSIONAL GEOPHYSICIST
DAVID J. BISSIRI
No. 1009
11/25/19
STATE OF CALIFORNIA

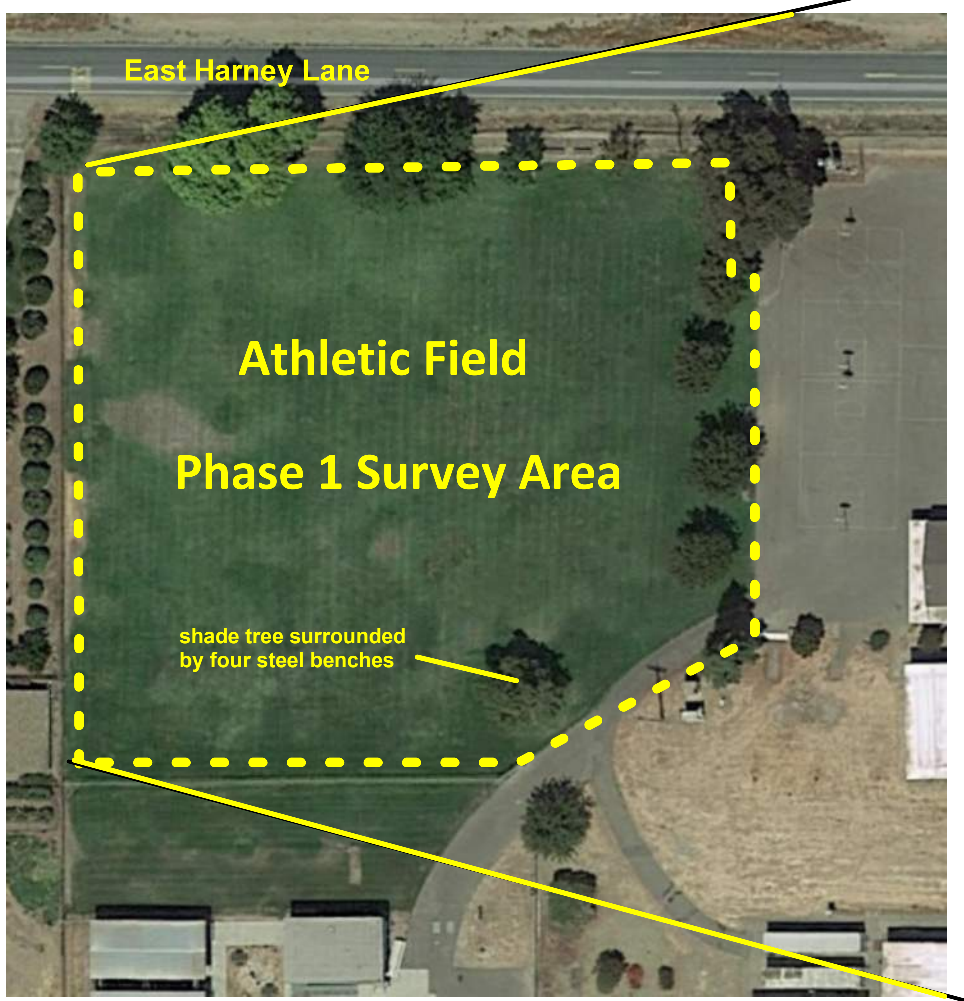
David Bissiri
California Professional Geophysicist, PGp 1009

Enclosure: Plates 1 through 4
Appendix A

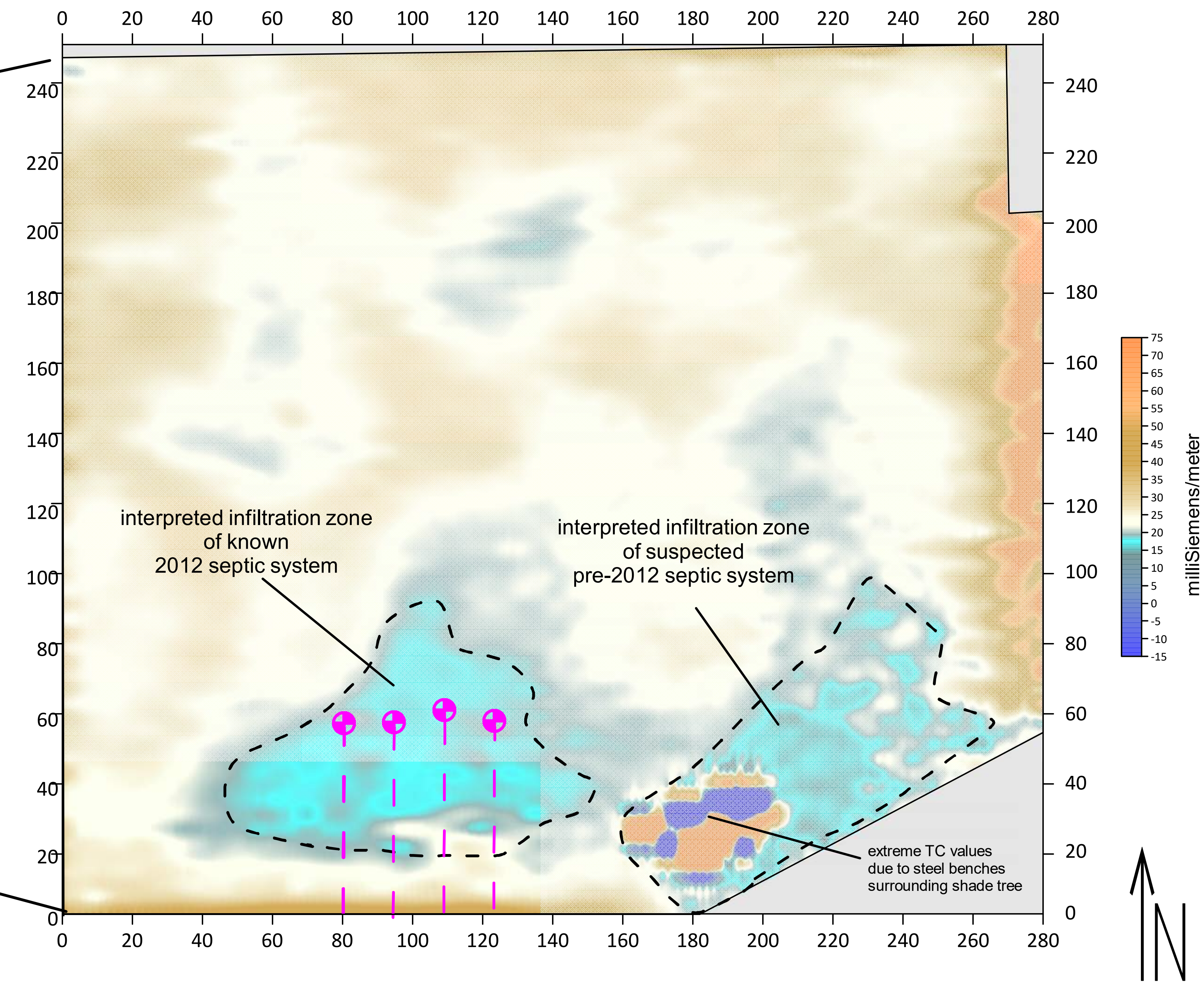
NORCAL Geophysical Consultants, Inc.
a Terreacon Company
Job No. 195054
Client: Lodi Unified Scholl Dist.
Date: Oct. 15, 2019
Graphics by: K. Powell / D. Bissiri

Valley Robotics Academy
Henderson School, Lodi, California
Phase 1 Vicinity and Terrain Conductivity Maps

Henderson School Athletic Field



Terrain Conductivity Map



: Leach lines*

: Septic Pits*

* year 2012 system

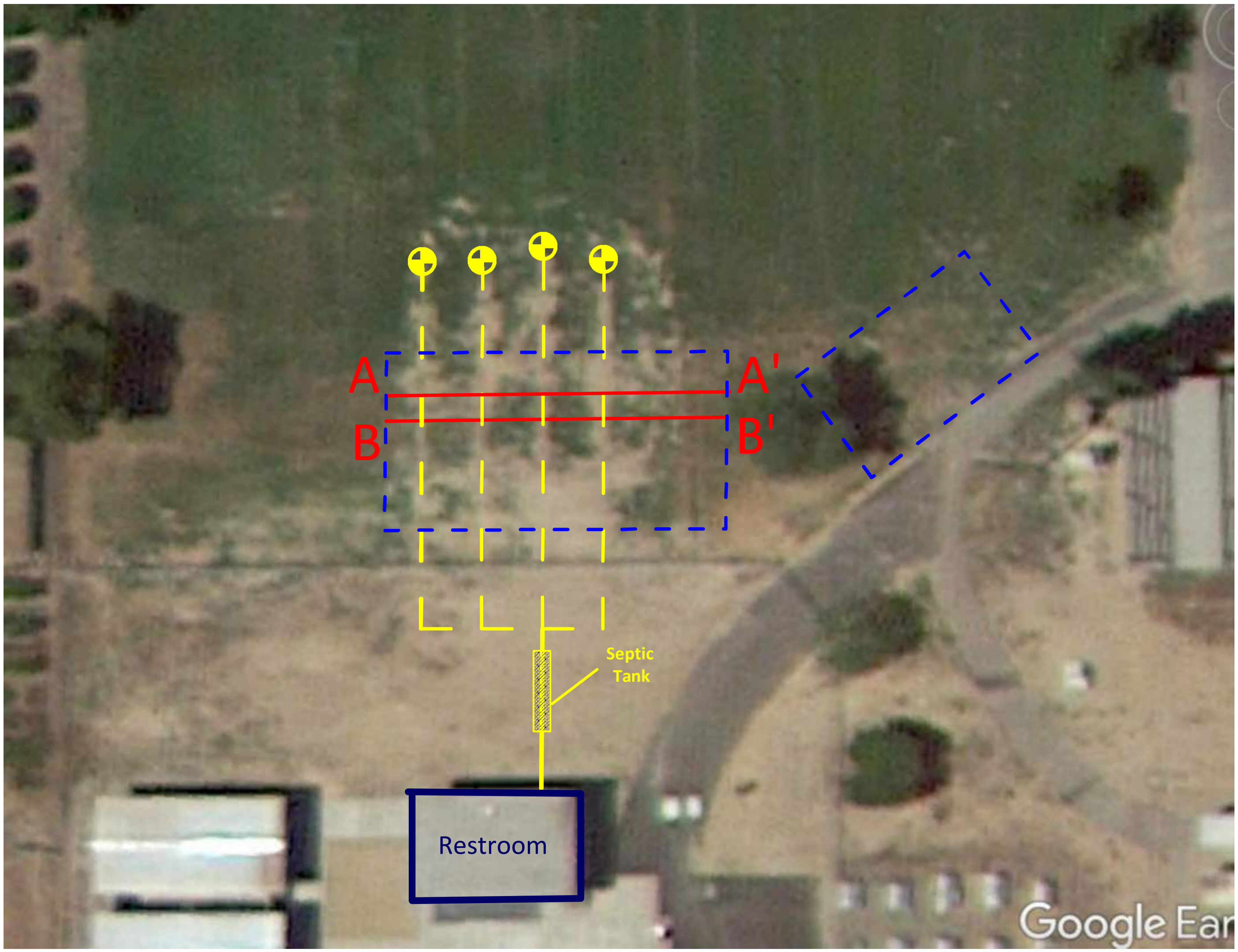
1 inch = 40 feet

Plate 1

NORCAL Geophysical Consultants, Inc.
a Terreacon Company
Job No. 195054
Client: Lodi Unified Scholl Dist.
Date: Oct. 11, 2019
Graphics by: K. Powell / D. Bissiri

Valley Robotics Academy
Henderson School, Lodi, CA
Phase 2 Results Map

(May 2012 image)



1 inch = 40 feet

A —— A' : Sample 2D GPR traverse

: Ph 2 GPR Survey Area

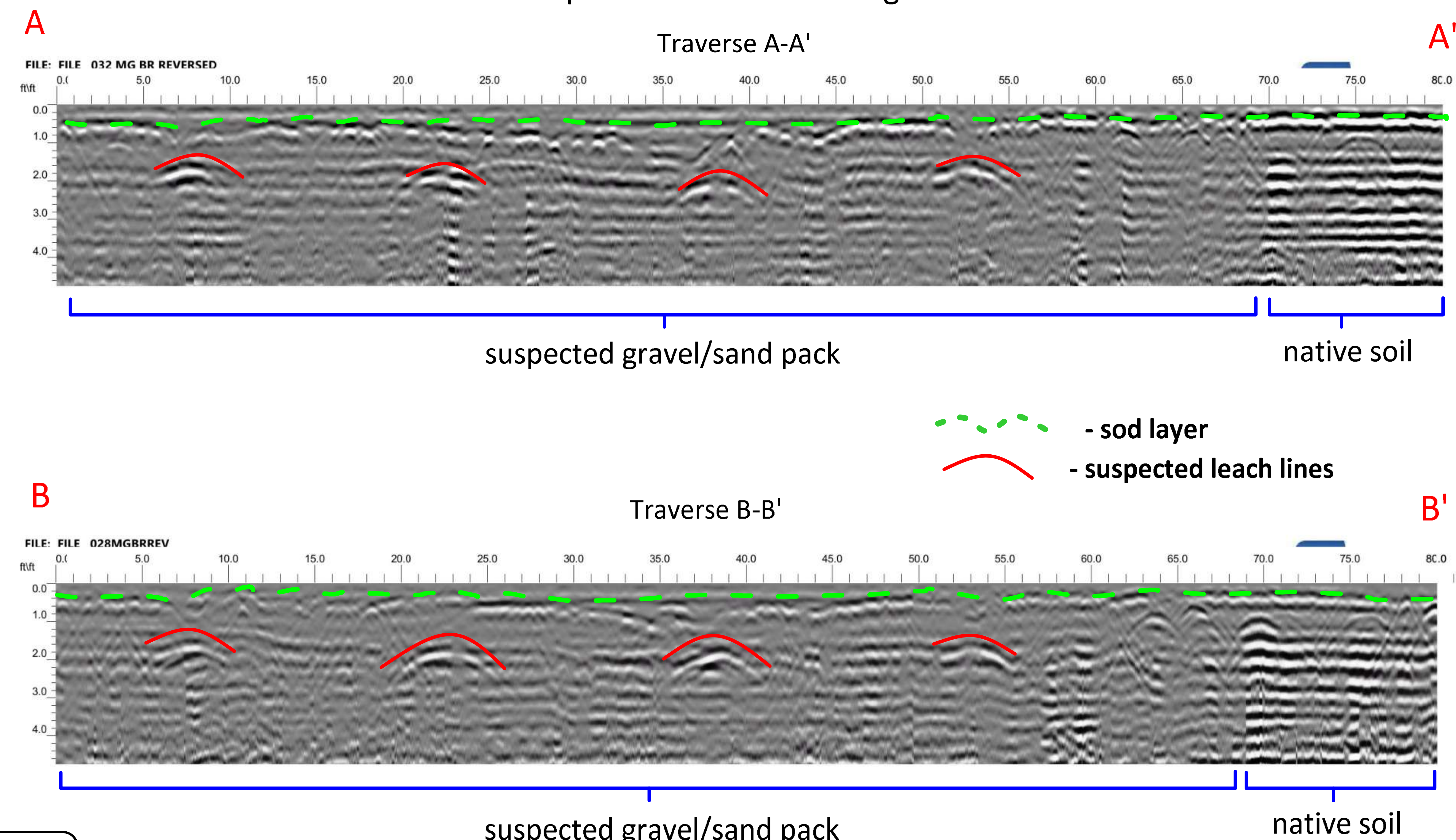
: Leach lines*

: Septic Pits*

* year 2012 system

Plate 2

Valley Robotics Academy
Henderson School
Lodi, California
Sample 2D GPR Profile Images

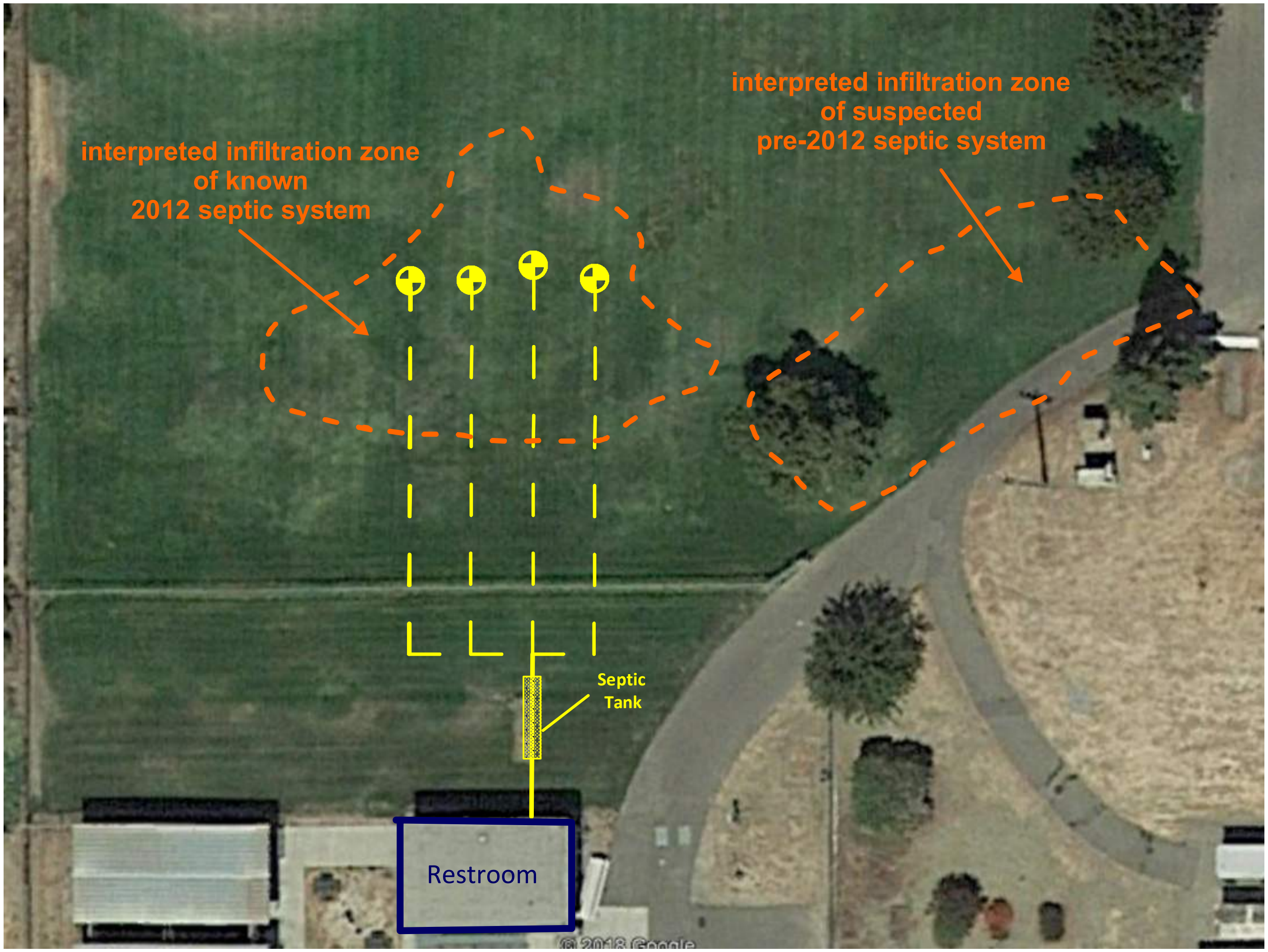


NORCAL Geophysical Consultants
a Terracon Company
Job No. NS195054
Client: Lodi Unified School District
Graphics by: K. Powell/D. Bissiri
Date: Oct. 11, 2019

Plate 3

NORCAL Geophysical Consultants, Inc.
a Terreacon Company
Job No. 195054
Client: Lodi Unified Schoil Dist.
Date: Oct. 11, 2019
Graphics by: K. Powell / D. Bissiri

Valley Robotics Academy
Henderson School, Lodi, CA
Phases 1 and 2
TC and GPR Results Map
(August 2018 image)



1 inch = 40 feet

: Leach lines*

: Septic Pits*

* year 2012 system

Plate 4

2:00

ONSITE WASTEWATER TREATMENT SYSTEM PERMIT

SAN JOAQUIN COUNTY ENVIRONMENTAL HEALTH DEPARTMENT
NON-REFUNDABLE PERMIT

CALL (209) 953-7697 FOR INSPECTIONS

600 E MAIN STREET - STOCKTON CA 95202 - (209) 468-3420

EXPIRES 1 YEAR FROM DATE ISSUED

SITE ADDRESS: 13451 Extension Rd. Lodi, Ca 95242

JOB ADDRESS 13451 N. Extension Rd CITY/ZIP Lodi 95242
CROSS STREET Harney Lane APN 058-05-005 PARCEL SIZE 6.37
OWNER NAME Lodi Unified School District PHONE 209-331-7000
OWNER ADDRESS 1305 E Vine St. CITY/STATE/ZIP Lodi Ca 95240
CONTRACTOR Ann Stephens PHONE 209-333-0136
CONTRACTOR ADDRESS 1717 S. Stockton St. CITY/STATE/ZIP Lodi, Ca 95240
LICENSE ☐C-42 ☐C-36 OTHER "A" NUMBER 404723 EXPIRATION DATE 05/31/2013

WATER TABLE DEPTH: ______ ft GEOGRAPHICAL INFORMATION: Coordinates X ______ Y ______
☐ PERC TEST # ______ BUILDING PERMIT # ______ LAND USE APPLICATION # ______
TYPE OF WORK: ☐ NEW INSTALLATION ☐ REPAIR/ADDITION ☐ ENGINEER DESIGNED /ALTERNATIVE
☐ REPLACEMENT ☐ OUT-OF-SERVICE SEPTIC SYSTEM ☐ DESTRUCTION
INSTALLATION WILL SERVE: ☐ RESIDENCE ☒ COMMERCIAL ☐ OTHER 6 CLASSROOM (16 EACH)
NUMBER OF LIVING UNITS: ______ NUMBER OF BEDROOMS: ______ NUMBER OF EMPLOYEES: 96

☒ SEPTIC TANK TYPE/MFG Jensen CAPACITY 2,500 gal # OF COMPARTMENTS 2
☐ GREASE TRAP TYPE/MFG ______ CAPACITY ______ gal # OF COMPARTMENTS ______
DISTANCE TO NEAREST: WELL ______ ft FOUNDATION ______ ft PROPERTY LINE ______ ft
☐ LIFT STATION SIZE ______ TYPE OF PUMP ______ ☐ PKG TX PLANT ☐ SAND OIL SEPARATOR (ENCLOSED SYSTEM)

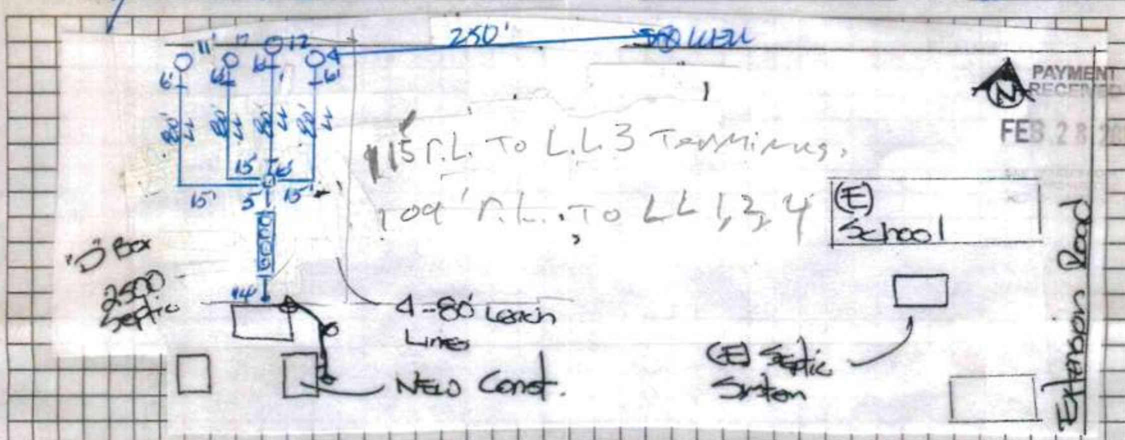
☒ LEACH LINES ☒ LEACHING CHAMBERS 4- # OF LINES 80' LENGTH OF LINES ______ ft
DISTANCE TO NEAREST WELL ______ ft FOUNDATION ______ ft PROPERTY LINE ______ ft
☐ FILTER BED WIDTH ______ ft LENGTH ______ ft DEPTH ______ ft
DISTANCE TO NEAREST WELL ______ ft FOUNDATION ______ ft PROPERTY LINE ______ ft
☐ MOUNDED WIDTH ______ ft LENGTH ______ ft DEPTH ______ ft
DISTANCE TO NEAREST WELL ______ ft FOUNDATION ______ ft PROPERTY LINE ______ ft
☐ SUMPS WIDTH ______ ft LENGTH ______ ft DEPTH ______ ft
DISTANCE TO NEAREST WELL ______ ft FOUNDATION ______ ft PROPERTY LINE ______ ft
☐ DISPOSAL PONDS WIDTH ______ ft LENGTH ______ ft DEPTH ______ ft
DISTANCE TO NEAREST WELL ______ ft FOUNDATION ______ ft PROPERTY LINE ______ ft
☒ SEEPAGE PITS NUMBER 4 WIDTH 4'-0" ft DEPTH 25 ft
DISTANCE TO NEAREST WELL 150 ft FOUNDATION 120 ft PROPERTY LINE 50 ft

I HEREBY CERTIFY THAT I HAVE PREPARED THIS APPLICATION AND THE WORK WILL BE DONE IN ACCORDANCE WITH SAN JOAQUIN COUNTY ORDINANCES, STATE LAWS AND RULES AND REGULATIONS OF SAN JOAQUIN COUNTY.

(209) 992-1449

MINIMUM 24 HOUR ADVANCE NOTICE REQUIRED FOR INSPECTIONS - PLEASE CALL (209) 953-7697

SIGNED [signature] TITLE Superintendent DATE 2-29-12



DEPARTMENT USE ONLY

Application Accepted By [signature] Date 2/29/2012 Area ______ Employee ID# 5944 4/99
Final Inspection By [signature] Date 3/7/12 ☐ SPECIAL PERMIT - Approved by ______
Character of Soil to Depth of 3 Ft: ______ Pit/Sump Soil Character: ______

COMMENTS PWS; PARTIAL INSPECTION TO REVIEW SEPTIC SYSTEM / PUBLIC WATER SYSTEMS ISSUES - 3/2/12 [illegible] (60 MIN); SEPTIC TANK/D-BOX/LL'S INSPECTED; PIPE @ INFILTRATORS REQUIRES SCREWS; LF NEEDS TO BE GRADED DOWN 3-4" TO MEET 24" COVER SOIL MAX. - 3/5/12

PE Code	SC INFO	Received By	Check#/Cash	Amount Remitted	Date	Permit/Service Request #	Invoice #	Permit ID#
4218	250	[illegible]	57097	$525.00	2/29/12	SR0064476		

[illegible] (90 MIN)

LPA

IRVINE • SACRAMENTO • SAN DIEGO • SAN JOSE • DALLAS • SAN ANTONIO

SIGN-IN SHEET

Project Name: Valley Robotics Extension Road
Location: 13451 N. Extension Road, Lodi, California 95242
LUSD Project No. 0826-8426
LPA Project No. 19160.11
DSA Application No. 02-118150
Date: 4/16/2020
Time: 10:00 am

Mandatory Pre-Bid Conference and Site Visit

Name	Company	Phone	E-Mail
Stella Cunha	LUSD	2093317248	Scunha@Lodiusd.net
MARC KARIM	LUSD	209-224-4840	MKARIM@LODIUSD.NET
JR Soares	A.M. Stephens	209-992-0130	JR@Amstephens.net
Hugo Gutierrez	McGuire & Hester	916-813-2690	SACESTIMATING@mcguireandhester.com
SCOTT ROGERS	WESTERN ENGINEERING	916-873-7344	SROGERS@WESTENG.COM
Derek Castillo	All-American	(530)870-6836	derek@all-americanconstruction inc.com
ANTHONY HARRIS	LPA		AHARRIS@LPAINC.COM