Geotechnical Engineering Report

Tokay High School New Classrooms and Gym
Lodi, California
October 30, 2018
Terracon Project No. NA185132

Prepared for:
Lodi Unified School District
Lodi, California

Prepared by:
Terracon Consultants, Inc.
Lodi, California

October 30, 2018

Lodi Unified School District
12345 Street Name
Lodi, California 95240

Attn: Vickie Brum
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Re: Geotechnical Engineering Report
Tokay High School New Classrooms and Gym
1111 W. Century Boulevard
Lodi, California
Terracon Project No. NA185132

Dear Vickie:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PNA185132 dated August 20, 2108. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

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.

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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.

Geotechnical Engineering Report

Tokay High School New Classrooms and Gym
1111 W. Century Boulevard
Lodi, California
Terracon Project No. NA185132
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INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed classroom and gym to be located at 1111 W. Century Boulevard 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
- Excavation considerations
- Foundation design and construction
- Floor slab design and construction
- Lateral earth pressures
- Seismic site classification per 2016 CBC

The geotechnical engineering Scope of Services for this project included the advancement of twelve test borings to depths ranging from approximately 16½ to 51½ feet below existing site grades.

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 1111 W. Century Boulevard in Lodi, California. Approximate coordinates of the project site are 38.1099°W; 121.2869°N. See **Site Location**
Existing Improvements	The property consists of an existing high school campus.

Item	Description
Current Ground Cover	Lawn, bare ground, and asphalt concrete pavement.
Existing Topography	Relatively level.
Geology	The near surface soils consist of Pleistocene Age arkosic alluvium deposits of the Modesto Formation (Qm).
Geologic Hazards	A geologic hazard report was not requested nor included in our scope of work. The project site is not located in a Liquefaction Hazard zone or an Alquist Priolo Fault zone.

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:

Item	Description
Information Provided	Basic scope of project was provided. This project is still in the conceptual planning phase between the District and the project architect. No detailed site plans were available at this time.
Project Description	-The project will include a new gym with weight room, team rooms, restrooms, ticketing and concessions. This structure will be approximately 18,000 SF. No demolition is anticipated at this location. -New modular building for 18 classrooms. Per information provided to us, it appears there will be 3 buildings in the location of the existing softball diamond. Each building size is approximately 14,000 SF, 12,000 SF and 7,600 SF.
Proposed Structures	The structures will include two story classroom buildings as described above.
Building Construction	The building construction type is unknown at this time but will likely consist of masonry/concrete tilt up with steel interior framing for the gym and steel or wood framing may be used for the classroom buildings. Buildings will have slab on grade floors.
Finished Floor Elevation	Unknown at this time. Anticipated to be within 2 feet of existing grade.
Maximum Loads (assumed)	■ Columns: 80 to 140 kips ■ Walls: 2 to 5 kips per linear foot (klf) Slabs: 150 pounds per square foot (psf)
Grading/Slopes	The site is relatively flat and grading should consist of minor cuts and fills, less than 3 feet in vertical extent.
Below-Grade Structures	None anticipated.

Item	Description
Free-Standing Retaining Walls	None anticipated.
Pavements	None as part of this project.
Estimated Start of Construction	Unknown at this time.

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 near surface soils generally consisted of very loose to dense silty sands that extended to depths of between 3½ and 8 feet below the existing ground surface (bgs). These upper soils were underlain by interbedded layers of medium dense to very dense silty sand and sand with silt and very dense to hard sandy silt that extended to the maximum depths explored. In boring B8, a layer of hard lean clay was encountered at a depth of approximately 14 feet bgs that extended to the maximum depth explored of 16½ feet bgs.

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.

GEOTECHNICAL OVERVIEW

Due to the variability relative density of the near surface silty sands within the proposed building footprints, in our opinion the foundations should be supported on a minimum of 12 inches of compacted 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 very 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, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations 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, existing vegetation and root mat should be removed. Complete stripping of the topsoil should be performed in the proposed building and parking/driveway areas.

The subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump 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 modified by stabilizing with cement. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

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 tank area 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 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%
Miscellaneous backfill:	90	0%	+3%
Utility Trenches:	90	0%	+4%
Bottom of native soil excavation receiving fill:	90	+1%	+4%

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

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.

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 splash blocks at a distance of at least 10 feet from the buildings.

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, 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. One density and water content test should be performed for each lift for every 50 linear feet of compacted utility trench backfill.

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.

Design Parameters

Item	Description
Maximum Net Allowable Bearing pressure [1, 2]	3,000 psf
Required Bearing Stratum [3]	Minimum 12 inches of compacted engineered fill
Minimum Foundation Dimensions	Columns: 3 feet Continuous: 1 foot
Maximum Foundation Dimensions	Columns: 8 feet Continuous: 4 feet
Ultimate Passive Resistance [4] **(equivalent fluid pressures)**	350 pcf
Ultimate Coefficient of Sliding Friction [5]	0.40

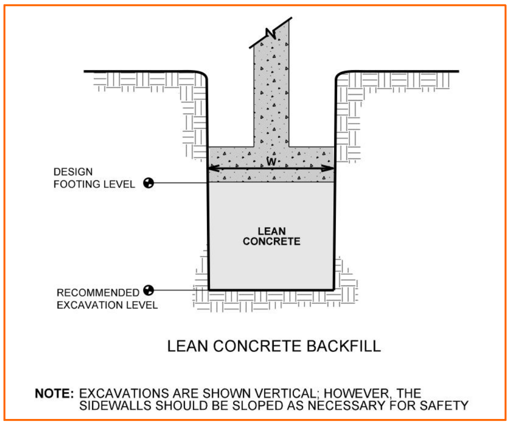
Item	Description
Minimum Embedment below Finished Grade [6]	12 inches for single story structures; 18 inches for two-story structures.
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 7]	About ½ of total settlement

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 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.

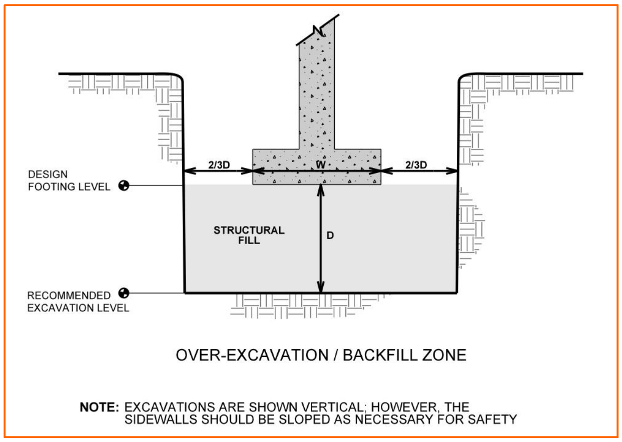
Foundation Construction Considerations

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.



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	38.1098° N
Site Longitude	121.2866° W
S_s Spectral Acceleration for a Short Period	0.768g
S_1 Spectral Acceleration for a 1-Second Period	0.305g
F_a Site Coefficient for a Short Period	1.193
F_v Site Coefficient for a 1-Second Period	1.790
S_{Ms} Maximum Considered Spectral Response Acceleration for a Short Period	0.916g
S_{M1} Maximum Considered Spectral Response Acceleration for a 1-Second Period	0.546g
S_{DS} Design Spectral Acceleration for a Short Period [3]	0.610g
S_{D1} Spectral Acceleration for a 1-Second Period [3]	0.364g
PGA_M Peak Ground Acceleration	0.337g

1. Seismic site classification in general accordance with the *2016 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/).

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 soils encountered in our deep boring and the historical depth to groundwater being greater than 50 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.

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

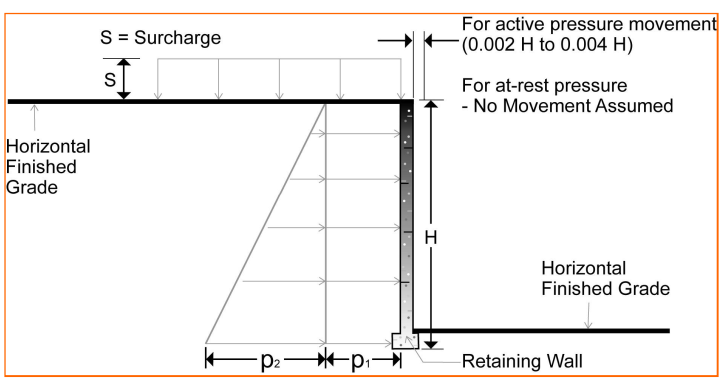
Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor 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).



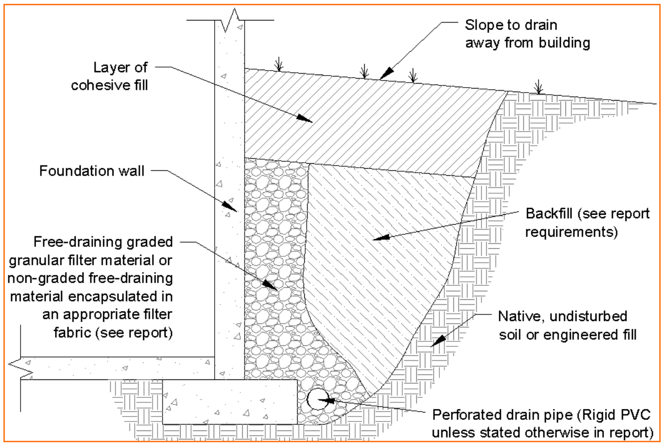
Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	**Coefficient for Backfill Type**[2]	**Surcharge Pressure** [3, 4, 5] **p_1 (psf)**	**Effective Fluid Pressures (psf)** [2, 4, 5]	
			Unsaturated [6]	**Submerged** [6]
Active (Ka)	Granular - 0.27	(0.27)S	(33)H	(80)H
At-Rest (Ko)	Granular - 0.42	0.42)S	(50)H	(90)H
Passive (Kp)		---	(390)H	(250)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.

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 (ppm)**	**Soluble Chloride (ppm)**	**Electrical Resistivity (Ω-cm)**	**pH**
B-9	1.5	Silty Sand	77	63	6305	8.73

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations 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.

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	Building area
4	16½	Building area
3	21½	Building area
4	11½	Building 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 following completion of fieldwork.

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.

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.

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 often 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.

Contents:

Note: All attachments are one page unless noted above.

SITE LOCATION

Tokay High School New Classrooms and Gym ■ Lodi, California
October 30, 2018 ■ Terracon Project No. NA185132

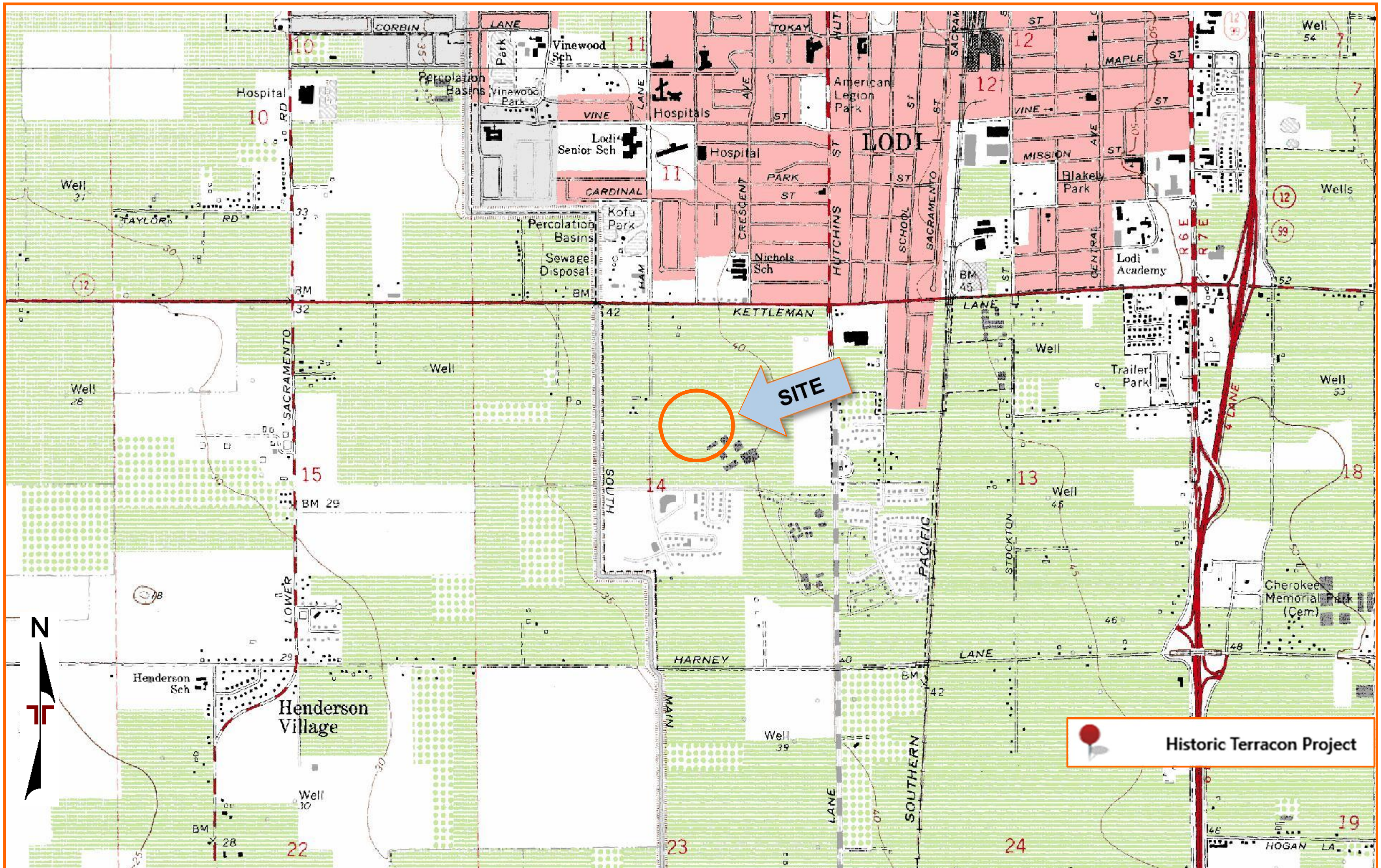


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

Tokay High School New Classrooms and Gym ■ Lodi, California

October 30, 2018 ■ Terracon Project No. NA185132

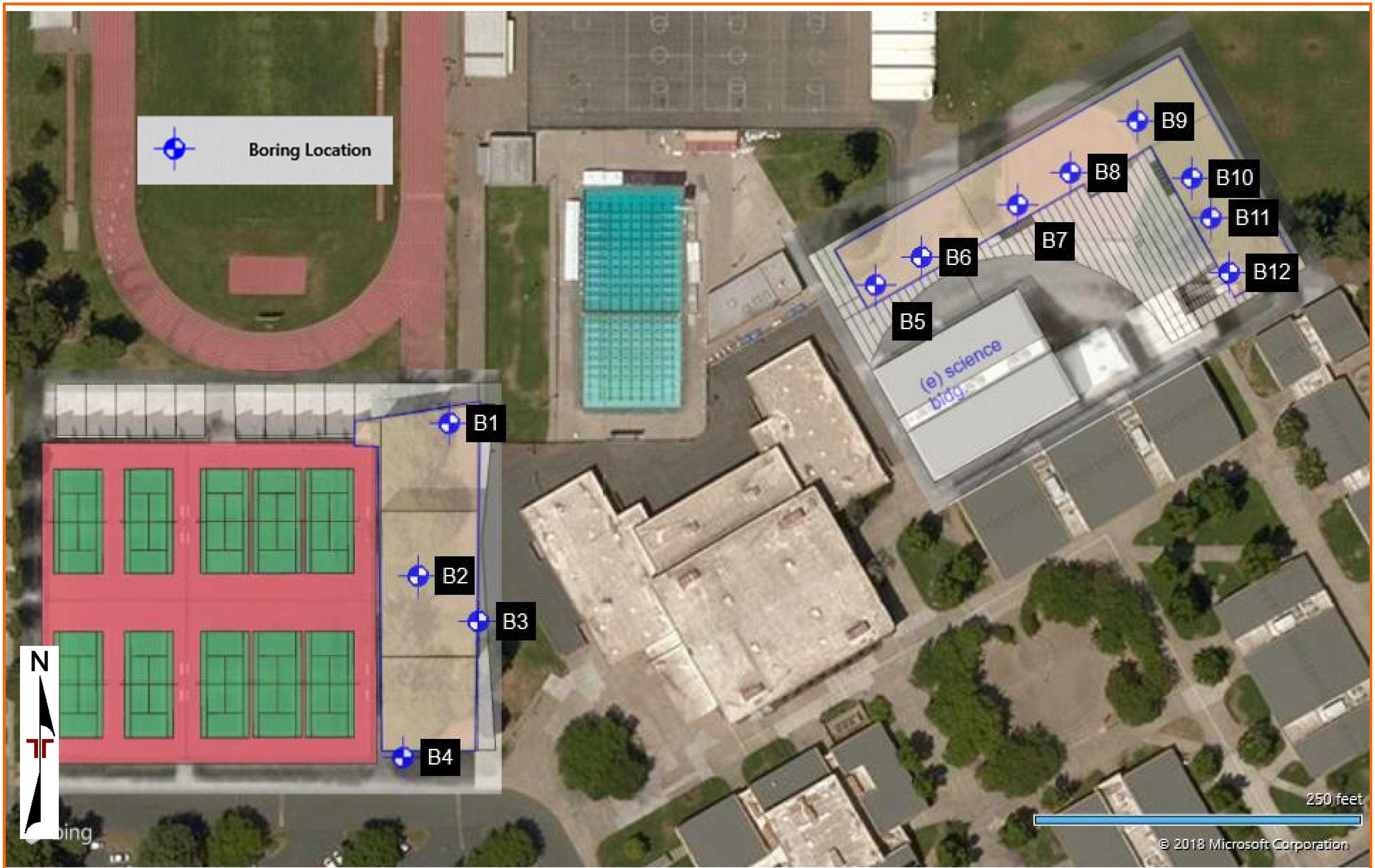


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Contents:

Note: All attachments are one page unless noted above.

BORING LOG NO. B1

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1101° Longitude: -121.2867°

GRAPHIC LOG	DEPTH	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				2-3-4		12	116	46
	orange brown, medium dense	5			7-9-16		10	100	
	dense	10			10-20-25		15	120	
	15.0 **SANDY SILT (ML)**, fine to medium grained, light brown, very dense	15			15-24-40	4.5+ (HP)	22	101	
	16.5 ***Boring Terminated at 16.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B2

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1098° Longitude: -121.2868°

DEPTH	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			X	1-1-2 N=3		13		
orange brown, medium dense	5		X	11-18-17 N=35		12		
very dense	10		X	18-37-50/5"		13		42
15.0 **POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, light brown, medium dense	15		X	13-13-12/5"		24		
18.5 **SILTY SAND**, fine to medium grained, borwn, very dense	20		X	16-26-36/5"		11		
dense	25		X	14-18-20 N=38		13		
27.0								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B2

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District, Lodi, CA

SITE: 1111 W. Century Blvd. Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1098° Longitude: -121.2868°

GRAPHIC LOG	DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	POORLY GRADED SAND WITH SILT (SP-SM), fine to coarse grained, brown, medium dense *(continued)*								
		30		X	9-11-14 N=25		6		8
	orange brown	35		X	12-13-16 N=29		5		
	39.0								
	WELL GRADED SAND (SW), fine to coarse grained, light brown, medium dense to dense	40		X	11-14-15 N=29		5		7
		45		X	11-15-18 N=33		5		
		50		X	14-15-18 N=33		6		
	51.5								
	Boring Terminated at 51.5 Feet								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B3

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1097° Longitude: -121.2867°

GRAPHIC LOG	DEPTH	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				2-2-4		12	118	
	5.0 **SANDY SILT (ML)**, light brown, very dense	5			18-32-50		9	119	37
		10			24-50/6"		11	112	
	11.0 ***Boring Terminated at 11 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B4

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1094° Longitude: -121.2869°

DEPTH	Description	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								
				X	4-4-4		10	115	
	light orange brown, dense	5		X	13-18-20		9	108	
	fine to coarse grained, orange brown	10		X	15-18-20		8	115	
14.0	**SILT WITH SAND**, fine to medium grained, light brown								
15.5	**SILTY SAND**, fine to coarse grained, orange brown w/gray, dense	15		X	11-21-31		12	120	
21.5		20		X	15-25-35		12	124	
	Boring Terminated at 21.5 Feet								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B5

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1104° Longitude: -121.2856°

GRAPHIC LOG	DEPTH	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 coarse grained, brown, loose								
				X	5-5-4		8	112	
		5		X	3-4-6		5	1418	14
		10		X	12-21-25		8	120	
	dense								
	13.0								
	SILT (ML), fine to coarse grained, brown, hard								
		15		X	11-21-30		29	96	
	18.5								
	SILTY SAND (SM), fine to coarse grained, dark orange brown, very dense								
		20		X	12-24-37		10	119	
	21.5								
	Boring Terminated at 21.5 Feet								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B6

PROJECT: Tokay HS New Classroom & Gym

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

**SITE: 1111 W. Century Blvd.
Lodi, CA**

LOCATION See Exploration Plan

Latitude: 38.1104° Longitude: -121.2855°

DEPTH	Description	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 coarse grained, brown, loose				5-5-6		7	117	
4.5	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, light brown, medium dense	5			4-7-25		5	109	
7.5	**SILTY SAND (SM)**, fine to coarse grained, orange brown, dense	10			14-24-28	4.5+ (HP)	14	121	36
13.0	**SILT (ML)**, fine to coarse grained, light brown								
15.5	**POORLY GRADED SAND WITH CLAY (SP)**, fine to medium grained, light brown, dense	15			9-20-26		11 28	103 90	
16.5	***Boring Terminated at 16.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B7

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1105° Longitude: -121.2852°

GRAPHIC LOG / DEPTH	Description	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 coarse grained, brown, loose			X	6-4-3		4	104	
4.5	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, medium dense	5		X	4-6-7		5	107	
7.5	**SILTY SAND (SM)**, fine to medium grained, very dense	10		X	17-27-46		16	112	
11.5	***Boring Terminated at 11.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B8

PROJECT: Tokay HS New Classroom & Gym

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

**SITE: 1111 W. Century Blvd.
Lodi, CA**

LOCATION See Exploration Plan

Latitude: 38.1106° Longitude: -121.2851°

DEPTH	Material Description	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 coarse grained, dark brown, loose								
				X	6-7-6		5	105	29
	brown, medium dense	5		X	8-10-11		6	111	
8.0	**SILT (ML)**, light brown, hard								
		10		X	30-50/4"	4.5+ (HP)	19	109	
14.0	**LEAN CLAY (CL)**, hard								
		15		X	15-33-41/-2"	4.5+ (HP)	29	97	
16.5	***Boring Terminated at 16.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B9

PROJECT: Tokay HS New Classroom & Gym

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

**SITE: 1111 W. Century Blvd.
Lodi, CA**

LOCATION See Exploration Plan

Latitude: 38.1107° Longitude: -121.2849°

DEPTH	Description	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	6-9-11		2	96	
	fine to coarse grained, light brown	5		X	9-11-15		3	110	
9.5	**POORLY GRADED SAND (SP)**, fine to coarse grained, light brown, medium dense	10		X	5-9-14		3	111	
12.5	**SILTY SAND (SM)**, fine to coarse grained, brown								
14.0	**SILT WITH SAND (ML)**, fine to medium grained, light brown, very stiff	15		X	5-11-19		26	98	
17.5	**SILTY SAND (SM)**, fine to coarse grained, reddish brown, dense	20		X	10-19-21		12	119	
21.5	***Boring Terminated at 21.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B10

PROJECT: Tokay HS New Classroom & Gym

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

**SITE: 1111 W. Century Blvd.
Lodi, CA**

LOCATION See Exploration Plan

Latitude: 38.1106° Longitude: -121.2848°

GRAPHIC LOG	DEPTH	DESCRIPTION	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	12-16-17		2	104	
		orange brown	5		X	12-14-19		4	115	
	9.0	**SILT WITH SAND (ML)**, fine to medium grained, light brown, hard								
			10		X	11-32-45		24	97	
	11.5	***Boring Terminated at 11.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B11

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1105° Longitude: -121.2847°

DEPTH	DESCRIPTION	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	11-12-11		3	101	
		5		X	9-11-12		3	107	16
9.5	**SILT WITH SAND (ML)**, fine to medium grained, light brown, hard	10		X	14-39-50/5"		14	99	
11.5	***Boring Terminated at 11.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

BORING LOG NO. B12

PROJECT: Tokay HS New Classroom & Gym

CLIENT: Lodi Unified School District
Lodi, CA

SITE: 1111 W. Century Blvd.
Lodi, CA

LOCATION See Exploration Plan

Latitude: 38.1104° Longitude: -121.2847°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND WITH GRAVEL (SM), fine to medium grained, dark brown, loose								
				X	8-6-5		38	87	
	orange brown, medium dense	5		X	5-7-9		8	110	
		10		X	7-17-27		17	110	
15.0	**SILT WITH SAND (ML)**, fine to medium grained, light borwn, very stiff	15		X	10-17-20		4 35	107 89	
16.5	***Boring Terminated at 16.5 Feet***								

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

Hammer Type: Automatic

Advancement Method:
6" Hollow stem auger

Abandonment Method:
Boring backfilled with cement grout 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 obtained using Google Earth

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
902 Industrial Way
Lodi, CA

Boring Started: 10-09-2018	Boring Completed: 10-09-2018
Drill Rig: D-50	Driller: R. Anderson
Project No.: NA185132	

CHEMICAL LABORATORY TEST REPORT

Project Number: NA185132
Service Date: 10/23/18
Report Date: 10/26/18
Task:

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

Client

Lodi Unified School District

Project

Tokay HS New Classroom & Gym

Sample Submitted By: Terracon (NA) **Date Received:** 10/22/2018 **Lab No.: 18-1279**

Results of Corrosion Analysis

Sample Number	B9-1-I
Sample Location	
Sample Depth (ft.)	1.5
pH Analysis, AWWA 4500 H	8.73
Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg)	77
Sulfides, AWWA 4500-S D, (mg/kg)	Nil
Chlorides, ASTM D 512, (mg/kg)	63
Red-Ox, AWWA 2580, (mV)	+680
Total Salts, AWWA 2520 B, (mg/kg)	367
Resistivity, ASTM G 57, (ohm-cm)	6305

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Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Tokay HS New Classroom & Gym ■ Lodi, CA

October 30, 2018 ■ Terracon Project No. NA185132

Terracon GeoReport

SAMPLING	WATER LEVEL	FIELD TESTS
Modified California Ring Sampler; Standard Penetration Test	**Water Initially Encountered** **Water Level After a Specified Period of Time** **Water Level After a Specified Period of Time** 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.	**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 is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. 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.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL		RELATIVE PROPORTIONS OF FINES	
Descriptive Term(s) of other constituents	Percent of Dry Weight	**Descriptive Term(s) of other constituents**	**Percent of Dry Weight**
Trace	<15	Trace	<5
With	15-29	With	5-12
Modifier	>30	Modifier	>12

GRAIN SIZE TERMINOLOGY		PLASTICITY DESCRIPTION	
Major Component of Sample	**Particle Size**	**Term**	**Plasticity Index**
Boulders	Over 12 in. (300 mm)	Non-plastic	0
Cobbles	12 in. to 3 in. (300mm to 75mm)	Low	1 - 10
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)	Medium	11 - 30
Sand	#4 to #200 sieve (4.75mm to 0.075mm	High	> 30
Silt or Clay	Passing #200 sieve (0.075mm)		

UNIFIED SOIL CLASSIFICATION SYSTEM

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Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	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 ³ 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 ³ 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” line [J]		CL	Lean clay [K, L, M]
			PI < 4 or plots below “A” line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			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	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			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] $Cu = D_{60}/D_{10}$ $\qquad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ³ 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 ³ 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 ³ 30% plus No. 200 predominantly sand, add “sandy” to group name.

[M] If soil contains ³ 30% plus No. 200, predominantly gravel, add “gravelly” to group name.

[N] PI ³ 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.