GEOTECHNICAL INVESTIGATION

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Prepared for:

TGS02-KYLE LLC
Austin, Texas

Prepared by:

GEOSCIENCE ENGINEERS, LLC
Dallas, Texas

August 2023

GeoScience

Project No. 23-DG3925

August 21, 2023

TGS02-KYLE LLC
10215 James Ryan Way
Austin, TX, 78730.

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Geoscience Engineers, LLC. is pleased to submit this geotechnical investigation for the above referenced project located in Kyle, Texas. This report briefly describes the procedures employed in our subsurface exploration and presents the results of our investigation.

Our Construction Materials Testing Division can provide the materials testing services that will be required during the construction phase of this project. We will be pleased to discuss the scope of work and submit a proposal for these services upon request.

We appreciate the opportunity to be of assistance on this project. Please feel free to contact us if you have any questions or if we can be of further service.

Respectfully,

Geoscience Engineers LLC.
Firm Reg # F-11285

Amir Shahed
Project Manager

Syed S. Afsar P.E.
Project Engineer

SYED S. AFSAR

8/21/23

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ILLUSTRATIONS

INTRODUCTION

Project Description

This report presents the results of the geotechnical investigation performed at the site of the referenced project located in Kyle, Texas. Based on the information provided, it is our understanding that construction will consist of a commercial development consisting of a Goddard school and retail building structures along with associated pavement. Information regarding structural loads was not available at the time of this investigation; however, we anticipate the loads will be light. It is expected that the finished floor elevation of the proposed structure will be above surrounding ground surface. At the time of this investigation, other information regarding the referenced project was not provided.

Site Description

The site of the referenced project is located at 870 Veterans Drive in the city of Kyle, Texas. At the time of this investigation the site was undeveloped land covered with native vegetation, grass, and a few trees along the property lines. The general location and orientation of the site is shown in the **Illustrations** section of this report.

Purposes and Scope of Work

The principal purposes of this investigation were to evaluate the general soil conditions at the referenced site and develop recommendations for the design and construction of the proposed residential building. The principal purposes of this investigation were:

1). Developing subsurface soil and rock stratigraphy at boring locations.

2). Evaluating soil swell potential and alternatives to reduce the soil movement.

3). Providing recommendations for foundation design parameters.

4). Providing pavement recommendations; and

5). Providing site preparation recommendations.

Report Format

The first sections of this report describe the field and laboratory phases of the study. The remaining sections present our engineering analyses and geotechnical parameters for the type of foundation system proposed for use at this site. Boring logs and laboratory test results are presented in the **Illustrations** section of this report.

FIELD INVESTIGATION

The field investigation of this study involved drilling and sampling a total of eleven (11) test borings. Test borings B-1 to B-6 were drilled to a depth of 20 feet below ground surface in the proposed building pads, test borings B-7 and B-8 were drilled to a depth of 10 to 20 feet in the proposed playground areas, and test borings B-9 to B-11 were drilled to a depth of 5 feet in the proposed pavement area. The approximate locations of the borings are shown on the Boring Location Plan Plate A. Logs of the borings with descriptions of the soils sampled are presented on Plates 1 to 11. The soil strata boundaries shown on the boring logs are approximate.

The borings were advanced using continuous flight auger techniques. Undisturbed surface cohesive soil samples were obtained using a 3-inch diameter thin-walled tube sampler pushed into the soil. The un-drained compressive strength of cohesive soils was estimated in the field using a calibrated pocket penetrometer.

To evaluate the relative density and consistency of harder formations, Texas Department of Transportation Cone Penetrometer tests were performed at selected locations. The actual test consists of driving a three-inch diameter cone with a 170-pound hammer freely falling 24 inches. In relatively soft materials, the penetrometer cone is driven one foot and the number of blows required for each six-inch penetration is tabulated at respective test depths, as blows per six inches on the boring logs. In hard materials, the penetrometer cone is driven with the resulting penetrations, in inches, accurately recorded for the first and second 50 blows for a total of 100 blows. The penetration for the total 100 blows is recorded at the respective testing depths on the boring logs.

All soil samples were extruded from the samplers in the field, visually classified and wrapped in plastic bags to prevent loss of moisture or disturbance during transfer to the laboratory. The borings were drilled using dry auger procedures to observe water level at the time of the exploration. Water level observations are recorded on the boring logs.

LABORATORY TESTING

Engineering properties of the foundation soils were evaluated in the laboratory by tests performed on representative soil samples. A series of moisture content was performed to develop soil moisture profiles and to aid in evaluating the uniformity of soil conditions at this location. Liquid and Plastic limit tests (Atterberg limits) and the free swell test were performed on selected soil samples to confirm visual classification and evaluate soil volume change potentials. All tests were performed using ASTM procedures by experienced technicians working under the direction of an engineer.

Review

Descriptions of strata made in the field were modified in accordance with laboratory tests results and visual examination in the laboratory. All recovered soil samples were examined, classified and described in accordance with ASTM D 2487, ASTM D 2488 and Unified Soil Classification procedures. Classifications of the soils and finalized descriptions of soil strata are shown on the attached boring logs.

GENERAL SUBSURFACE CONDITIONS

Regional Geological Stratigraphy

According to the Bureau of Economic Geology, Geologic Atlas of Texas, (Dallas Sheet 1972), the Subject Property lies within the Austin Chalk (Kau) geological formation.

Austin Chalk (Kau): Typically, this formation consists of: Undivided southward. Upper and lower parts, chalk, light gray, massive, some interbeds and partings of calcareous clay, marine mega-fossils scarce. Middle Part mostly thin-bedded marl with interbeds and partings of calcareous clay and massive chalk, marine mega-fossils scarce, light gray, weathers white, marine mega-fossils scarce. Austin Chalk subdivided eastward into six units, Roxton Limestone (Kr) Gober Chalk (Kgc) Brownstone Marl (Kbr) Blossom Sand (Kbl) Bonham Marl (Kbn) and Ector Marl (Ker). Thickness of Austin Chalk (undivided) approximately 600 feet.

Localized Subsurface Stratigraphy

Based on our interpretation of the borings drilled for this investigation, the subsurface stratigraphy encountered at the location of test borings consisted of dark brown, brown clay/sandy clay soils encountered from existing ground surface elevation to a depth of one to 2 feet, below which, tan weathered limestone was encountered and remained visible to the completion depth of the test borings B-8 to B-11 drilled and to a depth of 15 to 17 feet in the remaining test borings B-1 to B-7 drilled.

At a depth of 15 to 17 feet in test borings B-1 to B-7, gray limestone was encountered and remained visible to the completion depth of the test borings drilled.

Detailed descriptions of the subsurface stratigraphy encountered at the locations of the test borings drilled for this study are included in the **Illustrations** section of this report.

Subsurface Water Conditions

The borings were advanced using auger drilling method in order to observe groundwater seepage levels. No groundwater seepage was encountered in the test borings drilled at the time of this investigation. It should be noted that future construction activities may alter the surface and subsurface drainage characteristics of the site. Therefore, the depth to groundwater should be verified during construction. If there is a noticeable change in the conditions reported herein, this office should be notified immediately to review the effect that it may have on the design recommendations. Based upon short-term observations, it is not possible to accurately predict the magnitude of subsurface water fluctuations that might occur.

ANALYSIS AND RECOMMENDATIONS

Construction Consultation and Monitoring

We recommend that *GeoScience* be given an opportunity to review the final design drawings and specifications to ensure that the recommendations provided in this report have been properly interpreted. Wide variations in soil conditions are known to exist between the boring locations. Furthermore, unanticipated variations in subsurface conditions may become evident during construction. During the excavation and foundation phases of the project, we recommend that a reputable Geotechnical Engineering firm be retained to provide construction surveillance services in order to 1) observe compliance with the geotechnical design concepts, specifications, and recommendations, and 2) observe subsurface conditions during construction to verify that the subsurface conditions are as anticipated, based on the borings drilled for this investigation.

Soil Movement

The near surface calcareous clay soils encountered at this site exhibited Plasticity Indices ranging between 13 and 49. These types of soils are considered *non-expansive* in nature. The estimated moisture induced Potential vertical movement (PVR) of the soil at the time of this investigation is at the location of the test borings drilled was on the order of lea than an inch to 2 inches depending upon the depth and plasticity index of the clay soils encountered.

Considerably more movement will occur in areas where water ponding is allowed to occur during and/or after construction -or- thickness of the clay soils is greater than encountered at the location of the test borings -or- fill soils other than select fill soils are planned for use. Site grading may also increase or decrease the potential for movement.

To reduce the soil potential vertical movement (PVR) to one inch or less and to avoid any differential movement, we recommend the subgrade soils should be improved by moisture conditioning method.

- *By moisture conditioning of subgrade soils*:

Remove the subgrade soils to the depth of top limestone below finished grade and stockpile. We recommend the improvements extend an additional 5 feet beyond the perimeter of the building pad and all the areas sensitive to soil swell potential.

The exposed surface should be watered to bind the receiving fill soils. The previously removed soils should be placed back in 6 to 8 inches loose lifts and mixed thoroughly to form a homogenous consistent soil and each lift should be compacted between 92 and 98 percent of the maximum standard proctor dry density. The moisture contents of the soils should be a minimum of 4 points above optimum as per ASTM D- 698.

Field density tests should be taken at the rate of at least one test per each 2,500 square feet, per lift, in the area of all compacted fill. For areas where hand tamping is required, the testing frequency should be increased to approximately one test per lift, per 100 linear feet of area.

We recommend that during moisture conditioning the swell tests should be performed to ensure that the percentage swell tested on the sample is less than 1%. Also, full-time monitoring of moisture conditioning process will be required and a certification from the testing laboratory should be obtained to ensure that the swell potential of the soils has been adequately reduced for the design of the slab foundation.

- *By placement of select fill soils (most positive option):*

All the clay soil to the top of the limestone should be removed and replaced with select fill soils. The select fill soils should be placed as per the procedure outlined in the Building Pad preparation section of this report.

FOUNDATION DESIGN CRITERIA

The foundation recommendations provided in the report are based on the soil information obtained from the test borings drilled for this site. During construction if the soil at the other location of building is found to be different than encountered at the location of the test borings then additional drilling of the test borings will be required.

A. Shallow Footings

The foundation of the proposed building structures can be supported by spread footings. The spread footings should be installed atop or within the tan weathered limestone; however, in no case should be less than 3 feet below finished grade elevation.

The spread footings can be designed using a net allowable bearing pressure of 3,000 psf if installed atop the limestone and 4,500 psf if installed a minimum of one foot into the limestone.

These values include a factor of safety of 2.5 with respect to the un-drained shear strength of the foundation soils.

The bottom of the spread footings should be free of any loose and/or soft materials prior to concrete placement. Any areas at the bottom of the footings where soft spots are noted we recommend a) the bottom of the grade beams either is rolled or compacted by re-working with the optimum moisture with a hand compactor. A geotechnical engineer should evaluate each foundation excavation to ensure that the foundation bears within hard stratum -or - b) reduce the allowable soil bearing capacity. At the time of such evaluation compaction testing at the base of the foundation excavation be performed to assure that the above recommendations are adhered to.

Grade Beams and Floor Slab

Grade beams should be structurally connected into the top of the spread footings. For ground supported grade beams, the potential vertical movement (PVR) of soils should be reduced by moisture conditioning the subgrade soils or by placement of select fill soils as per the procedures outlined in this report. The depth of the grade beams should be at least 2.5 feet (to avoid any migration of water) and minimum of 12 inches in width.

Based on *Terzaghi's* Bearing Capacity theory a net allowable soil bearing pressure of 1,500 psf for the moisture conditioned soils, 2000 psf for the select fill soils and 3000 psf for the limestone can be used. The modulus of subgrade reaction of 50 pci for moisture conditioned soils, 100 pci can be used for select fill soils 150 pci for limestone. Grade beams and floor slabs should be adequately reinforced to minimize any future cracking as normal movements occur in the foundation soils. Also, a moisture barrier of polyethylene sheeting or similar material should be placed between the slab and the subgrade soils to retard moisture migration through the slab. It should be understood that a soil-supported foundation system will experience some movement over time.

B. Slab-On-Grade Type Foundation (for Goddard School building)

A slab-on-grade type foundation system is also a feasible option for use at this site provided:

- All the loose soils, vegetation, trees, and tree roots (if any) are removed and disposed of off-site.
- The cut and fill are within ±2 feet from existing grade elevation.
- The PVR is reduced by removing all the clay soils and replacing it with select fill soil.
- The risk of some post-construction movement is acceptable. Slab on grade type of foundation system require periodic cosmetic repairs to building finishes. Additionally, there is a risk that the ground movements could be greater than anticipated which could lead to the need for more extensive repairs. These circumstances are most often associated with poor drainage around the slab perimeter, sub-slab plumbing leaks, or trees or shrubs planted too close to the foundation. The potential for these movements, risks associated with long-term performance of slab-on-grade foundations, and owner/tenant maintenance responsibilities should be fully understood.
- If, after grading is completed, one side of the slab and grade beam is resting on limestone and the opposite side is resting on clay, then the likelihood of some differential movement occurring is increased. To ensure that the foundation is in the same stratum and avoid this situation from occurring, we recommend the building pad area be evenly excavated/elevated and piers be installed at the line of transition.
- Additional fill soil, if required, should consist of off-site select fill soils.

The slab may be a grid-type grade beam and slab reinforced with conventional rebars or post tension strands. The foundation should be designed with exterior and interior grade beams adequate to provide sufficient rigidity to the foundation system to sustain the vertical soil movements expected at this site. The depth of the grade beam should be at least 2.5 feet and width should be 12 inches. A net allowable soil bearing pressure of 1,500 for moisture conditioned soils, 2,000 psf for select fill soils, and 3,000 psf for the limestone can be used. The bottom of the beams should be free of any loose or soft material prior to the placement of the concrete. All grade beams and floor slabs should be adequately reinforced to minimize cracking as normal movements occur in the foundation soils. Also, a moisture barrier of polyethylene sheeting or similar material should be placed between the slab and the subgrade soils to retard moisture migration through the slab. It should be understood by all parties that a soil-supported foundation system will experience movement with time.

PTI PARAMETERS

Based on the soil conditions encountered at the location of the test borings drilled for this study, and, referring to the guide provided in the "Design and Construction of Post-Tensioned Slabs on Ground", (published by Post-Tensioning Institute (PTI), the structure can be supported on a foundation system comprised of post-tensioned slab. The "VOLFLO" computer program was used to estimate swell/shrinkage. The soil parameters to be utilized for design are as follows:

POST-TENSION PARAMETERS
After replacing the clay soils with select fill soils
(Post-Tensioning Institute Third Edition with 2008 Supplement Design)

Minimum Grade Beam Depth:	30 Inches	Edge Moisture Variation Distance (e_m) Center Lift: 8.3 ft. Edge Lift: 4.3 ft.
Minimum Grade Beam Width:	12 Inches	
		Differential Swell/shrinkage (y_m) Swell (edge lift): 1.5 inch Shrink (center lift): 1.1 inch
Depth to Constant Soil Suction:	Approximately 10-ft	
Principal Clay Mineral:	Montmorillonite	Allowable bearing capacity:

POST-TENSION PARAMETERS
After replacing the clay soils with select fill soils
(Post-Tensioning Institute Third Edition with 2008 Supplement Design)

Constant Suction Value: Fabric factor	pF = 3.6 1	Limestone: 3,000 psf Select fill: 2,500 psf Moisture conditioned soils: 1,500 psf
Thornthwaite Moisture Index:	-5	Slab subgrade coefficient Slab-on-sand bedding: 1.00 Slab-on-polyethylene over sand: 0.75
Estimated Total Settlement:	Less than 1-in.	
Estimated Moisture Velocity:	0.7 in/month	

The PTI differential soil movements estimates do not account for site preparation and vegetative influences, such as prior trees and residential landscaping, which can greatly influence foundation performance. The actual performance of slab-on-grade foundations will largely depend on actual soil moisture conditions, construction techniques, site preparation and landscaping. The construction of post-tensioned slabs requires close attention to detail during construction. It should also be noted that the trees will absorb the moisture from the soils underneath the foundation and cause the foundation soils to shrink resulting in foundation distress. As such, we recommend a root barrier be installed between the trees and the foundation to avoid any foundation distress in future. The root barrier should be at least 4 feet deep, and all the roots encountered should be cut. Corrugated roofing, commercial rubber roll or other such type materials should be used as a root barrier material. Seams in the barrier material should be overlapped at least 18 inches. Some roots may be deeper than the root barrier and may continue to negatively affect the foundation.

Building Pad Preparation

Prior to the placement of fill soils, all existing vegetation and loose soils should be removed and disposed of the site until hard stratum is encountered. Trees and tree roots (if any) should be removed and disposed of off-site. In the event that the locations of the existing trees are very close to the proposed residence, then the possibility of root webbing underneath the foundation may occur. Root webbing can cause foundation distress in future, as such, the option of keeping the trees should be determined by the homeowner based on the location of the proposed building. In the event that trees are removed, then the disturbed areas should be widened and deepened until hard stratum is encountered.

After removal of all mentioned items, the subgrade soils should be improved by moisture conditioning method or by removing all the clay soils and replacing with select fill soils as per the procedure described in previous sections of this report.

Placement of select fill soils method: Select fill soils should be placed in six (6) to eight (8)-inch loose lifts at moisture contents between optimum and 3 percentage points above optimum. Each lift compacted to between 95 and 100 percent of the maximum dry density as defined in ASTM D 698. Field density tests should be taken at the rate of one test per every 2,500 square feet per lift, or a minimum of 3 tests per lift in the area of all compacted fill. For areas where hand tamping is required, the testing frequency should be increased to approximately one test per lift, per 100 linear feet of area.

PAVEMENT RECOMMENDATION

General

Specific wheel loading and traffic volume characteristics were not available at the time of this investigation. However, we have assumed that light passenger vehicle traffic will be most predominant in the parking areas and the relatively heavier fire truck traffic will occur in the drive areas area around and behind the structure, and in the fire lane.

Based on assumed loading conditions, we have developed the following Portland Cement concrete pavement design sections for use at this site.

	Minimum Thickness (inches)
Light Traffic	
Portland Cement Concrete	5
Lime Stabilized Subgrade Soils	6
Compacted Subgrade Soils	6

	Minimum Thickness (inches)
Heavy Traffic	
Portland Cement Concrete	6
Lime Stabilized Subgrade Soils	6
Compacted Subgrade Soils	6

Prior to the placement of any fill in the pavement area, we recommend that all existing vegetation and debris (if any), loose and fill (if any) soils should be removed until hard stratum is encountered. The exposed subgrade should be proof rolled as per TxDOT item 216. After passing the proof rolling the exposed surface should then be scarified to a depth of 6 inches water as required and compacted to 95 and 100 percent of maximum dry density as defined by ASTM D 698 (Standard Proctor Test), at moisture content between optimum and 4 points above optimum.

Additional fill soils, if required, then onsite soils or offsite soils of similar characteristics should be placed in 8 inches loose lifts compacted to 95 and 100 percent of maximum dry density as defined by ASTM D 698 (Standard Proctor Test), at moisture content between optimum and 4 points above optimum.

The upper six inches of subgrade soils should then be stabilized with lime. We estimate approximately 28 to 36 lbs/yard for 6-inch-thick-soil will be required to stabilize the subgrade soils (to reduce the plasticity index to 15 or less). It should be noted that after the final grade is complete, the actual amount of lime required should be calculated by lime series test in the laboratory.

The lime stabilized soils should be compacted to a minimum of 95 percent of maximum dry density with the moisture content between optimum and 4 points above optimum. Field density tests should be taken at the rate of one test per every 2,500 square feet.

In the event lime stabilization is not economically feasible then a minimum of one inch of the concrete thickness can be increased in lieu of lime stabilization. Also, in the event limestone is exposed after the final grading is complete then lime stabilization is not required. However, a minimum of 8 inches of flex base should be placed in all the disturbed areas of the utility trenches and compacted to a minimum of 97 percent of maximum dry density with moisture content between -2 to +3 points of optimum.

Some differential movement in the pavement is anticipated over time due to the swelling of the subgrade clays at this site. The design of the concrete pavement should specify a minimum 28-day concrete compressive strength of 3,600 psi with 4 percent to 6 percent entrained air. The concrete should be placed within one and one-half hours of batching. During hot weather, the concrete placement should follow ACI 311 Hot Weather concreting and in no case should the concrete temperature be allowed to exceed 95°F. To avoid excessive heat periods, consideration should be given to limiting concrete placement to a time of day that will minimize large differences in the ambient and concrete temperature.

Past experience indicates that pavements with sealed joints on 15 to 20-foot spacings, cut to a depth of at least one-quarter of the pavement thickness, generally exhibit less uncontrolled post-construction cracking than pavements with wider spacings. As a minimum, expansion joints should be used wherever the pavement abut a structural element subject to a different magnitude of movement, e.g., light poles, retaining walls, existing pavement, building walls, or manholes. After construction, the construction and expansion joints should be inspected periodically and resealed, if necessary. The pavement should be reinforced using at least No. 3 bars, 18 inches in the center.

Select Fill

"Select fill," as referred to in this report, should consist of clayey sands free of organic materials and have a Plasticity Index between 6 and 16, a Liquid Limit of 35 or less, and between 25 and 45 percent passing a No. 200 Sieve. The Placement and compaction of select fill should be performed in accordance with the **"Building Pad Preparation"** section of this report.

Flex base

TxDOT 247 Type D Grade 1-2.

SITE GRADING and DRAINAGE

All grading should provide positive drainage away from the proposed structures and should prevent water from collecting or discharging near the foundations. Water must not be permitted to pond adjacent to the structures during or after construction.

Surface drainage gradients should be designed to divert surface water away from the building and towards suitable collection and discharge facilities. Unpaved areas and permeable surfaces should be provided with steeper gradients than paved areas. Pavement drainage gradients within 5 feet of buildings should be constructed with a minimum slope of 1/4 inch per foot to prevent negative drainage gradients (ponding water conditions) from developing due to differential upward pavement movements. Sidewalk drainage gradients should be along maximum slopes allowed by local codes.

Roofs should be provided with gutters and downspouts to prevent the discharge of rainwater directly onto the ground adjacent to the building foundations. Downspouts should not discharge into any landscaped bed near the foundations. Roof downspouts and surface drain outlets should discharge into erosion-resistant areas, such as paving or rock riprap. Recessed landscaped areas filled with pervious sandy loam or organic soil should not be used near the foundation. Landscaped beds should be elevated above a compacted and well-graded clay surface. Sealed planters are preferred. All trees should be a minimum of one-half their mature height away from the building or pavement edges to reduce potential moisture losses. Water permitted to pond in planters, open areas, or areas with unsealed joints next to structures can result in on-grade slab or pavement movements, which exceed those indicated in this report.

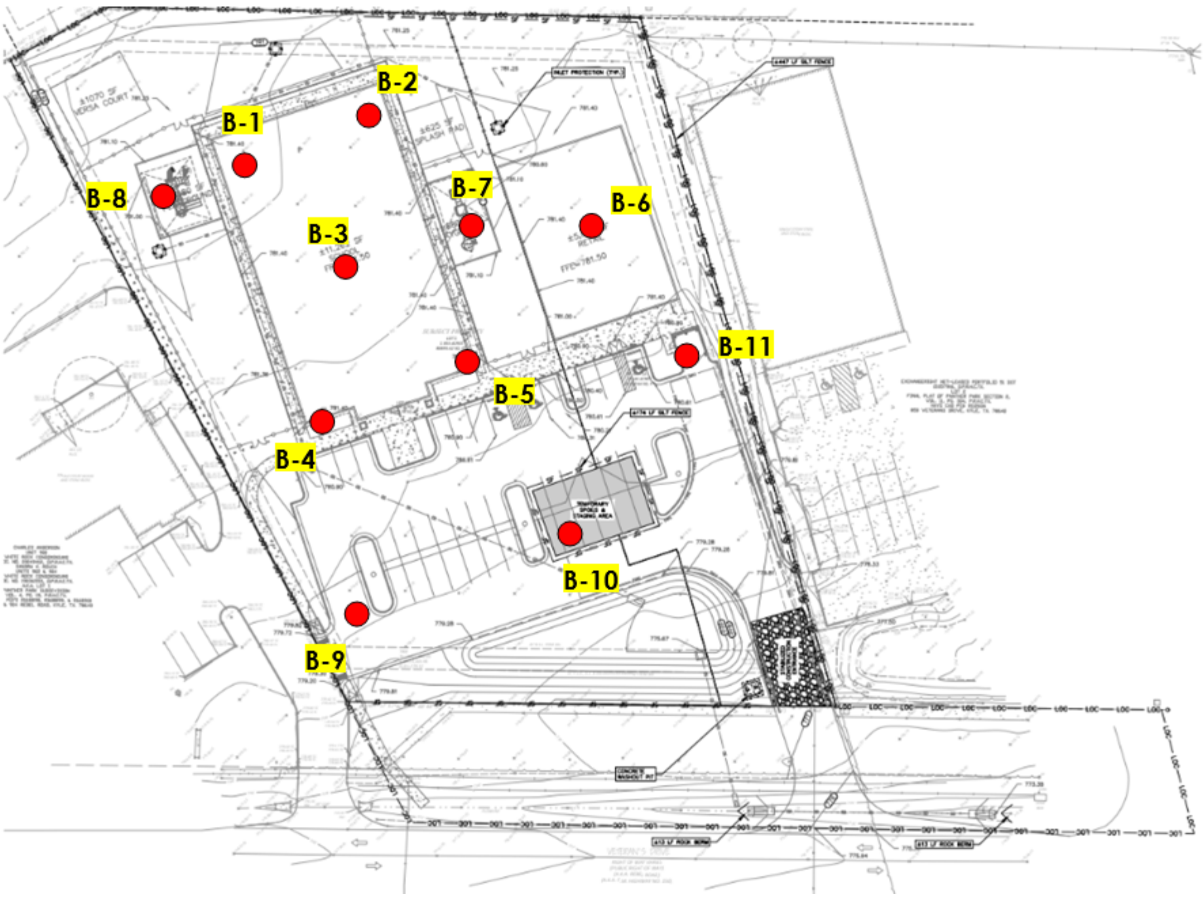
CLOSURE

It should be noted that some variations in soil and moisture conditions may exist between different parts of the site. Statements in this report as to subsurface variations over given areas are intended as estimations only, based upon the data obtained from specific borings location.

The results, conclusions, and recommendations contained in this report are directed at, and intended to be utilized within the scope of work outlined in this report. The report is not intended for use in any other manner. *Geoscience Engineers, LLC*. makes no claim or representation concerning any activity or condition falling outside the specified purposes for which this report is directed; said purposes being specifically limited to the scope of work as defined herein. Inquiries regarding the scope of work, activities and/or conditions not specifically outlined herein should be directed to *Geoscience Engineers, LLC*.

ILLUSTRATIONS

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas



● Approximate Boring Location

BORING LOCATION PLAN

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

GEOSCIENCE Project No.: 23-DG3925

Plate A

GeoScience Incorporated

LOG OF BORING NO. B-1

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 20
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0	▨	▮	P4.5+	2.0	Brown SANDY CLAY (CL) with calcareous nodules	5	34	15	19			54	
	▦				Tan weathered LIMESTONE with calcareous clay seams								
5	▦	◣	T100/ 4.0"			7							
10	▦	◣	T100/ 3.7"			9							
15	▦	◣	T100/ 3.2"	15.0		8							
	▦				Gray LIMESTONE								
20	▦	◣	T100/ 2.5"	20.0		8							
25													
30													

▮	◧	☒	◫	◣	⧅
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience Incorporated

LOG OF BORING NO. B-2

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

FIELD DATA | **LABORATORY DATA**

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 20
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0		▮	P4.5+	1.5	Brown SANDY CLAY (CL) with limestone fragments	7							
					Tan weathered LIMESTONE with calcareous clay seams								
5		◣	T100/ 3.7"			7							
					-increase in calcareous clay seams below 7'								
10		◣	T100/ 4.0"			8							
15		◣	T100/ 3.7"	15.0		8							
					Gray LIMESTONE								
20		◣	T100/ 2.7"	20.0		8							
25													
30													

▮	◧	☒	▯	◣	⧄
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience
Incorporated

LOG OF BORING NO. B-3

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 20
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0		■	P4.5	1.5	Brown CLAY (CH) with limestone fragments	16	75	26	49				
					Tan weathered LIMESTONE with calcareous clay seams								
5		◣	T100/ 3.5"			6							
10		◣	T100/ 3.7"			9							
15		◣	T100/ 3.5"	16.0		8							
					Gray LIMESTONE								
20		◣	T100/ 2.5"	20.0		8							
25													
30													

■	◧	⊠	◫	◣	⧄
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience
Incorporated

LOG OF BORING NO. B-4

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 20
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0		▮		2.0	Brown SANDY CLAY (CL) with limestone fragments	3							
					Tan weathered LIMESTONE with calcareous clay seams								
5		◣	T100/ 3.5"			6							
10		◣	T100/ 3.5"			9							
15		◣	T100/ 3.0"	16.0		8							
					Gray LIMESTONE								
20		◣	T100/ 2.2"	20.0		8							
25													
30													

▮	◧	☒	◫	◣	⧄
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience
Incorporated

LOG OF BORING NO. B-5

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 20
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0	▨	■	P4.5	1.5	Brown SANDY CLAY (CL) with calcareous nodules	5							
	▨				Tan weathered LIMESTONE with calcareous clay seams								
5	▨	◣	T100/ 4.2"			8							
10	▨	◣	T100/ 4.0"			8							
15	▨	◣	T100/ 3.5"	17.0		8							
	▦				Gray LIMESTONE								
20	▦	◣	T100/ 2.7"	20.0		8							
25													
30													

■	◧	☒	◫	◣	⧅
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience
Incorporated

LOG OF BORING NO. B-6

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 20
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0	▨	▮		1.0	Brown SANDY CLAY (CL) with limestone fragments	5	30	15	15				
	▩				Tan weathered LIMESTONE with calcareous clay seams								
5	▩	◣	T100/ 3.7"			6							
10	▩	◣	T100/ 4.0"			9							
15	▩	◣	T100/ 3.5"	16.0		8							
	▦				Gray LIMESTONE								
20	▦	◣	T100/ 2.2"	20.0		8							
25													
30													

▮	◧	☒	◫	◣	⍂
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

LOG OF BORING NO. B-7

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 20
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0		▮		1.0	Brown SANDY CLAY (CL) with limestone fragments	6							
					Tan weathered LIMESTONE with calcareous clay seams								
5		◣	T100/ 3.5"			6							
10		◣	T100/ 3.5"			8							
15		◣	T100/ 3.0"	16.0		8							
					Gray LIMESTONE								
20		◣	T100/ 2.2"	20.0		9							
25													
30													

▮	◧	☒	◫	◣	⧄
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience
Incorporated

LOG OF BORING NO. B-8

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 10
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0	▨	■		1.0	Brown SANDY CLAY (CL) with limestone fragments	4	28	15	13				
	▦				Tan weathered LIMESTONE with calcareous clay seams								
5	▦	◣	T100/ 4.0"			7							
10	▦	◣	T100/ 3.7"	10.0		8							
15													
20													
25													
30													

■	◧	☒	◫	◣	⧄
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience
Incorporated

LOG OF BORING NO. B-9

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 5
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0	▨	■	P4.5	1.5	Brown SANDY CLAY (CL)	3							
	▦				Tan weathered LIMESTONE with calcareous clay seams								
5		◣	T100/ 3.5"	5.0		7							
10													
15													
20													
25													
30													

■	◧	☒	◫	◩	⧄
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

LOG OF BORING NO. B-10

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 5
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0	▨	■	P4.5+	2.0	Dark brown, brown CLAY (CH) with calcareous nodules	14	62	23	39	110			
	▦	◣	T100/ 3.7"	5.0	Tan weathered LIMESTONE with calcareous clay seams	7							
5													
10													
15													
20													
25													
30													

■	◧	☒	◫	◣	⧅
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

GeoScience
Incorporated

LOG OF BORING NO. B-11

Proposed "Goddard School & Retail Development"
870 Veterans Drive
Kyle, Texas

Project No. 23-DG3925

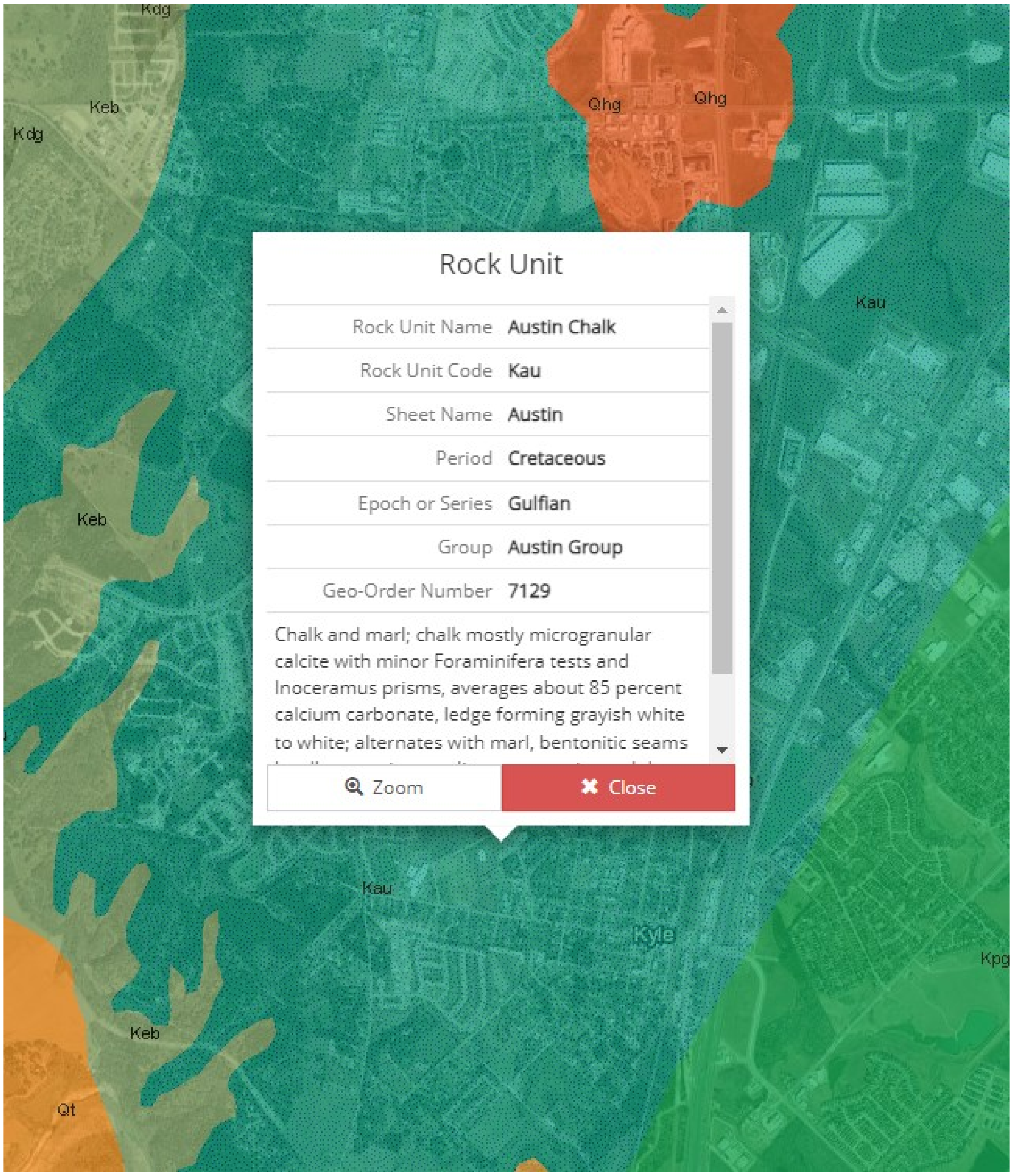
Location: See Location Plan
Surface Elevation: Unknown
Drilling Method: CFA
Date Boring Drilled: 08/07/2023
Completion Depth: 5
Groundwater Information:
Seepage Encountered During Drilling: None
Upon Completion: Dry

FIELD DATA						LABORATORY DATA							
DEPTH (ft.)	SOIL & ROCK SYMBOL	SAMPLE TYPE	P: HAND PEN., TSF T: THD, BLOWS/FT. N: SPT, BLOWS/FT.	STRATUM DEPTH (FT.)	DESCRIPTION OF STRATUM	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	UNIT DRY WEIGHT (PCF)	UNCONFINED STRENGTH (TSF)	% PASSING NO. 200 SIEVE	SOIL SUCTION TEST (TOTAL CM. OF WATER)
0	▨	■	P4.5	1.5	Dark brown, brown CLAY (CH) with calcareous nodules	11							
	▦				Tan weathered LIMESTONE with calcareous clay seams								
5		◣	T100/ 3.5"	5.0		6							
10													
15													
20													
25													
30													

■	◧	☒	◫	◣	⧄
TUBE SAMPLE	AUGER SAMPLE	SPLIT-SPOON	ROCK CORE	THD CONE PEN.	NO RECOVERY

REMARKS:

SITE GEOLOGY



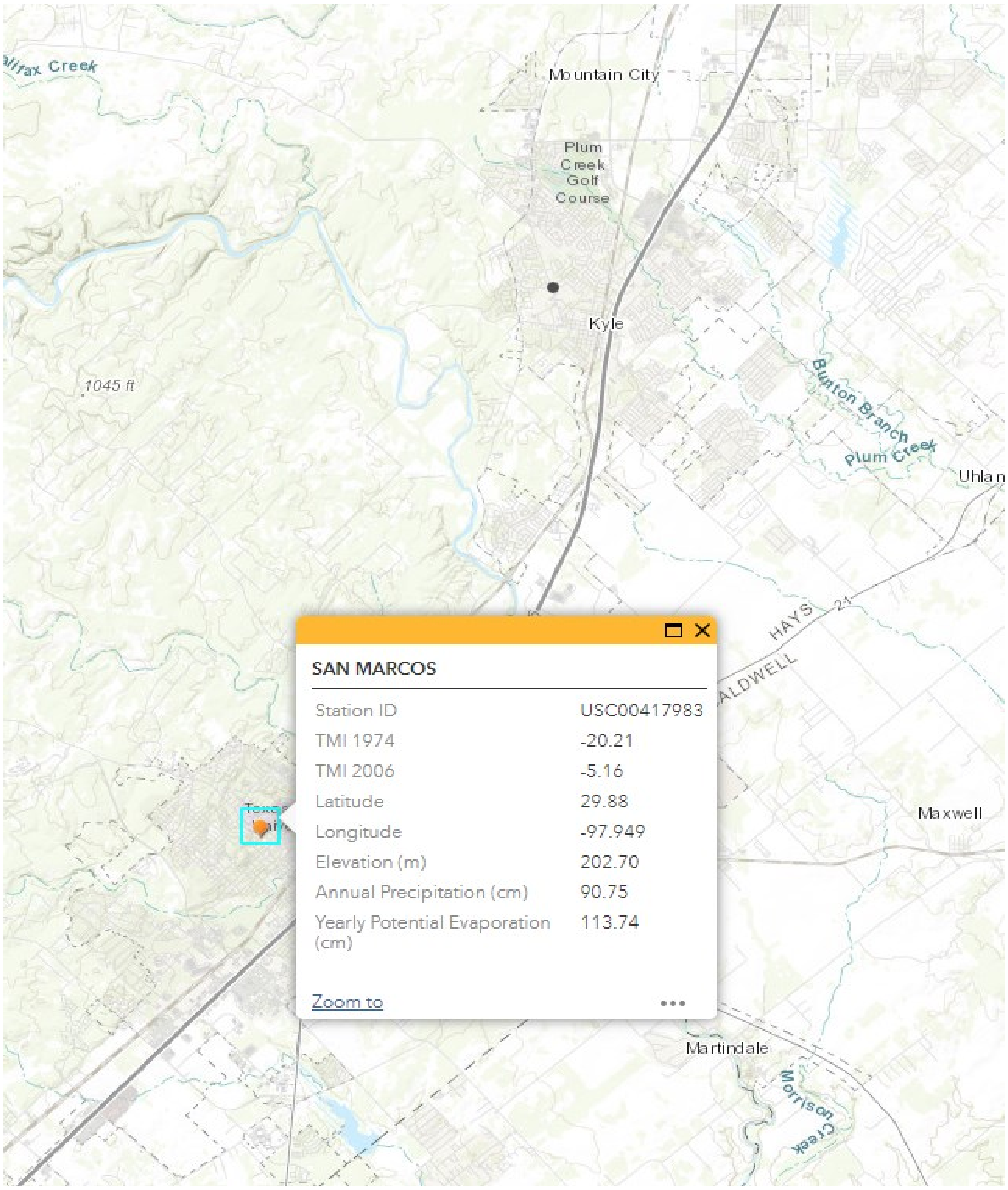
Rock Unit

Rock Unit Name	Austin Chalk
Rock Unit Code	Kau
Sheet Name	Austin
Period	Cretaceous
Epoch or Series	Gulfian
Group	Austin Group
Geo-Order Number	7129

Chalk and marl; chalk mostly microgranular calcite with minor Foraminifera tests and Inoceramus prisms, averages about 85 percent calcium carbonate, ledge forming grayish white to white; alternates with marl, bentonitic seams

Plate 12

THORNTHWAITE MOISTURE INDEX (TMI) MAP



SAN MARCOS

Station ID	USC00417983
TMI 1974	-20.21
TMI 2006	-5.16
Latitude	29.88
Longitude	-97.949
Elevation (m)	202.70
Annual Precipitation (cm)	90.75
Yearly Potential Evaporation (cm)	113.74

Zoom to

Plate 13