



Geotechnical Investigation Report
Proposed Retail Store
705 Baptist Road
Colorado Springs, CO 80921

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January 25, 2022

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Attn: Ms. Corie Fraker

Re: **Geotechnical Investigation**
Proposed Retail Store
705 Baptist Road
Colorado Springs, CO

Project No: D21G159

Dear Ms. Fraker:

Pursuant to your request, Triax Engineering, LLC ("Triax") has completed a geotechnical investigation for the Proposed retail store at the 705 Baptist Road in Colorado Springs, CO. The attached report presents the results of the field investigation and laboratory testing and recommendations for foundation type and bearing pressures and other recommendations related to the proposed construction.

We appreciate and wish to thank you for the opportunity to be of service to you on this project. If we can be of additional assistance, please contact us at (720) 230-1931.

Very Truly Yours,
Triax Engineering, LLC

Vinod Ravindran, PE
President

Distribution: Via Email

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EXECUTIVE SUMMARY

The soil conditions at the site of the proposed 4,500 Sq Ft Retail Store located at the 705 Baptist Road in Colorado Springs, CO, was explored by drilling nine borings to depths of 7 to 25-ft each. Laboratory tests were performed on selected specimens to evaluate the engineering characteristics of various soil strata encountered in our borings.

This report presents a description of subsurface conditions encountered at the site, earthwork recommendations, pavement thicknesses and other design and construction criteria influenced by the subsurface conditions. It is based on data obtained from field investigations, laboratory test results and our previous experience. A summary of our findings and recommendations is presented below:

This executive summary must be used in conjunction with the entire report. Please note that this section provides a broad overview and will not include specific details for each item. Therefore, the report must be read in its entirety to achieve a comprehensive understanding of the items contained herein.

- The subsurface conditions may generally be grouped into two generalized strata with similar physical and engineering properties. For detailed descriptions, the boring logs are provided at the end of this report.
- Groundwater seepage was not encountered in borings during our field exploration and 48 hours after drilling. However, groundwater levels will fluctuate with seasonal climatic variations and changes in the land use.
- Based on our design engineering analysis, we recommend utilizing straight shaft drilled piers to support the proposed Retail Store at the subject property.
- Detailed descriptions of subsurface conditions, engineering analysis, and design recommendations are included in this report.
- The proposed 4,500 sq ft retail store at the subject property can be supported by straight shaft drilled piers. Drilled piers founded at a minimum depth of 15-ft below the existing grade and a minimum embedment depth of 5-ft into the claystone / Siltstone bedrock shall be used to support the proposed structures. Straight

Shaft drilled piers founded at a minimum depth as outlined above shall be designed for an allowable end bearing capacity of 17,500 PSF and skin friction (side shear) of 1,750 PSF for the portion embedded within the claystone bedrock, all other skin friction should be ignored.

- Based on the soils encountered at the project site, we strongly recommend using drilled piers to support the proposed structure. However, we understand that at times, drilled piers might be cost prohibitive for the proposed development. As an alternative, shallow spread footings can be utilized in conjunction with soil modification outlined below, only if the owner understands the risk and can tolerate more movement.
- The proposed 4,500 sq ft retail store at the subject property can be supported by Shallow spread-type footings founded on undisturbed in-situ soils, bearing at minimum depth of 3-feet below the lowest finished grade. An allowable soil bearing pressure of 3,000 pounds per square foot (PSF) is recommended for the design of shallow spread-type footings bearing on undisturbed in-situ soils.

Table 1 EX-1 Recommended Foundation Systems

Location	Type of Foundation
Proposed Retail Store	Straight Shaft drilled piers founded at a minimum depth of 15-ft below existing grade
	Shallow spread footings founded on undisturbed in-situ soils

- There is a ***low to moderate*** risk of slab movement at the proposed slab elevations when the slab is supported by the near-surface soils, under current moisture conditions. Potential vertical movements on the order of three to four inches (unmitigated) can be anticipated at this project site due to seasonal moisture variation of subgrade soils. If some movement of a slab is not acceptable, the proposed structure should be constructed utilizing a structural floor system, rather than a slab.
- In order to minimize the chance for moisture infiltration into the foundation soils and limit the potential for movement of the foundations and/or slabs, positive drainage down and away from all foundation walls and the structure should be established and maintained at all times.
- An exterior foundation perimeter drain is recommended below foundation elevations.
- Detailed descriptions of subsurface conditions, engineering analysis, and design recommendations are included in this report.

1. Introduction:

This report presents the results of our Geotechnical Investigation for the proposed 4,500 sq ft retail store at 705 Baptist Road in Colorado Springs, CO. The object of this investigation was to evaluate the physical properties of the soils underlying the site and provide foundation and earthwork recommendations based on our findings.

2.0 Proposed Construction:

It is our understanding that the proposed construction will consist of a single story 4,500 sq. ft. retail store along with associated improvements such as parking, drives, and landscaping.

Table 2 Proposed Construction Information

Location	Proposed Construction
705 Baptist Road	4,500 Sq Ft Retail Store

The proposed construction will consist of a concrete floor system with masonry walls and wood frame / steel construction above grade. Although foundation loads are unknown at the time of this report, it is anticipated that the structure will be loaded with column and wall loads on the order of 18 kips and 1 to 2 kips per linear foot, respectively. Should designs details differ from those presented, this firm should be notified so we can provide additional recommendations, if required.

3.0 Purpose and Scope of Services:

The purpose of our geotechnical investigation was to provide subsurface information and geotechnical engineering recommendations for the proposed construction.

Our scope of services includes the following:

- 1) Drilling and sampling of Nine borings to depths of 7 to 25-ft each.

- 2) Evaluation of the in-place conditions of the subsurface soils.
- 3) Observation of the ground water conditions during field exploration operations;
- 4) Provide preliminary recommendations for earthwork related to
 - Straight Shaft Drilled Piers
 - Shallow foundations
 - Floor slab design
 - Earthwork and drainage
 - Pavement thickness design

The Scope of Services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client.

4.0 Site Conditions:

The project site is located at 705 Baptist Rd, Colorado Springs, West of the existing Autozone. The lot was vacant and had a slight vegetation cover, along with a water detention basin in the southeast corner of the property at the time of our field investigation. Proposed borings B-4, B-5, and B-5 were moved west due to inaccessibility caused by steep slopes.

Topographically, the site was steeply sloping toward the west, with the highest elevation on the hill along the eastern property line at 6885-ft and the lowest elevation along the western end of the property at 6865-ft.

5.0 Geotechnical Investigation:

Subsurface conditions were investigated by drilling nine borings to a depth of 7 to 25-ft each, from the existing grade at the locations indicated on the Site Map. The borings were advanced using a 4-inch diameter

continuous flight auger powered by a CME-55 drilling rig. Samples were taken at selected intervals using a Standard split spoon and a California ring sampler, which was driven into the soil by dropping a 140-pound hammer through a free fall of 30 inches. The number of blows required to drive the sampler into the soil is known as a penetration test. The number of blows required for the sampler to penetrate 12 inches is evaluated and gives an indication of the consistency or relative density of the soils and bedrock encountered. The results of the penetration test and log of materials encountered are presented in the Logs of Exploratory Boring.

Table 3 Summary of Field Exploration

Boring No.	Exploration Date	Depth (ft)
B-1	12/17/2021	7
B-2	12/17/2021	7
B-3	12/17/2021	7
B-4	12/17/2021	15
B-5	12/17/2021	15
B-6	12/17/2021	15
B-7	12/17/2021	25
B-8	12/17/2021	25
B-9	12/17/2021	25

6.0 Laboratory Testing Program

Samples were returned to the laboratory where they were visually classified, and testing was assigned to evaluate the engineering properties of the soil layers. A project specific laboratory testing program was designed to identify the engineering properties of the subsurface materials. Our laboratory testing program included the following tests on selected samples.

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Water Content | <input checked="" type="checkbox"/> Atterberg Limits | <input checked="" type="checkbox"/> -200 Wash |
| <input checked="" type="checkbox"/> Particle Size Analysis | <input checked="" type="checkbox"/> Swell / Consolidation | <input checked="" type="checkbox"/> Dry Density |
| <input checked="" type="checkbox"/> Unconfined Compressive strength Tests | <input checked="" type="checkbox"/> Moisture Density Relationship | <input checked="" type="checkbox"/> California Bearing Ratio |

☒ Soil pH

☒ Water Soluble Sulfates

☒ Soil Resistivity

7.0 General Subsurface Conditions:

The subsurface conditions may generally be grouped into two generalized strata – clayey sand underlain by a weathered bedrock – with similar physical and engineering properties as per the boring logs provided at the end of this report. The underlying bedrock is composed of weathered bedrock in the northern half of the property and by weathered sandstone/siltstone in the property's southern half.

Table 4 Subsurface Stratigraphy

Boring No.	Material Description	Approximate Depth (ft)	Consistency
B-1	Brown Clayey Sand	0-5	Moist, Very Dense
	Olive/Brown Claystone	5-7	Moist, Hard
B-2	Brown Clayey Sand	0-5	Moist, Dense to Very Dense
	Olive/Brown Claystone	5-7	Moist, Hard
B-3	Brown Clayey Sand	0-5	Moist, Dense to Very Dense
	Brown/Gray Sandstone/Siltstone	5-7	Moist, Hard
B-4	Brown Clayey Sand	0-5	Moist, Medium Dense to Very Dense
	Olive/Brown Claystone	5-15	Moist, Hard
B-5	Brown Clayey Sand	0-5	Moist, Very Dense
	Olive/Brown Claystone	5-15	Moist, Hard
B-6	Brown Clayey Sand	0-5	Moist, Medium Dense to Dense
	Brown/Gray Sandstone/Siltstone	5-15	Moist, Hard
B-7	Brown Clayey Sand	0-5	Moist, Very Dense
	Brown/Gray Sandstone/Siltstone	5-25	Moist, Hard
B-8	Brown Clayey Sand	0-5	Moist, Very Dense
	Brown/Gray Sandstone/Siltstone	5-25	Moist, Hard
B-9	Brown Clayey Sand	0-5	Moist, Very Dense to Dense
	Brown/Gray Sandstone/Siltstone	5-25	Moist, Hard

8.0 Groundwater Conditions:

Groundwater seepage was not encountered during hour field investigation. However, groundwater levels will fluctuate with seasonal climatic variations and changes in land use. It is not unusual to encounter shallow ground water during snow melt or during or after periods of precipitation. The surface water tends to percolate down until it encounters a relatively impervious layer.

Table 5 Groundwater Conditions

Boring No.	Date of Measurement	Depth from Existing grade (ft)
B-1	12/17/2021	NA
B-2	12/17/2021	NA
B-3	12/17/2021	NA
B-4	12/17/2021	NA
B-5	12/17/2021	NA
B-6	12/17/2021	NA
B-7	12/17/2021	NA
B-8	12/17/2021	NA
B-9	12/17/2021	NA

Accurate determination of the groundwater elevation may not be possible even after several days of observation. Seasonal variation, temperature, recent precipitation, and localized construction activities that influence drainage characteristics may influence the groundwater table and volumes of water will depend on the permeability of soils. Groundwater conditions can differ between borehole locations and in areas not explored.

9.0 Design Engineering Analysis:

The recommendations presented below are based on the data obtained from our field and laboratory tests, our past experience with geotechnical conditions similar to those at this site, and our engineering design analysis.

Based on the varying soils encountered at the project site, we recommend using deep foundations to support the proposed structure. However, we understand that deep foundations may be cost prohibitive to construct under certain circumstances. Therefore, as an alternative, shallow spread footings can be utilized in conjunction with soil modification outlined below, only if the owner understands the risk and can tolerate more movement in relation to deep foundations.

9.1 Drilled Piers:

The proposed single-story 4,500 sq ft retail store at the subject property shall be supported by a drilled pier foundation system. The drilled straight shaft pier system should be designed and constructed in accordance with the following criteria.

Drilled piers shall be founded at a minimum depth of 15-ft below existing grade and a minimum embedment depth of 5-ft into the claystone bedrock. Piers should be designed for a maximum allowable end bearing pressure of 17,500 PSF and allowable skin friction (side shear) of 1,750 PSF for the portion embedded within the claystone bedrock, all other skin friction should be ignored. The drilled piers shall be designed using the capacities provided in the report and to provide adequate uplift resistance.

Table 6 Drilled Pier Criteria

Criteria	Recommendations
Minimum bearing depth	15-ft
Minimum penetration into bedrock	5-ft
Minimum Length	15-ft
Roughening / shear rings required	yes
Allowable bearing capacity	17,500 psf
Maximum Skin friction	1,750 psf (for the portion embedded within claystone bedrock)
Estimated total movement	1 inch
Estimated uplift	23xpier diameter, kips

All piers should be reinforced full length to resist ultimate uplift forces caused by swelling soils. Reinforcement should extend into grade beams of foundation walls. A minimum **4-inch** void forming material should be placed between the piers to concentrate dead loads and avoid contact with potentially expansive soils. Sonotubes must be used to form the top of the pier and avoid "mushrooming" the tops of piers.

Shear rings shall be spaced about 18 inches on center for a minimum of 5-ft (in the bottom of the pier), that is embedded within the bedrock. Shear grooves used shall be a minimum of 3 inches high and 2 inches deep.

The minimum clear spacing between any two piers should not be less than $3d$, where d is the pier diameter. If the spacing between the piers is closer than $3d$, stress concentrations will occur between the two piers. The concentrated stress may be higher than the allowable bearing capacity. Hence, these piers should be designed for a lower bearing capacity than the maximum allowable. However, since the drilled shaft configurations are unknown at this time, we are unable to estimate the capacity reductions. Please contact our office with pier configurations if this analysis is required.

Moisture variation in the expansive soils at this site can cause vertical movements of the subsurface soils. This potential vertical movement can mobilize an uplift force along the shaft of a drilled pier. All piers should be reinforced full length to resist ultimate uplift forces caused by swelling soils. Drilled shafts shall be loaded as soon as practically possible to reduce the effects of uplift.

Groundwater may be encountered during the installation of the piers and dewatering will be required during drilled pier installation. Concrete shall not be placed in more than 3 inches of water. Concrete should be onsite at the time of drilling and placed immediately after the pier is drilled and inspected thus minimizing the potential for dewatering. A tremie pipe should be utilized for concrete placement. Concrete should not be allowed to freefall more than 6 feet. Concrete should be placed utilizing full depth vibratory consolidation methods to minimize segregation and voids. It is recommended that use of sulfate resistant cement be utilized in the concrete mix.

The installation of the piers should be observed by a representative of the geotechnical engineer to verify piers are bearing in suitable strata. The piers should be inspected for plumb, hole clean out, and placement of reinforcing steel.

Casing and dewatering of the holes may be required and the contractor should have casing equipment available on-site should the need arise. Some caving of the sidewall should be anticipated during drilling. Contractor shall use casing or other methods to stabilize the sidewalls during drilling.

Please ensure that the requirements contained herein are reflected in any construction plans developed for this site. In order to minimize the chances of water damage to the structure(s), an exterior perimeter drain is recommended for structures built on this site. This drain may flow into a sump pit fitted with a pump or may flow to a suitable 'daylight' outside of the structure

9.2 Shallow Spread Footings:

Alternatively, the proposed 4,500 sq ft retail store at the project site can be supported by shallow spread footings. Variable soil conditions encountered in the project site shall be mitigated as outlined in this section. The owner should understand and accept the risk that even after the mitigation, there will be foundation movement due to natural wetting and drying cycles of the foundation subgrade. Excessive wetting and drying will result in proportional movement of the foundation, sometimes in excess of the estimated movement provided in this report.

Shallow spread-type footings founded on undisturbed in-situ soils, bearing at minimum depth of 3-feet below the lowest finished grade, in conjunction with the recommended site preparation and moisture protection provisions, can be used to support proposed structures at the project site. An allowable soil bearing pressure of 3,000 pounds per square foot (PSF) is recommended for the design of shallow spread-type footings bearing on undisturbed in-situ soils. Please note that the any over-excavation performed shall extend a minimum of 5-ft beyond the building perimeter on all sides.

Footings shall have a maximum width of 6-ft. Allowable bearing capacities shall be reduced by 400 psf for footings that have more than 6-ft of width or in accordance with the table provided below. Interior footings located in areas not susceptible to frost penetration shall bear on materials prepared in accordance with the same criteria specified for full depth footings. Interior footings, bearing on undisturbed in-situ soils, founded at minimum depth of 1-ft below finish grade shall be designed for a maximum allowable bearing capacity of 2,500 psf.

Stiffened grid beam and slab foundations, if desired can be designed using the same recommendations as provided in this section. We recommend a minimum beam width of 12 inches. Beams shall intersect at relatively heavy load areas such as underneath columns.

Table 7 Allowable Bearing Capacities

Bearing Depth (ft)	Allowable Bearing Capacity (psf)	Max Footing Width (ft)	Reduction in Bearing Capacity (psf)
3-ft (for frost protection)	3,000	6	400
1-ft (interior footing)	2,500	6	250

In order to minimize the sensitivity of the structure to differential movement, the footings and walls should be reinforced to allow for a degree of load re-distribution should a localized zone of the supporting soils become saturated. Stem walls should either be positively separated from the floor slabs or reinforced to prevent cracking at the slab stem wall interface.

Significant moisture increase in the in-situ soils could create additional and/or excessive movements in some areas of the site. Accordingly, the site drainage and moisture protection provisions, recommended in this report are critical design considerations.

Prior to placing concrete, all bearing surfaces must be cleared of all loose material. Disturbed material may only be re-compacted with guidance from, and after contacting this office.

To verify the soil conditions and soil bearing capacity, it is required that an open hole observation be performed. The entire excavation must be dug down to final grade prior to the observation. **If potentially expansive clay, deleterious material, or other unsuitable conditions are found, additional over-excavation of some or the entire site may be required – replacing inadequate soils with acceptable materials.** Revised foundation recommendations – such as the use mat foundation – may also be required. **Please call to schedule this inspection.**

Ensure that the requirements contained herein are reflected in any construction plans developed for this site. In order to minimize the chances of water damage to the structure(s), **an exterior perimeter drain is recommended for structures built on this site.** This drain may flow into a sump pit fitted with a pump or may flow to a suitable ‘daylight’ outside of the structure (s).

Irrigation lines and sprinkler heads shall undergo periodic maintenance and inspection to detect and repair any leaks that may cause moisture infiltration and subsequent saturation of foundation subgrade.

The risk for wetting of foundation soils can be reduced by carefully planned and maintained surface drainage. The following precautions should be observed during construction and be maintained at all times after the structure is completed. Excessive wetting or drying of open foundation excavations should be avoided as much as possible during construction. Backfill adjacent to walls should be moisture conditioned. Any settlement of backfill after completion of the structure should be repaired and positive drainage reestablished.

9.3 Exterior Flatwork:

Exterior concrete flatwork not subject to vehicular loading, such as pedestrian sidewalks, may be supported directly on subgrade soil compacted in accordance with Table 18 of this report. We recommend extending the subgrade over-excavation and moisture conditioning, (as outlined in this report) to flatwork immediately adjacent to the structure.

Exterior flatworks shall be structurally independent of building foundations except at doorways, where vertical movement could impact doorway operation. At doorway locations, the adjacent flatwork should be doveled into the foundation in a manner as determined by the structural engineer. Exterior flatwork will likely experience seasonal movement. Therefore, some cracking and/or vertical movement shall be anticipated. We recommend using construction and control joints in accordance with ACI specifications.

9.4 Post Construction Movement:

Based on experience, we estimate total movement of one inch for footings designed and constructed as discussed in this report. Differential movement across individual buildings are estimated to be approximately $\frac{1}{2}$ to $\frac{3}{4}$ times of the total settlement. To reduce differential settlements between footings or along continuous footings, footing loads should be as uniform as possible. Differentially loaded footings will settle at different rates.

Table 8 Post Construction Movement

Description	Movement
Total Movement	1 Inch
Differential Movement	$\frac{1}{2}$ Inch to $\frac{3}{4}$ Inch

However, please note that higher magnitude of vertical movement on the order of several inches may occur if the excessive wetting or excessive drying of the subgrade soils occur due to final drainage conditions and / or lack of periodic maintenance.

10.0 Seismic Consideration:

Based on the chapter 20 of ASCE 7 / International Building Code (2012 IBC Table No. 1613.3.2), a site classification of "D" shall be used for the structures in the proposed structure. The site classification is based on the available geological data to an average depth of 100-ft and our previous experience with soil conditions in the general project area.

11.0 Slab on Grade Construction:

The risk of slab performance at this site is judged to be *low to moderate* under current moisture conditions. However, it must be understood, that changes in the water content of these soils may cause the soil to swell or shrink, which may cause movement or cracking of slabs.

Table 9 Slab Performance Risk

Building	Slab Performance Risk
Proposed Retail Store	Low to moderate

Potential vertical movements, predominantly settlement, on the order of three to four inches shall be anticipated at this project site due to seasonal moisture variations. To reduce the risk of potential movement, we recommend removal of shallow underlying clayey sands to a minimum depth of 2-ft and recompact to a minimum of 95% of maximum dry density between -2 to +2 percentage points of optimum moisture content as obtained by ASTM D698. Removal and replacement of onsite soils as outlined above shall significantly reduce the risk of movement of the slabs on grade, to the order of one inch. Criteria for fill material, if used is provided in section 17.0 of this report.

However, if some movement of a slab is not acceptable, the proposed structure should be constructed utilizing a structural floor system, rather than a slab.

Should the owner elect to accept the risks of expansive/consolidating soils and the effects they may have on slabs, the following measures have been shown to be helpful when constructing slabs. The following information, however, must not be construed as an approval to construct slabs-on-grade.

Slabs should bear on proof-rolled and re-compacted materials. A proof-roll of the subgrade shall be observed by the geotechnical engineer's representative. They must not bear on thick lifts of gravel or other materials which may allow the migration of water below the slabs. However, up to 4 inches of gravel can be used as a levelling course and as a capillary barrier.

If the on-site soils are not acceptable, it is preferable to bear slabs on non-expansive imported materials. This will minimize the transfer and retention of water below the slab. Materials with a Liquid Limit below 30 and a Plasticity Index between 10 and 15 are preferred.

Slabs shall be isolated from foundation components by slip joints constructed to allow the independent movement of the slab. Slabs shall also be separated from any utility components by isolation joints. Mechanical equipment resting on slabs must be fitted with expandable / collapsible sections in order to allow movement of the slab without damage to the equipment or to the structure.

Non-bearing partition walls must be constructed with a minimum of 2 inch of float to allow for movement of the slab without damaging any part of the structure. All doors shall be constructed with at least a 1 inch gap at floor level. It is the owner's responsibility to monitor and maintain all floats and gaps as necessary. If additional information on float is needed, please contact this office. A properly engineered and constructed vapor barrier should be provided beneath slabs-on-grade that will be carpeted or receive moisture sensitive coverings or adhesives.

Slabs must be appropriately reinforced to resist the anticipated loads as well as the effects of the supporting soils. Floor slabs must also be scored in accordance with the American Concrete Institute (ACI) recommendations in order to control cracking of the slab due to shrinkage or other factors. These scores should be a maximum of 12 feet apart.

12.0 Water Soluble Sulfates:

Laboratory test results indicate of 0.03% by dry weight of water-soluble sulfates, for selected samples. Potential exposure to water soluble sulfates is classified as **negligible** for this site. However, we recommend using sulfate resistant cement for below grade structures. A water / cement ratio of 0.4 or less can also reduce the risk of attack of water soluble sulfates, on concrete exposed to onsite soils.

Table 10 Water Soluble Sulfates

Boring No.	Depth (ft)	Concentration of Water-Soluble Sulfates (% dry wt.)	Severity of potential exposure¹
B-1	3	0.03	Class 0
B-7	1	0.03	Class 0

1- Severity of exposure potential classified as per 2015 CDOT pavement design manual.

13.0 Soil Corrosivity:

pH tests were conducted on selected samples. Test results indicate that the soils at the subject site can be classified as mildly corrosive to essentially non-corrosive. We recommend engaging a qualified corrosion engineer to review the test results presented her and determine the need for appropriate level of corrosion protection for buried metals.

Table 11 Soil Corrosivity

Boring	Depth (ft)	pH		Resistivity (Ω-cm) (Moist)
		(Distilled Water)	(Calcium Chloride 0.01N)	
B-1	3	5.7	5.3	>17,000
B-7	1	5.7	5.5	15,070

14.0 Pavement Design Recommendation:

It is our understanding that there will be light-duty, medium and heavy duty pavement/parking associated with the proposed construction. The following designs have been based on American Association of State Highway and Transportation Officials (AASHTO) Guideline for Design of Pavement Structures. Areas within the proposed pavement on the site have been divided into two categories based upon anticipated usage. We assume that the final pavement grades will provide adequate drainage for the pavement areas and that water will not be allowed to enter the pavement system by either edge penetration adjacent to landscape areas or penetration from

the surface due to surface ponding, or inadequate maintenance of pavement joints, or surface cracks that may develop

14.1 Subgrade Soils:

Results of our laboratory testing indicate that the subgrade materials classify predominantly clayey sands. According to AASHTO General subgrade rating, onsite soils are rated fair to good (Clayey Sands). Based on a CBR test value of 7, we estimated by correlation, a design R-value of 15 for the pavement design, a resilient modulus (M_R) of 4,195 psi and a modulus of subgrade reaction (k-value) of 80 pci by correlation.

14.2 Traffic Estimates:

Traffic estimates were not available during the preparation of this report. For the purpose of this report, it has been assumed that the three designs will be for general automotive parking areas, drives, and traffic corridors.

Table 12 Traffic Estimates

Areas	20-year ESAL
Light Duty	24,500
Medium Duty	45,000
Heavy Duty	75,000

14.3 Drainage:

For design purposes, local drainage characteristics of proposed pavements areas are considered fair. These characteristics, coupled with the approximate duration of saturated subgrade conditions, results in a design drainage coefficient of 0.90 when applying the AASHTO criteria for design.

For the flexible pavement design, a terminal serviceability index of 2.00 was utilized along with an initial serviceability of 4.2. An inherent reliability of 70% and design life of 20 years was assumed.

The recommendations provided shall be compared to the local agency pavement design standards and in the event of any conflict; the more stringent specification shall be adopted.

In addition to the flexible pavement design analysis, a rigid pavement design analysis was completed, based upon AASHTO design procedures. Rigid pavement design is based on an evaluation of the Modulus of Subgrade Reaction of the soils (K-value), the Modulus of Rupture of the concrete, and other factors previously outlined. A modulus of rupture of 650 psi was used for the pavement concrete.

Table 13 Pavement Design Alternatives

Traffic Area	Moisture Conditioned Subgrade Thickness	Alternative	Recommended Pavement Section Thickness (inches)			
			Aggregate Base Course	Plant Mixed Bituminous Pavement	Portland Cement Concrete Pavement	Total
Light Duty	24 inches	A		5.0 in.		5.0 in.
	24 inches	B	4.0 in.	4.0 in.		8.0 in.
	24 inches	C			4.5 in.	4.5 in.
Medium Duty	24 inches	D		5.5 in.		5.5 in.
	24 inches	E	6.0 in.	4.0 in.		10.0 in.
	24 inches	F			5.0 in.	5.0 in.
Heavy Duty	24 inches	G		6.0 in.		6.0 in.
	24 inches	H	6.0 in.	5.0 in.		11.0 in.
	24 inches	I			6.0 in.	5.5 in.
Sidewalks	12 inches				4.0 in.	4.0 In.
Loading Docks and Dumpster Pads	36 inches				7.0 in.	7.0 In.

14.4 Subgrade Preparation:

For the pavement to perform adequately, final grades shall provide adequate drainage and that water will not be allowed to enter the pavement system by either edge penetration adjacent to landscape areas or penetration from the surface due to surface ponding, or inadequate maintenance of pavement joints, or surface cracks that may develop. If water is allowed to permeate into the pavement subgrade, shrinking or swelling of the moisture conditioned subgrade soils may occur.

Each alternative should be investigated with respect to current material availability and economic conditions. Rigid concrete pavement, a minimum thickness of 7 inches is recommended for fire lanes, locations of loading docks and dumpsters where trash trucks park and load.

The subgrade shall be proof rolled using a rubber-tired equipment with a gross vehicle weight not less than 30,000 lbs.; such as a fully loaded water truck. A minimum of three passes should be made. The proof rolling should be observed by Triax Engineering. If proof roll cannot be achieved, the subgrade shall need to be stabilized.

Aggregate base course (if used on the site) should consist of a blend of sand and gravel that meets specifications for quality and gradation. The use of materials meeting Colorado Department of Transportation (CDOT) Class 6 base course specifications is recommended. All asphalt pavements shall conform to specifications in CDOT section 401 Standard Specifications for Road and Bridge Construction.

The pavements constructed on the subgrades such as the one encountered at this site may be subjected to swell / consolidation related movements. Hence, periodic maintenance such as crack sealing and surface finishing are anticipated. Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/contraction and isolation. The location and extent of the joints should be based upon the final pavement geometry and should be placed (in feet) at roughly twice the slab thickness (in inches) on center in either direction. Sawed joints should be cut within 24-hours of concrete placement and should be a minimum of 25% of the slab thickness plus ¼ inch. All joints should be sealed to prevent entry of foreign material and dowelled where necessary to provide load transfer.

It is important that any existing organic and compressible soils (the upper soils which contain organic materials such as leaves, roots, etc.) be removed and the exposed subgrade be properly prepared prior to pavement installation. The subgrade should be scarified to the required depth and then compacted to 95 percent of the maximum dry density as obtained by ASTM D698 and moisture content between -2 to +2 percentage points of

optimum moisture content. Base course material should be placed immediately upon completion of the subgrade compaction operation to prevent drying of the soils due to exposure.

15.0 Lateral Loads:

The ultimate passive soil resistance against edges of footings, grade beams, etc., with properly compacted (non-expansive) backfill, should be considered as being equal to forces exerted by a fluid of 55 pounds per cubic foot (PCF) unit weight.

Below grade walls must be designed for lateral loads. For "active" conditions, the walls should be designed for an equivalent fluid pressure of 45 PCF for properly compacted backfill. For "at rest" conditions, equivalent fluid pressures of 60 PCF should be used. For "passive" conditions, equivalent fluid pressures of 245 PCF (without factor of safety) should be used. These loads do not include swelling pressures, hydrostatic loads, or surcharge loads, such as sloping backfill or vehicles

Table 14 Equivalent fluid pressures

<u>Equivalent Fluid Pressure</u>	<u>Clayey Sands (On-site Soils)</u>	<u>CDOT Class 1 Structural backfill (Properly Compacted)</u>
Active	45 pcf	45 pcf
Passive (without factor of safety)	245 pcf	255 pcf
At rest	60 pcf	60 pcf

The above values are for properly compacted backfill. These values are not valid for submerged conditions.

16.0 Site Retaining Walls

Shallow spread-type footings founded on undisturbed in-situ soils, bearing at minimum depth of 3-feet below the lowest finished grade (for frost protection), in conjunction with the recommended site preparation and moisture protection provisions, can be used to support the site retaining walls.

Table 15 Shallow Bearing Capacities

Elevation (ft)	Allowable Bearing Capacity (psf)
3-ft below grade	3,000

Allowable soil bearing pressure as provided above is recommended for the design of shallow spread-type footings bearing on *undisturbed in-situ soils* and founded on a minimum depth of 3-feet below the lowest finished grade at the site (or that required by local jurisdiction; whichever is greater) for frost protection.

For structural design purposes the following parameters can be used for the site retaining walls. It is anticipated that the retaining walls will be constructed within the sandy clay and clayey sand fill encountered in our borings.

Table 16 Structural Design Parameters

Angle of Repose	32 ⁰ (1.5H:1V) (Clayey Sands)
Coefficient of Friction for sliding	0.35 between clayey sand and Concrete
Angle of Internal Friction	29 ⁰
Cohesion	300 psf
Total Unit Weight	106 pcf

For structural backfill and behind the retaining wall, properly compacted CDOT class 1 structural backfill shall be utilized. In order to minimize the sensitivity of the structure to differential movement, the footings and walls should be reinforced to allow for a degree of load re-distribution should a localized zone of the supporting soils become saturated.

Significant moisture increase in the in-situ soils could create additional and/or excessive movements in some areas of the site. Accordingly, the site drainage and moisture protection provisions, recommended in this report are critical design considerations.

Prior to placing concrete, all bearing surfaces must be cleared of all loose material. Disturbed material may only be re-compacted with guidance from, and after contacting this office.

To verify the soil conditions and soil bearing capacity, *it is required that an open hole observation be performed.* The entire excavation must be dug down to final grade prior to the observation. If potentially expansive clay, deleterious material, or other unsuitable conditions are found, additional over-excavation of some or the entire site may be required – replacing inadequate soils with acceptable materials. Revised foundation recommendations – such as the use of drilled piers – may also be required. **Please call to schedule this inspection.**

We recommend a foundation drain for the retaining walls built on this project site. Retaining walls shall have minimum 12 inch thick drainage layer or engineered drainage board between the wall and the backfill to relieve hydrostatic pressure.

The recommendations provided here are applicable only to cast-in-place concrete or modular block walls up to 5 feet in height. If taller single walls, tiered walls, or Mechanically Stabilized Earth (MSE) walls will be included in the proposed development, additional site-specific studies and laboratory testing will be required.

17.0 Onsite soils

Based on our laboratory test results, suitable onsite soils can be used for structural fill, and for general fill purposes such as landscaping, or trench backfill.

The owner should understand and accept the potential risk of increased movement if on-site soils are used as structural fill. In addition, the excavation may expose deleterious soils, soft spots, construction debris, trash, landfill, or other contaminants. In such cases, additional quantities of removal and replacement of onsite soils, greater than specified in this report may be required. If the risk of movement cannot be accepted, select structural fill shall be utilized underneath the foundations.

Table 17 Use of onsite soils

Soil type	Acceptable location for placement
Clayey Sands (SC)	Suitable onsite soils can be used for structural purposes. Can be used for landscape, trench backfill, embankments, and other general use.
Claystone / Siltstone	Cannot be used for Structural purposes Can be used for landscape, trench backfill, embankments, and other general use.

18.0 Drainage:

An exterior foundation perimeter drain is recommended in order to protect the structure from water damage. Foundation wall must be braced or be supported by first floor framing prior to backfilling the foundation.

The risk for wetting of foundation soils can be reduced by carefully planned and maintained surface drainage. The following precautions should be observed during construction and be maintained at all times after the structure is completed.

Excessive wetting or drying of open foundation excavations should be avoided as much as possible during construction. Backfill adjacent to foundation walls should be moistened and compacted. Any settlement of backfill after completion of the structure should be repaired and positive drainage reestablished.

The ground surface surrounding the structures should be sloped to drain away from the structures in all directions. A minimum slope of 12 inches in the first 10 feet should be achieved and maintained after construction. Roof downspouts and drains for the structures should discharge to the surface well beyond the limits of all backfill. Irrigated landscaping should not be placed within 5 to 10 feet of the foundation walls.

Plastic membranes should not be used to cover the ground surface immediately surrounding the structures. These membranes trap moisture and prevent normal evaporation from occurring. Geotextile fabrics are a suitable option to control weed growth and allow some evaporation.

In order to minimize the chances of water damage to the structures, an exterior perimeter drain is recommended for any structures built on this site. This drain may flow into a sump pit fitted with a pump or may flow to a suitable 'daylight' outside of these structures.

19.0 Site Preparation:

Organic material, manmade fill, and any debris or deleterious materials should be removed from the foundation area and wasted off site or used for non-structural purposes. Structural fill material (or processed on-site soils) must be placed in 8 inches loose layers and compacted to 6-inch lifts and compacted to 95 percent of the Standard Proctor maximum dry density within 2 percent of the optimum moisture content.

Structures supported by insufficiently compacted structural fill may settle. Any fill utilized for non-structural purposes – such as landscape backfill – must be compacted to a minimum of 90 percent of maximum dry density as determined by ASTM D 698. In hot, windy, or dry weather, the site should be periodically wetted with a water spray if needed to maintain its moisture content and not dry out excessively.

20.0 Compaction Requirements:

Any select structural fill used at the site should have a Liquid Limit less than 35 and a Plasticity Index between 10 and 20. The fill should contain no particles greater than 3 inches in diameter. The percent passing U.S. Standard Sieve No. 4 should be between 40 and 80 percent and passing Sieve No. 40 between 10 and 50 percent. The percent passing Sieve No. 200 should be less than 50 percent. The fill materials shall be placed in loose lifts not to exceed 8 inches and compacted to as outlined in the following table.

If the existing grade must be raised to attain the finish grade elevation, select fill should be placed, compacted, and tested for compaction compliance by Triax Engineering, LLC.

Table 18 Compaction Specifications

Soil Type	Dry Density	Moisture Content
Slab on Grade (import)	Min. 98% (ASTM D 698)	-2 to +2% of Optimum Moisture
Structural fill (import)	Min. 98% (ASTM D 698)	-2 to +2% of Optimum Moisture
Embankments / Class 6 ABC	Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture
Onsite soils – General Fill (SC)	Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture
Flatwork (onsite soils)	Min. 95% (ASTM D 698)	-2 to +2% of Optimum Moisture

21.0 Excavations and Shoring:

Excavations should not remain open for extended periods of time, permitting wetting or drying of the bearing materials. Moisture changes of the bearing materials may increase the risk for movement. Care should be taken when working near the sides of excavations at all times, and the slopes should be monitored by onsite personnel during construction for evidence of sloughing, bulging or toppling of the sidewalls or cracking at the ground surface.

Due to the soil types present, shoring or stabilization of the excavation may be necessary at this site. An open-hole observation should be performed if required by the local municipality or if there are any concerns regarding excavation safety or stability. If the proposed excavation is within 10' of any existing structure, or if potential property damage or safety is an issue, some form of shoring may be required.

22.0 Excavations and Slopes:

Based on the soil type encountered at the project site, temporary excavations in clayey sands shall have a minimum slope of 1.5H:1V, respectively. Project scope did not include a detailed slope stability analysis.

Table 19 Temporary Excavation slopes

Soil Type	Temporary Slopes	Long Term Slopes
Clayey Sands	1.5H:1V	3H:1V or greater (less steep)

A detailed slope stability analysis shall be conducted if the slopes will exceed a height of 5-ft and / or the slope will experience any surcharge, such as from traffic or other structures.

Surcharge loading at the top of the cut by equipment, materials, or vehicles must be avoided, since surcharge loading will increase the risk of caving. Spoils of the excavation must be placed a minimum of 5 horizontal feet from the edge of the excavation. Final evaluation of excavations, excavation slopes and soil and bedrock materials exposed in excavations should be done during construction by the contractors “competent person” as required by OSHA guidelines

23.0 Limitations:

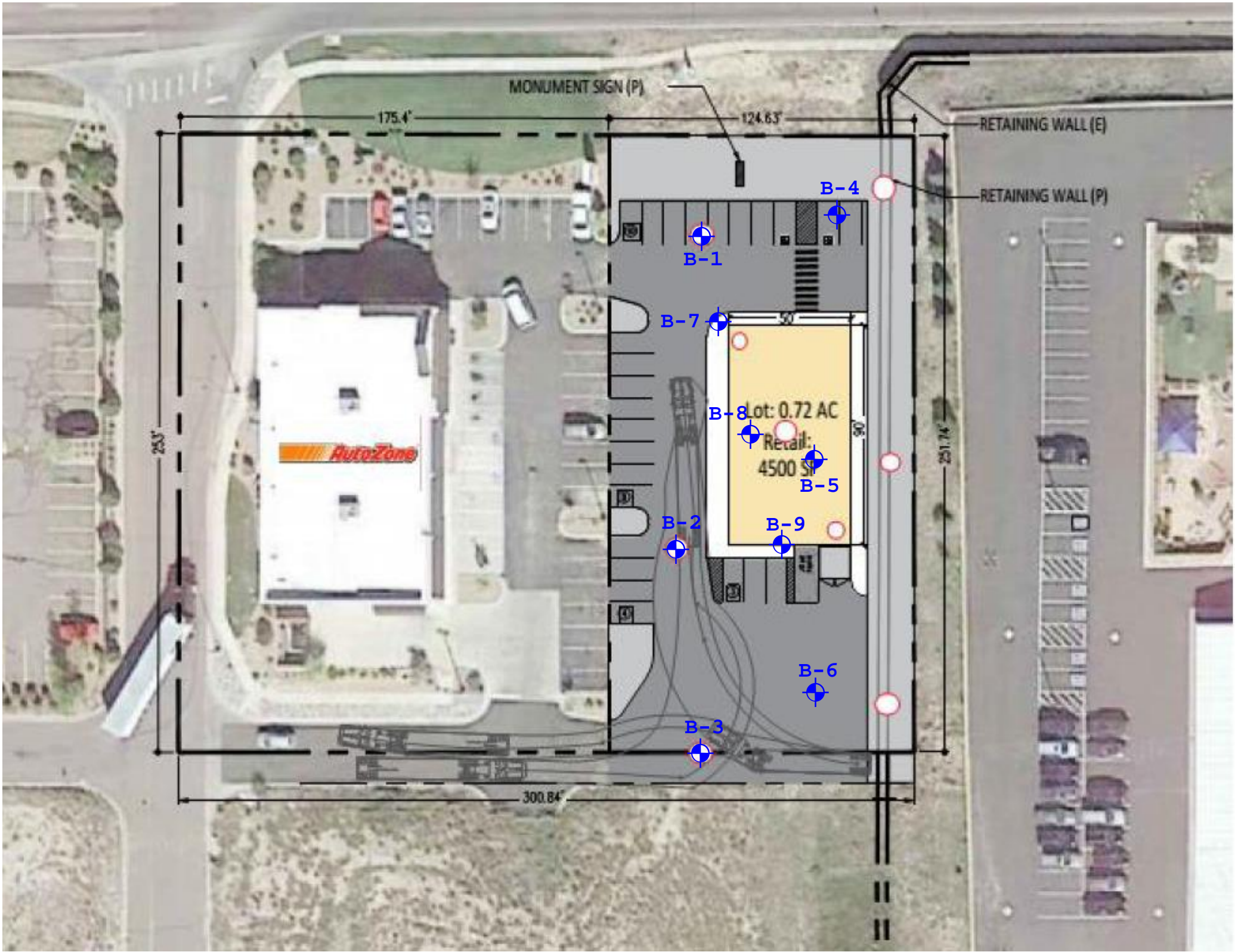
In any subsurface investigation, limited data is available from which to formulate soil descriptions and generate recommendations for foundations and related construction components. The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations. The report does not reflect variations that may occur between borings across the site. The samples taken are indicative of the subsurface materials at the time and at the location the samples were taken. Precipitation, seasonal changes, and excavating are just a few of the factors, which may create changes in the composition of the site. If variations then appear evident, it will be necessary to re-evaluate our recommendations after performing on-site observations and tests to establish the engineering significance of any variations.

This report does not address nor was intended to address any environmental issues, hazardous materials or toxic waste issues, or other subsurface situations or conditions other than those described within this report. The project geotechnical engineer declares that the findings, recommendations and/or professional advice contained herein have been made and this report prepared in accordance with generally accepted professional engineering practice in the fields of geotechnical engineering and engineering geology. No other warranties are implied or expressed.

This report is valid until site conditions change due to disturbance (cut and fill grading) or changes to nearby drainage conditions, or for 3 years from the date of this report, whichever occurs first. Beyond this validation date, Triax shall not accept any liability associated with the engineering recommendations in the report, particularly if the site conditions have changed. If this report is desired for use for design purposes beyond this validation date, we highly recommend drilling additional borings so that we can verify the subsurface conditions and validate the recommendations in this report."

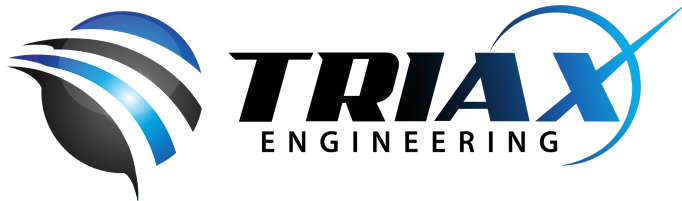
This report is intended for the sole use of Wall Development Group and approved agents during the construction of the above mentioned project site. This office cannot be responsible for any conclusions or recommendations made by other parties based upon the data contained herein.

Boring #	Depth (ft)
B-1	7
B-2	7
B-3	7
B-4	15
B-5	15
B-6	15
B-7	25
B-8	25
B-9	25



Baptist Rd Retail Store
705 Baptist Rd,
CO Springs, CO 80921

Boring Location Plan
Project No: D21G159
Not to Scale



Log of Boring:B-1

ELEVATION AND DATUM:
 Lat: 39.05628642 Long: -104.840823 Elev:ft. 6814

DATE STARTED: 12/17/2021 DATE FINISHED: 12/17/2021

TOTAL DEPTH (ft.): 7

GROUND WATER (ft):
 During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
 Colorado Springs, CO 80921

Location: North Parking Lot

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

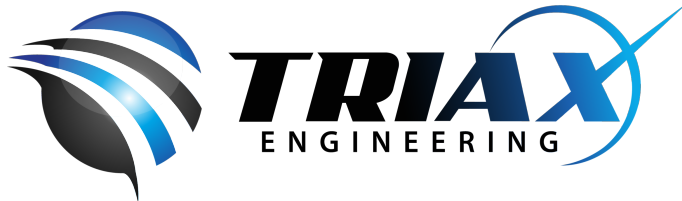
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
0				Top Soil / Vegetation	9.3											
		SS	50	Brown Clayey Sand	11.4		4.8			110.1		3372	0.03			
		CA	50	— Moist, Very Dense	20.4	62.0		54	36		CH					
5				Olive/Brown Claystone	20.4					109.8		9910				
		SS	45	— Moist, Hard												
		CA	50	— Weathered												
				— End of Borehole —												
10																
15																
20																
25																
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D21G159

Triax Engineering, LLC 5350 Broadway Denver CO 80216
 PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 1



Log of Boring:B-2

ELEVATION AND DATUM:
 Lat: 39.05594113 Long: -104.840827 Elev.ft. 6804

DATE STARTED: 12/17/2021 DATE FINISHED: 12/17/2021

TOTAL DEPTH (ft.): 7 GROUND WATER (ft):
 During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
 Colorado Springs, CO 80921

Location: West Parking Lot/Driveway

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

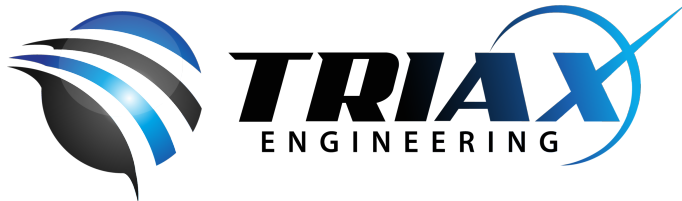
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
0				Top Soil / Vegetation	12.6											
		SS	31	Brown Clayey Sand	19.0		0.0			82.5		83				
		CA	50	— Moist, Dense to Very Dense	22.9	18.1		42	19		SC					
5				Olive/Brown Claystone	23.2					78.9		1507				
		SS	77	— Moist, Hard												
		CA	45	— Weathered												
				— End of Borehole —												
10																
15																
20																
25																
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D21G159

Triax Engineering, LLC 5350 Broadway Denver CO 80216
 PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 2



Log of Boring:B-3

ELEVATION AND DATUM: Lat: 39.05581396 Long: -104.840820 Elev:ft. 6806	
DATE STARTED: 12/17/2021	DATE FINISHED: 12/17/2021
TOTAL DEPTH (ft.): 7	GROUND WATER (ft): During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
Colorado Springs, CO 80921

Location: South Driveway

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

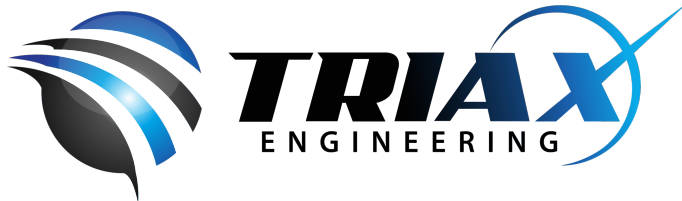
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
0				Top Soil / Vegetation	10.1	39.7		42	21		SC					
		SS	33	Brown Clayey Sand	17.4		-3.2			77.0		766				
		CA	50	— Moist, Dense to Very Dense	19.0	25.3		38	9		SM					
5		SS	80	Brown/Gray Sandstone/Siltstone	18.2					100.3		1959				
		CA	50	— Moist, Hard												
				— Weathered												
				— End of Borehole —												
10																
15																
20																
25																
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D21G159

Triax Engineering, LLC 5350 Broadway Denver CO 80216
PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 3



Log of Boring:B-4

ELEVATION AND DATUM:
 Lat: 39.05630324 Long: -104.840595 Elev:ft. 6810

DATE STARTED: 12/17/2021 DATE FINISHED: 12/17/2021

TOTAL DEPTH (ft.): 15

GROUND WATER (ft):
 During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
 Colorado Springs, CO 80921

Location: Retaining Wall (North)

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

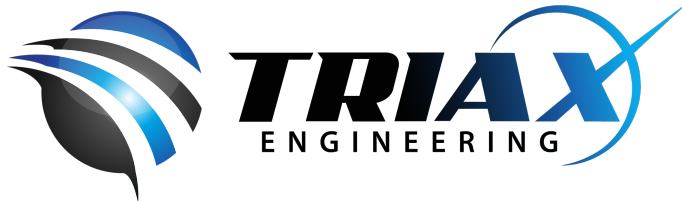
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
0				Top Soil / Vegetation	9.7	27.9		37	18		SC					
		SS	20	Brown Clayey Sand	10.8		-3.6			82.2		2903				
		CA	50	— Moist, Medium Dense to Very Dense	13.1											
5		SS	75	Olive/Brown Claystone	13.5		-0.7			110.0		1256				
		CA	50	— Moist, Hard	20.5	33.5		47	25		SC					
				— Weathered												
10		SS	90	— With Sandstone Seams and Layers	19.3					107.7						
15		CA	75													
				— End of Borehole —												
20																
25																
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D21G159

Triax Engineering, LLC 5350 Broadway Denver CO 80216
 PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 4



Log of Boring:B-5

ELEVATION AND DATUM:
 Lat: 39.05601091 Long: -104.840689 Elev.ft. 6806

DATE STARTED: 12/17/2021 DATE FINISHED: 12/17/2021

TOTAL DEPTH (ft.): 15

GROUND WATER (ft):
 During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
 Colorado Springs, CO 80921

Location: Retaining Wall (Center)

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

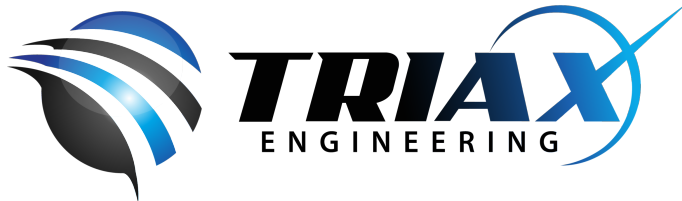
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
0				Top Soil / Vegetation	17.2											
		SS	60	Brown Clayey Sand	21.9		0.0			70.0		999				
		CA	54	— Moist, Very Dense	24.5	71.7		47	21		CL					
5		SS	75	Olive/Brown Claystone	20.3					89.9		5620				
		CA	85	— Moist, Hard	13.1											
				— Weathered												
10		SS	75	— With Sandstone Seams and Layers	33.6	6.0	-4.2	68	23	65.1	SP-SM					
15		CA	32													
				— End of Borehole —												
20																
25																
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D21G159

Triax Engineering, LLC 5350 Broadway Denver CO 80216
 PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 5



Log of Boring:B-7

ELEVATION AND DATUM:
 Lat: 39.05617110 Long: -104.840804 Elev.ft. 6812

DATE STARTED: 12/17/2021 DATE FINISHED: 12/17/2021

TOTAL DEPTH (ft.): 25 GROUND WATER (ft):
 During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
 Colorado Springs, CO 80921

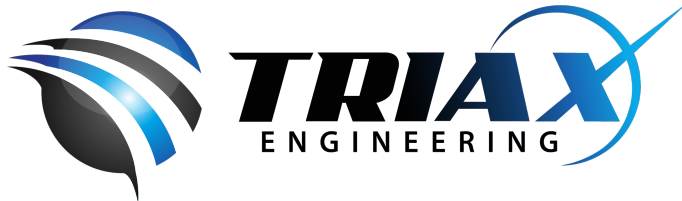
Location: Northwest Corner of Proposed Store

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
														0	20	40
0				Top Soil / Vegetation	10.6	15.6		38	17		SC		0.03			
		SS	88	Brown Clayey Sand												
		CA	50@6"	— Moist, Very Dense	14.0		0.0			81.9		1283				
5				Brown/Gray Sandstone/Siltstone	20.6	32.1		49	7		SM					
		SS	95	— Moist, Hard												
		CA	54	— Weathered	20.5					79.7		1524				
				— With Claystone Layers												
10		SS	65		18.6	4.8		44	8		SW					
15																
		CA	54		25.6		-0.7			72.7		1454				
20																
		SS	50@6"		14.5	9.0		41	7		SW-SM					
25		CA	50		29.3					82.1						
				— End of Borehole —												
30																
35																
40																
45																
Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.																
Project No.: D21G159					Triax Engineering, LLC 5350 Broadway Denver CO 80216 PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com										Plate: 7	



Log of Boring:B-8

ELEVATION AND DATUM:
 Lat: 39.05605913 Long: -104.840711 Elev:ft. 6814

DATE STARTED: 12/17/2021 DATE FINISHED: 12/17/2021

TOTAL DEPTH (ft.): 25

GROUND WATER (ft):
 During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
 Colorado Springs, CO 80921

Location: Center of Proposed Store

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

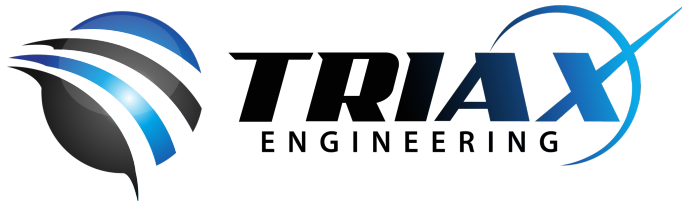
DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
0				Top Soil / Vegetation	17.0											
		SS	50@6"	Brown Clayey Sand	18.0		-2.9			85.3		951				
		CA	50	— Moist, Very Dense	21.6	11.9		44	8		SP-SM					
5				Brown/Gray Sandstone/Siltstone	22.2					95.1		1700				
		SS	72	— Moist, Hard	16.3	8.8		49	13		SW-SM					
		CA	50	— Weathered	25.6		-0.7			75.9		2354				
10				— With Claystone Layers	13.8	8.1		32	9		SW-SM					
		SS	50@5"		7.0		-5.8			101.7						
15		CA	50													
20																
		SS	50@6"													
25		CA	50@1"													
				— End of Borehole —												
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D21G159

Triax Engineering, LLC 5350 Broadway Denver CO 80216
 PH: 720.230.1931 FAX: 720.230.5471 Email: info@triaxgeo.com

Plate: 8



Log of Boring:B-9

ELEVATION AND DATUM:
 Lat: 39.05587304 Long: -104.840669 Elev:ft. 6811

DATE STARTED: 12/17/2021 DATE FINISHED: 12/17/2021

TOTAL DEPTH (ft.): 25 GROUND WATER (ft):
 During Drilling: N/A After 48 Hrs: N/A

Project Name: Proposed Baptist Rd Retail Store

ADDRESS: 705 Baptist Road,
 Colorado Springs, CO 80921

Location: Southeast Corner of Proposed Store

HAMMER WEIGHT: 140 lbs

DROP: 30 In.

LOGGED BY: Benjamin Ntumba

DEPTH (feet)	SAMPLES			MATERIAL DESCRIPTION	LABORATORY TESTS											
	Symbol	Samples	Blows/ Foot		Moisture Content (%)	% Fines	% Swell	Liquid Limit (LL)	Plasticity Index (PI)	NDD (psf)	USCS	UCS (psf)	Water Sol. Sulfates	Moisture Content (%)		
0				Top Soil / Vegetation	22.5											
		SS	75	Brown Clayey Sand	24.4		-8.5			75.6		1757				
		CA	42	— Moist, Very Dense to Dense	21.4	12.3		38	3		GM					
5		SS	70	Brown/Gray Sandstone/Siltstone	22.1					87.8		974				
		CA	54	— Moist, Hard	17.3	7.1		40	6		SP-SM					
			50@6"	— Weathered	25.7		-3.3			73.0		4311				
10		SS		— With Claystone Layers	15.7											
15		CA	50		16.7	9.2		NV	NV	100.7	SW-SM					
20		SS	50@5"													
25		CA	50@2"													
				— End of Borehole —												
30																
35																
40																
45																

Soil Stratigraphic boundaries represent approximate boundary lines between different soil / rock types. Actual transition may be gradual.

Project No.: D21G159

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Plate: 9



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Summary of Laboratory Test Results

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-1	1	9.3	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-1	3	11.4	110.1	--	--	--	--	--	5.7 / 5.3	0.03	--	0	3372	4.80

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-1	5	20.4	--	62.0	54	36	CH	A-7-6(20)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-1	7	20.4	109.8	--	--	--	--	--	--	--	--	--	9910	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-1	BULK	26.8	--	50.2	46	27	CL	A-7-6(9)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-2	1	12.6	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
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5350 Broadway
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Summary of Laboratory Test Results

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Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

B-2	3	19.0	82.5	--	--	--	--	--	--	--	--	--	83	0.00
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Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-2	5	22.9	--	18.1	42	19	SC	A-2-7(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-2	7	23.2	78.9	--	--	--	--	--	--	--	--	--	1507	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-2	BULK	30.4	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-3	1	10.1	--	39.7	42	21	SC	A-7-6(4)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-3	3	17.4	77.0	--	--	--	--	--	--	--	--	--	766	-3.20

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-3	5	19.0	--	25.3	38	9	SM	A-2-4(0)	--	--	--	--	--	--



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705 West Baptist Road
Colorado Springs, CO 80921

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-3	7	18.2	100.3	--	--	--	--	--	--	--	--	--	1959	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-4	1	9.7	--	27.9	37	18	SC	A-2-6(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-4	3	10.8	82.2	--	--	--	--	--	--	--	--	--	2903	-3.60

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-4	5	13.1	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-4	7	13.5	110.0	--	--	--	--	--	--	--	--	--	1256	-0.70

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-4	10	20.5	--	33.5	47	25	SC	A-2-7(2)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-4	15	19.3	107.7	--	--	--	--	--	--	--	--	--	--	--



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Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-5	1	17.2	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-5	3	21.9	70.0	--	--	--	--	--	--	--	--	--	999	0.00

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-5	5	24.5	--	71.7	47	21	CL	A-7-6(15)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-5	7	20.3	89.9	--	--	--	--	--	--	--	--	--	5620	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-5	10	13.1	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-5	15	33.6	65.1	6.0	68	23	SP-SM	A-2-7(0)	--	--	--	--	--	-4.20

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-6	1	19.2	--	35.3	42	18	SC	A-7-6(2)	--	--	--	--	--	--



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Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-6	3	21.8	87.2	--	--	--	--	--	--	--	--	--	1229	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-6	5	25.5	--	50.9	--	--	ML	A-4(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-6	7	15.1	82.5	--	--	--	--	--	--	--	--	--	6578	-0.10

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-6	10	12.8	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-6	15	32.1	73.3	--	--	--	--	--	--	--	--	--	--	-0.50

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-7	1	10.6	--	15.6	38	17	SC	A-2-6(0)	5.7 / 5.5	0.03	--	1507 0	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
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705 West Baptist Road
Colorado Springs, CO 80921

B-7	3	14.0	81.9	--	--	--	--	--	--	--	--	--	1283	0.00
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Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-7	5	20.6	--	32.1	49	7	SM	A-2-5(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-7	7	20.5	79.7	--	--	--	--	--	--	--	--	--	1524	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-7	10	18.6	--	4.8	44	8	SW	A-2-5(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-7	15	25.6	72.7	--	--	--	--	--	--	--	--	--	1454	-0.70

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-7	20	14.5	--	9.0	41	7	SW-SM	A-2-5(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-7	25	29.3	82.1	--	--	--	--	--	--	--	--	--	--	--



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Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-8	1	17.0	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-8	3	18.0	85.3	--	--	--	--	--	--	--	--	--	951	-2.90

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-8	5	21.6	--	11.9	44	8	SP-SM	A-2-5(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-8	7	22.2	95.1	--	--	--	--	--	--	--	--	--	1700	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-8	10	16.3	--	8.8	49	13	SW-SM	A-2-7(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-8	15	25.6	75.9	--	--	--	--	--	--	--	--	--	2354	-0.70

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/Co.
B-8	20	13.8	--	8.1	32	9	SW-SM	A-2-4(0)	--	--	--	--	--	--



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Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-8	25	7.0	101.7	--	--	--	--	--	--	--	--	--	--	-5.80

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-9	1	22.5	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-9	3	24.4	75.6	--	--	--	--	--	--	--	--	--	1757	-8.50

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-9	5	21.4	--	12.3	38	3	GM	A-2-4(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-9	7	22.1	87.8	--	--	--	--	--	--	--	--	--	974	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-9	10	17.3	--	7.1	40	6	SP-SM	A-2-4(0)	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	CI	Res	UCS	%Sw/ Co.
B-9	15	25.7	73.0	--	--	--	--	--	--	--	--	--	4311	-3.30



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Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	Cl	Res	UCS	%Sw/Co.
B-9	20	15.7	--	--	--	--	--	--	--	--	--	--	--	--

Bor. #	Depth (ft)	MC	NDD	% Fines	LL	PI	USCS	AASHTO	pH	Su	Cl	Res	UCS	%Sw/Co.
B-9	25	16.7	100.7	9.2	NV	NV	SW-SM	A-2-4(0)	--	--	--	--	--	--

Bor. Boring, MC - Moisture Content (%), NDD - Natural Dry Density (pcf), % Fines (passing -200)(%), LL- Liquid Limit (%), PI- Plasticity Index (%), USCS - USCS Classification, AASHTO - AASHTO Classification, pH- pH in Distilled Water / pH in Cacl2, Su - Water Soluble Sulfates (% by dry mass), Cl - Water Soluble Chlorides (% by dry mass), Res - Resistivity at in-situ Moisture Content (ohm.cm), UCS - Unconfined Compressive Strength (psf), %Sw/Co. Percent Swell / Consolidation



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000001

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-1

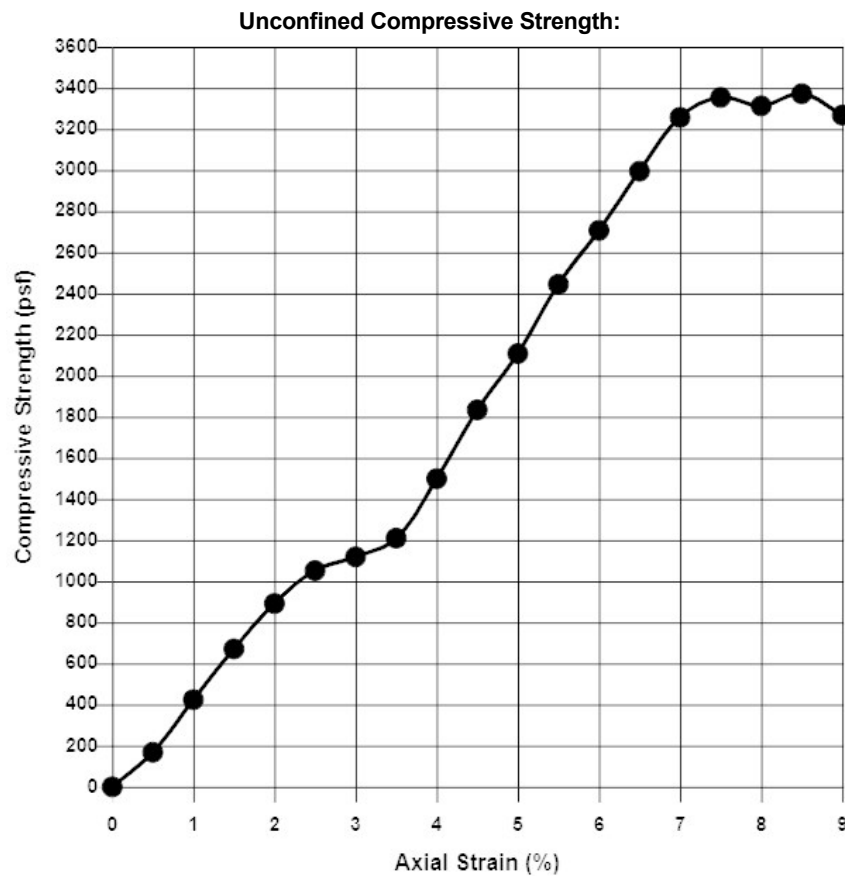
Sample Number: 1819

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2064

Soil Description: LIGHT BROWN SANDY CLAY



Wet Unit Weight (pcf): 122.8pcf

Dry Unit Weight (pcf): 110.2pcf

Moisture Content (%): 11.4

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 9%

Unconfined Compressive Strength (psf): 3372



Swell - Consolidation Test

Report #: SO:SW-000001

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

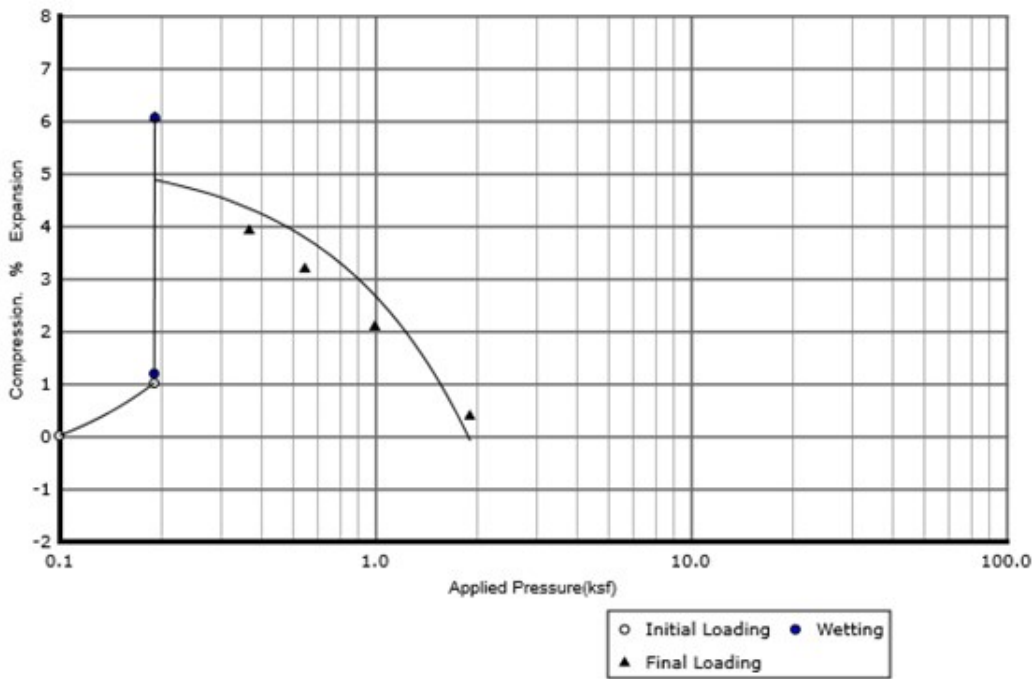
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-1 Sample Number: 1819

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: LIGHT BROWN SILTY SAND

Swell / Consolidation Chart



Swelling due to wetting under constant pressure @ Surcharge Load:200 psf

Moisture Content (%): 11.4 Wet Density of Soil(pcf): 122.7 Dry Density (pcf): 110.1 % Swell / Consolidation: 4.80



Triax Engineering, LLC
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Laboratory Test Results for Soil

Report #: SO:CHE-000001

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

pH of Soils (ASTM D4972)

Water used: De-ionized Water (type ii)

Calcium Chloride Reagent: Stock Solution

Test Method: Method A (pH Meter)

Soil pH in Water: 5.7

Soil pH in CaCl_2 : 5.3

Water Soluble Sulfates (CPL-2103)

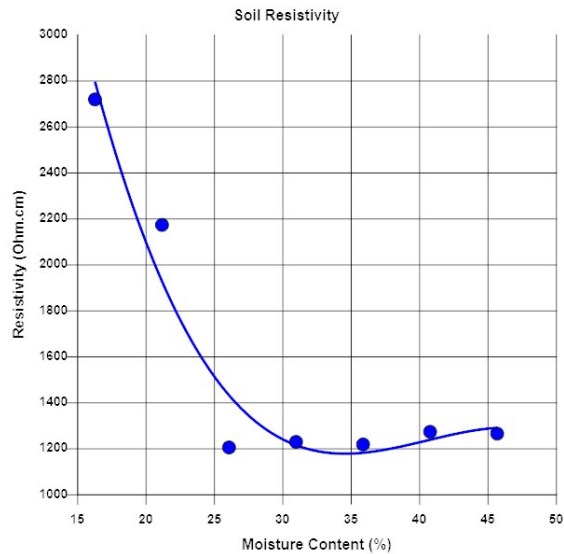
Sulfate Concentration (ppm): 300

Sulfate Concentration (percent Sulfate in Soil by mass): 0.03

Severity of Potential Exposure (CDOT): Class 1

Soil Resistivity (ASTM G57)

Resistivity Chart:



Minimum Resistivity Ohm.cm: 1204

Resistivity at In-Situ Moisture Content (Ohm.cm): 0



Sieve Analysis

Report #: SO:SAS-000001

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2065

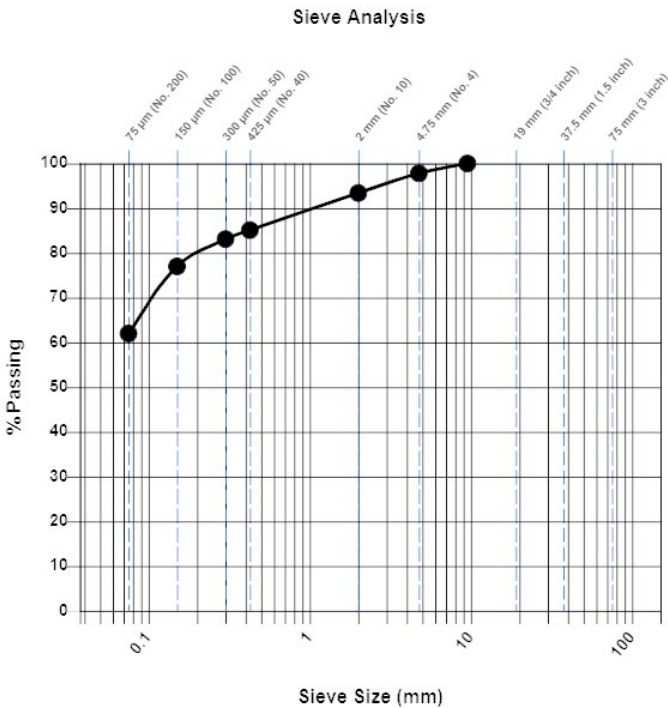
Boring No: B-1

Depth (ft): 5

Soil Description: BROWN SANDY FAT CLAY

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	97.8
2 MM (NO. 10)	93.4
425 MM (NO. 40)	85.1
300 MM (NO. 50)	83.1
150 MM (NO. 100)	77.0
75 MM (NO. 200)	62.0
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 2.2

Percent Sand: 35.8

Percent Fines: 62.0

Liquid Limit: 54

Plasticity Index: 36

USCS Classification: CH

AASHTO Classification: A-7-6(20)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000002

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-1

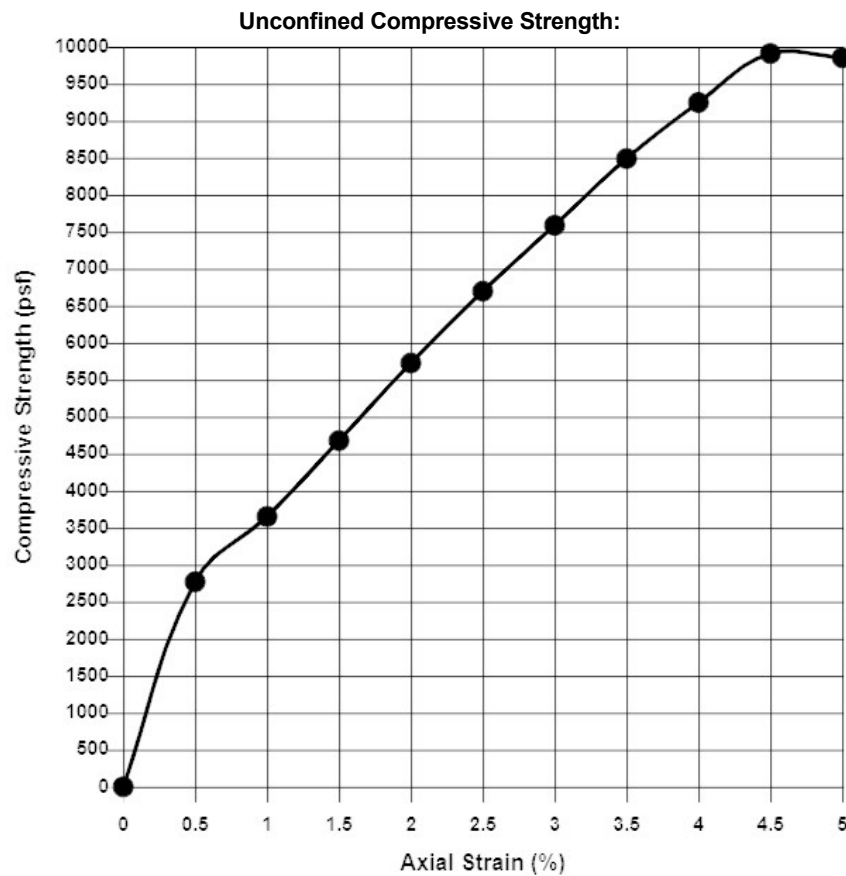
Sample Number: 1819

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2066

Soil Description: BROWN CLAYEY SAND



Wet Unit Weight (pcf): 131.2pcf

Dry Unit Weight (pcf): 109pcf

Moisture Content (%): 20.4

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 5%

Unconfined Compressive Strength (psf): 9910

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2067

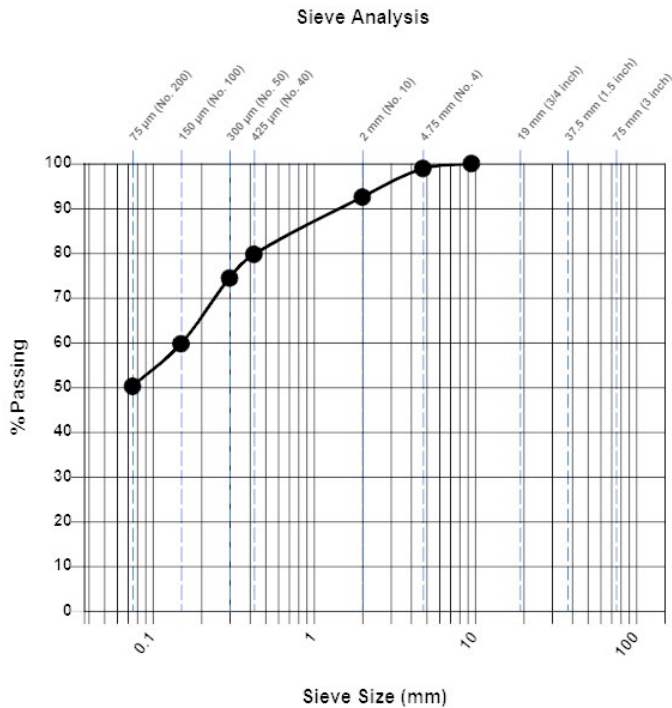
Boring No: B-1

Depth (ft): BULK

Soil Description: BROWN SANDY LEAN CLAY

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	98.9
2 MM (NO. 10)	92.5
425 MM (NO. 40)	79.7
300 MM (NO. 50)	74.4
150 MM (NO. 100)	59.7
75 MM (NO. 200)	50.2
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 1.1

Percent Sand: 48.7

Percent Fines: 50.2

Liquid Limit: 46

Plasticity Index: 27

USCS Classification: CL

AASHTO Classification: A-7-6(9)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Results

Moisture Content of Subspecimen	Dry Unit Weight of Specimen (kN/m ³)	Dry Unit Weight of Specimen (lb/ft ³)	Percent of Swell from Specimen	Immersion Period (in number of hours)
16.9	7.94	52.19	114.3	89

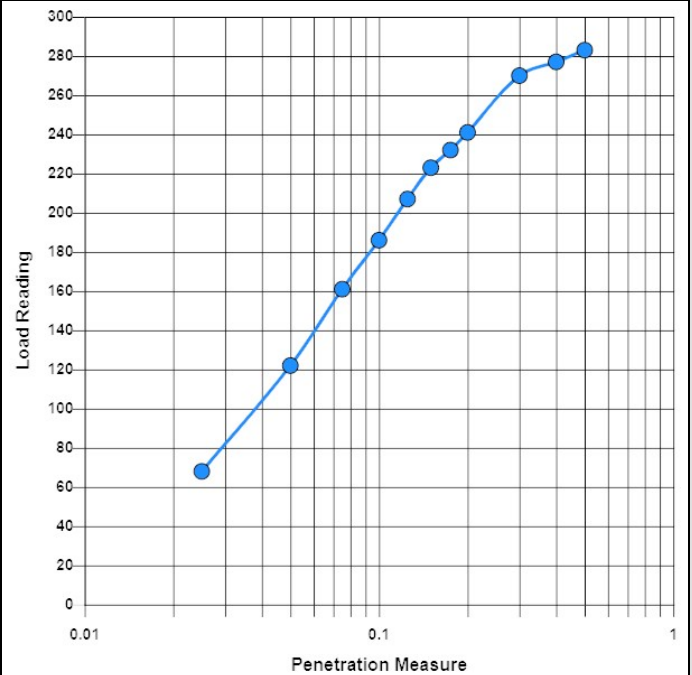
Measure of Penetration (in inches)	Load Reading (in psi)
0.025	68.00
0.050	122.00
0.075	161.00
0.100	186.00
0.125	207.00
0.150	223.00
0.175	232.00
0.200	241.00
0.300	270.00
0.400	277.00
0.500	283.00

CBR @ 0.1 (inches): 6.200

CBR @ 0.2 (inches): 8.000

Test Date: 12/22/2021

Lab Technician: Michael Puckett



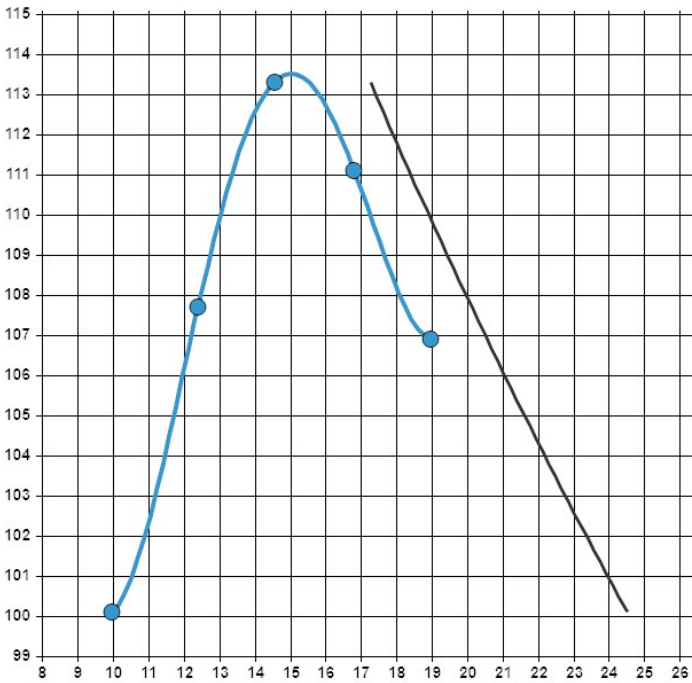


Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Results

Soil Classification:	CL Lean Clays, Low to medium plasticity, Gravelly Clays, Sandy or Silty Clays	Color of Soil:	BROWN SANDY LEAN CLAY
Sample Preparation Method Used:		Moist	
Percent of Water Content from As Received Sample:		27	
Percent Retain from 4.75 mm (No. 4) Sieve:		Percent Passing 4.75 mm (No. 4) Sieve:	
Compaction Method Used: Method A (ASTM D698 - 12e2)		Type of Rammer Used: Mechanical	
Method Used for Specific Gravity Determination:		Assumed	
Proctor Curve:		Specific Gravity of Sample: 2.65	
		Maximum Dry Density: 113.5	
		Optimum Moisture: 15.0	
		Test Completed Date: 01/06/2022	
		Test Completed By: Michael Puckett	



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000003

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-2

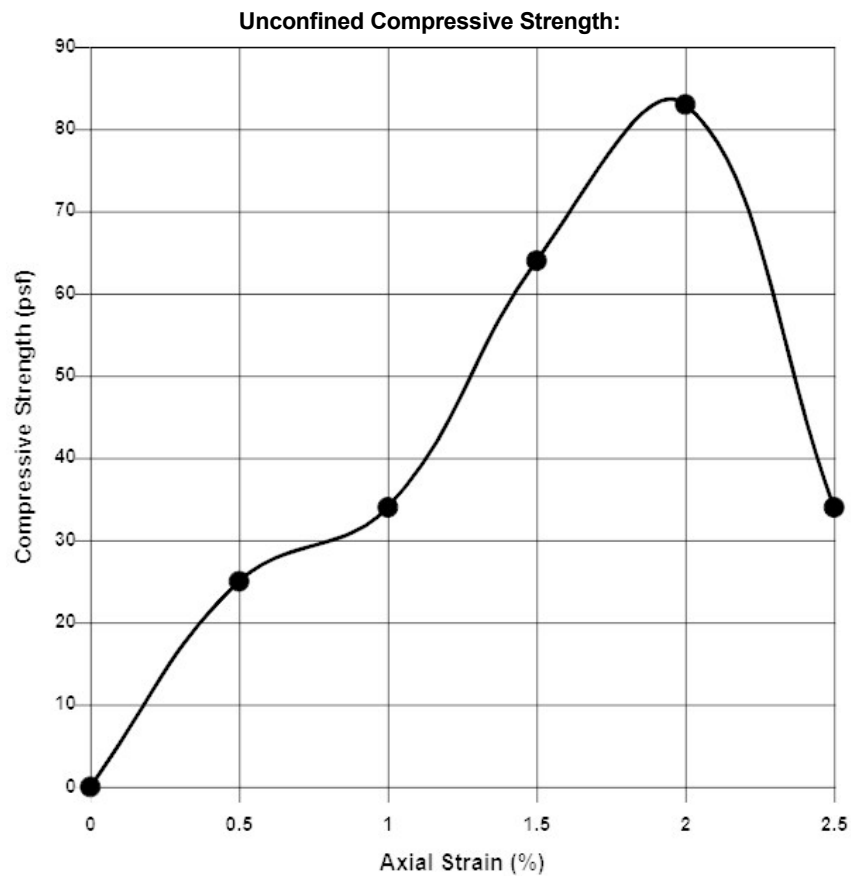
Sample Number: 1820

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2069

Soil Description: GRAY CLAYEY SAND



Wet Unit Weight (pcf): 95.6pcf

Dry Unit Weight (pcf): 80.3pcf

Moisture Content (%): 19.0

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 2.5%

Unconfined Compressive Strength (psf): 83



Swell - Consolidation Test

Report #: SO:SW-000002

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

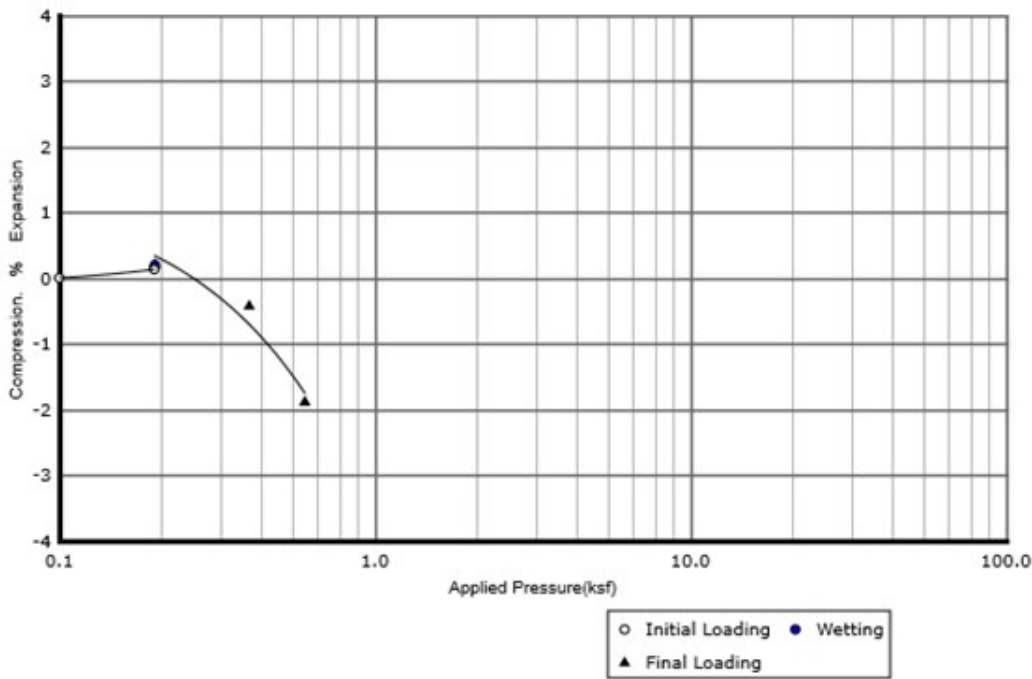
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-2 Sample Number: 1820

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: GRAY SILTY SAND

Swell / Consolidation Chart



No Movement due to wetting under constant pressure @ Surcharge Load:200 psf

Moisture Content (%): 19.0 Wet Density of Soil(pcf): 98.2 Dry Density (pcf): 82.5 % Swell / Consolidation: 0.00



Sieve Analysis

Report #: SO:SAS-000002

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2070

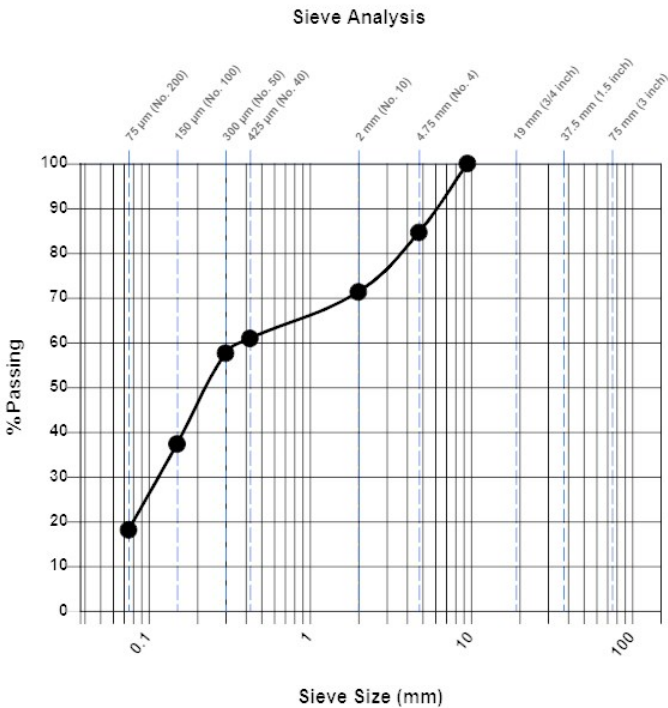
Boring No: B-2

Depth (ft): 5

Soil Description: BROWN CLAYEY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	84.6
2 MM (NO. 10)	71.3
425 MM (NO. 40)	60.9
300 MM (NO. 50)	57.6
150 MM (NO. 100)	37.3
75 MM (NO. 200)	18.1
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 15.4

Percent Sand: 66.5

Percent Fines: 18.1

Liquid Limit: 42

Plasticity Index: 19

USCS Classification: SC

AASHTO Classification: A-2-7(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000004

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-2

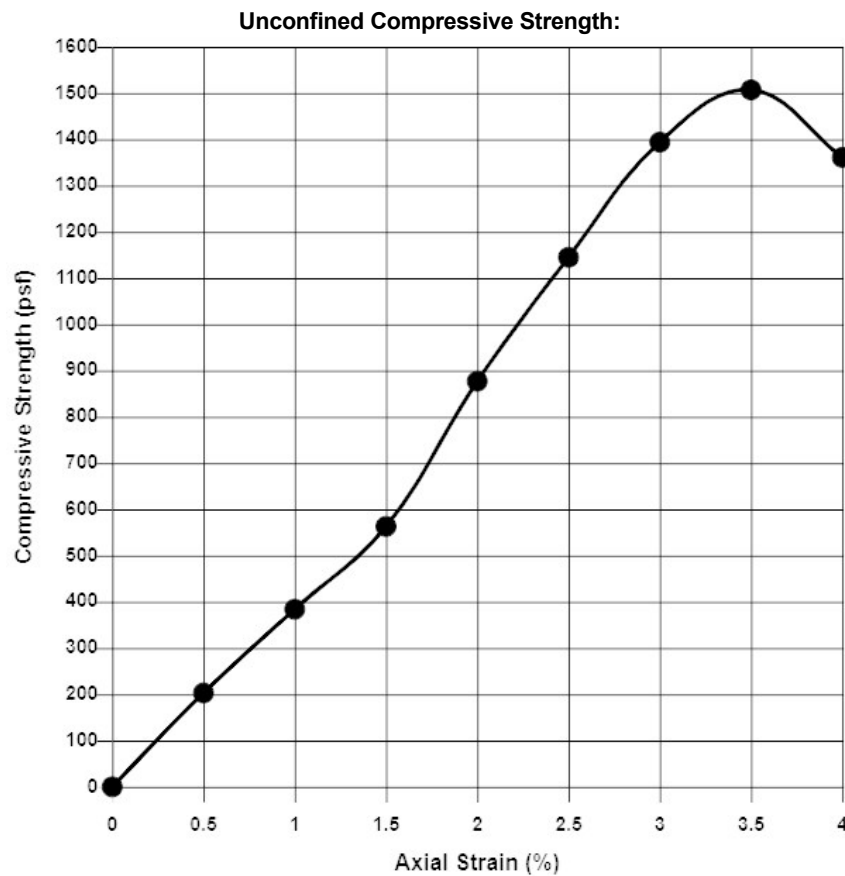
Sample Number: 1820

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2071

Soil Description: BROWN CLAYEY SAND



Wet Unit Weight (pcf): 114.7pcf

Dry Unit Weight (pcf): 93.1pcf

Moisture Content (%): 23.2

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 4%

Unconfined Compressive Strength (psf): 1507



Sieve Analysis

Report #: SO:SAS-000003

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2073

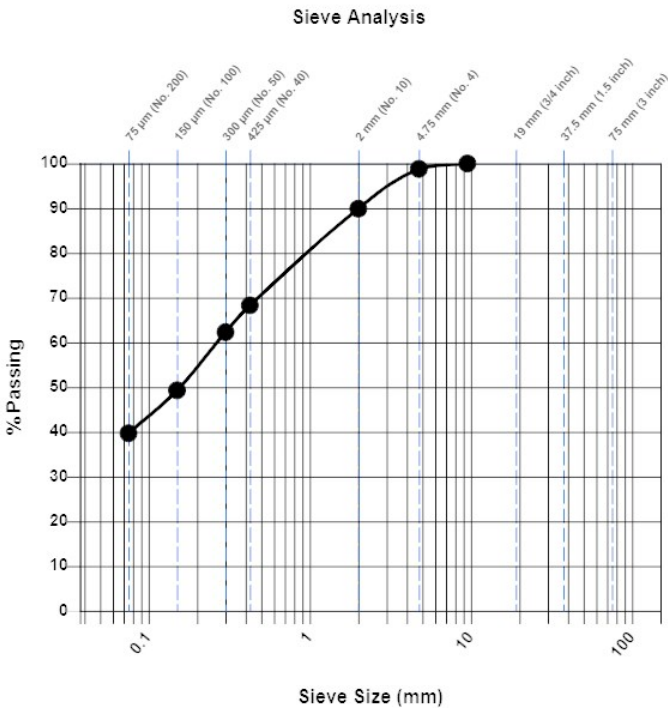
Boring No: B-3

Depth (ft): 1

Soil Description: BROWN CLAYEY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	98.8
2 MM (NO. 10)	89.9
425 MM (NO. 40)	68.3
300 MM (NO. 50)	62.3
150 MM (NO. 100)	49.3
75 MM (NO. 200)	39.7
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 1.2

Percent Sand: 59.1

Percent Fines: 39.7

Liquid Limit: 42

Plasticity Index: 21

USCS Classification: SC

AASHTO Classification: A-7-6(4)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000005

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-3

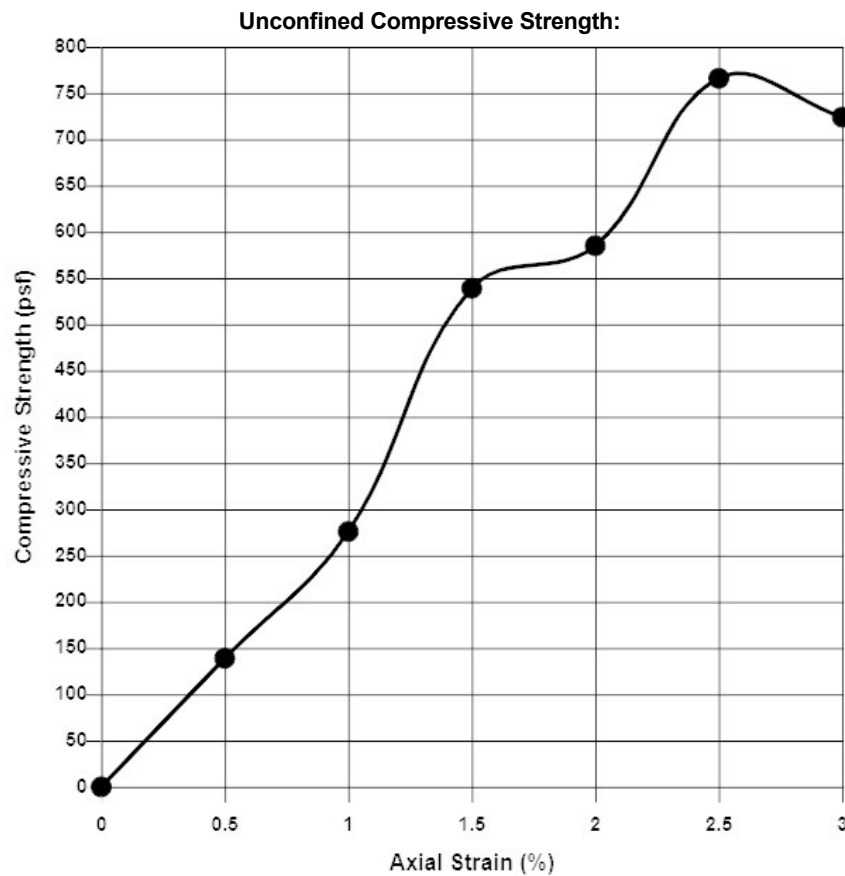
Sample Number: 1821

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2074

Soil Description: BROWN SILTY SAND



Wet Unit Weight (pcf): 99.3pcf

Dry Unit Weight (pcf): 84.6pcf

Moisture Content (%): 17.4

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 3%

Unconfined Compressive Strength (psf): 766



Swell - Consolidation Test

Report #: SO:SW-000003

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

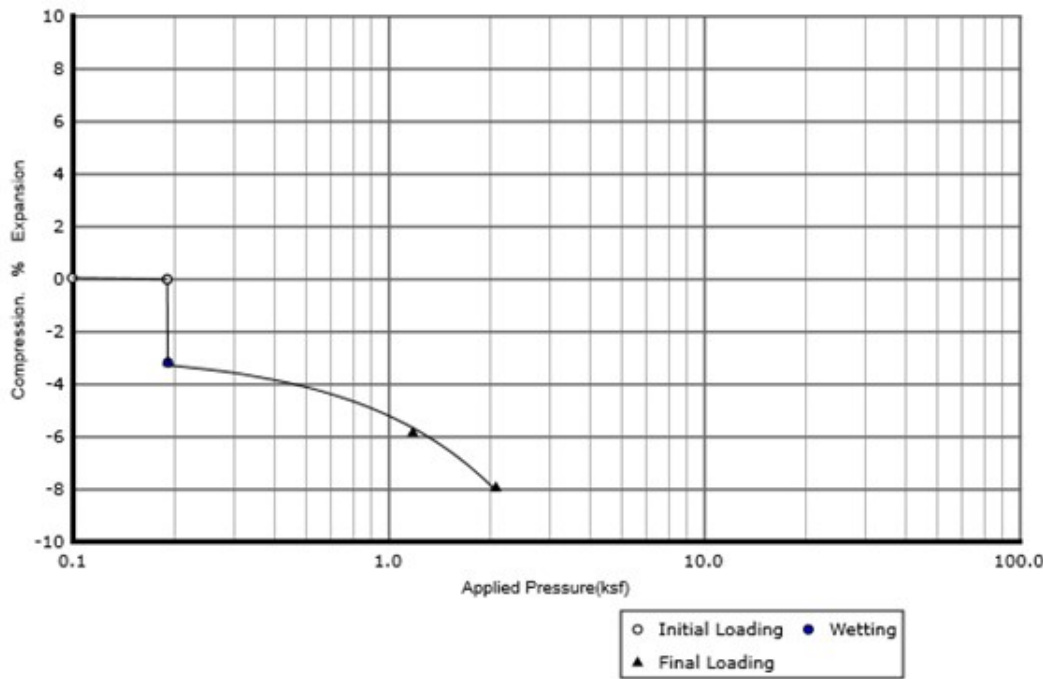
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-3 Sample Number: 1821

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: BROWN SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:200 psf

Moisture Content (%): 17.4 Wet Density of Soil(pcf): 90.4 Dry Density (pcf): 77.0 % Swell / Consolidation: -3.20



Sieve Analysis

Report #: SO:SAS-000004

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2075

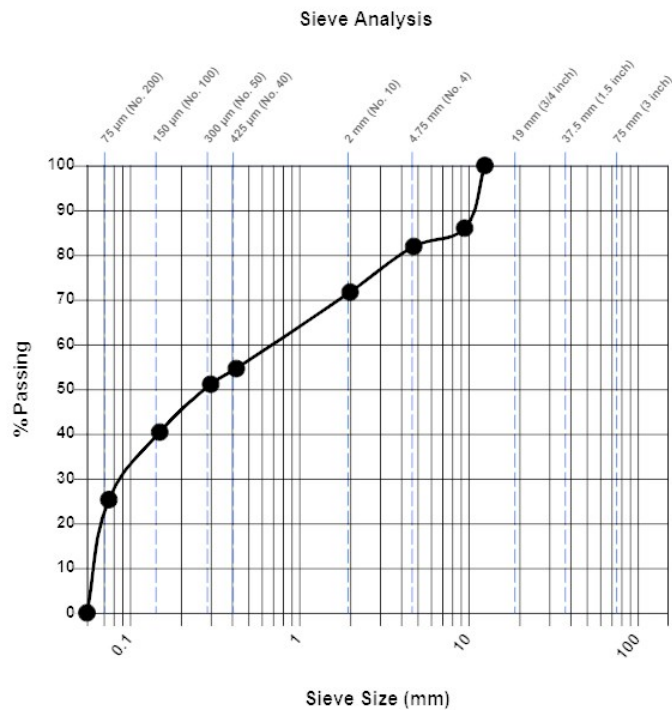
Boring No: B-3

Depth (ft): 5

Soil Description: BROWN SILTY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
12.5 MM (1/2 INCH)	100.0
9.5 MM (3/8 INCH)	86.0
4.75 MM (NO. 4)	81.9
2 MM (NO. 10)	71.7
425 MM (NO. 40)	54.6
300 MM (NO. 50)	51.1
150 MM (NO. 100)	40.4
75 MM (NO. 200)	25.3
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 18.1

Percent Sand: 56.5

Percent Fines: 25.3

Liquid Limit: 38

Plasticity Index: 9

USCS Classification: SM

AASHTO Classification: A-2-4(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000006

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-3

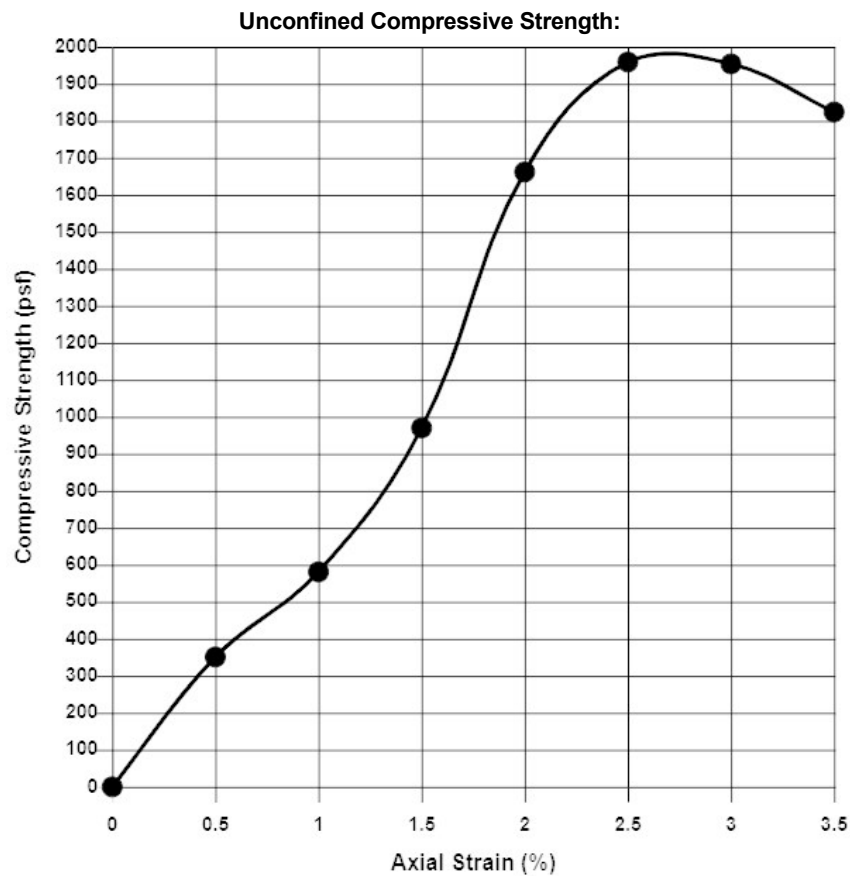
Sample Number: 1821

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2076

Soil Description: GRAY CLAY



Wet Unit Weight (pcf): 107.9pcf

Dry Unit Weight (pcf): 91.2pcf

Moisture Content (%): 18.2

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 3.5%

Unconfined Compressive Strength (psf): 1959



Sieve Analysis

Report #: SO:SAS-000005

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2077

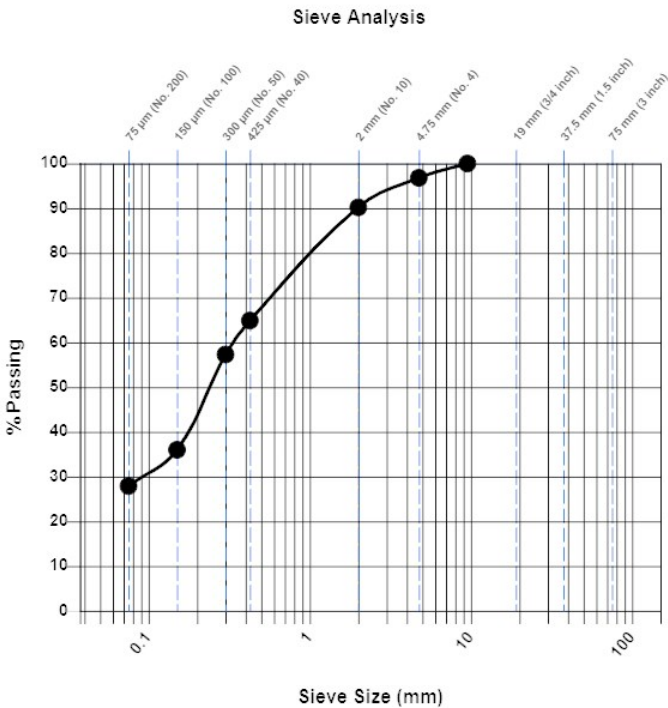
Boring No: B-4

Depth (ft): 1

Soil Description: BROWN CLAYEY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	96.8
2 MM (NO. 10)	90.2
425 MM (NO. 40)	64.9
300 MM (NO. 50)	57.3
150 MM (NO. 100)	36.0
75 MM (NO. 200)	27.9
PAN	0.0

Percent Finer than #200 Sieve (Wash)Test Method: Method A

Percent Gravel: 3.2

Percent Sand: 69.0

Percent Fines: 27.9

Liquid Limit: 37

Plasticity Index: 18

USCS Classification: SC

AASHTO Classification: A-2-6(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000007

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-4

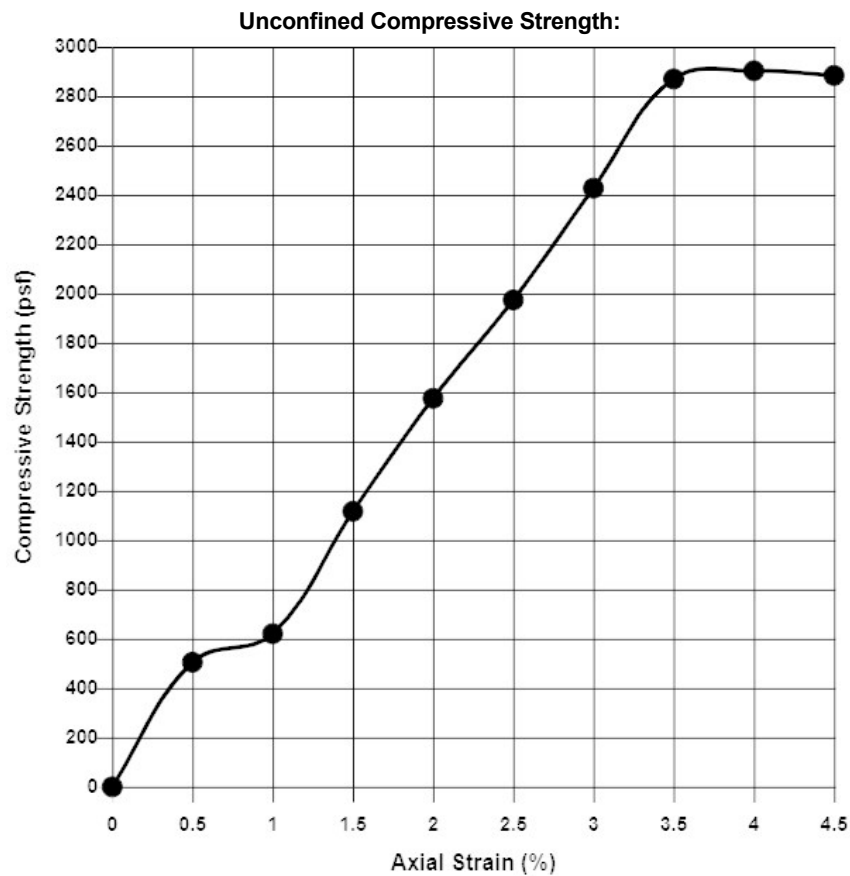
Sample Number: 1822

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2078

Soil Description: LIGHT BROWN CLAYEY SAND



Wet Unit Weight (pcf): 134.1pcf

Dry Unit Weight (pcf): 121pcf

Moisture Content (%): 10.8

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 4.5%

Unconfined Compressive Strength (psf): 2903



Swell - Consolidation Test

Report #: SO:SW-000004

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

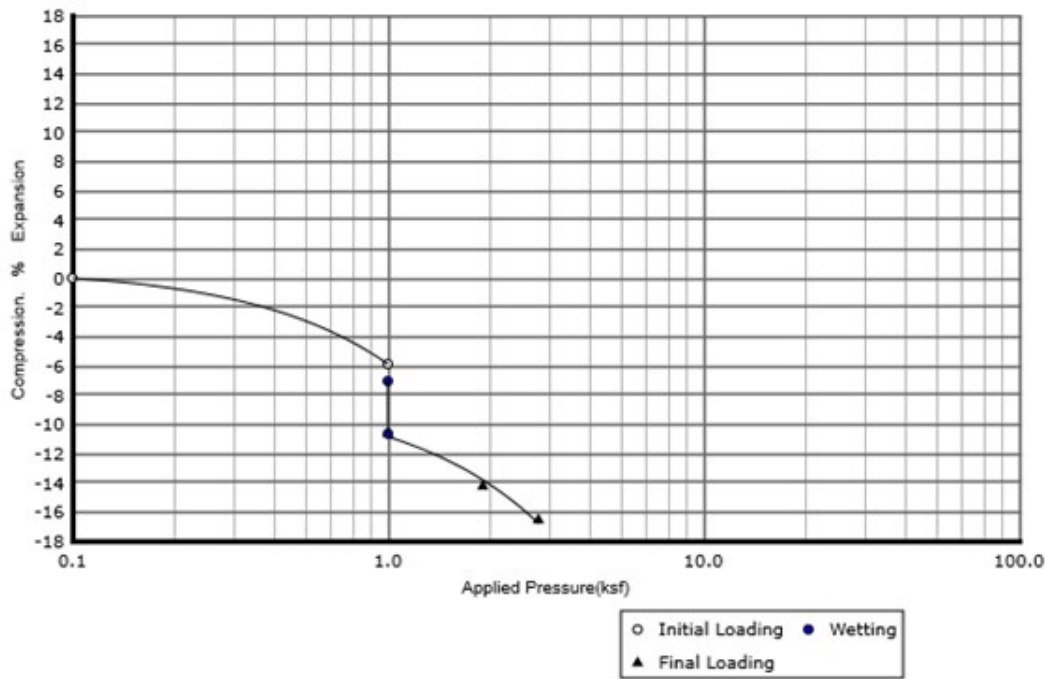
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-4 Sample Number: 1822

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: LIGHT BROWN SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 10.8 Wet Density of Soil(pcf): 91.1 Dry Density (pcf): 82.2 % Swell / Consolidation: -3.60



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000008

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-4

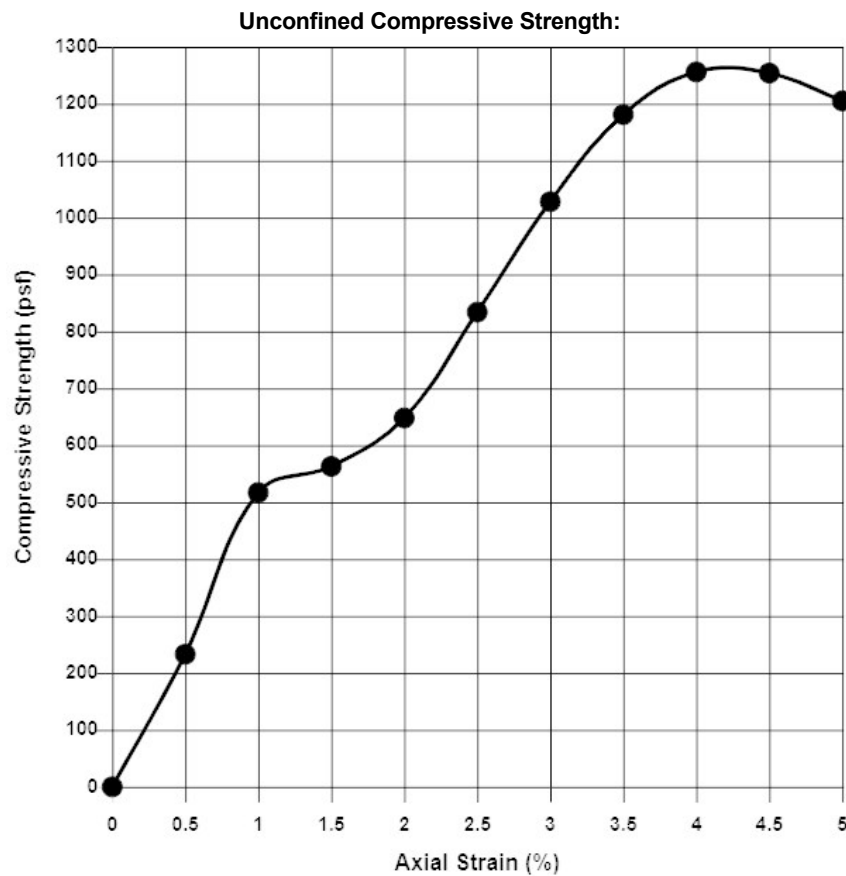
Sample Number: 1822

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2080

Soil Description: ORANGE CLAYEY SAND



Wet Unit Weight (pcf): 107.4pcf

Dry Unit Weight (pcf): 94.7pcf

Moisture Content (%): 13.5

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 5%

Unconfined Compressive Strength (psf): 1256



Swell - Consolidation Test

Report #: SO:SW-000005

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

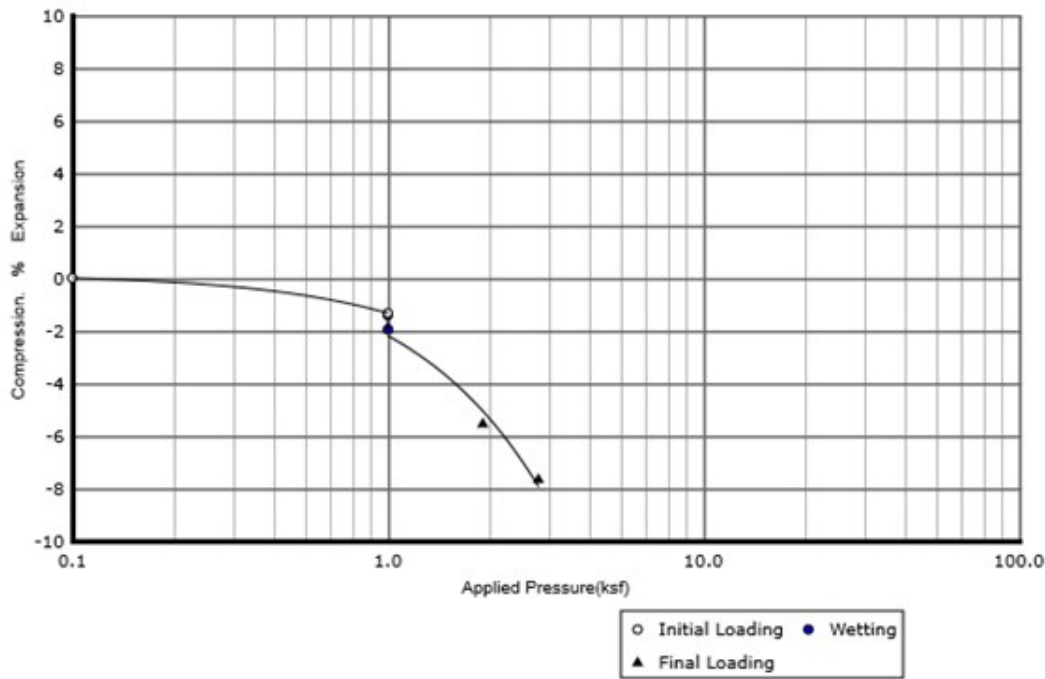
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-4 Sample Number: 1822

Specimen Number: 4 Sample Depth: 7-ft

Soil Description: ORANGE CLAYEY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 13.5 Wet Density of Soil(pcf): 124.9 Dry Density (pcf): 110.0 % Swell / Consolidation: -0.70



Sieve Analysis

Report #: SO:SAS-000006

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2081

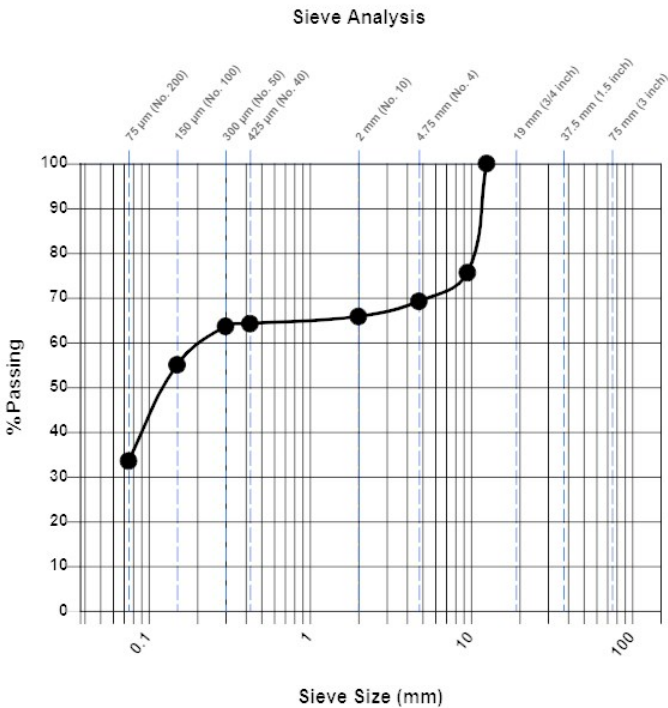
Boring No: B-4

Depth (ft): 10

Soil Description: BROWN CLAYEY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
12.5 MM (1/2 INCH)	100.0
9.5 MM (3/8 INCH)	75.6
4.75 MM (NO. 4)	69.2
2 MM (NO. 10)	65.8
425 MM (NO. 40)	64.2
300 MM (NO. 50)	63.6
150 MM (NO. 100)	55.0
75 MM (NO. 200)	33.5
PAN	0.0

Percent Finer than #200 Sieve (Wash)Test Method: Method A

Percent Gravel: 30.8

Percent Sand: 35.7

Percent Fines: 33.5

Liquid Limit: 47

Plasticity Index: 25

USCS Classification: SC

AASHTO Classification: A-2-7(2)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000009

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-5

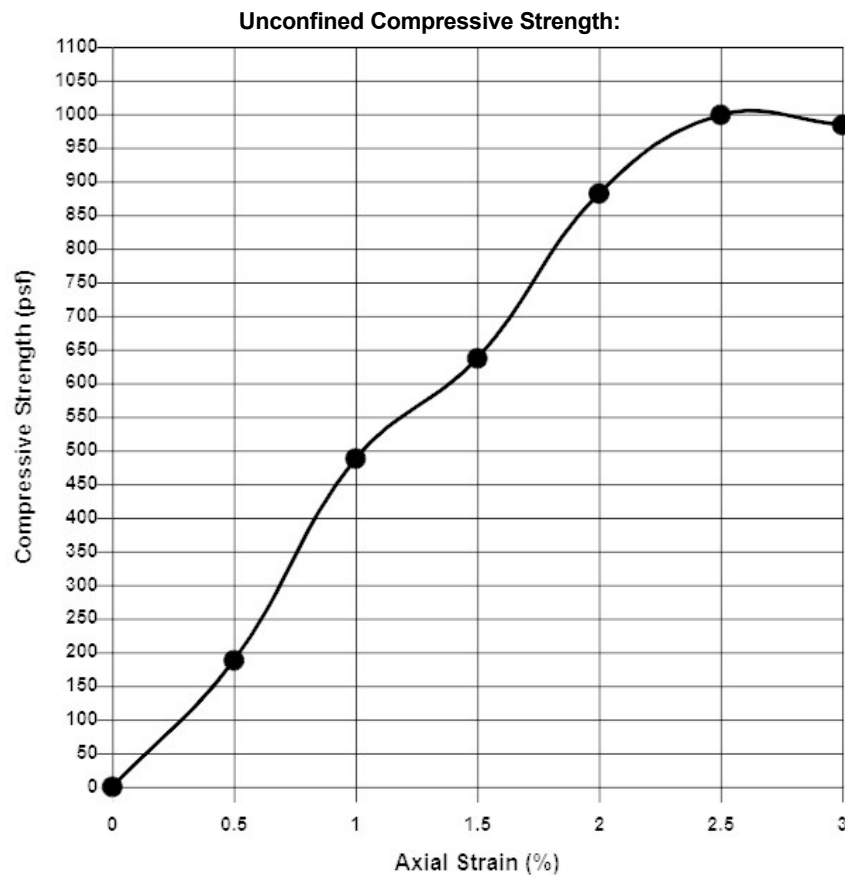
Sample Number: 1823

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2084

Soil Description: BROWN SANDY CLAY



Wet Unit Weight (pcf): 99pcf

Dry Unit Weight (pcf): 81.2pcf

Moisture Content (%): 21.9

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 3%

Unconfined Compressive Strength (psf): 999



Swell - Consolidation Test

Report #: SO:SW-000006

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

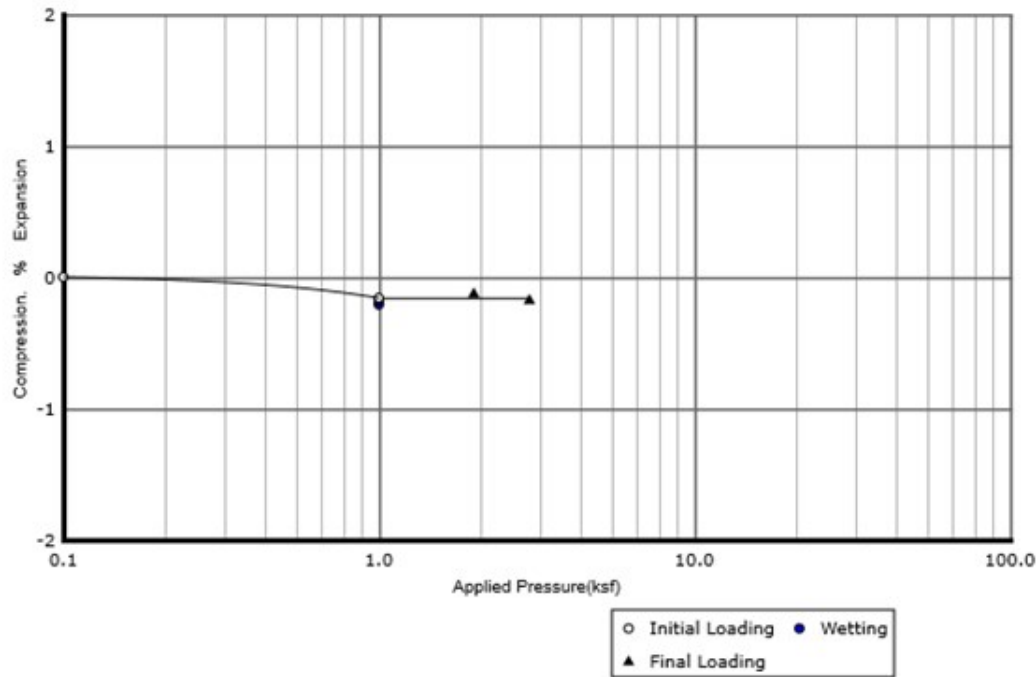
Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-5 Sample Number: 1823

Specimen Number: 2 Sample Depth: 3-ft

Swell / Consolidation Chart



No Movement due to wetting under constant pressure @ Surcharge Load:0 psf

Moisture Content (%): 21.9 Wet Density of Soil(pcf): 85.3 Dry Density (pcf): 70.0 % Swell / Consolidation: 0.00



Sieve Analysis

Report #: SO:SAS-000007

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2085

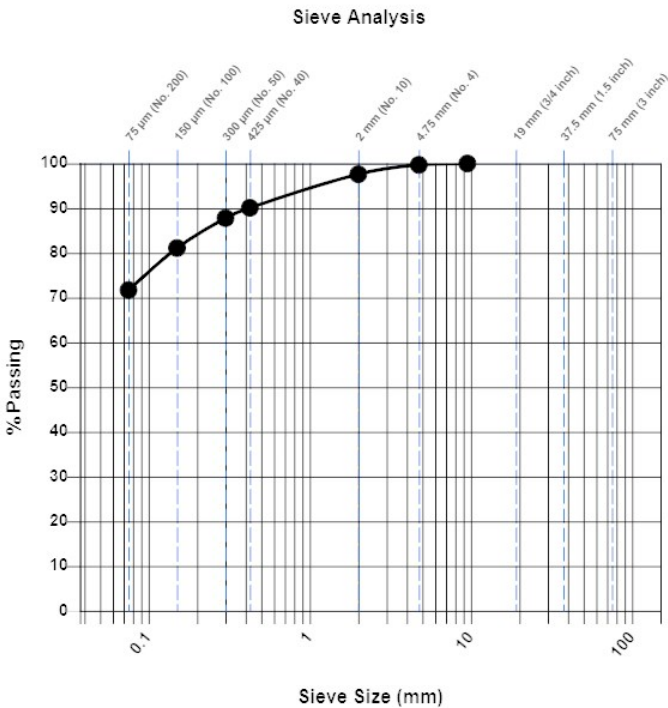
Boring No: B-5

Depth (ft): 5

Soil Description: BROWN LEAN CLAY WITH SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	99.7
2 MM (NO. 10)	97.6
425 MM (NO. 40)	90.1
300 MM (NO. 50)	87.8
150 MM (NO. 100)	81.1
75 MM (NO. 200)	71.7
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.3

Percent Sand: 28.0

Percent Fines: 71.7

Liquid Limit: 47

Plasticity Index: 21

USCS Classification: CL

AASHTO Classification: A-7-6(15)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000010

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-5

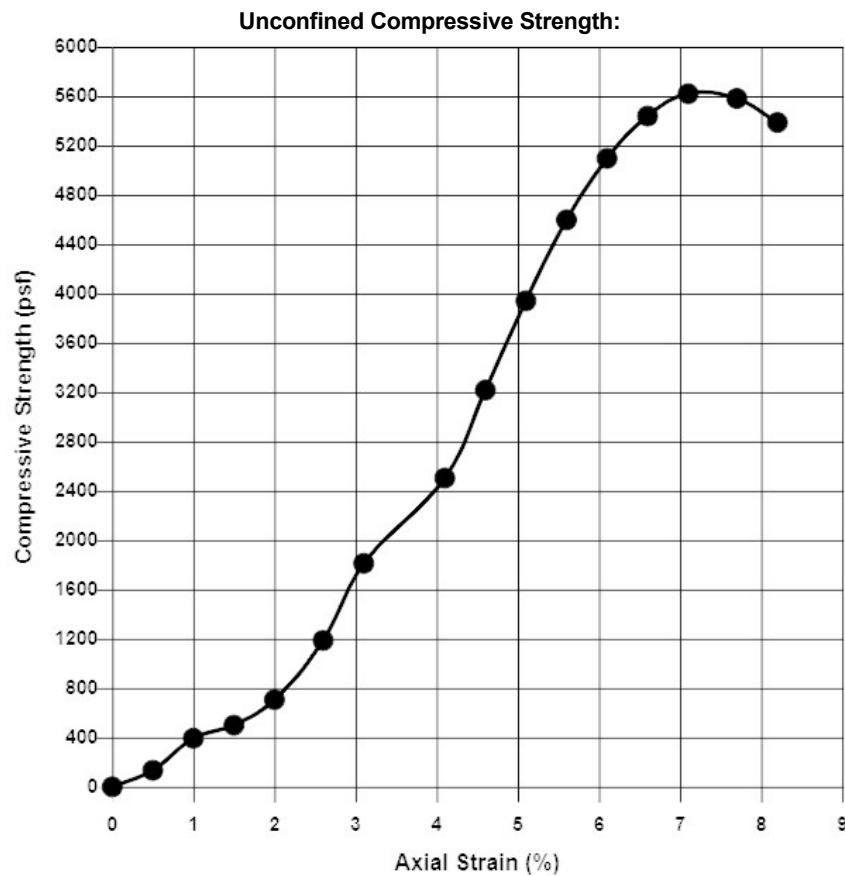
Sample Number: 1823

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2086

Soil Description: GRAY SANDY CLAY



Wet Unit Weight (pcf): 119.5pcf

Dry Unit Weight (pcf): 99.4pcf

Moisture Content (%): 20.3

Average Height of Specimen (in): 3.920

Average Diameter of Specimen (in): 1.920

Max Strain: 8.2%

Unconfined Compressive Strength (psf): 5620



Sieve Analysis

Report #: SO:SAS-000008

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2088

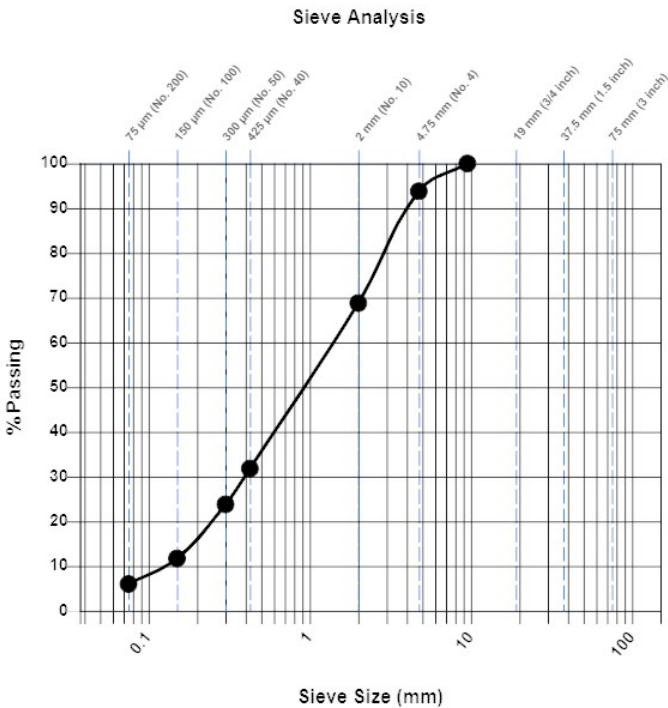
Boring No: B-5

Depth (ft): 15

Soil Description: BROWN POORLY-GRADED SAND WITH SILT

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	93.8
2 MM (NO. 10)	68.8
425 MM (NO. 40)	31.8
300 MM (NO. 50)	23.8
150 MM (NO. 100)	11.7
75 MM (NO. 200)	6.0
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 6.2

Percent Sand: 87.8

Percent Fines: 6.0

Cu: 108.3

Cc: 0.1

Liquid Limit: 68

Plasticity Index: 23

USCS Classification: SP-SM

AASHTO Classification: A-2-7(0)



Swell - Consolidation Test

Report #: SO:SW-000007

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

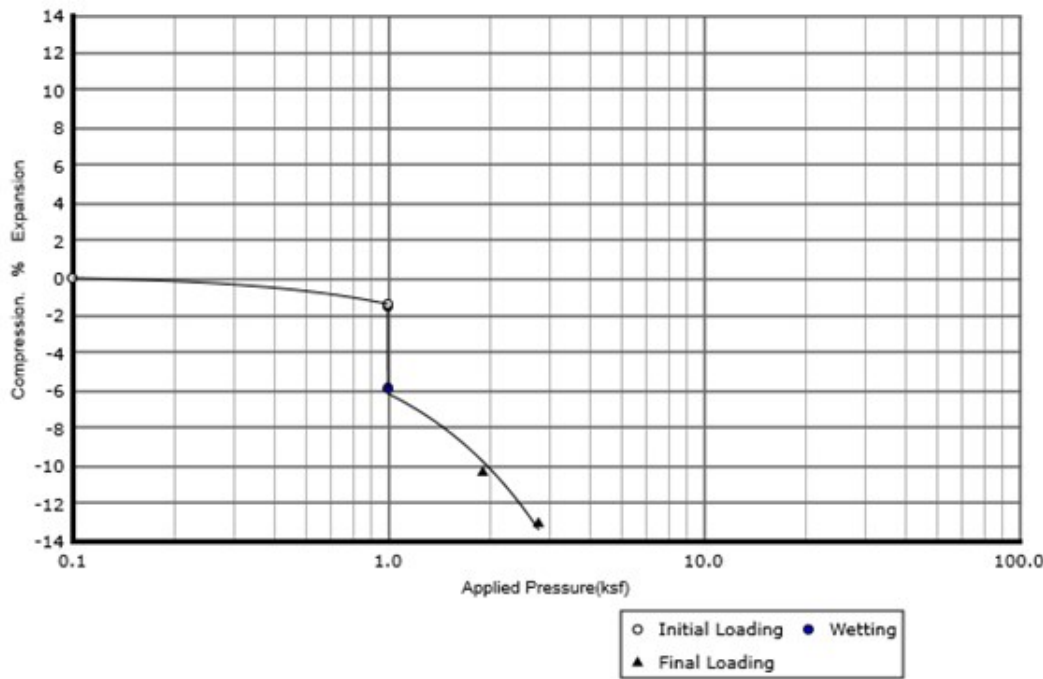
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-5 Sample Number: 1823

Specimen Number: 6 Sample Depth: 15-ft

Soil Description: GRAY SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 33.6 Wet Density of Soil(pcf): 87.0 Dry Density (pcf): 65.1 % Swell / Consolidation: -4.20

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2089

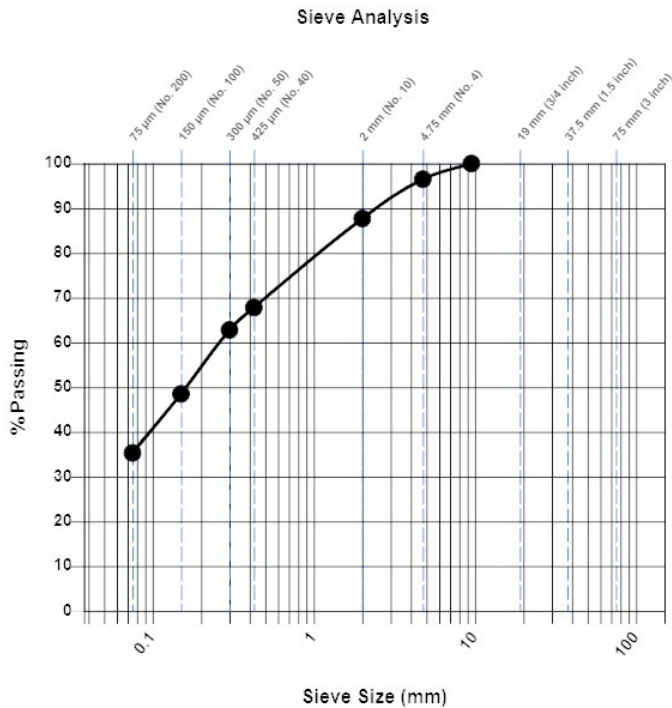
Boring No: B-6

Depth (ft): 1

Soil Description: BROWN CLAYEY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	96.5
2 MM (NO. 10)	87.7
425 MM (NO. 40)	67.8
300 MM (NO. 50)	62.8
150 MM (NO. 100)	48.5
75 MM (NO. 200)	35.3
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 3.5

Percent Sand: 61.1

Percent Fines: 35.3

Liquid Limit: 42

Plasticity Index: 18

USCS Classification: SC

AASHTO Classification: A-7-6(2)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000011

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-6

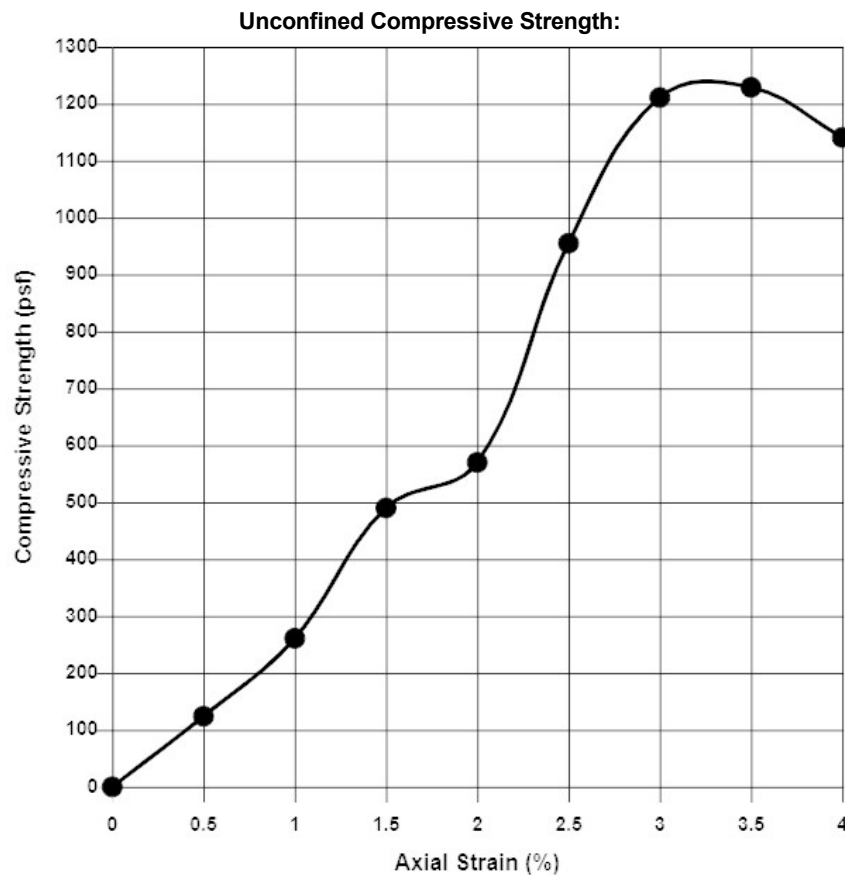
Sample Number: 1824

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2090

Soil Description: BROWN SANDY CLAY



Wet Unit Weight (pcf): 106.4pcf

Dry Unit Weight (pcf): 87.4pcf

Moisture Content (%): 21.8

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 4%

Unconfined Compressive Strength (psf): 1229



Sieve Analysis

Report #: SO:SAS-000011

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2091

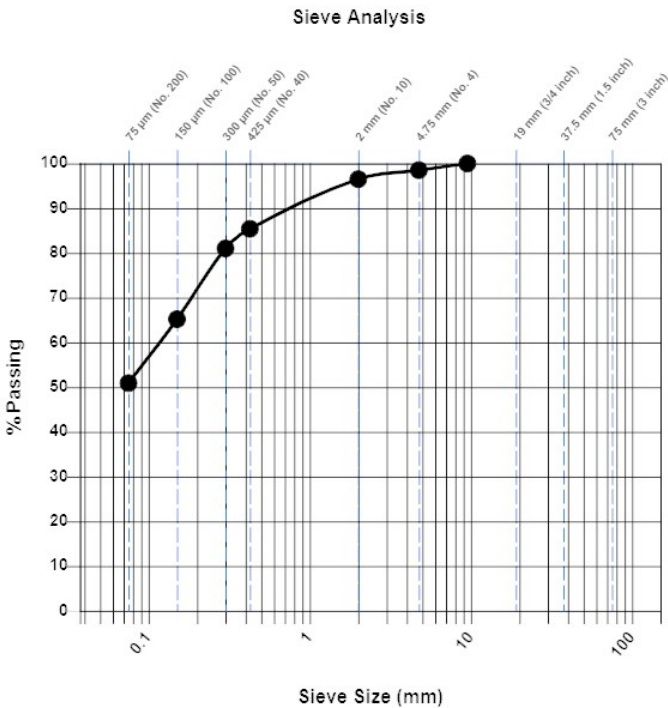
Boring No: B-6

Depth (ft): 5

Soil Description: BROWN SANDY LEAN CLAY

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	98.5
2 MM (NO. 10)	96.5
425 MM (NO. 40)	85.4
300 MM (NO. 50)	81.0
150 MM (NO. 100)	65.2
75 MM (NO. 200)	50.9
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 1.5

Percent Sand: 47.6

Percent Fines: 50.9

Plasticity Index: 0

USCS Classification: ML

AASHTO Classification: A-4(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000012

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-6

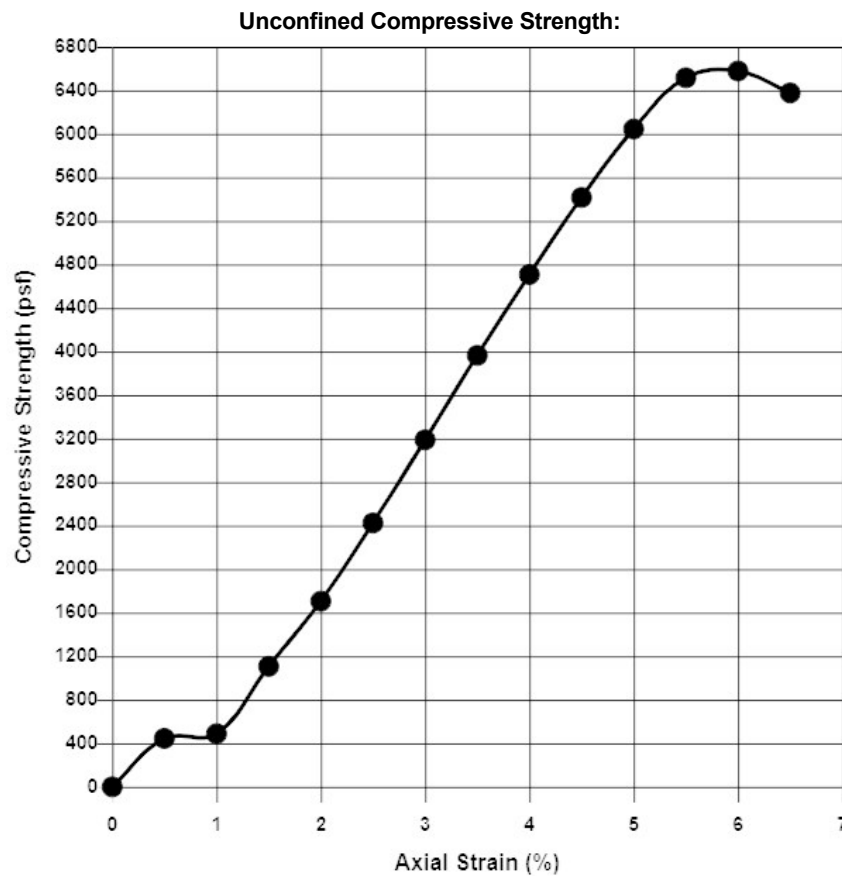
Sample Number: 1824

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2092

Soil Description: LIGHT GRAY CLAYEY SAND



Wet Unit Weight (pcf): 131.8pcf

Dry Unit Weight (pcf): 114.5pcf

Moisture Content (%): 15.1

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 6.5%

Unconfined Compressive Strength (psf): 6578



Swell - Consolidation Test

Report #: SO:SW-000008

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

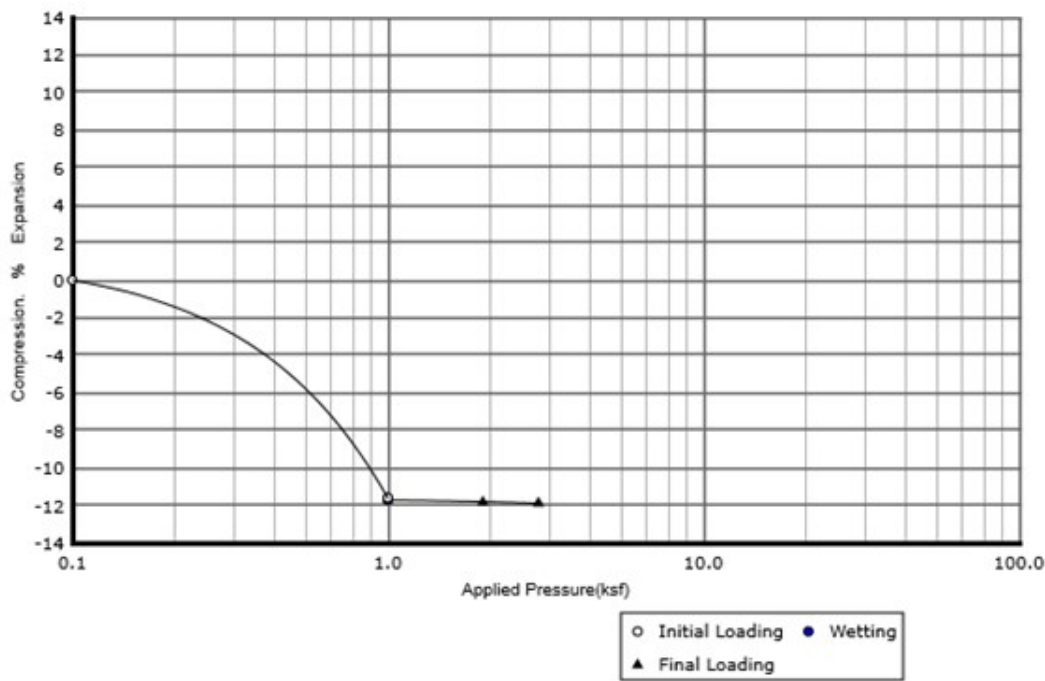
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-6 Sample Number: 1824

Specimen Number: 4 Sample Depth: 7-ft

Soil Description: LIGHT GRAY SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 15.1 Wet Density of Soil(pcf): 95.0 Dry Density (pcf): 82.5 % Swell / Consolidation: -0.10



Swell - Consolidation Test

Report #: SO:SW-000009

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

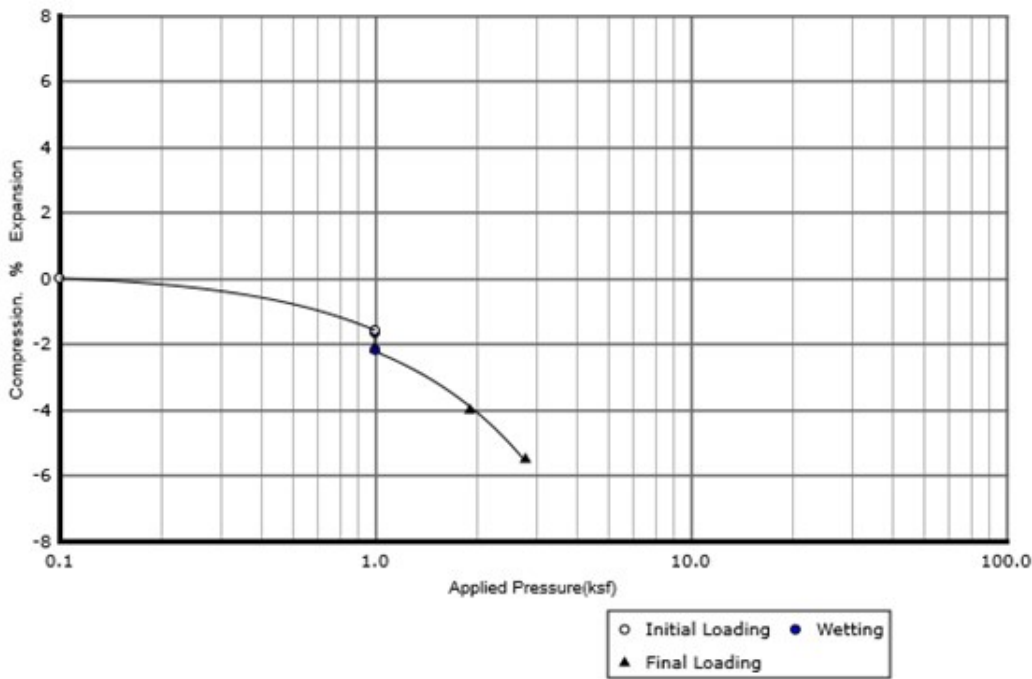
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-6 Sample Number: 1824

Specimen Number: 6 Sample Depth: 15-ft

Soil Description: GREEN SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 32.1 Wet Density of Soil(pcf): 96.8 Dry Density (pcf): 73.3 % Swell / Consolidation: -0.50



Sieve Analysis

Report #: SO:SAS-000012

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2095

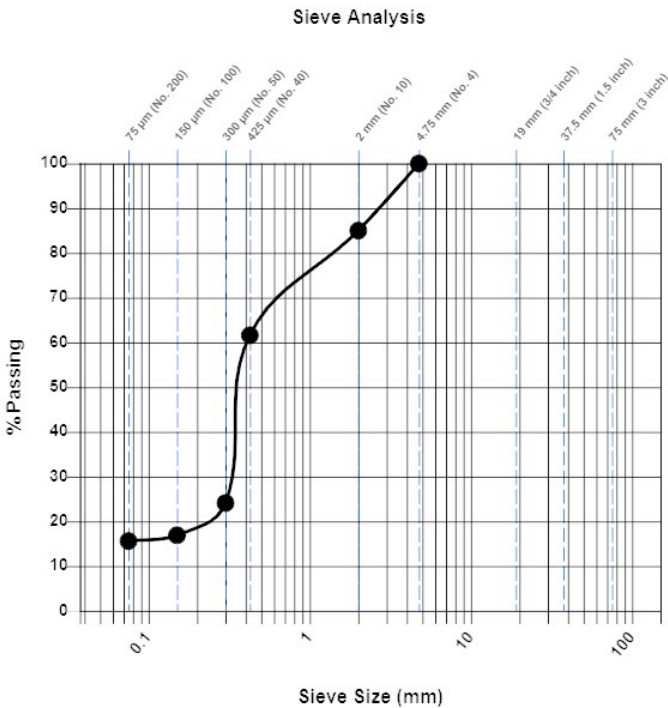
Boring No: B-7

Depth (ft): 1

Soil Description: LIGHT BROWN CLAYEY SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
4.75 MM (NO. 4)	100.0
2 MM (NO. 10)	85.0
425 MM (NO. 40)	61.6
300 MM (NO. 50)	24.1
150 MM (NO. 100)	16.9
75 MM (NO. 200)	15.6
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 0.0

Percent Sand: 84.4

Percent Fines: 15.6

Liquid Limit: 38

Plasticity Index: 17

USCS Classification: SC

AASHTO Classification: A-2-6(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Laboratory Test Results for Soil

Report #: SO:CHE-000002

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

pH of Soils (ASTM D4972)

Water used: De-ionized Water (type ii)

Calcium Chloride Reagent: Stock Solution

Test Method: Method A (pH Meter)

Soil pH in Water: 5.7

Soil pH in CaCl_2 : 5.5

Water Soluble Sulfates (CPL-2103)

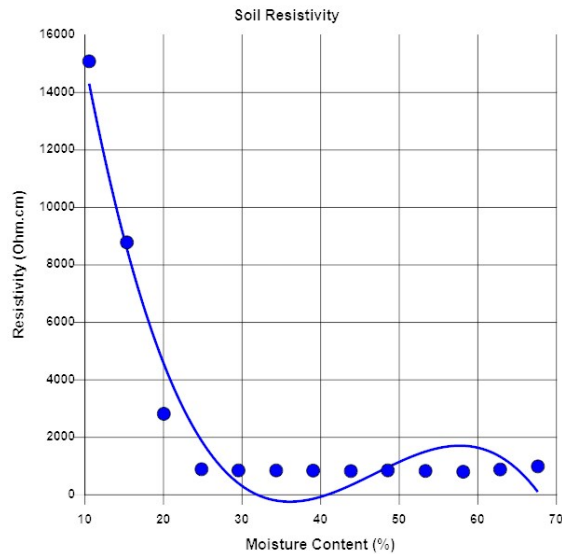
Sulfate Concentration (ppm): 300

Sulfate Concentration (percent Sulfate in Soil by mass): 0.03

Severity of Potential Exposure (CDOT): Class 1

Soil Resistivity (ASTM G57)

Resistivity Chart:



Minimum Resistivity Ohm.cm: 787

Resistivity at In-Situ Moisture Content (Ohm.cm): 15070



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000013

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-7

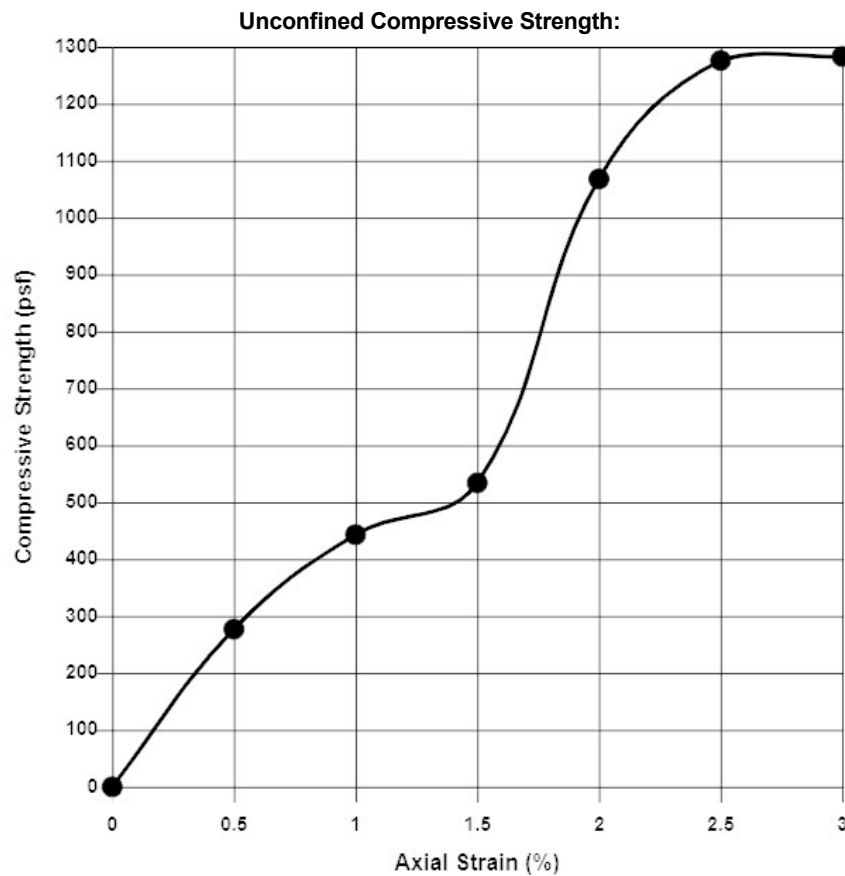
Sample Number: 1825

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2096

Soil Description: BROWN CLAYEY SAND



Wet Unit Weight (pcf): 102.1pcf

Dry Unit Weight (pcf): 89.6pcf

Moisture Content (%): 14.0

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 3%

Unconfined Compressive Strength (psf): 1283



Swell - Consolidation Test

Report #: SO:SW-000010

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

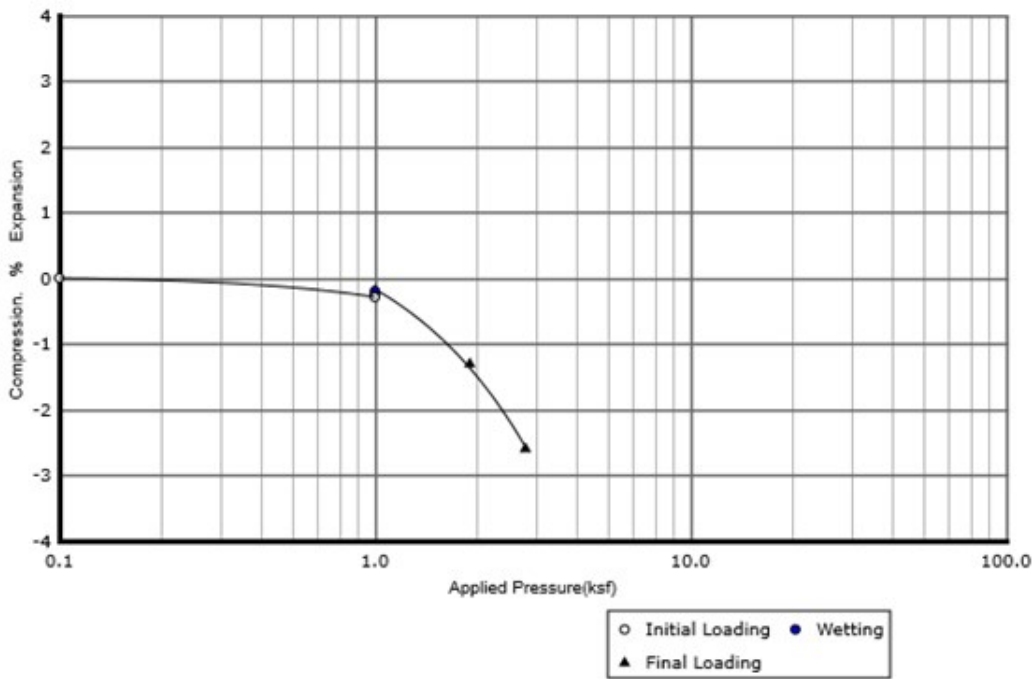
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-7 Sample Number: 1825

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: BROWN SILTY SAND

Swell / Consolidation Chart



No Movement due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 14.0 Wet Density of Soil(pcf): 93.4 Dry Density (pcf): 81.9 % Swell / Consolidation: 0.00



Sieve Analysis

Report #: SO:SAS-000013

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2097

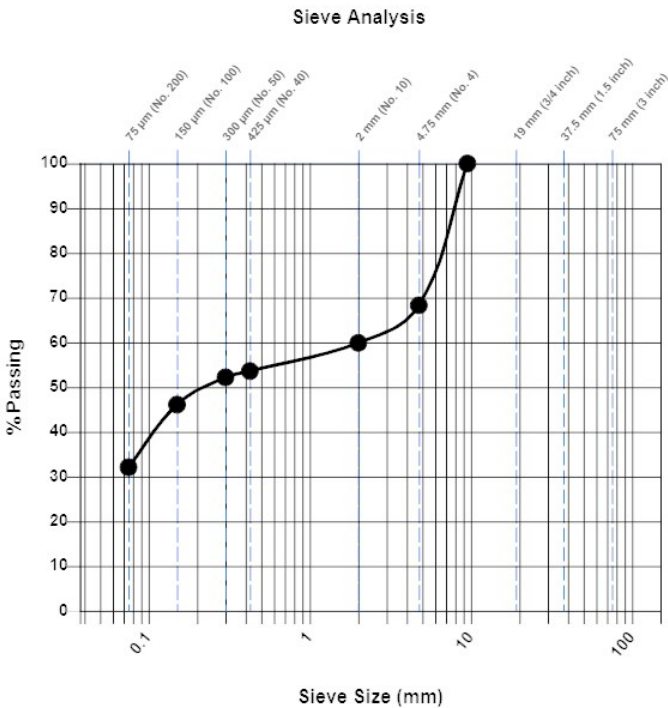
Boring No: B-7

Depth (ft): 5

Soil Description: BROWN SILTY SAND WITH GRAVEL

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	68.3
2 MM (NO. 10)	59.9
425 MM (NO. 40)	53.6
300 MM (NO. 50)	52.2
150 MM (NO. 100)	46.1
75 MM (NO. 200)	32.1
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 31.7

Percent Sand: 36.2

Percent Fines: 32.1

Liquid Limit: 49

Plasticity Index: 7

USCS Classification: SM

AASHTO Classification: A-2-5(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000014

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-7

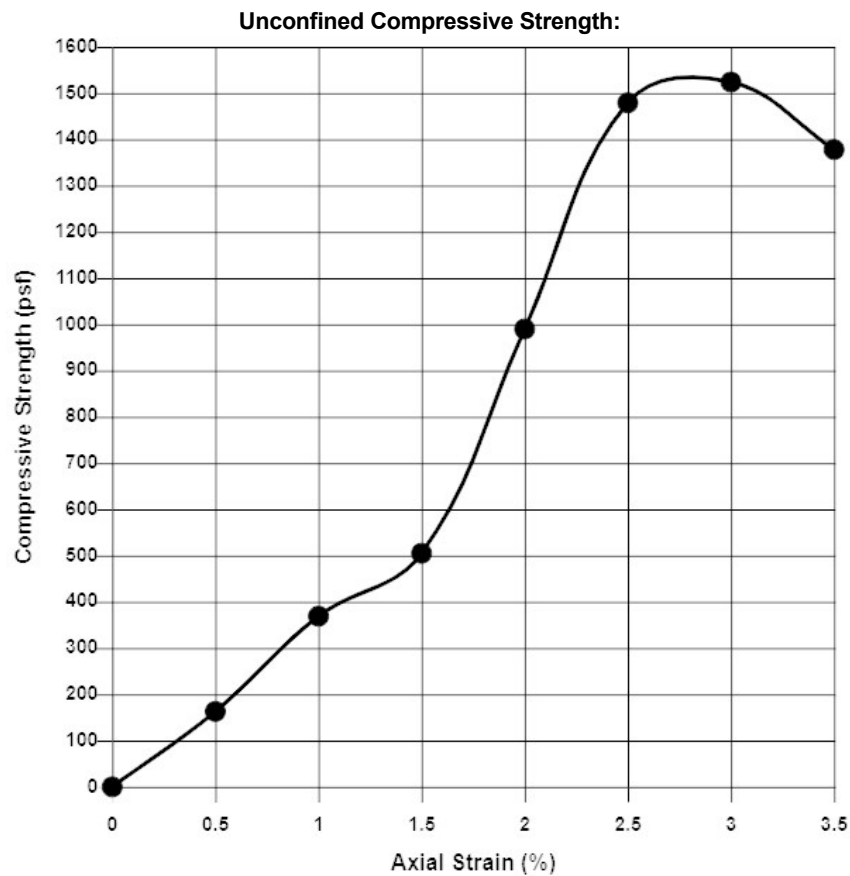
Sample Number: 1825

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2098

Soil Description: BROWN SILTY SAND WITH CLAY



Wet Unit Weight (pcf): 101.1pcf

Dry Unit Weight (pcf): 83.9pcf

Moisture Content (%): 20.5

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 3.5%

Unconfined Compressive Strength (psf): 1524



Sieve Analysis

Report #: SO:SAS-000014

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2099

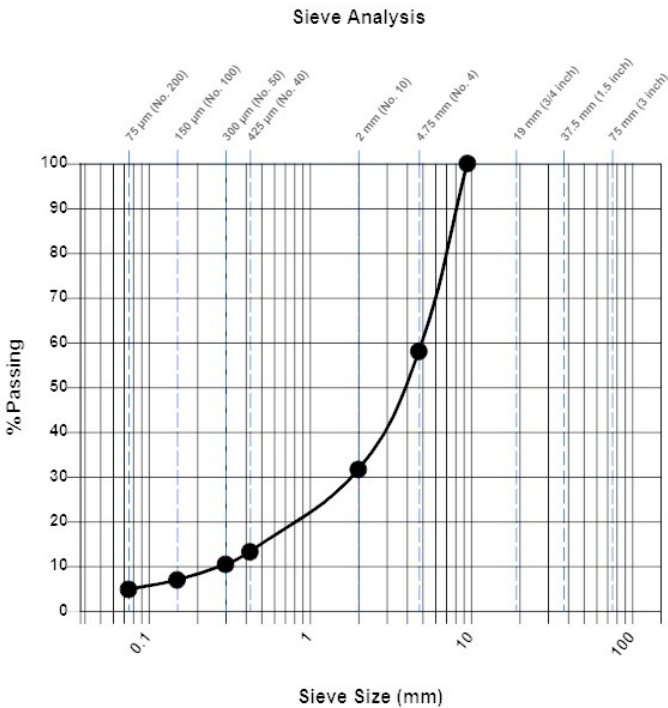
Boring No: B-7

Depth (ft): 10

Soil Description: BROWN WELL-GRADED SAND WITH SILT AND GRAVEL

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	58.0
2 MM (NO. 10)	31.6
425 MM (NO. 40)	13.2
300 MM (NO. 50)	10.4
150 MM (NO. 100)	6.9
75 MM (NO. 200)	4.8
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 42.0

Percent Sand: 53.2

Percent Fines: 4.8

Cu: 17.9

Cc: 2.6

Liquid Limit: 44

Plasticity Index: 8

USCS Classification: SW

AASHTO Classification: A-2-5(0)



Swell - Consolidation Test

Report #: SO:SW-000011

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

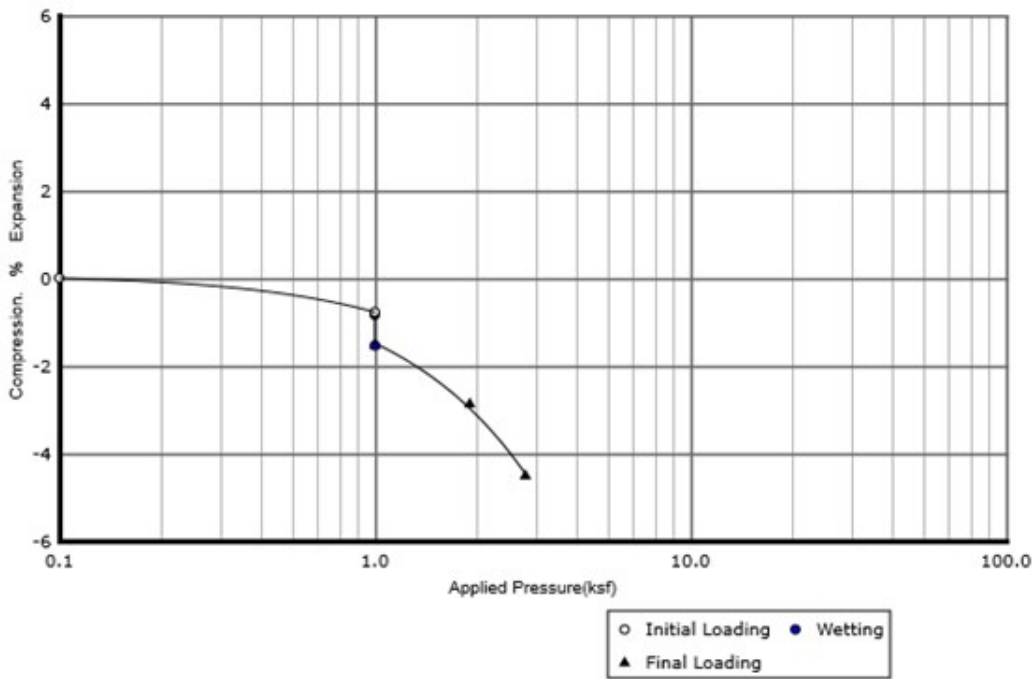
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-7 Sample Number: 1825

Specimen Number: 6 Sample Depth: 15-ft

Soil Description: GRAY SANDY SILT

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 25.6 Wet Density of Soil(pcf): 91.3 Dry Density (pcf): 72.7 % Swell / Consolidation: -0.70



Sieve Analysis

Report #: SO:SAS-000015

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2101

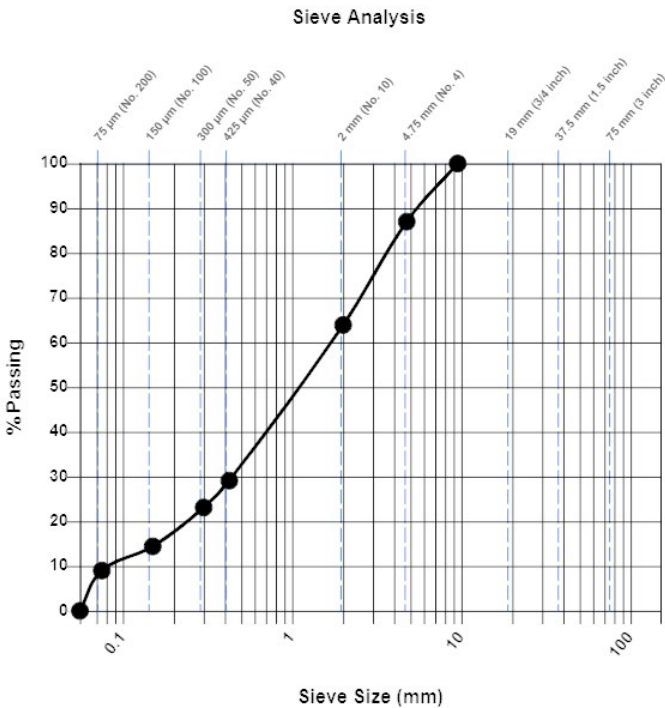
Boring No: B-7

Depth (ft): 20

Soil Description: BROWN WELL-GRADED SAND WITH SILT

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
9.5 MM (3/8 INCH)	100.0
4.75 MM (NO. 4)	87.0
2 MM (NO. 10)	63.9
425 MM (NO. 40)	29.1
300 MM (NO. 50)	23.1
150 MM (NO. 100)	14.4
75 MM (NO. 200)	9.0
PAN	0.0

Percent Finer than #200 Sieve (Wash)Test Method: Method A

Percent Gravel: 13.0

Percent Sand: 78.0

Percent Fines: 9.0

Cu: 21.3

Cc: 1.4

Liquid Limit: 41

Plasticity Index: 7

USCS Classification: SW-SM

AASHTO Classification: A-2-5(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000015

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-7

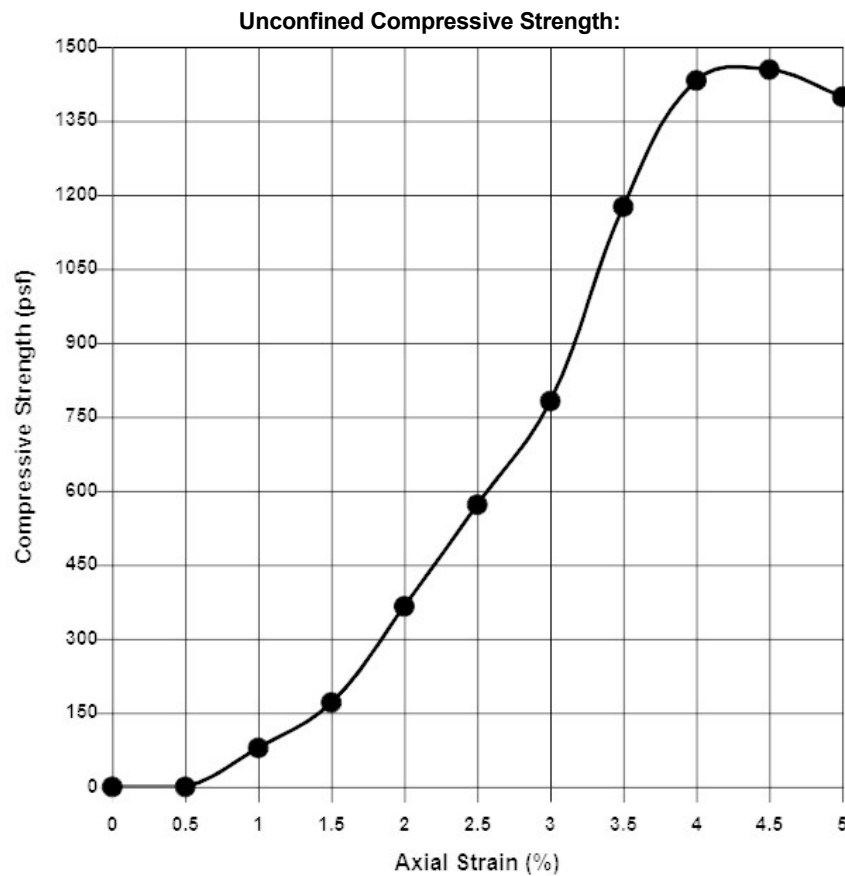
Sample Number: 1825

Sample Depth: 15-ft

Specimen Number: 6

Triax Soil ID: 21-2100

Soil Description: GRAY SILTY SAND



Wet Unit Weight (pcf): 95.5pcf

Dry Unit Weight (pcf): 76.1pcf

Moisture Content (%): 25.6

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 5%

Unconfined Compressive Strength (psf): 1454



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000016

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-8

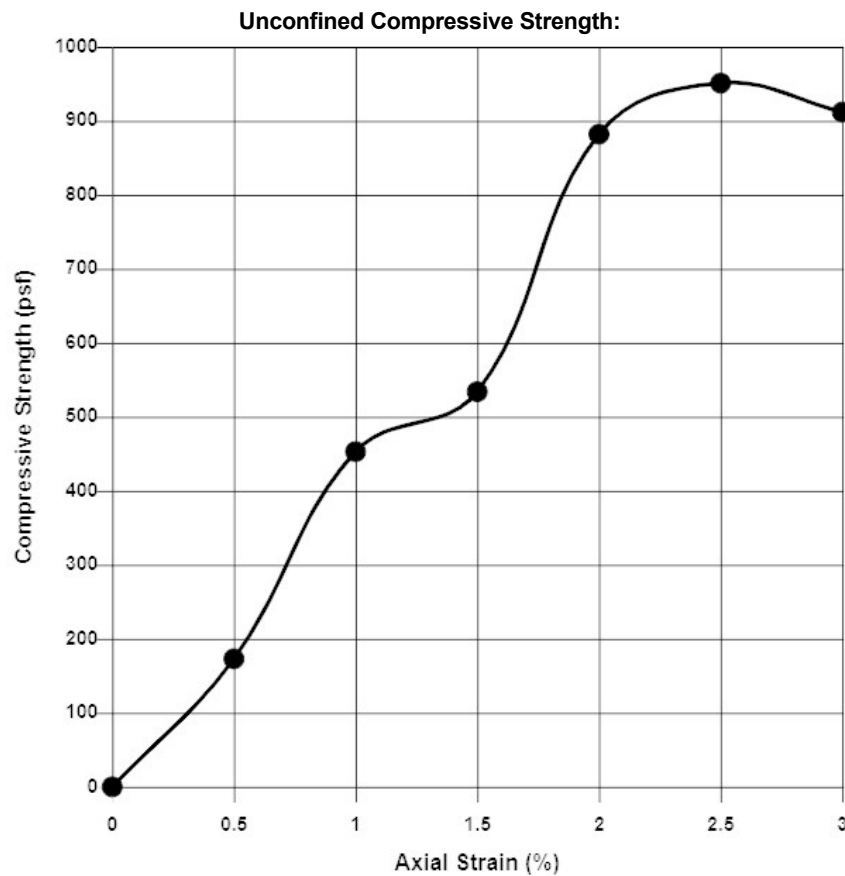
Sample Number: 1826

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2104

Soil Description: LIGHT BROWN CLAYEY SAND



Wet Unit Weight (pcf): 103.2pcf

Dry Unit Weight (pcf): 87.4pcf

Moisture Content (%): 18.0

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 3%

Unconfined Compressive Strength (psf): 951



Swell - Consolidation Test

Report #: SO:SW-000012

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

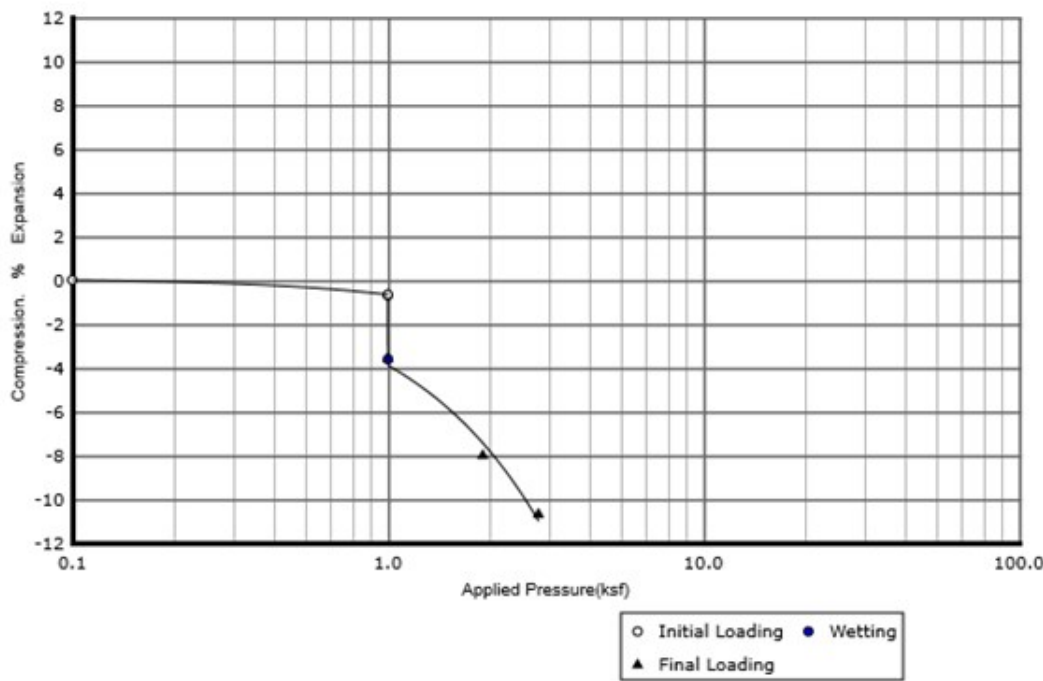
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-8 Sample Number: 1826

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: LIGHT BROWN CLAYEY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 18.0 Wet Density of Soil(pcf): 100.6 Dry Density (pcf): 85.3 % Swell / Consolidation: -2.90



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000017

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-8

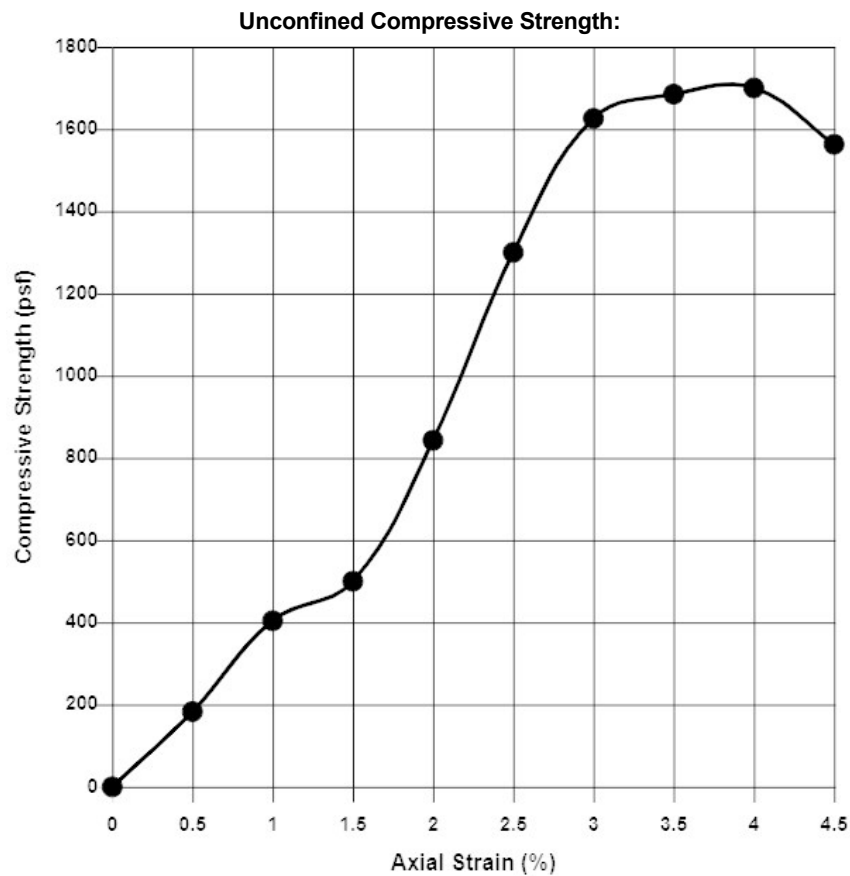
Sample Number: 1826

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2106

Soil Description: BROWN SILTY SAND



Wet Unit Weight (pcf): 104.6pcf

Dry Unit Weight (pcf): 85.6pcf

Moisture Content (%): 22.2

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 4.5%

Unconfined Compressive Strength (psf): 1700

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2107

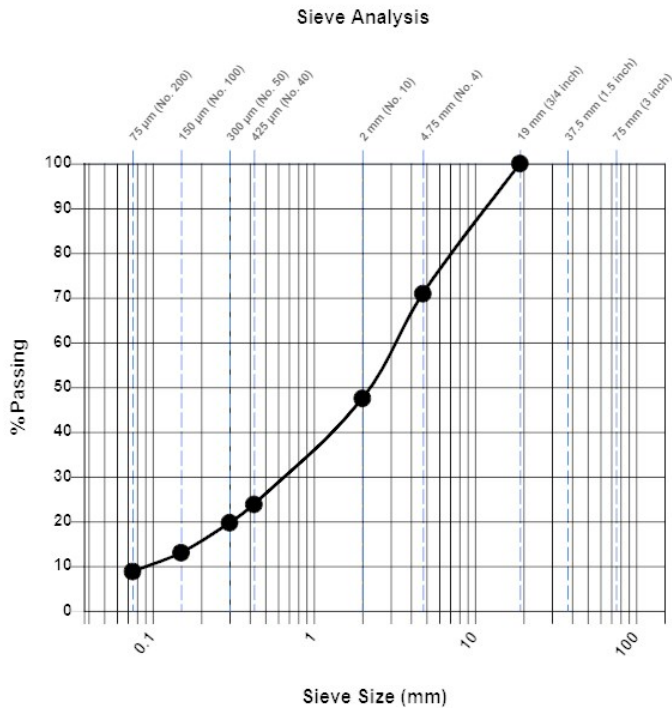
Boring No: B-8

Depth (ft): 10

Soil Description: WELL-GRADED SAND WITH SILT AND GRAVEL

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
19 MM (3/4 INCH)	100.0
4.75 MM (NO. 4)	70.9
2 MM (NO. 10)	47.5
425 MM (NO. 40)	23.8
300 MM (NO. 50)	19.7
150 MM (NO. 100)	13.0
75 MM (NO. 200)	8.8
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 29.1

Percent Sand: 62.1

Percent Fines: 8.8

Cu: 41.3

Cc: 1.8

Liquid Limit: 49

Plasticity Index: 13

USCS Classification: SW-SM

AASHTO Classification: A-2-7(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000018

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-8

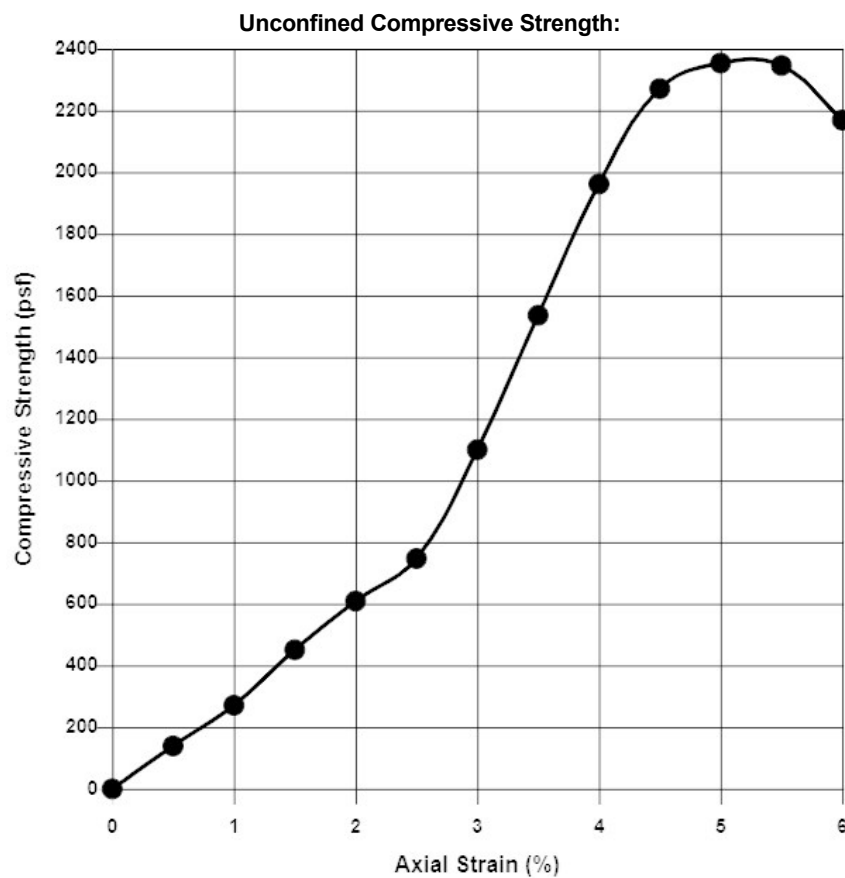
Sample Number: 1826

Sample Depth: 15-ft

Specimen Number: 6

Triax Soil ID: 21-2108

Soil Description: GRAY SILTY SAND



Wet Unit Weight (pcf): 102.3pcf

Dry Unit Weight (pcf): 81.4pcf

Moisture Content (%): 25.6

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 6%

Unconfined Compressive Strength (psf): 2354



Swell - Consolidation Test

Report #: SO:SW-000013

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

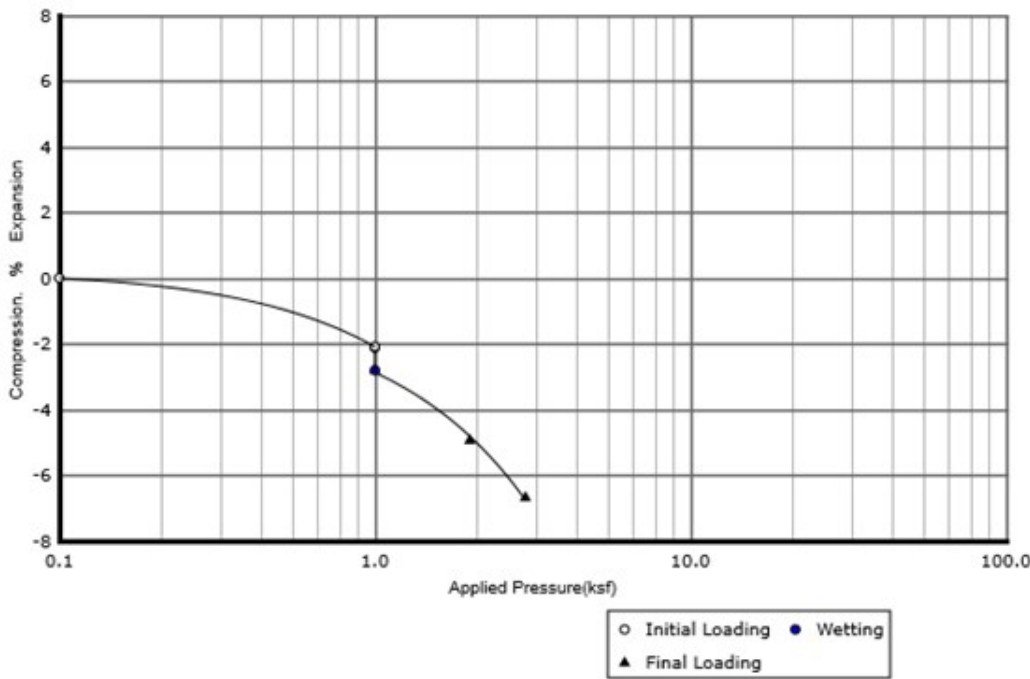
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-8 Sample Number: 1826

Specimen Number: 6 Sample Depth: 15-ft

Soil Description: GRAY SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 25.6 Wet Density of Soil(pcf): 95.3 Dry Density (pcf): 75.9 % Swell / Consolidation: -0.70



Sieve Analysis

Report #: SO:SAS-000018

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2109

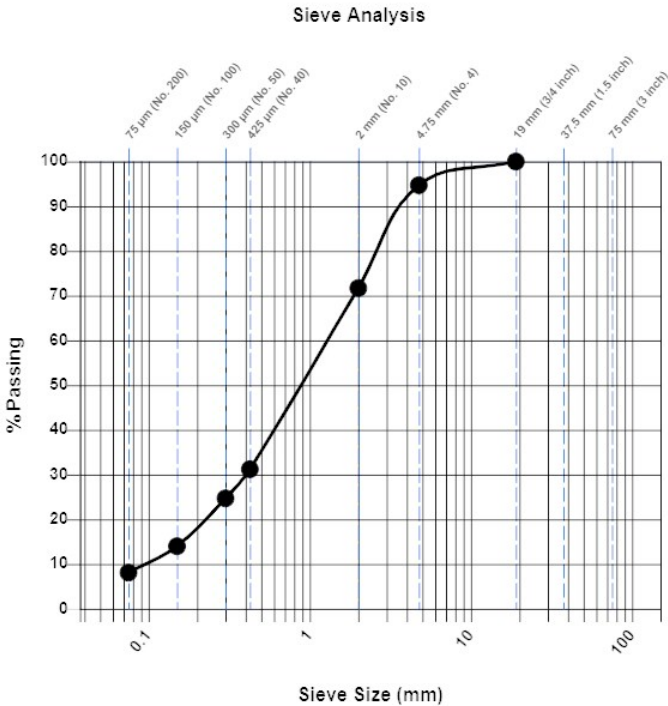
Boring No: B-8

Depth (ft): 20

Soil Description: WELL-GRADED SAND WITH SILT

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
19 MM (3/4 INCH)	100.0
4.75 MM (NO. 4)	94.7
2 MM (NO. 10)	71.7
425 MM (NO. 40)	31.2
300 MM (NO. 50)	24.7
150 MM (NO. 100)	14.0
75 MM (NO. 200)	8.1
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 5.3

Percent Sand: 86.6

Percent Fines: 8.1

Cu: 15.6

Cc: 1.3

Liquid Limit: 32

Plasticity Index: 9

USCS Classification: SW-SM

AASHTO Classification: A-2-4(0)



Swell - Consolidation Test

Report #: SO:SW-000014

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

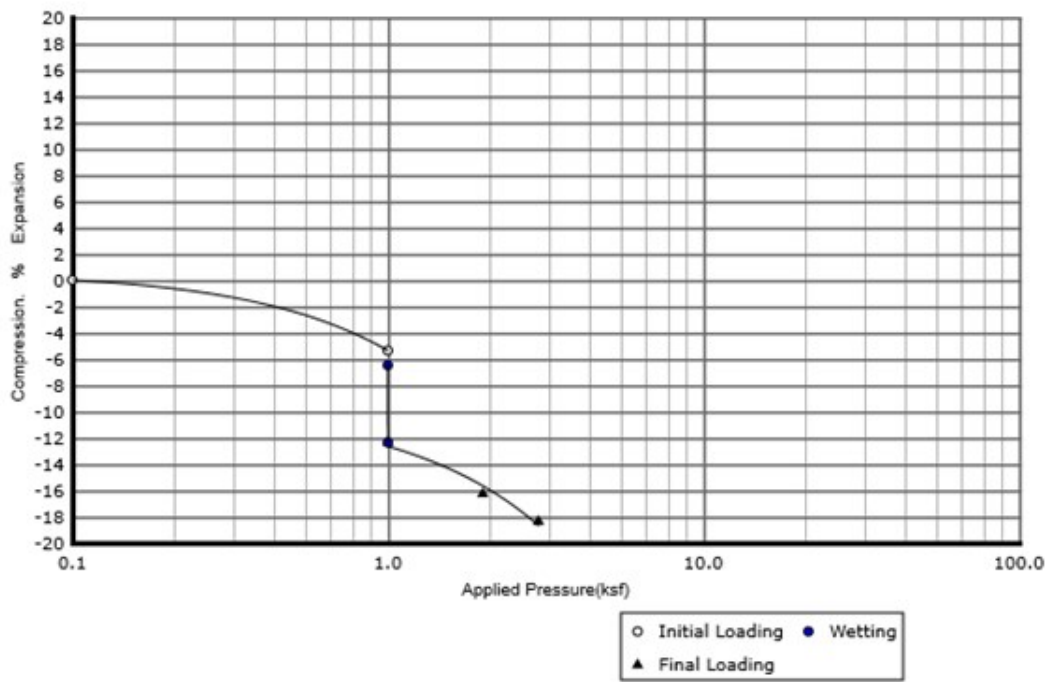
Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-8 Sample Number: 1826

Specimen Number: 8 Sample Depth: 25-ft

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 7.0 Wet Density of Soil(pcf): 108.8 Dry Density (pcf): 101.7 % Swell / Consolidation: -5.80



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000019

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-9

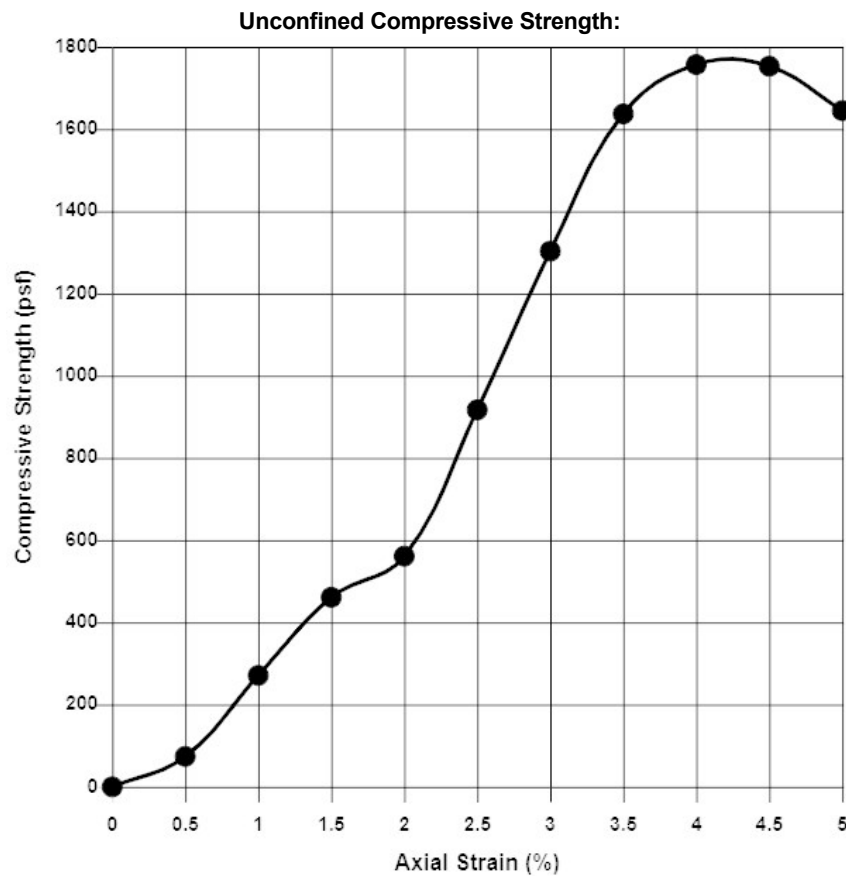
Sample Number: 1827

Sample Depth: 3-ft

Specimen Number: 2

Triax Soil ID: 21-2112

Soil Description: BROWN SILTY SAND



Wet Unit Weight (pcf): 102.6pcf

Dry Unit Weight (pcf): 82.4pcf

Moisture Content (%): 24.4

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 5%

Unconfined Compressive Strength (psf): 1757



Swell - Consolidation Test

Report #: SO:SW-000015

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

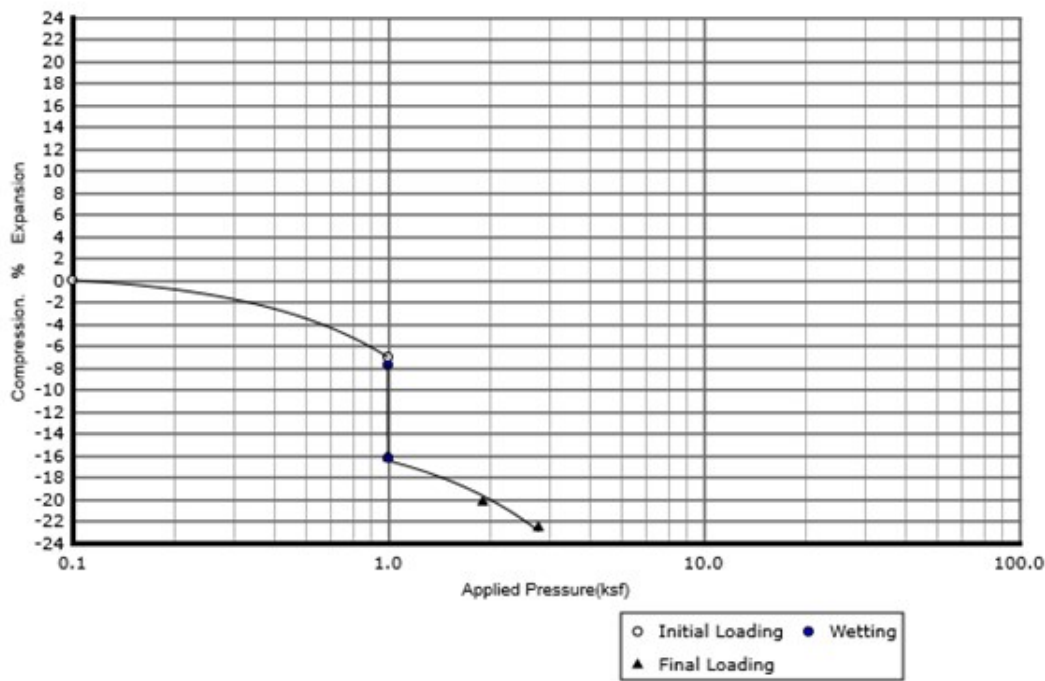
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-9 Sample Number: 1827

Specimen Number: 2 Sample Depth: 3-ft

Soil Description: BROWN SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 24.4 Wet Density of Soil(pcf): 94.0 Dry Density (pcf): 75.6 % Swell / Consolidation: -8.50



Sieve Analysis

Report #: SO:SAS-000019

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2113

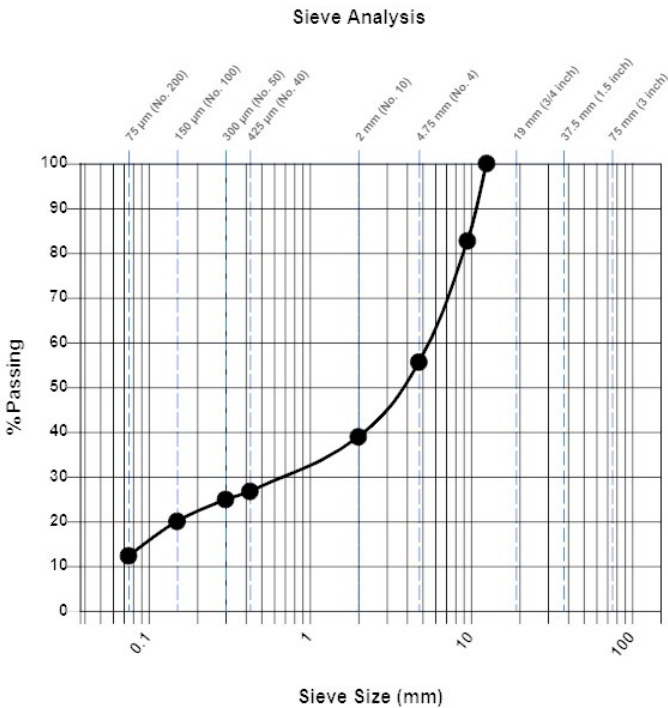
Boring No: B-9

Depth (ft): 5

Soil Description: SILTY GRAVEL WITH SAND

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
12.5 MM (1/2 INCH)	100.0
9.5 MM (3/8 INCH)	82.7
4.75 MM (NO. 4)	55.6
2 MM (NO. 10)	38.9
425 MM (NO. 40)	26.7
300 MM (NO. 50)	24.9
150 MM (NO. 100)	20.0
75 MM (NO. 200)	12.3
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 44.4

Percent Sand: 43.2

Percent Fines: 12.3

Liquid Limit: 38

Plasticity Index: 3

USCS Classification: GM

AASHTO Classification: A-2-4(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000020

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-9

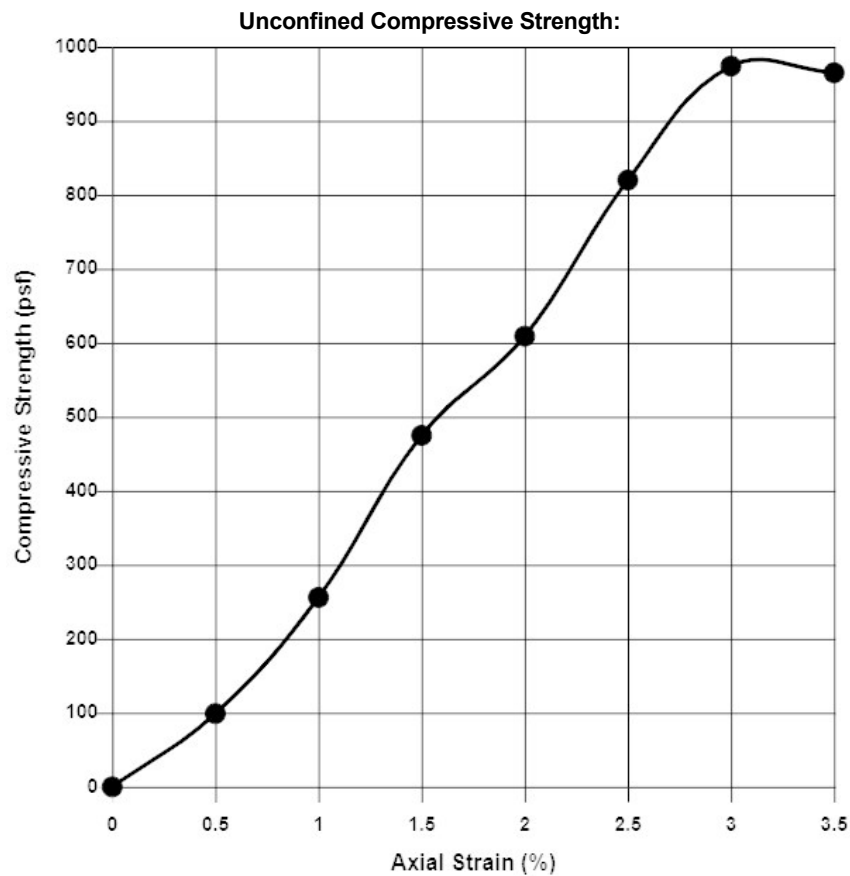
Sample Number: 1827

Sample Depth: 7-ft

Specimen Number: 4

Triax Soil ID: 21-2114

Soil Description: BROWN SILTY SAND



Wet Unit Weight (pcf): 101.1pcf

Dry Unit Weight (pcf): 82.8pcf

Moisture Content (%): 22.1

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 3.5%

Unconfined Compressive Strength (psf): 974



Sieve Analysis

Report #: SO:SAS-000020

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2115

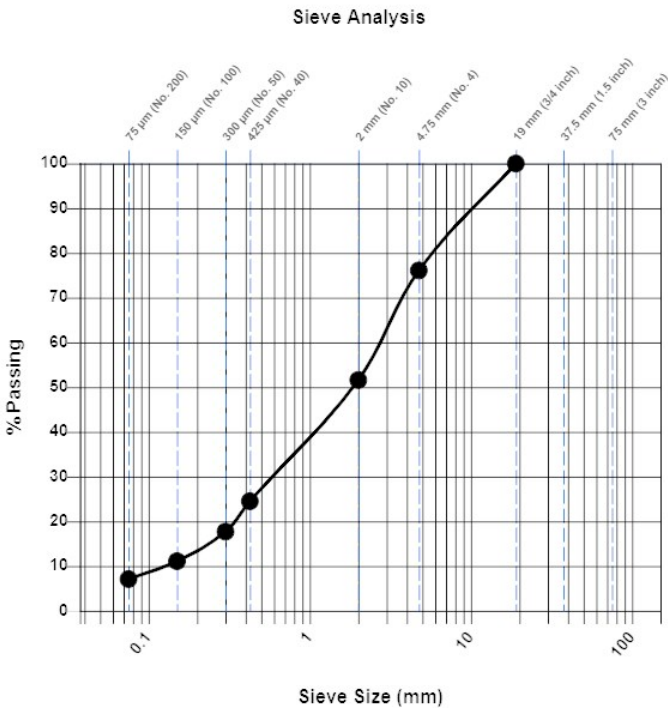
Boring No: B-9

Depth (ft): 10

Soil Description: POORLY GRADED SAND WITH GRAVEL

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
19 MM (3/4 INCH)	100.0
4.75 MM (NO. 4)	76.1
2 MM (NO. 10)	51.6
425 MM (NO. 40)	24.5
300 MM (NO. 50)	17.7
150 MM (NO. 100)	11.1
75 MM (NO. 200)	7.1
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 23.9

Percent Sand: 69.1

Percent Fines: 7.1

Cu: 21.5

Cc: 7.0

Liquid Limit: 40

Plasticity Index: 6

USCS Classification: SP-SM

AASHTO Classification: A-2-4(0)



Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Unconfined Compressive Strength

Report #: MF0102-000021

Client:

Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:

D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-9

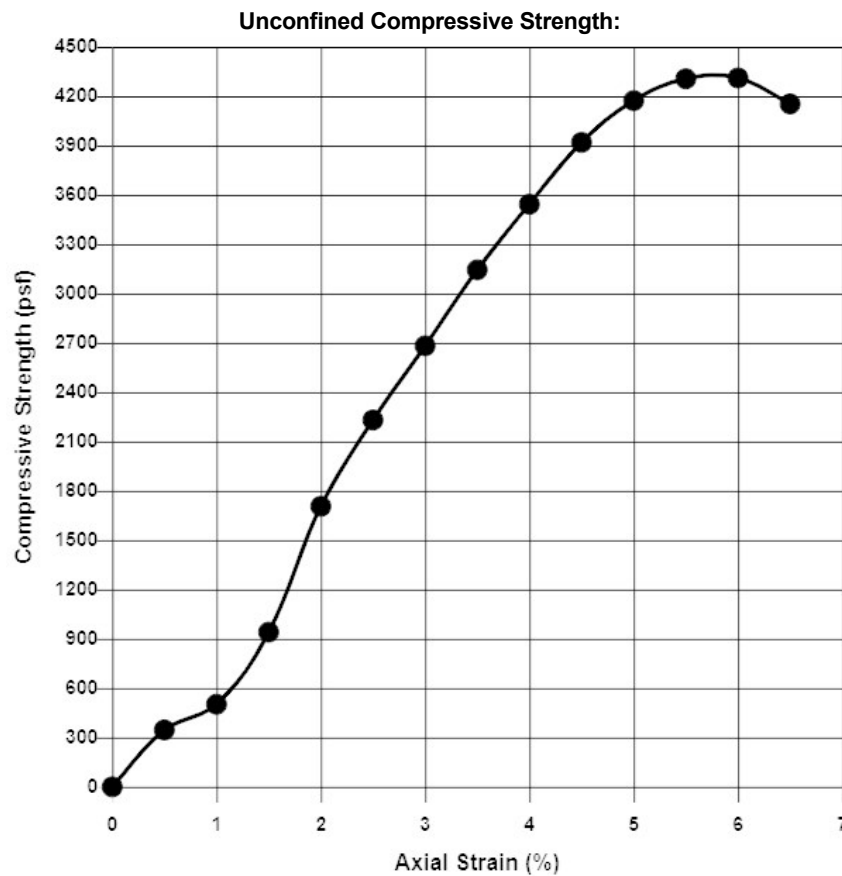
Sample Number: 1827

Sample Depth: 15-ft

Specimen Number: 6

Triax Soil ID: 21-2116

Soil Description: BROWN SILTY SAND



Wet Unit Weight (pcf): 101.4pcf

Dry Unit Weight (pcf): 80.6pcf

Moisture Content (%): 25.7

Average Height of Specimen (in): 3.980

Average Diameter of Specimen (in): 1.920

Max Strain: 6.5%

Unconfined Compressive Strength (psf): 4311



Swell - Consolidation Test

Report #: SO:SW-000016

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

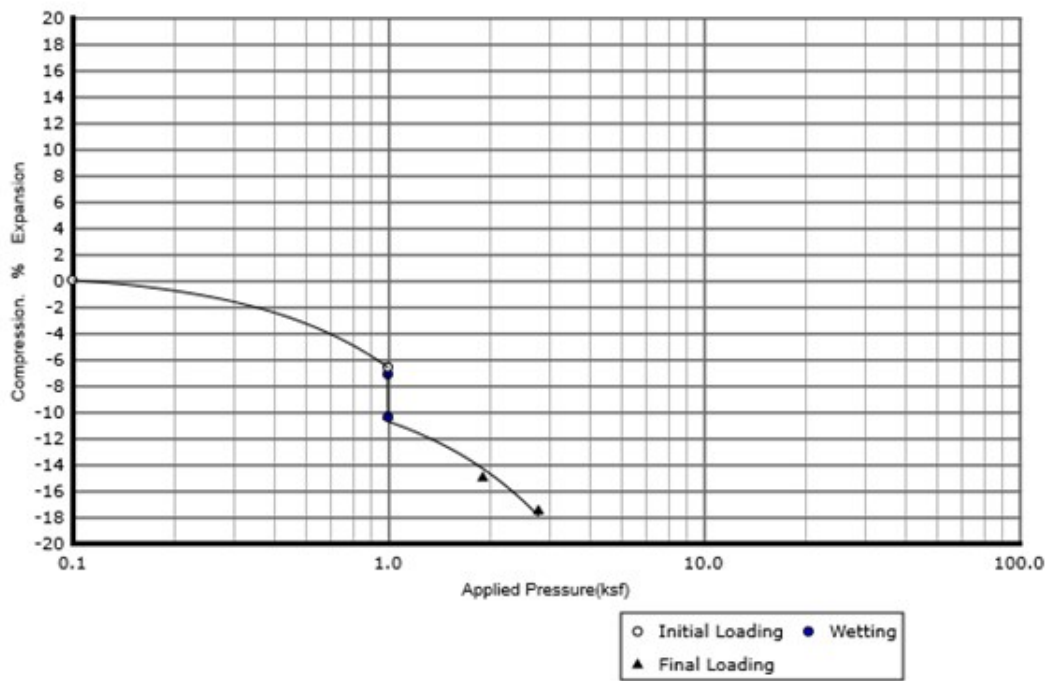
Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Boring Number: B-9 Sample Number: 1827

Specimen Number: 6 Sample Depth: 15-ft

Soil Description: BROWN SILTY SAND

Swell / Consolidation Chart



Consolidation due to wetting under constant pressure @ Surcharge Load:1000 psf

Moisture Content (%): 25.7 Wet Density of Soil(pcf): 91.8 Dry Density (pcf): 73.0 % Swell / Consolidation: -3.30



Sieve Analysis

Report #: SO:SAS-000021

Triax Engineering, LLC
5350 Broadway
Denver, CO 80216
Phone: 720.230.1931

Client:
Wall Development Group
4201 E. Yale Ave | Suite 140
Denver, CO 80222

Project:
D21G159
West Baptist Retail Store
705 West Baptist Road
Colorado Springs, CO 80921

Test Date: 12/22/2021

Lab ID: 21-2118

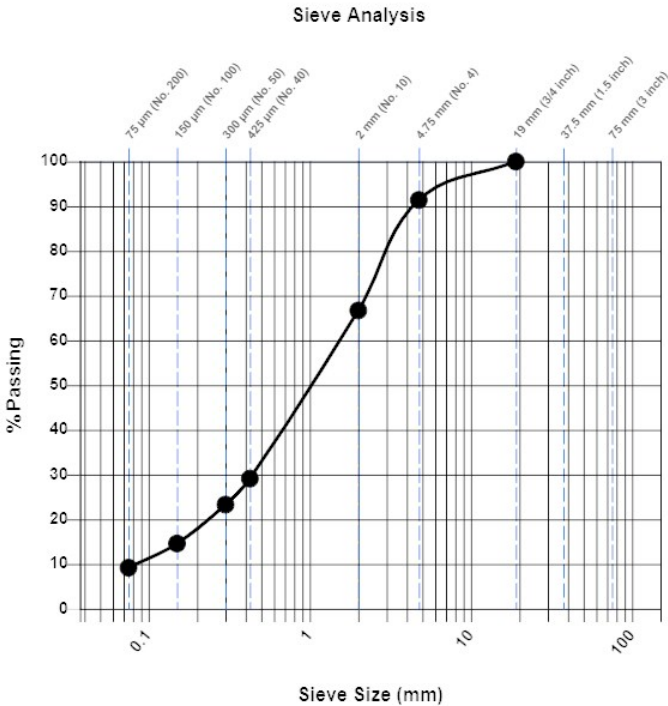
Boring No: B-9

Depth (ft): 25

Soil Description: WELL-GRADED SAND WITH SILT

Sample Prep Procedure: Oven-Dried

Test Method: Method A



Sieve Analysis Data	
Sieve Size	% Passing
19 MM (3/4 INCH)	100.0
4.75 MM (NO. 4)	91.4
2 MM (NO. 10)	66.7
425 MM (NO. 40)	29.1
300 MM (NO. 50)	23.3
150 MM (NO. 100)	14.6
75 MM (NO. 200)	9.2
PAN	0.0

Percent Finer than #200 Sieve (Wash) Test Method: Method A

Percent Gravel: 8.6

Percent Sand: 82.2

Percent Fines: 9.2

Cu: 21.3


Cc: 1.5


Liquid Limit: NV


Plasticity Index: NV


USCS Classification: SW-SM


AASHTO Classification: A-2-4(0)


Location	Baptist Road Retail Store				
20-year Equivalent Single Axle Load Applications (ESAL)				24,500	
Soil Sample Information:					
Boring	B-1 to B-3		Depth	1 to 7	feet
Sample description SC					
USCS	SC	AASHTO Group Number		AASHTO Group Index:	
Pavement Thickness Calculation Input Parameters:					
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841		
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0		
Design R-value, R	15	Equiv. Daily Load App. (EDLA)	--		
M _R =	4195				
Design Structural Number:		2.16			
OPTION A -Light Duty (ESAL=24500)					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Hot Mix Asphalt (HMA)	0.44	1	5	2.20
					2.20
OPTION B -Light Duty (ESAL =24500)					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Hot Mix Asphalt (HMA)	0.44	1	4	1.76
2	Aggregate Base with 77 <= R-value <83	0.12	1	4	0.48
					2.24
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO.	D21G159
		Baptist Road Retail Store		FIGURE NO. P-1A	


Location	Baptist Road Retail Store				
20-year Equivalent Single Axle Load Applications (ESAL)	45,000				
Soil Sample Information:					
Boring	B-1 to B-3		Depth	1 to 7	feet
Sample description	Brown Clayey Sand				
USCS	SC	AASHTO Group Number	AASHTO Group Index:		
Pavement Thickness Calculation Input Parameters:					
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841		
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0		
Design R-value, R	15	Equiv. Daily Load App. (EDLA)	--		
M _R =	4195				
Calculated Design Structural Number:		2.38			
<u>OPTION D - Medium Duty (ESAL=45000)</u>					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Hot Mix Asphalt (HMA)	0.44	1	5 1/2	2.42
					2.42
<u>OPTION E - Medium Duty (ESAL =45000)</u>					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Hot Mix Asphalt (HMA)	0.44	1	4	1.76
2	Aggregate Base with 77 <= R-value <83	0.12	1	6	0.72
					2.48
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO.	D21G159
		Baptist Road Retail Store		FIGURE NO. P-1A	


Location	Baptist Road Retail Store				
20-year Equivalent Single Axle Load Applications (ESAL)				75,000	
Soil Sample Information:					
Boring	B-1 to B-3		Depth	1 to 7 feet	
Sample description		Brown Clayey Sand			
USCS	SC	AASHTO Group Number	AASHTO Group Index:		
Pavement Thickness Calculation Input Parameters:					
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841		
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0		
Design R-value, R	15	Equiv. Daily Load App. (EDLA)	--		
M _R =	4195				
Calculated Design Structural Number:		2.58			
<u>OPTION G - Heavy Duty (ESAL=75000)</u>					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Hot Mix Asphalt (HMA)	0.44	1	6	2.64
					2.64
OPTION H - Heavy Duty (ESAL=75000)					
Layer	Material Desc.	Structural Coeff.	Drain Coeff.	Thickness (in.)	Calculated SN
1	Hot Mix Asphalt (HMA)	0.44	1	5	2.20
2	Aggregate Base with 77 ≤ R-value <83	0.12	1	6	0.72
					2.92
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO.	D21G159
		Baptist Road Retail Store		FIGURE NO. P-1A	


Location	Baptist Road Retail Store			
20-year Equivalent Single Axle Load Applications (ESAL)				
Soil Sample Information:				
Boring	B-1 to B-3		Depth	1 to 7 feet
Sample description		Brown Clayey Sand		
USCS	SC	AASHTO Group Number	AASHTO Group Index:	
Pavement Thickness Calculation Input Parameters:				
Terminal Serviceability, Pt	2.0	Modulus of Rupture, S _c (psi)	650.000	
Modulus of Elasticity, E _c (psi)	3400000.00	Modulus of Subgrade Reaction, k	80.0	
Reliability Level (%)	80.0	Overall Standard Deviation, S _o	0.340	
Load Transfer Coefficient, J	4.2	Loss of Support, LS	2.0	
Standard Normal Deviate, Z _r	-0.674	Drainage Coefficient, C _d	0.9	
Design Serviceability Loss, ΔPSI	2.5			
<u>OPTION- C Light Duty (ESAL =24500)</u>				
Layer	Material Desc.	Design SN	Thickness (in.)	Calculated SN
1	Rigid Pavement	4.39	4 1/2	4.85
				4.85
<u>OPTION- F Medium Duty (ESAL =45000)</u>				
Layer	Material Desc.	Design SN	Thickness (in.)	Calculated SN
1	Rigid Pavement	4.65	5	4.85
				4.85
<u>OPTION- I Medium Duty (ESAL =75000)</u>				
Layer	Material Desc.	Design SN	Thickness (in.)	Calculated SN
1	Rigid Pavement	4.88	6	5.30
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D21G159
		Baptist Road Retail Store		FIGURE NO. P-1B


Location	Baptist Road Retail Store		
20-year Equivalent Single Axle Load Applications (ESAL)	24500		
Light Duty			
Soil Sample Information:			
Boring	B-1 to B-3	Depth	1 to 7 feet
Sample description	Brown Clayey Sand		
USCS	SC	AASHTO Group Nur	AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0
Design R-value, R	15.0	Equiv. Daily Load App. (EDLA)	--
Design CBR	7.0		
Resilient Modulus Calculation:			
S ₁ = [(R - 5) / 11.29 + 3] = 3.886		Mr = 2555 x (CBR) ^{0.64} 8877	
M _R = 10 ^[(S₁ + 18.72) / 6.24]			
M _R = 4195			
Design R-value based on removal and replacement. If proof rolling cannot be achieved, stabilization may be required.			
Pavement Thickness Calculation:			
$\text{Log}_{10}(18\text{kESAL}) = [Z_R \times S_o] + [9.36 \times \text{log}_{10}(\text{SN} + 1) - 0.20 + \frac{\text{log}_{10}(\text{DPSI}/(4.2 - 1.5))}{(0.4 + 1094/(\text{SN} + 1)^{5.19})} + [2.32 \times \text{log}_{10}(\text{MR})] - 8.07$			
select Structural layer coeff:	Hot Mix Asphalt (HMA)		
Structural layer coeff:	0.44		
select Base layer1 coeff:	Aggregate Base with 77 ≤ R-value <83		
select Base layer 1 coeff:	0.12		
select Base layer2 coeff:			
select Base layer 2 coeff:			
"A"	"B"		
4.389166	< 4.401381		
SN= 2.16 (Choose SN such that "A" is less than "B")			
Pavement Thickness:			
Option A Option B			
5	4	inches of Hot Mix Asphalt (HMA)SC=0.44 inches of Aggregate Base with 77 ≤ R-value <83SC=0.12 inches of SC=	
	4		
2.2	2.24	0	
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS - FULL DEPTH	
		Baptist Road Retail Store	
		JOB NO.	D21G159
		FIGURE NO. P-1B	

Location	Baptist Road Retail Store		
20-year Equivalent Single Axle Load Applications (ESAL)	45000		
Medium Duty			
Soil Sample Information:			
Boring	B-1 to B-3	Depth	1 to 7 feet
Sample description	Brown Clayey Sand		
USCS	SC	AASHTO Group Number	AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Reliability Level (%)	80.0	Standard Normal Deviate, Z _r	-0.841
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0
Design R-value, R	15.0	Equiv. Daily Load App. (EDLA)	--
Design CBR	7.0		
Resilient Modulus Calculation:			
S ₁ = [(R - 5) / 11.29 + 3]	= 3.886	Mr = 2555 x (CBR) ^{0.64}	8877
M _R = 10 ^[(S₁ + 18.72) / 6.24]			
M _R =	4195		
Design R-value based on removal and replacement. If proof rolling cannot be achieved, stabilization may be required.			
Pavement Thickness Calculation:			
Log ₁₀ (18kESAL) =	$\frac{[Z_R \times S_o] + [9.36 \times \log_{10}(SN + 1) - 0.20 + \log_{10}(DPSI/(4.2 - 1.5))]}{(0.4 + 1094/(SN+1)^{5.19})}$		
	+ [2.32 x log ₁₀ (MR)] - 8.07		
select Structural layer coeff:	Hot Mix Asphalt (HMA)		
Structural layer coeff:	0.44		
select Base layer1 coeff:	Aggregate Base with 77 <= R-value <83		
select Base layer 1 coeff:	0.12		
select Base layer2 coeff:			
select Base layer 2 coeff:			
"A"	"B"		
4.65321251	<	4.66118435	
SN= 2.38	(Choose SN such that "A" is less than "B")		
Pavement Thickness:			
Option A	Option B		
5.5	4		
	6		
2.42	2.48	0	
		inches of Hot Mix Asphalt (HMA)SC=0.44 inches of Aggregate Base with 77 <= R-value <83SC=0.12 inches of SC=	
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS - FULL DEPTH	
		Baptist Road Retail Store	
		JOB NO.	D21G159
		FIGURE NO. P-1B	

Location	Baptist Road Retail Store		
20-year Equivalent Single Axle Load Applications (ESAL)	75000		
Heavy Duty			
Soil Sample Information:			
Boring	B-1 to B-3		Depth 1 to 7 feet
Sample description	Brown Clayey Sand		
USCS	SC	AASHTO Group Number	AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Reliability Level (%)	80.0	Standard Normal Deviate, Zr	-0.841
Overall Standard Deviation, S _o	0.44	Sevicability Loss, DPSI	2.0
Design R-value, R	15.0	Equiv. Daily Load App. (EDLA)	--
Design CBR			
Resilient Modulus Calculation:			
S ₁ = [(R - 5) / 11.29 + 3] =		3.886	Mr = 2555 x (CBR) ^{0.64} = 0
M _R = 10 ^[(S₁ + 18.72) / 6.24]			
M _R = 4195			
Design R-value based on removal and replacement. If proof rolling cannot be achieved, stabilization may be required.			
Pavement Thickness Calculation:			
$\text{Log}_{10}(18\text{kESAL}) = \frac{[Z_R \times S_o] + [9.36 \times \text{log}_{10}(\text{SN} + 1) - 0.20 + \text{log}_{10}(\text{DPSI}/(4.2 - 1.5))]}{(0.4 + 1094/(\text{SN} + 1)^{0.19})} + [2.32 \times \text{log}_{10}(\text{MR})] - 8.07$			
select Structural layer coeff:		Hot Mix Asphalt (HMA)	
Structural layer coeff:		0.44	
select Base layer1 coeff:		Aggregate Base with 77 ≤ R-value <83	
select Base layer 1 coeff:		0.12	
select Base layer2 coeff:			
select Base layer 2 coeff:			
"A"	"B"		
4.875061263	< 4.880407866		
SN= 2.58 (Choose SN such that "A" is less than "B")			
Pavement Thickness:			
Option A	Option B		
6	5	inches of Hot Mix Asphalt (HMA)SC=0.44	
	6	inches of Aggregate Base with 77 ≤ R-value <83SC=0.12	
		inches of SC=	
2.64	2.92	0	
		FLEXIBLE PAVEMENT THICKNESS CALCULATIONS - FULL DEPTH	
		JOB NO. D21G159	
		Baptist Road Retail Store	
		FIGURE NO. P-1B	

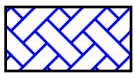
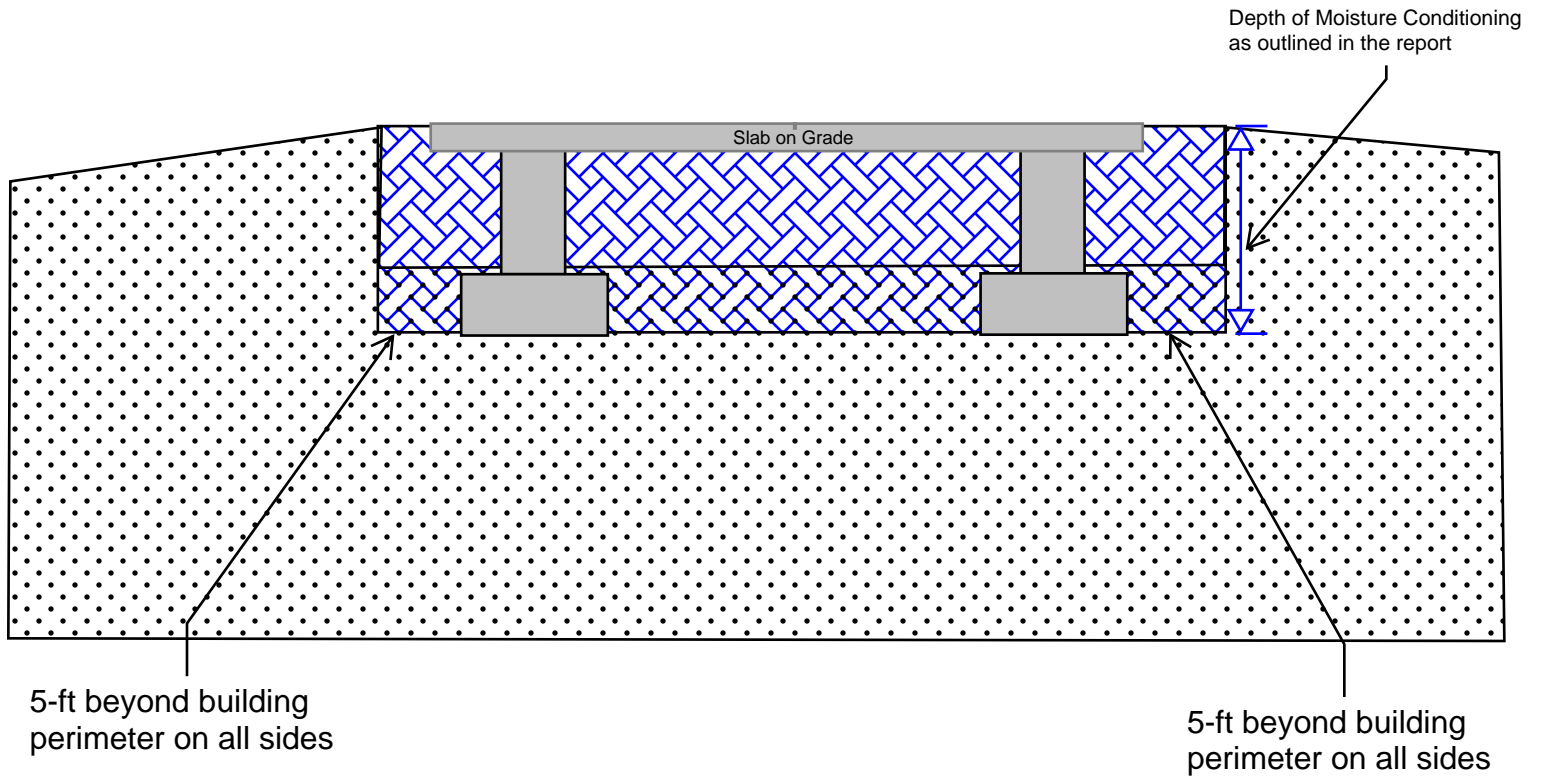
Location	Baptist Road Retail Store		
20-year Equivalent Single Axle Load Applications (ESAL)	24500		
Soil Sample Information:			
Boring	B-1 to B-3		Depth 1 to 7 feet
Sample description	Brown Clayey Sand		
USCS	SC	AASHTO Group Number	AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Terminal Serviceability, P_t	2.0	Modulus of Rupture, S'_c (psi)	650
Modulus of Elasticity, E_c (psi)	3,400,000	Modulus of Subgrade Reaction, k	80
Reliability Level (%)	80.0	Overall Standard Deviation, S_o	0.34
Load Transfer Coefficient, J	4.2	Drainage Coefficient, C_d	0.9
Standard Normal Deviate, Z_r	-0.674	Loss of Support, LS	2.0
Design Serviceability Loss, $DPSI$	2.5		
Pavement Thickness Calculation:			
$\log_{10}(18kESAL) = Z_R \times S_o + 7.35 \times \log_{10}(D + 1) - 0.06 + \frac{\log_{10}(DPSI/(4.5 - 1.5))}{(1 + 1.624 \times 10^7 / (D + 1)^{8.46})}$			
$+ (4.22 - 0.32xp_i) \times \log_{10}(S'_c \times C_D \times (D^{0.75} - 1.132) / (215.63 \times J \times (D^{0.75} - 18.42 / (E_c/k) \times 0.25)))$			
"A"		"B"	
4.389166084	<	4.589691942	
D= 4.5 (Choose D such that "A" is less than "B")			
Pavement Thickness:			
4 1/2 inches of portland cement concrete (Min used)			
	FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D21G159
	Baptist Road Retail Store		FIGURE NO. P-1

Location	Baptist Road Retail Store		
20-year Equivalent Single Axle Load Applications (ESAL)		45000	
Soil Sample Information:			
Boring	B-1 to B-3	Depth	1 to 7 feet
Sample description		Brown Clayey Sand	
USCS	SC	AASHTO Group Number	AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Terminal Serviceability, P_t	2.0	Modulus of Rupture, S'_c (psi)	650
Modulus of Elasticity, E_c (psi)	3,400,000	Modulus of Subgrade Reaction, k	80
Reliability Level (%)	80.0	Overall Standard Deviation, S_o	0.34
Load Transfer Coefficient, J	4.2	Drainage Coefficient, C_d	0.9
Standard Normal Deviate, Z_r	-0.674	Loss of Support, LS	2.0
Design Serviceability Loss, $DPSI$	2.5		
Pavement Thickness Calculation: $\text{Log}_{10}(18kESAL) = Z_R \times S_o + 7.35 \times \log_{10}(D + 1) - 0.06 + \frac{\log_{10}(DPSI/(4.5 - 1.5))}{(1 + 1.624 \times 10^7 / (D + 1)^{8.46})}$ $+ (4.22 - 0.32x_{p_t}) \times \log_{10}(S'_c \times C_D \times (D^{0.75} - 1.132) / (215.63 \times J \times (D^{0.75} - 18.42 / (E_c/k) \times 0.25)))$ <div style="display: flex; justify-content: space-around;"> <div>"A"</div> <div>"B"</div> </div> <div style="display: flex; justify-content: space-around;"> <div>4.65321251</div> <div><</div> <div>4.84551967</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div>D= 5</div> <div>(Choose D such that "A" is less than "B")</div> </div>			
Pavement Thickness: <div style="display: flex; justify-content: space-around; align-items: center;"> <div>5</div> <div>inches of portland cement concrete</div> <div>(Min used)</div> </div>			
	FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D21G159
	Baptist Road Retail Store		FIGURE NO. P-1

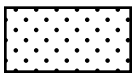
Location	Baptist Road Retail Store		
20-year Equivalent Single Axle Load Applications (ESAL)		75000	
Soil Sample Information:			
Boring	B-1 to B-3		Depth 1 to 7 feet
Sample description		Brown Clayey Sand	
USCS	SC	AASHTO Group Number	AASHTO Group Index:
Pavement Thickness Calculation Input Parameters:			
Terminal Serviceability, P_t	2.0	Modulus of Rupture, S'_c (psi)	650
Modulus of Elasticity, E_c (psi)	3,400,000	Modulus of Subgrade Reaction, k	80
Reliability Level (%)	80.0	Overall Standard Deviation, S_o	0.34
Load Transfer Coefficient, J	4.2	Drainage Coefficient, C_d	0.9
Standard Normal Deviate, Z_r	-0.674	Loss of Support, LS	2.0
Design Serviceability Loss, $DPSI$	2.5		
Pavement Thickness Calculation:			
$\log_{10}(18kESAL) = Z_R \times S_o + 7.35 \times \log_{10}(D + 1) - 0.06 + \frac{\log_{10}(DPSI/(4.5 - 1.5))}{(1 + 1.624 \times 10^7 / (D + 1)^{8.46})}$			
$+ (4.22 - 0.32x_{p_i}) \times \log_{10}(S'_c \times C_D \times (D^{0.75} - 1.132) / (215.63 \times J \times (D^{0.75} - 18.42 / (E_c/k) \times 0.25)))$			
"A"	"B"		
4.875061263	<	5.295365071	
D= 6 (Choose D such that "A" is less than "B")			
Pavement Thickness:			
6 inches of portland cement concrete			
	FLEXIBLE PAVEMENT THICKNESS CALCULATIONS		JOB NO. D21G159
	Baptist Road Retail Store		FIGURE NO. P-1

Slab on Grade over excavation and replacement with recompacteds onsite soils

1. Over Excavation depth according to report
2. Each lift shall have a maximum compacted thickness of 6 inches / 8 inches loose lift.
3. Each lift shall be compacted to a minimum of 95% of max. dry density with in -2 to +2 percentage points of optimum moisture content as obtained by ASTM D398
4. Recompacted onsite soils shall be protected from excessive evaporation / drying out until the construction of slab on grade is complete.



Recompacteds Onsite Soils

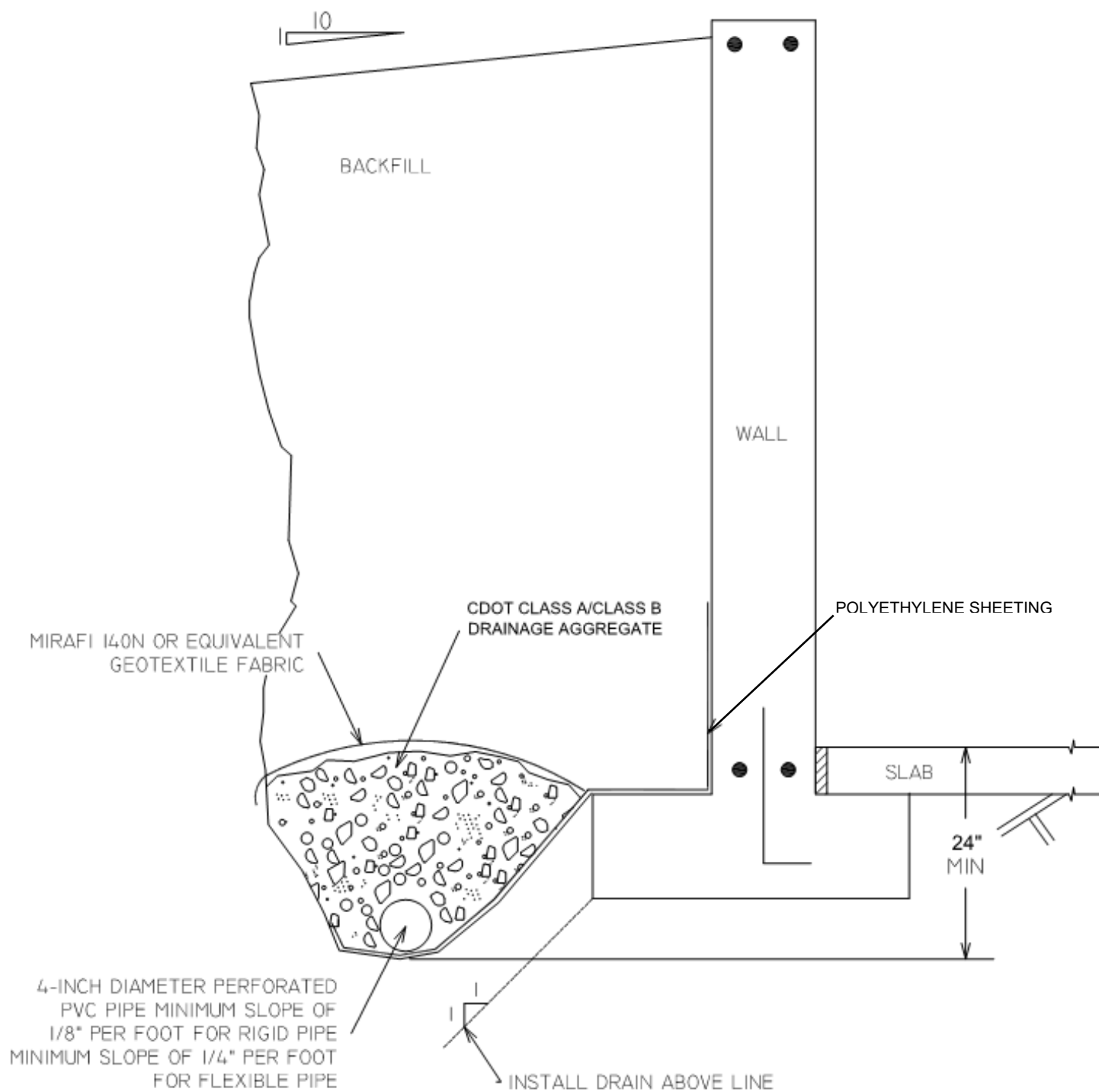


Onsite Soils

Not to Scale



OVER EXCAVATION AND REPLACEMENT WITH COMPACTED
STRUCTURAL FILL - SLAB ON GRADE



NOTES:

1. DRAIN PIPE SHOULD LEAD TO SUMP OR POSITIVE GRAVITY DISCHARGE.
2. COVER GRAVEL COMPLETELY WITH GEOTEXTILE IN SANDY OR SILTY SOILS.
3. BOTTOM OF DRAIN SHOULD BE A MINIMUM OF **24** INCHES BELOW TOP OF SLAB AT HIGH POINT.



TYPICAL EXTERIOR PERIMETER DRAIN

KEY TO CLASSIFICATION SYMBOLS USED ON BORING LOGS

MAJOR DIVISIONS			GROUP SYMBOLS		DESCRIPTIONS	
COARSE-GRAINED SOILS More Than Half of Material LARGER Than No. 200 Sieve size	GRAVELS More Than Half of Coarse Fraction is LARGER Than No. 4 Sieve Size	Clean Gravels (Little or no Fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines	
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines	
		Gravels With Fines (Appreciable Amount of Fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures	
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures	
	SANDS More Than Half of Coarse Fraction is SMALLER Than No. 4 Sieve Size	Clean Sands (Little or no Fines)	SW		Well-Graded Sands, Gravelly Sands, Little or no Fines	
			SP		Poorly-Graded Sands, Gravelly Sands, Little or no Fines	
		Sands With Fines (Appreciable Amount of Fines)	SM		Silty Sands, Sand-Silt Mixtures	
			SC		Clayey Sands, Sand-Clay Mixtures	
	FINE-GRAINED SOILS More Than Half of Material is SMALLER Than No. 200 Sieve Size.	SILTS & CLAYS	Liquid Limit Less Than 50	ML		Inorganic Silts & Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
				CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
		SILTS & CLAYS	Liquid Limit Greater Than 50	MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils, Elastic Silts
				CH		Inorganic Clays of High Plasticity, Fat Clays
FORMATIONAL MATERIALS	SANDSTONE					
	SILTSTONE					
	CLAYSTONE					
	SHALE					
	IGNEOUS BEDROCK					
	METAMORPHIC BEDROCK					
	GROUNDWATER			Indicates Final Observed Groundwater Level Indicates Initial Observed Groundwater Location		

GENERAL NOTES

Consistency of Fine – Grained Soils

<u>Unconfined Compressive Strength, Qu, psf</u>	<u>Standard Penetration Blow Counts (N-Value)</u>	<u>Consistency</u>
<500	0-1	Very Soft
500-1000	2-4	Soft
1000-2000	4-8	Medium Stiff
2000-4000	8-15	Stiff
4000-8000	15-30	Very Stiff
8000+	>30	Hard

Relative Density of Coarse Grained Soils

<u>Standard Penetration Blow Counts (N-Value)</u>	<u>Consistency</u>
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
>50	Very Dense

Grain Size Terminology

<u>Terminology</u>	<u>Nominal Particle Size</u>
Boulders	Over 12 inch (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 Sieve (75mm to 4.75mm)
Sand	#4 to #200 Sieve (4.75 mm to 0.075 mm)
Silt/Clay	Passing #200 Sieve (<0.075mm)

Plasticity Description

<u>Term</u>	<u>PI Range</u>
Non Plastic	0
Low Plasticity	1-10
Medium Plasticity	11-30
High Plasticity	>30

Slab Performance Risk

<u>Slab Performance Risk Category</u>	<u>Representative % Swell (500 psf Surcharge)</u>	<u>Representative % Swell (1000 psf Surcharge)</u>
Low	0 to <3	0 to <2
Moderate	3 to <5	2 to <4
High	5 to <8	4 to <6
Very High	≥8	≥6

The data collected by Triax Engineering, LLC during this investigation was used to provide geotechnical information and recommendations regarding subsurface conditions on the site investigated, the effect of those conditions on the proposed construction, and the foundation type for the named client. The stratification lines indicated on the boring log are approximate, and subsurface conditions encountered during construction may differ from those presented herein. This uncertainty cannot be eliminated because of the many variability's associated with geology. For example material and engineering characteristics of soil and bedrock may change more gradually or more quickly indicated in this report and the actual engineering properties of non-sampled soil or rock may differ from interpretations. Quantitative conclusions regarding the performance of geotechnical structures prior to construction are not possible because of the complexity of subsurface conditions. Rather, engineering judgments and experience are used to estimate likely geotechnical performance and provide the necessary recommendations. Put another way, we cannot be sure about what is not visible, so the collected data and our training and experience are used to develop predictions and recommendations. There are no guarantees or warranties implied or expressed.

The owner and/or client must understand that uncertainties are associated with geotechnical engineering, and they, the owner and/or client, must determine the level of risk they are willing to accept for the proposed construction. The risks can be reduced, but not eliminated, through more detailed investigation, which costs more money and takes more time, and through any appropriate construction, which might be recommended as a result of that, more detailed investigation. To reduce the level of uncertainty, this report was prepared only for the referenced client and for the proposed construction indicated in the report. Unless authorized by us in writing, the owner will assume additional geotechnical risk if this report is used for any construction that differs from that indicated in the report. Our firm should be consulted well before changes in the proposed construction occur, such as the nature, size, configuration, orientation, or location of any improvements. Additionally, the knowledge and experience of the local geotechnical practice is continually expanding and it must be understood the presented recommendations were made according to the standard of practice at the time of report issuance. If the construction occurs 1 or more years after issuance of the report, the owner and/or client should contact our firm to determine if additional investigation or revised recommendations would be advisable.

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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