COBBLESTONE SM
ENGINEERING, INC.
Geotechnical, Environmental and Materials Consultants

Report of Geotechnical Exploration

Pharr Bridge Business Park Building

Prepared for
Pharr Bridge Business Park
Pharr, TX

June 2013
CEI Project No. 13-115.GE

Commitment Experience Integrity

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Rio Grande Valley

COBBLESTONE SM
ENGINEERING, INC.

June 3, 2013

Ms. Ilse Fernandez
Pharr Bridge Business Park
3501 W. Utility Drive
Pharr, Texas 78577

Re: Report of Geotechnical Exploration
Pharr Bridge Business Park Building
Pharr, Texas
CEI Project No. 13-115.GE

Dear Ms. Fernandez;

Cobblestone Engineering, Inc. (CEI) has completed the geotechnical exploration for the proposed Pharr Bridge Business Park Building in Pharr, Texas. This report briefly describes the investigative procedures and presents the findings of the exploration along with our conclusions and recommendations for design and construction of the foundation.

We appreciate the opportunity of working with you on this phase of the project and look forward to providing the materials testing and construction review services that you will require during the construction phase. If you have any questions regarding the report, or if we can be of further service to you, please contact us.

Very truly yours,
COBBLESTONE ENGINEERING, INC.

Ralph M. O'Quinn

Ralph M. O'Quinn, P.E.
Manager

STATE OF TEXAS
RALPH M. O'QUINN
61290
REGISTERED PROFESSIONAL ENGINEER

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EXECUTIVE SUMMARY

Cobblestone Engineering, Inc. (CEI) has completed a geotechnical exploration for the Pharr Bridge Business Park Building in Pharr, Texas. We understand that the structure will be single story in height, will be constructed dock high, and will be of concrete tilt up construction. Associated parking and driveway areas will be constructed around the perimeter of the building.

The subsurface data was obtained by drilling 6 soil test borings to a depth of 20 feet in the building area and 3 soil test borings to a depth of 5 feet in the roadway areas, as requested. Samples recovered from the field operations were laboratory tested to determine properties related to soil strength and classification.

Based upon the data available from this study, the soil conditions in the explored locations predominantly consists of clay and silty clay. The stratigraphy can be summarized as follows:

DEPTH, FT	DESCRIPTION	CLASSIFICATION
0 - 8	Firm to very stiff, moist, dark brown and brown **CLAY**	CH
8 - 20	Firm to hard, moist, brown **SILTY CLAY** with clay seams and layers	CL

Groundwater was observed at a depth of 12.5 to 13.5 feet below existing grade during the drilling operations. Follow-up readings approximately 72 hours after completion of the drilling operations indicated groundwater at 5.1 and 5.3 feet and the soil test borings caved in at depths of 7.8 and 8.3 feet below existing grade in soil test borings B-1 and B-2. Groundwater levels in the remaining soil test borings could not be obtained due to irrigation and recent rainfall. It should be noted that groundwater levels may fluctuate seasonally and with climatic changes.

The soil conditions at this site are relatively expansive near the surface. Modification of the near surface soil conditions will be necessary to reduce the Potential Vertical Rise (PVR) to a value that the structures can withstand utilizing a relatively shallow foundation system of spread footings, continuous footings or a slab-on-grade. The structures can also be supported by a relatively deeper foundation system of drilled piers with a structurally suspended floor slab without modifying the near surface soils.

The soil conditions at this site have a relatively high expansion/contraction potential as evidenced by Plasticity Index (PI) values that vary from 18 to 42 percent in the upper 15 feet. We calculated the Potential Vertical Rise (PVR) for the in-situ conditions and obtained a value of 2.3 inches. We also calculated the PVR assuming 4 feet of fill to make the structure "dock high" and we obtained a value on the order of 1.4 inches. A value of 1 inch or less is generally required for structures of the type planned for this site. To reduce the PVR to approximately 1 inch, it will be necessary to remove 2 feet of the existing material, moisture condition the underlying material, replace the excavated material with compacted and tested select fill material and then add the remaining select fill material to bring the site to grade for the structure. This condition reduces the PVR to approximately 1 inch.

Recommendations for the relatively shallow foundation system are as follows:

SHALLOW FOUNDATION BEARING CAPACITY, SETTLEMENT, AND PVR SUMMARY	
Depth of Seasonal Moisture Change	Approximately 8 feet below existing grade
Design Plasticity Index, In-situ conditions	34
Grade Beams / Continuous Footings Allowable Bearing Capacity at 2 feet below grade in new fill material*: Dead Load plus Sustained Live Load (SF = 3) Total Design Load (SF = 2)	 1,200 psf 1,800 psf
Individual Footings Allowable Bearing Capacity at 2 feet below grade in new fill material*: Dead Load plus Sustained Live Load (SF = 3) Total Design Load (SF = 2)	 1,400 psf 2,100 psf
Estimated Total Settlement	< 1 inch
Potential Vertical Rise (PVR), In-situ conditions	2.3 inches
Potential Vertical Rise (PVR) with removal of 2' of existing material, moisture condition and compact underlying 6", and then add select fill material* to bring the site to dock high grade 4' above the existing grade	Approximately 1 inch

* meeting requirements of the Subgrade Preparation and Fill Placement sections of this report.

A relatively deeper foundation system of drilled piers can also be utilized to support the structure. The piers should be founded at a depth of 10 feet below existing grade. Piers founded at this depth can be sized based upon a net allowable dead plus sustained live

load pressure of 2,000 psf or a net allowable total load pressure of 3,000 psf, whichever condition governs. The bearing pressures contain a factor of safety of 3 and 2, respectively. The floor slab used in conjunction with drilled piers should be structurally suspended to allow the underlying soils to move vertically without causing distress in the structure. At least a 6 inch void should be constructed beneath the floor slab used in conjunction with a drilled pier foundation system without modification of the near surface soils to reduce the PVR.

The information contained in this Executive Summary is provided as a general guide to the data presented in this report. The design data and recommendations are contingent upon the client's following the entirety of the recommendations provided in this report and subject to the limitations as described herein.

CEI Project No. 13-115.GE
June 3, 2013

GEOTECHNICAL EXPLORATION

PHARR BRIDGE BUSINESS PARK BUILDING

PHARR, TEXAS

INTRODUCTION

This is the report of the geotechnical exploration performed for a Building to be constructed in the Pharr Bridge Business Park in Pharr, Texas. The exploration included soil test borings to determine the subsurface conditions and obtain representative soil samples; laboratory testing to determine the engineering properties of the soils; engineering studies to develop earthwork and foundation recommendations; and preparation of this report. This work was authorized by Ms. Ilse Fernandez of the Pharr Bridge Business Park signing our Agreement on April 30, 2013. It should be noted that the field operations were delayed for approximately 2 weeks while working with the natural gas line companies to accurately locate their lines in the area.

PROJECT DESCRIPTION

The new Building planned for the Pharr Bridge Business Park will be a single story structure that will be constructed dock high, and of concrete tilt-up construction. The building will have a footprint of approximately 87,500 square feet. The remainder of the site will consist of associated parking and driveway areas.

Structural loads were not provided but they are anticipated to be relatively light to moderate and commensurate with other similar construction. For the purpose of this report, we have assumed that wall loads will be on the order of 3 kips per lineal foot and concentrated loads will be less than 40 kips. If the actual loading conditions are determined to differ significantly (+10%) from those indicated, CEI should be notified for review and possible modification of the recommendations presented in this report.

SUBSURFACE EXPLORATION

The subsurface conditions at the site were determined by drilling 6 soil test borings to a depth of 20 feet in the proposed building area and 3 soil test borings to a depth of 5 feet in the paving areas. The 4-inch nominal diameter borings were drilled with flight auger equipment at the locations selected by others and located in the field by CEI. The approximate boring locations are shown on the attached Boring Plan in the Appendix.

The boring and sampling operations were conducted in general accordance with the applicable ASTM standards. As the test borings were advanced, the engineering technician maintained a log of the subsurface profile noting soil types and stratifications, groundwater, and other pertinent data. Representative portions of the samples were sealed at the site and transported to the laboratory. All samples were marked for proper identification.

LABORATORY TESTING

The soil samples obtained during the exploration were transported to the laboratory where they were visually reviewed and classified according to the Unified Soil Classification System (ASTM Standard D 2487) by the Geotechnical Engineer. A testing program was conducted on selected samples to aid in classification and evaluation of the engineering properties required for analysis. The laboratory tests were performed by experienced laboratory technicians and monitored by the Geotechnical Engineer. The following soil parameters were evaluated by laboratory tests:

- Classification, potential volumetric swell and shrinkage characteristics of the cohesive soils, as defined by the Plasticity Index (PI) and the Liquid Limit (LL), were determined by means of the Atterberg Limit tests (ASTM Standard D 4318).

- The undrained shear strength of cohesive soils was evaluated by means of unconfined compression tests (ASTM Standard D 2166).

- The undrained shear strength of cohesive/frictional soils was evaluated by means of a strain controlled triaxial compression test (ASTM Standard D 2850).

- The moisture condition of the material was evaluated by determining the natural moisture content (ASTM Standard D 2216).

The final Logs of Boring indicating the soil description, sampling and laboratory test results were prepared by the Geotechnical Engineer based upon review of the samples in the laboratory, the laboratory test results and the field logs prepared by the engineering technician. Copies of the Logs of Boring are included in the Appendix.

SITE AND SUBSURFACE CONDITIONS

Site Conditions

The Pharr Bridge Business Park is situated on the south side of Highline Road in Pharr, Texas. The new Building is planned for a site along the eastern portion of the site as shown on the attached Boring Plan. The site is relatively level and the surface soils were relatively moist and strong at the time of the field study. The site is currently being utilized for agricultural purposes.

Subsurface Conditions

The particular subsurface stratigraphy, as determined by the exploration, is shown in detail on the Logs of Boring in the Appendix. A review of the logs indicates that the subsurface stratigraphy within the explored depth generally consists of strata of clay and silty clay. The typical soil stratigraphy encountered at this site is summarized in the following Table.

DEPTH, FT	DESCRIPTION	CLASSIFICATION
0 - 8	Firm to very stiff, moist, dark brown and brown **CLAY**	CH
8 - 20	Firm to hard, moist, brown **SILTY CLAY** with clay seams and layers	CL

Groundwater was observed at a depth of 12.5 to 13.5 feet below existing grade during the drilling operations. Follow-up readings approximately 72 hours after completion of the drilling operations indicated groundwater at 5.1 and 5.3 feet and the soil test borings caved in at depths of 7.8 and 8.3 feet below existing grade in soil test borings B-1 and B-2. Groundwater levels in the remaining soil test borings could not be obtained due to irrigation and recent rainfall. It should be noted that groundwater levels may fluctuate seasonally and with climatic changes.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based upon a visual reconnaissance of the site, the data obtained in our soil test borings and laboratory testing, visual examination of the samples, the project information provided to us, and our experience with similar soils and site conditions in the Rio Grande Valley area.

The Atterberg Limits tests indicate that the near surface soils have a relatively high expansion/contraction potential as evidenced by Plasticity Index (PI) values of 18 to 42 percent. We estimated the Potential Vertical Rise (PVR) at this site with the in-situ conditions and obtained a value of approximately 2.3 inches. We also calculated the PVR assuming a "dock high" floor slab elevation 4 feet above the existing ground surface and obtained a value on the order of 1.4 inches. This result indicates that the in-situ soils at this site can swell within the stated values if they are subjected to a moisture source. Most permanent structures cannot withstand a PVR greater than 1 inch without distress to the structure. To reduce the PVR to approximately 1 inch, it will be necessary to remove 2 feet of the existing material; scarify, moisture condition and recompact the underlying 6 inches; and fill with compacted and tested select fill material to bring the site to a grade that results in a finish floor slab elevation 4 feet above the existing ground surface.

Slab-on-Grade / Shallow Spread Footings / Grade Beams

The structure can be supported by a slab-on-grade foundation system with shallow spread footing and grade beams designed for the parameters indicated below, after modification of the near surface soils to reduce the PVR to an acceptable level. The Atterberg Limits tests indicate that the foundations may be subjected to vertical movements due to volume changes in the near surface clays. The foundations should be designed to resist bending moments induced by the estimated movements as indicated in the information provided

in the following sections. The analysis of the field and laboratory data indicates that the in-situ soil parameters in the following Table may be utilized for design.

SHALLOW FOUNDATION BEARING CAPACITY, SETTLEMENT, AND PVR SUMMARY	
Depth of Seasonal Moisture Change	Approximately 8 feet below existing grade
Design Plasticity Index, In-situ conditions	34
Grade Beams / Continuous Footings Allowable Bearing Capacity at 2 feet below grade in new fill material*: Dead Load plus Sustained Live Load (SF = 3) Total Design Load (SF = 2)	 1,200 psf 1,800 psf
Individual Footings Allowable Bearing Capacity at 2 feet below grade in new fill material*: Dead Load plus Sustained Live Load (SF = 3) Total Design Load (SF = 2)	 1,400 psf 2,100 psf
Estimated Total Settlement	< 1 inch
Potential Vertical Rise (PVR), In-situ conditions	2.3 inches
Potential Vertical Rise (PVR) with removal of 2' of existing material, moisture condition and compact underlying 6", and then add select fill material* to bring the site to dock high grade 4' above the existing grade	Approximately 1 inch

* meeting requirements of the Subgrade Preparation and Fill Placement sections of this report.

Footings should have a minimum width of 12 inches and should extend a minimum of 24 inches below final grade. Disturbance of the bearing area of the grade beams and individual footings should be minimized during the excavation operations. Soft spots

should be over excavated to firm soil and loose material in the grade beam or footing excavations should be removed before placing concrete. The bearing areas should be reviewed under the direction of the Geotechnical Engineer.

The design Plasticity Index was calculated based on the average stratigraphy of existing soils encountered during our investigation. If additional cut and fill operations are required at the site, the Geotechnical Engineer should be notified prior to construction to determine the need for additional recommendations.

Site Modification

The near surface soils can be modified to reduce the PVR to less than 1 inch at this site. Removal of 2 feet of the existing soil; scarifying, moisture conditioning, compacting and testing the underlying 6 inches, and backfilling the excavation with compacted and tested select fill material to bring the site to a finish floor slab elevation that is 4 feet above the existing ground surface will reduce the PVR to approximately 1 inch. With the PVR reduced to a value that the structure can tolerate, then a relatively shallow foundation system consisting of a slab-on-grade, spread footings or grade beams can be utilized.

Drilled Pier Foundations

The structure can also be supported by a foundation system of drilled piers to bypass the expansive soil and support the foundation at or below the zone of seasonal moisture change. We estimate the zone of seasonal moisture change extends approximately 8 to 10 feet below existing grade at this site. Material encountered at this depth generally consisted of a stiff to very stiff brown clay. Piers should not extend below approximately 15 feet below existing grade without further exploration to determine the underlying soil conditions.

It should be noted that it is often difficult to determine the constructability of underreams based on 3 inch diameter samples from the soil test borings. The contractor should perform a test pier to determine if the underream will remain open for a sufficient period of time to allow placement of the reinforcing steel and concrete. The contractor should also be prepared to convert any pier that an underream will not remain open, into a straight shaft pier.

Piers founded at a depth of 10 feet below existing grade can be designed based upon a net allowable dead plus sustained live load bearing pressure of 2,000 psf or a net allowable total load pressure of 3,000 psf, whichever condition governs. The allowable bearing

pressures contain a safety factor of 3 and 2, respectively and are based upon a depth below grade to footing width ratio of 1. We can provide information for deeper piers if desired. The allowable bearing pressures apply to single, isolated piers.

It is recommended that the drilled pier excavation and construction operations be monitored under the direction of the Geotechnical Engineer or his representative to verify that piers extend into the material specified in the design, and that pier excavations are relatively clean prior to placement of the reinforcing steel and concrete. The reinforcing steel and concrete should be placed in the pier excavations as soon as the drilling operations are complete at each location. Field observation should confirm that the steel reinforcing is clean and free of soil and other contaminants and that the proper number and placement of reinforcing bars are utilized. The concrete should be sampled and tested to verify that it meets the specified slump and strength requirements.

Floor Slab

The most positive method of supporting the floor slab used in conjunction with a relatively deeper foundation system of drilled piers is to structurally suspend the floor slab and provide a void beneath the slab for vertical movement in the underlying soil. This will allow the underlying soils to move vertically without causing distress to the structure. A void

constructed utilizing 6 inch void boxes should provide an adequate space to allow the soils to move vertically without affecting the floor slab.

As an alternate, a slab-on-grade may be used, provided it bears on the compacted fill material after site modifications to reduce the PVR to 1 inch as recommended in this report. The slab-on-grade should be isolated from the foundation system to allow for independent movement of the two systems and the structure should be designed to accommodate the anticipated vertical movements. All structural fill placed below the slab should satisfy the requirements as defined in the Subgrade and Fill Placement section of this report.

Excavations

Excavations to a depth of approximately 2 to 4 feet below existing grade may be necessary for installation of the shallow foundations at this site. It is anticipated that spread footing or grade beam excavations may be formed with open slopes. The temporary footing excavation slopes could be formed on a 1 horizontal to 1 vertical gradient dependent upon the subsoil conditions at the time of the excavation. Vertical cut spread footing or grade beam excavations may require shoring. All excavations should be performed in accordance with applicable laws, standards, and codes. The contractor should use shoring and bracing for deeper excavations, if necessary.

Based on the findings of this study, shallow excavations are not anticipated to encounter the groundwater table. CEI makes no warranty regarding the actual groundwater level that will be discovered during construction. Excavations performed for foundation construction should be relatively clean without excessive amounts of cuttings from the excavation operations remaining in the bottom of the excavations prior to placing concrete. The excavations should be performed with equipment capable of providing a relatively clean bearing area. To minimize the amount of loose material in the spread footing or grade beam excavation bottoms and disturbance to the bearing areas, it is recommended that the excavations be made with a smooth-mouth bucket. If a toothed-bucket is used, ridges resulting from the teeth should be removed prior to placement of the reinforcing steel and concrete in the excavations. This may require hand excavation of the last 4 to 6 inches.

The bearing surfaces should be protected against disturbance and deterioration. The reinforcing steel and concrete should be placed in the excavations as soon as possible after completion of the excavation operations to reduce the potential for degradation of the bearing surfaces. Any foundation excavation that does not have concrete placed within the day it is exposed should be covered with a thin seal slab. The excavation bottoms should be properly sloped to allow water infiltrating into the excavation to be collected at a convenient location along the edge of the excavation. Water must not be allowed to

collect or stand on any bearing area. The excavations should be reviewed under the direction of the Geotechnical Engineer.

Settlement

Settlement of shallow foundations constructed using the allowable bearing pressures indicated previously should occur during and shortly after construction. Utilizing the loading conditions provided, settlements should be less than 1 inch. Differential settlements will result from variances in subsurface conditions, loading conditions, construction procedures and cleanliness of the bearing area. It is our experience that differential settlement will be approximately one-half (½) the total settlement between any two columns.

Surface Area and Site Preparation

Care should be taken to shape the building area such that water will not pond around or beneath the structure during construction and cause the near surface clays to swell or lose strength. The proposed structure should be isolated from any moisture source which might also cause swelling or softening of the clays after completion of the construction. When the structure is complete, the ground surface should slope away from the structure and downspouts should carry runoff water several feet from the building, preferably into paved areas or sewers, before discharging. Care should be taken to not plant or leave in place deep rooted trees within proximity to the perimeter of the structure. Deep rooted trees

have the potential to remove moisture from beneath the buildings if planted close enough to allow the root bulb to extend near or beneath the buildings.

Subgrade Preparation and Fill Placement

The building area should be stripped of all vegetation, including trees, bushes and roots. Any existing utilities should be removed and properly backfilled. It is imperative that any drain lines, irrigation lines, basements, sumps, wells, excavations due to foundation or tree removal, or other recessed areas should be properly exposed and backfilled with compacted fill materials under the direction of the Geotechnical Engineer of Record (GER).

Soft spots in the subgrade should be excavated to firm soil. The exposed subgrade should be scarified 6 inches, moisture conditioned to within -2 to +2 percent of the optimum moisture content and compacted. All fill required should then be added to the site to bring the pad to final grade. The exposed subgrade and structural fill should be compacted to at least 95 percent of the maximum density as determined by the Standard Moisture-Density Relation (ASTM D-698). Following complete clearing and preparation of the site for construction, it is recommended that the Geotechnical Engineer observe the site to determine that satisfactory preparation has been accomplished.

It is recommended that structural fill be composed of clean, uniform, inactive clay with a PI between 10 and 20. The fill should be placed in thin lifts not exceeding 8 inches loose measure, moisture conditioned to within -2 to +3 percent of the optimum moisture content, and compacted to the above recommended density. It is recommended that sand or other lower PI material not be used to backfill utility excavations or any other excavations at this site. The sand or lower PI material can provide a direct path for water to enter the near surface clays and allow swelling of the underlying soil.

Prior to any filling operations, samples of the proposed borrow materials should be obtained by the GER for laboratory moisture-density testing. The tests will provide a basis for evaluation of fill compaction by in-place testing. A soil technician with the GER should perform sufficient in-place density tests during the filling operations to verify that proper levels of compaction are being attained.

Surface Paving

The subgrade soils at the site are typical of those in this general area that react readily with hydrated lime. Lime stabilization minimizes the effects of the expansive soils and increases the supporting strength of the subgrade. It is recommended that the top 6 inches of finished subgrade soils be stabilized with hydrated lime prior to placing paving.

At the time of this study precise traffic loadings for surfaced paved automobile and truck areas were not available. However, it is assumed that the traffic will be relatively light to moderate. Using these assumptions the pavement thicknesses in the following Table were obtained:

TRAFFIC LOADING	FLEXIBLE PAVEMENT, IN.			RIGID PAVEMENT, IN.
	ASPHALT SURFACE COURSE	BASE COURSE OPTION[1]		
		CALICHE	LIMESTONE	
Auto & Light Truck[2]	1½	8	6	5
Truck & Heavy Auto[3]	2½	10	8	6

[1] Option of selecting either caliche or crushed limestone for the base course. Material must satisfy requirements as defined in this section.

[2] Lime stabilized subgrade and not over approximately 250 cars and light trucks per day having 2 loaded axles and with a maximum total vehicle weight of 6 kips.

[3] Lime stabilized subgrade and not over approximately 25 trucks, busses or combination vehicles per day having 3, or 4 or more loaded axles and with a total vehicle weight of 40 kips or less and not over approximately 250 loaded 2 axle trucks having a total vehicle weight of 12 kips or less.

It is recommended that the driveway areas be designed for the latter conditions due to the possible truck and concentrated automobile traffic in these areas. The Geotechnical Engineer should be contacted for additional recommendations if loading conditions are expected to differ from those assumed.

The pavement materials should meet the material properties recommended on the attached Table. The calculations used to determine the required pavement thickness are based upon only the physical and engineering properties of the material, a stabilized subgrade strength based upon our experience in the area and laboratory test results, and conventional thickness determination procedures.

It should be noted that the expansion/contraction potential of the soil at this site extends to a depth of approximately 10 to 15 feet below existing grade. Due to this condition, some vertical movement in the pavement and sidewalks can be expected. The extent of expected movement is dependent on numerous factors such as drainage, maintenance, traffic, etc. Related civil engineering design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required.

PAVING MATERIALS	
Class	**Requirements**
1.0	**Caliche Base:** Base material shall be composed of caliche meeting the requirements of Grade 4 in the Texas Department of Transportation (TXDOT) 1993 Standard Specification Item 247. The caliche shall be compacted to a minimum of 98 percent of the maximum density as determined by the Standard-Moisture Relation (ASTM D 698). The base materials shall have a minimum lab California Bearing Ratio (CBR) of 50.
2.0	**Limestone Base:** Base material shall be composed of crushed limestone meeting the requirements of Grade 1 in the TXDOT 1993 Standard Specifications Item 247. The limestone shall be compacted to a minimum of 98 percent of the maximum density as determined by the Standard Moisture-Density Relation (ASTM D-698). The material shall have a minimum soak CBR of 80 percent.
3.0	**Hot Mixed Asphaltic Concrete Surface Course (Class A):** The asphaltic surface course should be plant mixed, hot laid Type D (Fine Graded Surface Course) and meet the requirements specified in TXDOT Item 340.
4.0	**Concrete:** The materials and properties of concrete shall meet the applicable requirements in the ACI Manual of Concrete Practice. The concrete shall have a minimum modulus of rupture of 500 psi at 28 days. The mixture shall contain 3 to 5 percent entrained air.
5.0	**Subgrade:** The subgrade shall be stabilized with hydrated lime in accordance with TXDOT 1993 Standard Specification Item 260. The quantity of lime required should be determined after the site is stripped of the loose topsoil and the subgrade soils are exposed. It is anticipated that approximately 4 percent hydrated lime will be required; however, a greater quantity could be required if the site has been heavily fertilized. The subgrade shall be compacted to a minimum of 95 percent of the Standard Moisture-Density relation (ASTM D 698) within -2 to +3 percent of the optimum moisture content.

DESIGN REVIEW

It is recommended that the Geotechnical Engineer be retained to review the foundation plans and specifications to verify that the recommendations contained in this report have been interpreted as intended.

CONSTRUCTION MONITORING

The recommendations are based on the laboratory and engineering analysis of the samples taken in the soil test borings. Should any subsurface conditions other than those described in our boring logs be encountered, CEI should be immediately notified so that further exploration and supplemental recommendations can be provided.

It is recommended that the foundation excavations be reviewed under the supervision of the Geotechnical Engineer to verify that the bearing soils are similar to those encountered in the borings and that the bearing area is properly prepared before placing concrete.

LIMITATIONS

This study was performed in accordance with accepted geotechnical engineering practice for the exclusive use of Pharr Bridge Business Park and their clients and consultants in preparation of the foundation drawings and specifications for the proposed Building at the Pharr Bridge Business Park in Pharr, Texas and as described in this report. Verification of

the subsurface conditions for purposes of determining difficulty of excavation, dewatering, trench retention parameters, trafficability, etc., is the responsibility of others specializing in those areas or beyond the scope of our services for this project.

In the event that any changes in the nature, design or location of the structure are made from those assumed herein, the conclusions and recommendations contained in this report shall not be considered valid until the changes are reviewed and the conclusions are verified in writing.

Because changes in surface, subsurface and climatic conditions as well as economic fluctuations can occur with time, and from site to site, we recommend for our mutual interest that the use of this report be restricted to this specific project.

During the course of preparing the final contract documents, the plans and specifications, if additions or changes are made, we recommend that our office be contacted in order that we may review such changes in light of the recommendations contained herein.

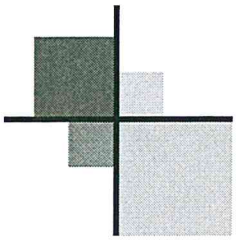
The scope of our services did not include an environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface

water, groundwater or air, on or below or around this site. A separate environmental assessment should be conducted to address any environmental concerns.

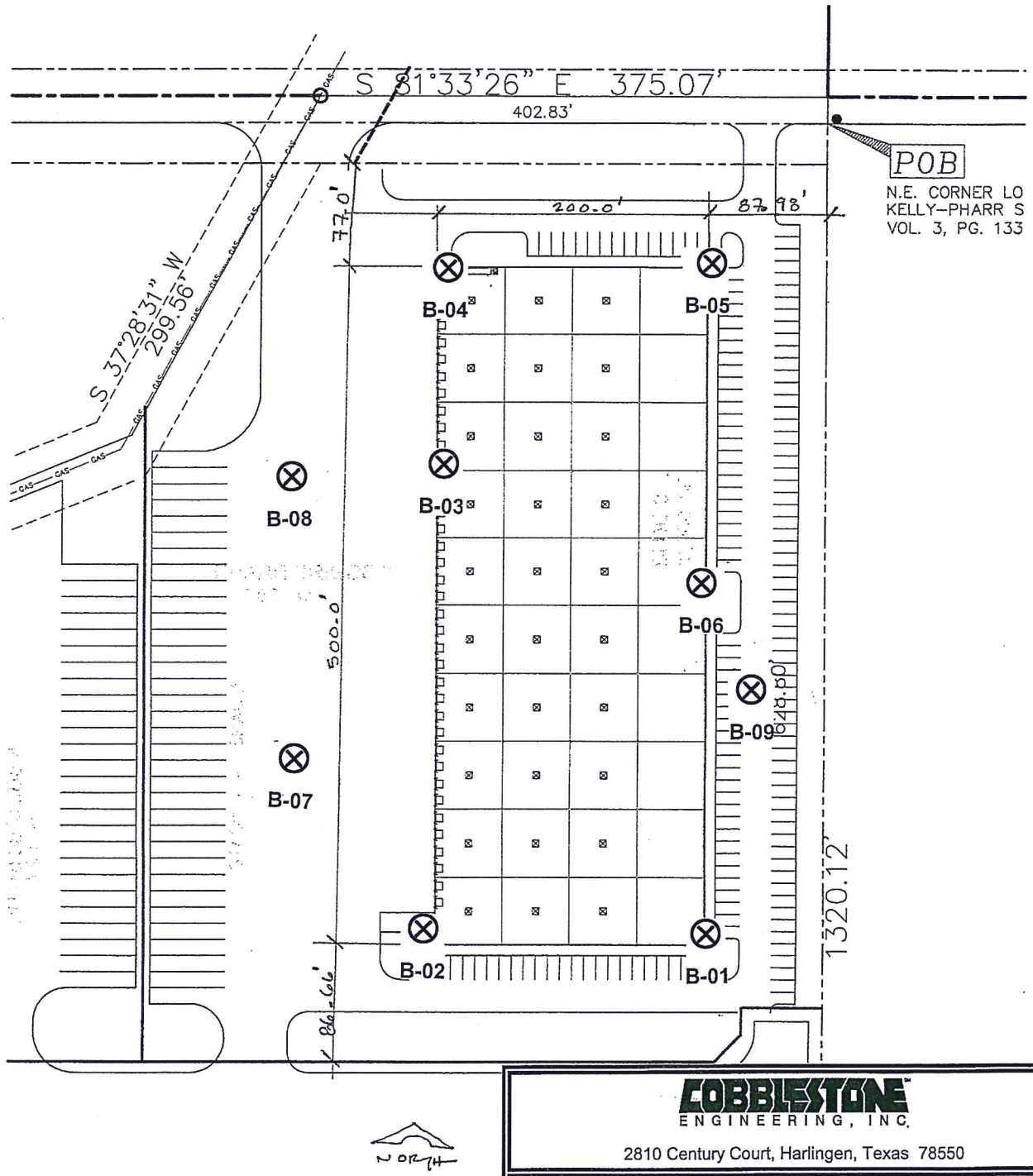
It is our understanding that the time frame for beginning and completing the foundation and site work for this project will be continuous without interruption or delay. Should serious interruptions or delays occur, our office should be kept appraised to determine what recommendations must be modified accordingly.

We have performed the test borings and laboratory testing for our evaluation of the site conditions and for the formulation of the conclusions and recommendations of this report. We assume no responsibility for the interpretation or extrapolation of the data by others.

The earthwork recommendations of this report presume that the earthwork will be monitored continuously by an Engineering Technician under the direction of a Licensed Professional Geotechnical Engineer. We recommend that the Owner contract these services directly with CEI.



APPENDIX



COBBLESTONE ENGINEERING, INC.

2810 Century Court, Harlingen, Texas 78550

SITE PLAN

Pharr Bridge Business Park Bldg.

Pharr, Texas

Scale:	Date:	Project No.:
Not To Scale	June 2013	13-115.GE

LOG OF BORING B-01

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was encountered at a depth of 13.5 feet during the drilling operations.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				20									Very stiff, moist, dark brown **CLAY**
				22	64	22	42	103	1.73	8.8	0		- becomes stiff at 2'
	5			24									
				23	44	22	22	99	1.25	8.8	7		Stiff, moist, brown **SILTY CLAY**witrh clay seams and layers
				26									
	10												
			N=10	28									
	15												
			N=32	25									- becomes hard at 18.5'
	20												Boring terminated at 20'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

LOG OF BORING B-02

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was encountered at a depth of 13 feet during the drilling operations.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				18									Very stiff, moist, dark brown **CLAY**
				23									- becomes stiff, color change to brown at 2'
	5			25									
				25									
				24	54	22	32	97	.87	8.6	9		- becomes firm at 8'
	10												Firm, moist, brown **SILTY CLAY** with clay seams and layers
			N=12	27									- becomes stiff at 13.5'
	15												
			N=33	19									- becomes hard at 18.5'
	20												Boring terminated at 20'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

LOG OF BORING B-03

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was encountered at a depth of 12.5 feet during the drilling operations.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	PLASTIC LIMIT PL	PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				19									Very stiff, moist, dark brown **CLAY**
				23									- becomes stiff, color change to brown at 2'
	5			25									
				25									
				24									Firm, moist, brown **SILTY CLAY** with clay seams and layers
	10												
			N=9	25	46	20	26						- becomes stiff at 13.5'
	15												
			N=24	26									- becomes very stiff at 18.5'
	20												Boring terminated at 20'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

LOG OF BORING B-04

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was encountered at a depth of 13.5 feet during the drilling operations.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				18									Very stiff, moist, dark brown **CLAY**
				22									- becomes stiff, color change to brown at 2'
	5			23	62	24	38	100	1.71	8.3	0		
				24									
				25									Stiff, moist brown **SILTY CLAY** with clay seams and layers
	10												
			B=13	26									
	15												
			B=34	25									- becomes hard at 18.5'
	20												Boring terminated at 20'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

CEIROCKLOG 13-115GE.GPJ ATTEBERG - PROCTOR.GDT 6/4/13

LOG OF BORING B-05

SHEET 1 of 1

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was encountered at a depth of 13 feet during the drilling operations.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	 PLASTIC LIMIT PL	 PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				21									Very stiff, moist dark brown **CLAY**
				22									
	5			21									- becomes stiff, color change to brown at 4'
				26									- becomes firm at 6'
				30	36	18	18						Firm, moist brown **SILTY CLAY** with clay seams and layers
	10												
			N=14	29									- becomes stiff at 13.5'
	15												
			N=42	28									- becomes hard at 18.5'
	20												Boring terminated at 20'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

CEIROCKLOG 13-115GE.GPJ ATTEBERG - PROCTOR.GDT 6/4/13

LOG OF BORING B-06

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was encountered at a depth of 13.5 feet during the drilling operations.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				17									Very stiff, moist dark brown **CLAY**
				23	60	22	38	102	1.35	8.8	0		- becomes stiff, color change to brown at 2'
	5			25									
				24									Stiff, moist, brown **SILTY CLAY** with clay seams and layers
				24									
	10												
			N=11	26									
	15												
													- becomes very stiff at 18.5'
			N=26	29									
	20												Boring terminated at 20'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

CEIROCKLOG 13-115GE.GPJ ATTEBERG - PROCTOR.GDT 6/4/13

LOG OF BORING B-07

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was not encountered during or upon completion of the drilling operations and the boring remained open for the entire depth.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				20	58	24	34						Very stiff, moist dark brown **CLAY**
				26									- becomes stiff at 2'
				25									- color change to brown at 4'
	5												Boring terminated at 5'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

LOG OF BORING B-08

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was not encountered during or upon completion of the drilling operations and the boring remained open for the entire depth.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
				18				99	3.05	7.6	0		Very stiff, moist, dark brown **CLAY**
				24									- becomes stiff, color change to brown at 2'
	5			23									Boring terminated at 5'

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

LOG OF BORING B-09

COBBLESTONE ENGINEERING, INC.
2810 Century Court Dr.
Harlingen, Texas 78550
Telephone: (956) 423-0235

CLIENT: Pharr Bridge Business Park
PROJECT: Pharr Bridge Business Park Bldg.
LOCATION: Pharr, Texas
NUMBER: 13-115.GE
DATE(S) DRILLED: 5/24/2013 - 5/24/2013

DRILLING METHOD(S):
Drilled dry with solid flight augers.

GROUNDWATER INFORMATION:
Groundwater was not encountered during or upon completion of the drilling operations and the boring remained open for the entire depth.

SURFACE ELEVATION: Existing

SOIL SYMBOL	DEPTH (FT)	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT PERCENT RECOVERY/ ROCK QUALITY DESIGNATION	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	FAILURE STRAIN (%)	CONFINING PRESSURE (POUNDS/SQ IN)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
													Stiff, moist dark brown **CLAY**
													- becomes firm, color change to brown at 2'
	5												Boring terminated at 5'

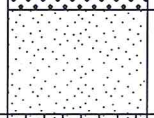
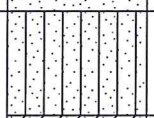
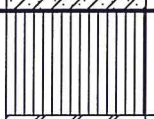
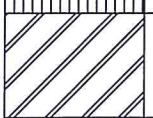
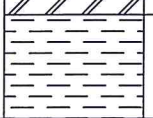
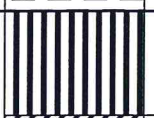
FIELD DATA | LABORATORY DATA

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE
T - POCKET TORVANE SHEAR STRENGTH

REMARKS:

CEIROCKLOG 13-115GE.GPJ ATTEBERG - PROCTOR.GDT 6/4/13

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	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
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, 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 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND 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
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS