REPORT
GEOTECHNICAL INVESTIGATION

PROPOSED RESIDENCE
LOT 6, PILGRIM ESTATES DRIVE
TEXAS CITY, TEXAS 77590

Amerikor Project No.: 18-0072

Amerikor
416 Pickering Street
Houston, Texas 77091

March 14, 2018

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416 Pickering Street, Houston, TX 77091
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March 14, 2018

Ms. Lynn Allred
6545 Sea Isle
Galveston, Texas 77554

Re: Report
Geotechnical Investigation
Proposed Residence
Lot 6, Pilgrim Estates Drive
Texas City, Texas 77590

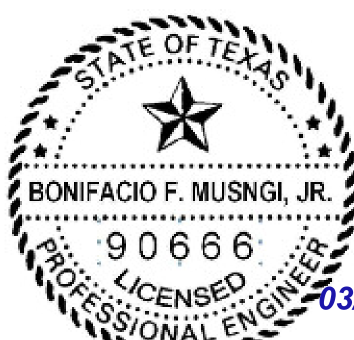
Amerikor Project No.: 18-0072

Dear Ms. Allred:

Amerikor is pleased to transmit our report of the geotechnical investigation for the above referenced project. This report includes the results of field and laboratory testing and geotechnical recommendations pertaining to the proposed project.

We appreciate the opportunity to perform this geotechnical investigation and look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report or if we may be of further service, please contact me at your convenience.

Respectfully submitted,
Amerikor/HTS, Inc. Consultants



03/14/2018

Bonifacio F. Musngi, Jr, P.E.
Senior Engineer

HTS, Inc. Consultants
F-3478

BFM/bfm

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HTS, INC. Consultants

REPORT
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENCE
LOT 6, PILGRIM ESTATES DRIVE
TEXAS CITY, TEXAS 77590

PREPARED FOR:

Ms. Lynn Allred
6545 Sea Isle
Galveston, Texas 77554

PREPARED BY:

Amerikor
416 Pickering Street
Houston, Texas 77091

Amerikor Project No.: 18-0072

March 14, 2018

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PROPOSED RESIDENCE
LOT 6, PILGRIM ESTATES DRIVE
TEXAS CITY, TEXAS 77590

1.0 INTRODUCTION AND SUMMARY

1.1 Introduction

This report presents the results of a geotechnical investigation pertaining to the proposed new residence that will be constructed at Lot 6, Pilgrim Estates Drive in Texas City, Texas. The area for the proposed residential development project has a relatively flat terrain that is covered with grasses. The site location for the proposed development is shown in Figures 1 and 2.

The purpose of this geotechnical investigation was to define subsoil and groundwater conditions within the project area and provide recommendations concerning the design and construction of the proposed residential building.

This geotechnical investigation was performed by Amerikor for Ms. Lynn Allred in accordance with a verbal authorization on or about March 2, 2018.

The scope of work for this geotechnical investigation consisted of:

- drilling and sampling a total of 3 geotechnical borings to depths of 15 and 20 feet beneath the surface (Boring Nos. B-1 and B-2 for the building area and Boring No. B-3 for the pool area) within the project area as shown in Figure 2,
- performing field tests and recovering relatively undisturbed soil samples,
- measuring the depth to groundwater in the geotechnical borings during drilling and after the completion of drilling,
- backfilling the borings with soil cuttings after drilling activities were complete,
- visually classifying samples obtained and conducting laboratory tests to determine the physical and mechanical properties of the soils,
- analyzing the field and laboratory test data,
- preparing boring logs based on visual soil classifications and the results of laboratory tests,

- performing potential vertical rise, bearing capacity, and settlement analyses for foundations which may be used to support the proposed residential building,

- performing engineering analyses for the purpose of developing and providing:
  a) site preparation requirements for the proposed building, and
  b) recommendations pertaining to foundation and floor slab design and construction, and

- submitting 1 bound copy and a pdf file of the geotechnical investigation report.

1.2 Summary of Findings

The pertinent findings of this geotechnical investigation that pertains to the design and construction of the proposed residential building are provided below.

1.2.1 Subsurface Soil Strata

The subsurface soil conditions as determined from the drilling of the geotechnical borings are provided on the boring logs (Boring Nos.B-1 through B-3) as presented in the Appendix.

Data from the 3 geotechnical borings drilled for this study suggest that the upper 20 feet of subsurface soils within the project area are generally composed of 1 soil layer as described below.

Layer	Depth * (ft)	Soil Description
I	0 - 20	Gray, brown, reddish brown, and yellowish brown FAT CLAY (CH), firm to very stiff.

* Measured below ground surface

Laboratory testing was performed on selected samples of the subsurface materials obtained to classify the soils in accordance with ASTM D 2487 and to define the engineering properties of the soils. Portions of the test results indicating the high and low values of specific testing are provided in the table below:

LAYER	DEPTH (FT)	LIQUID LIMIT (%)		PLASTICITY INDEX (%)		MOISTURE CONTENT (%)		PASSING NO. 200 SIEVE (%)		COMPRESSIVE STRENGTH (TSF)	
		HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW
I	0 - 20	84	51	61	30	36.1	20.7	91.9	85.9	2.0	1.1

1.2.2 Groundwater Condition

Groundwater was not encountered during the drilling of the borings. The borings were backfilled with soil cuttings after the completion of the drilling activities.

1.2.3 Shrink/Swell Potential

The clayey soils within the project area are classified as having a high to very high plasticity and potential for vertical movement (shrink/swell). The maximum potential vertical rise (PVR) of the upper 8 feet of the site soils, based on worst case soil moisture condition, is about **3.5 inches** under a 144 psf [1 pound per square inch (psi)] restraining load. The potential vertical rise analyses were performed by using the Texas Department of Transportation (TxDOT) Test Method Tex-124-E and the results of laboratory index tests.

1.3 Summary of Recommendations

Recommendations are provided below pertaining to the design and construction of the foundations for the proposed residential building.

1.3.1 Recommended Site and Subgrade Preparation Requirements – Proposed Building

These recommendations pertain to site preparation in the area of the proposed building. It is recommended that site preparation be performed by:

- establishing site drainage and installing storm water drainage structures, if required,

- stripping vegetation and organic topsoil to a depth of at least 6 inches and as necessary to achieve the desired grade, as applicable,

- proofrolling the exposed subgrade soils with a 15-ton roller or other equivalent suitable equipment as approved by the engineer, observing the soils during proofrolling so as to detect any wet, soft, loose, or unstable soils and treating such soils with suitable drying or stabilizing agents or removing the unsuitable soils and replacing with properly compacted select fill,

- compacting the exposed subgrade soils to an in-place dry density equal to at least 95% of the maximum standard dry density (ASTM D 698) at a moisture content within ± 2% of the optimum moisture content, and

- placing properly compacted select fill as necessary to achieve the desired grade elevation.

Select fill should consist of inactive lean clays with a maximum liquid limit of 35 and a plasticity index range of 8 to 20. The select fill should be placed in 8-inch thick loose lifts (6-inch compacted lifts) and compacted to an in-place dry density equal to at least 95% of the maximum standard dry density (ASTM D 698) at a moisture content within ± 2% of the optimum moisture content.

Depending upon weather conditions, difficulty may be encountered in adequately densifying/compacting the surficial site soils. If the surficial clays/silts are unsuitably wet, excess pore pressures ("pumping") may develop and excess displacement of the subgrade soils may occur during site preparation. If the site subgrade soils become unsuitably wet, the construction contractor should:

- bring the subgrade soils to within ± 2% of the optimum moisture content by discing these materials, or

- dry the soils by blending a stabilizing agent (lime or fly ash) with the unsuitably wet soils, or

- remove the unsuitably wet soils and replace with properly compacted select fill having an acceptable moisture content.

1.3.2 Recommended Foundation Types and Allowable Loadings – Proposed Building

After the site has been properly prepared as previously discussed, foundation systems provided below may be used to support the building loads.

Foundation System - Drilled Underreamed Pier Foundation

Drilled underreamed piers and grade beams may be used to support the proposed building loads as described below. The floor may consist of slab-on-grade floor with site preparation as previously discussed in Section 1.3.1 of this report. Foundation recommendations pertaining to the proposed building columns, walls, grade beams, and floor are provided below.

- **Building Columns and Walls - Drilled Piers**
  The loads of the proposed residential building may be supported on drilled underreamed piers. Underreamed drilled piers may be founded at a depth of at least 13 feet beneath the existing grade or at least 13 feet beneath finished grade. The underreamed drilled piers (maximum pier bell diameter of 4 feet) should be designed for maximum net allowable bearing pressures of 3,000 psf for axial compression dead loads plus sustained live loads and 4,500 psf for axial compression dead loads plus sustained and transient live loads.

The center-to-center spacing of the drilled piers should be equal to a minimum of 1.3 times the average drilled pier bell diameter of adjacent drilled piers. Should piers be located closer than 1.3 bell diameters, measured edge-to-edge, a reduction in the allowable net bearing pressures will be required. Amerikor should be notified for further evaluation in order to determine the appropriate reduction values.

Allowable shaft friction in compression and tension for the portions of the drilled pier shafts below a depth of 5 feet beneath finished grade is 350 psf. The ultimate shaft friction which could be exerted against the drilled pier shafts as a result of swelling soils is about 900 psf.

Drilled piers should be belled in order to provide resistance against pullout forces which may be exerted on the drilled pier shafts by swelling soils.

The uplift capacity of drilled and underreamed piers can be determined from the following semi-empirical relationships:

For H/D greater than 1.5:

$$Qu = 5.8c\,(D^2 - d^2) \qquad \text{(Equation 1)}$$

For H/D less than 1.5:

$$Qu = 2.1c^{0.5}\,(H/D)^2\,(D^2 - d^2) \qquad \text{(Equation 2)}$$

or Equation 1, whichever is less

Where: Qu = *ultimate uplift capacity, tons*
c = *cohesion, tsf (use 0.65 tsf)*
D = *diameter of underream or bell, ft.*
d = *diameter of shaft, ft.*
H = *depth to base of bell below ground surface, ft.*

Use a factor of safety of 2.0 to obtain the allowable uplift capacity.

Caving of pier bell excavations may occur during construction of drilled piers. The adverse effects of pier bell excavation caving can be limited by:

- the designer using a maximum bell-to-shaft diameter ratio of 3,
- the designer minimizing pier bell diameters, and
- the construction contractor minimizing the time between the completion of pier bell under-reaming and concrete placement.

A trial pier may be constructed prior to construction to assure that the pier bell excavations will remain open and free from debris due to sloughing and/or caving.

For cases where drilled pier excavations cave so rapidly that concrete cannot be placed quickly enough to allow construction of the piers, it will be necessary to use casing to maintain an open drilled pier excavation or consider the use of drilled straight shafts.

Use of the above recommended allowable net foundation bearing pressures provide for:

- a safety factor of at least 3.0 against a drilled pier bearing failure under axial compression dead loads plus sustained live loads,

- a safety factor of at least 2.0 against a drilled pier bearing failure under axial compression dead loads plus sustained and transient live loads, and

- a maximum total settlement of the drilled piers of less than 1 inch and a maximum differential settlement of the drilled piers of 0.5 inch, assuming a maximum pier bell diameter of 4 feet.

- **Grade Beams**
  Grade beams should be at least 12 inches wide, extend at least 1.5 feet below finished grade, and be founded on drilled piers. When the required thickness of select fill is placed for a slab-on-grade floor, carton forms to create a void beneath the grade beams and the subgrade soils are not required. Grade beams may be formed directly on the properly prepared building pad soils.

- **Slab-on-Grade Floor**
  The floor for the proposed residential building may consist of a slab-on-grade floor placed over at least **5.5 feet** of properly compacted select fill prepared in accordance with site preparation as described in Section 1.3.1 of this report. An allowable net bearing pressure of 600 psf can be used for slab-on-grade bearing on properly compacted select fill. The select fill soils should be placed and extend at least eight (8) feet beyond the perimeters of the foundation. It is suggested that cushion sand (leveling sand) not be placed within the area of the slab-on-grade floor. If cushion sand becomes wet, erosion, and/or settling of the sand may occur which can result in the formation of voids beneath the floor and associated structural distress.

- **Structural Floor in-lieu of Slab-on-Grade Floor**
  In lieu of the use of a slab-on-grade floor system and placement of at least 5.5 feet of select fill soil, a floor placed over void boxes or an elevated floor system (structural floor system) may be considered where the floor is not affected by shrinking/swelling of the subsoils beneath the floor. The loads of these floor systems are supported on grade beams (with at least 6 inch void underneath) or structural beams (with at least 6 inch void underneath) that are supported on drilled piers.

Foundation System - Continuous Footing/Grade Beam Foundation
Provided the site and subgrade preparation recommendations provided in Section 1.3.1 of this report are followed and at least **5.5 feet** of properly compacted select fill is placed over the foundation area and to a distance of at least eight (8) feet beyond the perimeters of the foundation, it is our opinion that the planned building construction can also be supported on a conventional continuous footing and/or grade beam foundation system. Foundations bearing on the properly compacted select fill soil should be placed at least two (2) feet below finished grade and be designed for a net allowable bearing pressure of 2,000 psf for dead load plus sustained live loads and 3,000 psf for dead loads plus sustained and transient live loads, whichever results in a larger bearing area. These values consider a safety factor of at least 3 and 2, respectively, against a bearing capacity failure.

Footing foundations should be prepared by excavating the overburden soils to the final foundation grade elevation, compacting the foundation subgrade soils to an in-place dry density equal to at least 95% of the maximum dry density at a moisture content within ± 2% of the optimum moisture content as determined by ASTM D 698. A tamping plate hand compactor or other suitable impact compactor should be used to perform the compaction. Without proper compaction of the spread footing/grade beam foundation soils, settlement of the shallow spread/grade beam footings could exceed 1 inch.

After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, they should be protected to minimize evaporation or entry of moisture.

- **Slab-on-Grade Floor**
  The floor for the proposed building may consist of a slab-on-grade floor with site preparation performed as described above in Section 1.3.1 of this report. An allowable net bearing pressure of 600 psf can be used

for slab-on-grade bearing on properly compacted select fill. It is suggested that cushion sand (leveling sand) not be placed within the area of the slab-on-grade floor. If cushion sand becomes wet, erosion, and/or settling of the sand may occur which can result in the formation of voids beneath the floor and associated structural distress.

Foundation System - Shallow Spread Footing Foundation - Provided the site and subgrade preparation recommendations provided in Section 1.3.1 of this report are followed and at least **5.5 feet** of properly compacted select fill is placed over the foundation area and to a distance of at least eight (8) feet beyond the perimeters of the foundation, it is our opinion that the planned building construction can also be supported by shallow spread footings. The shallow spread footings should be a maximum of 5-ft square, be founded at a depth of at least 3.0 feet below the desired finished grade and be designed for maximum allowable net bearing pressures of 2,400 psf for axial compression dead loads plus sustained loads and 3,600 psf for axial compression dead loads plus sustained and transient live loads.

If a cluster of closely spaced footings (i.e., if the center to center spacing of the footings is less than two times the width of the footing) are planned, Amerikor should be contacted to calculate the amount of settlement.

Footing foundations should be prepared by excavating the overburden soils to the final foundation grade elevation, compacting the foundation subgrade soils to an in-place dry density equal to at least 95% of the maximum dry density at a moisture content within ± 2% of the optimum moisture content as determined by ASTM D 698. A tamping plate hand compactor or other suitable impact compactor should be used to perform the compaction. Without proper compaction of the spread footing/grade beam foundation soils, settlement of the shallow spread/grade beam footings could exceed 1 inch.

After opening, footing excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. The foundation concrete should be placed during the same day the excavation is made. If it is required that footing excavations be left open for more than one day, they should be protected to minimize evaporation or entry of moisture.

- **Grade Beams**
  Grade beams should be at least 12 inches wide, extend at least 1.5 feet below finished grade, and be founded on drilled piers. When the required thickness of select fill is placed for a slab-on-grade floor, carton forms to create a void beneath the grade beams and the

subgrade soils are not required. Grade beams may be formed directly on the subgrade soils.

- **Slab-on-Grade Floor**
  The floor for the proposed building may consist of a slab-on-grade floor with site preparation performed as described above in Section 1.3.1 of this report. An allowable net bearing pressure of 600 psf can be used for slab-on-grade bearing on properly compacted select fill. It is suggested that cushion sand (leveling sand) not be placed within the area of the slab-on-grade floor. If cushion sand becomes wet, erosion, and/or settling of the sand may occur which can result in the formation of voids beneath the floor and associated structural distress.

Foundation System - Post-Tensioned Slab Foundation – The loads of the proposed residential building may also be supported on a post-tensioned slab founded on at least **2.0 feet** of properly compacted select fill soil prepared in accordance with Section 1.3.1 of this report. The select fill should be placed over the foundation area and to a distance of at least six (6) feet beyond the perimeters of the foundation. Provided below are the parameters for the design of post-tensioned slab-on-grade in accordance with the Post Tensioning Institute (PTI) requirements and guidelines as contained in the Third Edition of the PTI's 2004 publication entitled "Design and Construction of Post-Tensioned Slabs-on-Ground".

DESIGN PARAMETERS	
Allowable Net Bearing Pressure (Total Load)	2,000 psf *
Unconfined Compressive Strength	1,800 psf
Predominant Clay Mineral	Montmorillonite
Percent Fine Clay	60 %**
Thornwaite Moisture Index (I_m)	+ 18
Depth of Constant Soil Suction	9 feet
Constant Soil Suction	3.5 pF
Edge Moisture Variation Distance (e_m) Center Lift Edge Lift	 8.8 feet 4.9 feet
Differential Soil Movement (y_m) Center Lift Edge Lift	 1.13 inches 0.89 inch

DESIGN PARAMETERS	
Slab-Subgrade Coefficient of Friction (μ)	0.6 to 0.7
Effective Plasticity Index	48

* Provided the recommendations in Section 1.3.1 of this report are followed.
** Estimated value.

The PTI methods for design of slab-on-grade foundations are essentially empirical design techniques and the parameters provided above are based on our interpretation of the soil borings, laboratory test results, and the criteria published in the PTI design manuals.

We recommend that the grade beams extend to a depth based on structural design and considerations. The grade beam width and depth should be properly evaluated by the structural engineer. Grade beams may be thickened and widened to serve as spread footings at concentrated load areas.

At the bearing pressure indicated, post construction settlements for the slab foundations described in this addendum should be less than 1 inch, assuming proper construction. Settlement response of slabs may be influenced more by quality of construction than by soil-structure interaction.

2.0 FIELD INVESTIGATION

For this geotechnical study, a total of 3 geotechnical borings (Boring Nos. B-1 through B-3) were drilled and sampled on March 6, 2018 at the locations shown in Figure 2. The boring locations were selected/ staked in the field by a representative of Amerikor. Drilling, sampling, and testing were performed in accordance with applicable ASTM standards and methods by using a drill rig mounted on a truck-mounted drill rig and conventional auger drilling methods.

Soil sampling during the drilling of the geotechnical borings consisted of continuous sampling to 12 feet and intermittent sampling thereafter, with relatively undisturbed samples being obtained.

Relatively undisturbed samples were obtained by hydraulically forcing sections of 3-inch outside diameter (O.D.) tubing (Shelby tube) into the subsoils. The tube samples were extruded in the field, sealed with foil, and placed into airtight plastic bags. Estimates of the unconfined compressive strengths and undrained shear strengths of the cohesive soils were obtained with pocket penetrometer readings being taken on the tube samples.

The soil samples were visually classified in accordance with ASTM D 2488 standards and methods. All samples were transported to AmeriKor's laboratory for purposes of performing laboratory tests on selected samples.

3.0 LABORATORY TESTING

For the current geotechnical study, a laboratory testing program was conducted to obtain engineering properties for use in performing engineering analyses and to adjust field soil classifications. The following laboratory tests were performed:

LABORATORY TEST	TEST STANDARD
Moisture Content of Soils	ASTM D 2216
Moisture Content and In Situ Dry Density of Soils	ASTM D 2937
Percent Soil Particles Passing a No. 200 Sieve	ASTM D 1140
Liquid Limit, Plastic Limit, and Plasticity Index of Soils	ASTM D 4318
Unconfined Compressive Strength of Cohesive Soils	ASTM D 2166

The number of tests and the test results are presented on the boring logs provided in Appendix A. All tests were performed in accordance with applicable ASTM procedures and methods and soil classifications were completed in accordance with the procedures and guidelines of ASTM D 2487 and ASTM D 2488.

4.0 SUBSURFACE CONDITIONS

4.1 Subsoils

The subsurface soil conditions as determined from the drilling of the geotechnical borings are provided in:

- Section 1.2.1 of this report, and
- the boring logs in the Appendix.

The boring logs were prepared by using both field visual classifications and the results of laboratory testing. The stratification lines shown on the boring logs represent the approximate boundaries between soil types and the transitions between soil types may be gradual.

4.2 Groundwater

Groundwater conditions are described in Section 1.2.2 of this report and on the boring logs provided in the Appendix. The depth to ground water was obtained by observing the drilling operations and the free moisture contained in the samples recovered during drilling and determining presence or absence of water during drilling and after the completion of drilling.

Groundwater was not encountered during the drilling of the borings. It is possible that seasonal variations will cause fluctuations in the water level data measured at the time of our field investigation. We recommend that the contractor determine the actual groundwater level at the site at the time of construction in order to assess the impact, if any, of the groundwater to the construction activities including the pool construction. It should be noted that recommendations contained in this report are based on groundwater depths at the time of this geotechnical investigation and that an accurate determination of the true groundwater level may require several days or even months of observations.

5.0 CONSTRUCTION CONSIDERATIONS

The following recommendations should be followed with regard to construction of the proposed residential building:

5.1 Foundation Construction

- Excavations for foundations should be clean and free of all loose materials prior to the placement of concrete. Concrete should be placed at the foundation areas immediately upon forming, reinforcing steel placement, cleaning, and inspection.

- Fill material and fill compaction should comply with the recommendations provided in Section 1.3 of this report.

- To facilitate cleaning and inspection of belled piers, it is suggested that drilled pier shafts have a minimum diameter of 24 inches.
- Concrete should have a 4 to 6-inch slump and be placed in 1 continuous placement.

- Concrete may be allowed to drop freely in dry drilled pier excavations containing 1 inch or less of water.

- Drilled piers with more than 1 inch of water in the bottom should be filled with concrete by the tremie method of concrete placement. Concrete should not fall against the steel reinforcing or the shaft sides.

- If casing is required, the casing should be removed as concrete is being placed. The casing should be removed in a manner that precludes the surrounding soil from invading the fresh concrete. This requires a vertical, smooth removal of the casing while maintaining the bottom of the casing below the top of the concrete a distance sufficient enough to offset the surrounding material pressure.

- Construction operations should be monitored by a qualified representative of the soil engineer.

- Materials testing should be performed so as to assure that acceptable materials and construction methods are provided by the contractor.

5.2 Surface Drainage

The following drainage precautions should be observed during construction and maintained at all times after construction has been completed:

- The ground surface surrounding the exterior of the structures should be provided with erosion protection and sloped to drain away from the structures in all directions. We recommend a minimum slope of 6 inches in the first 10 feet.

- Roof downspouts and drains should discharge beyond the limits of the edges of the foundations and be channeled to drain immediately away from the foundations.

- Excessive wetting or drying of foundations should be avoided. Trees and other vegetation capable of withdrawing significant amounts of moisture from the subsoils should be located a distance from the nearest foundation equal to at least the expected ultimate extent of the vegetation root system, or appropriate moisture barriers should be provided.

6.0 CLOSING REMARKS

Amerikor has performed a geotechnical investigation and provided recommendations pertaining to the design and construction of the proposed residential building that will be constructed at Lot 6, Pilgrim Estates Drive in Texas City, Texas. This report has been prepared for the exclusive use of Ms. Lynn Allred and her authorized representatives in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

In the event that changes are made in the nature, design, or location of the proposed project, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the findings/recommendations of this report are modified or verified in writing. The analyses and recommendations presented in this report are based upon data obtained from 3 geotechnical borings drilled on March 6, 2018. The nature and extent of variations within the subsurface materials may not become evident until after construction is initiated. If significant variations in the subsurface materials are encountered during construction, it may be necessary to re-evaluate the recommendations provided in this report.

FIGURES

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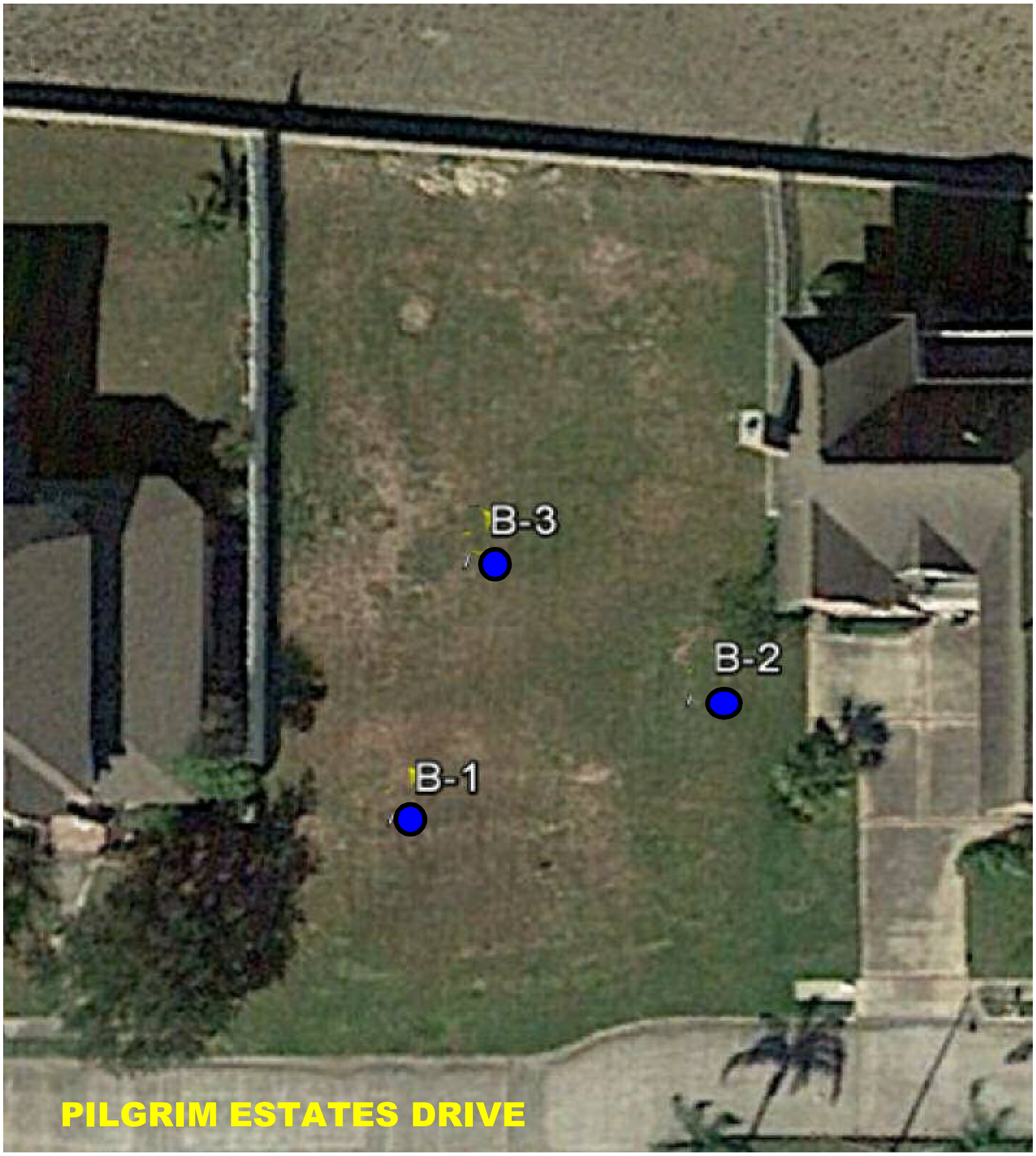
PROPOSED RESIDENCE
LOT 6, PILGRIM ESTATES DRIVE
TEXAS CITY, TEXAS 77590

SITE LOCATION

Date: 03/12/18	Project No: 18-0072	Plate 1



- Geotechnical borings included in the study

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PROPOSED RESIDENCE
LOT 6, PILGRIM ESTATES DRIVE
TEXAS CITY, TEXAS 77590

LOCATIONS OF BORINGS

Date: 03/12/18	Project No: 18-0072	Plate 2

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APPENDIX

BORING LOGS

(Boring Nos. B-1 through B-3)

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LOG OF BORING

PROJECT:	**Proposed Residence** **Lot No. 6, Pilgrim Estates Drive**	BORING NO.:	**B-1**
		BORING LOCATION:	**See Figure 2**
		BORING TYPE:	**Auger**
PROJECT LOCATION:	**Texas City, Texas 77590**	APPROX. ELEVATION:	**NA** ft-MSL
		PROJECT NO.:	**18-0072**
CLIENT:	**Ms. Lynn Allred**	DATE:	**March 6, 2018**

DEPTH, FT.	SAMPLE	SOIL TYPE	DESCRIPTION OF STRATUM	HAND PEN. READING(TSF)	SPT BLOWS (PER 6")	MOISTURE CONTENT, %	ATTERBERG LIMITS (%)			PASS #200 SIEVE, %	DRY DENSITY (PCF)	COMPRESSIVE STRENGTH (TSF)
							LL	PL	PI			
1			**FAT CLAY (CH)**, stiff to very stiff, gray, brown, and reddish brown	1.50		22.7	51	21	30	86.7		
2												
3				1.50		36.1						
4			- gray and dark brown at 4'									
5				2.00		32.4					90.6	1.10
6			- gray, reddish brown, and yellowish brown at 6'									
7				2.00		31.0	75	22	53	91.9		
8			- gray and brown at 8'									
9				2.50		26.9						
10												
11				3.00		26.3	83	23	60			
12												
13												
14				3.00		30.1					96.2	1.90
15			15'									

(Boring terminated at 15')

GPS Location of boring: **N 29° 25' 19.03" at W 94° 55' 56.65"**

DRILLING CONTRACTOR: **Amerikor** LOGGER: **David Aburahma**

Groundwater was not encountered during drilling. The boring was backfilled w/ soil cuttings after the completion of the drilling activities.

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LOG OF BORING

PROJECT: **Proposed Residence**
Lot No. 6, Pilgrim Estates Drive

PROJECT LOCATION: **Texas City, Texas 77590**

CLIENT: **Ms. Lynn Allred**

BORING NO.: **B-2**
BORING LOCATION: **See Figure 2**
BORING TYPE: **Auger**
APPROX. ELEVATION: **NA** ft-MSL
PROJECT NO.: **18-0072**
DATE: **March 6, 2018**

DEPTH, FT.	SAMPLE	SOIL TYPE	DESCRIPTION OF STRATUM	HAND PEN. READING(TSF)	SPT BLOWS (PER 6")	MOISTURE CONTENT, %	ATTERBERG LIMITS (%) LL	PL	PI	PASS #200 SIEVE, %	DRY DENSITY (PCF)	COMPRESSIVE STRENGTH (TSF)
1			**FAT CLAY (CH)**, stiff to very stiff, gray and brown	2.00		30.3						
2												
3			- gray and dark brown at 2'	1.50		20.7	52	21	31	86.9		
4												
5			- gray and brown at 4'	2.00		28.0						
6												
7				3.50		23.0					106.0	2.00
8			- gray, brown, and yellowish brown at 8'									
9				2.00		24.8	76	23	53	85.9		
10			- yellowish brown at 10'									
11				2.00		27.9	87	23	64			
12												
13												
14				3.00		27.0					101.7	1.10
15												
16												
17												
18												
19				2.50		26.0						
20			20'									

(Boring terminated at 20')

GPS Location of boring: **N 29° 25' 19.03" at W 94° 55' 56.65"**

DRILLING CONTRACTOR: **Amerikor** LOGGER: **David Aburahma**

Groundwater was not encountered during drilling. The boring was backfilled w/ soil cuttings after the completion of the drilling activities.

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AmeriKōr
www.amerikor.net

LOG OF BORING

PROJECT: **Proposed Residence**
Lot No. 6, Pilgrim Estates Drive

PROJECT LOCATION: **Texas City, Texas 77590**

CLIENT: **Ms. Lynn Allred**

BORING NO.: **B-3**
BORING LOCATION: **See Figure 2**
BORING TYPE: **Auger**
APPROX. ELEVATION: **NA** ft-MSL
PROJECT NO.: **18-0072**
DATE: **March 6, 2018**

DEPTH, FT.	SAMPLE	SOIL TYPE	DESCRIPTION OF STRATUM	HAND PEN. READING(TSF)	SPT BLOWS (PER 6")	MOISTURE CONTENT, %	ATTERBERG LIMITS (%) LL	PL	PI	PASS #200 SIEVE, %	DRY DENSITY (PCF)	COMPRESSIVE STRENGTH (TSF)
1			**FAT CLAY (CH)**, firm to very stiff, gray and brown	1.00		23.2	53	20	33	88.2		
2			- gray, brown, and yellowish brown at 2'									
3				1.50		20.7						
4			- gray and dark brown at 4'									
5				1.50		30.9	80	22	58	90.6		
6			- yellowish brown at 6'									
7				2.00		29.7						
8			- gray, brown, and yellowish brown at 8'									
9				2.00		27.4	84	23	61			
10												
11				2.00		27.9						
12												
13												
14				3.50		33.3					96.4	1.30
15			15'									

(Boring terminated at 15')

GPS Location of boring: **N 29° 25' 19.03" at W 94° 55' 56.65"**

DRILLING CONTRACTOR: **Amerikor**

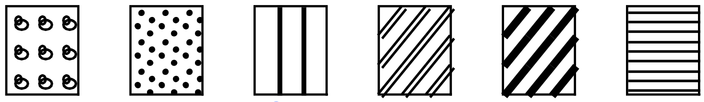
LOGGER: **David Aburahma**

Groundwater was not encountered during drilling. The boring was backfilled w/ soil cuttings after the completion of the drilling activities.

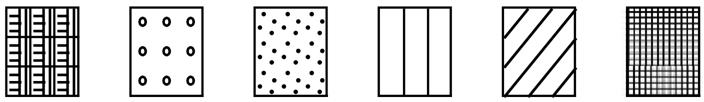
HTS, INC. Consultants

KEY TO TERMS AND SYMBOLS USED ON BORING LOGS

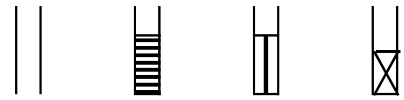
SOIL TYPE

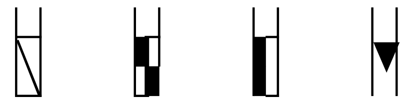


MODIFIERS

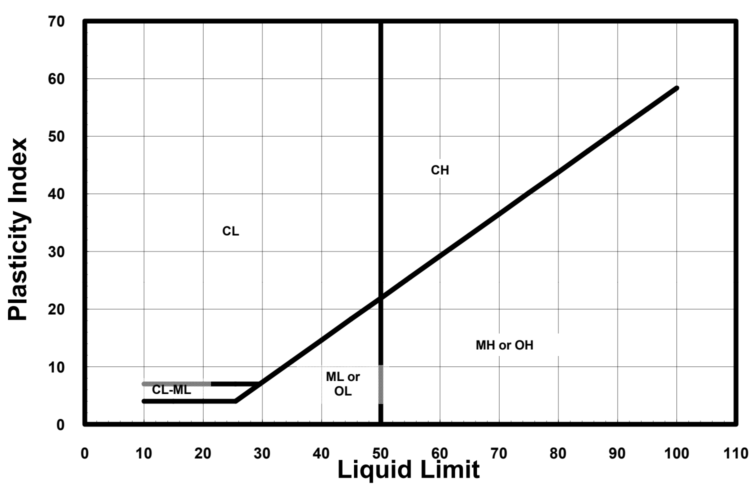


SAMPLER TYPE





UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D 2487



CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	SHEAR STRENGTH (Tons/ft^2)
Very Soft	0 - 0.125
Soft	0.125 - 0.25
Firm	0.25 - 0.5
Stiff	0.5 - 1.0
Very Stiff	1.0 - 2.0
Hard	> 2.0 or 2.0+

RELATIVE DENSITY - GRANULAR SOILS

CONSISTENCY	N-VALUE (Blows/Foot)
Very Loose	O - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50 or 50+

DEGREE OF PLASTICITY OF FINE-GRAINED SOILS

DEGREE OF PLASTICITY	PLASTICITY INDEX	SWELL POTENTIAL
None	0 - 4	Low
Slight	5 - 10	Low
Medium	11 - 20	Low to Medium
High	21 - 40	Medium to High
Very High	> 40	Very High

MOISTURE CONDITION COHESIVE SOILS

DESCRIPTION	CONDITION
Absence of moisture, dusty, dry to touch	DRY
Damp but no visible water	MOIST
Visible free water	WET

CONSISTENCY OF COHESIVE SOILS AFTER TERZAGHI (1948)

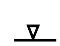
CONSISTENCY	N-VALUE (Blows/Foot)
Very Soft	< 2
Soft	2 - 4
Firm	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	> 30

ABBREVIATIONS

HP - Hand Penetrometer
TV - Torvane
MV - Miniature Vane
UC - Unconfined Compression Test
UU - Unconsolidated Undrained Triaxial Test
CU - Consolidated Undrained Triaxial Test

NOTE: Plot indicates shear strength as obtained by above tests.


Final Groundwater Level


Initial Groundwater Level

CLASSIFICATION OF GRANULAR SOILS

U.S. STANDARD SIEVE SIZE(S)

6"		3"	3/4"	4	10	40	200		
BOUL- -DERS	COBBLES	GRAVEL COARSE	GRAVEL FINE	SAND COARSE	SAND MEDIUM	SAND FINE	SILT	CLAY	
152	76.2	19.1	4.76	2.0	0.42	0.074	0.005	0.001	

GRAIN SIZE IN MM