GEOTECHNICAL ENGINEERING
DRILLING & SAMPLING
FOUNDATION DESIGN

HOLT
ENGINEERING, INC.

CONSTRUCTION INSPECTION
LABORATORY TESTING
MATERIALS TESTING

4 March 2020

Mr. Louis Corne
7320-B Colina Vista Loop
Austin, Texas 78750

Re.: Corne Residence
3350 Far View Drive
Austin, Texas

Holt File No: 02-05620

Dear Mr. Corne:

Enclosed please find one copy of our Subsurface Investigation and Foundation Recommendations Report for the above referenced project.

Should you have any questions concerning our report or if we can be of further service, please do not hesitate to call.

Sincerely,

Steve B. Johnson, P.E.
Geotechnical Division

Holt Engineering, Inc.
TBPE Firm Registration No. F-430

Enc.: Engineering Report
Invoice

2220 Barton Skyway • Austin, Texas • 78704 • Ph. (512) 447-8166 • Fax (512) 447-0852

SUBSURFACE INVESTIGATION

AND

FOUNDATION RECOMMENDATIONS

FOR

CORNE RESIDENCE

3350 FAR VIEW DRIVE

AUSTIN, TEXAS

REPORT FOR:

MR. LOUIS CORNE

7320-B COLINA VISTA LOOP

AUSTIN, TEXAS 78750

PREPARED BY:

STEVE B. JOHNSON, P.E.
GEOTECHNICAL DIVISION MANAGER

HOLT ENGINEERING, INC.
TBPE FIRM REGISTRATION NO. F-430

FILE NO. 02-05620
4 MARCH 2020

TABLE OF CONTENTS

APPENDIX

SUBSURFACE INVESTIGATION

AND

FOUNDATION RECOMMENDATIONS

FOR

CORNE RESIDENCE

3350 FAR VIEW DRIVE

AUSTIN, TEXAS

INTRODUCTION

An exploration of subsurface soil conditions was performed for the proposed Corne Residence to be located at 3350 Far View Drive in Austin, Texas. The exploration was authorized by Mr. Louis Corne, the Owner, on 25 July 2019 in accordance with our proposal. The purpose of this investigation was to determine subsurface conditions and materials at the site and to establish design and construction recommendations for the project's foundation system.

SCOPE

Our investigation consisted of the following:

A. Laying out and drilling three soil borings to a depth of 15 feet each below existing grade.

B. Logging the borings in the field and a visual reconnaissance of the area's terrain.

C. Taking samples of selected subsurface soils for laboratory tests.

D. Performing field tests.

E. Making recommendations based on engineering analysis of field notes and laboratory test results.

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SITE DESCRIPTION

The proposed Corne Residence is to be located at 3350 Far View Drive in Austin, Texas. The property consists of a vacant wooded residential lot covered in native grasses. The terrain steeply slopes down to the southwest.

FIELD TEST AND SAMPLING

All borings were made with a CME 55 truck mounted drilling rig. Holes were drilled using 4-inch diameter flight augers. The soil conditions were logged, and materials visually classified by the soil engineer in the field. Disturbed samples were taken, and standard penetration tests were performed using a 2-inch O.D. split-barrel sampler driven by a 140-pound hammer dropping a distance of 30 inches. The number of blows to drive the sampler 12 inches is recorded and shown on the attached Logs of Borings.

LABORATORY TESTS

The following laboratory tests were run on selected samples:

1. Moisture content (ASTM D2216);
2. Minus 200-mesh sieve (ASTM D422);
3. Atterberg limits (ASTM D4318).

These tests were performed together with visually inspecting and classifying the soil in general accordance with ASTM D2487 and described as recommended in ASTM D2488. Results of these tests were used to determine the foundation design criteria such as bearing capacity and the potential for settlement or heave.

SUBSURFACE CONDITIONS

The approximate locations of the borings are shown in the attached Generalized Boring Location Plan. A general description of the soil conditions is given below. A detailed depiction of the soil conditions is given in the Logs of Borings found in the Appendix. The area is located in what is geologically referred to as the Glen Rose Formation. This formation consists of layers of tan to gray limestone rock interbedded with layers of tan silts and tan clayey silts that range from several inches to several feet thick. A thin layer of organic brown

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silty clay overlies the formation. The subsurface soil conditions generally correlate with this description.

In general, residual brown lean clay is found on the surface that extends to depths ranging from 6 inches to 12 inches and overlies tan and light brown severely weathered limestone. The tan and light brown severely weathered limestone extends to depths ranging from 1 foot to 6.8 feet and overlies tan limestone rock. The tan limestone rock extends to the termination of borings at a depth of 15 feet below existing grade.

The surficial brown silty lean clay is thinly deposited and contains and small to large sized limestone rock. The tan and light brown severely weathered limestone layer is very silty and contains concretions and thin hard layers. The tan limestone rock is medium hard with thin fractured layers and interbedded layers of medium stiff to stiff tan silty soils and hard limestone layers.

Groundwater was not encountered during the drilling operations; however, groundwater levels will vary with seasonal weather conditions as water migrates through the fractures, seams and joints in the rock and the interface of the rock and fine-grained soils above. Water may be found near the surface after heavy rains.

DISCUSSION AND RECOMMENDATIONS

It is our understanding a new multi-level custom residence and swimming pool are planned for the site. We expect the residence will be wood frame with masonry veneer. The foundation will stairstep up the hill. Based on the plans provided portions of the foundation will be below grade and reinforced concrete basement walls will be used where the slab is below grade. Portions of the foundation will also be on fill and we expect less than five feet of fill be needed under the floor slab. The depth of the proposed swimming pool is unknown at the time of this report; however, we expect the pool to range in depth from 4 feet to 8 feet.

The soils and rock encountered in our borings are suitable for a shallow foundation system consisting of perimeter beams with a soil supported floor slab and intermediate stiffening beams.

The building pad should be prepared by removing the top 6 inches to 12 inches of surficial brown lean clay and any organic soils and replacing with a low P.I. (P.I. 3 to 18) select fill (see attached Select Fill Specifications). There should be a minimum of 12 inches of

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select fill below the floor slab except in areas where the slab is below grade. In areas where the floor slab is below grade a gravel capillary barrier should be used (see capillary barrier an underdrain recommendations below). Select fill will be necessary to level the building pad and all perimeter beams must extend through the fill and into the undisturbed tan severely weathered limestone or tan limestone rock. The exposed subgrade and all fill should be compacted in 8-inch lifts to a minimum of 95% of the maximum dry density in accordance with TxDOT test method TEX-113-E. Soil moisture should be within 3% of optimum.

Where the floor slab is below grade (basement), the slab is supported on a 6-inch thick (minimum) gravel capillary barrier consisting of 3/8-inch (pea size) uniformly graded crushed rock or washed gravel. A high-quality vapor barrier should be placed over the gravel blanket and below the floor slab. An under-drain should be constructed under the capillary barrier and should consist of one or more trenches 12 inches wide and 12 inches deep with a 4-inch perforated pipe and backfilled with one-inch uniformly graded gravel. The pipe should be sloped to drain to daylight. We can assist with under-drain design details upon request. Beams and floor slab should be poured monolithically.

Perimeter beams should be seated 24 inches into the tan and light brown severely weathered limestone or 12 inches into the tan limestone rock and sized for an allowable bearing value of 3,000 PSF. Seating depths will vary across the site.

It is our understanding that a cut will be made on the hillside and below-grade (basement type) walls will be used in these areas. Basement wall footings should be seated 24 inches into the tan and light brown severely weathered limestone or 12 inches into the tan limestone rock at a minimum depth of 24 inches below the cut basement level subgrade and sized for an allowable bearing value of 3,000 PSF. Where basement walls are planned, the basement walls should be properly waterproofed with asphaltic mastic, heavy felt paper, and protection board or other approved system. Backfill against walls should be a minimum of 36 inches thick (horizontal dimension) to within 18 inches of the surface and consist of a one-inch diameter uniformly graded free-draining crushed rock or washed gravel. Collector drains behind the walls will be necessary to remove groundwater seepage. The remaining portion of the backfill should consist of select fill (see attached Select Fill Specifications) and be compacted to a minimum of 95% of the optimum dry weight in accordance with TxDOT test

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method TEX-113-E. Lifts should not exceed 6 inches. If these conditions are met, an equivalent fluid pressure of 55 PCF can be used for the at-rest condition.

It is our understanding some retaining walls will be necessary on the downhill side of the residence and will be used for supporting fill material under the house and around the pool. We recommend the wall footings be seated a minimum of 12 inches into the tan limestone rock or 24 inches into the tan and light brown severely weathered limestone and sized for an allowable bearing value of 3,000 PSF when seated approximately 24 inches below the existing grade. In order to resist sliding, a key should be placed a minimum of 12 inches below the bottom of the footing. A lateral bearing value of 600 PSF may be used for the face of the key seated into the tan and light brown severely weathered limestone or tan limestone rock. The walls should be backfilled with a one-inch diameter free-draining rock or gravel at a minimum thickness of 36 inches to within 18 inches of the surface. Weep holes should be placed on approximately 6-foot centers. The remaining portion of the backfill should consist of select fill and be compacted to a minimum of 95% of the optimum dry weight in accordance with TxDOT test method TEX-113-E. Lifts should not exceed 6 inches. If these conditions are met, the walls may be designed for an equivalent fluid pressure of 45 PCF for the active condition.

It is also our understanding a new swimming pool is to be constructed as part of this project. We recommend the pool bottom be designed as stiffened reinforced concrete mat with a bearing capacity of 1,500 PSF for a uniform allowable loading on the limestone rock. A leveling course consisting of one-inch diameter gravel with minimum thickness of 6 inches may be placed on top of the tan limestone rock or the tan and light brown severely weathered limestone, under the pool bottom. The swimming pool walls should be designed for an at-rest lateral equivalent fluid pressure of 55 PCF. We also recommend designing the pool walls assuming no pressure is being exerted from water in the pool (the pool is empty).

We recommend that backfill soils for the swimming pool walls have a plasticity index (P.I.) not exceeding 18 and be compacted to at least 95% of maximum dry density as determined by TxDOT test method TEX-113-E. Soil moisture should be within 3% of optimum.

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We request to review the final grading plan and foundation drawings to verify our recommendations are properly interpreted and to make suggestions for changes and improvements, if necessary.

The limestone rock is medium hard and excavation for beams, footings, piers or utilities will require a rock saw, hoe ram or jack hammer. Where hard layers are encountered, bit wear may be excessive.

SPECIFIC FOUNDATION RECOMMENDATIONS

A. Shallow Foundation System:

This foundation consists of a shallow foundation system consisting of perimeter beams with a soil supported floor slab. Stiffening beams in large slab sections are recommended.

1. Building Pad – Remove the top 6 inches to 12 inches of brown lean clay and any organic soils and replace with a low P.I. (P.I. 3 to 18) select fill (see attached Select Fill Specifications). There should be a minimum of 12 inches of select fill below the floor slab except in the basement area described in Item 6 below. Compact the exposed subgrade and all fill to a minimum of 95% of the optimum dry weight in accordance with TxDOT test method TEX-113-E. Compaction moisture should be within 3% of optimum.
2. Beams and Floor Slab – Trench for perimeter beams (wall footings) and stiffening beams. Select fill will be necessary to level the site and all perimeter beams and footings must extend through the fill and into undisturbed limestone rock or severely weathered limestone. Place a 10 mil (or heavier) vapor barrier between foundation and base material or rock. Immediately after placing reinforcing steel, pour beams and floor slab monolithically. Building pad moisture should be maintained in a uniform condition.
3. Soil Bearing Pressure and Seating Depths – Perimeter beams should be seated 12 inches into the tan limestone rock or 24 inches into the tan

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and light brown severely weathered limestone and sized for an allowable bearing value of 3,000 PSF. Seating depths will vary across the site.

4. Basement Walls – The basement walls may be designed to be supported on reinforced concrete spread footings seated 12 inches into the tan limestone rock or 24 inches into the tan and light brown severely weathered limestone at a minimum of 24 inches below the cut basement level subgrade and sized for an allowable bearing value of 3,000 PSF.

5. Basement Wall Waterproofing, Drainage, and Backfill – The basement walls should be waterproofed with an asphaltic mastic coating and heavy felt paper or other approved products. The walls should be backfilled with a one-inch diameter uniformly graded washed gravel for a minimum thickness of 36 inches to within 18 inches of the surface. A collector drain should be placed at the wall footing at least 12 inches below the bottom of the floor slab and should consist of a 4-inch PVC perforated pipe and sloped for gravity flow to daylight. The remaining portion of the backfill should consist of select fill (see attached Select Fill Specifications) and be compacted to a minimum of 95% of the optimum dry weight in accordance with TxDOT test method TEX-113-E. Lifts should not exceed 6 inches. If these conditions are met, an equivalent fluid pressure of 55 PCF can be used for the at-rest condition.

6. Basement Floor Slab and Gravel Capillary Barrier – The basement floor slab and floor slab areas bearing on cut tan and light brown severely weathered limestone or tan limestone rock are soil supported on a gravel capillary barrier consisting of a minimum of 6 inches of 3/8-inch diameter (pea size) uniformly graded washed gravel and overlaid by a high-quality vapor barrier (minimum 10 mil thickness). An under-drain system should be placed below the capillary barrier and

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should consist of one or more trenches down the center of the below grade area. Trenches should be 12 inches wide and 12 inches deep with a 4-inch diameter perforated PVC pipe and backfilled with one-inch uniformly graded gravel. The pipe should be sloped for gravity flow to daylight. We can assist with the under-drain layout upon request.

7. Retaining Walls – The retaining walls may be designed to be supported on reinforced concrete spread footings seated a minimum of 12 inches into the tan limestone rock or 24 inches into the tan and light brown severely weathered limestone and sized for an allowable bearing value of 3,000 PSF when seated approximately 24 inches below the existing grade. A key should be placed a minimum of 12 inches below the bottom of the footing. A lateral bearing value of 600 PSF may be used for the face of the key seated into the severely weathered limestone or limestone rock. The walls should be backfilled with a one-inch diameter uniformly graded washed gravel for a minimum thickness of 36 inches to within 18 inches of the surface. Weep holes should be placed on approximately 6-foot centers.

8. Inspection – Subgrade and each 8-inch lift of fill material should be tested by the testing laboratory for proper compaction and moisture content. All perimeter beams or footings should be inspected by the soils engineer to verify proper seating depth and bearing strata prior to concrete placement.

9. Drainage – Slope grounds away from foundation to provide rapid drainage.

B. Swimming Pool – Shallow Foundation System:

This foundation consists of a stiffened reinforced concrete mat bearing on limestone. Perimeter beams are optional.

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1. Pad Preparation – Remove all brown lean clay, any organic materials, any root systems from trees, or other vegetation to the desired depth of the pool bottom. Compact the exposed subgrade and all fill to a minimum of 95% of the optimum dry weight in accordance with TxDOT test method TEX-113-E. Compaction moisture should be within 3% of optimum. A leveling course consisting of one-inch diameter gravel with minimum thickness of 6 inches may be placed on top of the tan limestone rock or the tan and light brown severely weathered limestone, under the pool bottom.
2. Lateral Earth Pressure – The swimming pool walls should be designed for an equivalent fluid pressure of 55 PCF for the at-rest condition. We also recommend designing the pool walls assuming no pressure is being exerted from water in the pool (the pool is empty).
3. Inspection – All fill material should be tested by the testing laboratory for proper compaction and moisture content. All perimeter beams or footings should be inspected by the engineer to verify the proper seating depth and bearing strata prior to concrete placement.
4. Drainage – Slope grounds away from foundation to provide for good drainage.

QUALITY CONTROL PROGRAM

We recommend a Quality Control Program be implemented by the Owner or Architect to inspect the construction of the foundation and framing to verify all work is being performed in accordance with the approved engineered drawings and specifications. The inspections should include (but not limited to) preparation of the building pad subgrade and placement and compaction of all fill material to verify proper density and moisture content. Inspections should be conducted on all foundation beams, piers and footings to verify proper bearing and seating depth. Where drilled piers are used, or driven piles are installed then full-time inspection is recommended to verify proper bearing capacity is achieved. Pre-pour inspections should be made in order to verify proper placement of the reinforcement. All concrete should be inspected during placement for proper slump, air-content and temperature. Test cylinders

should be made to verify compressive strength. All plumbing should be leak tested both before slab is poured and after concrete is placed. Framing should be inspected to verify all floor trusses and roof members (trusses) are placed in accordance with the approved drawings. Anchor bolts and wind bracing should also be inspected. Welding and bolting on structural steel framing and connections should be inspected by a certified welding inspector. Reports of all inspections and tests should be forwarded to the Owner, Architect, Engineer, and Contractor. We can provide these services upon request.

LIMITATIONS

This geotechnical report has been prepared for the exclusive use of our client and the client's authorized design team in preparing the appropriate design and construction documents for this project. It is not intended for any other person's benefit. This report is based on specific project information provided by the client and/or design team as described herein. Any changes in the structure, loadings, building footprint, configuration, finished floor elevations or grades should be brought to our attention so that we may determine what impact the change may have on our conclusions and recommendations. We expect to review the final grading plan and structural drawings to verify our recommendations are properly interpreted.

Our analyses and recommendations are based on subsurface conditions encountered in our borings. Variations in soil conditions may occur between borings. If during construction the soil strata are found to differ from that reported here, we should be notified immediately. This report contains soil-boring logs which are for the purpose of arriving at foundation design criteria and are not to be used by the excavation and/or pile driving contractor in arriving at rock hardness or rock depth.

The presence or absence of water in our borings might not represent the groundwater conditions under all seasonal conditions. No long-term groundwater monitoring was performed in the preparation of this report.

This report is based on conditions that exist on the site at the time of our investigation. Changes to the project, the building site or adjacent properties may affect the reliability of our report. We expect the structures addressed in our report to be started or substantially completed within approximately 24 months of the issuance of our report. The geotechnical report and specific recommendations will need to be re-evaluated if building construction is

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delayed by more than 24 months from the time of our report. Our report should not be used if the elapsed time of substantial completion exceeds 5 years without review or written consent from Holt Engineering, Inc.

The procedures, tests and recommendations of this investigation and report have been conducted and furnished in accordance with generally accepted professional engineering practices in the field of foundations, engineering soil mechanics and engineering geology. No other warranty is either expressed or implied.

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APPENDIX

ITEM 1

SELECT FILL SPECIFICATIONS

SELECT FILL

Select fill as called for on the plans shall meet one of the following requirements (% Passing or % Retained) as verified by the Engineer when properly slaked and tested by standard laboratory methods:

	% Retained	Or	% Passing
2 ½" Screen	0%		100%
1 ½" Screen	0% - 25%		75% - 100%
7/8" Screen	15% - 55%		45% - 85%
No. 4 Sieve	45% - 75%		25% - 55%
No. 40 Sieve	60% - 90%		10% - 40%

Material passing the No. 40 sieve shall have a minimum plasticity index of 3 and shall not have a plasticity index of greater than 18.

COMPACTION OF FILL

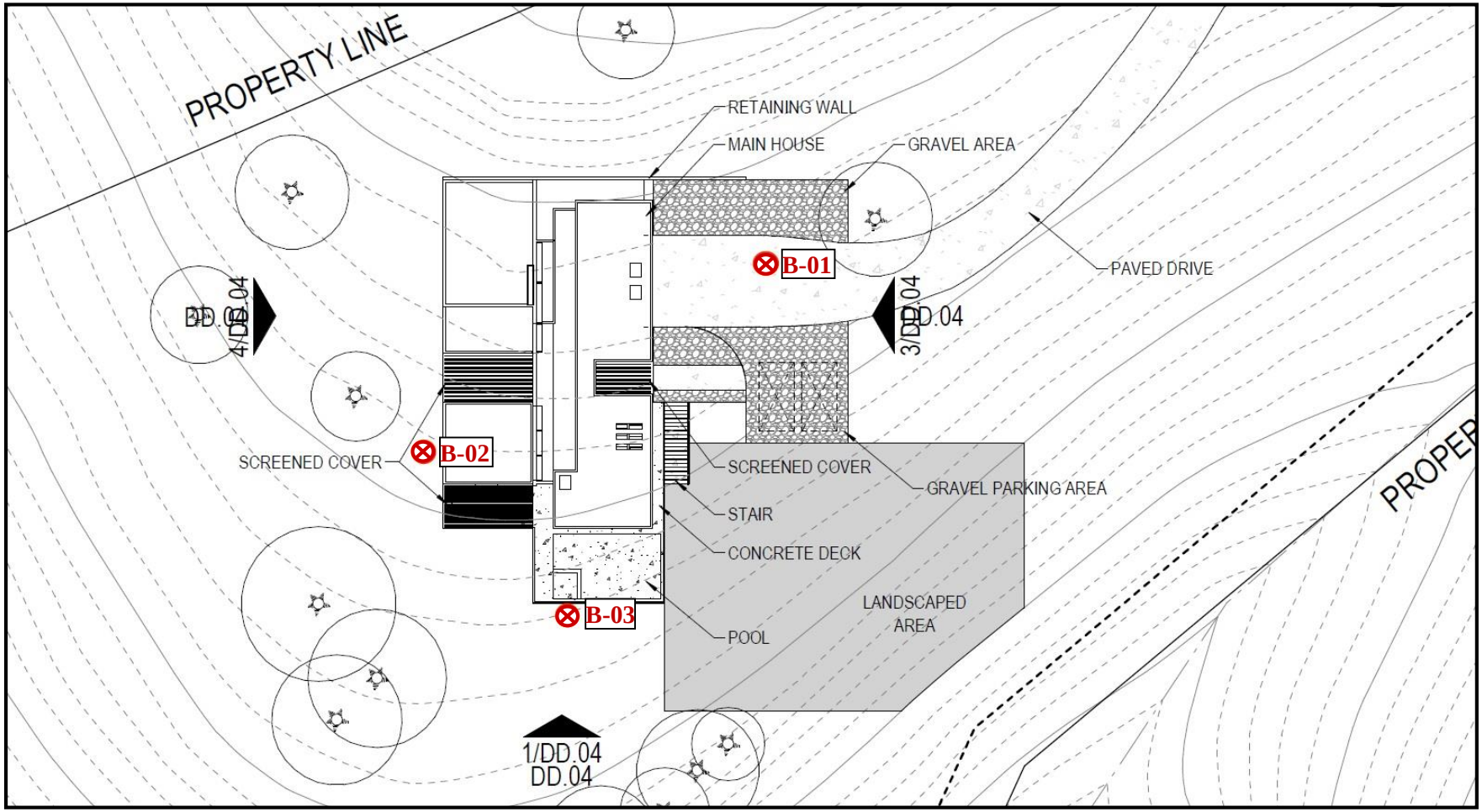
Select fill shall be placed in lifts not to exceed 8 inches loose measure and compacted to 95% or greater of the maximum dry density as determined in accordance with TxDOT test method TEX 113E. Field densities shall be checked in accordance with ASTM D-6938 (Nuclear Gauge) to ensure compliance with project specifications.

Select fill should be processed and moisture conditioned as needed to meet requirements of project moisture specifications.

Samples of fill shall be furnished to the testing laboratory seven days prior to installation to permit time for specification compliance, inspection, and approval.

APPENDIX

ITEM 2



N

Not to Scale

GENERALIZED BORING LOCATION PLAN
CORNE RESIDENCE
3350 FAR VIEW DRIVE
AUSTIN, TEXAS

File No 02-05620

APPENDIX

ITEM 3

CORNE RESIDENCE
3350 FAR VIEW DRIVE
AUSTIN, TEXAS

LOG OF BORING B-01

NOTES : Hole dry upon completion of drilling operation

DATE DRILLED : 02-17-20 | BORING DEPTH : 15.0 FEET

DRILLER : John Webb | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT : | LONG. :

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	CLAY, brown, silty, sandy w/ small to large limestone rock							
	SEVERLY WEATHERED LIMESTONE, tan & light brown, very silty, clayey, sandy, firm -- 0.5' - 1.5' - w/ tan concretion & thin hard layers	16		8.5		22	10	68.5
5		13						
	LIMESTONE, tan -- 6.8' - 7.5' - medium hard w/ numerous thin fractured layers & firm silt layers -- 7.5' - 8.5' - medium hard w/ thin fractured layers -- 8.5' - 10.0' - medium hard, solid	50/3"						
10	-- 10.0' - 15.0' - medium hard w/ scattered thin fractured layers & hard layers	50/1"						
15	Terminated @ 15 feet							
20								

LOG OF BORING 02-05620 - CORNE RESIDENCE, 3350 FAR VIEW DR., AUSTIN, TX.GPJ HOLT ENGINEERING.GDT 3/5/20

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CORNE RESIDENCE
3350 FAR VIEW DRIVE
AUSTIN, TEXAS

LOG OF BORING B-02

NOTES : Hole dry upon completion of drilling operation

DATE DRILLED : 02-17-20 | BORING DEPTH : 15.0 FEET

DRILLER : John Webb | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT : | LONG. :

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	CLAY, brown, silty, sandy w/ small to large limestone rock							
	LIMESTONE, tan -- 1.0' - 3.0' - hard w/ thin fractured layers	50/0"						
	-- 3.0' - 5.0' - medium hard w/ thin fractured & hard layers							
5	-- 5.0' - 6.0' - hard w/ few thin fractured layers	50/2"						
	-- 6.0' - 7.0' - w/ stiff tan silt layers							
	-- 7.0' - 8.5' - w/ thin fractured layers							
	-- 8.5' - 15.0' - medium hard w/ scattered thin fractured layers & hard layers							
10		50/1"						
15	Terminated @ 15 feet							
20								

LOG OF BORING 02-05620 - CORNE RESIDENCE, 3350 FAR VIEW DR., AUSTIN, TX.GPJ HOLT ENGINEERING.GDT 3/5/20

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CORNE RESIDENCE
3350 FAR VIEW DRIVE
AUSTIN, TEXAS

LOG OF BORING B-03

NOTES : Hole dry upon completion of drilling operation

DATE DRILLED : 02-17-20 | BORING DEPTH : 15.0 FEET

DRILLER : John Webb | WATER LEVEL : | ELEVATION :

DRILLING METHOD : 4" Flight Augers | LAT : | LONG. :

DEPTH (feet)	SOIL DESCRIPTION	BLOWS PER FOOT	UCC STR. (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	LIQUID LIMIT(%)	PLASTICITY INDEX	% PASSING #200 SIEVE
	LIMESTONE, tan							
	-- 0.0' - 1.0' - severely fractured w/ thin brown clayey silt layers							
	-- 1.0' - 3.7' - hard w/ thin fractured layers	50/3"						
	-- 3.7' - 5.2' - firm, tan silt layers							
5	-- 5.2' - 7.0' - w/ thin stiff silt layers and lard limestone layers	50/1"						
	-- 8.5' - 13.5' - medium hard w/ few thin fractured layers							
10		50/1"						
	LIMESTONE, gray, solid							
15	Terminated @ 15 feet							
20								

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BORING LOGS – TERMS & SYMBOLS

SOIL TYPES


Silt


Clay


Sand


Silty Clay or Clayey Silt


Silty Sand


Clayey Sand


Gravel


Shale


Limestone


Rock/Fragments


Crushed limestone base


Tan Limestone w/Interbedded Silt Layers


Silty clay w/Gravel


Asphalt


Sandstone


Concrete

SAMPLER TYPES


Standard Penetration Test


Rock Core


Seamless Push Shelby Tube


Grab Sample

PARTICLE SIZE (ASTM D2487)

Boulders	>12 in.	Coarse Sand	5 mm – 2 mm	Silt	0.075 mm – 0.005 mm
Cobbles	12 in. – 3 in.	Medium Sand	2 mm – 0.4 mm	Clay	< 0.005 mm
Gravel	3 in. – 5 mm	Fine Sand	0.4 mm – 0.075 mm		

STRENGTH OF COHESIVE SOILS

CONSISTENCY	COMPRESSIVE STRENGTH (TSF)
Very Soft	**< 0.25**
Soft	**0.25 to 0.50**
Firm	**0.50 to 1.0**
Stiff	**1.0 to 2.0**
Very Stiff	**2.0 to 4.0**
Hard	**> 4.0**

DENSITY OF GRANULAR SOILS

NUMBER OF BLOWS PER FT., N	RELATIVE DENSITY
0 – 4	**Very Loose**
4 – 10	**Loose**
10 – 30	**Medium Dense**
30 – 50	**Dense**
Over 50	**Very Dense**

Structure Description (ASTM D2488)

Stratified	**Alternating layers of varying material or color with layers at least 6 mm thick**
Laminated	**Alternating layers of varying material or color with the layers less than 6 mm thick**
Fissured	**Breaks along definite planes of fracture with little resistance to fracturing**
Slickensided	**Fracture planes appear polished or glossy, sometimes striated**
Blocky	**Cohesive soil that can be broken down into small angular lumps which resist further breakdown**
Lensed	**Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay**
Homogeneous	**Same color and appearance throughout**

Percentages of Sand & Gravel (ASTM D2488)

Trace	**< 5%**
Few	**5% to 10%**
Little	**15% to 25%**
Some	**30% to 45%**
Mostly	**50% to 100%**

Criteria for Describing Moisture Conditions (ASTM D2488)

Dry	**Absence of moisture, dusty, dry to the touch**
Moist	**Damp but no visible water**
Wet	**Visible free water, usually soil is below water table**

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