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GEOTECHNICAL INVESTIGATION

LOST OAKS

HOUSTON, TEXAS

PREPARED BY

THE MURILLO COMPANY
GEOTECHNICAL CONSULTANTS
HOUSTON, TEXAS

REPORT NUMBER

GEO3082023

REPORTED TO

MARK-DANA CORPORATION
SPRING, TEXAS

AUGUST 2023

GEOTECHNICAL INVESTIGATION

LOST OAKS

HOUSTON, TEXAS

INTRODUCTION

The study reported herein is an investigation of the subsurface conditions at the site of the Lost Oaks, to be located at 810 Oak Avenue in Houston, Harris County, Texas (Key Map 452 G).

AUTHORIZATION

This investigation was authorized on July 28, 2023 by David Mark Koogler, President of Mark-Dana Corporation, in an agreement with this office for Geotechnical Engineering Services.

PURPOSE

The Purpose of this investigation was to evaluate the subsurface soil conditions in the subject development and provide recommendations for foundation and pavement design.

SUBSURFACE EXPLORATION

The Subsurface Exploration at the site was to consist of four (4) undisturbed sample core borings drilled to a depth of twenty five (25) feet and two (2) to a depth of five (5) feet below existing ground surface. Approximate locations of all borings are shown on the attached Boring Plan.

SUBSURFACE INVESTIGATION

The Subsurface Investigation consisted of drilling three (3) inch nominal diameter core borings. Undisturbed samples of the cohesive soils were obtained from the borings by means of thin-wall, seamless steel Shelby Tube samplers in accordance with ASTM Method D-1587.

All undisturbed samples were extruded mechanically from the core barrels in the field, classified, wrapped in aluminum foil and sealed in air-tight plastic bags to prevent moisture loss and disturbance. The samples were placed in core boxes and transported to our laboratory for testing and further study.

Where granular soils were encountered, they were sampled with a two (2) inch diameter split-barrel sampler in general accordance with ASTM Method D-1586. Driving resistance for the granular soils is recorded as “Blows per Foot” on the Boring Logs.

LABORATORY INVESTIGATIONS

Boring Logs have been included in this report. The logs present visual descriptions of all soil strata encountered using the Unified Soils Classification System.

All samples from the borings were examined and classified in the laboratory by a senior soils technician or geotechnical engineer in accordance with the Unified Soils Classification System.

Laboratory tests were performed on selected soil samples in order to evaluate the engineering properties of the foundation medium in accordance with the ASTM Standards.

Undrained shear strengths of selected cohesive soils were determined by unconfined compression tests. The results of these tests are plotted on the Boring Logs as small solid circles.

Water content and dry unit weight of the foundation soils were determined as routine parts of the unconfined compression tests. Liquid and plastic limit tests were also performed on appropriate cohesive soils.

Estimated shear strengths of cohesive samples were also determined in the field with a calibrated hand penetrometer, and these values are plotted on the Boring Logs as open circles.

SUBSURFACE CONDITIONS

Specific types and depths of subsurface strata encountered at the site are shown on the attached Boring Logs. Review of the Boring Logs indicates that the generalized stratigraphy at the site is approximately as follows:

Depth, Feet	Description of Strata
0 - 2	Loose brown silty sand (SM) w/surface vegetation
2 - 8	Hard to very stiff gray and tan sandy clay (CL) w/ferrous nodules and vertical sand seams
8 - 12	Plastic to stiff gray and tan sandy clay (CL) w/sand seams, dry to moist or Medium dense gray and tan silty fine sand (SM), moist
12 - 25	Medium dense tan silty fine sand (SM), waterbearing

Surface Soils

The near Surface Soils are "SM-CL" type when classified by the Unified Soils Classification System. These type soils normally exhibit low to moderate swell potential when subjected to seasonal wetting and drying cycles.

Ground Water Observations

Ground water was encountered at the site during drilling operations between fifteen (15) feet and fourteen (14) feet below existing ground surface. Static water level upon completion was between eleven (11) feet and nine (9) feet.

SUBSURFACE VARIATIONS

The information contained in this report summarizes conditions encountered on the date and at the locations where the borings were drilled. The depth to a static ground water table and subsurface soil moisture content will vary with seasonal and environmental variations, such as frequency and magnitude of rainfall and future construction activities, which may alter the surface and drainage characteristics of the site. In cohesive soils, fluctuations in ground water depth occur over a longer period than in granular soils.

An accurate evaluation of the steady ground water level requires long-term measurements of monitoring wells and/or piezometers, which was beyond the scope of this study. The ground water level that might occur cannot be accurately predicted based on short-term exploration.

DESIGN ANALYSIS AND RECOMMENDATIONS

Development of the property envisions a five (5) level building consisting of Apartments, a Swimming Pool and Amenity Center. An Underground Detention Facility will be placed under the pavement area.

Review of the Boring Logs indicates that a uniform soil condition should exist in the area investigated. Analysis of the Boring Logs and Laboratory Testing indicates that the proposed structure should be supported by a Post Tension Foundation, Square Spread Footings or Drilled and Underreamed Footings. Each will be discussed in subsequent paragraphs.

Post Tension Foundation

The structural design procedure as recommended by the Post-Tensioning Institute (PTI) in their design manual entitled "Design of Post-Tensioned Slabs-on-Ground," Third Edition dated 2004, should be used in design.

The design should consist of four (4) inch minimum slab thickness and exterior grade beams of ten (10) inch minimum width, using the following parameters:

1. Type Clay Soil	= Montmorillonite
2. Effective Plasticity Index (P.I.)	= 25%
3. Percent of Clay Mineral	= 40%
4. Depth to Constant Moisture	= 9 feet
5. Constant Suction, pF	= 3.45
6. Velocity of Moisture Flow	= 0.70 in/mo
7. Thornthwaite Moisture Index	= +18

Utilizing the soils properties given above, the edge moisture variation, e_m equals 8.7 feet (for center lift) and 4.8 feet (for edge lift). The differential soil movement, Y_m is then calculated as:

Y_m = 0.300 inches (edge lift) < 4.0 inch

Y_m = 0.600 inches (center lift) < 4.0 inch

An allowable bearing capacity not exceeding 1,200 pounds per square foot for dead load or 1,800 pounds per square foot for total load may be used in design. Exterior grade beams supporting the structural loads should extend a minimum twelve (12) inches into the regraded surface or compacted building pad soils.

Square Spread Footings

Square Spread Footings, placed in the undisturbed sandy clay stratum at a depth of approximately three (3) feet below existing ground surface, may be used to support the proposed structure.

An allowable bearing pressure not exceeding 2,000 pounds per square foot for dead load or 3,000 pounds per square foot for total load may be used. Where Long Continuous Footings (Grade Beams) are used, they should be sized using 80% of the above design values.

Drilled and Underreamed Footings

A foundation consisting of Drilled and Underreamed Footings should extend to a depth of seven (7) feet below existing ground surface.

Utilizing a minimum factor of safety of 3 for dead load or a minimum factor of safety of 2 for total load, the allowable bearing capacity of the foundation soils at the recommended depth, is given as 3,000 pounds per square foot for dead load or 4,500 pounds per square foot for total load.

An allowable side friction value of 500 pounds per square foot may be used if uplift pressures are considered. Lateral loads acting against drilled pier shafts should be based on a maximum 20 kips.

Footing Installation

Each footing excavation should be inspected by the On-Site Geotechnical Engineer's Representative prior to placing concrete to insure that (a) the footing has been constructed to the specified dimensions, at the correct depth and in the correct formation established by the previously mentioned criteria, (b) the footing is concentric with the pier shaft or column, and (c) the excessive cuttings, build-up and any soft compressible materials have been removed from the bottom of the excavation.

A bell angle of forty five (45) degrees and a shaft to bell diameter of 3:1 may be used for all footings which do not exceed seventy two (72) inches. Footings which exceed seventy two (72) inches may require that they be sized with a bell angle of sixty (60) degrees and a shaft to bell diameter of 2:1, if sloughing occurs.

Placement of concrete should be accomplished as soon as possible to prevent changes in the state of stress and caving of the foundation soils. No footings should be poured without the prior approval of the On-Site Geotechnical Engineer's Representative.

Foundation Settlement

A detailed settlement analysis was not within the scope of this study. It is anticipated that the footings designed using the recommended allowable bearing pressures will experience maximum settlements of less than one (1) inch, which should be within the tolerable limit for the proposed structure.

Potential Vertical Rise

Potential Vertical Rise (PVR) was estimated using a computer program, based on an empirical modified procedure developed by Mc Dowell, as outlined in Texas Department of Transportation (TxDOT) Test Method TEX-124.

Based on existing grades, the total PVR at this site was computed at 1.00 inch. It is possible that the magnitudes of PVR may be greater than the predicted values if soils with greater potential for shrink-swell movement are present in areas of the site where boreholes were not located.

Movement (PVR) is normally influenced by seasonal changes in soil moisture, placement of a building pad, location of landscaping, or permanent watering systems placed adjacent to a structure.

Floor Slab and Building Pad

Conventional “slab on fill” may be used for the interior portion of the structure planned at the site. The Floor Slab should be placed on a compacted Building Pad, minimum twelve (12) inch in thickness, to an elevation which conforms to City of Houston Building Authority minimum code requirements and to provide positive drainage away from the structure.

Prior to placement of the Building Pad, any vegetation, topsoil containing organic material or other deleterious material should be cleared and grubbed. Once rough grade is established, the exposed surface area should be proof-rolled in accordance with TxDOT Item 216 (2014). Any pockets of soft or weak soils encountered should be removed and replaced by compacted sandy clay type soils.

The material required to construct the Building Pad should consist of a select non-active sandy clay or clayey sand having a Plasticity Index (P.I.) between 8% and 25%.

The fill material should be placed under laboratory control in no greater than eight (8) inch loose layers and compacted to a minimum 95% of Standard Proctor Density as determined by the ASTM D-698 Procedure, at Optimum Moisture Content (0 to +3%).

FLOOD ZONE CONSIDERATION

Determining a site specific Flood Zone and related building criteria is beyond the scope of our services and this report. Site development engineering firms can provide these services when the subject property is located within a Flood Zone, and should be contacted for this information.

Wet Weather Construction

The near surface soils, a silty sand, are in a dry condition at this time. Based on our experience with these soils, if a waterbearing condition exists at the time of construction, these soils become saturated and weak. When saturated, the soils begin pumping under small wheel loads, and cannot be compacted to the required 95% of Standard Proctor Density.

One of the following measures may be utilized to mitigate these soil conditions, and aid in construction expediency.

(a) Remove and replace saturated soils with select fill.

(b) Utilize a chemical treatment to aid in drying the soils and improve the subgrade.

(c) Dry the saturated soils by natural means.

The Murillo Company (TMC) should be notified if this site condition exists at the time of construction for further evaluation.

SURFACE DRAINAGE

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

(a) Backfill around the perimeter foundation walls should be compacted to a minimum 90% of Standard Proctor Density according to ASTM D-698 Procedure, at Optimum Moisture Content (0 to +3%)

(b) The ground surface around the perimeter foundation walls should have a minimum slope that provides positive drainage away from the structure a minimum ten (10) feet, or can be sloped to drain away from the structure in all directions on a maximum 1:12 slope

(c) Roof downspouts and other water collection systems should discharge well beyond the limits of the backfill, or perimeter grade beams. We suggest a minimum three (3) feet

(d) Perimeter grade beams should not be exposed more than eight (8) inches above final grade, in order to minimize moisture changes and erosion of the soil strata at bottom of grade beams

LANDSCAPING

The owner and design team should be made aware that placing large bushes and trees adjacent to the structure may contribute to future distress to the foundation system. Above grade planter boxes should be considered in lieu of landscape beds. If this landscape approach is not acceptable, vegetation placed in landscape beds adjacent to the structure should be limited to plants and shrubs that will not exceed a mature height of about four (4) feet.

Large bushes and trees that will generally exceed this height should be planted at a reasonable distance away from the structure so that their canopy or “drip line” does not extend over the structure when the tree reaches maturity. Cut-off walls or barriers may be considered to prevent roots from existing trees and vegetation from affecting the foundation of the proposed structure. Watering of vegetation should be performed in a timely and controlled manner and prolonged watering should be avoided.

Swimming Pool

It is assumed that the new Swimming Pool to be constructed will be to a depth of approximately six (6) feet below existing ground surface.

Utilizing a minimum factor of safety of 3 for dead load or a minimum factor of safety of 2 for total load, the allowable bearing capacity between a depth of four (4) feet and eight (8) feet is given as 2,000 pounds per square foot for dead load or 3,000 pounds per square foot for total load.

The materials encountered in the area of the Swimming Pool consist of a silty sand (0' - 2'), sandy clay (2' - 10'), then silty sand to the full depth explored at twenty five (25) feet.

The sandy clay soils may be excavated to a depth of approximately six (6) feet without encountering water problems or sloughing in these soils.

Sloughing of the side walls during excavation could occur if the excavation is left open for an extended period of time and the side walls are not protected.

Lateral Earth Pressure

Active pressures exerted by the soil against retaining walls will be equal to an equivalent fluid pressure of fifty (50) pounds per square foot/foot, if the natural sandy clay soils at the site remain in contact with the walls. At rest, a pressure of sixty five (65) pounds per square foot/foot is recommended.

Passive pressures utilizing natural sandy clay soils are given as three hundred (300) pounds per square foot/foot. The coefficient of sliding friction is estimated at 0.40 times the overburden pressure (0.40 “x” the sum of the unit weight of the soils “x” the depth of the wall).

GENERAL AREA PAVING

Light Duty Pavement (Vehicle Parking) may be constructed using a Portland Cement Concrete Pavement of five (5) inch minimum thickness. Heavy Duty Pavement (Entrance Drive and Fire Lanes) should be a minimum six (6) inches in thickness. Compactor Pads should be seven (7) inches in thickness.

The concrete strength should be equivalent to 3,500 psi compressive strength at twenty eight (28) days, with a minimum five and one half (5.5) sack cement content.

It is recommended that the five (5) inch thick pavement be reinforced with a minimum #4 bars at twenty four (24) inch on center, the six (6) inch thick pavement be reinforced with a minimum #4 bars at eighteen (18) inch on center, and the seven (7) inch thick pavement be reinforced with a minimum #4 bars at eighteen (18) inch on center.

Subgrade preparation after reaching rough grade should consist of scarifying to eight (8) inches, adding moisture as needed, then recompacting to a minimum 95% of Standard Proctor Density, as determined by the ASTM D-698 Procedure, at Optimum Moisture Content (0 to +3%).

If a wet condition exists at the time of construction, it may be advantageous for expediency to stabilize the subgrade. Based on our laboratory tests, TMC estimates the silty sand soils should be stabilized with approximately nine (9) pounds of Hydrated Lime and twenty seven (27) pounds of Fly Ash per square yard for an six (6) inch depth.

The type and amount of stabilization required should be re-evaluated in the field once final grade is reached. This is recommended to insure the correct type and amount of stabilization is used.

The stabilized mixture should be compacted to a minimum 95% of Standard Proctor Density as determined by the ASTM D-698 Procedure, at Optimum Moisture Content (0 to +3%).

Control Joints

Control joints should be spaced a maximum twelve and one half (12.5) feet for five (5) inch thick pavement and a maximum control joint spacing of fifteen (15) feet for six (6) inch or thicker pavement.

Sawcut control joints should be cut within six (6) to twelve (12) hours of concrete placement to help control the formation of plastic shrinkage cracks as the concrete cures. The depth of the joint should be at least one quarter (1/4) of the slab depth when using a conventional saw or one (1) inch when using early entry saws. The width of the cut should be in accordance with the joint sealant manufacturers recommendations.

The installation of expansion joints is optional, but if used, they should have a maximum spacing of sixty (60) feet.

When concrete is planned to be placed at different times, we recommend the use of a construction joint between paving areas. The construction joint should consist of a butt joint, but not a keyway joint.

Dowels at expansion and construction joints should consist of three quarter (3/4) inch bars, eighteen (18) inches in length, with one (1) end treated to slip, and spaced at twelve (12) inches on center at each joint.

UNDERGROUND DETENTION CHAMBER

Information made available to this office indicates that an Underground Detention Chamber will be located under the proposed pavement.

The Underground Detention Chamber type is not known at this time, but could consist of a Storm Chamber, Contech or R-Tank. Typically, these chambers are placed at a depth of six (6) feet below existing grade.

The surface materials encountered in all borings were a silty sand (0' - 2'), then sandy clay soils to a depth of ten (10) feet. The chambers may be extended to the proposed six (6) foot depth without encountering water problems.

The allowable bearing capacity of the foundation soils at six (6) feet is given as 2,000 pounds per square foot for dead load, or 3,000 pounds per square foot for total load.

The Underground Detention Chamber should be placed according to the Manufacturers Specifications.

SITE PREPARATION

In order to remedy construction problems which may develop if attempts are made to work the surface materials following prolonged periods of rainfall, it is recommended that prior to starting any work at the site, proper construction drainage be provided to maintain a relatively dry construction site.

If any old foundations are encountered in areas of new construction, the upper two (2) feet should be removed and the resulting excavation backfilled with a Stabilized Sand to 95% of Standard Proctor Density, as determined by the ASTM D-698 Procedure.

CONSTRUCTION MATERIALS TESTING

The Murillo Company (TMC) should be retained to provide Construction Materials Testing (CMT) and observation services during construction, particularly during all foundation installation and earthwork related activities.

As the Geotechnical Engineer of Record, it is important that our technical personnel provide these services to help ensure that our design recommendations are interpreted properly and that actual field conditions are those described in our geotechnical report.

With TMC's involvement in the project during the construction phase, we can help avoid potential problems before they become a significant issue. This can only be an effective process if our technical personnel routinely visit the project site and perform appropriate tests and observations during construction.

By continuing our involvement on the project after the geotechnical design phase, and by providing the CMT services during construction, a single point of contact is established for the owner regarding TMC's services for the project.

LIMITATIONS

This report was intended for the exclusive use of Client or Their Representative, and is applicable only for the project and property identified herein. As to any other property or project, this report is informational only and is not a recommendation for any design of any other structure. It is not to be used for any other purpose or property and is specifically not to be used as a basis to design any other structure.

An environmental assessment of the site or identification or prevention of pollutants, hazardous materials or conditions was not in our scope of services for this project and any reference in this report is provided for information purposes only.

Your receipt of this report signifies your agreement to hold harmless The Murillo Company from any liability whatsoever if this report is used for, or the basis of, a design of any other structure.

Respectfully submitted,

Digitally signed by Daniel Gutierrez
Date: 2023.08.31 11:38:01 -05'00'

Daniel Gutierrez, P.E.
President

THE MURILLO COMPANY
F-2911

August 31, 2023

Copies submitted:

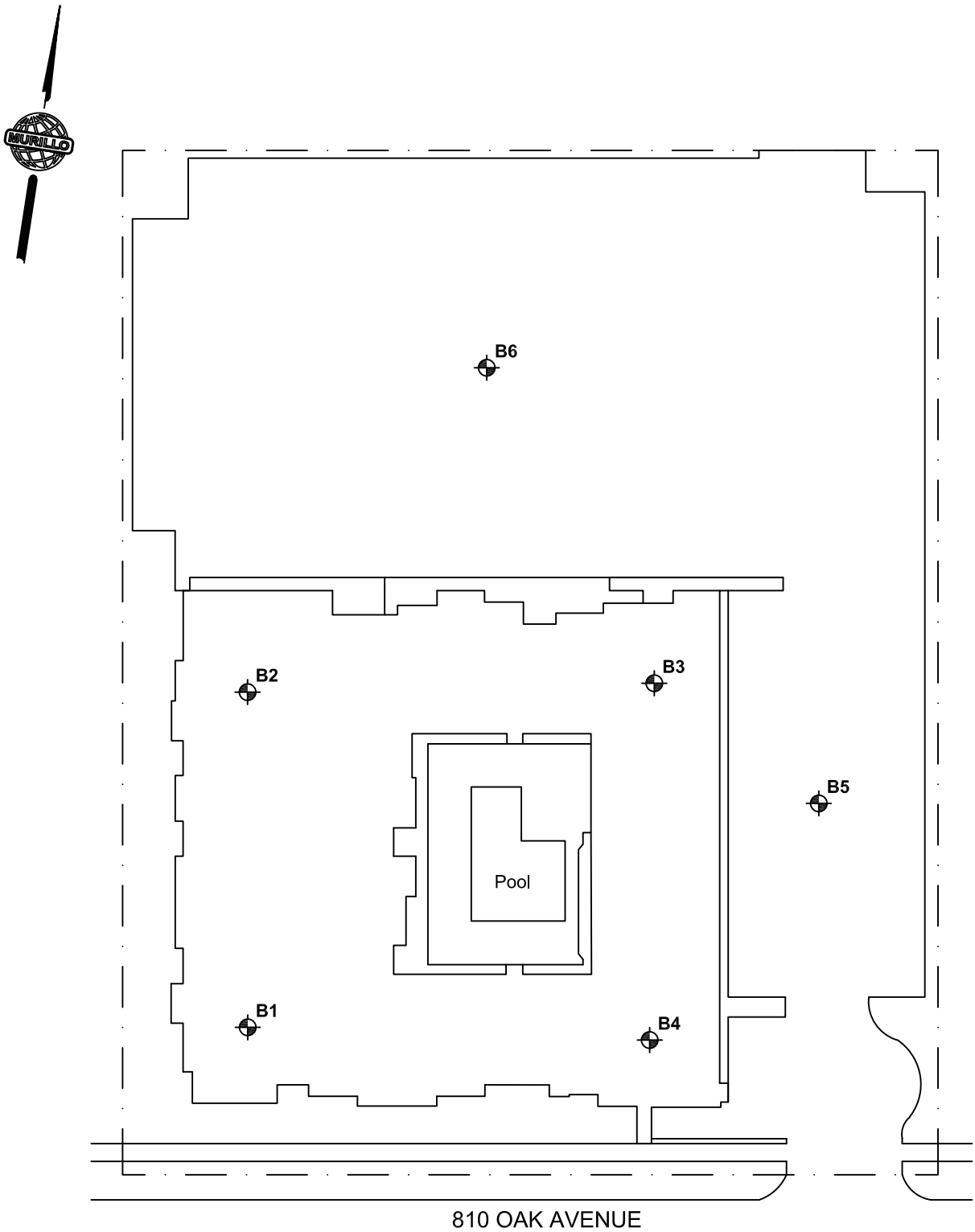
Mark-Dana Corporation (1)
Mucasey Architects (1)
File (1)

APPENDIX

Boring Plan

Boring Logs B1 - B6

Test Methods Used



NOT TO SCALE

BORING PLAN
AUGUST 2023

BORING LOG **B1**

The Murillo Company
10325 Landsbury, Suite 400
Houston, Texas 77099

PROJECT: LOST OAKS
PROJECT NO.: GEO3082023
LOCATION: SEE BORING PLAN
DRILL DATE: 8-2-23

DEPTH, ft	DESCRIPTION	UNIT DRY WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	PASSING #200 SIEVE, %	CLAY CONTENT, %	BLOWS PER FOOT
0	Loose brown silty sand w/surface vegetation		3	15	15	0			
	Hard gray and tan sandy clay w/ferrous nodules and sand seams								
5	Very stiff gray and tan sandy clay w/vertical sand seams	115	15	46	16	30			
		115	14						
	Plastic gray and tan very sandy clay w/sand seams, moist	111	16						
10	▼								
	Medium dense tan silty fine sand, waterbearing								
15	▽		28	19	17	2			13
									18
20									
									23
25	Termination depth = 25 feet depth								
30									

SHEAR STRENGTH, tsf
○ POCKET PENETROMETER
● LABORATORY UNCONFINED
0.5 1.0 1.5 2.0 2.5

GROUND WATER OBSERVATIONS:
▽: WATER ENCOUNTERED AT 15.0 FT. DURING DRILLING.
▼: WATER DEPTH AT 11.0 FT. AFTER DRILLING.

BORING LOG **B2**

The Murillo Company
10325 Landsbury, Suite 400
Houston, Texas 77099

PROJECT: LOST OAKS
PROJECT NO.: GEO3082023
LOCATION: SEE BORING PLAN
DRILL DATE: 8-2-23

DEPTH, ft	DESCRIPTION	UNIT DRY WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	PASSING #200 SIEVE, %	CLAY CONTENT, %	BLOWS PER FOOT
0	Loose brown silty sand w/surface vegetation								
	Hard gray and tan sandy clay w/ferrous nodules and vertical sand seams	120	10	45	16	29			
5		116	14	48	17	31			
	Medium dense gray and tan silty fine sand, moist ▼	108	19	23	21	2			
10									10
	Medium dense tan silty fine sand, waterbearing ▽								
15									15
20									
									27
25	Termination depth = 25 feet depth								
30									

SHEAR STRENGTH, tsf
○ POCKET PENETROMETER
● LABORATORY UNCONFINED
0.5 1.0 1.5 2.0 2.5

GROUND WATER OBSERVATIONS:
▽ : WATER ENCOUNTERED AT 14.0 FT. DURING DRILLING.
▼ : WATER DEPTH AT 9.0 FT. AFTER DRILLING.

BORING LOG **B3**

The Murillo Company
10325 Landsbury, Suite 400
Houston, Texas 77099

PROJECT: LOST OAKS
PROJECT NO.: GEO3082023
LOCATION: SEE BORING PLAN
DRILL DATE: 8-2-23

DEPTH, ft	DESCRIPTION	UNIT DRY WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	PASSING #200 SIEVE, %	CLAY CONTENT, %	BLOWS PER FOOT
0	Loose brown silty sand w/surface vegetation								
	Hard gray and tan sandy clay w/ferrous nodules and sand seams								
5	Very stiff gray and tan sandy clay w/sand seams	116	15	44	16	28			
		112	17						
	Stiff gray and tan sandy clay w/sand seams ▼								
10									
	Medium dense tan silty fine sand, waterbearing								
	▽		25	19	18	1			11
15									
									15
20									
									21
25	Termination depth = 25 feet depth								
30									

SHEAR STRENGTH, tsf
○ POCKET PENETROMETER
● LABORATORY UNCONFINED
0.5 1.0 1.5 2.0 2.5

GROUND WATER OBSERVATIONS:
▽ : WATER ENCOUNTERED AT 15.0 FT. DURING DRILLING.
▼ : WATER DEPTH AT 10.0 FT. AFTER DRILLING.

BORING LOG **B4**

The Murillo Company
10325 Landsbury, Suite 400
Houston, Texas 77099

PROJECT: LOST OAKS
PROJECT NO.: GEO3082023
LOCATION: SEE BORING PLAN
DRILL DATE: 8-2-23

DEPTH, ft	DESCRIPTION	UNIT DRY WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	PASSING #200 SIEVE, %	CLAY CONTENT, %	BLOWS PER FOOT
0	Loose brown silty sand w/surface vegetation								
	Hard gray and tan sandy clay w/ferrous nodules and vertical sand seams	105	14	44	17	27			
5	Very stiff gray and tan sandy clay w/ferrous nodules and sand seams	114	16	39	15	24			
	Stiff gray and tan sandy clay w/vertical sand seams ▼	111	16						
10	Medium dense tan silty fine sand, waterbearing ▽								11
15									
20									18
25	Termination depth = 25 feet depth								21
30									

SHEAR STRENGTH, tsf
○ POCKET PENETROMETER
● LABORATORY UNCONFINED
0.5 1.0 1.5 2.0 2.5

GROUND WATER OBSERVATIONS:
▽ : WATER ENCOUNTERED AT 14.0 FT. DURING DRILLING.
▼ : WATER DEPTH AT 9.0 FT. AFTER DRILLING.

BORING LOG **B5**

The Murillo Company
10325 Landsbury, Suite 400
Houston, Texas 77099

PROJECT: LOST OAKS
PROJECT NO.: GEO3082023
LOCATION: SEE BORING PLAN
DRILL DATE: 8-2-23

DEPTH, ft	SYMBOL	CORES	DESCRIPTION	UNIT DRY WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	PASSING #200 SIEVE, %	CLAY CONTENT, %	BLOWS PER FOOT
0			Loose brown silty sand w/surface vegetation		1	17	16	1			
5			Hard to very stiff gray and tan sandy clay w/ferrous nodules and sand seams	119	14	48	17	31			
			Termination depth = 6 feet depth								

SHEAR STRENGTH, tsf
○ POCKET PENETROMETER
● LABORATORY UNCONFINED
0.5 1.0 1.5 2.0 2.5

GROUND WATER OBSERVATIONS:
NO WATER ENCOUNTERED DURING DRILLING

BORING LOG **B6**

The Murillo Company
10325 Landsbury, Suite 400
Houston, Texas 77099

PROJECT: LOST OAKS
PROJECT NO.: GEO3082023
LOCATION: SEE BORING PLAN
DRILL DATE: 8-2-23

DEPTH, ft	SYMBOL	CORES	DESCRIPTION	UNIT DRY WEIGHT, PCF	MOISTURE CONTENT, %	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	PASSING #200 SIEVE, %	CLAY CONTENT, %	BLOWS PER FOOT	SHEAR STRENGTH, tsf (○ POCKET PENETROMETER, ● LABORATORY UNCONFINED; 0.5 1.0 1.5 2.0 2.5)
0			Loose brown silty sand w/surface vegetation									
			Hard gray and tan sandy clay w/ferrous nodules and vertical sand seams	119	13	44	17	27				● 2.0, ○ 2.0
5			Termination depth = 6 feet depth									
10												
15												
20												
25												
30												

GROUND WATER OBSERVATIONS:
NO WATER ENCOUNTERED DURING DRILLING

TEST METHODS USED (If Applicable)

ASTM D698 – Moisture Density Relations (Standard Proctor)

ASTM D854 – Specific Gravity of Soils

ASTM D1140 – Amount of Material in Soils Finer than No. 200 Sieve

ASTM D1557 – Moisture Density Relations (Modified Proctor)

ASTM D1883 – CBR (California Bearing Ratio) of Laboratory-Compacted Soils

ASTM D2166 – Unconfined Compressive Strength of Cohesive Soil

ASTM D2216 – Water Content of Soil, Rock, and Soil-Aggregate Mixtures

ASTM D2435 – One-Dimensional Consolidation Properties of Soils

ASTM D2487 – Classification of Soils for Engineering Purposes

ASTM D2850 – Unconsolidated, Undrained Strength of Cohesive Soils in Triaxial Compression

ASTM D4221 – Dispersive Characteristics of Clay Soil by Double Hydrometer

ASTM D4318 – Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D4546 – One-Dimensional Swell or Settlement Properties of Cohesive Soils

ASTM D4972 – pH of Soils

ASTM D6572 – Determining Dispersive Characteristics of Clayey Soils by the Crumb Test

ASTM D6913 – Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

ASTM D7928 – Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis