

**GEOTECHNICAL ENGINEERING REPORT
PROPOSED OAKBROOK DEVELOPMENT
STINSON ROAD
LUCAS, TEXAS**

Prepared for:

**M. CHRISTOPHER CUSTOM HOMES
Fairview, Texas**

**EWI Report No. MC143294
October 2014**



Ellerbee-Walczak, Inc.
GEOTECHNICAL ENGINEERING &
CONSTRUCTION MATERIALS TESTING SERVICES

October 31, 2014

M. Christopher Custom Homes
630 Oakmont Court
Fairview, Texas 75069

Attn: Mr. Rudy Rivas

Re: Geotechnical Engineering Report
Proposed Oakbrook Development
Lucas, Texas
EWI Report No. MC143294

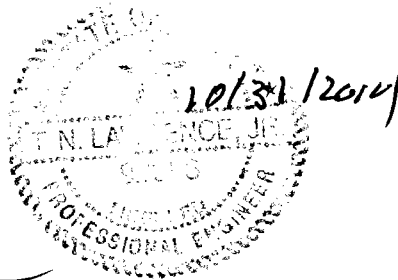
Gentlemen:

Ellerbee-Walczak, Inc. (EWI) has completed its Geotechnical Engineering Report at the above referenced location. The results are presented in the attached report.

Please do not hesitate to contact us if you have any questions regarding the information in this report or if we can be of any additional assistance.

It has been a pleasure providing geotechnical services for this project.

Sincerely,
Ellerbee-Walczak, Inc.
TBPE Firm No. F-4610





T. Neill Lawrence, Jr., P.E.
Manager Engineering

TABLE OF CONTENTS

	Page
1.0 SITE & PROJECT INFORMATION.....	1
2.0 SCOPE OF SERVICES.....	1
3.0 FIELD OPERATIONS.....	1
4.0 LABORATORY TESTING.....	2
5.0 SITE SUBSURFACE CONDITIONS.....	5
6.0 GROUNDWATER.....	6
7.0 ANALYSIS AND RECOMMENDATIONS.....	6
7.1 Foundation Recommendations.....	6
7.1.1 Ground Supported Foundation Systems.....	6
7.1.1.1 Excavation and Replacement.....	8
7.1.1.2 Ground-Supported Stiffened Slabs.....	8
7.1.2 Piers.....	10
7.2 Utilities.....	11
7.3 Earthwork/Site Grading.....	11
7.4 Site Drainage.....	12
8.0 LIMITATIONS.....	12

APPENDIX

	Figure
Plan of Borings.....	1
Boring Logs.....	2 - 44
Key to Symbols used on Boring Logs.....	45
Water Pressure Injection Specifications.....	46
Chemical Pressure Injection Specifications.....	47

**GEOTECHNICAL ENGINEERING REPORT
PROPOSED OAKBROOK DEVELOPMENT
STINSON ROAD
LUCAS, TEXAS**

1.0 SITE & PROJECT INFORMATION

The proposed 92.134-acre site is designated as the Oakbrook Development and is located on the west side of Stinson Road, southwest of the intersection of Stinson Road and Hickory Hill Road in Lucas, Collin County, Texas. The site was mostly agricultural fields which are forested along the NW/SE creek. The site generally drains towards the creek.

Proposed construction consists of forty four (Block A – Lots 1 through 22 and Block B – Lots 1 through 22), single-family, one or two-story residences with relatively light foundation loads. It is our understanding that post-tensioned, ground supported foundations are planned for the residences. We assume cuts and fills within the areas of construction to achieve finished grades will mostly to be less than ± 3 feet of existing grades with larger fills near Muddy Creek.

2.0 SCOPE OF SERVICES

The purpose of our geotechnical services for this site were to:

- Evaluate the subsurface conditions encountered in the borings.
- Evaluate the pertinent engineering properties of the recovered samples.
- Provide recommendations concerning suitable types of foundation and floor slab systems for the proposed residences.
- Provide recommendations for earthwork and site grading.

3.0 FIELD OPERATIONS

The subsurface conditions of the site were evaluated by performing 43 borings, which were drilled on September 5, 9 and September 10, 2014. The approximate boring locations are provided on the Plan of Borings (Figure 1) in the Appendix. The results of the field exploration program are presented on the Boring Logs (Figures 2 through 44) in the Appendix. A Soil Classification Chart containing the keys to symbols and the description of terms used on the boring logs is presented on Figure 45.

A truck-mounted drilling rig with continuous flight augers was used to advance the borings. Soils were sampled using steel tubes or during the performance of standard penetration tests. The samples were extruded in the field, logged, sealed, and packaged to preserve their in-situ moisture content and reduce disturbance during transportation to the laboratory. The load carrying capacity of the limestone encountered in most of the borings was evaluated in the field by performance of the Texas Department of Transportation's (TxDOT) Cone Penetration Tests. Drilling and sampling were performed in general accordance with applicable ASTM and TxDOT procedures.

4.0 LABORATORY TESTING

The Boring Logs and samples were reviewed by a geotechnical engineer who assigned soil samples for testing. Tests were performed in the laboratory by technicians working under the direction of the engineer. Testing was performed in general accordance with applicable ASTM procedures.

Liquid and Plastic Limit tests were performed on samples of the cohesive soils. These tests were used in conjunction with moisture content tests for classification and estimating their volume change potential. Absorption swell tests were performed on selected samples of the cohesive materials to quantitatively evaluate volume change potential at the in-situ moisture levels. Percent passing the No. 200 sieve tests were performed on selected samples of the cohesive soils to determine the percentage finer than 0.075 mm and to aid in classification. Hand penetrometer and unconfined compression tests were performed on samples of cohesive soils to evaluate consistency and strength.

The results of the laboratory tests are presented on the Boring Logs in the Appendix. Results of the swell tests are presented below in Table 1.

TABLE 1 - SUMMARY OF SWELL TESTS

Boring	Depth (feet)	LL %	PI	Initial Moisture (%)	Final Moisture (%)	Surcharge (psf)	Swell (%)
1	4 - 6	39	23	14.1	17.3	625	1.0
2	2 - 4	58	35	22.8	24.0	375	0.6
3	2 - 4	58	35	23.4	27.6	375	4.8
3	8 - 10	81	49	32.1	37.1	1125	0.4
4	2 - 4	67	40	29.1	33.1	375	0.9
4	6 - 8	54	32	22.0	28.7	875	1.0
5	2 - 4	67	40	28.6	32.3	375	1.3
6	6 - 8	59	36	22.7	26.3	875	0.5

TABLE 1 - SUMMARY OF SWELL TESTS

Boring	Depth (feet)	LL %	PI	Initial Moisture (%)	Final Moisture (%)	Surcharge (psf)	Swell (%)
7	6 - 8	50	30	15.9	22.2	875	2.8
8	0 - 2	59	35	23.8	29.0	125	1.3
8	6 - 8	40	20	14.3	21.6	875	0
9	2 - 4	60	32	27.0	32.2	375	0.9
10	6 - 8	64	39	25.8	29.6	875	0.7
11	2 - 4	64	38	27.4	32.1	375	0.5
12	4 - 6	67	40	28.9	33.9	625	0.7
13	4 - 6	49	27	19.6	21.2	625	1.0
14	4 - 6	64	44	20.3	24.1	625	0.5
15	6 - 8	69	40	30.0	31.5	875	0.9
16	8 - 10	65	41	20.8	24.7	1125	2.9
17	6 - 8	59	35	20.3	25.4	875	1.3
18	4 - 6	70	44	28.4	33.6	625	0.4
19	2 - 4	69	41	30.4	34.7	375	0.7
20	0 - 2	59	30	29.4	33.2	125	2.1
21	4 - 6	57	35	19.9	24.2	125	0.7
22	6 - 8	55	34	22.4	26.8	875	0.6
23	2 - 4	72	44	33.9	37.4	375	0.9
24	4 - 6	68	41	28.6	30.4	625	0.2

Boring	Depth (feet)	LL %	PI	Initial Moisture (%)	Final Moisture (%)	Surcharge (psf)	Swell (%)
25	4 – 6	64	39	22.5	27.7	625	2.2
26	4 – 6	67	40	25.3	29.9	625	3.0
27	0 – 2	67	38	28.3	29.8	125	2.8
28	2 – 4	66	38	29.1	33.0	375	1.1
29	6 – 8	53	32	19.2	24.6	875	1.9
30	8 – 10	50	30	22.8	25.5	125	0.3
31	2 – 4	64	39	25.0	27.8	375	1.9
32	4 – 6	57	35	22.7	24.7	625	0.4
33	8 – 10	63	37	24.3	28.2	1125	1.4
34	2 – 4	71	42	28.8	33.6	375	1.5
35	8 – 10	70	44	27.4	33.2	1125	1.1
36	4 – 6	58	36	21.2	29.2	625	1.4
37	0 – 2	57	34	23.6	26.0	125	1.7
37	4 – 3	53	32	20.3	22.9	625	1.0
38	4 – 6	50	30	19.5	21.9	625	0.5
39	6 – 8	55	33	19.7	23.0	875	0.9
40	2 – 4	70	42	29.0	32.7	375	0.7
41	0 – 2	67	40	30.1	32.9	125	1.1
42	2 – 4	65	37	31.8	35.4	375	0
43	2 – 4	72	44	32.5	34.6	375	0.6

5.0 SITE SUBSURFACE CONDITIONS

The conditions encountered at the boring locations are depicted on the Boring Logs in the Appendix. Descriptions of each stratum with its approximated depth and thickness are provided. The depths reported on the logs refer to the depth from the existing ground surface at the time the borings were performed. A brief description of the stratigraphy indicated by the borings is presented below.

Dark brown, light brown, brownish tan and tan clays were encountered from ground surface in Borings 1 through 43 and extended to depths of 2, 4, 8, 13, 12, 8, 4, 4, 8, 8, 8, 13, 12, 4, 8, 8, 8, 8, 8, 4, 6, 6, 8, 8, 6, 7, 12, 8, 8, 8, 6, 6, 9, 8, 14, 6, 6, 13, 8, 6, 6, 6 and 5 feet below existing grades, respectively. The upper 4, 2, 6 and 6 feet of the clays were considered to be fills in Borings 6, 10, 11 and 13, respectively and contained brick fragments and some roots in Boring 13. The surface clays and fills had Liquid Limits (LL) of 49 to 74 percent and Plasticity Indices (PI) of 27 to 46. The surface clays and fills mostly classified as CH according to the Unified Soil Classification System (USCS) and were stiff to hard in consistency and generally moist.

Tan and brown silty clays were next encountered in Borings 1, 2, 7 through 11, 13, 15 through 31, 32, 34, 36 through 41 and 43. The silty clays extended to depths of about 17, 12, 13, 14, 14, 13½, 9, 10½, 14, 14, 13½, 18½, 18, 15, 12, 9, 12, 17, 16, 13½, 11, 7, 13½, 155, 17, 15, 9, 7, 7 and 6½ feet in Borings 1, 2, 8, 9, 10, 11, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 36, 37, 38, 39, 40, 41 and 43, respectively, and to termination depths of about 20 feet in Borings 7, 13, 19, and 32. They had LL's of 32 to 65 percent; PI's of 16 to 41, classified as CL and to a lesser extent CH according to the USCS and was stiff to hard in consistency.

Tan and gray shaley clays were next encountered in Borings 2, 3, 4, 10, 14 and 16. The shaley clays extended to depths of about 18, 19, 19, 14 and 15 feet below existing grades in Borings 2, 10, 14 and 16, respectively, and extended to termination depths of 20 feet below existing grades in Borings 3 and 4. The shaley clays had LL's of 64 to 81 percent, PI's of 43 to 49, classified as CH according to the USCS and was very stiff to hard in consistency.

Tan limestone with clay seams were next encountered in Borings 1, 2, 5, 6, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 and 43. The tan limestone extended to depths of about 18, 17, 17, 18, 18 and 17 feet below existing grades in Borings 5, 12, 16, 18, 20 and 24, respectively, and extended to termination depths of about 15 and 20 feet below existing grades in borings 1, 2, 6, 8, 9, 10, 11, 14, 15, 17, 21, 22, 23, 25, 26, 27, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 and 43.

Gray limestone was next encountered in Borings 5, 12, 16, 18, 20, 24 and 28, and extended to termination depths of about 20 feet below existing grades.

The clay soils encountered in the borings are considered to be moderately active (silty clays) to highly active (clays/shaley clays) with respect to moisture-induced volume changes. Active soils will shrink and swell within the active zone with variations in seasonal moisture change.

6.0 GROUNDWATER

The borings were advanced in the dry using auger-drilling techniques. This process allows relatively accurate short-term observations of groundwater while drilling. Seepage was observed in Borings 7, 13, 19, 21, 27, 28, 32, 36, 37 and 38 while drilling at depths of about 19, 18, 13, 18, 12, 19, 18, 13, 13 and 13 feet below existing grades, respectively. Water levels of about 19, 18, 10, 18, 15, 19, 18, 18, 18 and 18 feet below existing grades were measured in Borings 7, 13, 19, 21, 27, 28, 32, 36, 37 and 38, respectively, after completion of drilling. Seepage was not observed in Borings 1 through 6, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 22 through 26, 29, 30, 31, 33, 34, 35, 39, 40, 41, 42 and 43 at the time of drilling and they remained dry at drilling completion.

Groundwater levels will seasonally fluctuate due to variations in the amount of precipitation, evaporation and surface water runoff. Seepage can occur above and within the limestone, particularly during wet seasonal cycles. In addition, groundwater conditions may change due to landscape irrigation, tree root demand and from leaking buried utilities.

7.0 ANALYSIS AND RECOMMENDATIONS

7.1 Foundation Recommendations

If some differential foundation movements can be tolerated, area residence structures such as these commonly use a post-tensioned or conventionally reinforced, stiffened ground supported foundation system (Slab-On-Grade) for soil conditions similar to this site. The installation of straight drilled shafts (piers) placed independent the ground-supported foundation can be considered for additional support.

Design parameters are presented below.

7.1.1 Ground Supported Foundation Systems

Lightly loaded ground supported foundation systems placed on site subgrades will be subject to some movement as a result of moisture-induced volume changes in the active soils. The more clayey soils expand (heave) with increases in moisture and contract (shrink) with decreases in moisture. The movement typically occurs as post construction heave.

The potential magnitude of the moisture-induced movements is rather indeterminate. It is influenced by the soil properties, overburden pressures, thickness of clay strata and to a great extent by soil moisture levels at the time of construction. The greatest potential for post-construction movement occurs when the soils are in dry condition at the time of construction. Site grading can affect the potential movements. For example, the use of clays as fill material will increase the potential movements by increasing the total clay thickness. Cuts can decrease the potential movements by removing a part of the active clays.

The Potential Vertical Rise (PVR) estimates for the borings were estimated using the information from the testing program and are based on the Texas Highway Department's Method 124-E and our general knowledge of the area. PVR calculations are one-dimensional representations of the Potential Vertical Movements (PVM) (i.e. – swell is only considered). Shrinkage due to soil desiccation of near the same magnitude can also occur. PVR calculations are estimates based on assumptions that the area around the structures will be well drained (Properly Graded), landscape beds are not over-watered, and utility leaks are promptly repaired. Long term utility leaks beneath the foundation may exceed those estimated in this report.

Based on the soils encountered in the borings, we estimate the potential magnitude of post-construction heave for slabs-on-grade placed near existing grade for soils at dry conditions is on the order of 2½ inches up to on the order of 7 inches.

Swell and moisture tests indicate the soil were at a favorable moisture state at the time of drilling therefore the lots with the deeper CH clays may be designed for a maximum PVR of 4½ inches, or less, assuming earthwork is completed prior to the summer of 2015, fills are placed at a moisture conditioned state and a poly liner is placed to reduce drying prior to house construction. The poly sheeting (5 mil or thicker) should have a minimum of 12 inches of compacted cover soils.

If allowed to dry it is estimated movements of 2½ inches, or less, can be obtained by moisture-conditioned soils by either excavation and replacement or water or chemical pressure injection with a minimum 1 foot compacted soils over poly sheeting on the lots with the deeper CH clays. Slabs not capable of experiencing this lower level of movement should be structurally suspended as described below or designed to accommodate the estimated movements. Water and chemical pressure injection recommendations are provided in the appendix of this report if soil modification is being considered.

Consideration should be given to extending the above moisture conditioning and select fill process beyond the building lines to include entrances, sidewalks, and other areas sensitive to movement. Outside the building lines a single lift of select fill (6 to 8 inches) is recommended to reduce desiccation during construction.

It is common to experience some distress to structures with slab-on-grade foundation systems due to ground movements. This can include cracks in brick walls, cracks in ground supported slabs, adjustment to doors and windows that can stick, and interior cracks in sheetrock walls. Cracks in exterior brick walls can be less noticeable with the use of closely spaced vertical joints (12-foot on-center or less for the height of the wall).

7.1.1.1 Excavation and Replacement

Potential slab movements on the order of 2½ inches, or less can be obtained through excavation of in-situ soils to the top of tan limestone or a minimum depth of 7 feet below existing grades. The clay soils can then be replaced in loose lifts, less than 9 inches thick and uniformly compacted to a minimum of 94 percent of Standard Proctor (ASTM D 698) at a minimum of +4 percentage points above the soil's optimum moisture content. Care should be taken that a lift is not allowed to desiccate prior to placing a subsequent lift. The moisture should be maintained by surface watering during the construction process until the floor/slab is placed.

7.1.1.2 Ground-Supported Stiffened Slabs

Post-tensioned or conventionally reinforced, ground-supported stiffened slab foundation systems must be designed to resist and/or tolerate potential vertical movements due to volume changes in the site soils without inducing unacceptable distress in the foundation or structural elements. These movements will typically occur as differential movement between the periphery and interior of the slab-on-grade system.

PVR calculations are estimates based on assumptions that the area around the structures will be well drained (Properly Graded), landscape beds are not over-watered, and utility leaks are promptly repaired. Long term utility leaks can result in soil movements in excess of those estimated above. The following parameters assume that the subgrade beneath the slab should meet the requirements discussed in the Earthwork/Site Grading section of this report.

Adjacent flatwork such as sidewalks and pavements should be designed in such a way as to allow for differential movements between flatwork and the exterior perimeter of the foundations.

As per code, design parameters were developed for differential swell (y_m) using the Post-Tensioning Institute's (PTI) slabs-on-ground (3rd Edition) design method and the VOLFLO 1.5 computer program. The PTI design criteria for the design of slabs-on-ground based on current conditioned soils, dry condition soils or moisture-conditioned/chemical injected soils some with a poly liner are provided below in Tables 2 through 5 below.

TABLE 2 – PTI DESIGN CRITERIA

Block A - Lot 22

Based on Dry Condition Soils (PTI 3rd Edition) Boring 1	Center Lift	Edge Lift
Edge Moisture Variation (em)	7.3 ft.	4.1 ft.
Differential Swell (Ym)	1.0 in.	1.5 in.
Potential Vertical Rise (PVR)	About 2½ inches	

TABLE 3 – PTI DESIGN CRITERIA

Block A – Lots 1, 10 & 21 and Block B – Lots 2, 6, 8, 9 & 10

Based on Dry Condition Soils (PTI 3rd Edition) Borings 2, 8, 13, 15, 31, 40, 41 & 42	Center Lift	Edge Lift
Edge Moisture Variation (em)	7.3 ft.	4.1 ft.
Differential Swell (Ym)	1.6 in.	2.3 in.
Potential Vertical Rise (PVR)	About 4 inches, or less	

TABLE 4 – PTI DESIGN CRITERIA

Block A – Lots 12, 14, 15 & 16 and Block B – Lots 11, 12, 15, 16 & 20

Based on Dry Condition Soils (PTI 3rd Edition) Borings 20, 21, 22, 25, 32, 33, 37, 38 & 39 Poly Liner Not Required	Center Lift	Edge Lift
Edge Moisture Variation (em)	7.3 ft.	4.1 ft.
Differential Swell (Ym)	1.7 in.	2.4 in.
Potential Vertical Rise (PVR)	About 4½ inches	

TABLE 5 – PTI DESIGN CRITERIA

**Block A – Lots 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, 17, 18, 19 & 20
and Block B – Lots 1, 3, 4, 5, 7, 13, 14, 17, 18, 19, 21 & 22**

Based on Current Condition Soils (PTI 3rd Edition) Borings 3, 4, 5, 6, 7, 9, 10, 11, 12, 14, 16, 17, 18, 19, 23, 24, 26, 27, 28, 29, 30, 34, 35 & 36 With Poly Liner	Center Lift	Edge Lift
Edge Moisture Variation (em)	7.3 ft.	3.9 ft.
Differential Swell (Ym)	1.0 in.	2.4 in.
Potential Vertical Rise (PVR)	About 4½ inches	

Site grading can greatly affect the movements discussed above.

The grade beams of the slab-on-grade foundation systems should exert a maximum bearing pressure of 1,800 PSF on undisturbed in place soils, fill or chemical/water injected soils. These beams should extend a minimum of 12 inches below finished grade.

A properly engineered and constructed vapor retarder should be provided beneath slab areas, which will be covered, carpeted, or sealed.

7.1.2 Piers

Straight drilled shafts should be situated in the tan limestone or gray limestone encountered in Borings 1, 2, 5, 6, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, and 43. Piers (straight shaft) should terminate into competent limestone. A minimum diameter of 12-inches is recommended for the straight shafts. Under-reamed shafts (Belled Piers) may be considered for the boring locations where tan limestone or gray limestone was not observed. This office should be contacted if under-reamed shafts are being considered, to provide recommendations.

The drilled shafts may be proportioned using an allowable bearing pressure of 15,000 pounds per square foot (PSF) and an allowable skin friction value of 2,000 PSF for compressive and tensile loads are recommended for the tan limestone. Skin friction is applicable for that portion of the shaft embedded in the bearing stratum below any temporary casing. A minimum penetration of 4 feet into the tan limestone and/or gray limestone is recommended to achieve the allowable skin friction and end bearing values stated above.

Adjacent shafts should maintain a minimum center-to-center spacing of 2.5 times the diameter of the larger shaft. Closer spacing will require reductions in the skin friction values presented above, and possibly special installation sequences. As a general guide, the design skin friction will vary linearly from the full value at a spacing of 2.5 diameters to 50 percent of the design value at 1.0 diameter. EWI should be contacted to review, on a case-by-case basis, shafts requiring closer spacing.

Settlements of properly constructed drilled shafts bearing in the tan limestone for the structures, at the anticipated loads, should be negligible.

The shafts will be subject to uplift as a result of heave in the overlying soils. The magnitude of these loads varies with the shaft diameter, soil parameters, and particularly the in-situ moisture levels at the time of construction. They can be approximated at this site by assuming a uniform uplift of 2,000 PSF over the shaft perimeter for a depth of 4 to 10 feet. This can be reduced by 40 percent for shafts extending through current/moisture-conditioned soils. The shafts must contain sufficient continuous vertical reinforcing to resist the net tensile load.

Groundwater seepage was observed in some of the borings and may be encountered during installation of the drilled shafts, particularly if construction proceeds during a wet period of the year. Rapid placement of steel and concrete may permit shaft installation to proceed; however, seepage rates or caving soils could be sufficient to require the use of temporary casing for installation of the shafts. Should casing be necessary, it should be seated with all water and most loose material removed prior to beginning the design penetration. Care must then be taken that a sufficient head of plastic concrete is maintained within the casing during extraction.

The drilled shaft design recommendations provided in this report are based on proper construction procedures, including maintaining a dry shaft excavation and proper cleaning of bearing surfaces prior to placing reinforcing steel and concrete. All drilled shaft installations should be inspected by qualified geotechnical personnel to help verify the bearing stratum, the design penetration, and perform related duties.

7.2 Utilities

Care should be taken that utility cuts are not left open for extended periods, and that the cuts are properly backfilled. Backfilling should be accomplished with properly compacted on-site soils, rather than granular materials. A positive cut-off at the building line is recommended to help prevent water from migrating in the utility trench backfill.

7.3 Earthwork/Site Grading

Site grading can greatly affect the potential vertical movements as discussed above. Fills constructed using clay soils can increase the potential movements. The on-site soils may be used as general fill. All clay fills should be moisture conditioned or should be select fill. Imported fill (select) should have a Liquid Limit less than 35. The subgrade in areas to be filled and/or under structures, slopes and pavements should be stripped of vegetation and any debris present.

The soil subgrade beneath structure pads should be scarified to a minimum depth of 6 inches and uniformly compacted to a minimum of 94 percent of ASTM D 698 at +4 percentage points above the soil's optimum moisture determined by that test. Native fill materials should then be spread in loose lifts, less than 8 inches thick and uniformly compacted to the same criteria. Imported fill materials should be spread in loose lifts, less than 8 inches thick and uniformly compacted to a minimum of 95 percent of ASTM D 698 at or above the soil's optimum moisture determined by that test.

If trees are removed within the perimeter of the pads, the soil should be excavated to a depth beneath the root bulb and replaced to the same criteria presented above. The pad should be proof rolled with heavy pneumatic equipment. Any soft or pumping areas should be excavated to a firm subgrade and properly backfilled. It should then be scarified to a minimum depth of 6 inches and uniformly compacted to the same criteria presented above. If tree bulbs are not removed, the rooted areas may be in a desiccated state and the potential for heave may exist as moisture levels increase over time.

7.4 Site Drainage

All grades must be adjusted to provide positive drainage away from the ground supported structures. Water permitted to pond near or adjacent to the perimeter of a structure can result in soil movements, which exceed those discussed in this report. Open ground should preferably be sloped at a minimum of 5 percent grade for at least 10 feet (or to drainage swales) beyond the perimeter of the foundations.

Flatwork will be subject to post-construction movement. Maximum grades practical should be used for flatwork to prevent areas where water can pond. In addition, allowances in final grades should take into consideration post-construction movement of flatwork, particularly if such movement would be critical. Where paving or flatwork abuts the structures, care should be taken that the joint is properly sealed and maintained to prevent the infiltration of surface water.

Planters located adjacent to the structures should be designed to drain. Sprinkler mains should be located a minimum of five feet away from the building lines. If heads must be located adjacent to the structures, then service lines off the main should be provided. It is important to maintain moist ground conditions during prolonged periods of dry weather. Trees and deep-rooted shrubs should be located no closer to the structure than $\frac{1}{2}$ their mature height to reduce the potential for foundation settlement caused by moisture demand of the root systems.

Roof drains should discharge on flatwork or be extended a minimum of 5 feet away from the structures.

8.0 LIMITATIONS

The professional services performed for the preparation of this geotechnical report were accomplished in accordance with current and locally accepted geotechnical engineering principles and practices. The recommendations presented in this report are based upon the data obtained from the borings at the indicated locations and/or from other information discussed in this report. The possibility always exists that the subsurface conditions occurring between borings, across the site, or due to seasonal/annual climatic cycles may vary from those encountered in the borings. The nature of these variations may not become evident until during or after construction. Should subsurface conditions varying significantly from those described herein, EWI should be immediately notified to evaluate the effects on these recommendations and so supplemental recommendations can be provided. EWI's services should also be retained for the final review of design plans/specifications so comments can be made regarding interpretation of the geotechnical recommendations provided in this report.

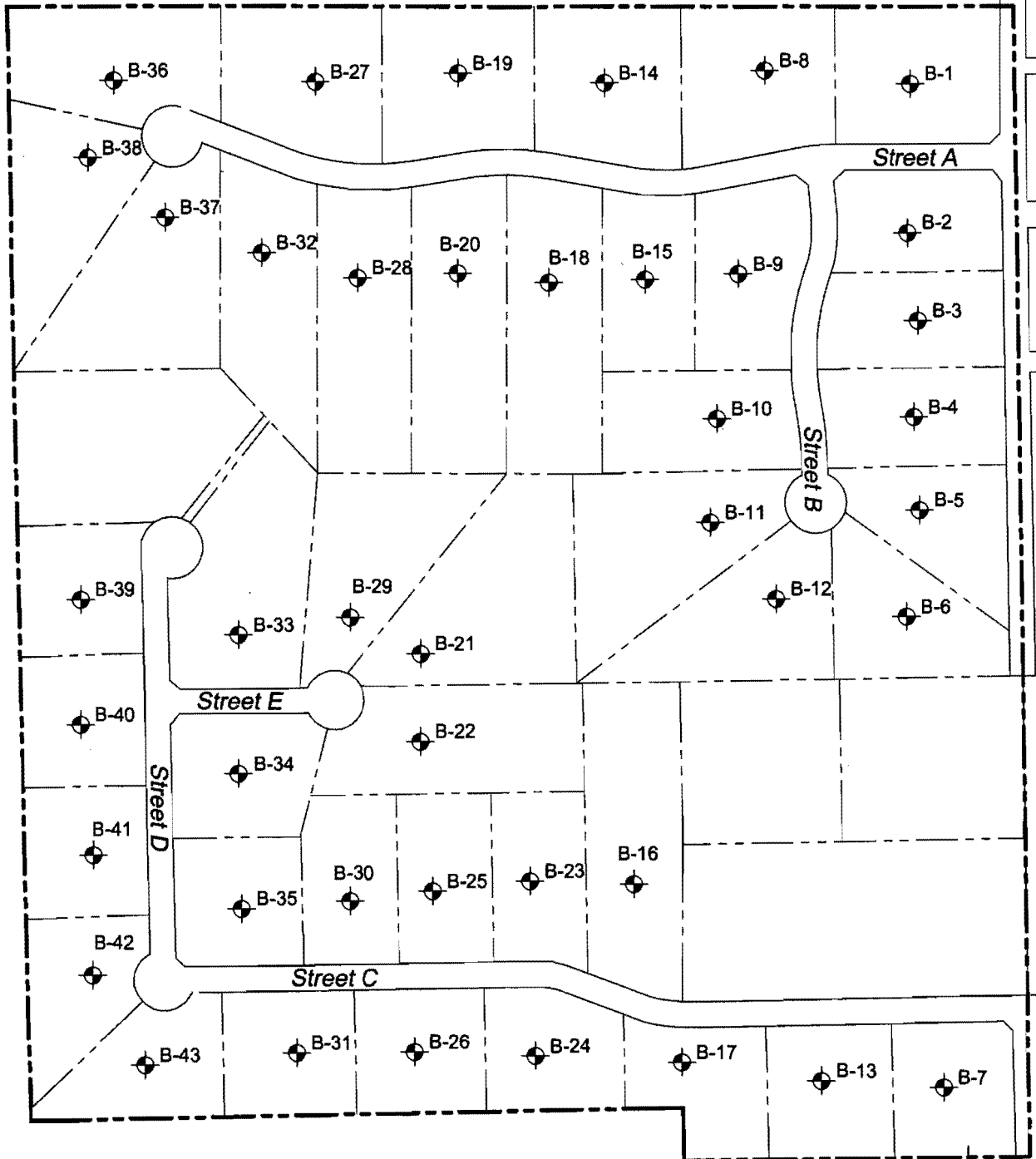
The recommendations provided in this report were prepared for the exclusive use of our client. No warranties, expressed or implied, are intended or made. The information and recommendations provided in this report are applicable only for the design of the types of structure(s) described in the Site and Project Information section of this report and should not be used for any other structures, locations or for any other purposes. We should not be held responsible for the conclusions, opinions or recommendations made by others based upon the information submitted in this report. If changes to the design and/or location of this project as outlined in this report are planned, the recommendations provided in this report shall not be considered valid unless EWI reviews these changes and either verifies or amends this report in writing. Construction issues such as site safety support of excavations and dewatering procedures are the responsibility of others.

The scope of services for this report does not include any environmental or biological assessments either specifically or implied. If the owner is concerned about the potential mold, fungi, bacteria, identification of contaminants or hazardous materials and conditions, additional studies should be undertaken.

EWI's capabilities include a full range of construction material testing and observation services. EWI should be retained to provide testing and observation during excavation, grading, foundation and construction phases of this project.

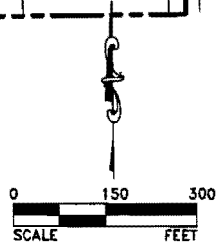
We will retain the samples recovered from the borings on this project for a period of 30 days subsequent to the submittal date printed on this report. After the 30-day period, the samples will be discarded unless otherwise notified by the owner in writing.

File name: J:\Drawings\EWI\2014\MC143294\MC143294.dwg



LEGEND:

- Boring Location
- Approximate Site Boundary



EWI Ellerbee Walczak, Inc.
EWI Project No. MC143294

PLAN OF BORINGS
Oakbrook
Lucas, Texas

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook

PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14 GROUND ELEVATION N/A



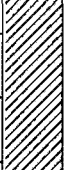

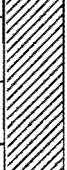
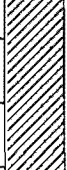
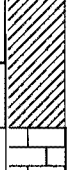
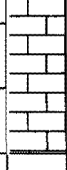

DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Brownish-tan clay	ST	P = 3.0		21	53	20	33	89
		Tan silty clay - with calcareous particles	ST	P = 4.5+						
5			ST	P = 4.5+		14	39	16	23	
			ST	P = 4.5+						
			ST	P = 4.5+						
10										
			ST	P = 4.5+		13	38	18	20	
15		Tan limestone - with clay seams	ST	P = 4.5+						
			THD	T = 2.75"/100						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 2

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-2

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/5/14 COMPLETED 9/5/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING ---


DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Brown clay	ST	P = 4.5+						
-			ST	P = 4.5+		23	58	23	35	
5		Tan and gray silty clay	ST	P = 4.5+						
-			ST	P = 4.5+		14	32	16	16	
10		Tan and gray silty clay - with gravel layers	SS	N = 18						
15		Tan and gray shaley clay	ST	P = 4.5+		21	68	25	43	
20		Tan limestone - with clay seams	THD	T = 4.5"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 3

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook
 PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX
 DATE STARTED 9/5/14 COMPLETED 9/5/14 GROUND ELEVATION N/A
 DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:
 AT TIME OF DRILLING Dry
 AT END OF DRILLING Dry
 NOTES _____ AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Q _u : Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Brown clay	ST	P = 2.5						
			ST	P = 2.75	23	58	23	35		
5			ST	P = 3.75						
		Brownish-tan clay	ST	P = 3.75						
			ST	P = 2.5	35	81	32	49		
10		Tan and gray shaley clay								
	ST		P = 4.5+							
15	ST		P = 4.5+							
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 4

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B- 4

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/5/14 COMPLETED 9/5/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Brown clay								
-			ST	P = 2.0						
-			ST	P = 1.25		29	67	27	40	
5			ST	P = 4.0						
-		Tan and gray clay								
-			ST	P = 4.5+		22	54	22	32	
10			ST	P = 2.0						
-		Tan and gray shaley clay								
15			ST	P = 4.5+						
-			ST	P = 4.5+						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 5

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-5

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/5/14 COMPLETED 9/5/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Brown clay								
-			ST	P = 1.5						
-			ST	P = 2.25		29	67	27	40	
5			ST	P = 2.0						
-			ST	P = 3.0						
-		Tan and gray clay	ST	P = 3.0						
10										
-		Tan limestone - with clay seams								
15			THD	T = 1.5"/100						
-		Gray limestone								
20			THD	T = 1"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 6

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-6

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook

PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/5/14 COMPLETED 9/5/14 GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay (FILL)	ST	P = 2.25 Qu = 4.4	95	28				
			ST	P = 1.75						
5		Tan and brown clay	ST	P = 2.25						
			ST	P = 2.0		23	59	23	36	
			ST	P = 1.75						
10										
		Tan limestone - with clay seams	AU							
15			THD	T = 0.88"/100						
			AU							
20			THD	T = 2"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 7

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-7

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 19.0 ft

▼ AT END OF DRILLING 19.0 ft

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.5		34	72	30	42	
			ST	P = 2.75						
5		Brownish-gray silty clay	ST	P = 4.5+						
			ST	P = 4.5+		16	50	20	30	
			ST	P = 4.5+						
10										
			ST	P = 1.5						
15										
			ST	T = 4.5"/100						
20		Bottom of hole at 20 feet.	THD							

GEO TECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 8

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-8

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook

PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14 GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:
 AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 4.0		24	59	24	35	
		Brownish-gray clay	ST	P = 4.0						
5		Tan silty clay	ST	P = 4.5+						
			ST	P = 4.5+		15	40	20	20	
			ST	P = 4.5+						
15		Tan limestone - with clay seams	AU	P = 4.5+						
			THD	T = 2.5"/100						
20			THD	T = 1.5"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC:143294.GPJ GINT US GDT 10/30/14

FIGURE 9

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-9

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger



GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0										
0 - 5		Dark brown clay	ST	P = 3.25						
5 - 7			ST	P = 2.0		27	60	28	32	
7 - 8			ST	P = 1.75						
8 - 9			ST	P = 1.0						
9 - 10		Tan and brown silty clay	ST	P = 1.5		24	58	22	36	
10 - 15		Tan limestone - with clay seams	THD	T = 1.5"/100						
15 - 18			AU							
18 - 20			THD	T = 4.75"/100						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 10

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-10

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay (FILL)	ST	P = 1.25						
		Dark brown clay	ST	P = 1.75						
5			ST	P = 2.25						
			ST	P = 2.0		26	64	25	39	
		Tan and brown silty clay	ST	P = 2.25						
10										
15		Tan and gray shaley clay	ST	P = 4.5+						
			AU							
20		Tan limestone - with clay seams	THD	T = 2"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 11

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook
 PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX
 DATE STARTED 9/9/14 COMPLETED 9/9/14 GROUND ELEVATION N/A
 DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:
 AT TIME OF DRILLING Dry
 AT END OF DRILLING Dry
 AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay (FILL)	ST	P = 1.75						
-			ST	P = 2.0		27	64	26	38	
5		Brown clay	ST	P = 2.5						
-			ST	P = 2.5		24	62	24	38	
10		Tan and brown silty clay	ST	P = 2.75						
15		Tan limestone - with clay seams	AU							
-			THD	T = 3.1"/100						
20			AU							
-			THD	T = 2.5"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 12

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-12

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay								
-			ST	P = 3.5						
-			ST	P = 1.75						
5			ST	P = 1.75		29	67	27	40	
-			ST	P = 1.75						
-			ST	P = 1.75						
10										
-										
-										
15		Tan limestone - with clay seams	AU							
-			THD	T = 5.25"/100						
-										
-										
-		Gray limestone	AU							
20			THD	T = 3.5"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 13

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-13

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 18.0 ft

▽ AT END OF DRILLING 18.0 ft

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0										
-		Dark brown clay (FILL) - with bricks and roots	ST	P = 2.25						
-			ST	P = 2.5						
5			ST	P = 3.5	20	49	22	27		
-		Light brown clay	ST	P = 2.25						
10			ST	P = 3.0						
-		Tan silty clay - with gravel								
15			ST	P = 1.25	23	39	19	20		
-										
20			SS	N = 50/2"						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 14

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-14

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger



GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 3.0		28	67	27	40	96
-		Brown clay	ST	P = 2.25						
-		Tan shaley clay	ST	P = 2.75		20	64	20	44	
5				ST	P = 3.25					
-				ST	P = 2.75					
10		Tan limestone - with clay seams'	ST	P = 4.5+						
15			THD	T = 3"/100						
-				THD	T = 2"/100					
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 15

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-15

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook
 PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX
 DATE STARTED 9/9/14 COMPLETED 9/9/14 GROUND ELEVATION N/A
 DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:
 AT TIME OF DRILLING Dry
 AT END OF DRILLING Dry
 AFTER DRILLING ---

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay								
-			ST	P = 3.0						
-			ST	P = 1.75						
5			ST	P = 2.0						
-			ST	P = 2.5		30	69	29	40	
-		Tan and brown silty clay	ST	P = 2.75						
10		Tan limestone - with clay seams	THD	T = 4.25"/100						
-			AU							
15			THD	T = 8.5"/100						
		Bottom of hole at 15 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 16

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-16

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 1.5						
-			ST	P = 1.0		31	74	28	46	
5		Brown clay	ST	P = 3.25						
-			ST	P = 2.25						
-		Tan and brown silty clay	ST	P = 4.5+		21	65	24	41	
10		Tan and gray shaley clay								
-			ST	P = 4.5+						
15		Tan limestone - with clay seams								
-			AU							
-		Gray limestone								
20			THD	T = 2.5"/100						
		Bottom of hole at 20 feet.								

GEOTECH.BH.COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 17

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-17

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.5						
			ST	P = 3.5		23	62	27	35	
5		Brown clay	ST	P = 3.5						
			ST	P = 4.5+		20	59	24	35	
		Tan silty clay	ST	P = 3.75						
10										
		Tan limestone - with clay seams	THD	T = 2.75"/100						
15										
			THD	T = 3"/100						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/31/14

FIGURE 18

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-18

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Cu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 4.5+						
			ST	P = 2.0						
5			ST	P = 2.0		28	70	26	44	
			ST	P = 1.75						
		Tan and brown silty clay	ST	P = 2.25		21	62	22	40	
10										
			AU							
15		Tan limestone - with clay seams	THD	T = 2.25"/100						
		Gray limestone	AU							
20			THD	T = 1.5"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 19

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-19

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 13.0 ft

▽ AT END OF DRILLING 10.0 ft

NOTES

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 1.75						
1			ST	P = 1.0		30	69	28	41	
5		Brown clay - with calcareous particles	ST	P = 2.75						
6			ST	P = 2.5						
8		Tan silty clay	ST	P = 3.25						
10										
13		Tan silty clay - with gravel	ST							
15			SS	N = 7						
18										
20			SS	N = 16						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14





FIGURE 20

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-20

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook
 PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX
 DATE STARTED 9/9/14 COMPLETED 9/9/14 GROUND ELEVATION N/A
 DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:
 AT TIME OF DRILLING Dry
 AT END OF DRILLING Dry
 AFTER DRILLING --

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0										
-		Dark brown clay	ST	P = 4.5+		29	59	29	30	
-			ST	P = 2.0						
-										
5		Tan and brown silty clay	ST	P = 2.5						
-			ST	P = 2.75		21	55	22	33	
-			ST	P = 2.5						
10										
-		Tan limestone - with clay seams	AU							
15			THD	T = 1.25"/100						
-		Gray limestone	AU							
20			THD	T = 1"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 21

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-21

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger





GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 18.0 ft

▽ AT END OF DRILLING 18.0 ft

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0										
-		Dark brown clay	ST	P = 4.5+						
-		Brown clay	ST	P = 2.25						
5		Brown clay	ST	P = 4.5+		20	57	22	35	
-		Tan silty clay	ST	P = 4.5+						
-		Tan silty clay	ST	P = 4.5+		18	48	21	27	
10										
15		Tan silty clay	THD	P = 3.0						
-										
20		Tan limestone - with clay seams	THD	T = 3"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC:143294.GPJ GINT US.GDT 10/30/14

FIGURE 22

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-22

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		Dark brown clay	ST	P = 1.5		33	67	27	40		
		Brown clay	ST	P = 3.75							
			ST	P = 2.75							
5			Tan silty clay	ST	P = 3.0		22	55	21	34	
				ST	P = 3.0						
10			ST	P = 4.5+							
15		Tan limestone - with clay seams	THD	T = 6"/100							
			AU								
			THD	T = 2"/100							
20		Bottom of hole at 20 feet.									

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 23

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-23

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook

PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14 GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.0						
			ST	P = 1.25		34	72	28	44	
5		Brown clay	ST	P = 3.0						
			ST	P = 4.5+						
		Tan and brown silty clay	ST	P = 4.25		22	62	23	39	
10										
			ST	P = 2.75						
15		Tan limestone - with clay seams								
			AU							
			THD	T = 2.25"/100						
20		Bottom of hole at 20 feet.								

GEOTECH:BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 24

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-24

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook
 PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX
 DATE STARTED 9/10/14 COMPLETED 9/10/14 GROUND ELEVATION N/A
 DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:
 AT TIME OF DRILLING Dry
 AT END OF DRILLING Dry
 AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 3.75						
1			ST	P = 2.0						
5		Brown clay	ST	P = 2.0		29	68	27	41	
10		Tan silty clay - with calcareous particles	ST	P = 3.25						
15		Tan limestone - with clay seams	THD	T = 3"/100						
20		Gray limestone	THD	T = 1.75"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 25

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-25

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 3.25						
			ST	P = 2.75						
5		Brown clay	ST	P = 4.5+		23	64	25	39	
		Tan and brown silty clay	ST	P = 4.5+		16	47	22	25	
		Tan silty clay	ST	P = 4.5+						
10		Tan limestone - with clay seams	THD	T = 12"/61						
			AU							
15			THD							
			AU							
20			THD	T = 1.75"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 26

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-26

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES _____

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 1.75		35	72	30	42	
		Brownish-gray clay	ST	P = 3.5						
5		Tan silty clay	ST	P = 4.5+		25	67	27	40	
		Tan limestone - with clay seams	ST	P = 4.5+						
10			THD	T = 1"/100						
15										
20			THD	T = 3.25"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 27

Ellerbe-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-27

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14

COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 12.0 ft

▽ AT END OF DRILLING 15.0 ft

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 4.5		28	67	29	38	
		Brown clay	ST	P = 3.75						
5		Tan clay - with calcareous particles	ST	P = 4.0						
		Tan clay - with calcareous particles	ST	P = 3.75						
		Tan clay - with calcareous particles	ST	P = 0.5						
10		Tan silty clay - with gravel								
		Tan silty clay - with gravel	ST	P = 2.25		19	41	20	21	
15		Tan limestone - with clay seams								
		Tan limestone - with clay seams	THD	T = 2.5"/100						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 28

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-28

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 19.0 ft

▽ AT END OF DRILLING 19.0 ft

NOTES

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Cu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.25						
		Brown clay	ST	P = 2.25		29	66	28	38	
5			ST	P = 3.75						
			ST	P = 2.75						
		Tan and brown silty clay	ST	P = 2.5						
10										
		Tan silty clay	ST	P = 1.0						
15										
		Gray limestone	AU							
			THD	T = 2.5"/100						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 29

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-29

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Q _u : Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 1.0						
		Brownish-tan clay	ST	P = 4.25						
5			ST	P = 4.5+						
			ST	P = 4.5+		19	53	21	32	
		Tan and gray silty clay	ST	P = 4.0						
10										
		Tan limestone - with clay seams	AU							
15			THD	T = 2.4"/100						
			AU							
20			THD	T = 6"/100						
		Bottom of hole at 20 feet.								

GEOTECH.BH.COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 30

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-30

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 1.5						
			ST	P = 2.75		30	72	27	45	
5		Brown clay	ST	P = 2.75						
			ST	P = 2.0						
		Tan silty clay	ST	P = 2.5		23	50	20	30	
10		Tan limestone - with clay seams	AU							
			THD	T = 4.25"/100						
15			AU							
			THD	T = 1.5"/100						
20		Bottom of hole at 20 feet.								

GEO TECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 31

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-31

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook

PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14 GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:
 AT TIME OF DRILLING Dry

NOTES _____ AT END OF DRILLING Dry
 AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 1.75						
		Brownish-gray clay	ST	P = 4.5+		25	64	25	39	
5		Tan silty clay - with calcareous particles	ST	P = 4.5+						
		Tan limestone - with clay seams	THD	T = 3.25"/100						
10			THD	T = 3.25"/100						
15		Bottom of hole at 15 feet.	THD	T = 2"/100						

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 32

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-32

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 18.0 ft

▽ AT END OF DRILLING 18.0 ft

NOTES

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 3.25						
			ST	P = 4.25						
5		Brownish-tan clay	ST	P = 4.25		23	57	22	35	
		Tan silty clay	ST	P = 2.5						
10			ST	P = 2.5						
		Tan silty clay - with gravel	ST	P = 2.25						
15			ST	P = 2.25						
20			ST	P = 3.75						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 33

Ellerbe-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-33

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger


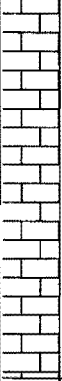
GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0										
0 - 5		Dark brown clay	ST	P = 1.75						
5 - 8			ST	P = 2.25						
8 - 10		Tan and brown clay	ST	P = 3.5						
10 - 11			ST	P = 4.0		24	63	26	37	
11 - 15		Tan limestone - with clay seams	THD	T = 3.75"/100						
			AU							
			THD	T = 1"/100						
15		Bottom of hole at 15 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 34

Ellerbe-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-34

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING --

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.75						
			ST	P = 2.5		29	71	29	42	
5		Brown clay	ST	P = 3.75						
			ST	P = 3.5						
10			Tan silty clay	ST	P = 4.5+					
	AU									
15				Tan limestone - with clay seams	THD	T = 5.5"/100				
		AU								
20		Bottom of hole at 20 feet.	THD	T = 1.25"/100						

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 35

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-35

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.0						
			ST	P = 2.5						
5			ST	P = 2.5						
		Tan and brown clay	ST	P = 2.5						
			ST	P = 1.75		27	70	26	44	
10										
		Tan limestone - with clay seams	AU							
15			THD	T = 7.75"/100						
			AU							
			THD	T = 1.5"/100						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 36

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-36

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 13.0 ft

▽ AT END OF DRILLING 18.0 ft

NOTES

AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Q _u : Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.25						
			ST	P = 4.5+						
5		Brownish-gray clay	ST	P = 4.0		21	58	22	36	
		Tan silty clay - with calcareous particles	ST	P = 2.25						
			ST	P = 3.75						
10										
		Tan silty clay - with gravel								
15			SS	N = 36						
		Tan limestone - with clay seams								
			THD	T = 2.75"/100						
20		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US GDT 10/30/14

FIGURE 37

Ellerbe-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-37

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 13.0 ft

▽ AT END OF DRILLING 18.0 ft

NOTES

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.0		24	57	23	34	
			ST	P = 2.5						
5		Brownish-tan clay	ST	P = 4.5		20	53	21	32	
		Tan silty clay	ST	P = 3.5						
			ST	P = 2.5						
10										
		Tan silty clay - with gravel	ST	P = 0.75						
15										
		Tan limestone - with clay seams								
20			THD	T = 3.25"/100						
		Bottom of hole at 20 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT.US.GDT 10/31/14

FIGURE 38

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook

PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14 GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:

▽ AT TIME OF DRILLING 13.0 ft

▽ AT END OF DRILLING 18.0 ft

NOTES _____ AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Q _u : Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 2.25						
		Brownish-tan clay	ST	P = 3.25						
5		Tan clay	ST	P = 3.75		20	50	20	30	
			ST	P = 4.25						
10			ST	P = 4.5						
		Tan silty clay - with gravel	AU							
15			ST	P = 4.5+						
		Tan limestone - with clay seams	THD	T = 5.25"/100						
20			THD	T = 3"/100						
Bottom of hole at 20 feet.										

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 39

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-39

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/9/14 COMPLETED 9/9/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brown clay	ST	P = 0.75						
		Brown clay	ST	P = 3.25						
5			ST	P = 3.75						
			ST	P = 3.25		20	55	22	33	
		Tan silty clay	ST							
10		Tan limestone - with clay seams	THD	T = 4.5"/100						
			AU							
15			THD	T = 2.25"/100						
		Bottom of hole at 15 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 40

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-40

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING ---

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Brownish-gray clay	ST	P = 2.75						
			ST	P = 2.0		29	70	28	42	
5			ST	P = 4.5						
		Tan silty clay - with calcareous particles	ST	P = 4.5+						
		Tan limestone - with clay seams	THD	T = 5.25"/100						
10			THD	T = 3"/100						
15			THD	T = 2"/100						
		Bottom of hole at 15 feet.								

GEO TECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 41

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-41

PAGE 1 OF 1

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger

GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Cu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Dark brownish-gray clay	ST	P = 1.5		30	67	27	40	
			ST	P = 3.5						
5			ST	P = 4.5+						
		Tan silty clay - with calcareous particles	ST	P = 4.5+						
		Tan limestone - with clay seams	THD	T = 6.5"/100						
10			THD	T = 1.5"/100						
15			THD	T = 1.25"/100						
		Bottom of hole at 15 feet.								

GEO TECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 42

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-42

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook

PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14 GROUND ELEVATION N/A


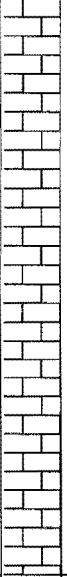
DRILLING METHOD Continuous Flight Auger GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

AFTER DRILLING ---

NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0										
		Dark brown clay	ST	P = 2.25						
			ST	P = 1.5		32	65	28	37	
5		Brownish-gray clay	ST	P = 2.0						
		Tan limestone - with clay seams	THD	T = 8.75"/100						
10			THD	T = 4"/100						
15				THD	T = 2"/100					
		Bottom of hole at 15 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 43

Ellerbee-Walczak, Inc.
 4501 Broadway Avenue
 Haltom City, Texas 76117
 Telephone: 817-759-9999
 Fax: 817-759-1888

BORING NUMBER B-43

CLIENT M. Christopher Custom Homes

PROJECT NAME Oakbrook

PROJECT NUMBER MC143294

PROJECT LOCATION Stinson Rd. Lucas, TX

DATE STARTED 9/10/14 COMPLETED 9/10/14

GROUND ELEVATION N/A

DRILLING METHOD Continuous Flight Auger
















GROUND WATER LEVELS:

AT TIME OF DRILLING Dry

AT END OF DRILLING Dry

NOTES _____

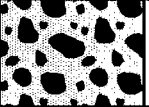


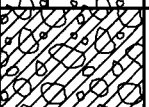
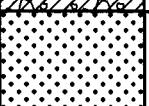
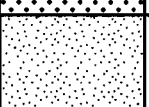
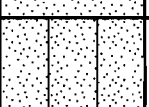
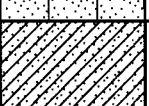

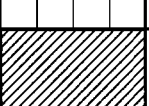



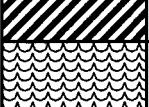

AFTER DRILLING --

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
							LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0										
0 - 1		Dark brown clay	ST	P = 1.75						
1 - 2			ST	P = 2.0		32	72	28	44	
2 - 3										
3 - 4		Brownish-gray clay								
4 - 5		Tan silty clay	ST	P = 4.25						
5 - 6			THD	P = 4.5+						
6 - 7		Tan limestone - with clay seams	THD	T = 3.75"/100						
7 - 8										
8 - 9										
9 - 10			THD	T = 7.25"/100						
10 - 11										
11 - 12										
12 - 13										
13 - 14										
14 - 15			THD	T = 7"/100						
15		Bottom of hole at 15 feet.								

GEOTECH BH COLUMNS MC143294.GPJ GINT US.GDT 10/30/14

FIGURE 44

SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Figure 45

**GENERAL SPECIFICATIONS
FOR
WATER - PRESSURE INJECTION**

1. Injection process shall be observed on a full time basis by a qualified inspector under the direction of the owner's designated geotechnical engineer.
2. A surfactant (wetting agent) shall be added to the water. The amount of surfactant used should be in accordance with the manufacturer's recommendations.
3. The lower portion of the injection nozzle shall consist of a hole pattern that will uniformly disperse the water throughout the entire depth.
4. Injection pressures should be adjusted to disperse as large a volume of water as possible within a pressure range of 50 to 200 pounds per square inch.
5. Injection pipe shall be forced downward (not jetted or washed) in twelve to 18 inch intervals, injecting to refusal at each interval (minimum of five intervals) to a minimum depth of 7 feet below existing grades or until rod refusal into limestone. Refusal will be determined on site by the inspector.
6. Spacing for the injections not to exceed five feet on center each way, and injections shall be carried at least five feet outside building lines. Subsequent injections should be offset from initial locations in a pattern that maximizes distribution of the mixture.
7. After the recommended number of injection passes the moisture content of the soils shall be evaluated by the owner's designated geotechnical engineer on the basis of laboratory tests on tube samples (not cuttings) obtained from shallow borings under his supervision following a twenty-four hour curing period. This engineer shall develop recommendations on the need for any additional injections.
8. In the event that more than three injection passes are required, the surface of the injected area shall be scarified to a depth of at least eight inches and re-compacted prior to the next injection.
9. The surface of the injected area should be sealed or otherwise protected against moisture loss as soon as possible after acceptance of the water injection process.

**GENERAL SPECIFICATIONS
FOR
CHEMICAL - PRESSURE INJECTION**

1. The chemical ionic stabilizer should be mixed with clean water at the concentration recommended by the manufacturer.
2. The lower portion of the injection nozzle shall consist of a hole pattern that will uniformly disperse the chemical throughout the entire depth.
3. Injection pressures should be adjusted to disperse as large a volume as possible within a pressure range of 200 to 250 pounds per square inch.
4. Injection pipe shall be forced downward (not jetted or washed) in twelve to 18 inch intervals, injecting to a minimum depth of 7 feet below existing grades or until rod refusal into limestone.
5. Spacing for the injections not to exceed three feet on center each way, and injections shall be carried at least one foot outside curb lines. Subsequent injections, if necessary, should be offset from initial locations in a pattern that maximizes distribution of the mixture.
6. After the chemical injection is completed, the soils shall be evaluated by the owner's designated geotechnical engineer on the basis of laboratory tests on tube samples (not cuttings) obtained from shallow boring under his supervision following a Seventy-two hour curing period. This engineer shall develop recommendations on the need for any additional injections should the average of 3 swell tests per test boring exceed one percent.
7. The surface of the injected area should be properly compacted and sealed as soon as possible after acceptance of the injection process.