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

10/31/2010

T. Neill Lawrence, Jr., P.E

Manager Engineering

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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.

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



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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 %	Pl	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 moistureconditioned 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 <u>Earthwork/Site Grading</u> 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

Based on Dry Condition Soils (PTI 3 rd 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			

Block A - Lot 22



TABLE 3 – PTI DESIGN CRITERIA

Based on Dry Condition Soils (PTI 3 rd 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				

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

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 3 rd 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 41/2 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 3 rd 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, 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 ½ 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.



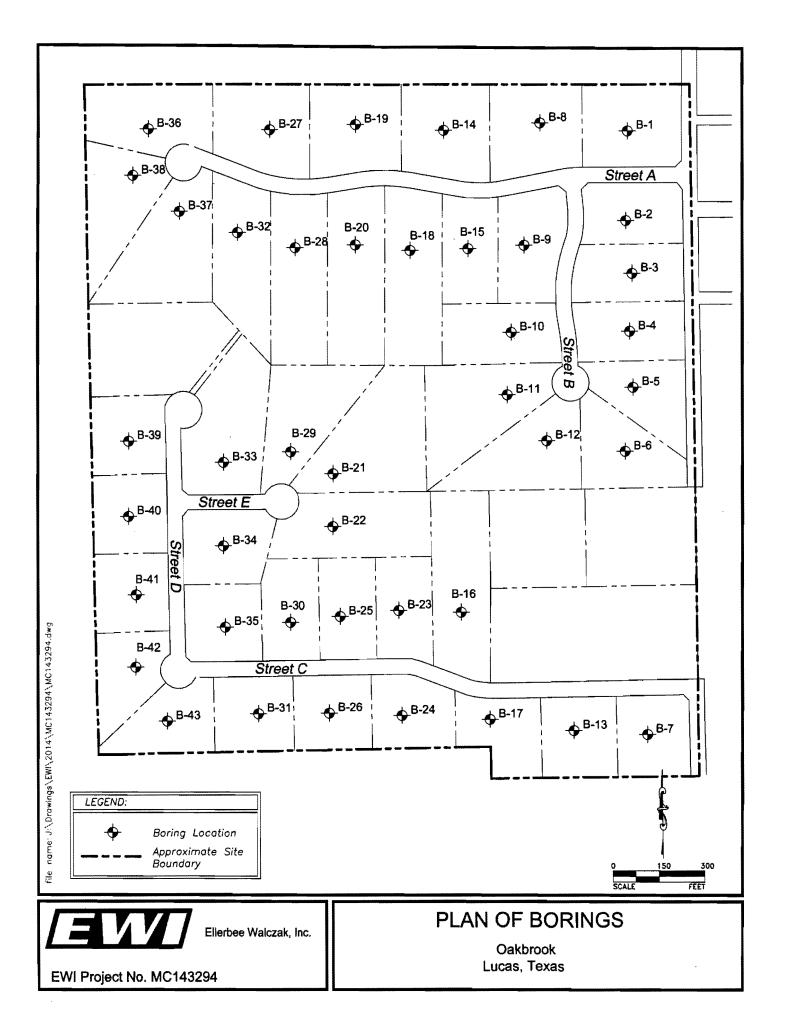
The recommendations provided in this report were prepared for the exclusive use of our client. No warranties, expressed or implied, are intended or made. The information and recommendations provided in this report are applicable only for the design of the types of structure(s) described in the <u>Site and Project Information</u> 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.





4501 B Haltom Teleph Fax: 81	e-Wald roadwa i City, 1 one: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888			BO	RIN	IG N	IUN		R E			
		ristopher Custom Homes			Dakbrook								
		IBER MC143294	PROJECT LOCATION Stinson Rd. Lucas, TX										
DATE S	TE STARTED <u>9/9/14</u> COMPLETED <u>9/9/14</u>												
			GROUND W										
DRILLIN	RILLING METHOD Continuous Flight Auger				ILLING Dry								
NOTES					LLING <u>Dry</u>								
			ALTER DRITTING " Ti Inches/100 Blows/fi Ti Inches/100 Blows/fi PLASTICITY Sample PLASTICITY CONTENT (%) LUQUID PLASTICITY CONTENT (%) LUQUID PLASTICITY CONTENT (%) LUQUID PLASTICITY CONTENT (%) PLASTICITY CONTENT (%) PLASTICITY CONTENT (%) PLASTICITY CONTENT (%) PLASTICITY CONTENT (%) PLASTICITY (%)										
o 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 (%)		LIMITS	S >			
		Brownish-tan clay											
				ST	P = 3.0		21	53	20	33			
		Tan silty clay - with calcareous particles		ST	P = 4.5+								
				ST	P = 4.5+		14	39	16	23			
				ST	P = 4.5+								
				ST	P = 4.5+								
				ST	P = 4.5+		13	38	18	20			
<u> 15 </u>					r ~ 4.0T			50	10				
 		Tan limestone - with clay seams											
				ST	P = 4.5+								
20		Bottom of hole at 20 feet.		THD	T = 2.75"/100					┼──			
		Bottom of hole at 20 leet.					1						

Ellerbe 4501 E Haltorr Teleph Fax: 8	e-Wal Broadw n City, none: 8 17-759	czak, Inc. /ay Avenue Texas 76117 17-759-9999 -1888			BC	RIN	IG N	NUN		R B E 1 C	
		nristopher Custom Homes	PROJECT N	AME (Dakbrook						
1		IBER			DN Stinson Rd	. Luc	as, T)	(
DATE S	TARTE	D 9/5/14 COMPLETED 9/5/14									
			GROUND WA								
DRILLIN		HOD <u>Continuous Flight Auger</u>			ILLING Dry						
					LLING Dry						
NOTES											
						1	r		ERBE	-00	
_	0			түре	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 (%)			5	FINES CONTENT (%)
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		L L		ÉR	ΞŦ	0.	U	'≤	N _G
	Ϋ́	MATERIAL DESCRIPTION		Ы	ws/fl is/Sc cent ps/s Perc	LIND (pc)	VIE N	LIQUID	MIT	₽Ĥ	50
	0			SAMPLE	Star Park	DR)	Žõ	122	PLASTIC LIMIT	PLASTICITY INDEX	Ň
0		Brown clay			<u>zherd</u> a	+					<u> </u>
		Di Uwili Clay									
				ST	P = 4.5+						
						1					1
				ST	P = 4.5+		23	58	23	35	
				31	F = 4.57		25	50	23	35	
						4					
_		Tan and gray silty clay									
5				ST	P = 4.5+						
						1					
				6 7	D - 4 5						
				ST	P = 4.5+		14	32	16	16	
						-					
		Tan and gray silty clay - with gravel layers	k-			-					
		- with gravenayers		ss	N = 18						
10			/	\bigvee	11 - 10						
			ľ-	-		1					
		Ten and grave sheles at									
		Tan and gray shaley clay									
				6T	D - 45	1	24	60	05	40	1
15				ST	P = 4.5+		21	68	25	43	
		Tan limestone									
_		- with clay seams									
				THD	T = 4.5"/100]					
20	╞┯┷┥				1 - 4.57100	ļ					
		Bottom of hole at 20 fee	.				1				
					<u></u>						

Ellerbee-Wal 4501 Broadw Haltom City, Telephone: 8 Fax: 817-759	czak, Inc. vay Avenue Texas 76117 317-759-9999 3-1888		BC	DRIN	IG N	NUN		R B E 1 (
	hristopher Custom Homes	PROJECT NAME	Oakbrook						
	MBER <u>MC143294</u>	PROJECT LOCAT		1. Luc	as, T)	(
DATE STARTE	D <u>9/5/14</u> COMPLETED <u>9/5/14</u>	GROUND ELEVATIO	DN _N/A	_					
		GROUND WATER L	EVELS:						
DRILLING ME	THOD Continuous Flight Auger		RILLING Dry						
			RILLING Dry				••••••		
NOTES		AFTER DRILL					_		
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 (%)		PLASTIC WIT	s	FINES CONTENT (%)
0		S	A L L L L L L L L L L L L L L L L L L L	ă	- ö		đ	P-	FIN
	Brown clay	ST							
		ST	P = 2.75		23	58	23	35	
		ST	P = 3.75						
	Brownish-tan clay	ST	P = 3.75						
	Tan and gray shaley clay	ST	P = 2.5		35	81	32	49	
				_					
		ST	P = 4.5+						
	Bottom of hole at 20 feet.	ST	P = 4.5+	-					
L								<u> </u>	I

CLIENT M. Christopher Custom Homes PROJECT NAME Oakbrook PROJECT NAME Oskbrook PROJECT LICATION Sitteren Rd. Lucas, TX DATE STARTED 9/5/14 COMPLETED 9/5/14 GROUND ELEVATION MATERIAL USES, TX DRILLING METHOD Control MAR GROUND WATER LEVELS: AT TIME OF DRILLING Dry AT TIME OF DRILLING Dry NOTES AFTER DRILLING - - - - - M_d (G) MATERIAL DESCRIPTION MATERIAL DESCRIPTION ST P = 2.0 1 1 Brown clay ST P = 1.25 29 67 27 40 - ST P = 1.25 29 67 27 40 - ST P = 4.0 ST P = 4.0 1 1 - ST P = 4.6+ 22 54 22 32 - - ST P = 4.6+ 1 1 1 - - - ST P = 4.6+ 1 1 1 - - - - - - - - - - - - - - - - - - - - <td< th=""><th>4501 Broadw Haltom City, Telephone: 8 Fax: 817-759</th><th>zzak, Inc. ay Avenue Texas 76117 17-759-9999 -1888</th><th></th><th>BC</th><th>DRIN</th><th>IG N</th><th>NUN</th><th></th><th>R B E 1 (</th><th></th></td<>	4501 Broadw Haltom City, Telephone: 8 Fax: 817-759	zzak, Inc. ay Avenue Texas 76117 17-759-9999 -1888		BC	DRIN	IG N	NUN		R B E 1 (
PROJECT NUMBER MC143234 COMPLETED 9/8/14 GROUND Stimson Rd. Lucas, TX DATE STATED 9/8/14 COMPLETED 9/8/14 GROUND METHAL EVELS: DRILLING METHOD Confinuous Flight Auger AT THE OF DRILLING Dry NOTES AT THE OF DRILLING Dry MATERIAL DESCRIPTION MATERIAL DESCRIPTION MATERIAL DESCRIPTION MATERIAL DESCRIPTION 0 Brown clay ST P = 2.0 I			PROJECT NAME	Oakbrook						
GRUND WATER LEVELS: AT TIME OF DRILLING DDY. AT TEM OF DRILLING DDY. ATTERDERO DDY. ATTERDERO DDY. ATTERDERO DDY. ATTERDERO DDY. ATTERDERO DY. BROWN Clay ST P = 125 29 67 27 40 Tan and gray clay ST P = 4.0 A Tan and gray shaley clay ST P = 4.5+ Tan and gray shaley clay ST P = 4.5+ A A<	PROJECT NUN	IBER MC143294	PROJECT LOCAT	ON Stinson Ro	1. Luc	as, T)	(
DRILLING METHOD Continuous Flight Auger AT TIME OF DRILLING Dry AT END OF DRILLING Dry ATTEN OF DRILLING Dry ATTEN OF DRILLING Dry ATTEN OF DRILLING Dry Hard Mattenial Description Mattenial Description Mattenial Description Mattenial Description Mattenial Description Brown clay ST P = 2.0 A A A A A ST P = 1.25 29 67 27 40 A A ST P = 1.25 ST P = 4.0 A	DATE STARTE	D 9/5/14 COMPLETED 9/5/14	GROUND ELEVATIO	N <u>N/A</u>						
NOTES AT END OF DRILLING Dry 4 END OF DRILLING -			GROUND WATER LE	EVELS:						
NOTES AFTER DRILLING	DRILLING MET	HOD Continuous Flight Auger	AT TIME OF D	RILLING Dry						
Hat Waterial Description			AT END OF DF							
Brown clay ST $P = 2.0$ I I I - ST $P = 1.25$ 29 67 27 40 - ST $P = 1.25$ I I I I I - ST $P = 4.0$ ST $P = 4.0$ I I I - Tan and gray clay ST $P = 4.5+$ 22 54 22 32 - I P = 2.0 ST $P = 2.0$ I I	NOTES		AFTER DRILLI							
Brown clay ST $P = 2.0$ I I I - ST $P = 1.25$ 29 67 27 40 - ST $P = 1.25$ I I I I I - ST $P = 4.0$ ST $P = 4.0$ I I I - Tan and gray clay ST $P = 4.5+$ 22 54 22 32 - I P = 2.0 ST $P = 2.0$ I I	EPTH (ft) APHIC OG	MATERIAL DESCRIPTION	LE TYPE	A. 4100 Blows Sq. Ft. Int Isq. Ft.	JNIT WT.	STURE ENT (%)			ş	CONTENT (%)
Brown clay ST $P = 2.0$ I I I - ST $P = 1.25$ 29 67 27 40 - ST $P = 1.25$ I I I I I - ST $P = 4.0$ ST $P = 4.0$ I I I - Tan and gray clay ST $P = 4.5+$ 22 54 22 32 - I P = 2.0 ST $P = 2.0$ I I			SAMP	N: Blows T: Inches P: Tons/ R: Perce Qu: Kips RQD: Perce	DRY L	CONT		PLAS	PLASTI	FINES (
$ \begin{array}{c} - & - & - & - & - & - & - & - & - & - $		Brown clay				1				
$ \begin{array}{c} - & - & - & - & - & - & - & - & - & - $			ST	P = 2.0						
Tan and gray clay Tan and gray clay Tan and gray clay Tan and gray shaley clay Tan and gray			ST	P = 1.25		29	67	27	40	
$ \begin{array}{c} - & - & - & - & - & - & - & - & - & - $	5_		ST	P = 4.0						
$ \begin{array}{c} 10 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ $	-	Tan and gray clay	ST	P = 4.5+	_	22	54	22	32	
$ \begin{array}{c} $			ST	P = 2.0						
$ \begin{array}{c} $										
		Tan and gray shaley clay								
20			ST	P = 4.5+						
20										
20			ST	P = 4.5+	1					
	20	Rottom of hole at 20 fast				<u> </u>				

Ellerbe 4501 E Halton Teleph	e-Wal Broadw 1 City, 10ne: 8	czak, Inc. /ay Avenue Texas 76117 /17-759-9999)-1888			BC	RIN	IG N	NUN	PAG	R B E 1 C	- 5 DF 1
		hristopher Custom Homes	PROJECT NA	ME (Oakbrook						
		MBER MC143294			ON Stinson Rd	. Luc	as, T)	(
DATE S	STARTE	D 9/5/14 COMPLETED 9/5/14									
			GROUND WATE	ER LE'	VELS:						
DRILLI	NG MET	THOD Continuous Flight Auger	AT TIME (OF DR	ILLING Dry						
			AT END O	F DRI	LLING Dry						
NOTES			AFTER DI	RILLIN							
o DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent RQU: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT		}	FINES CONTENT (%)
		Brown clay		0.7			<u> </u>				
				ST	P = 1.5						
				ST	P = 2.25		29	67	27	40	
				ST	P = 2.0						
				ST	P = 3.0						
		Tan and gray clay		ST	P = 3.0						
		Tan limestone - with clay seams									
				THD	T = 1.5"/100						
		Gray limestone									
20			Ν	THD	T = 1"/100						
		Bottom of hole at 20 feet.									

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 GROUND WATER LEVELS: GROUND WATER LEVELS: DRILLING METHOD Continuous Flight Auger AT TIME OF DRILLING Dry NOTES AFTER DRILLING	Ellerbee-Wa 4501 Broadw Haltom City, Telephone: 8 Fax: 817-759	czak, Inc. /ay Avenue Texas 76117 317-759-9999 9-1888			BC	RIN	IG N	IUN		R B E 1 C	
PROJECT NUMBER MC143234 PROJECT LOCATION Stinson Rd. Lucas, TX DATE STARTED 9/6/14 GROUND LEVATION NA			PROJECT N	AME	Oakbrook						
GROUND WATER LEVELS: AT TIME OF DRILLING _Dry	1					. Luc	as, T)	(
DRILLING METHOD Continuous Flight Auger AT TIME OF DRILLING Dry NOTES AFTER DRILLING - $H_{LD} \oplus Q$ MATERIAL DESCRIPTION $H_{L} \oplus Q$	DATE STARTE	D 9/5/14 COMPLETED 9/5/14	GROUND ELE	VATIO	N_N/A						
AT END OF DRILLING Dry AFTER DRILLING u <td></td> <td></td> <td>GROUND WA</td> <td>TER LE</td> <td>VELS:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>			GROUND WA	TER LE	VELS:						
NOTES AFTER DRILLING	DRILLING ME	THOD Continuous Flight Auger	AT TIME	OF DR	NLLING Dry						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $			AT END	OF DR	ILLING Dry						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	NOTES			DRILLIN							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		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 (%)		LIMITS	S	FINES CONTENT (%)
Tan and brown clay Tan a		Dark brown clay (FILL)		ST	P = 2.25	95	28				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				ST	P = 1.75						
ST P = 1.75	5	Tan and brown clay		ST	P = 2.25						
				ST	P = 2.0		23	59	23	36	
- - <td></td> <td></td> <td></td> <td>ST</td> <td>P = 1.75</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>				ST	P = 1.75						
- - <td></td>											
$ \begin{array}{c} -15 \\ -15 \\ -17 $		Tan limestone - with clay seams	ļ	AU							
$ \begin{array}{c} - & - & - & - & - & - & - & - & - & - $				тнр	T = 0.88"/100	-					
$- \frac{1}{1}$ $- $											3775 5777 7777
20 THD T = 2"/100 Bottom of hole at 20 feet. Image: Comparison of hole at 20 feet.				AU							
Bottom of hole at 20 feet.				THD	T = 2"/100						
		Bottom of hole at 20 feet.		N							

Ellerbe 4501 E Haltorr Teleph Fax: 8	e-Wal Broadw n City, ione: 8 17-759	czak, Inc. ray Avenue Texas 76117 17-759-9999 1888			BC	RIN	IG N	NUN		R B E 1 C	
		nristopher Custom Homes	PROJECT		Oakbrook					_	
		MBER <u>MC143294</u>	PROJECT	LOCATI	ON <u>Stinson Rd</u>	<u>. Luc</u>	as, T)	(
DATE S	TARTE	D 9/9/14 COMPLETED 9/9/14	GROUND E	LEVATIO	N <u>N/A</u>						
DRILLI	NG MET	HOD Continuous Flight Auger			RILLING 19.0 ft						
NOTES				ND OF DR R DRILLIN	ILLING <u>19.0 ft</u>			•••• • ••••••		.	
						1	<u> </u>				
o 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 (%)			S >	FINES CONTENT (%)
		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	
 10				ST	P = 4.5+						
				ST	P = 1.5						
		Bottom of hole at 20 feet.		ST THD	T = 4.5"/100						

Ellerbe 4501 E Halton Teleph Fax: 8	e-Wal Broadw n City, none: 8 17-759	czak, Inc. /ay Avenue Texas 76117 /17-759-9999 9-1888				BO	RIN	IG N	IUN		R B E 1 C	
CLIENT	<u>M. CI</u>	hristopher Custom Homes	PROJECT	NAM	E _(Dakbrook						
PROJE		MBER	PROJECT	LOC	ΑΤΙΟ	N <u>Stinson Rd</u>	. Luc	<u>as, TX</u>	(_
DATE S	TARTE	D <u>9/9/14</u> COMPLETED <u>9/9</u>	/14 GROUND E	LEVA	TION	N/A						_
			GROUND W	ATER	R LEV	/ELS:						
	NG MET	THOD Continuous Flight Auger	AT TI	ME OI	FDR	ILLING Dry						
						LLING <u>Dry</u>	_					
NOTES			AFTE	RDRI		G						
o DEPTH	GRAPHIC LOG	MATERIAL DESCRIPT	TION			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 (%)				FINES CONTENT (%)
		Dark brown clay										
					sт	P = 4.0		24	59	24	35	
		Brownish-gray clay			ST	P = 4.0						
		Tan silty clay			sт	P = 4.5+						
					sт	P = 4.5+		15	40	20	20	
 _ 10					ST	P = 4.5+						
 		Tan limestone - with clay seams		T	AU HD	P = 4.5+ T = 2.5"/100 T = 1.5"/100						
20		Bottom of hole at 2	0 feet.		1							

Haltom Telepho Fax: 81	roadwa i City, 1 one: 8 17-759	czak, Inc. ay Avenue Fexas 76117 17-759-9999 -1888			BC	RIN	ig n	IUM		КВ Е 1 С	
		ristopher Custom Homes	PROJECT NA		Dakbrook			_			
PROJEC		BER <u>MC143294</u>		CATK	ON <u>Stinson Rd</u>	. Luc	as, TX	<u> </u>			
DATE ST	TARTE	D <u>9/9/14</u> COMPLETED <u>9/9/14</u>	GROUND ELE		N_N/A						
			GROUND WAT	ER LE	VELS:						
DRILLIN	IG MET	HOD <u>Continuous Flight Auger</u>	AT TIME	OF DR	ILLING Dry						
			ATEND	of Dri	LLING Dry						
NOTES			AFTER [RILLIN							
o 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 (%)		PLASTIC FIANT		FINES CONTENT (%)
		Dark brown clay		ST	P = 3.25						
-				ST	P = 2.0		27	60	28	32	
				ST	P = 1.75						
				ST	P = 1.0						
		Tan and brown silty clay		ST	P = 1.5		24	58	22	36	
				AU							
		Tan limestone - with clay seams		THD	T = 1.5"/100						
				AU							
				THD	T - 4 75"400	1					
20		• · · · · · · · · · · · · · · · · · · ·			T = 4.75"/100	ļ					
		Bottom of hole at 20 feet.									

FIGURE 10

Ilerbe 501 B Ialtom eleph ax: 81	e-Wal roadw City, one: 8 17-759	czak, Inc. /ay Avenue Texas 76117 17-759-9999 -1888			BO	RIN	g n	UM		R B-	
		nristopher Custom Homes	PROJECT N		Dakbrook						
ROJE		/BER	PROJECT L	OCATIC	N <u>Stinson Rd</u>	. Luca	as, TX	(
ATE S	TARTE	D <u>9/9/14</u> COMPLETED <u>9/9/14</u>		EVATION	<u>N/A</u>						
			GROUND WA		/ELS:						
RILLIN	IG MET	HOD Continuous Flight Auger	AT TIM	e of dr	LLING Dry						
			AT END	O OF DRI	LLING Dry						
IOTES			AFTER	DRILLIN							
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 (%)	IQUID LIMIT	PLASTIC PLASTIC LIMIT	}	FINES CONTENT
0				SA S		ä	۳ ۵		<u>a</u>	P L A I =	LIN
		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	8 M.
		Tan and brown silty clay		ST	P = 2.25						
		Tan and gray shaley clay		ST	P = 4.5+						
				AU	-						
		Tan limestone		THD	T = 2"/100						
20	╞╧┯╡	- with clay seams Bottom of hole at 20 feet.									┼──

Ellerbee-Walczak, Inc. 4501 Broadway Avenue Haltom City, Texas 76117 Telephone: 817-759-9999 Fax: 817-759-1888	BORING NUMBER B-11 PAGE 1 OF 1
CLIENT <u>M. Christopher Custom Homes</u>	
PROJECT NUMBER MC143294	PROJECT LOCATION <u>Stinson Rd.</u> Lucas, TX
DATE STARTED 9/9/14 COMPLETED 9/9/14	
	GROUND WATER LEVELS:
DRILLING METHOD <u>Continuous Flight Auger</u>	AT TIME OF DRILLING <u>Dry</u>
	AT END OF DRILLING Dry
NOTES	
HLAND MATERIAL DESCRIPTION	AMPLE TYPE SAMPLE TYPE R. Blows/ft. T. Inches/100 Blows T. Inches/100 Blows T. Prons/sq. Ft. R. Percent Quic Kips/sq. Ft. RQD: Percent (pcd) DRY UNIT WT. (pcd) DRY UNIT WT. (pcd) DRY UNIT WT. (pcd) DRY UNIT WT. (pcd) DRY UNIT WT. (pcd) DRY UNIT WT. (pcd) FINES CONTENT FINES CONTENT (%)
	ST P = 1.75
	ST P = 2.0 27 64 26 38
	ST P = 2.5
Brown clay	ST P = 2.5 24 62 24 38
Tan and brown silty clay	ST P = 2.75
	AU THD T = 3.1"/100
Tan limestone 	AU THD T = 2.5"/100
Bottom of hole at 20 feet.	

CLEENT M. Christopher Custom Homes PROJECT NUMBER MC143294 PROJECT LOCATION Stinson Rd. Lucas, TX PROJECT NUMBER MC143294 COMPLETED 99/14 GROUND ELEVENTION MATCH Levels: DATE STARTED 99/14 COMPLETED 99/14 GROUND WATER Levels: ORILING METHOD Continuous Flight Auger AT TER OPILLING _Dr NOTES ATTER PRILING	Ellerbe 4501 B Haltom Teleph Fax: 81	e-Wal roadw city, one: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888		-	BO	RIN	G N	UM	PAG	R B - E 1 (- 12 DF 1
DATE STARTED 9/9/14 COMPLETED 9/9/14 GROUND ELEVATION MA GROUND WATER LEVELS: AT TIME OF DRILLING Dry AT TIME OF DRILLING Dry NOTES AT TIME OF DRILLING Dry AT TERD OF DRILLING Dry NOTES AT TERD OF DRILLING Dry ATTERDERIG Dry NOTES MATERIAL DESCRIPTION WATER OF DRILLING TrepReric Dry 0 Order dry ST P = 3.5 Dry Dry - - ST P = 1.75 29 67 27 40 - - ST P = 1.75 ST P = 1.75 10 <				PROJECT NA	ME_	Dakbrook						
GROUND WATER LEVELS: DRILLING METHOD Continuous Flight Auger AT TIME OF DRILLING Dry NOTES AT TEM OF DRILLING Dry NOTES AFTER DRILLING Dry MATERIAL DESCRIPTION User State User State OILS YN THE OF DRILLING THE OF DRILLING U U U/L SY THE OF DRILLING U U/L SY THE OF DRILLING U/L SY THE OF DRILING U/L SY THE OF DRILLING U/L SY	PROJE		MBER MC143294				. Luc	as, T)	(
DRILLING METHOD Continuous Flight Auger AT TIME OF DRILLING Dry NOTES AFTER DRILLING H Op AFTER DRILLING AFTER DRILLING H Op Op AFTER DRILLING AFTER DRILLING H Op Op AFTER DRILLING AFTER DRILLING O Dark brown clay ST P = 3.5 A A A - - ST P = 1.75 ST P = 1.75 P = 1.75 P = 1.75 - ST P = 1.75 ST P = 1.75 A A A A - - - - - - - - - - - -	DATE S	TARTE	D <u>9/9/14</u> COMPLETED <u>9/9/14</u>		ATION	I_N/A						
AT END OF DRILLING Dry AFTER DRILLING Hard Of Dry MATERIAL DESCRIPTION Material Description </td <td></td> <td></td> <td></td> <td>GROUND WAT</td> <td></td> <td>VELS:</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>				GROUND WAT		VELS:						
NOTES AFTER DRILLING	DRILLIN	IG MET	HOD Continuous Flight Auger	AT TIME	of dr	ILLING Dry						
H Material Description Material Descriping Description Material Descript				AT END (of Dri	LLING Dry						
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	NOTES			AFTER D	RILLIN	IG						
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	EPTH (ft)	VAPHIC LOG	MATERIAL DESCRIPTION		ole type	s/ft. s/100 Blows /Sq. Ft. ent s/sq. Ft. ercent	UNIT WT. (pcf)	ISTURE TENT (%)			5	FINES CONTENT (%)
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$		5			SAMF	CD: Pero	DRY	NON CON	E E G	PLAS	IND	INES
$ \begin{array}{c} - & - & - & - & - & - & - & - & - & - $			Dark brown clay			ZHERQR						
$ \begin{array}{c} - & - & - & - & - & - & - & - & - & - $					ST	P = 3.5	-					
$ \begin{array}{c} - & - \\ - & - & - \\ - & - & - & - \\ - & - & - \\ - & - & - & - \\ - & - & - & - \\ - & - & - & - $					ST	P = 1.75						
	5				ST	P = 1.75		29	67	27	40	
					ST	P = 1.75						
					ST	P = 1.75						
- Tan limestone - - -												
15 THD T = 5.25"/100 - - - <td></td> <td></td> <td>Tan limestone - with clay seams</td> <td>}</td> <td>AU</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>			Tan limestone - with clay seams	}	AU							
	15				THD	T = 5.25"/100						
Gray limestone 												
			Gray limestone									
Bottom of hole at 20 feet.				I		T = 3.5"/100						
	20		Bottom of hole at 20 feet.		II	i 						

Ellerbe 4501 E Halton Teleph	ee-Wa Broadv n City, none: 8	Iczak, Inc. vay Avenue Texas 76117 317-759-9999 Ə-1888			BO	RIN	g n	UM		R B- E 1 C	
		hristopher Custom Homes	PROJECT N	۵ME	Oakbrook						
		MBER MC143294			TION Stinson Ro	I. Luc	as. TX				``
		ED 9/10/14 COMPLETED 9/10/14									
			GROUND WA			-					
DRILLI	NG ME	THOD Continuous Flight Auger			DRILLING 18.0 ft						
					DRILLING 18.0 ft						
NOTES					LING						
	1				SA	Ι.		AT	ERBE	RG	E
_	2			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 (%)		IMITS	5	FINES CONTENT (%)
DEPTH (f)	GRAPHIC LOG	MATERIAL DESCRIPTION		Ш	sq. F F F	1 S	12 F	≙⊢	2∟	Ex.	NO Q
	L &			SAMPLE	ns/S Per Cer	29	SIO	LIQUID	PLASTIC LIMIT	PE STIC	ເ ເ ເ
0				SA		Ъ	20	22	5		NII.
, ů		Dark brown clay (FILL)									
		- with bricks and roots		s	T P = 2.25						
				ľ	1 1 - 2.25						
						4					
				S	T P = 2.5						
				S.	T P = 3.5		20	49	22	27	
	III	Light brown clay				-					
				s	T P = 2.25						
				Ŭ	1 1 - 1.20						
						4					
					_						
				S	T P = 3.0						
10						4					
		Tan silty clay		1							
		- with gravel									
				0	T D = 4.05	1		20	40	20	
15				S	T P = 1.25	_	23	39	19	20	
		<u>,</u>									
			k	/		-					
20				(s:	S N = 50/2"	1					
 	- ma	Bottom of hole at 20 feet.	ľ	¥	I						

Ellerbee-Wal 4501 Broadw Haltom City, Telephone: 8	czak, Inc. /ay Avenue Texas 76117 /17-759-9999 }-1888			BO	RIN	G N	UM		R B-	
	hristopher Custom Homes	PROJECT N	AME (Dakbrook						
	MBER MC143294			ON <u>Stinson Rd</u>	. Luc	as, TX				
DATE STARTE	D_9/9/14 COMPLETED 9/9/14									
		GROUND WAT		VELS:						
DRILLING ME	THOD Continuous Flight Auger	AT TIME	OFDR	ILLING Dry						
		AT END	OF DRI	LLING Dry						
NOTES			DRILLIN	IG						
H SHO			ТҮРЕ	00 Blows . Ft. Ft. ent	П WT.	URE VT (%)			S	NTENT
o 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 (%)	LIQUID	PLASTIC	PLASTICITY INDEX	FINES CONTENT (%)
	Dark brown clay				1					
			ST	P = 3.0		28	67	27	40	96
	Brown clay				1					
			ѕт	P = 2.25						
5	Tan shaley clay									
			ST	P = 2.75		20	64	20	44	
			ѕт	P = 3.25						
			ST	P = 2.75						
30/14										
	Tan limestone		ST	P = 4.5+	_					
	- with clay seams`		THD	T = 3"/100				Į		
H A			THD	T = 2"/100						
GEOTECH BH COLUMNS MC143294. GPJ GINT 1030/14	Bottom of hole at 20 feet			I	_					

Ellerbe 4501 E Halton Teleph Fax: 8	e-Wa Broadv n City, none: 8	Iczak, Inc. vay Avenue Texas 76117 317-759-9999 9-1888					BO	RIN	G N	UM		R B-	
		hristopher Custom Homes		_ PROJECT	NA	ME (Dakbrook						
		MBER					DN <u>Stinson Rd</u>	. Luc	as, T>	(-		
DATE S	TART	ED <u>9/9/14</u> COMP	LETED 9/9/14							-			
				GROUND W	ATE		VELS:						
DRILLI	NG ME	THOD <u>Continuous Flight</u>	Auger	_ AT TIN	IE (OF DR	ILLING Dry						
				AT EN	DO	F DRI	LLING <u>Dry</u>						
NOTES				_ AFTER	R DF	RILLIN							
				、 、		ш	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent			AT	ERBE	RG	NT
Ξ	GRAPHIC LOG					TYPE		DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)		LIMITS	; ≻	FINES CONTENT (%)
DEPTH (ft)	L5 ₹	MATERIA	AL DESCRIPTION			빌	s/ft. s/ft. s/sq.	LIN (D	IEN	₽⊑	E E E	ΠÖΠ	00 %
	5					SAMPLE	Blow Peros D: Kip ons	RY	No.	LIQUID	PLASTIC LIMIT	PLASTICITY INDEX	AES
0		- Devil 1				s	ZHUKOK				<u> </u>	4	Ë,
		Dark brown clay											
						ST	P = 3.0						
						ST	P = 1.75						
								1					
5						ST	P = 2.0						
						0.	1 - 2.0						
								-					
						ST	P = 2.5		30	69	29	40	
		Tau and business siles of											
		Tan and brown silty cl	ау			ST	P = 2.75						
		Tan limestone											
10	<mark> </mark>	 with clay seams 				THD	T = 4.25"/100						
						1							
						•							
					-								
						AU							
							T 0 58/400	4					
15						THD	T = 8.5"/100						
		Bottom	of hole at 15 feet.										

Ellerbe 4501 E Haltom Teleph	e-Wal broadw n City, none: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888			BO	RIN	G N	UM		R B-	- 16 DF 1
		nristopher Custom Homes		AME (Dakbrook						
		MBER MC143294			ON <u>Stinson Rd</u>	. Luc	as, T)	(
DATE S	TARTE	D <u>9/10/14</u> COMPLETED <u>9/10/14</u>	GROUND ELE	VATIO	N/A						
			GROUND WA	FER LE	VELS:						
DRILLIN	NG MET	HOD Continuous Flight Auger	AT TIME	OFDR	ILLING Dry						
				OF DR	LLING Dry						
NOTES			AFTER I	DRILLIN							
DEPTH	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 (%)		PLASTIC FIMIT	s	FINES CONTENT (%)
0		Dark brown clay			ZHEROR						u.
		· · · · · · · · · · · · · · · · · · ·		ST	P = 1.5						
				ST	P = 1.0		31	74	28	46	
5				ST	P = 3.25						
		Brown clay		ST	P = 2.25						
 10		Tan and brown silty clay		ST	P = 4.5+		21	65	24	41	
		· · · · · · · · · · · · · · · · · · ·				1					
		Tan and gray shaley clay									
				ST	P = 4.5+						
<u> </u>		Tan limestone - with clay seams									
 		Gray limestone									
				AU							
				THD	T = 2.5"/100						
		Bottom of hole at 20 feet.									

Ellerbe 4501 E Haltorr Teleph Fax: 8	e-Wal roadw City, one: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888			BOI	RIN	g N	UMI		R B-			
		ristopher Custom Homes			Dakbrook				×				
PROJE	PROJECT NUMBER <u>MC143294</u>			PROJECT LOCATION Stinson Rd. Lucas, TX									
DATE S	TARTE	D 9/10/14 COMPLETED 9/10/14		VATION	I <u>N/A</u>								
			GROUND WAT	ER LE	VELS:								
DRILLI	NG MET	HOD <u>Continuous Flight Auger</u>	AT TIME	OF DR	ILLING Dry								
			AT END	OF DRI	LLING Dry								
NOTES			AFTER [RILLIN									
				щ	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. Qu: Kips/sq. Ft. RQD: Percent	Ľ.		AT		RG	12		
1 E	GRAPHIC LOG			TYPE		DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)			, ≥	FINES CONTENT (%)		
DEPTH (ft)	LO P	MATERIAL DESCRIPTION		SAMPLE	ssrff. ssrff. erce	N S S	TEN	LIQUID	PLASTIC LIMIT	PLASTICITY INDEX	୫ଛ		
	5			WW	D: Kip	₹ X	NS	32	μŽ	AS IN	NES		
0				0 O	ZHAROR				-	굽	Ē		
		Dark brown clay											
				ST	P = 2.5								
											1		
				ST	P = 3.5		23	62	27	35			
5													
				ST	P = 3.5								
		Brown clay											
				ST	P = 4.5+		20	59	24	35			
	1	Tan silty clay				1					1		
				ST	P = 3.75								
									l	[
						-							
									ļ				
						ĺ							
								ļ					
		Tan limestone		THD	T = 2.75"/100								
15		- with clay seams		N		1	1				1		
							1						
-													
							1						
											1		
-						1					1		
20				THD	T = 3"/100								
 		Bottom of hole at 20 feet.]					
Ś													

Ellerbee- 4501 Bro Haltom C Telephor Fax: 817	Walczak, Inc. badway Avenue City, Texas 76117 ne: 817-759-9999 -759-1888			BO	RIN	GN	UM		R B .		
	M. Christopher Custom Homes		ME (Dakbrook							
1	NUMBER MC143294	PROJECT LOCATION <u>Stinson Rd. Lucas, TX</u>									
DATE STA	ARTED <u>9/9/14</u> COMPLETED <u>9/9/14</u>										
		GROUND WATE	RLE	VELS:							
DRILLING	METHOD Continuous Flight Auger	AT TIME (of Dr	ILLING Dry							
		AT END O	F DRI	LLING Dry							
NOTES		AFTER DF	RILLIN								
o DEPTH (ft) CEANDHIC	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 (%)		PLASTIC PLASTIC PLASTIC	<u>ک</u>	FINES CONTENT (%)	
	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		
-		P	AU								
	Tan limestone - with clay seams	Ń	THD	T = 2.25"/100							
	Gray limestone		AU THD	T = 1.5"/100							
	Bottom of hole at 20 feet.										

Ellerbe 4501 E Halton Teleph	ee-Wal Broadw n City, none: 8	czak, Inc. vay Avenue Texas 76117 317-759-9999 9-1888			BO	RIN	g n	UM		R B- E 1 C			
		hristopher Custom Homes			Dakhrook								
1	PROJECT NUMBER MC143294			PROJECT NAME <u>Oakbrook</u> PROJECT LOCATION <u>Stinson Rd. Lucas, TX</u>									
	DATE STARTED 9/9/14 COMPLETED 9/9/14												
DRILLI	NG ME	THOD Continuous Flight Auger	GROUND WATER LEVELS: $\ \ \underline{\nabla}$ AT TIME OF DRILLING <u>13.0 ft</u>										
					LLING 10.0 ft								
NOTES													
	T			1		1		ΔΤ	FERBE				
-	U U			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 (%)		LIMITS	3	FINES CONTENT (%)		
DEPTH	GRAPHIC LOG	MATERIAL DESCRIPTION		ЦЦ		₽₽	12F		ບຼ	ΪÈ.	-N 0@		
L R	SR L			MPL	hes/ ns/S ps/	50	NTE	LIMIT	PLASTIC LIMIT		S S S S		
0				SAI		DR	≥S		5		INE I		
		Dark brown clay			ZFEEOE						-		
				ST	P = 1.75								
				31	F - 1.70								
				ST	P = 1.0		30	69	28	41			
		Brown clay											
		- with calcareous particles		ST	P = 2.75								
				sт	P = 2.5								
				01	P ~ 2.5								
		Tan silty clay											
		fair sity clay											
				ST	P = 3.25								
10		2											
		7											
		Tan silty clay - with gravel											
1		that graver		ST									
15				$\sqrt{7}$	A	1							
				X ss	N = 7								
				X ss	N = 16								
 _ 20		Bottom of hole at 20 feet.		<u>()</u>									
h			L.			******				FIGUR			

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Ellerbe 4501 E Halton Telept Fax: 8	ee-Wal Broadw n City, none: 8 17-759	czak, Inc. /ay Avenue Texas 76117 /17-759-9999 -1888		-	BO	RIN	GN	UM		R B -	
		hristopher Custom Homes	PROJECT N		Oakbrook						
PROJE		MBER MC143294	PROJECT LO	DCATI	ON <u>Stinson Rd</u>	<u>Luc</u>	as, T)	(
DATE S	STARTE	D <u>9/9/14</u> COMPLETED <u>9/9/14</u>	GROUND ELE	VATIO	N_N/A						
			GROUND WAT	FER LE	VELS:						
DRILLI	NG MET	THOD <u>Continuous Flight Auger</u>	AT TIME	OF DF	ULLING Dry						
				OF DR	ILLING Dry						
NOTES	i										
o 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 (%)	LIMIT LIMIT	PLASTIC FIAN	S ≻	FINES CONTENT (%)
		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						
				AU							
<u> </u>		Tan limestone - with clay seams				-					
15		-		THD	T = 1.25"/100						
		Gray limestone		•							
				AU		4					
20				THD	T = 1"/100						
		Bottom of hole at 20 feet.		N	L						
<u>الــــــــــــــــــــــــــــــــــــ</u>						1	I	L	L		L

	17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888									PAG	E 1 (- 21 DF 1
			tom Homes	PROJECT	NAME	<u>_</u> 0	akbrook						
		BER MC143					N Stinson Rd	. Luc	as, TX	(
DATE S	TARTE	D 9/10/14	COMPLETED 9/10/14										
				GROUND W									
DRILLIN	IG MET	HOD Continu	ious Flight Auger				LLING <u>18.0 ft</u>						
							LING 18.0 ft						
NOTES					R DRIL								
								1					
	0				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 (%)		LIMIT:	5	FINES CONTENT
DEPTH	GRAPHIC LOG						ent Fr.	Ée	2F		U	PLASTICITY INDEX	IN A
E E	¶20		MATERIAL DESCRIPTION				vs/ft es/1 s/Sq cent cent cent cent	N S S			NIT STI		00
_	U				NAN N			RY I	ĭžố	33	PLASTIC LIMIT	ASI	ЦЙ И
0		Deels been			<i>"</i>		ZHERGR					ā	μ
		Dark browr	i clay										ļ
					S	т	P = 4.5+						
						-		1					
					s	-	P = 2.25						
ļ					S	'	P = 2.25						
	////	D											
_		Brown clay]	
5					S'	т	P = 4.5+		20	57	22	35	
	"	Tan silty cla	av	-									1
		·			S.	-	P = 4,5+						
:					3	'	P = 4.5+						1
		4			.			1					
					S	т	P = 4.5+		18	48	21	27	
_10													
_													
		Tan silty cla	ау										1
15		•	-		ТН	טו	P = 3.0						
						T							
													ļ
	//// }_												
	- - - - - -	Tan limesto											
		- with clay	seams		ТН		T = 3"/100]					
20							1 - 37100						ļ
			Bottom of hole at 20 feet.										

Ellerbe 4501 E Haitom Teleph Fax: 8	e-Wal Broadw 1 City, 10ne: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888			BO	RIN	G N	UM		R B- E 1 0	
		nristopher Custom Homes	PROJECT N		Oakbrook						
		/BER _MC143294	PROJECT L	OCATI	ON <u>Stinson Rd</u>	. Luc	as, TX	(
DATE S	TARTE	D <u>9/10/14</u> COMPLETED <u>9/10/14</u>		EVATIO	N <u>N/A</u>						
			GROUND WA	TER LE	VELS:						
DRILLI	NG MET	HOD <u>Continuous Flight Auger</u>			ILLING Dry						
NOTER					ILLING Dry						
NOTES	1 1		AFIER		IG	1					
o DEPTH	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 (%)			5 >	FINES CONTENT (%)
		Dark brown clay		ST	P = 1.5		33	67	27	40	
		Brown clay		ST	P = 3.75	-					
				ST	P = 2.75						
		Tan silty clay		ST	P = 3.0		22	55	21	34	
				ST	P = 3.0						
15				ST	P = 4.5+						
		Tan limestone - with clay seams		THD	T = 6"/100	- -					
 				AU							
20				тно	T = 2"/100						
		Bottom of hole at 20 feet.			L	<u> </u>					

Ellerbe 4501 E Haltorr Teleph Fax: 8	e-Wal Broadw 1 City, 10ne: 8	czak, Inc. /ay Avenue Texas 76117 /17-759-9999 }-1888			BO	RIN	G N	UM	PAG	R B -	-23 DF 1
		hristopher Custom Homes	PROJECT I	NAME	<u>Oakbrook</u>						
		MBER MC143294			ON Stinson Rd	. Luc	<u>as,</u> T)	(·····		
DATE S	TARTE	D 9/10/14 COMPLETED 9/10/14									
			GROUND W	ATER LE	VELS:						
DRILLI	NG MET	THOD Continuous Flight Auger	AT TIN	IE OF DF	RILLING Dry						
			AT EN	D OF DR	ILLING Dry				-		
NOTES			AFTER								
				ų	N: Blows/ft. T: inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	Г <u>⊢</u> ́	()	AT	TERBE		L L
E	GRAPHIC LOG		1	SAMPLE TYPE		DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)		LIMITS	<u>ک</u>	FINES CONTENT (%)
DEPTH (ft)	Ľ¢ ₹	MATERIAL DESCRIPTION		Щ	erce s/sq.	D C N	TEN	₿₽		ēΨ	ାର୍ଚ୍ଚ
U	ō			AM	D. Kerche	RY	NO NO	LIQUID	PLASTIC LIMIT	PLASTICITY INDEX	AES
0		Dark human		0	zharga					ਕ	Ē
		Dark brown clay									
				ST	P = 2.0						
				ST	P = 1.25		34	72	28	44	
		Brown clay				1					
5				ST	P = 3.0						
					1 - 0.0						
						-					
				ST	P = 4.5+						
		Ten and have all here a									
		Tan and brown silty clay									
				ST	P = 4.25		22	62	23	39	
10											
			1	0.7	D - 0 77	1					
15				ST	P = 2.75						
		Tan limestone - with clay seams									
		- with day scalls									
			F								
				AU							
				┦──	<u> </u>						
_ 20				THD	T = 2.25"/100						
		Bottom of hole at 20 feet				1					

Ellerbe 4501 E Halton Teleph Fax: 8	e-Wal Broadw 1 City, 10ne: 8 17-759	czak, Inc. /ay Avenue Texas 76117 /17-759-9999 /-1888			BOI	RIN	G N	UM		R B -	
		nristopher Custom Homes		IE C	Dakbrook						
I		MBER _ MC143294			ON Stinson Rd	. Luc	as, TX	<		***	
DATE S	TARTE	D 9/10/14 COMPLETED 9/10/14		•••••							
			GROUND WATE		VELS:						
DRILLI	NG MET	THOD Continuous Flight Auger		FDR	ILLING Dry						
			AT END OI	F DRI	LLING Dry						
NOTES			AFTER DR	ILLIN	IG						
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE IYPE	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 (%)	LIQUID LIMIT	PLASTIC FIAIT	3 >	FINES CONTENT (%)
0				AN	H H H H H H H H H H H H H H H H H H H	ď	≥ö	122	d' _'	₹≝	IN
		Dark brown clay		ST	P = 3.75						
			-	ST	P = 2.0						
				ST	P = 2.0		29	68	27	41	
		Brown clay		ST	P = 3.5						
		Tan silty clay - with calcareous particles		ST	P = 3.25						
		Tan limestone									
		- with clay seams									
<u>15</u>				THD	T = 3"/100						
 		Gray limestone									
		Bottom of hole at 20 feet.		тнр	T = 1.75"/100						

,

Ellerbe 4501 E Halton Telept Fax: 8	ee-Wal Broadw n City, hone: 8 17-759	czak, Inc. /ay Avenue Texas 76117 /17-759-9999)-1888			BO	RIN	GN	UM		R B- E 1 C	
		hristopher Custom Homes			Oakbrook					-	
1		MBER MC143294			ON Stinson Rd	. Luc	as, T)	(
DATE S	STARTE	D 9/10/14 COMPLETED 9/10/14	GROUND EL	EVATIO	N <u>N/A</u>						
			GROUND WA	ATER LE	VELS:						
DRILLI	NG ME	THOD Continuous Flight Auger	AT TIM	IE OF DF	RILLING Dry						
			AT EN	D OF DR	ILLING Dry						
NOTES	\$		AFTER	DRILLI	4G						
				щ	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	E					INT
E E	GRAPHIC LOG			SAMPLE TYPE	at t.	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)				Ë.
DEPTH (ft)	L R	MATERIAL DESCRIPTION		ЫЕ	es/ft. vs/ft. es/ftes/file s/sq	LIND (DC)	UST UTE	LIMIT	STIC	EA	08
	0		1	SAM	D Kinch	ΒY	¥õ	123	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0		Dark brown clay			<u>zherd</u> a					à	<u> </u>
		Dark brown blay									
				ST	P = 3.25						
	-///					-					
- ·				ST	P = 2.75						
_		Brown clay				1					1
				ST	P = 4.5+		23	64	25	39	
		Tan and brown silty clay									1
				ST	P = 4.5+		16	47	22	25	
				01	1 = 4.5				~~	25	
		Tan silty clay				-					ł
				ST	P = 4.5+						
		Tan limestone		тно	T = 12"/61	1					
10	┥╧┵┨	- with clay seams				-					
_ .								l			
	177		-	K							
				AU							
				THD							
15											
	1		-								
				AU							
				THD	T = 1.75"/100	1					
		Detter of balance 00 for the									<u> </u>
 		Bottom of hole at 20 feet.									
·	-L					1		1	I	<u>i</u>	<u> </u>

Ellerbe 4501 E Haiton Teleph Fax: 8	ee-Wal Broadw n City, none: 8 17-759	Iczak, Inc. vay Avenue Texas 76117 317-759-9999 9-1888			BO	RIN	g n	UM		R B -	
		hristopher Custom Homes	PROJECT N	AME	Oakbrook						
		MBER <u>MC143294</u>			ON Stinson Rd	. <u>L</u> uc	as, TX	<u> </u>			
DATE S	STARTE	D 9/10/14 COMPLETED 9/10/14	GROUND ELE	VATIO	N <u>N/A</u>						
			GROUND WA	TER LE	VELS:						
DRILLI	NG ME	THOD Continuous Flight Auger	AT TIME	OF D	RILLING Dry						
[RILLING Dry				-		
NOTES			AFTER								
DEPTH	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 (%)			} ≻	FINES CONTENT (%)
0				SAI		R	≥ö		5	lä ₹	FINE
Ť		Dark brown clay					ļ				
-				ST	P = 1.75		35	72	30	42	
		Brownish-gray clay									
		blownish-gray clay		ST	P = 3.5						
5_				ST	P = 4.5+		25	67	27	40	
_		Tan silty clay		ST	P = 4.5+						
				ST	P = 4.5+						
		Tan limestone							,		
		- with clay seams									
				THC	T = 1"/100	-					
-											
				ТНС	T = 3.25"/100						
20		Bottom of hole at 20 feet.		N							

FIGURE 27

Ellerbee-Waiczak, Inc. 4501 Broadway Avenue Haltom City, Texas 76117 Telephone: 817-759-9999 Fax: 817-759-1888			BO	RIN	GN	UM	PAG	R B - E 1 (-27 DF 1
CLIENT M. Christopher Custom Homes	PROJECT N		Dakbrook						
PROJECT NUMBER MC143294			ON Stinson Rd	. Luc	as, TX	(
DATE STARTED 9/9/14 COMPLETED 9/9/14	GROUND ELE	VATION	I_N/A						
	GROUND WAT		ELS:						
DRILLING METHOD <u>Continuous Flight Auger</u>	¥ AT TIME	OF DR	ILLING <u>12.0 ft</u>						
	T AT END	OF DRI	LLING <u>15.0 ft</u>	-					
NOTES	AFTER [RILLIN							
		ТҮРЕ	00 Blows . Ft. ent	л WT.	URE VT (%)			<u>}</u>	NTENT
H A B B B B B B B B B B B B B B B B B B		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 (%)	LIQUID	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
Dark brown clay									-
		sт	P = 4.5		28	67	29	38	
Brown clay		ST	P = 3.75						
		sт	P = 4.0						
Tan clay - with calcareous particles		ST	P = 3.75						
		ST	P = 0.5						
Tan silty clay - with gravel				-					
_ <u>15</u>		ST	P = 2.25		19	41	20	21	
Tan limestone Tan limestone 									
Tan limestone with clay seams									
		THD	T = 2.5"/100	1					
Bottom of hole at 20 feet									

Eller 4501 Halto Tele	bee-Wa Broady om City, phone: (817-75)	Iczak, Inc. vay Avenue Texas 76117 317-759-9999 9-1888			BO	RIN	G N	UM		R B- E 1 C	
		hristopher Custom Homes	PROJECT	NAME	Dakbrook						
		MBER MC143294			ON Stinson Rd	<u>Luc</u>	as, T)	(
DATE	START	ED <u>9/9/14</u> COMPLETED <u>9/9/14</u>		EVATION	N_N/A						
			GROUND W	ATER LE	VELS:						
DRILI	LING ME	THOD Continuous Flight Auger			ILLING 19.0 ft				-		
					LLING 19.0 ft			-,			
NOTE	:5										
DEPTH	U	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 (%)				FINES CONTENT (%)
-		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						
- 10		Tan and brown silty clay		ST	P = 2.5						
114 											
- 1030 - 1030	5	Tan silty clay		ST	P = 1.0						
		Gray limestone									
OLUMNS MC1		L		AU							
ы В		-		THD	T = 2.5"/100						
20 GEOTECHI		Bottom of hole at 20 feet.									

Ellerb 4501 Haltor Telep Fax: 8	ee-Wa Broadv m City, hone: 8 317-75	Iczak, Inc. vay Avenue Texas 76117 317-759-9999 9-1888			BO	RIN	G N	UM		R B-	
		hristopher Custom Homes			Dakbrook						
		MBER MC143294			ON Stinson Rd	. Luc	as, TX	(
DATE	STARTI	ED 9/10/14 COMPLETED 9/10/14	GROUND ELE	VATIO	N/A						
			GROUND WAT	ER LE	VELS:						
DRILL	ING ME	THOD Continuous Flight Auger			ILLING Dry						
			AT END	OF DR	LLING Dry						
NOTES	s		AFTER {	RILLIN	IG						
DEPTH	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 (%)	LIQUID	PLASTIC WIT	}	FINES CONTENT (%)
0		Dark brown clay			ZHEROR						ш.
-				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						
		Tan limestone		AU							
- 20		- with clay seams		THD	T = 2.4"/100						
-				AU	T = 6"/100						
20		Bottom of hole at 20 feet.		N							
;										l	L

FIGURE 30

4501 B Haltom Teleph Fax: 81	e-Wali Iroadw I City, one: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888				BOI	RIN	G N	UMI	BEF PAGI	R B-	30)F 1
CLIENT	M. Ch	ristopher Custom Homes	PROJECT N	AME	<u> </u>	akbrook			.			
PROJEC	CT NUN	BER MC143294	Bassing			N Stinson Rd.	Luc	as, TX	(
DATE S	TARTE	D <u>9/10/14</u> COMPLETED <u>9/10/14</u>		EVAT	ION	<u>N/A</u>						
			GROUND WA	TER	LEV	ELS:						
DRILLIN	IG MET	HOD <u>Continuous Flight Auger</u>	AT TIM	E OF	DRI	LLING Dry			-		_	
						LING Dry					·····	
NOTES			AFTER	DRIL								
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 (%)				FINES CONTENT (%)
0		Dark brown clay		s	ST	Z⊢ <u>a</u> œoœ P=1.5					ш.	<u>u</u>
						-						
		Brown clay		S	эт	P = 2.75		30	72	27	45	
				5	ST	P = 2.75						
				s	бт	P = 2.0						
		Tan silty clay		s	ST	P = 2.5		23	50	20	30	
		Tan limestone - with clay seams										
			-	P A	10							
15				T	HD	T = 4.25"/100						
					٩U							
				Т	HD	T = 1.5"/100						
20		Bottom of hole at 20 feet.		N								

Ellerbee-Walczak, Inc. 4501 Broadway Avenue Haltom City, Texas 76117 Telephone: 817-759-9999 Fax: 817-759-1888 BORING NUMBER B-31 PAGE 1 OF 1												
		hristopher Custom Homes		NAN	NE _(Dakbrook						
		MBER <u>MC143294</u>	_ PROJECT L	_00	CATIC	ON Stinson Rd	Luc	as, TX	(
DATE S	TARTI	ED <u>9/10/14</u> COMPLETED <u>9/10/14</u>	GROUND EL									
			GROUND WA	ATE	RLE	VELS:						
	NG ME	THOD Continuous Flight Auger	AT TIM	IE C	of DR	ILLING Dry			<u>-</u>			
						LLING Dry						
NOTES	·····		AFTER									
					ш с	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	5	ш <i></i>	AT			FINES CONTENT (%)
DEPTH (ft)	GRAPHIC LOG				SAMPLE TYPE	ent Ft.	1 E E	NT()	•		Σ	LNC (
	RA L	MATERIAL DESCRIPTION				ws/ft ies/16 is/Sc cent cent Perc Perc	129	UIS I	LIQUID	MIT	EX I	0 0 0 0 0
					SAN	ÖH D D D D D D D D D D D D D D D D D D D	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	Z⊐	PLASTIC LIMIT	PLASTICITY INDEX	INE
0		Dark brown clay				ZHERQR					<u>e</u> .	<u>ш</u>
		,			ST	P = 1.75						
					51	F ~ 1.75						
		Brownish-gray clay										
		Drownion gray oray				.						
					ST	P = 4.5+		25	64	25	39	
					ST	P = 4.5+						
		Tan silty clay			ST	P = 4.5+						
		- with calcareous particles Tan limestone										
		- with clay seams		N	THD	T = 3.25"/100						
		-										
10	1			١	тнр	T = 3.25"/100						
15				V	THD	T = 2"/100						
		Bottom of hole at 15 feet.										
,												

Ellerbe 4501 E Haltom Teleph Fax: 8	ee-Wa Broadv n City, none: 8 17-759	lczak, Inc. vay Avenue Texas 76117 317-759-9999 Э-1888			BO	RIN	G N	UM		R B- E 1 0	
		hristopher Custom Homes	PROJECT		Dakbrook						
PROJE	CT NU	MBER MC143294	PROJECT I		ON Stinson Rd	. Luc	as, TX				
DATE S	STARTE	D 9/9/14 COMPLETED 9/9/14	GROUND EL	EVATION	N/A						
			GROUND W	ATER LE	VELS:						
DRILLI	NG ME	THOD Continuous Flight Auger	🕎 AT TIN	E OF DR	ILLING 18.0 ft						
			🗶 AT EN	D OF DRI	LLING <u>18.0 ft</u>		•				
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 (%)	LIQUID	PLASTIC IMIT DIMIT		FINES CONTENT (%)
0		Dark brown clay		•/	ZHEROR				,	<u> </u>	Ē
		Dark blown diay		ST	P = 3.25						
				ST	P = 4.25						
		Brownish-tan clay		ST	P = 4.25		23	57	22	35	
		Tan silty clay		ST	P = 2.5						
				ST	P = 2.5						
					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						
		Tan silty clay - with gravel									
				ST	P = 2.25						
    		Ţ									
				ST	P = 3.75						
		Bottom of hole at 20 feet.									

	llerbe 501 E altorr eleph	e-Wa broadw City, one: 8	lczak, Inc. vay Avenue Texas 76117 317-759-9999 Ə-1888			BO	RIN	G N	UM		<b>R B</b> -	
			hristopher Custom Homes	PROJECT	NAME	Oakbrook						
PF	ROJE	CT NUI	MBER MC143294	PROJECT		ON <u>Stinson Rd</u>	. Luc	as, T)	< <u> </u>			
D	ATE S	TARTE	D 9/10/14 COMPLETED 9/10/14	GROUND EL	EVATIO	N N/A	•					_
				GROUND W								
	RILLIN	NG ME	THOD <u>Continuous Flight Auger</u>			RILLING Dry						
	DTES				d of df R Drilli							
<u> </u>							T	1		TERBE		
	o 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 (%)		LIMITS	3	FINES CONTENT (%)
			Dark brown clay			<u>  _, _, _, _</u>			<u> </u>			
-					ST	P = 1.75						
-					ST	P = 2.25						
-	5				ST	P = 2.75						
			Tan and brown clay		ST	P ≈ 3.5						
-					ST	P = 4.0		24	63	26	37	
			Tan limestone		THD	T = 3.75"/100	1					
-	10		- with clay seams				-					
-												
-												
	-											
	-				AU							
- 13							-					
- 15	15				THD	T = 1"/100						
			Bottom of hole at 15 feet.									
0 MC143234.0												
GEOLECH BH COLUMNS MC143294 GPJ GINL US GUT 103014												

Ellert 4501 Halto Telep Fax:	ee-Wa Broady m City, hone: 817-75	alczak, Inc. way Avenue Texas 76117 817-759-9999 9-1888			BO	RIN	G N	UM		<b>R B</b> -	
		Christopher Custom Homes	PROJECT N	AME	Dakbroo <u>k</u>						
PROJ	ECT NU	MBER <u>MC143294</u>	PROJECT L	OCATIO	ON <u>Stinson Rd</u>	. Luc	as, T)	<u> </u>			
DATE	START	ED <u>9/10/14</u> COMPLETED <u>9/10/14</u>		EVATION	N/A						
			GROUND WA	TER LE	VELS:						
DRILL	ING ME	THOD Continuous Flight Auger	AT TIMI	e of dr	ILLING Dry						
				OF DR	LLING Dry				m		
NOTE	S		AFTER	DRILLIN	IG						
o DEPTH	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 (%)				FINES CONTENT (%)
-		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							
-		Tan limestone				-					
15		- with clay seams		тно	T = 5.5"/100						
<u>13</u>	┥┽┰┥					-					
-											
-											
_											
				AU							
-						-					
20				THD	T = 1.25"/100						
- <u>15</u> - <u>-</u> - <u>-</u> 20		Bottom of hole at 20 feet.									

Ellerbe 4501 E Haltorr Teleph Fax: 8	e-Wal Broadw n City, none: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888			BO	RIN	G N	UM		<b>R B-</b> E 1 C	
		ristopher Custom Homes		IAME	Oakbrook						
		MBER MC143294			ON <u>Stinson Rd</u>	. Luc	as, T)	(			
DATE S	TARTE	D <u>9/10/14</u> COMPLETED <u>9/10/14</u>	GROUND EL	EVATIO	N <u>N/A</u>		* <u></u>				
			GROUND WA		VELS:						1
DRILLIN	NG MET	HOD Continuous Flight Auger	AT TIM	E OF DI	RILLING Dry						
			AT EN	OF DR	ILLING Dry						
NOTES			AFTER	DRILLI							
				щ	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	Е.		AT		RG	INT
E_	GRAPHIC LOG			TYPE		N E	E E			Σ	NTE
DEPTH (ft)	μĞ	MATERIAL DESCRIPTION		ЫП	s/Sq. s/Sq. s/Sq. sent s/Sq.	N g	TEA	LIQUID	STIC	Ξŭ	00%
	Ø			SAMPLE	D: Ferrar	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ΞΞ	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0		Dark brown clay		-	<u>SHURGX</u>	ļ				٩	<u>u</u>
		Dark brown bidy									
				ST	P = 2.0						
						4					
				ST	P = 2.5						
						1					
F											
				ST	P = 2.5						
		Tan and brown clay									
				ST	P = 2.5						
_ · _											
				ST	P = 1.75		27	70	26	44	
10											
			-								
				AU							
		Tan limestone		TUD	T = 7.75"/100						
15		- with clay seams		THD	1 = 7.757700						
				1							
			F	K	-						
				AU							
				THD	T = 1.5"/100	1					
20		Dattom of hole of 00 forth				<u> </u>					
		Bottom of hole at 20 feet.									
L	I					1	l		L	L	I

4501 E Halton Teleph Fax: 8	e-Wal Broadw n City, ' none: 8 17-759	czak, Inc. ay Avenue Texas 76117 17-759-9999 -1888					BO	RIN	g n	UM		<b>R B</b> -	
			m Homes	PROJECT	NA	ME_	Oakbrook						
		BER <u>MC143294</u>					ON Stinson Re	d. Luc	as, T)	(			
DATE S	TARTE	D 9/9/14	COMPLETED 9/9/14		LEV	ATIO	N_N/A	_					
				GROUND W		ER LE	VELS:						
DRILLI	NG MET	HOD <u>Continuou</u>	us Flight Auger		ME	OF DR	ILLING 13.0 ft						
							LLING 18.0 ft						
NOTES							IG						
					T			T		ΔΤ	TERBE	RC	
-	0					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 (%)		LIMITS	3	FINES CONTENT (%)
DEPTH (ft)	GRAPHIC LOG		MATERIAL DESCRIPTION			Г <del>Г</del> Ш		178	25	ο.	<u>0</u>	PLASTICITY INDEX	∑⊲
DE DE	L KA					P	ws/f nes/ is/Sol ps/s Peri	150	VIE	LIQUID	<b>MIT</b>	EB	0 S S
	Ŭ					SAN		DR	₹Ö	22	PLASTIC LIMIT	₽́Ľ	N N
0		Dark brown c	láv				ZHEROR					٩	ц.
		Dark brown c	lay		-								
						ST	P = 2.25						
											1		
					Long a van								
						ST	P = 4.5+						ĺ
						ψ.	1 4.0						
		Brownish-gra	v clav					-					-
5		biownian-gia	y ciay										
						ST	P = 4.0		21	58	22	36	
		Tan silty clay						-					1
		- with calcar	eous particles			ST	P ≈ 2.25		[				1
								-					
						ST	P = 3.75						
10													
		Tan silty clay											
		- with gravel						_					
46					V	SS	N = 36						
15	1111	Tan limeston	e		M	00	14 - 30						
		- with clay se			<u> </u>			1					
		•											
	┨╌╌┸┸	-											
								-					
 	     					THD	T = 2.75"/100						
			Bottom of hole at 20 feet.		Γ			-					1

Ellerbee-Wa 4501 Broadv Haltom City, Telephone: 8 Fax: 817-759	lczak, Inc. vay Avenue Texas 76117 317-759-9999 Э-1888			BO	RIN	g n	UM		<b>R B</b> -	
	hristopher Custom Homes		E_C	akbrook						
PROJECT NU	MBER <u>MC143294</u>	PROJECT LOCA	TIC	N Stinson Rd	. Luc	as, T)	ζ			
DATE STARTE	ED <u>9/9/14</u> COMPLETED <u>9/9/14</u>	GROUND ELEVAT	ION	N/A						
		GROUND WATER	LEV	ELS:						
DRILLING ME	THOD Continuous Flight Auger		DRI	LLING 13.0 ft						
		AT END OF I	DRII	LLING 18.0 ft						
NOTES		AFTER DRIL	LIN	G						
				SS			ATT	ERB	ERG	E
<u>-</u> 일		ТҮРЕ		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 (%)		IMIT	S	FINES CONTENT
DEPTH (ft) GRAPHIC LOG	MATERIAL DESCRIPTION			11 10 10 10 10 10 10 10 10 10 10 10 10 1	ES	5Ë	ᅀᄂ	<u>د</u>	E×	No s
B B B		SAMPLE		hes/ ns/S Per Per	59	SIO	LIMIT	PLASTIC LIMIT		00
		SAI			DR	≥S	μ	5	PLASTICITY INDEX	NE
0	Dark brown clay			ZHEROR					<u>u</u>	<u> </u>
			_							
		S	T	P = 2.0		24	57	23	34	
///										
///		s	т	P = 2.5						
	Brownish-tan clay									
5	Brownion tail day									
		S	T	P = 4.5		20	53	21	32	
	Tan silty clay									
		s	т	P = 3.5						
					-					
		S	Т	P = 2.5						
_10										
	7									
	Tan silty clay									
	- with gravel				-					
		s	т	P = 0.75						
			-+		1					
					1					
	Tan limestone									
	- with clay seams									
			$\neg$		1					
		ТН	비	T = 3.25"/100						
	Bottom of hole at 20 feet				1					

Ellerbe 4501 E Haltorr Teleph Fax: 8	e-Wald Broadwa n City, 1 none: 8 17-759-	zak, Inc. ay Avenue exas 76117 17-759-9999 1888			BOI	RIN	G N	UMI		<b>R B-</b> ≣ 1 C	
		ristopher Custom Homes	PROJECT NA		Dakbrook						
1		BER MC143294			ON Stinson Rd.	Luca	as, TX				
DATE S	TARTE	0 9/9/14 COMPLETED 9/9/14	GROUND ELE	VATION	N_N/A						
			GROUND WAT		VELS:						
DRILLI	NG MET	HOD <u>Continuous Flight Auger</u>	<u>V</u> at time	OF DR	LLING 13.0 ft						
			T AT END	OF DRI	ILLING <u>18.0 ft</u>						
NOTES	<u></u>			ORILLIN	IG						
				ш	Blows t t	<u> </u>		ATI	ERBE	RG	Ł
L I	₽			түре		DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)		IMITS	; ≻	FINES CONTENT (%)
DEPTH (f)	GRAPHIC LOG	MATERIAL DESCRIPTION		Щ	Ser 10	IN D	STU	읖느	PLASTIC LIMIT	PLASTICITY INDEX	ତ୍ତିଛି
ā	GR 1			SAMPLE	C Kips	2	<b>N</b> NO	LIMIT	LIAS	AST	ES
0				Ś	N: Blows/ft. T: Inches/100 Bl P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	ā	- ŏ		٩	5	NH NH
		Dark brown clay									
				ѕт	P = 2.25						
		Brownish-tan clay				-					
				07	5						
				ST	P = 3.25						
		Tan clay									
5				ST	P = 3.75		20	50	20	30	
											1
				ST	P = 4.25						
				•.							
	- N		8 5 5								
				ST	P = 4.5		ł				
10											1
									1		
		1			_						
41/0		Tan silty clay		AU							
- 103	-////	- with gravel				-					
105 15				ST	P = 4.5+						
		Tan limestone		THD	T = 5.25"/100	-					
EN _		- with clay seams		N IND	1 = 5.257100						
GP											
- 3294											
AC14											
- INS		-									
5 - E				THD	T = 3"/100						
GEOTECH BH COLUMNS MC143294, GPJ GINT US, GDT 10/30/14				N						┼──	
EOT		Bottom of hole at 20 feet.									
ōL							<u> </u>			<u></u>	. <b>.</b>

Ellerb 4501 Halto Telep	bee-Wa Broady m City, phone: 1 817-75	liczak, Inc. way Avenue Texas 76117 817-759-9999 9-1888			BO	RIN	G N	UM		<b>R B-</b> E 1 C	
		hristopher Custom Homes	PROJECT N	AME (	Dakbrook						
		MBER MC143294			DN Stinson Rd	. Luc	as. T)	(	280.000		
DATE	START	ED 9/9/14 COMPLETED 9/9/14									
1			GROUND WA								
DRILL	ING ME	THOD Continuous Flight Auger	AT TIMI		ILLING Dry						
					LLING Dry						
NOTE	s		AFTER	DRILLIN	IG						
o DEPTH	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 (%)		PLASTIC PLASTIC PLASTIC		FINES CONTENT (%)
-		Dark brown clay		ST	P = 0.75						
-		Brown clay		ST	P = 3.25						
<u>5</u>				ST	P = 3.75		1				
-		Tan silty clay		ST	P = 3.25		20	55	22	33	
-				ST							
10		Tan limestone - with clay seams		тно	T = 4.5"/100						
-				AU							
45				THD	T = 2.25"/100						
15		Bottom of hole at 15 feet.									
_ 15											

Ellerbe 4501 E Halton Teleph Fax: 8	e-Wal Broadw n City, none: 8 17-759	czak, Inc. /ay Avenue Texas 76117 /17-759-9999 -1888	<b>A.</b>			BO	RIN	G N	UM		<b>R B-</b> E 1 C	
		aristopher Custom Homes			EC	Dakbrook						
		MBER MC143294				N Stinson Rd	. Luc	as, T)	{			
DATE S	TARTE	D 9/10/14 COMPLETED 9/10/14	GROUND ELI	EVAT	TION	N/A						
			GROUND WA	TER	LEV	ELS:						
DRILLI	NG MET	HOD Continuous Flight Auger	AT TIM	E OF	DRI	LLING Dry						
			AT END	) OF	DRII	LLING Dry						
NOTES			AFTER	DRIL	LLIN						·	
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION		SAMPLE TYPE		N: Błows/ft. T. Indres/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)		PLASTIC LIMIT	}	FINES CONTENT (%)
	Ū			SAM		DD: Ferring	DRY	¥ N N N N N N N N N N N N N N N N N N N	ΞΞ	ΞĘ	IND	INES
<u> </u>		Brownish-gray clay				ZHERQX					٩	u.
				s	ST	P = 2.75						
				s	ST	P = 2.0		29	70	28	42	
				s	ST	P = 4.5						
		Tan silty clay - with calcareous particles		s	бТ	P = 4.5+						
		Tan limestone - with clay seams		ΗT	HD	T = 5.25"/100						
					нр	T = 3"/100						
				ТІ	HD	T = 2"/100						
		Bottom of hole at 15 feet.										

FIGURE 41

		czak, Inc. /ay Avenue Texas 76117 917-759-9999 9-1888	92		BO	RIN	G N	UM	PAG	<b>R B-</b> E 1 C	<b>41</b> DF 1
CLIEN.	T <u>M. CI</u>	hristopher Custom Homes	PROJECT I		<u>Oakbrook</u>						
		MBER <u>MC143294</u>			ON Stinson Rd	. Luc	as, TX	(			
DATE	STARTE	D 9/10/14 COMPLETED 9/10/14	_ GROUND EL	EVATIO	N <u>N/A</u>						
			GROUND W/	ATER LE	VELS:						
DRILLI	NG ME	THOD Continuous Flight Auger	_		RILLING Dry	<u>-</u>					
					ILLING Dry						
NOTES	•			DRILLI							
o DEPTH	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 (%)	LIQUID LIMIT	PLASTIC PLASTIC LIMIT LIMIT	}  ≻	FINES CONTENT (%)
		Dark brownish-gray clay			ZFUUOU	1					<u>u</u> .
				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+						
<u> </u>		Tan limestone - with clay seams		тно	T = 6.5"/100						
_											
10				тно	T = 1.5"/100						
_											
1											
15				тно	T = 1.25"/100						
5		Bottom of hole at 15 feet.									
234-0L7											
O MCI4											
OFOMM											
GEULECH BH CULUMNS MC143284.GFJ GINI US GUI 103014											

Ellerbe 4501 E Halton Teleph Fax: 8	Ellerbee-Walczak, Inc. 4501 Broadway Avenue Haltom City, Texas 76117 Telephone: 817-759-9999 Fax: 817-759-1888											
		hristopher Custom Homes	PROJECT	NAME	ΞC	Dakbrook						
PROJE		MBER				N Stinson Rd	. Luca	as, TX	<u> </u>			
DATE S	TART	ED 9/10/14 COMPLETED 9/10/14	GROUND EL	EVAT	ION	<u>N/A</u>						
			GROUND W	ATER	LE\	/ELS:						
DRILLI	NG ME	THOD Continuous Flight Auger	AT TI	IE OF	DR	ILLING Dry		*****				
						LLING Dry						
NOTES	<b>-</b>		AFTEI		LIN							
				ų		N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	E.	(%	AT		RG	LN I
E_	GRAPHIC LOG			Σ		at H	N E	URE 1T (9		[	Σ	NTE
DEPTH (ft)	LCR	MATERIAL DESCRIPTION		PLE		vs/ft. s/Sq. s/Sq. sent	N Da	ITEN TEN		l S I S I S I	EX I	88
	0			SAMPLE TYPE		D: Far and Blov	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	55	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0		Dark brown clay			_	ZHCKOK					ā	Ē
		Bark Brown oldy			_							
				s	T	P = 2.25						
				S	T	P = 1.5		32	65	28	37	
		Brownish-gray clay										
			•	s	т	P = 2.0						
		Tan limestone		Т	ΗD	T = 8.75"/100						
		- with clay seams							:			
10				Т	HD	T = 4"/100						
	┱╡											
15		4		TH	HD	T = 2"/100						
	1	Bottom of hole at 15 feet.			I.							
									:			

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

Ellerbe 4501 E Halton Teleph Fax: 8	ee-Wal Broadw n City, none: 8 17-759	czak, Inc. /ay Avenue Texas 76117 /17-759-9999 -1888		_	BOI	RIN	G N	UM		<b>R B-</b> E 1 C	
		nristopher Custom Homes	PROJECT N		Dakbrook						
PROJE		MBER		OCATIO	ON <u>Stinson Rd.</u>	Luca	as <u>, TX</u>	<u> </u>	-		
DATES	STARTE	D <u>9/10/14</u> COMPLETED <u>9/10/14</u>	_ GROUND ELE	VATION	<u>N/A</u>						
			GROUND WA		VELS:						
DRILLI	NG ME	THOD Continuous Flight Auger				_					
					LLING Dry						
NOTES	·		AFTER								
				н	N: Blows/ft. T: Inches/100 Blows P: Tons/Sq. Ft. R: Percent Qu: Kips/sq. Ft. RQD: Percent	Ŀ.		AT	LIMITS	RG	FINES CONTENT (%)
Ι _Ε	GRAPHIC LOG			ТҮРЕ	ent Fr.	ې ۲		-		Ł	EN C
DEPTH (ft)	Ľ ₹	MATERIAL DESCRIPTION		PLE	vs/ft. es/ft. s/Sq cent os/sc	Ng	ISI I	LIQUID	UT N	EX	5 2 2 2
-	0			SAMPLE	DD: King	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	35	PLASTIC LIMIT	PLASTICITY INDEX	INE
0		Dark brown clay			ZHŨŔŎŔ		<b></b>			<u>a</u>	<u>لد</u>
		Carl Momilolay		~~	P = 1.75						
_				ST	P = 1.75						
-	-///					-					
-				ST	P = 2.0		32	72	28	44	
_											
		Brownish-gray clay									
		Tan silty clay		ST	P = 4.25						
-				THD	P = 4.5+	-					
-	┥╪┯┥	Tan limestone - with clay seams		THD	T = 3.75"/100		ļ				
						-					
-											
-	┥ <u></u> ┰┶┨					-					
10				THD	T = 7.25"/100				ļ		
						1					
-											
-											
_											
410											
						1					
15				THD	T = 7"/100						 
z		Bottom of hole at 15 feet.									
5  21											
24						1					
ž											
E E											
EOIE											
اق				_		1	<u> </u>				1

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## SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL
			GRAPH	LETTER	DESCRIPTIONS
	GRAVEL AND	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
COARSE GRAINED SOILS	GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	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	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
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				СН	INORGANIC CLAYS OF HIGH PLASTICITY
				ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			<u>70 70 70 70 70</u> 7 77 70 70 70 7 7 77 70 70 70 7	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

## 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.

