SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

ALASKA
CALIFORNIA
COLORADO
FLORIDA
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OREGON
WASHINGTON
WISCONSIN

February 25, 2014

Mr. Michael Rodney
Michael Roth & Associates
200 S. Hanley Road, Suite 1105
St. Louis, Missouri 63105
mrodney@mraap.com

RE: GEOTECHNICAL ENGINEERING REPORT
VA IDIQ BONHAM AMBULATORY CARE EXPANSION
SAM RAYBURN MEMORIAL VETERANS CENTER
BONHAM, TEXAS

Dear Mr. Rodney:

Our report summarizing the results of a geotechnical study conducted for the proposed Sam Rayburn Memorial Veterans Center Ambulatory Care Site located in Bonham, Texas is enclosed. The report documents our understanding of the project; describes our field exploration, laboratory testing, and engineering analyses of the subsurface conditions encountered at the site; and provides geotechnical recommendations for the proposed project. We have appreciated this opportunity to assist you on this project and look forward to working with you again. If you have questions concerning this submittal, please contact me.

Sincerely,

SHANNON & WILSON, INC.

William B. Kremer
Senior Associate

Enc: Geotechnical Engineering Report, Sam Rayburn Memorial Veterans Center, Ambulatory Care Expansion, Bonham, Texas

AGM:WBK:GRF/tad

GEOTECHNICAL ENGINEERING REPORT
SAM RAYBURN MEMORIAL VETERANS CENTER, AMBULATORY CARE EXPANSION
BONHAM, TEXAS

February 25, 2014

Submitted to:
Mr. Michael Rodney
Michael Roth & Associates
200 S. Hanley Road, Suite 1105
St. Louis, Missouri 63105
mrodney@mraap.com

By:
Shannon & Wilson, Inc.
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St. Louis, Missouri 63146

41-1-37425-001

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GEOTECHNICAL ENGINEERING REPORT
SAM RAYBURN MEMORIAL VETERANS CENTER
AMBULATORY CARE EXPANSION
BONHAM, TEXAS

1.0 INTRODUCTION

This report summarizes the results of a geotechnical study of the site for the proposed Ambulatory Care Expansion facility at the Sam Rayburn Memorial Veterans Center in Bonham, Texas. The purpose of this study was to provide geotechnical design and construction recommendations for the project. The scope of our services included the exploration of the subsurface; field and laboratory testing; engineering analysis of the collected data; development of design and construction recommendations for the building, earthwork and other geotechnical related portions of the proposed construction; and preparation of this report. These services were provided in general accordance with our proposal dated October 22, 2013.

2.0 PROJECT AND SITE DESCRIPTION

The proposed project will include construction of renovations and additions to the existing medical center. The additions are expected to total 17,000 square feet and will include new lab space, extension and expansion of the front entrance, and a porte-cochere at the front entrance. All of the new structures are expected to be single-story, light-weight construction. Foundation loads are anticipated to be on the order of 150 kips per column for supporting the mechanical penthouse, 50 kips per column for supporting the rest of the building, and 1 kip per foot for perimeter wall loads. New pavement for parking and drives to support the additions also will be constructed near the building. The project area covers about 2 acres. The site is relatively flat and should require little to no cuts and fills. Figure 1 shows the site location in Bonham, Texas.

3.0 SITE EXPLORATION AND TESTING

The site exploration consisted of a visual reconnaissance of the site and surrounding area and the drilling of 14 borings at the approximate locations shown on Figure 2. Borings are identified as B-1 through B-9 for the building additions and SB-1 through SB-5 for parking improvements. Our representative established the boring locations at the site by measuring from existing site features such as building corners. Approximate boring location coordinates were surveyed using a hand-held GPS unit. Boring elevations were estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.

Appendix A contains individual logs of each boring that summarize sampling intervals and types, SPT results, material descriptions, groundwater observations, and other pertinent field and laboratory observations and data. Stratification boundaries and characteristics of soil and rock materials shown on the boring logs and discussed in this report are based on observations made during drilling, the results of the sample observation, laboratory test results, and interpretations of the local and regional geology. The location of stratification boundaries between different material types should be considered approximate because changes in these boundaries may occur gradually or between sampled intervals.

Drilling and sampling were performed in general accordance with applicable ASTM procedures and typical drilling practice. Split barrel samples were recovered from the borings at 2.5 to 5.0 foot intervals using the procedures outlined in ASTM D1586. Relatively undisturbed samples of cohesive soils were recovered at selected locations and depths by hydraulically pressing 3.0-inch diameter thin walled steel sampling tubes into the soil using the procedures outlined in ASTM D1587. Recovered samples were described in the field using the visual manual procedure described on the soil classification criteria sheets in Appendix A. Cohesive samples were tested to determine relative consistency with a calibrated penetrometer. Select portions were sealed in jars or sampling tubes in the field by our representative and transported to our laboratory for further observation and testing.

Laboratory testing included determination of natural moisture content for cohesive samples. Atterberg liquid and plastic limits, density, unconfined compressive strength, swell potential determinations, and percent water soluble sulfates were performed on selected samples. Laboratory testing was performed using current ASTM procedures except the sulfate content, which was performed in accordance with AASHTO T 290, Standard Method of Test for Determining Water-Soluble Sulfate Ion Content in Soil. Laboratory test results are summarized on the boring logs or are otherwise provided in Appendix A.

A seismic surface-wave analysis was completed to provide data for evaluation of the International Building Code (IBC) seismic design site classification. Shear wave velocities were measured using the SeisOpt® seismic method for evaluating the in-situ shear-wave (S-wave) velocity profiles from surface wave measurements. This method uses ambient seismic "noise", or microtremors, which are constantly generated by cultural and natural noise as the seismic source energy. Ambient seismic data was recorded with a SeisDAQ® ReMi V30+ Recording System connected to a 12-geophone (10 Hz) array. One ReMi line was completed on January 10, 2104 at the location shown on Figure 1. Geophones were placed approximately 25 feet apart. Ambient and seismic noise was recorded for 30-second intervals and digitally recorded for later analysis. A diagram of the ReMi velocity spectrum diagram (p-f image) and resultant dispersion curve fit for the test is included in Appendix A.

4.0 SUBSURFACE CONDITIONS

The subsurface conditions encountered in the borings generally consisted of soft to very stiff (typically medium stiff to stiff), lean to fat clay with occasional thin layers of loose to medium dense silt.

In borings B-5, B-7, B-8, and B-9, fill soils were encountered to depths of 1.6, 2, 6, and 6 (minimum) feet, respectively, and generally consisted of soft to stiff, dark brown, fat to lean clay. The exception was in boring B-9 where medium dense, silty gravel and loose sand fill were encountered above a plastic water line.

In-situ moisture contents of the clay ranged from 10 to 24 percent, with the majority of the moisture contents between 16 and 22 percent. Measured liquid limits of the fat clay ranged from 54 to 69 percent. Plasticity indices ranged from 33 to 46. The measured liquid limit of the lean clay ranged from 37 to 38 percent with plasticity indices of 19 to 21. Swell tests indicated a potential swell of about 1 percent for the lean clay and 4 percent for the fat clay under surcharge pressures of approximately 850 psf. Swell test results are summarized in Table 1. Measured water soluble sulfate concentrations were 0.01 percent in Sample ST-3 of Boring B-6 and less than 0.001 percent in Sample ST-3 from Boring B-4.

TABLE 1
SWELL TEST RESULTS

Boring	Sample Depth	In-situ Moisture Content	% Swell	Inundation Pressure	Swell Pressure
B-4	6.5 feet	18.9%	+1.0	840 psf	Not determined
B-6	6.8 feet	19.4%	+3.9	880 psf	17,000 psf

Notes: psf = pounds per square foot

Groundwater was not observed in any of the borings. The absence of groundwater should not be construed to represent an exact or permanent condition. There is uncertainty with short term groundwater level readings in boreholes, particularly when the soil is of relatively low permeability such as that present at the site. Groundwater levels may fluctuate with variations in precipitation, site grading, and drainage.

5.0 STRUCTURE RECOMMENDATIONS

5.1 Swelling Clay

Based on the laboratory test results, the clay soil at the site is susceptible to noticeable volume change due to swelling and shrinking associated with changes in the soil moisture content. The potential swell is capable of causing damage to the building and distress to the parking lot. Measures should be taken to mitigate the potential for damage.

The recommendations provided in this report attempt to address the destructive nature of these materials and reduce the potential for damage to structures and other elements. However, the risk can only be reduced, not entirely eliminated, by geotechnical engineering considerations. Further reduction of the risk of damaging movements must be made by: (a) the design team by designing the structure to accommodate movement and incorporating drainage measures into the design; (b) the contractor by recognizing the importance of quality control in the construction process and following the recommendations and considerations herein; and (c) by the Owner with long-term maintenance and restraint of excessive lawn and plant watering.

For the soil to swell/shrink, the moisture regime must change. The mechanism of change involves features that are not necessarily geotechnically related, such as site development (e.g., irrigation can cause swelling) and construction schedule/methods (extended exposure to air or prolonged wetting can change the moisture regime and result in volume change in the underlying materials). In addition, unforeseen events, such as leaking water or sewer lines, can change the moisture regime beneath a site. Subsequent sections of this report provide recommended design and construction measures that should be taken to reduce the potential for swell-related distress to structures constructed at the site.

5.2 Foundation Support

Shallow foundations and slab-on-grade floors will be susceptible to movement from swelling of the clay. As such, it is our opinion that the most reliable support system for the buildings and floor slabs is a deep foundation system that transfers the loads of the buildings and floor system to below potentially expansive soil zones. A drilled shaft foundation system involves the least risk of future movement and subsequent damage.

We recommend the use of straight-sided, drilled shafts with a minimum shaft diameter of 18 inches. Drilled shafts may be designed for axial load support using an allowable end-bearing pressure of 5 kips per square foot (ksf) with a factor of safety of 3.

Shafts should be designed to resist uplift loads applied along the shaft perimeter from swell. Uplift loads along the shaft may be computed using the following formula (Chen, 1975):

$$\mathrm{U} = \pi D u L_1 = 68D$$

where U = uplift load in kips;
D = diameter of the drilled shaft in feet;
u = adhesion due to swell in ksf (recommended value of 2.7 ksf); and
L_1 = depth of shaft affected by wetting in feet (recommended value of 8 feet to account for maximum thickness of CH layers in the upper 12 feet).

Resistance to uplift will be provided by adhesion along the shaft below the depth of wetting, the dead load of the shaft and applied structure dead loads. Drilled shafts should be reinforced their entire length to provide full development of the available uplift resistance. Ultimate resisting adhesion below the depth of wetting may be calculated using the following formula:

$$\mathrm{R} = \pi D c L_2 = 3DL_2$$

where R = ultimate resisting adhesion in kips;
D = diameter of the drilled shaft in feet;
c = soil adhesion in ksf (recommended value of 1.0 ksf for shafts drilled dry); and
L_2 = depth of shaft unaffected by wetting = L - L_1,

where L = the total shaft length in feet.

A factor of safety should be applied to this resistance.

Drilled shafts should bear at least 35 feet below grade (L = 35 feet). The recommended shaft length extends below the termination depth of the borings completed for this study. The ReMi survey results indicate a transition to harder materials around a depth of 35 to 40 feet below grade. Additional exploration should be accomplished and reviewed before the beginning of construction to verify that suitable conditions are present at depth and that drilled shafts can be extended to the recommended depth.

Installation techniques should be compliant with the 1999 Federal Highway Administration (FHWA) manual, "Drilled Shafts: Construction Procedures and Design Methods." Frictional and end-bearing design parameters used in this analysis assume that the bottom of the shaft is properly cleaned and proper concrete placement techniques are used. In particular, drilled shafts should be pumped free of water, cleaned of loose material, and observed by us prior to pouring. The drilling and concreting process should be relatively continuous with minimal stoppage of work between the completion of drilling and cleaning the hole and placement of concrete after setting the rebar cage, and under no circumstances after the day of drilling. We anticipate the contractor should be able to drill the shaft dry.

5.3 Floor Slab

Because a drilled shaft foundation system does not reduce the potential for the ground to swell, the use of a structural floor slab with a well-ventilated crawl space provides the best protection against potential swell. The use of a structural floor slab is beneficial in that it also allows heavier loads to be transferred to the foundation, increasing its resistance to heaving. Perimeter grade beams underlain by void form should likewise be used to support and transfer the structural slab and wall loads to the drilled shaft foundation. A minimum 6-inch-high void space should be provided beneath grade beams (extending the full width of the grade beam from pier to pier) and structural slabs to reduce the potential for uplift to act against the bottom of the grade beams and slabs.

- Slabs should be isolated from slab projections. At the discretion and judgment of the designer, slabs may be lightly tied to foundations at entries to prevent a lip from forming as a result of slab movement. This should be limited to the minimum required. Where slabs are tied to walls, a control joint about 3 to 5 feet in is suggested to collect cracks and allow the slab to hinge if movement occurs. Exterior slabs should be similarly isolated from foundation components.

- Utilities penetrating or supported by the slab should be constructed with flexible couplings and isolated from slab.
- Mechanical or heating, ventilation, and air conditioning (HVAC) equipment supported on slabs should be provided with flexible connections or collapsing ductwork sufficient to allow for a conservative estimate of 4 inches of vertical movement.

ACI recommendations should be consulted for control joint frequency to help reduce problems associated with shrinkage and cracking.

5.4 Seismic Design Factors

Shear wave velocities were determined using the SeisOpt® seismic method for evaluating the in-situ shear-wave (S-wave) velocity profiles from surface wave measurements. Results from seismic surface-wave analysis provide an accepted and proven method to determine the International Building Code (IBC 2012) seismic design site classification. This method determines the average velocity profile over the length of the seismic array. As such, the resultant velocity profile is appropriate for determining the site classification but should not be used for the determination of any other geotechnical design parameter.

The measured velocity profile completed for this project indicated an IBC site classification “D” for seismic design. The following table summarizes the results from this site.

TABLE 2
IBC SITE CLASSIFICATION RESULTS

Survey Line	Measured $\overline{v_s}$	IBC Site Classification	$\overline{v_s}$ range for IBC Classification
Line 1	1,024 ft/sec	IBC 'D'	600 to 1,200 ft/sec

5.5 Pavements

The following recommendations are based on our experience and recommendations published by the Asphalt Institute and ACI. We can perform a detailed pavement design if you desire. To perform a detailed design, we will require the anticipated volume, type and pattern of traffic.

The pavement borings generally encountered medium stiff to stiff, fat clay near the ground surface (with the exception of boring SB-4 where soft fat clay was encountered) that is anticipated to have a field CBR of 5 (based on published correlations) provided that pavement subgrades are prepared in accordance with the grading recommendations of this report. Based on the observed subsurface conditions and laboratory testing, it is likely the fat clays will be present at an elevation that may influence the performance of the pavement.

Because of the swell potential of the clay subgrade, we recommend that pavements be constructed of full depth, hot-mix asphaltic concrete (HMA). HMA pavements are somewhat flexible and tolerate ground movements associated with swelling and shrinkage better than do rigid Portland cement concrete (PCC) pavements. Granular or aggregate base materials can collect and trap water adjacent to the clay subgrade, thereby increasing the potential for swell. The use of full depth HMA pavements eliminates the granular section and the associated potential to trap and hold water. Reinforced PCC only should be considered for slabs subject to heavy, repetitive, channelized loads such as those experienced by pavements for loading docks and trash dumpsters.

We recommend full-depth pavement sections consisting of at least 5 inches of full depth HMA pavement for light traffic areas (no truck traffic) and at least 7 inches of full depth HMA pavement for fire lanes and access drives where truck traffic is anticipated. PCC pavement sections should be constructed with a minimum thickness of at least 7 inches and should be reinforced. The maximum joint spacing for PCC pavement should be equal to or less than the value expressed in feet equal to 2.5 times the concrete thickness in inches. For example, an 8-inch pavement should have a joint spacing no greater than 20 feet. The HMA sections assume that traffic will generally be limited to automobile and light trucks for staff and visiting patients within light traffic areas. In PCC areas, truck loading is expected to consist of only the occasional delivery vehicle or trash hauler, with a frequency on the order of a few vehicles per day.

Lime could be used to stabilize the fat clay. Texas Department of Transportation's "Guidelines for Modification and Stabilization of Soils and Base for Use in Pavement Structures" should be utilized to determine the proper percentage of lime to be added to the soil and placement procedures. The treated layer should be at least 12 inches thick. Water may need to be added during mixing to allow for proper hydration of the lime. Pulverizing and tilling equipment, such as “gators,” are preferred for mixing the lime into the soil.

Drainage is the most important factor affecting pavement performance besides the design of the pavement section. Adequate slope must be provided to both the pavement and subgrade to quickly drain away surface water and runoff that infiltrates below the pavement surface. To promote drainage of surface water from pavement areas, a minimum grade of 1/8 inch per foot should be maintained at the final pavement surface (1/4 inch per foot where possible), and ponding of water should not be allowed. Drives and roadways should be crowned, except in superelevated curves, with a cross-slope of at least 2.0 percent to promote drainage of surface water. Surface water should be collected and transported by means of catch basins and sewers, or other positive means. The subgrade should be shaped and drained similar to the pavement surface so that there are no spots where water would pond and saturate the soil.

Regardless of the pavement section used, some periodic maintenance, such as sealing of cracks and joints along with repair of damaged areas, will be necessary. Sealing of the entire asphaltic concrete surface should be accomplished every few years as it reduces the permeability of the pavement and subsequent infiltration of water and reduces the rate of oil loss due to weathering. Sealing of cracks and joints in both concrete and asphaltic concrete pavements should be performed on a regular basis to reduce water infiltration. Reducing water infiltration will reduce the amount of subgrade softening that occurs during wet or freezing weather, and the associated potential for subsequent pavement breakup.

6.0 GRADING RECOMMENDATIONS

6.1 Site Preparation

The remnants of any previous or existing structures, including foundations, debris, and existing vegetation including trees, brush, stumps, large roots, and topsoil should be removed from areas that are to be cut, receive fill, or otherwise be constructed upon. In general, buried concrete walls, slabs, and foundations should be removed. Existing vegetation should be removed from the site. Topsoil should be removed from the site or used as fill in landscaped areas only. Abandoned sewer lines should be excavated and removed or grouted full to mitigate the potential for collapse and ground loss.

After clearing and stripping is complete, the site should be checked by a representative of the project geotechnical engineer to determine that the clearing and stripping has been sufficient to remove the topsoil, vegetation, and existing asphalt pavement and base rock. Only the parking lot area that will receive fill should be systematically proofrolled with a fully loaded, tandem axle dump truck (gross weight of approximately 40,000 pounds). Where access prohibits the use of trucks, the heaviest piece of available equipment should be used, subject to approval of the geotechnical engineer. Areas that rut or pump excessively should be removed to firm material. Excavations resulting from clearing should be backfilled in accordance with the grading recommendations for the site.

Provisions should be made both during and after grading, to protect all exposed earthwork construction areas and earth slopes from erosion as required by applicable Federal, State, and local regulations.

6.2 Fill and Backfill Materials

The existing site soils are expansive and therefore should not be used for structural fill or backfill. The importation and use of acceptable soil materials as defined below is recommended to reduce the swell potential.

Fill and backfill material brought from off-site borrow areas should be approved by the geotechnical engineer before delivery to the site. Acceptable fill and backfill materials include, in general, crushed rock, well-graded sand and gravel complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP. We recommend the use of granular fill containing between 20 and 35 percent fines. CL and ML soil groups may also be acceptable pending review of the swell potential. Soils exhibiting a liquid limit greater than 40 percent or a plasticity index greater than 15 percent should not be considered. Other soils may be used provided they exhibit no swell potential. Unsatisfactory soils include those complying with ASTM D-2487 soil classification groups MH, CH, OL, OH, and Peat.

Open graded (or clean) sands and gravels should be avoided beneath and around structures. Open graded aggregates can collect and hold water that subsequently can cause swell of the adjacent clay soil. Imported fill should not include any rocks or rubble larger than 3 inches in diameter or any significant amounts of organics or debris. Material other than soil, sand, and gravel should be considered deleterious material unless Shannon & Wilson personnel state otherwise after visual inspection of the material. Deleterious material should not be used in site fills, regardless of whether it is from an onsite source or delivered to the site. Deleterious material will include any organic matter, wood, metal, and metal or plastic piping. Concrete fragments may also be considered deleterious depending upon the size and gradation and should not be used unless approved by Shannon & Wilson after visual inspection.

6.3 Placement and Compaction

All fill material should be placed in loose lifts not exceeding 8 inches in thickness and compacted to standards below. No fills should be placed on soft material, muddy or frozen ground. The compacted earth fill should be sloped and graded to permit rapid runoff of rainwater. No ponding on the fill surface should be allowed.

Fill and backfill should be compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). The moisture content of fill materials should be sufficiently controlled to permit ease in handling and placement to achieve the specified compaction. A moisture content range within 2 to 3 percent above or below the optimum moisture content as determined by the standard Proctor test is usually sufficient. However, for lean clay and silt materials, the moisture content should be kept at or wet of the optimum moisture content as determined by the standard Proctor test to limit the swell potential unless testing has shown that the soil is non-swell susceptible.

6.4 Construction Monitoring

Fill placement and proofrolling of exposed subgrades should be monitored by Shannon & Wilson to confirm that unstable materials are not present and that proper placement and compaction of materials has been accomplished. Before fill and backfill operations begin, representative samples of the proposed fill and backfill material should be tested for laboratory compaction characteristics in accordance ASTM D698 as recommended above. Liquid and plastic limit determinations should also be accomplished in accordance with ASTM D4318 to check material classification and evaluate shrink/swell potential if clay soil is to be used.

Compaction of subgrade surfaces, fill, and backfill should be checked with a sufficient number of density tests to assure that adequate compaction is being achieved. Construction specifications should require at least one in-place density test of the compacted fill for every

2,500 to 5,000 square feet of fill placed in building areas and base course placed for pavements and slabs. For backfill of utility trenches or around structures, construction specifications should require at least one in-place density test per lift for every 100 feet of trench, or fraction thereof. At least one test should be completed per lift regardless of the size or location of the fill area.

6.5 Temporary Excavations

All temporary excavations (such as those required for utility trenches, etc.) should be constructed in accordance with OSHA regulations. Acceptable cut slope angles should be determined by site personnel during construction and in accordance with OSHA criteria. For design purposes, the soils at the site can generally be considered as OSHA Type B. Some fill was encountered and would classify as OSHA Type C, but the frequency and depth of the fill appeared to be fairly limited for most of the site. Excavations extending into Type B soils should be cut on a slope no steeper than 1 vertical on 1 horizontal. Conditions could vary and flatter slopes could be required at specific excavations. All excavation operations should be performed under the supervision of qualified site personnel in accordance with OSHA regulations. Any excavation slope left exposed should be protected from erosion and saturation by rainfall and runoff. Adequately designed bracing may also be used to support excavations.

Excavations should not encroach within an area extending 45 degrees downward and from the outside edge of existing foundations. If proposed excavations will extend within this area, then we should be contacted to provide specific recommendations to maintain foundation support of the existing foundations and lateral support of the excavations.

7.0 LIMITATIONS OF REPORT

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they presently exist and further assume that the explorations are representative of the subsurface conditions throughout the site, i.e. the subsurface conditions everywhere are not significantly different from those disclosed by the explorations. If, during construction, subsurface conditions different from those encountered in the explorations are observed, or appear to be present beneath excavations, we should be advised at once so that we can review these conditions and reconsider our recommendations, when necessary.

Unanticipated soil, rock, and groundwater conditions are frequently encountered and cannot be fully determined by merely taking samples or performing subsurface explorations. Such unexpected conditions commonly require that additional expenditures be made to obtain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

We recommend that we be retained to review those portions of the plans and specifications which pertain to earthwork and foundations to determine if they are consistent with our recommendations. In addition, we should be retained to observe construction, particularly the compaction of structural fill, installation drilled shafts, and also to make field measurements of ground displacements and such other field observations as may be necessary.

The scope of our services for this report did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or around this site. Any statements contained in this report, or on the boring logs, regarding odors noted or unusual or suspicious items or conditions observed, are strictly for the information of our client.

SHANNON & WILSON, INC.
Texas Registered Engineering Firm F-3824

STATE OF TEXAS
GREGORY R. FISCHER
96164
LICENSED
PROFESSIONAL ENGINEER
2/25/14

Gregory R. Fischer, P.E.
Senior Vice President

AGM:WBK:GRF/tad

8.0 REFERENCES

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FIGURES

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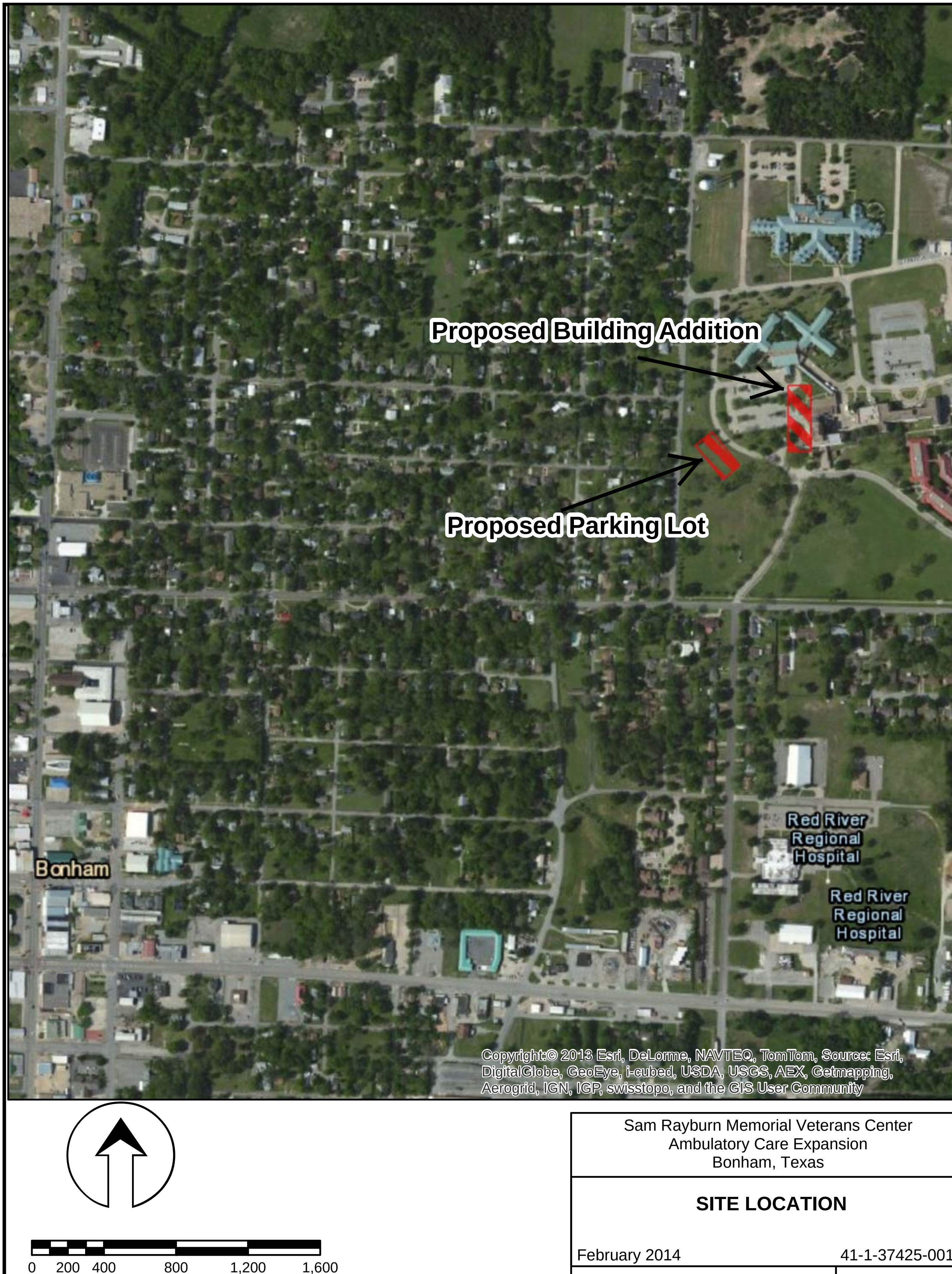

Sam Rayburn Memorial Veterans Center
Ambulatory Care Expansion
Bonham, Texas

SITE LOCATION

February 2014 41-1-37425-001

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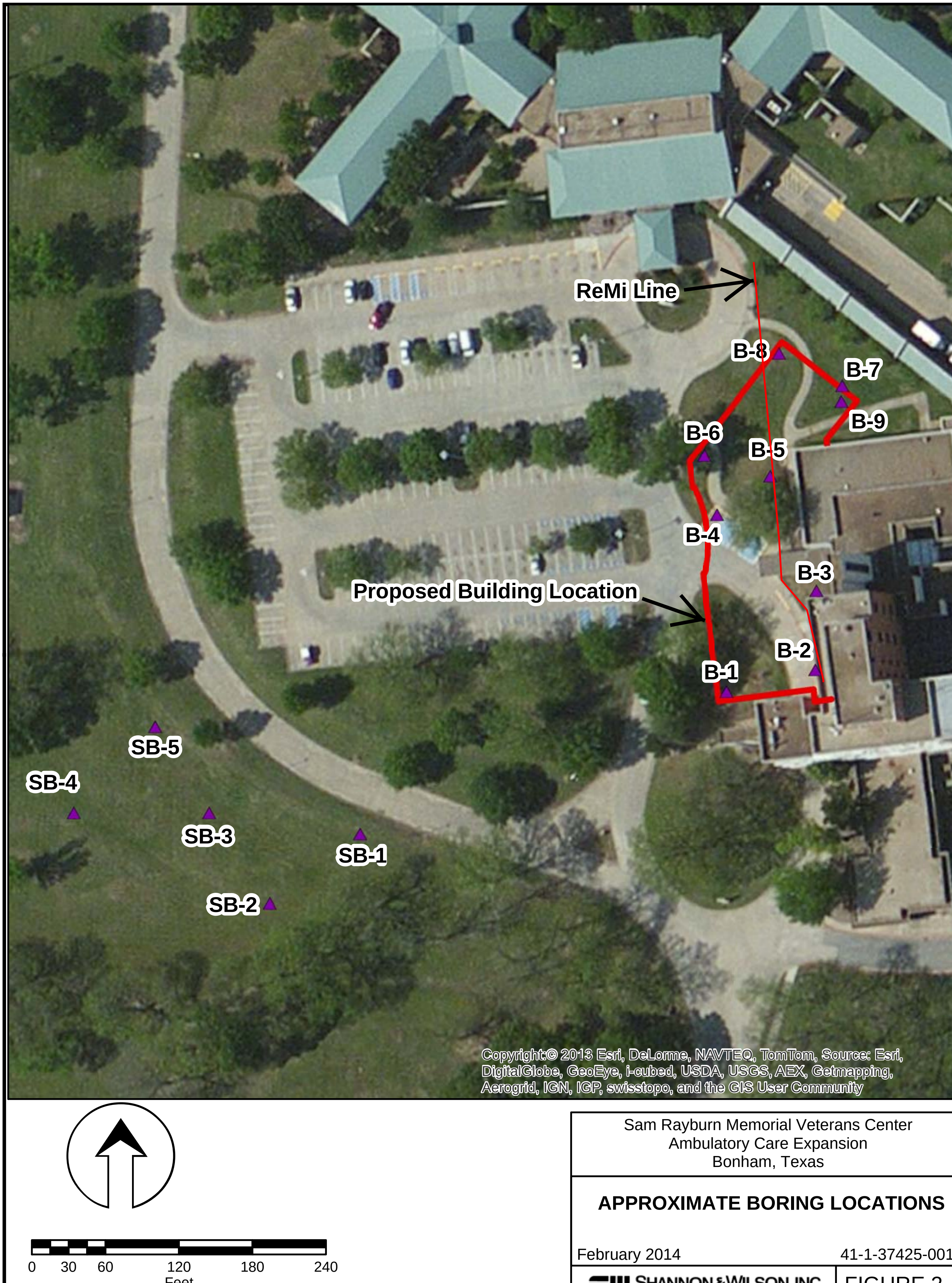
FIGURE 1



Sam Rayburn Memorial Veterans Center
Ambulatory Care Expansion
Bonham, Texas

APPROXIMATE BORING LOCATIONS

February 2014 41-1-37425-001

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FIGURE 2

APPENDIX A

EXPLORATION LOGS AND LABORATORY TESTS

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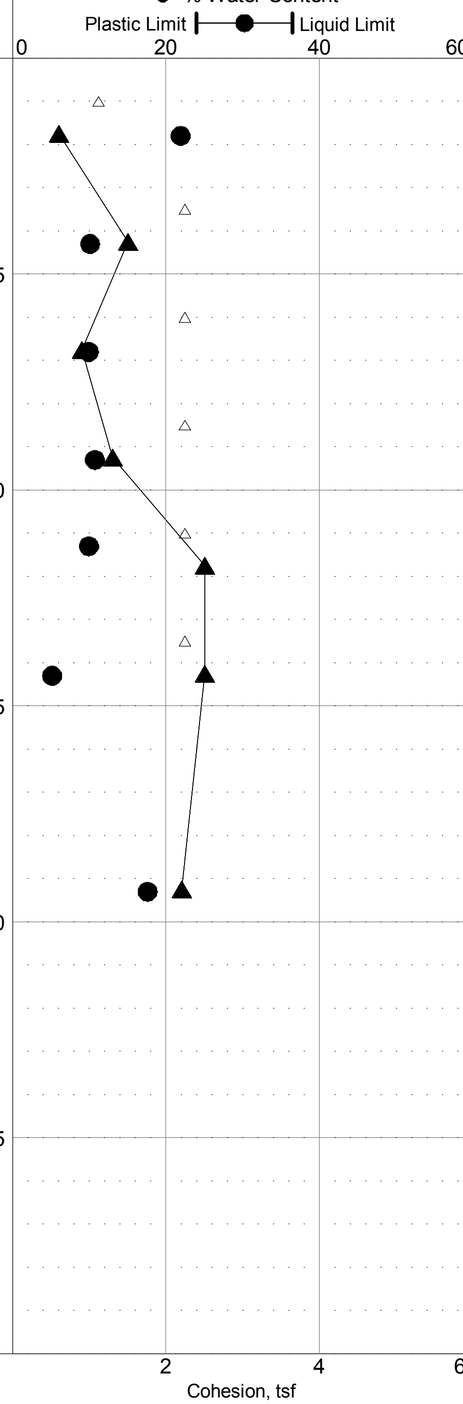
Elevation	SOIL DESCRIPTION N: 33.58369 E: 96.1664 Surface Elevation 97.9 Ft.	Depth (ft)	Symbol	Sample	Ground Water	Depth (ft)
95	Medium stiff to very stiff, gray to light gray, fat CLAY (CH); moist.	5.5		SS-1 SS-2		5
90 85	Stiff to very stiff, light gray, lean CLAY (CL); moist.	14.0		SS-3 SS-4 SS-5		10
	Medium dense, light gray, SILT (ML); dry.	16.0		SS-6		15
80	Very stiff, gray, fat CLAY (CH); moist.	20.0		SS-7		20
75 70	Boring terminated at 20.0 feet on 01/08/14. Groundwater was not encountered during drilling. Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.					25

PENETRATION RESISTANCE & LAB DATA



△ Pocket Penetrometer Shear Strength
☐ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification and selected laboratory index testing.

Sam Rayburn Memorial Veterans Center
Ambulatory Care Expansion
Bonham, Texas

LOG OF BORING B-1

February 2014 41-1-37425-001

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-1

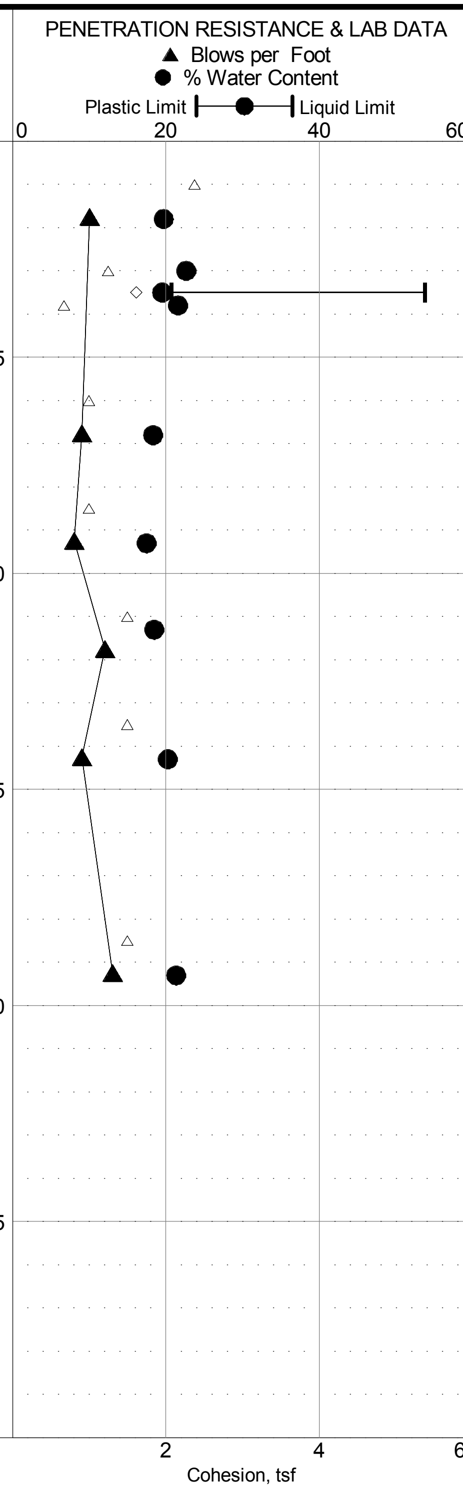
Page 1 of 1

Log: AGM Rev: WBK Typ: CMB Driller: West Drilling Drilling Method: HSA Date Completed: 1/8/2014

LOG OF BORING B-2

Elevation	SOIL DESCRIPTION N: 33.58379 E: 96.16622 Surface Elevation 95 Ft.	Depth (ft)	Sample
	6 inches CONCRETE	0.5	
	Medium stiff to stiff, brown to light gray-brown, fat CLAY (CH); moist. 3.5 Feet - Dry Density = 107.3 pcf		SS-1, ST-2
90	Stiff, light gray-brown, lean CLAY (CL); moist.	5.5	SS-3, SS-4
85			SS-5
80	Stiff, gray to green-gray, fat CLAY (CH); moist.	13.0	SS-6
75	Boring terminated at 20.0 feet on 01/09/14. Groundwater was not encountered during drilling.	20.0	SS-7
70	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.		
65			

Date Completed: 1/9/2014   Drilling Method: HSA   Driller: West Drilling   Typ: CMB   Rev: WBK   Log: AGM



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- ∇ Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification and selected laboratory index testing.

Sam Rayburn Memorial Veterans Center
Ambulatory Care Expansion
Bonham, Texas

LOG OF BORING B-2

February 2014   41-1-37425-001

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FIG. A-2
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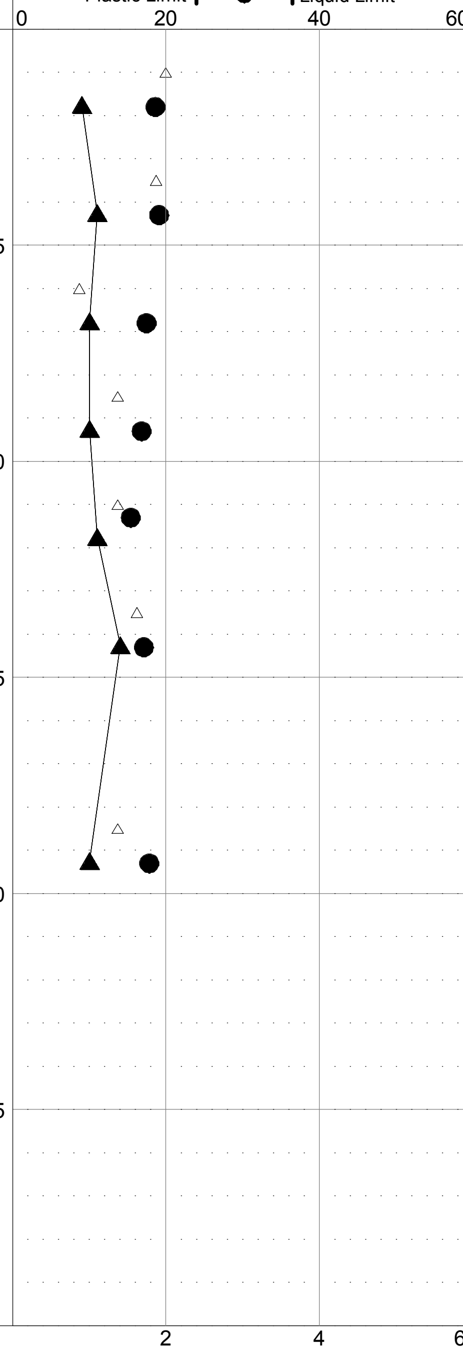
MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14

Elevation	SOIL DESCRIPTION N: 33.58391 E: 96.16623 Surface Elevation 99.5 Ft.	Depth (ft)	Symbol	Sample	Ground Water	Depth (ft)
	Stiff, gray-brown, fat CLAY (CH); moist; calcareous white nodules, iron staining.			SS-1		
95				SS-2		5
				SS-3		
	Stiff, gray-brown, lean CLAY (CL); moist; silt content increasing with depth.	8.0				
90				SS-4		10
				SS-5		
85				SS-6		15
80				SS-7		
	Boring terminated at 20.0 feet on 01/09/14. Groundwater was not encountered during drilling.	20.0				20
75						25
	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.					
70						

PENETRATION RESISTANCE & LAB DATA



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

Date Completed: 1/9/2014 Drilling Method: HSA Driller: West Drilling Rev: WBK Typ: CMB

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- ∇ Ground Water Level

NOTES

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2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
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4. Refer to KEY for explanation of "Symbols" and definitions.
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Ambulatory Care Expansion
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LOG OF BORING B-3

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FIG. A-3

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MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14

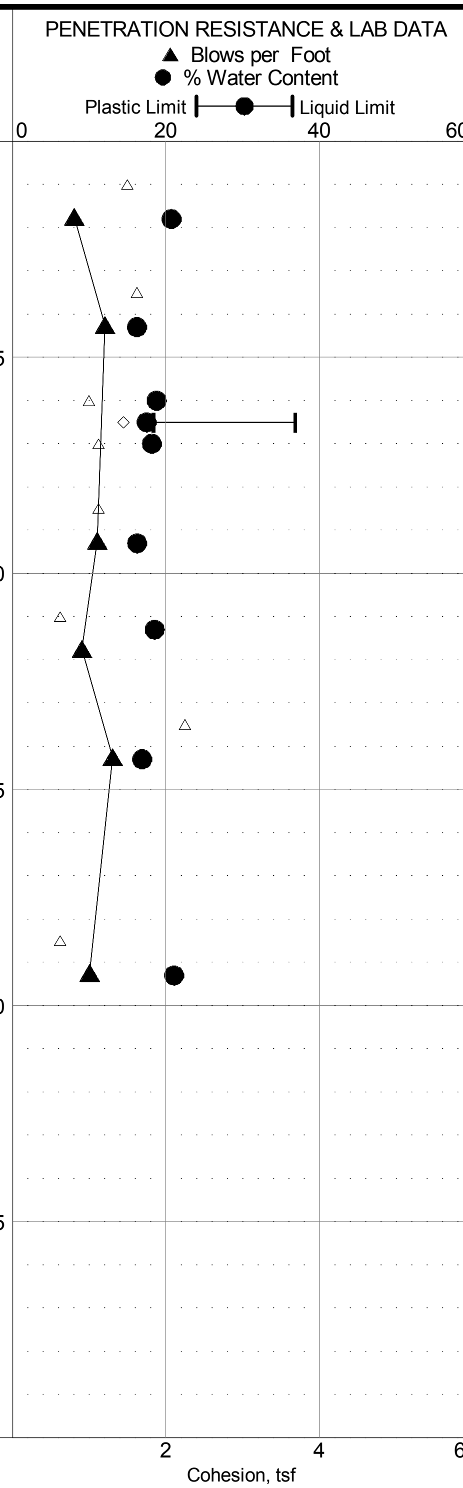
Date Completed: 1/9/2014 Drilling Method: HSA Driller: West Drilling Typ: CMB Rev: WBK Log: AGM

SOIL DESCRIPTION

N: 33.58401 E: 96.16641

Surface Elevation 98.8 Ft.

Elevation	Soil Description	Depth (ft)	Sample
	4 inches CONCRETE	0.3	
	Medium stiff to stiff, gray to light gray, fat CLAY (CH); moist; iron staining.	3.0	SS-1
95	Stiff, light gray to light brown, lean CLAY (CL); moist.		SS-2
	6.5 Feet - Dry Density = 111.6 pcf		ST-3
90			SS-4
		14.0	SS-5
85	Stiff, light gray, fat CLAY (CH); moist.	17.0	SS-6
80	Loose to medium dense, light gray, SILT (ML); moist.	20.0	SS-7
	Boring terminated at 20.0 feet on 01/09/14. Groundwater was not encountered during drilling.		
75			
70	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.		



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% RQD% Rock Core
- Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
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LOG OF BORING B-4

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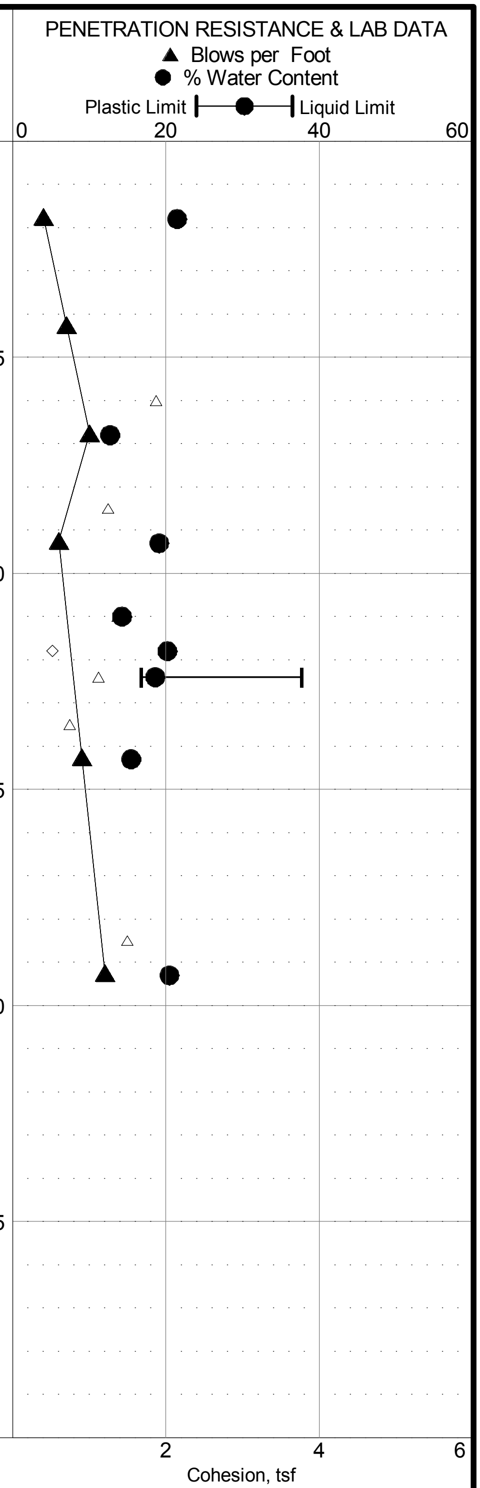
FIG. A-4

MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14

Elevation	SOIL DESCRIPTION N: 33.58405 E: 96.16631 Surface Elevation 99.4 Ft.	Depth (ft)	Sample
	Soft, dark brown, lean CLAY (CL); moist; FILL.		
	Soft, gray-brown, fat CLAY (CH); moist.	1.6	SS-1
95	Medium stiff to stiff, light gray, lean CLAY (CL) to loose to medium dense, SILT (ML); moist.	3.0	SS-2, SS-3
90	Medium stiff, gray-brown, fat CLAY (CH); moist.	8.7	SS-4
85, 80	Stiff, gray-brown, lean CLAY (CL); moist. 11.8 Feet - Dry Density = 105.1 pcf	10.5	ST-5, SS-6, SS-7
75, 70	Boring terminated at 20.0 feet on 01/09/14. Groundwater was not encountered during drilling. Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.	20.0	



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- ∇ Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
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LOG OF BORING B-5

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FIG. A-5

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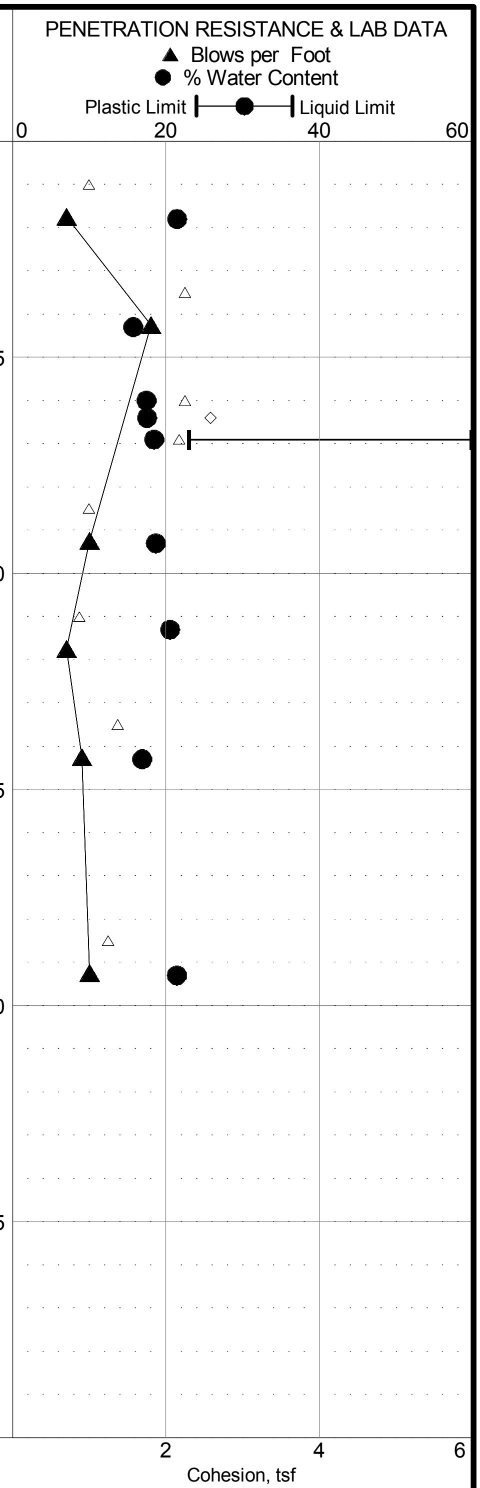
Date Completed: 1/9/2014 Drilling Method: HSA Driller: West Drilling Typ: CMB Rev: WBK Log: AGM

MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14

Elevation	SOIL DESCRIPTION N: 33.58417 E: 96.16644 Surface Elevation 102.6 Ft.	Depth (ft)	Symbol	Sample	Ground Water
100	Medium stiff to very stiff, dark gray to light gray-brown, fat CLAY (CH); moist; trace organics.			SS-1, SS-2	
95	6.4 Feet - Dry Density = 109.3 pcf			ST-3	
	Medium stiff to stiff, light gray-brown, lean CLAY (CL); moist.	8.0		SS-4, SS-5, SS-6	
90					
85	Stiff, light gray-brown, fat CLAY (CH); moist.	16.0		SS-7	
80	Boring terminated at 20.0 feet on 01/08/14. Groundwater was not encountered during drilling.	20.0			
75	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.				



LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification and selected laboratory index testing.

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LOG OF BORING B-6

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FIG. A-6

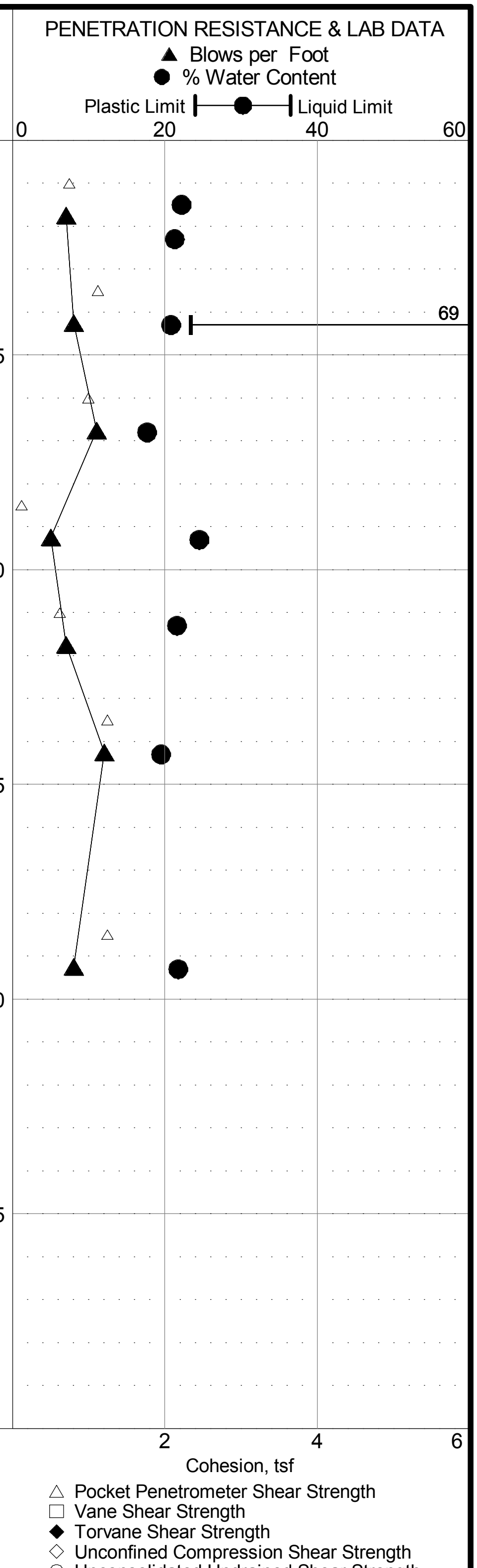
MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14 Log: ACM Rev: WBK Typ: CMB Driller: West Drilling Drilling Method: HSA Date Completed: 1/8/2014

SOIL DESCRIPTION

N: 33.58423 E: 96.16615

Surface Elevation 99.6 Ft.

Elevation	Soil Description	Depth (ft)	Sample
	Medium stiff, brown to dark brown, fat CLAY (CH); moist; trace organics; FILL.	2.0	SS-1
95	Medium stiff to stiff, gray-brown, fat CLAY (CH); moist; trace organics.	5.5	SS-2
	Stiff, light gray-brown, lean CLAY (CL); moist.	8.0	SS-3
90	Medium stiff, light gray-brown to gray-brown, fat CLAY (CH); moist.	10.5	SS-4
85	Medium stiff to stiff, light gray-brown to gray, lean CLAY (CL); moist.	16.5	SS-5, SS-6
80	Medium stiff to stiff, gray-brown, fat CLAY (CH); moist.	20.0	SS-7
75	Boring terminated at 20.0 feet on 01/09/14. Groundwater was not encountered during drilling.		
70	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.		



LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
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Bonham, Texas

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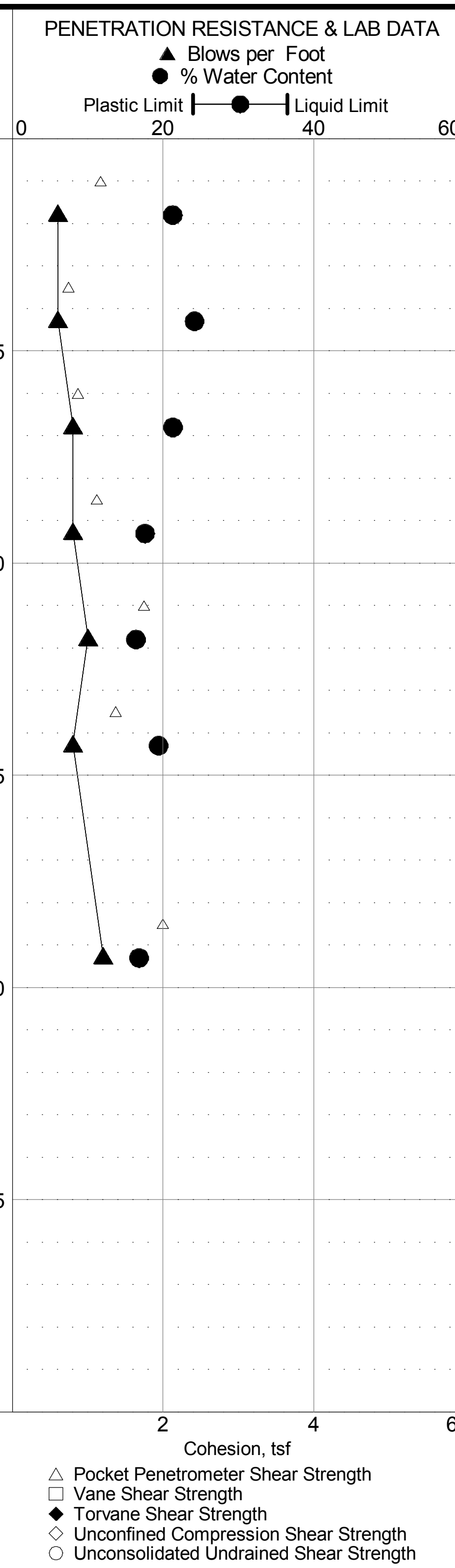
FIG. A-7

Page 1 of 1

Date Completed: 1/9/2014 Drilling Method: HSA Driller: West Drilling Typ: CMB Rev: WBK Log: AGM

MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14

Elevation	SOIL DESCRIPTION N: 33.58431 E: 96.16625 Surface Elevation 101 Ft.	Depth (ft)	Symbol	Sample	Ground Water
100	Medium stiff, dark brown, fat CLAY (CH); moist; plastic; FILL.			SS-1 SS-2	
95	Medium stiff to stiff, gray to light gray, lean CLAY (CL); moist.	6.0		SS-3 SS-4 SS-5 SS-6	
90					
85	Stiff, light gray, fat CLAY (CH); moist.	17.0		SS-7	
80	Boring terminated at 20.0 feet on 01/08/14. Groundwater was not encountered during drilling.	20.0			
75	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.				



LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
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3. Groundwater level, if indicated above, is for the date specified, and may vary.
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Bonham, Texas

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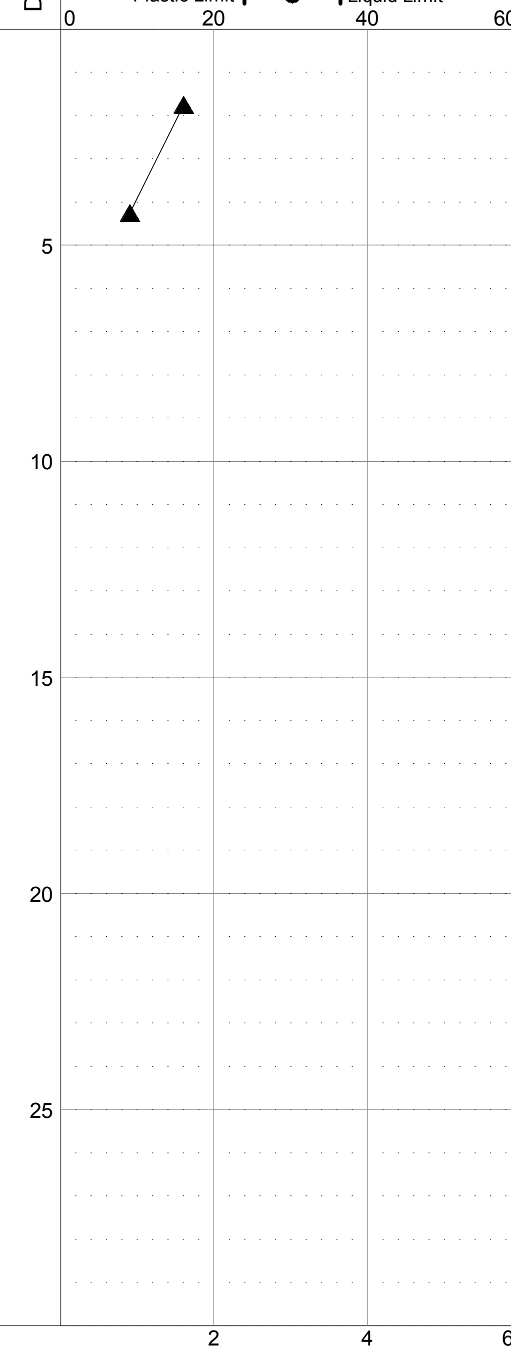
FIG. A-8

Elevation	SOIL DESCRIPTION N: 33.58418 E: 96.16615 Surface Elevation 98.8 Ft.	Depth (ft)	Symbol	Sample	Ground Water
	Stiff, dark brown, fat CLAY (CH); moist; FILL.				
	Medium dense, gray, silty GRAVEL (GM); moist; FILL.	1.7		SS-1	
95	Loose, red-brown, fine SAND (SP); moist; FILL.	4.1		SS-2	
	-Encountered plastic water line at 6.0 feet. Boring terminated at 6.0 feet on 01/08/14. Groundwater was not encountered during drilling.	6.0			
90					
	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.				
85					
80					
75					
70					

PENETRATION RESISTANCE & LAB DATA

▲ Blows per Foot
● % Water Content
Plastic Limit ├──●──┤ Liquid Limit



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- ∇ Ground Water Level

NOTES

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Bonham, Texas

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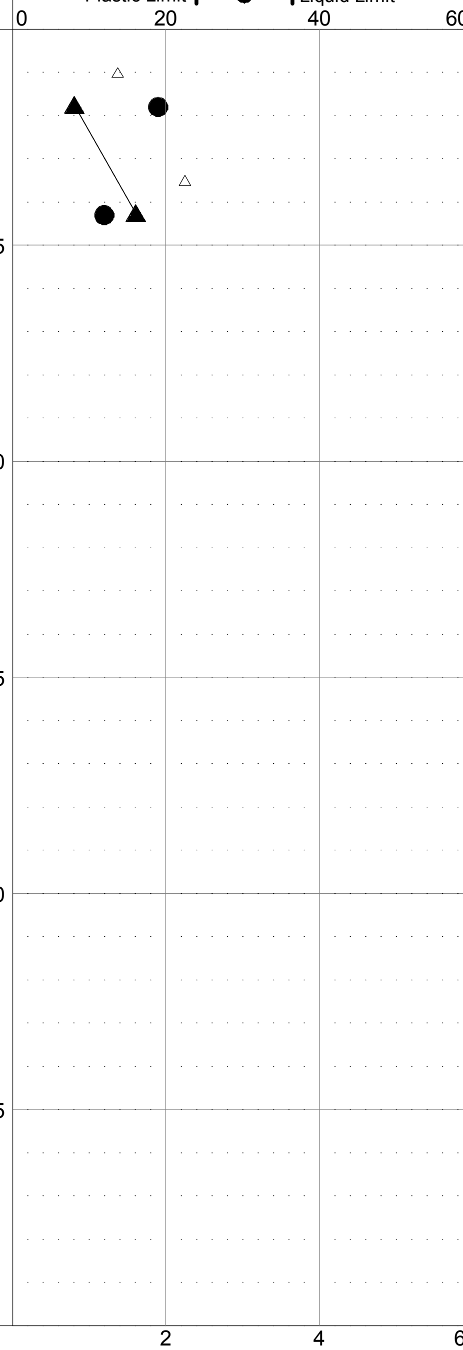
FIG. A-9

MASTER SU 41-1-37425-001 BORING LOGS.GPJ SHAN WIL.GDT 2/24/14 Log: AGM Rev: WBK Typ: CMB Driller: West Drilling Drilling Method: HSA Date Completed: 1/8/2014

Elevation	SOIL DESCRIPTION N: 33.58341 E: 96.16721 Surface Elevation 98.5 Ft.	Depth (ft)	Symbol	Sample	Ground Water	Depth (ft)
	Medium stiff to stiff, dark brown, fat CLAY (CH); moist; trace organics.			SS-1		
95	Very stiff, gray-brown, fat CLAY (CH); moist; trace organics.	3.0		SS-2		
	Boring terminated at 5.0 feet on 01/09/14. Groundwater was not encountered during drilling.	5.0				5
90						
	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.					10
85						15
80						20
75						25
70						

PENETRATION RESISTANCE & LAB DATA
▲ Blows per Foot
● % Water Content
Plastic Limit ├─●─┤ Liquid Limit



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% RQD% Rock Core
- ▽ Ground Water Level

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Bonham, Texas

LOG OF BORING SB-1

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FIG. A-10
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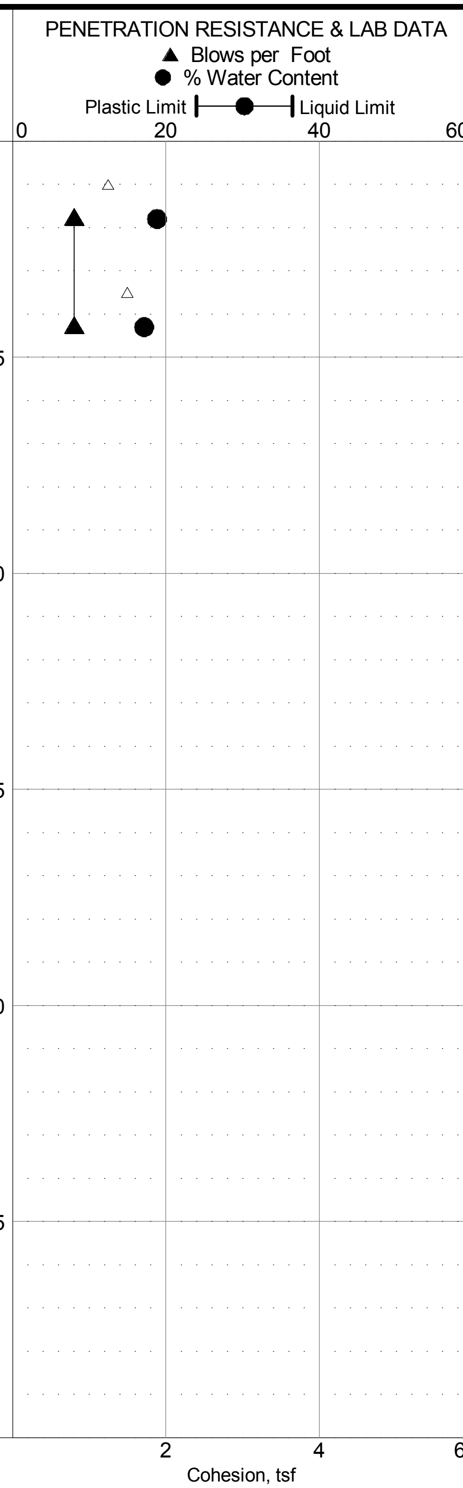
MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14
Log: AGM Rev: WBK Typ: CMB Driller: West Drilling Drilling Method: HSA Date Completed: 1/9/2014

Elevation	SOIL DESCRIPTION N: 33.58328 E: 96.16743 Surface Elevation 98 Ft.	Depth (ft)	Symbol	Sample	Ground Water	Depth (ft)
95	Medium stiff to stiff, gray-brown to light gray-brown, fat CLAY (CH); moist; trace organics. -Lignite nodules 3.5 - 4.0 feet.	5.0		SS-1 SS-2		5
90	Boring terminated at 5.0 feet on 01/09/14. Groundwater was not encountered during drilling.					10
85	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.					15
80						20
75						25
70						

PENETRATION RESISTANCE & LAB DATA



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% RQD% Rock Core
- Ground Water Level

NOTES

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LOG OF BORING SB-2

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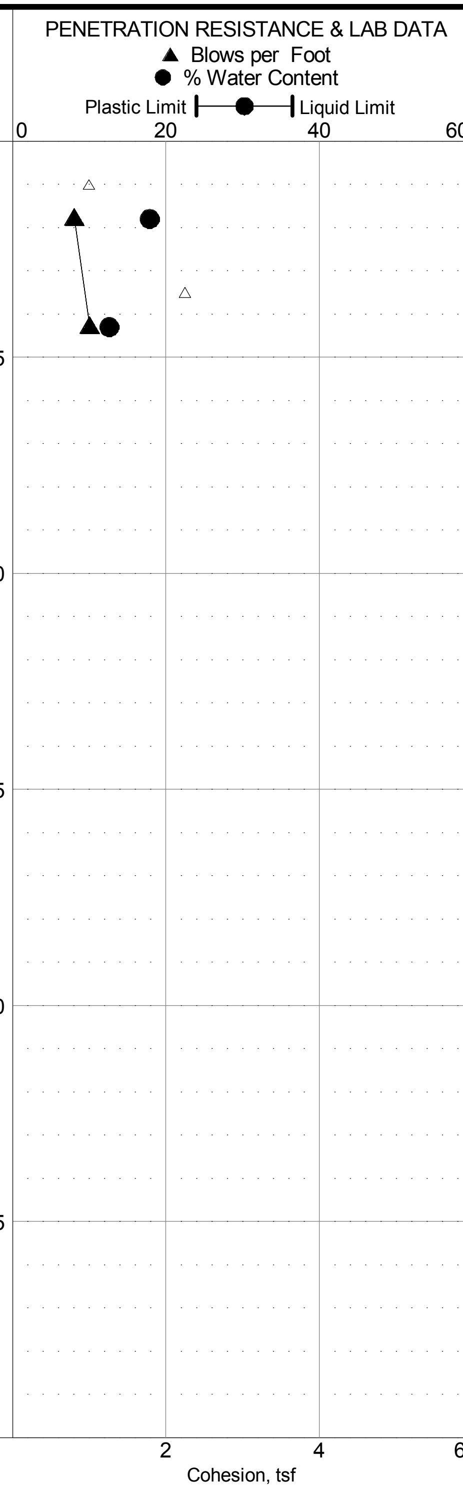
FIG. A-11

Elevation	SOIL DESCRIPTION N: 33.58362 E: 96.16768 Surface Elevation 101 Ft.	Depth (ft)	Symbol	Sample	Ground Water	Depth (ft)
100	Medium stiff to stiff, brown to dark brown, fat CLAY (CH); moist to dry; trace organics.			SS-1		
	Stiff, gray-brown, fat CLAY (CH); moist to dry.	3.0		SS-2		
95	Boring terminated at 5.0 feet on 01/09/14. Groundwater was not encountered during drilling.	5.0				5
90	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.					10
85						15
80						20
75						25



LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- Ground Water Level

- △ Pocket Penetrometer Shear Strength
- □ Vane Shear Strength
- ◆ Torvane Shear Strength
- ◇ Unconfined Compression Shear Strength
- ○ Unconsolidated Undrained Shear Strength

NOTES

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4. Refer to KEY for explanation of "Symbols" and definitions.
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LOG OF BORING SB-3

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FIG. A-12
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MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14 Log: AGM Rev: WBK Typ: CMB Driller: West Drilling Drilling Method: HSA Date Completed: 1/9/2014

LOG OF BORING SB-4

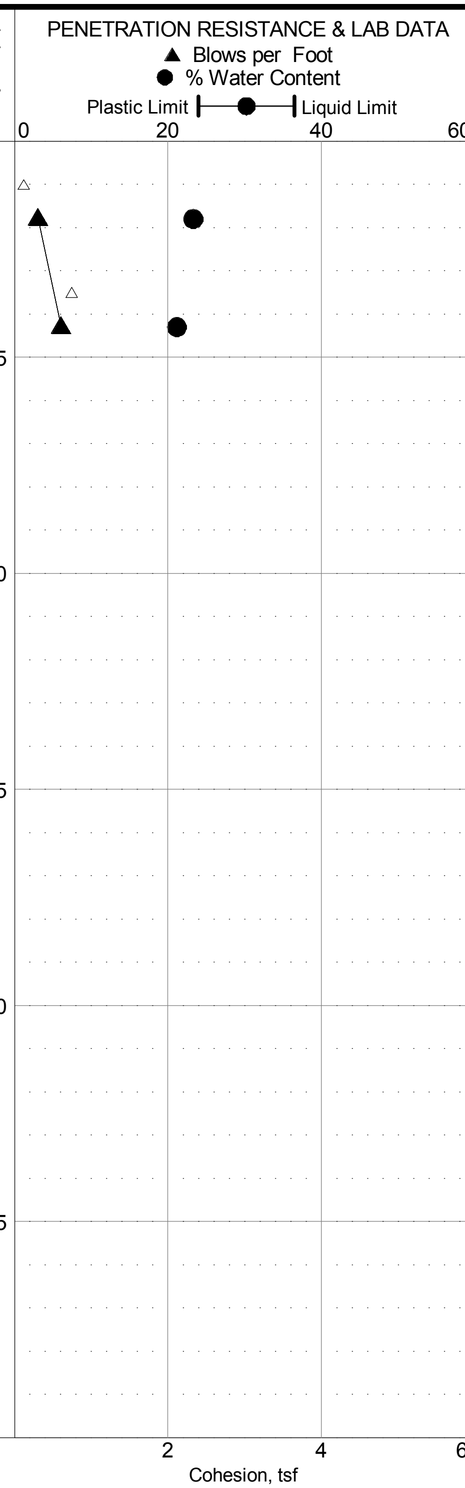
SOIL DESCRIPTION

N: 33.58346 E: 96.16785

Surface Elevation 99.5 Ft.

Elevation	Soil Description	Depth (ft)	Symbol	Sample	Ground Water
	Soft, dark brown, fat CLAY (CH); moist; trace organics.			SS-1	
95	Medium stiff, gray-brown, fat CLAY (CH); moist.	3.0		SS-2	
	Boring terminated at 5.0 feet on 01/09/14. Groundwater was not encountered during drilling.	5.0			
90					
	Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.				
85					
80					
75					
70					

PENETRATION RESISTANCE & LAB DATA



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification and selected laboratory index testing.

Sam Rayburn Memorial Veterans Center
Ambulatory Care Expansion
Bonham, Texas

LOG OF BORING SB-4

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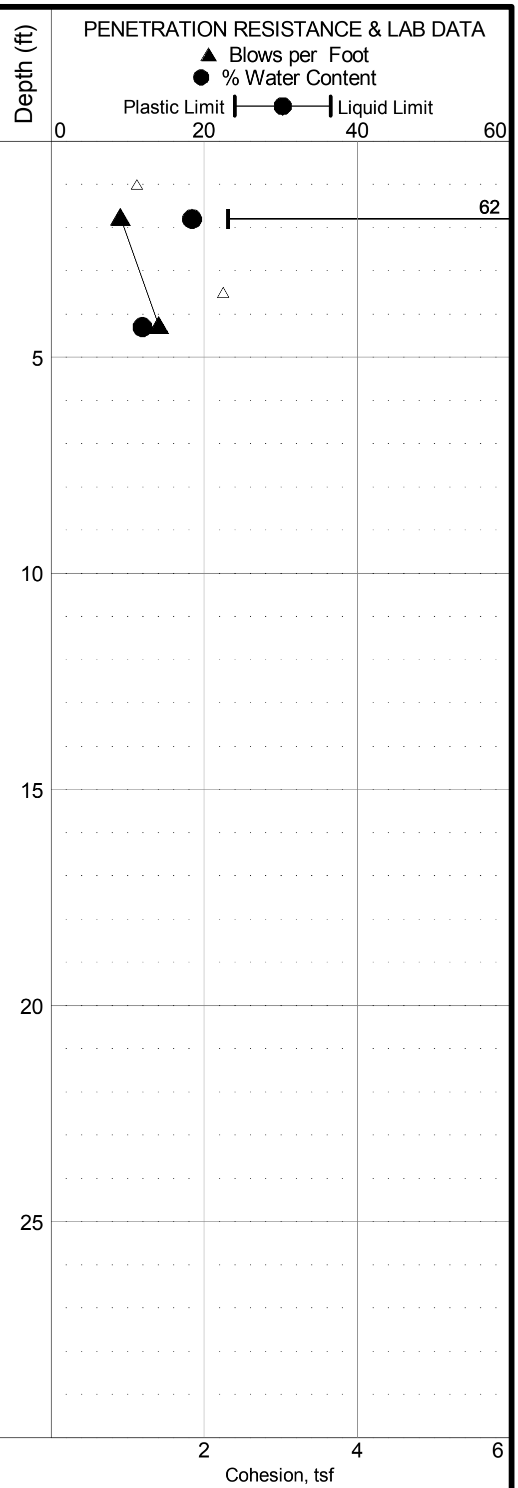
FIG. A-13

MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14 Log: ACM Rev: WBK Typ: CMB Driller: West Drilling Drilling Method: HSA Date Completed: 1/9/2014

Elevation	SOIL DESCRIPTION N: 33.58345 E: 96.16755 Surface Elevation 99.5 Ft.	Depth (ft)	Symbol	Sample	Ground Water
	Stiff, red-brown, fat CLAY (CH); moist; trace organics.			SS-1	
95	Stiff, gray, fat CLAY (CH); moist; trace organics.	3.0		SS-2	
90	Boring terminated at 5.0 feet on 01/09/14. Groundwater was not encountered during drilling. Latitude and Longitude taken with handheld GPS unit. Boring elevation was estimated using a hand level using the existing finish floor elevation of the Ambulatory Care Center as a temporary benchmark with assumed elevation of 100.0 feet.	5.0			
85					
80					
75					
70					



△ Pocket Penetrometer Shear Strength
□ Vane Shear Strength
◆ Torvane Shear Strength
◇ Unconfined Compression Shear Strength
○ Unconsolidated Undrained Shear Strength

LEGEND

- * Sample Not Recovered
- 2-inch O.D. Split Spoon Sample
- 3-inch O.D. Shelby Tube Sample
- REC% / RQD% Rock Core
- Ground Water Level

NOTES

1. The stratification lines represent the approximate boundaries between soil types, and the transition may be gradual.
2. The discussion in the text of this report is necessary for a proper understanding of the nature of the subsurface materials.
3. Groundwater level, if indicated above, is for the date specified, and may vary.
4. Refer to KEY for explanation of "Symbols" and definitions.
5. USCS designation is based on visual-manual classification and selected laboratory index testing.

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LOG OF BORING SB-5

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FIG. A-14

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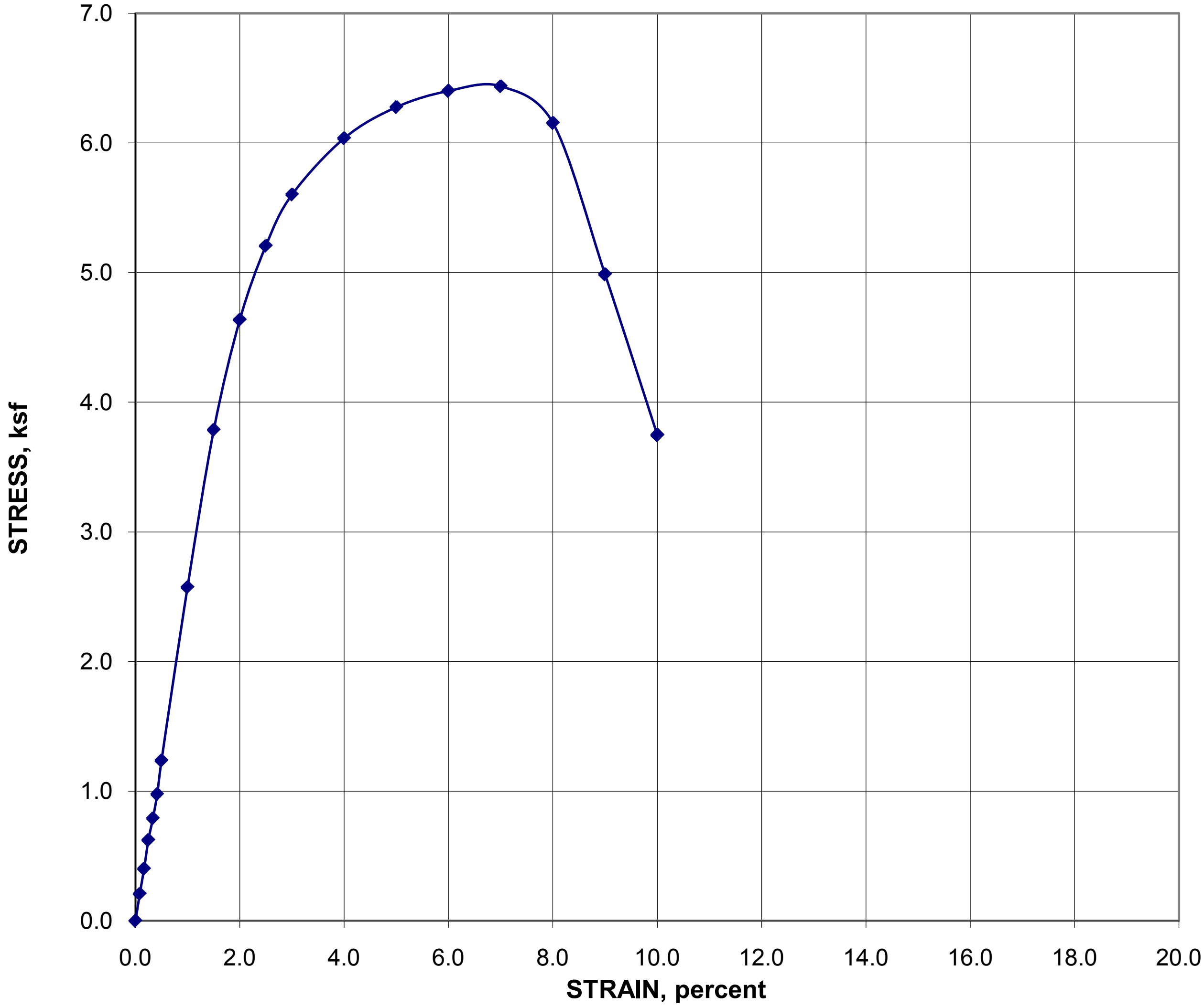
MASTER_SU 41-1-37425-001 BORING LOGS.GPJ SHAN_WIL.GDT 2/24/14 Log: AGM Rev: WBK Typ: CMB Driller: West Drilling Drilling Method: HSA Date Completed: 1/9/2014

UNCONFINED COMPRESSION STRENGTH



SHEAR STRENGTH ksf	*H-D RATIO*	AVG STRAIN RATE in per min	*STRENGTH* ksf	*STRAIN*	*MOISTURE*	*DRY DENSITY* pcf
3.219	2.17	0.028	6.437	7.0%	19%	107.3

Sample Identification: Boring B-2, Sample ST-2, at 3.5 feet

DESCRIPTION

Medium stiff to stiff, mottled light gray-brown, fat CLAY (CH).

Sam Rayburn Memorial Veterans Center Ambulatory Care Expansion Bonham, Texas	
UNCONFINED COMPRESSION TEST **B-2** **ST-2**	
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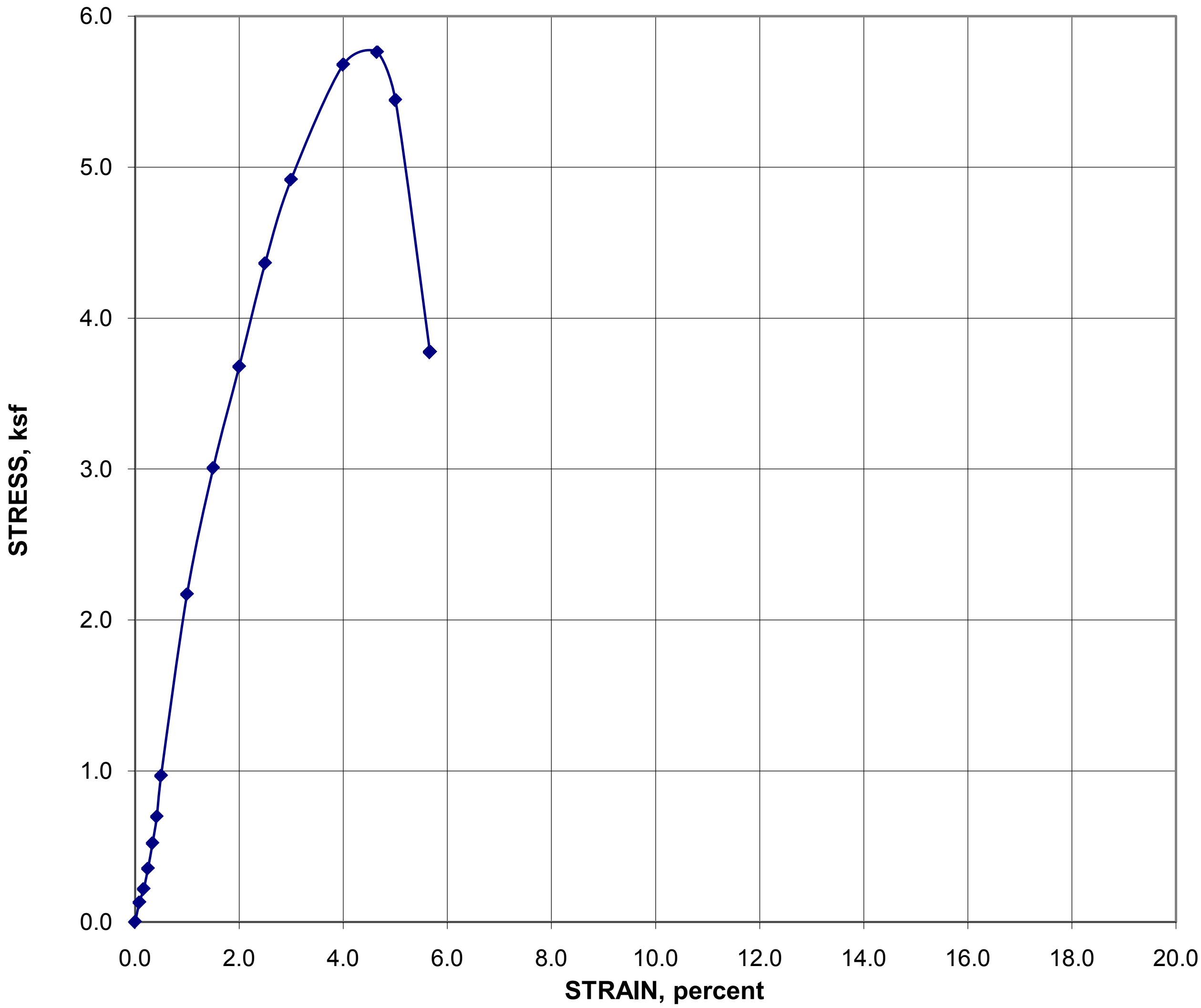
SHANNON & WILSON, INC. Geotechnical and Environmental	**FIG. A-15** **Page 1 of 4**

UNCONFINED COMPRESSION STRENGTH



SHEAR STRENGTH ksf	*H-D RATIO*	AVG STRAIN RATE in per min	*STRENGTH* ksf	*STRAIN*	*MOISTURE*	*DRY DENSITY* pcf
2.881	2.17	0.019	5.763	4.7%	17%	111.6

Sample Identification: Boring B-4, Sample ST-3, at 6.5 feet

DESCRIPTION

Very stiff, light gray-brown, fat CLAY (CH).

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UNCONFINED COMPRESSION TEST
B-4
ST-3

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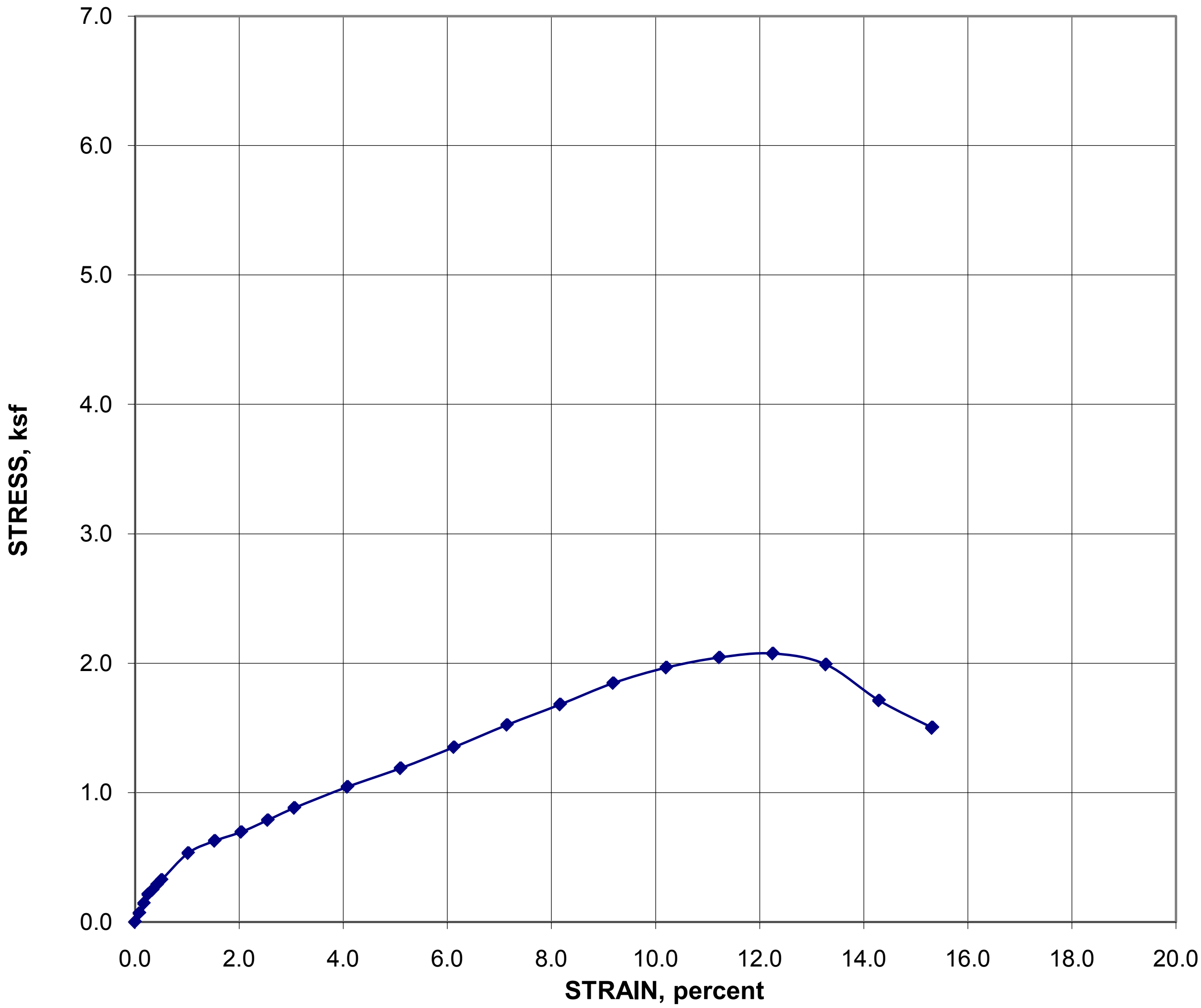
FIG. A-15

UNCONFINED COMPRESSION STRENGTH



SHEAR STRENGTH ksf	*H-D RATIO*	AVG STRAIN RATE in per min	*STRENGTH* ksf	*STRAIN*	*MOISTURE*	*DRY DENSITY* pcf
1.037	2.20	0.048	2.074	12.3%	20%	105.1

Sample Identification: Boring B-5, Sample ST-5, at 11.8 feet

DESCRIPTION

Very stiff, light gray-brown, fat CLAY (CH).

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UNCONFINED COMPRESSION TEST
B-5
ST-5

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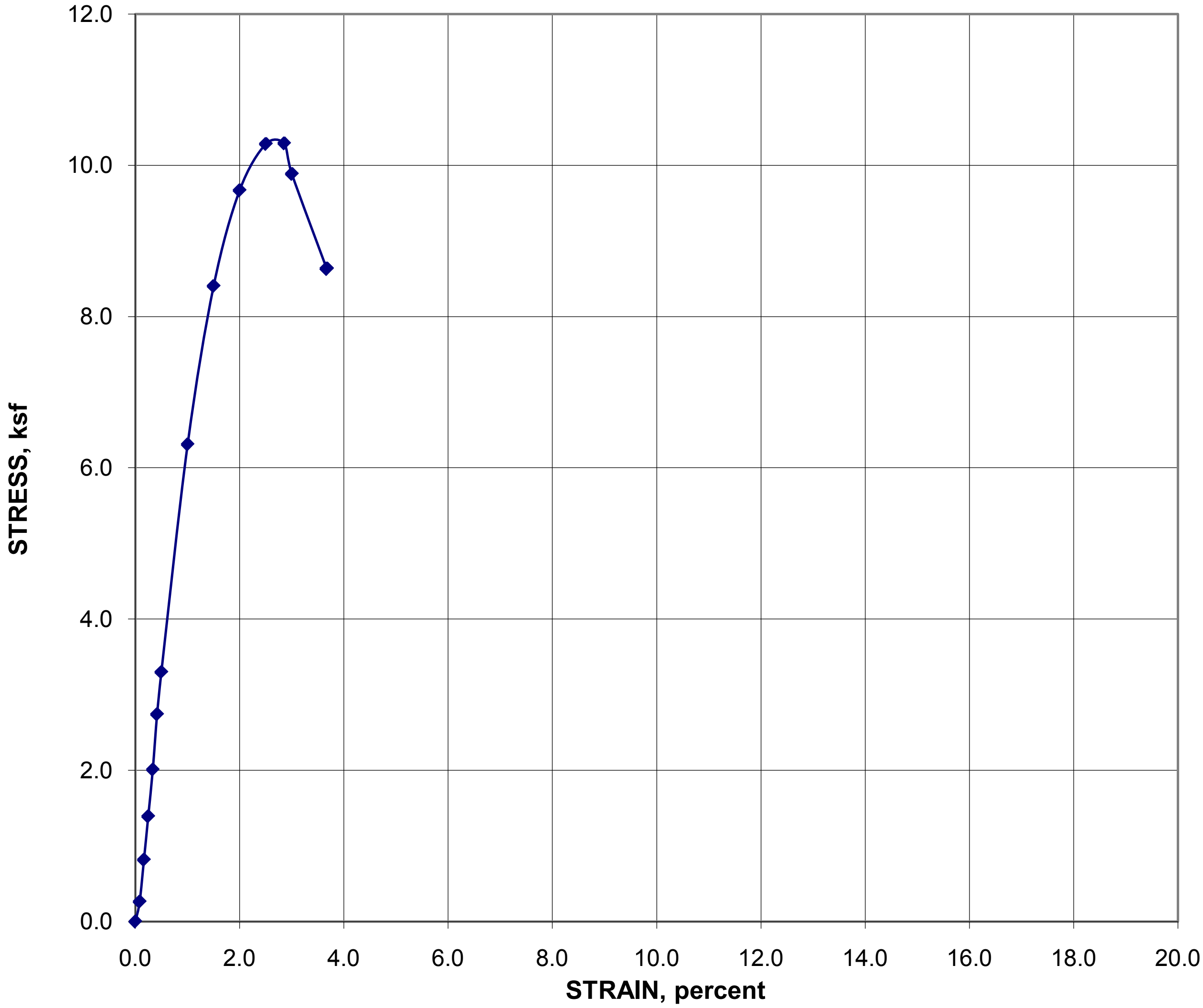
FIG. A-15

UNCONFINED COMPRESSION STRENGTH



SHEAR STRENGTH ksf	*H-D RATIO*	AVG STRAIN RATE in per min	*STRENGTH* ksf	*STRAIN*	*MOISTURE*	*DRY DENSITY* pcf
5.144	2.16	0.011	10.289	2.9%	17%	109.3

Sample Identification: Boring B-6, Sample ST-3, at 6.4 feet

DESCRIPTION

Hard, light gray, fat CLAY (CH).

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UNCONFINED COMPRESSION TEST
B-6
ST-3

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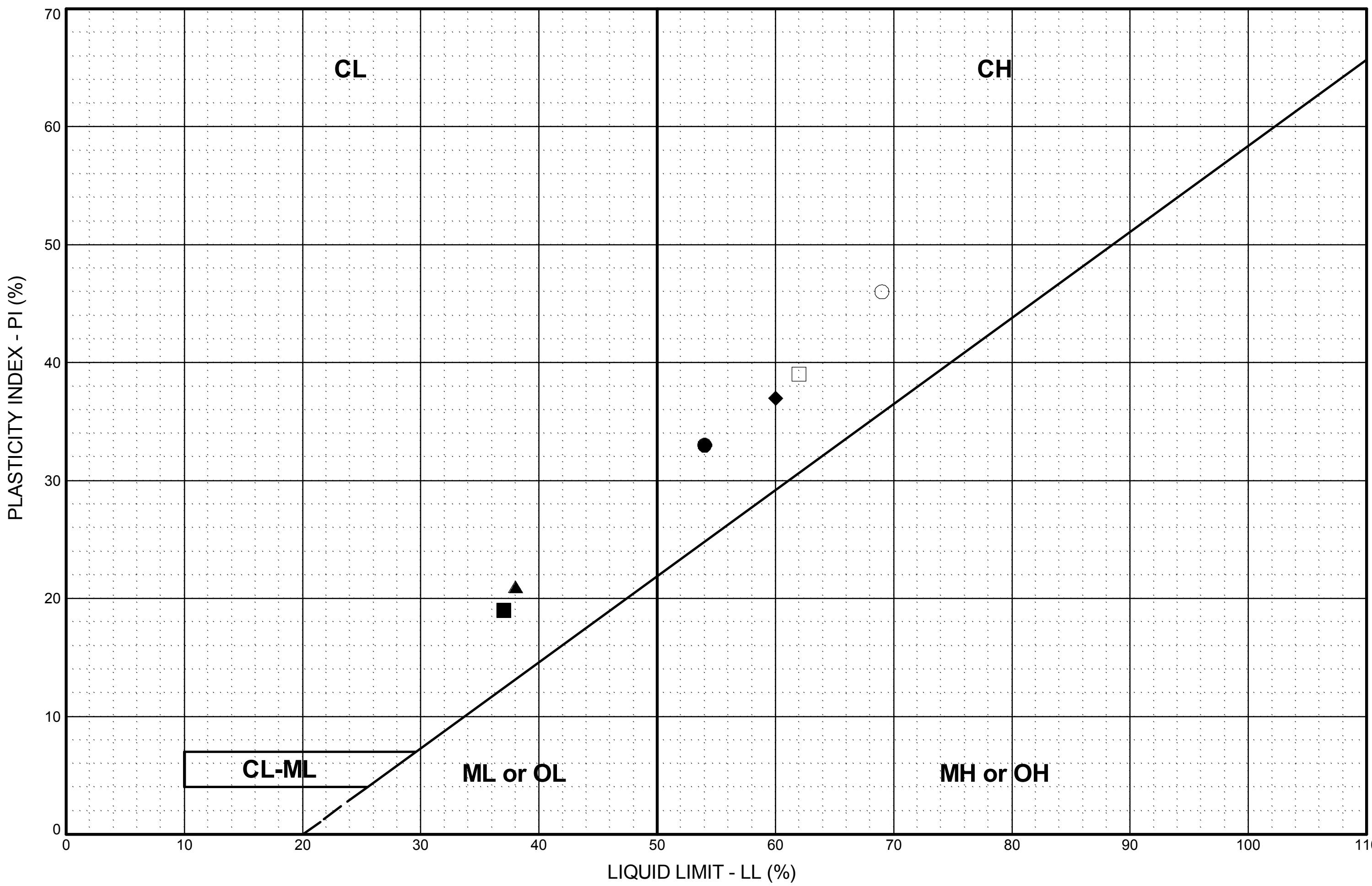
FIG. A-15



LEGEND

CL: Low plasticity inorganic clays; sandy and silty clays

CH: High plasticity inorganic clays

ML or OL: Inorganic and organic silts and clayey silts of low plasticity

MH or OH: Inorganic and organic silts and clayey silts of high plasticity

CL-ML: Silty clays and clayey silts

BORING AND SAMPLE NO.	DEPTH (feet)	U.S.C.S. SYMBOL	SOIL CLASSIFICATION	LL %	PL %	PI %	NAT. W.C. %	PASS. #200, %
● B-2, ST-2	3.5	CH	Brown to light gray-brown, fat CLAY.	54	21	33	19.5	
■ B-4, ST-3	6.5	CL	Light gray to light brown, lean CLAY.	37	18	19	17.4	
▲ B-5, ST-5	12.4	CL	Gray-brown, lean CLAY.	38	17	21	18.5	
◆ B-6, ST-3	6.9	CH	Dark gray to light gray-brown, fat CLAY .	60	23	37	18.4	
○ B-7, SS-2	4.3	CH	Gray-brown, fat CLAY.	69	23	46	20.7	
□ SB-5, SS-1	1.8	CH	Red-brown, fat CLAY.	62	23	39	18.3	

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PLASTICITY CHART

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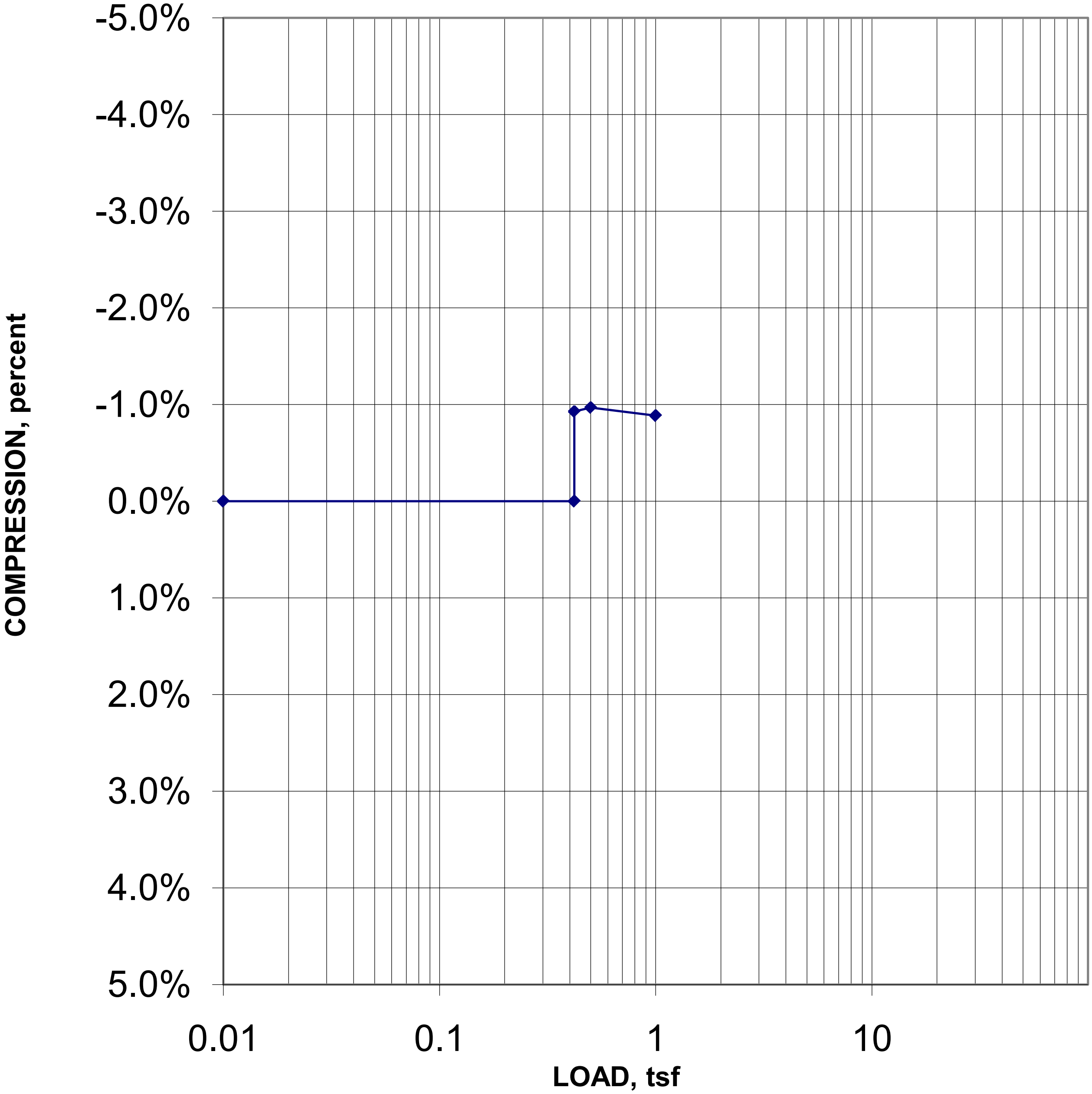
FIG. A-16

SWELL TEST



Load, tsf	Coefficient of Consolidation, mm²/second	Load, tsf	Coefficient of Consolidation, mm²/second
0.01	NA		
0.42	3.3E+00		
0.42	NA		
0.5	2.8E+00		
1.0	7.3E+00		

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SETTLEMENT PLOTS

B-4

ST-3

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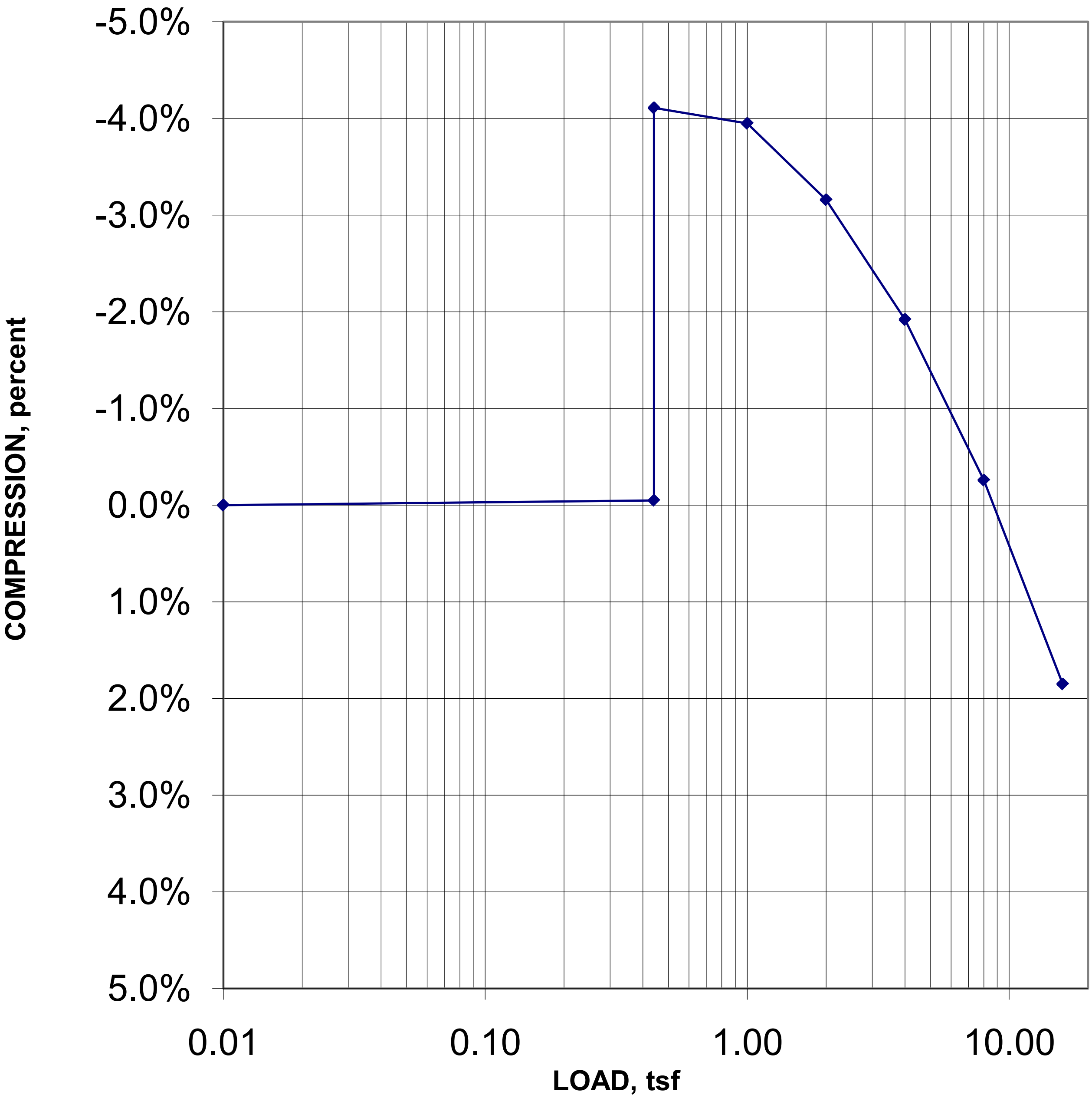
FIG. A-17
Page 1 of 2

SWELL TEST



Load, tsf	Coefficient of Consolidation, mm²/second	Load, tsf	Coefficient of Consolidation, mm²/second
0.44	5.2E+00		
0.44	NA		
1.0	4.4E-02		
2.0	3.0E-02		
4.0	3.9E-02		
8.0	2.8E-02		
16.0	1.6E-02		

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SETTLEMENT PLOTS

B-6

ST-3

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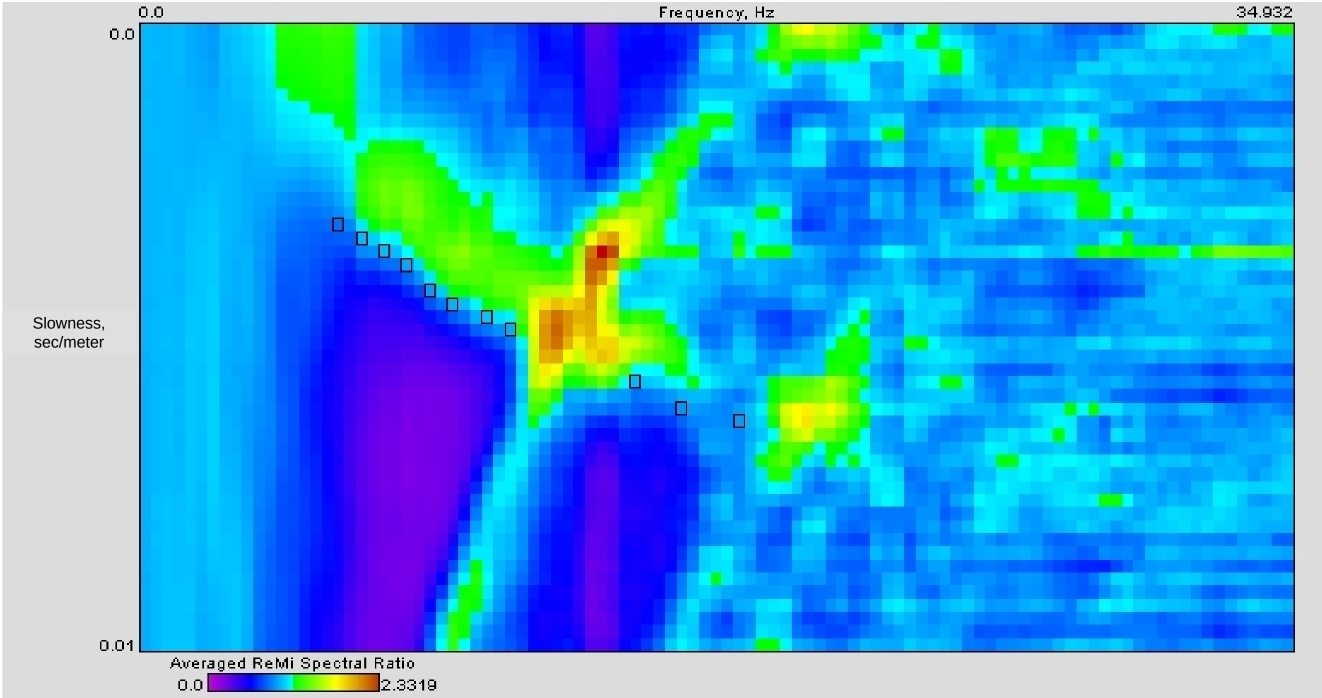
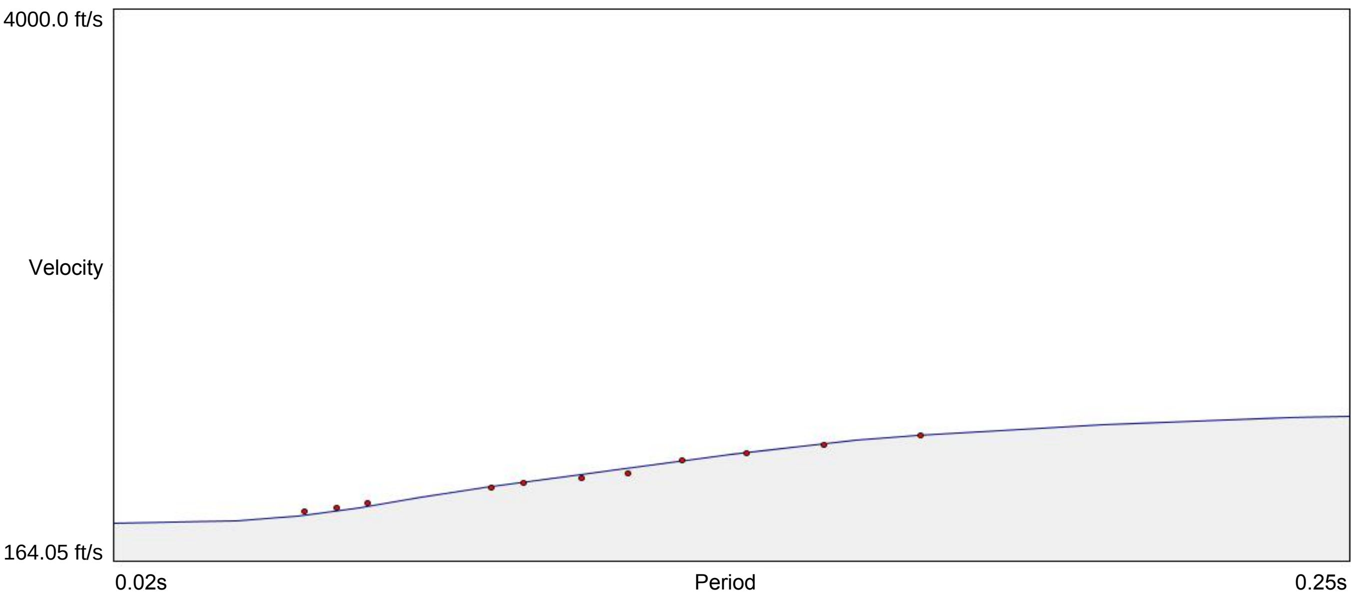
FIG. A-17





RMS Error: 18.5 ft/s
Vs=1023.535
IBC Site Class D (IBC 2012 1615.1.1)

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REMI DATA

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FIG. A-18

APPENDIX B

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL REPORT

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SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 41-1-37425-001

Date: February, 2014
To: Mr. Michael Rodney
Michael Roth & Associates

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland