Information To Build On
Engineering • Consulting • Testing

December 16, 2008

Tompkins Architects
612 NW Kay Drive
Lee's Summit, Missouri 64063

Attn: Mr. James E. Tompkins

Re: Geotechnical Engineering Services Report
Proposed Out-Patient Mental Health Building
Overton Brooks VAMC
Shreveport, Louisiana
Project No. VA256-08-RP-0307
PSI Project Number 249-85040

Dear Mr. Tompkins:

Thank you for choosing Professional Service Industries, Inc. (PSI) as your consultant for the referenced project. Per your authorization, PSI has completed a geotechnical engineering study for the referenced project. The results of the study are discussed in the accompanying report, five copies of which are enclosed.

If you have any questions pertaining to this report, please contact our office at (318) 631-5547. PSI would be pleased to continue providing geotechnical services throughout the implementation of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

STATE OF LOUISIANA
ALFRED E. JOHNSON
License No. 27900
PROFESSIONAL ENGINEER
CIVIL ENGINEERING
DEC 2008

Alfred E. Johnson, P.E.
Project Engineer
Geotechnical Engineering Services

Reviewed By:
Shailendra Endley, P.E., PhD.
Principal Consultant

Enclosures

TABLE OF CONTENTS

PROJECT INFORMATION

Project Authorization

The following table summarizes, in chronological order, the Project Authorization History for the services performed and represented in this report by Professional Service Industries, Inc. (PSI).

PROJECT TITLE: OUT-PATIENT MENTAL HEALTH BUILDING		
Document and Reference Number	**Date**	**Requested/Provided By**
Request for Proposal	10/20/08	Tompkins Architects
PSI Proposal Number: 249-85052(Rev. 2)	11/05/08	Matt Redmon and Al Johnson of PSI
Notice to Proceed	11/05/08	James Tompkins – Tompkins Architects, LLC

Project Description

Information furnished to PSI by the client indicates the proposed mental health building will be a steel framed structure with non load bearing walls. The initial phase will include the above grade "basement" and one to three stories with later phases to include additional stories up to a total building height of no more than ten stories. Interior and exterior column spacing will be between twenty to thirty feet on centers. Maximum interior and exterior column loads are expected to be about 1000 and 400 kips respectively.

The following table lists the material and information provided for this project:

DESCRIPTION OF MATERIAL	PROVIDER/SOURCE	DATE
Final Soil Boring Location Plan	Tompkins Architects, LLC	10/22/08
Plan of Site	Tompkins Architects, LLC	10/21/08
Specification for Subsurface Investigation	Tompkins Architects, LLC	10/21/08
Rough Grading Plan	Tompkins Architects, LLC	10/21/08

The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If any of the information noted is incorrect, please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site to prepare recommendations for foundations and an aggregate paving section for the proposed construction. PSI's contracted scope of services included drilling six soil test borings at the site to depths of approximately thirty feet below the ground surface, select laboratory testing, and preparation of this geotechnical report. The boring locations and depths were specified by the client. This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents recommendations regarding the following:

- Site Preparation.
- Foundation types, depths and allowable bearing capacities.
- Seismic site class per 2003 IBC.
- Heavy duty asphalt pavement section and roadway subgrade preparation.
- Comments regarding factors which could impact construction and performance of the proposed construction.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on, below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

PSI's scope also did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. Client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Client should be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or reoccurrence of mold amplification.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The approximately 12,500 square feet site for the proposed building is located in a parking area adjacent to the south side of the Overton Brooks Veterans Administration Medical Center. The new structure and existing medical center will share a common entryway. The site latitude and longitude is approximately N 32.50248° and W 93.72184°, respectively.

The property is bordered by the existing medical center to the north and on the south and west sides by the existing parking lot. Driveways border the eastern side of the site.

Surface runoff appears to generally flow from north to south toward an existing drainage channel.

Based on information furnished by Tompkins Architects the existing parking lot grade of about ninety two feet is near the proposed basement floor grade and little additional cut or fill is expected.

Subsurface Conditions

The site subsurface conditions were explored with six soil test borings drilled within the proposed structure footprint area. All borings were drilled to a depth of approximately thirty feet.

The boring locations and depths were specified by Tompkins Architects. PSI marked the borings in the field.

The borings were advanced utilizing rotary drilling methods. Soil samples were routinely obtained during the drilling process. Select soil samples were later tested in the laboratory to obtain soil material properties for the foundation recommendations. Drilling, sampling, and laboratory testing were accomplished in general accordance with ASTM procedures.

The soils encountered at the site generally consist of medium to very stiff sandy lean clays, sandy silty clays and clayey sand base material in the upper two feet underlain by hard and very stiff lean and fat clays extending to depths of eighteen to twenty three feet. Below these depths most borings contained a stratum of hard lignite or had traces of lignite. The lignite strata were typically about five to eight feet thick. In borings not terminated in the lignite strata, the remaining depth explored was composed of hard silty clay extending to the boring termination depths at thirty feet.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in the Appendix should be reviewed for specific information at individual boring locations. These records include soil/rock descriptions, stratifications, penetration resistances, and locations of the samples and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. Samples not altered by laboratory testing will be retained for sixty (60) days from the date of this report and then will be discarded.

Water Level Measurements

Free groundwater was observed in all borings except B-2 at depths ranging between fifteen and twenty five feet upon completion. Water can be present at different depths during other times of the year depending upon drainage pattern alterations, climatic and rainfall conditions. PSI recommends the contractor determine the current groundwater depth at the time of construction.

GEOTECHNICAL EVALUATION

Geotechnical Discussion

The soils across the site are generally good to very good in bearing quality. The fat and lean clay soils encountered in the borings had liquid limit values indicative of low to moderate potential for shrinking and swelling with changes in moisture contents. The maximum liquid limit found in the upper six feet of soils tested was fifty nine in boring B-4 at four feet below existing grade. The plasticity indices of the clay soils are higher than normally recommended for structural use and the estimated potential vertical movements (PVR) due to shrinking and swelling clays is about two inches in areas. Providing three feet of select fill under the slab will reduce the PVR to about one inch.

Equipment Mobility

Any soils can undergo a loss of stability during wetter portions of the year, however, the in situ soils at this site should be less sensitive and more stable than most.

Depending on weather and soil conditions at the time of construction, methods for accomplishing grading may include the use of wide-track, low-contact-pressure type equipment to perform the necessary site grading. The determination of the proper equipment for use in excavation would be dependent on the condition of the soils at the time of construction and the prevailing weather conditions. Narrow track equipment and rubber tired vehicles may experience difficulty moving about the site and may deteriorate otherwise suitable soils.

GEOTECHNICAL RECOMMENDATIONS

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

Site Preparation

In order to lessen the impact of potential movements caused by shrinking and swelling clay soils under the floor slab, PSI recommends at least three feet of select fill be provided under the floor slab. Undercut soils meeting the subsequent select fill requirements may be reused as select fill. After stripping the existing paving, areas to be paved, areas to receive fill and rough graded soil in cut areas should be proof-rolled with a loaded tandem axle dump truck or similar pneumatic tired vehicle having a minimum gross weight of twenty five tons. Soils observed to rut or deflect excessively under the moving load should be undercut and either recompacted or replaced with properly compacted select fill material. The proof-rolling and undercutting activities should be witnessed by a representative of the geotechnical engineer and should be performed during a period of dry weather. After proof-rolling and repairs, the exposed soils in the structure and pavement areas should be scarified to a depth of at least eight (8) inches below the surface and recompacted to at least 95% of the Standard Proctor (ASTM D-698) maximum dry density.

After subgrade preparation and observation have been completed, fill placement required to establish design grade may begin. Fill materials should be select soil free of organic or other deleterious materials and have a maximum particle size of less than three (3) inches. Select fill should have a liquid limit of thirty five or less with plasticity index (PI) values between eight and eighteen. A representative of PSI should be on-site to observe, test, and document placement of the fill. If the fill is too dry, water should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Close moisture content control will be required to achieve the recommended degree of compaction. It should be noted higher plasticity clays are typically more difficult to compact and achieve the optimum moisture content during the placement of fill. If fill placement must proceed during a wet time of the year, it will likely be infeasible to re-use the on-site soils as fill and the use of imported fill materials will likely be required.

Fill should be placed in maximum loose lifts of eight (8) inches and compacted to at least 95% of the materials' Standard Proctor maximum dry density. The required density will be more readily attained if compaction is done within a range of the optimum moisture content designated in the table below. Compacted fill should extend a minimum of five (5) feet beyond the foundation

perimeter prior to sloping in fill areas.

Each lift of compacted select fill should be tested and documented by a representative of the geotechnical engineer prior to placement of subsequent lifts. The fill should be evaluated in accordance with the following table:

MATERIAL TESTED	PROCTOR TYPE	MIN % DRY DENSITY	PLACEMENT MOISTURE CONTENT RANGE	FREQUENCY OF TESTING
Select Lean Clay Fill (Cohesive)	Standard	95%	-1 to +3 %	1 per 5,000 ft^2 of fill placed / lift
Select Silty Clay Fill (Cohesive)	Standard	95%	0 to +3%	1 per 5,000 ft^2 of fill placed / lift
Select Fat Clay Fill (Cohesive)	Standard	95%	-2 to +2 %	1 per 5,000 ft^2 of fill placed / lift
Random Fill (non load bearing)	Standard	90%	-3 to +3 %	1 per 6,000 ft^2 of fill placed / lift
Trench Backfill	Standard	95%	-1 to +3 %	1 per 150 lineal foot / lift

Tested fill materials not achieving either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner. A re-test of that area should be performed after the Contractor performs remedial measures.

Foundation Recommendations

The planned construction can be supported on a shallow foundation system using spread and continuous footings bearing at least five feet below existing grade on competent naturally deposited soils. Spread footings for building columns and continuous footings for walls can be designed for allowable soil bearing pressures of 4,500 pounds per square foot (psf) and 3,600 psf, respectively, based on dead load plus design live load.

Differential settlement between the new and existing construction should be expected. Construction joints should be provided between the existing building entryway and the addition.

The foundation excavations should be observed and documented by a representative of PSI prior to steel or concrete placement to assess the foundation materials are consistent with the materials discussed in this report, and therefore are capable of supporting the design loads. Soft or loose soil zones encountered at the bottom of the footing excavations, as indicated by blows with a dynamic cone penetrometer (DCP) equivalent to N-values of less than 15 blows per foot should be removed to the level of suitable natural soils and replaced with select fill compacted to ninety five percent of the Modified Proctor (ASTM D-1557) dry density or lean concrete. Fill placed below the foundations where unsuitable materials are removed should extend one (1) foot outside the foundation limits for every one (1) foot in thickness between the intended bearing surface and the underlying, suitable natural soils.

After opening, foundation excavations should be observed and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If foundation excavations are left open for more than one day they should be protected to reduce evaporation or entry of moisture.

Settlement

Long term total settlement due to consolidation under a footing ten by ten feet in dimension is estimated to be about one inch if the allowable loads are not exceeded. Once the final footing sizes and spacing are determined, PSI can provide more accurate settlement estimates. Depending on the final footing dimensions, additional soil information below the depth of thirty feet may be required for a proper settlement analysis.

Deep Foundation Recommendations

If the potential total and differential consolidation settlement across the site is considered excessive, deep foundations using drilled piers may be preferred for use at this site. If deep foundations are to be considered, PSI recommends increasing the exploration depth to at least sixty five feet in three locations in the structure footprint.

Lateral and Uplift Loads

Lateral loads will be resisted by friction between the footing bottoms and the soil and passive soil pressure resistance. For sustained loads, an ultimate coefficient of friction value of 0.50 and passive soil pressure value equal to 300 pounds per square foot (psf) times the footing depth may be used calculate the ultimate lateral resistance. For transient loads, the ultimate friction between the footing bottom and soil can be taken as 800 psf and the ultimate passive soil resistance will be 3000 psf. A minimum safety factor of two should be applied to the ultimate values for design purposes.

Uplift forces will be resisted by the footing weight and the weight of the soil above the footings. The unit weight of reinforced concrete and soil above the water table may be taken as 150 and 120 pounds per cubic foot respectively. Backfill against and above footings should be compacted to ninety five percent of the Standard Proctor density. A minimum safety factor of two should be applied to the uplift values for design purposes.

Seismic Information

The site class according to the 2003 IBC will be a "D". Liquefaction potential in the soil types found at the site is minimal.

Slab on Grade Recommendations

For a slab bearing on select fill subgrade prepared as recommended, a modulus of subgrade reaction, *k* value, of 140 pounds per cubic inch (pci) may be used in the slab design based on

correlation to values typically resulting from a 1 ft. x 1 ft. plate load test.

Asphalt Pavement Recommendations

PSI's scope of services did not include extensive sampling and CBR testing of existing subgrade or potential sources of imported fill for the specific purpose of detailed pavement analysis. Instead, this report is based on design parameters considered to be typical for the clay soil type found at the site which should have a CBR value of about five (5) or greater. The traffic at the site was assumed to consist mainly of passenger vehicles with occasional delivery trucks or passenger vans.

The recommended roadway section thicknesses presented below are considered typical and minimum for the assumed parameters in the general site area. Preparation of the subgrade as previously recommended in the Site Preparation of this report is required.

Heavy Duty Asphalt Pavement

COMPONENT	REQUIRED THICKNESS
Surface Course (LaDOTD table 502-5, 0.5 in. Aggregate)	3.5 inches
Crushed Aggregate (LaDOTD 1003.04 a or c)	8 inches
Geotextile Fabric	Yes
Prepared Subgrade	8 inches

Light Duty Asphalt Pavement

COMPONENT	REQUIRED THICKNESS
Surface Course (LaDOTD table 502-5, 0.5 in. Aggregate)	2.5 inches
Crushed Aggregate (LaDOTD 1003.04 a or c)	6 inches
Geotextile Fabric	Yes
Prepared Subgrade	8 inches

Aggregate should be compacted to ninety five percent of the Standard Proctor (ASTM D-698) density.

Allowance for proper drainage of base materials is most important for performance of asphalt pavement. Inadequate drainage will allow for quick deterioration of the roadway due to water retention and subsequent saturation and weakening of the underlying subgrade materials.

CONSTRUCTION CONSIDERATIONS

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project. PSI cannot accept responsibility for conditions that deviate from those described in this report, nor for the performance of the

foundation system if not engaged to also provide construction observation and testing for this project.

Moisture Sensitive Soils/Weather Related Concerns

The upper fine-grained clay soils encountered at this site can be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

Drainage and Groundwater Considerations

PSI recommends the Contractor determine the actual groundwater levels at the site at the time of construction to assess the impact groundwater may have on construction. Water should not be allowed to collect in the foundation excavations, on slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the slabs.

It is possible seasonal variations will cause fluctuations or a water table to be present in the upper soils. Water should be removed from excavations by pumping. The Geotechnical engineer should be consulted should excessive and uncontrolled amounts of seepage occur.

Excavations

In Federal Register, Volume 54, Number 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better enhance the safety of workers entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. PSI understands these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding section constitutes PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

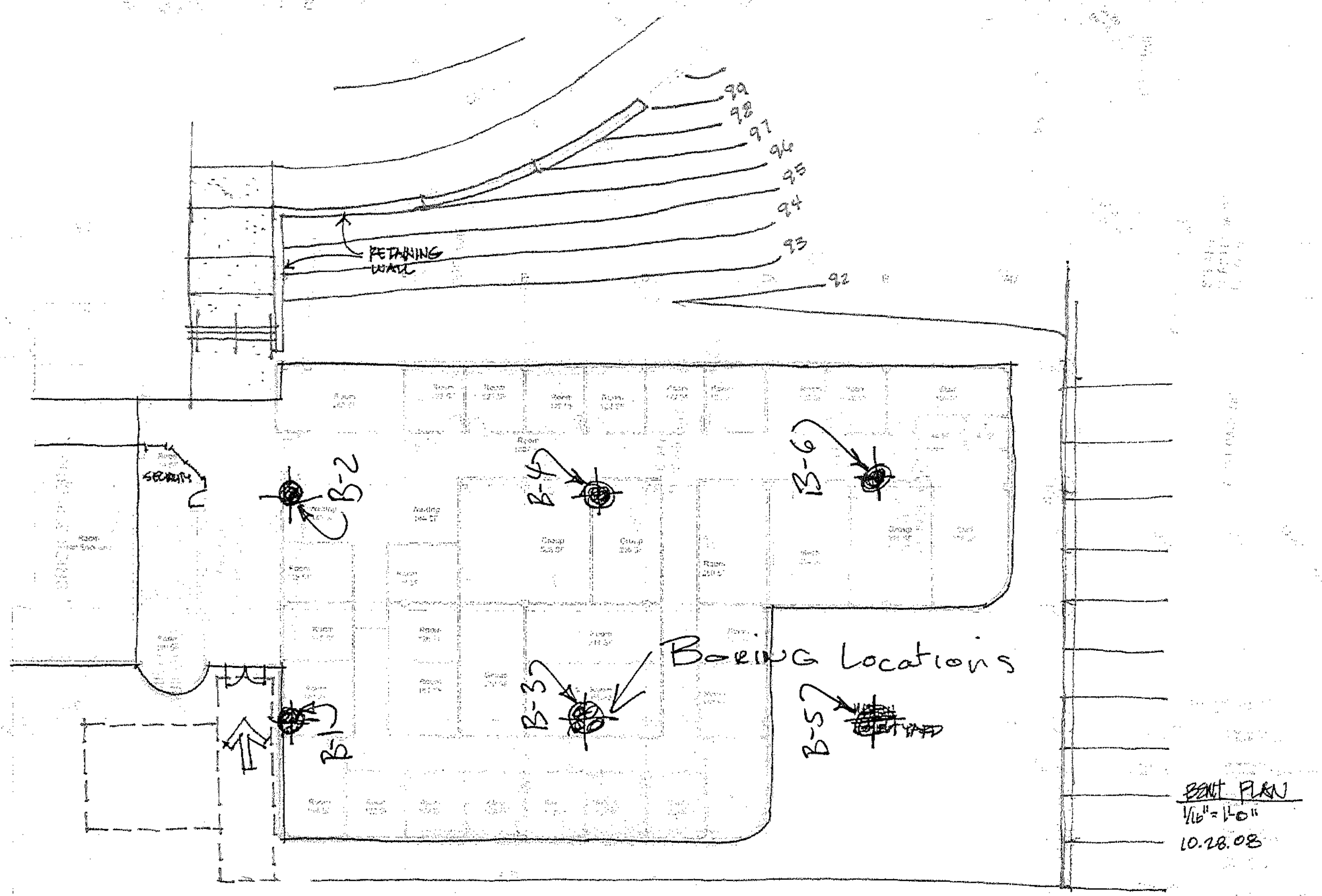
REPORT LIMITATIONS

The recommendations submitted are based on the available subsurface information obtained by PSI and preliminary design details furnished by Tompkins Architects. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Tompkins Architects for the specific application to the proposed Outpatient Mental Health Building located at the Overton Brooks VA Medical Center in Shreveport, Louisiana.

Appendix



Six Boring Locations

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-1

Project Name: Out-patient Mental Health Center

Date of Boring: November 16, 2008

Site: VA Medical Center-Shreveport, La.

Project No: 249-85040

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface											
Medium Brown Sandy Lean Clay (CL)		SS	18	–	–	–	24	–	–	57	–
--Becomes Stiff and Tan at 2'		SS	16	–	–	–	21	49	–	–	–
---Becomes Very Stiff and without Sand at 4'	5	ST	–	2.49	3.25	96.3	26	–	–	–	–
Medium Tan Clayey Sand (SC)		SS	15	–	–	–	22	–	–	41	–
Hard Tan Fat Clay (CH)	10	ST	–	–	4.5+	–	21	–	–	–	–
---Becomes Very Stiff at 13'	15	ST	–	–	3.75	–	31	–	–	–	–
Black Lignite	20	SS	50@5.5	–	–	–	72	–	–	–	–
Gray Silty Clay (CL-ML)	25	SS	63	–	–	–	24	–	–	–	–
	30	SS	77	–	–	–	19	–	–	–	–
Water encountered at 25' Boring terminated at 30'	35		–	–	–	–	–	–	–	–	–
	40		–	–	–	–	–	–	–	–	–
	45		–	–	–	–	–	–	–	–	–
	50		–	–	–	–	–	–	–	–	–

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-2

Project Name: Out-patient Mental Health Center

Date of Boring: November 16, 2008

Site: VA Medical Center-Shreveport, La.

Project No: 249-85040

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface											
Medium Brown Clayey Sand (SC)		SS	12	–	–	–	7	–	–	–	–
Very Stiff Grayish Tan Lean Clay (CL)		ST	–	3.01	3.50	104.7	20	47	–	–	–
---Becomes Hard at 4'	5	ST	–	–	4.5+	–	21	–	–	–	–
---Becomes Very Stiff at 6'		ST	–	3.00	4.5+	102.7	21	–	–	–	–
Medium Tan Silty Sand (SM)		SS	13	–	–	–	19	–	–	47	–
	10										
Very Stiff Tan Fat Clay (CH)		ST	–	2.33	4.50	101.2	21	–	–	–	–
	15										
---Becomes Hard at 18'		ST	–	–	4.5+	–	35	–	–	–	–
	20										
Hard Gray Silty Clay (CL-ML)		SS	60	–	–	–	19	–	–	–	–
	25										
		SS	73	–	–	–	19	–	–	–	–
	30										
No water encountered Boring terminated at 30'											
	35		–	–	–	–	–	–	–	–	–
	40		–	–	–	–	–	–	–	–	–
	45		–	–	–	–	–	–	–	–	–
	50		–	–	–	–	–	–	–	–	–

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-3

Project Name: Out-patient Mental Health Center

Date of Boring: November 16, 2008

Site: VA Medical Center-Shreveport, La.

Project No: 249-85040

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface											
Stiff Brown Sandy Lean Clay (CL)		SS	19	–	–	–	19	–	–	–	–
Hard Tan Fat Clay (CH)		ST	–	5.02	4.5+	108.4	18	50	–	–	–
	5	ST	–	–	4.5+	–	21	–	–	–	–
---Becomes Very Stiff at 6'		ST	–	3.22	3.75	103.4	24	–	–	–	–
	10	ST	–	2.20	2.75	91.7	29	–	–	–	–
---Becomes Hard at 13'	15	ST		–	4.5+	–	22	–	–	–	–
---Becomes Very Stiff at 18'	20	ST	–	–	2.75	–	37	–	–	–	–
Black Lignite	25	SS	49	–	–	–	48	–	–	–	–
	30	SS	67	–	–	–	31	–	–	–	–
Water encountered at 18' Boring terminated at 30'	35		–	–	–	–	–	–	–	–	–
	40		–	–	–	–	–	–	–	–	–
	45		–	–	–	–	–	–	–	–	–
	50		–	–	–	–	–	–	–	–	–

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-4

Project Name: Out-patient Mental Health Center

Date of Boring: November 16, 2008

Site: VA Medical Center-Shreveport, La.

Project No: 249-85040

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface											
Medium Brown Clayey Sand (SC)		SS	15	–	–	–	12	–	–	–	–
Stiff Gray Sandy Lean Clay (CL)		ST	–	1.94	4.25	102.4	21	41	–	–	–
Very Stiff Gray Fat Clay (CH)	5	ST	–	3.98	4.5+	105.6	20	59	–	–	–
		ST	–	–	2.75	–	25	–	–	–	–
---Becomes Stiff at 8'	10	ST	–	1.91	2.75	99.7	25	–	–	–	–
	15	ST	–	1.52	2.75	96.2	26	–	–	–	–
Black Lignite	20	ST	–	–	1.75	–	147	–	–	–	–
Hard Gray Silty Clay (CL-ML)	25	SS	47	–	–	–	25	–	–	–	–
	30	SS	75	–	–	–	22	–	–	–	–
Water encountered at 18'											
Boring terminated at 30'	35		–	–	–	–	–	–	–	–	–
	40		–	–	–	–	–	–	–	–	–
	45		–	–	–	–	–	–	–	–	–
	50		–	–	–	–	–	–	–	–	–

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-5

Project Name: Out-patient Mental Health Center

Date of Boring: November 16, 2008

Site: VA Medical Center-Shreveport, La.

Project No: 249-85040

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface											
Stiff Dark Brown Sandy Silty Clay (CL-ML)		SS	11	–	–	–	19	–	–	–	–
Very Stiff Brown Sandy Lean Clay (CL)		ST	–	3.64	4.5+	106.4	20	45	–	–	–
---Becomes Hard at 4'	5	ST	–	–	4.5+	–	21	48	–	–	–
---Becomes Stiff and Sandy at 6'		ST	–	1.45	4.00	103.7	21	36	–	–	–
Very Stiff Tan Gray Fat Clay (CH)	10	ST	–	2.15	2.50	96.9	25	–	–	–	–
Stiff Tan Gray Lean Clay (CL)	15	SS	14	–	–	–	17	–	–	–	–
Stiff Gray Lean Clay with Lignite (CL)	20	ST	–	1.76	3.00	70.8	33	–	–	–	–
Black Lignite	25	SS	69	–	–	–	32	–	–	–	–
	30	SS	50@5.5	–	–	–	31	–	–	–	–
Water encountered at 15' Boring terminated at 30'	35		–	–	–	–	–	–	–	–	–
	40		–	–	–	–	–	–	–	–	–
	45		–	–	–	–	–	–	–	–	–
	50		–	–	–	–	–	–	–	–	–

Professional Service Industries, Inc.

Record of Subsurface Exploration

Boring: B-6

Project Name: Out-patient Mental Health Center

Date of Boring: November 16, 2008

Site: VA Medical Center-Shreveport, La.

Project No: 249-85040

Description	Depth feet	Sample type	N	Qu tsf	Qp tsf	δd pcf	Mc %	LL	PI	-200	Remarks
Surface											
Medium Brown Lean Clay CL)		SS	19	–	–	–	11	–	–	–	–
Hard Tan Lean Clay (CL)		ST	–	4.34	3.50	107.4	17	46	–	–	–
	5	ST	–	–	4.5+	–	22	–	–	–	–
---Becomes Stiff at 6'		ST	–	1.90	3.75	96.2	28	–	–	–	–
---Becomes Hard at 8'		ST	–	–	4.5+	–	23	–	–	–	–
	10										
---Becomes Stiff at 13'		ST	–	1.73	3.25	92.4	25	–	–	–	–
	15										
---Becomes Hard at 18'		ST	–	–	4.00	–	29	–	–	–	–
	20										
---Becomes Black with Lignite at 23'		SS	46	–	–	–	30	–	–	–	–
	25										
		SS	50@5	–	–	–	27	–	–	–	–
	30										
Water encountered at 20'											
Boring terminated at 30'											
			–	–	–	–	–	–	–	–	–
	35										
			–	–	–	–	–	–	–	–	–
	40										
			–	–	–	–	–	–	–	–	–
	45										
			–	–	–	–	–	–	–	–	–
	50										

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N:	Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split-spoon.
Qu:	Unconfined compressive strength, tsf.
Qp:	Penetrometer value, index value of unconfined compressive strength, tsf.
Mc:	Water content, %.
PL:	Plastic limit, %.
LL:	Liquid Limit, %.
PI:	Plasticity Index.
γd:	Natural dry density, pcf.
▼	Groundwater level observed at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

SS:	Split-Spoon – 1 3/8" I.D., 2" O.D., except where noted.
ST:	Shelby Tube – 3" O.D., except where noted.
AU:	Auger Sample.
DB:	Diamond Bit.
CB:	Carbide Bit.
WS:	Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION (Terzaghi & Peck, 1948)

TERM (COHESIONLESS SOILS)	STANDARD PENETRATION RESISTANCE
Very Loose	0 – 4
Loose	4 – 10
Medium	10 – 30
Dense	30 – 50
Very Dense	Over 50

TERM (COHESIVE SOILS)	Qu – (TSF)
Very Soft	0 – 0.25
Soft	0.25 – 0.50
Medium	0.50 – 1.00
Stiff	1.00 – 2.00
Very Stiff	2.00 – 4.00
Hard	4.00+

PARTICLE SIZE (ASTM D2487 AND D422)

Boulders	≥ 12 in. (300mm)	Medium Sand	<2mm (10 sieve) to 425μm (#40 sieve)
Cobbles	< 12 in.(300mm) to 3 in. (75mm)	Fine Sand	<425μm (#40 sieve) to 75μm (#200 sieve)
Gravel	< 3 in. (75mm) to 4.75mm (#4 sieve)	Silt	<75μm (#200 sieve) to 5μm
Coarse Sand	<4.75mm (#4 sieve) to 2mm (#10 sieve)	Clay	<5μm