SOIL DATA:

Mendez Office Building

in
Southlake, TX

GEOTECHNICAL INVESTIGATION
PROPOSED MEDICAL BUILDING
900 E. SOUTHLAKE BOULEVARD
SOUTHLAKE, TEXAS

PARKLAND ENGINEERING & TESTING, INC.

GEOTECHNICAL INVESTIGATION
PROPOSED MEDICAL BUILDING
900 E. SOUTHLAKE BOULEVARD
SOUTHLAKE, TEXAS

CONDUCTED FOR:

EAST SOUTHLAKE #1, LTD.

GRAPEVINE, TEXAS

BY

PARKLAND ENGINEERING & TESTING, INC.

IRVING, TEXAS

APRIL 19, 2004

JOB NO.: 04-119

PARKLAND ENGINEERING & TESTING, INC.
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April 19, 2004
Job No.: 04-119

East Southlake #1, Ltd.
1600 W. College Street, Suite 304
Grapevine, Texas 76051

ATTN: **Dr. Angelo Mendez, M.D.**

Geotechnical Investigation
Proposed Medical Building
900 E. Southlake Boulevard
(**0.9437 acres**: Tract **3D2**, W.W. Hall Survey Abstract No. 695)
Southlake, Texas

Gentlemen:

Please find enclosed our report of the geotechnical investigation for the proposed **Medical Building** at the above location.

Included in this report are the results of field and laboratory investigation, engineering analyses, and recommendations for the foundation design and other soil related aspects of the above referenced project.

We trust that this will provide the information you have requested. If you have any questions, please feel free to call us. An **invoice** for our service is enclosed.

Respectively submitted,
PARKLAND ENGINEERING & TESTING, INC.

Peter Yu, M.S., P.E.
Geotechnical Engineer

PY/ta
Copies submitted: 1 - Client
2 - Blake Architects/ Mr. Skip Blake, AIA

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APPENDIX

PART I – INTRODUCTION

The site (**0.9437 acres**) for the proposed **Medical Building** is located at **900** East Southlake Boulevard (F.M.Road 1709), and is legally described as Tract **3D2**, W.W. Hall Survey Abstract No. 695 in **Southlake**, Texas. According to the available information, the proposed project will consist of a single story **stucco** building and the associated paved parking area and drives. The site location is shown on **Plate 1.**

These studies were performed for the purpose of providing geotechnical engineering data for the design and construction of this project. The following specific information was desired:

1. General subsurface conditions;
2. Foundation Types and Depths
3. Allowable foundation loading;
4. Subgrade preparation for support of slab-on-grades; and
5. Pavement recommendations.

PART II: FIELD INVESTIGATION

The subsurface soil conditions at this site were defined by three (3) borings using a truck mounted rotary drill rig with continuous flight solid stem auger used to advance the borings. The locations of the borings were **staked** by our firm based on the available information. The boring locations are as shown approximately on Plate 2 in the illustrations of this report.

Undistributed samples of the subsurface cohesive soils were obtained using seamless three (3)-inch Shelby Tube samplers. The consistency of these samples was measured using a hand penetrometer. The resistance to penetration of a 0.25 inch diameter piston penetrating the soil sample 0.25 inches is recorded on the logs of borings.

The maximum capacity of this device is 4.5 tons per square foot. The keys on Terms and Classifications are shown on Plate 6.

PART III – LABORATORY INVESTIGATION

The visual classification of the cohesive soils encountered was verified by Atterberg's Limit Tests. Several moisture content determinations were made to determine the relationship between those values and the Atterberg's Limits. The results of these tests are also shown on the logs of borings, Plates 3 through 5. Compressive strength of the cohesive foundation materials was obtained by unconfined compressive strength tests. In this test, a cylindrical specimen is subjected to axial loading until failure. The results of these tests are shown on the logs of borings.

PART IV- SITE TOPOGRAPHY AND SURFACE FEATURES

The site was relatively of uniform grade, and it was vegetated with grass, weeds and some **cactus** plants. Topographically, the property sloped very gently from the north one-fifth area (approximately at **Elevation 644.00 feet**) toward the south and north (approximately at **Elevations 639.5 /640.5 feet**). See the Topographic Map, **Plate 2A** for details. At the time of our field investigation, the site had an existing single story **brick house** along with a couple detached **metal sheds**, a **kennel**-slab with the steel-wire cage and some leftover household refuse. An **overhead powerline** connected the existing brick house from the east main-line. There existed a **gravelly un-paved** driveway (measured as approximately **7'-6"** wide) north of the southeast approach area. The site was **wooded** with a few widely-scattered trees / shrubs, some of which were very close to the proposed building area. The drainage was from fair to **good.**

Although it was exposed, the underground **septic tank** and associates field lines could exist within the property.

PART V- SITE GEOLOGY

The primary geological formation underlying the proposed site is the Woodbine Formation of the upper Cretaceous Period. In general, this formation consists of sandstone, sand, sandy clay and clay. The upper portions weather to form sand and medium to highly plastic clay. Locally, some of the site soils could be the alluvial materials associated with the nearby **Creek**..

PART VI- GENERALIZED SUBSURFACE CONDITIONS

The subsurface materials encountered in the test borings can be divided into three (3) major material types:

1. SURFICIAL DARK BROWN SILTY CLAYEY SAND /SANDY CLAY - extending from the surface to approximately depths of **2.5 feet,** one **(1) foot** and **3.0 feet** in Borings B-1 through B-3 respectively were the surficial strata of the dark brown silty clayey sand / sandy clay. These materials were moist, very soft to medium stiff (measured Unconfined Compressive Strength of 0.5 tons per square foot), and were low to medium plastic The upper **two (2)** feet of these soils in **B-3** were the existing **fill / fill**-like materials consisting of **debris** of gravel and plastic-sheet remnants. These fillls could locally be

deep (over the **septic-tank** and field-line area) and they could vary in quality and the state of compaction

2. GREYISH BROWN SANDY CLAY- Next encountered and extending to approximately **14.0** and **10.0 feet** deep in B-1 and B-2 respectively, and to the full penetration depth of B-3, was the stratum of the greyish brown sandy clay. This soil was moist, medium stiff to hard (measured Unconfined Compressive Strengths ranged from 0.6 to 7.8 tons per square foot), was medium plastic (measured Plasticity Index of **21**), and consisted of underlying **clayey sand** layers. **Seepage water** was encountered at approximately **18.0 feet deep** in B-1 only during drilling.

3. GREY AND BROWN SHALEY CLAY / SANDY SHALEY CLAY– Below the materials described above and extending to the full penetration depths of both B-1 and B-2 were the undivided-strata of the grey and brown shaley clay **sandy shaley** clay. These materials were moist, stiff (measured Unconfined Compressive Strength varied from 2.2 to 4.7 tons per square foot), highly plastic (measured Plasticity Index of **29**), were variably stratified, and consisted of underlying grey shaley clay and somelocalized **cementitious** sand seams.

The detailed description of all subsurface materials encountered is shown on the attached logs of borings. Unified Soil Classification System was used for soil identification. **Groundwater level** measurements taken immediately after drilling indicated a free water surface at approximately **16'-10"** deep in B-1 only. See logs of boring for further information.

PART VII- ANALYSIS OF RESULTS AND RECOMMENDATIONS

GENERAL

The site was relatively **of uniform grade** and had very gentle slope. Depending on the final grading plan, some fills may be required to bring the site to grade. The drainage design and construction methods will be reviewed by a competent Civil Engineer. **No** surface water will be allowed to **infiltrate** into the proposed building subgrade or be **discharged** into the neighboring lots.

Based on the test results of this study, we would recommend that the major structural loads be supported by the underlying stable greyish brown sandy clay / shaley clay strata using a system of drilled, **underreamed piers.** For the purpose of this study, depths to the foundation materials are based on the existing grades (without considering the addition of the imported make-up fills). All **joints** between the paved side-walks/ parking areas shall be **sealed off** properly with a sealing-compound such as the **hot-poured rubber**.

UNDERREAMED PIERS

Based on the test results of this study, major structural loads can be transferred to the underlying grayish brown sandy clay /shaley clay strata by a system of drilled, underreamed piers. An allowable soil end bearing pressure of **3,000 pounds per square foot** can be used for piers positioned at approximately **15.0 feet deep, into** the stable soils and **above** the groundwater (without considering the addition of any make-up select fills required to bring the site to grade). The ratio of the underreamed diameter to shaft diameter should generally be in the range of two **(2)** to one **(1)**, to three **(3)** to one **(1)**. The soil bearing stratum and the pier depth shall be subjected to site-**verification** by a qualified personnel during the pier construction. Side skin of the piers shall be **neglected**.

We would recommend that a few **pilot-pier holes** be cautiously drilled for **monitoring** purposes. The soil bearing stratum and the pier depth shall be subjected to site-**verification** by a qualified personnel during the pier construction.

All pier shafts should contain at least 0.5 percent steel reinforcement by cross sectional area over their full length. Groundwater measurements taken after drilling indicated entrapped water and the static groundwater table existed at depths of **16'-10"** deep in B-1 only. A temporary casing may **not** be required unless the conditions change (such as after a heavy rainfall or due to the delay of concrete placement). Shallow groundwater, if encountered, could be just the " **perch-water** " and it can normally be emptied by using a **submersible pump**. Should the pier hole be **accidentally** over-penetrated, and that groundwater constitutes a problems, this particular pier hole can be partially **filled** with controlled-amount of the fresh concrete-mix, up to the level just slightly **above** the groundwater, let **cure** somewhat, prior to the underreaming. All pier holes should be cleaned of all cuttings, **dry**, and concrete should be placed within four **(4)** hours after drilling.

GRADE BEAMS

As a common practice, grade beams are generally separated from the clayey subgrade by a **void-box**. Depending on the final cut and fill and the make-up materials to be used during the site grading operation, grade beams can be **supported directly** by the **natural** undisturbed silty clayey sand / sandy clay **or** by the imported inactive select fill (**PVR** values to be controlled to less than one-inch range if the appropriate floor-slab subgrade preparation procedures are complied according to one of the following paragraph entitled " Floor-Slabs Subgrade Preparation ").

FLOOR SLABS AND SUBGRADE PREPARATION

The site soils contained clayey materials that are active and they will be subjected to some volumetric change with change in moisture contents. Estimate of Potential Vertical Rise (**PVR**) using published methods and based on the existing / assumed conditions are estimated as following:

BORING USED	PVR (IN.)	ASSUMED CONDITIONS
B-1	1.0	Existing;
B-2	1.0	Existing;

In the above calculations, it was assumed that the subgrade soils were subjected to an additional overburden equivalent to that produced by a four (4) inch thick concrete slab over six (6) inches of cushion sand. It should be mentioned that actual Potential Heave will depend on the construction season and method, which could alter the soil moisture conditions.

Based on the results of these studies, it is believed that change of environmental conditions due to construction, or other unforeseen phenomenon could change the soil moisture conditions, and lightly reinforced floors could experience significant post-construction movements if they are constructed directly on the active clayey materials or on the un-controlled fills. Thus, precautions should be taken to prevent excessive heave. It is our opinion that a **pier** and conventional reinforcing slab-on-grade system could perform satisfactorily provided some post-construction movements can be **tolerated**, and provided the following steps are taken:

1. Remove and waste any vegetation, tree roots, **septic tanks** and field- lines (if any) and the deleterious materials (debris, organic or over-sized); Considerations shall be given to **strip** a portion of the upper site soils (fills) to

reduce the movements. An **average** stripping depth of **eight (8) inches** (and to **expose** any old fills which may locally exist, to **reach** a stable subgrade) is deemed as appropriate; **Proof-roll** the subgrade to **reveal** any loose or un-consolidated area; protect the site soils from the potential **erosions** and settlements; .

2. Scarify the exposed subgrade to minimum depth of six (6) inches, adjust the moisture, and re-compact to at least 95 percent of the maximum density as obtained by Standard Compaction Procedure (ASTM D-698). The moisture content of this material should range between optimum and four (4) percent wet of optimum.

3. **Use inactive select fill materials for final grading.** This select fill shall **extend** minimum four (4) feet beyond the proposed building lines where practical. Protect the fill from intrusion of surface water after construction. Selection and compaction criteria are outlined below.

4. Place four (4) to six (6) inches of select sand cushion and a thin polyethylene moisture barrier below the proposed slab; and

5. Implement the precautionary steps in the following section of our report entitled "Secondary Design Considerations ".

All fill materials should be inactive select material with Liquid Limit less than 30 percent and Plasticity Index between four (4) and 12. All such soils should be placed in no more than 10 inch per lift and be compacted to not less than 95 percent of the maximum dry density as obtained in the Standard Compaction Procedure (ASTM D-698), and moisture content in the range of one (1) percent below to four (4) percent above the optimum value.

PAVEMENT

The site soils consisted of clayey materials. These active clayey soils can undergo some volumetric changes when subjected to moisture variations. If the moisture contents of these upper soils reduce, they will shrink and cracks may develop. On the other hand, if their moisture contents increase, they will swell and lose strength. Shrinkage or swelling could be detrimental to the proper function of the Pavement. It is anticipated that the wheel loading in the general parking areas and drives will consist mainly of light automobile for the general parking and pick-up traffic, with some medium size to **heavy** delivery **trucks**. Based on the above assumptions, a Portland Cement Concrete pavement can be used. Alternate pavement designs, including the required components and thicknesses are tabulated on Plate 7.

Subgrade Preparation

All inferior materials (organic and **debris**) shall be removed. The exposed subgrade in the paved areas should be undercut to a depth to or greater than the total wearing surface.

If **lime** stabilization (such as in the case of the **rainy season** when the subgrade is relatively wet) is used following the undercutting, the exposed subgrade should be stabilized by the addition of hydrate lime. Approximate eight (8) percent hydrated lime may be considered for budget purposes. The application, mixing, final mixing, compaction and curing of the stabilized subgrade should be in accordance with the current Texas Highway Department Specifications, Item 260. Compaction may be accomplished in a single lift provided the resultant dry density is at least equal to 97 percent of the maximum dry density as obtained by the Standard Compaction Test (ASTM-D698). The moisture content of the lime treated soils should be approximately four (4) percent above the optimum moisture content at the time of mixing. At the time of compaction, the moisture content should be near the optimum and should not be greater than two (2) percent above optimum value. All lime stabilized soils should receive a prime coat prior to placing the next pavement component.

If lime stabilization is **not** used, the exposed subgrade should be scarified to a minimum depth of six (6) inches, the moisture adjusted, and re-compacted to not less than 95 percent of the maximum dry density as obtained in the Standard Compaction Procedure (ASTM-D698). The moisture content of this material should range between the optimum and four (4) percent wet of the optimum.

Portland Cement Concrete

Portland Cement Concrete paving should have uniform thickness, and should meet the requirements of the current Texas Highway Department Specifications, Item 364. sawed joints at a spacing of 15 feet or less on center each way should be provided in both the longitudinal and the transverse directions in concrete paved drives and parking areas. Joints are installed not only to reduce the stresses caused by volume changes in concrete due to temperature change but also to prevent the formation of irregular cracks.

PART VIII – SECONDARY DESIGN CONSIDERATIONS

The following information has been assimilated after examination of numerous problems dealing with active soil throughout the area. It is presented for your convenience. If these features are incorporated in the overall design of the project, the performance of the structure will be improved.

1. Roof drainage should be collected and transmitted to a storm drainage system or to a paved surface where the water can drain away without entering the soil.

2. Sidewalk should not be structurally connected to the building. They should be sloped away from the building so that water will be drained away from the structure.

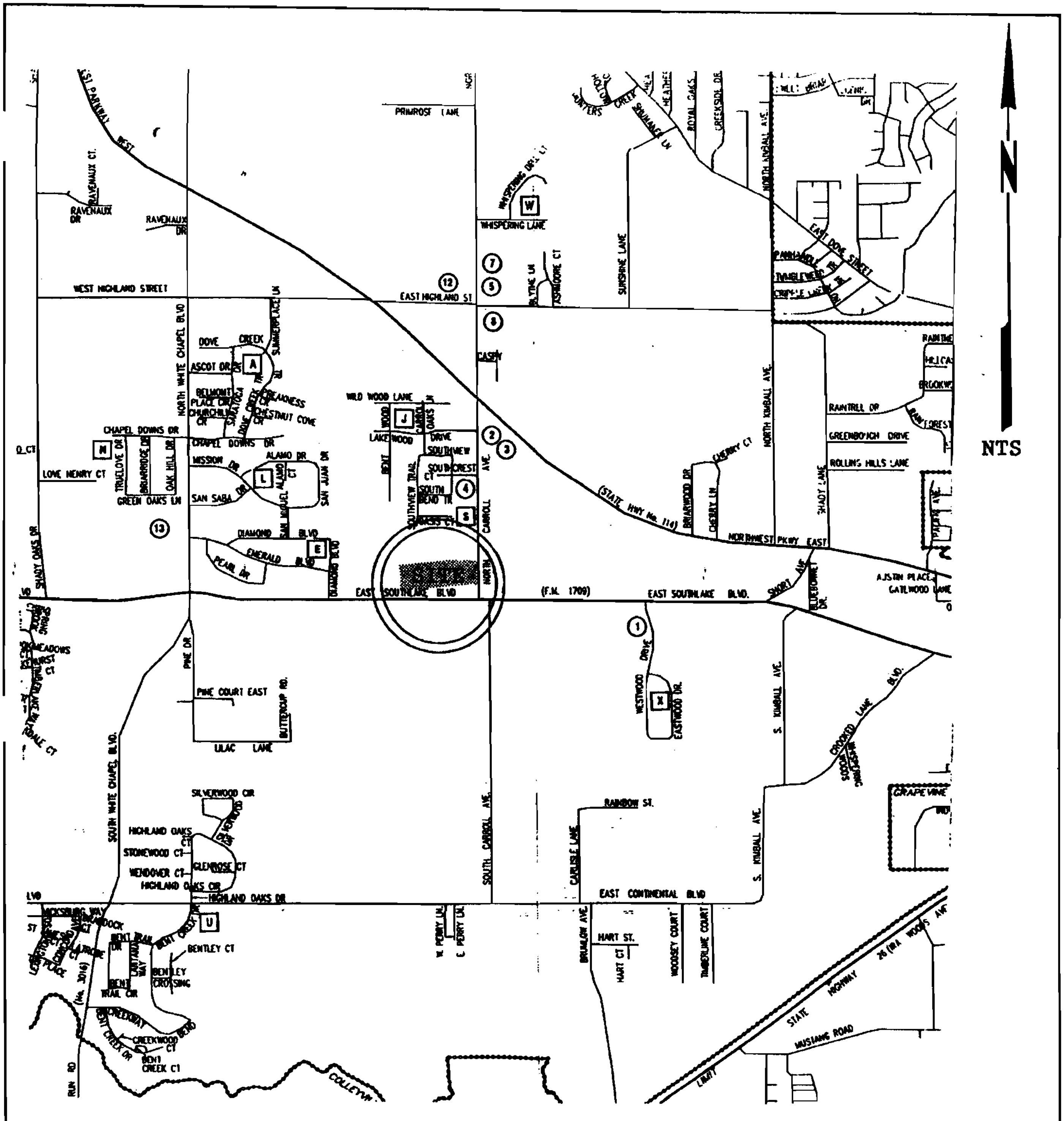
3. Paved areas and the general ground surface should be sloped away from the building on all sides so that water will always drain away from the structure. Water should not be allowed to pond near the building after the slab has been placed.

4. Backfill for utility lines should be carefully placed so that they will be stable. If backfill is placed to dense or too dry, it will swell and a mound will form along the ditch line. If backfill is placed too loose or too wet, it will settle and a sink will form along the ditch line. Either case is undesirable, since several inches of movement is possible and distress cracks are likely to results. The soils should be compacted to a density of approximately 90 percent of the maximum density as obtained in the Standard Compaction Tests (ASTM D-698). Where the utility lines pass through the parking lots, the top layers should be treated similar to the remainder of the lot.

PART IX – LIMITATIONS

The above findings and recommendation were derived from a very limited soil testing program. This study is intended for the **exclusive use** by our client for the proposed structures specified at this time and is not transferable for other applications without our authorization. No responsibility for construction compliance with the design concepts, specifications, recommendations or due to change of foundation schemes is assumed unless an on-site review by our firm is performed during the construction phase which pertains to the specific areas covered by the recommendations that have been presented in this study. This geotechnical report is valid as of the present date. Our firm is **not** responsible for any changes in the conditions of the property as it can occur with the passage of time due to natural processes or due to the works of man, on this property **or** resulting from the neighboring sites. Therefore, the geotechnical report for this project is subject to review and should **not** be relied upon after one (1) year without such a review. We understand that it is the responsibility of our client, the owner, or the proper representative thereof, to ensure that the information and recommendations be called to the attention of all parties interested in this project and that necessary steps taken to ensure the contractors and subcontractors carry out such recommendations in the field. As a disclaimer, should other soil conditions be encountered during construction, this office should be notified and additional testing is required.

APPENDIX

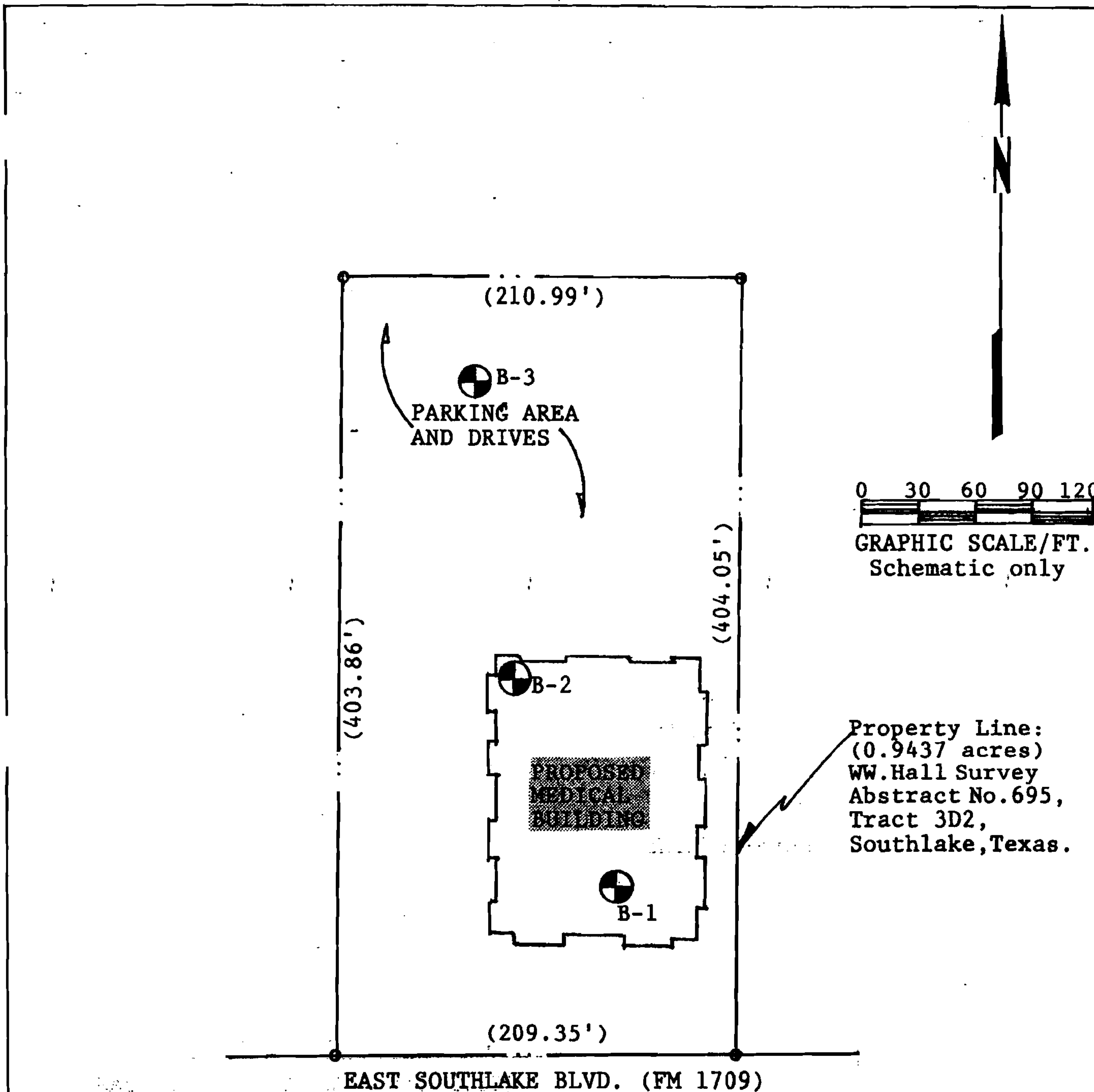


VICINITY MAP

PROJECT: PROPOSED MEDICAL BUILDING- 900 E. SOUTHLAKE BOULEVARD	JOB NO.: 04-119	DATE: 4-16-04
CLIENT: EAST SOUTHLAKE #1, LTD.	LOCATION: SOUTHLAKE, TEXAS	

PLATE 1

PARKLAND ENGINEERING & TESTING, INC.

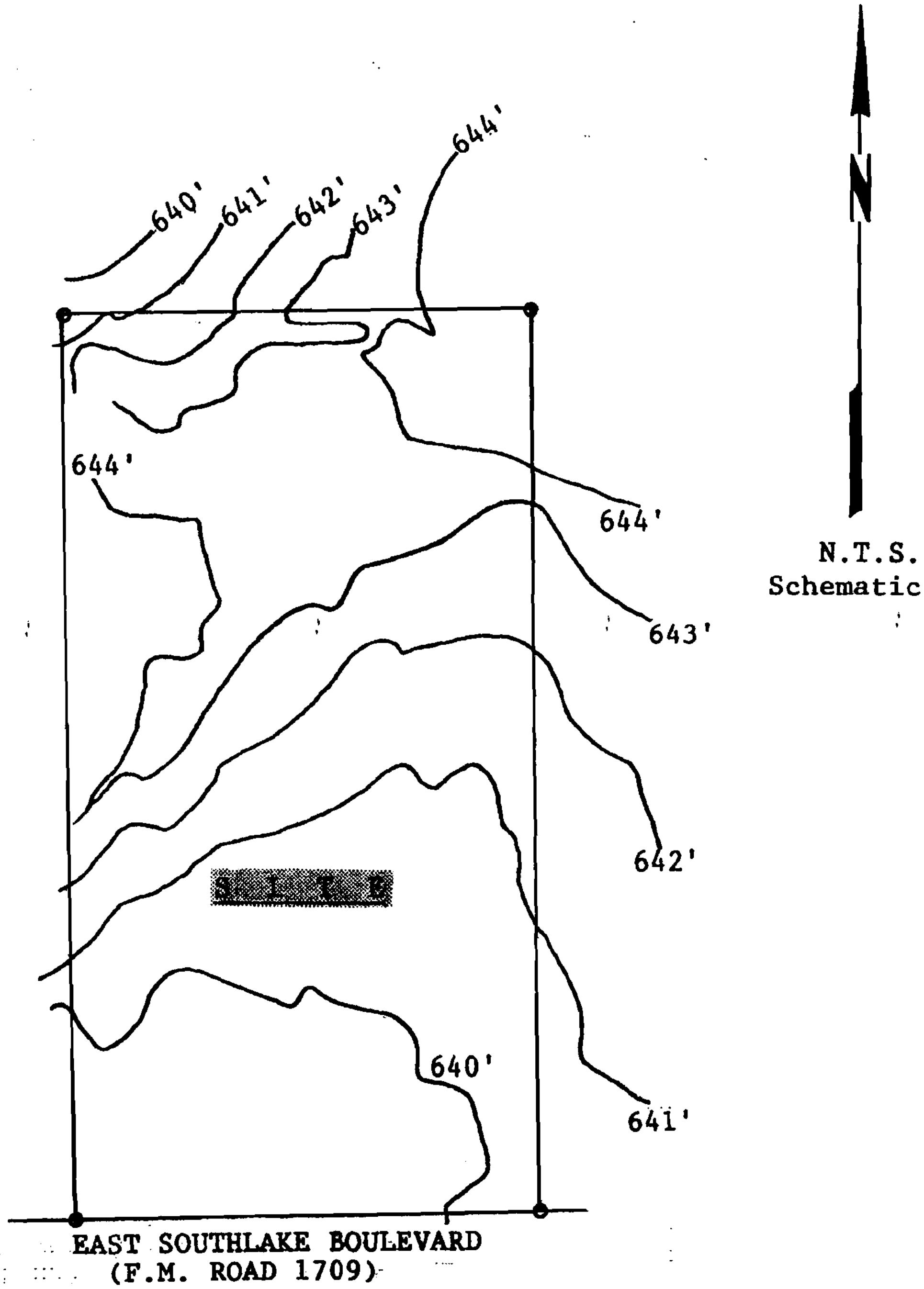


LOCATION PLAN

PROJECT: PROPOSED MEDICAL BUILDING- 900 E.SOUTHLAKE BLVD.	**JOB NO.:** 04-119	**DATE:** 4-16-04
CLIENT: EAST SOUTHLAKE #1, LTD.	**LOCATION:** SOUTHLAKE, TEXAS	

PLATE 2

PARKLAND ENGINEERING & TESTING, INC.



TOPOGRAPHIC SURVEY MAP (subject to change)

Log of Boring No. B-1

PROPOSED MEDICAL BUILDING
900 EAST SOUTHLAKE BOULEVARD
SOUTHLAKE, TEXAS

TYPE BORING: Undisturbed

LOCATION: See Plan of Borings, Plate 2

DEPTH, FT.	SYMBOLS	SAMPLE TYPE	STRATA DESCRIPTION	BLOWS/FOOT OR % CORE RECOV.	% PASSING NO. 200 SIEVE	LIQUID LIMIT %	PLASTICITY INDEX	MOISTURE CONTENT, %	POCKET PEN. TSF	COMPRESSIVE STRENGTH-TSF X-CONFINED +-UNCONFINED	UNIT DRY WT. LBS./CU. FT.
		S	Dark Brown Silty Clayey Sand-moist & soft; SC-CL					15.6	0.5	+0.5	93
		S	Greyish Brown Sandy Clay-moist & stiff;					16.4	0.5	+0.6	117
						41	21	18.7	4.0	+2.8	109
5		S	w/iron oxide stains;								
		S	hard & desiccated below 8';					14.4	4.5+	+6.2	117
		S						12.4	4.5+	+7.8	125
10			CL								
			Light Grey & Brown Sandy Clay-moist & hard; w/clayey sand layers;								
15		S	CL					15.0	4.5+	+2.3	120
			Grey & Brown Sandy Shaley Clay-moist & stiff; variably stratified; slickensided; *trace of seepage @ 18'								
		S	w/cementitious sand seams; CH					15.4	4.5+		107
20											

*NOTES:
Trace of seepage was noticed @ approximately 18.0'deep during drilling.
Groundwater was measured @ 16'-10" deep at 1.5 hours after drilling.

25

30

35

COMPLETION DEPTH: 20.0'
DATE: 4-14-04

* DEPTH TO WATER: 16'-10"(caved 19'-2")
DATE: 4-14-04

(04-119)

PARKLAND ENGINEERING & TESTING, INC.

Log of Boring No. B-2

PROPOSED MEDICAL BUILDING
900 E.SOUTHLAKE BOULEVARD
SOUTHLAKE, TEXAS

TYPE BORING: Undisturbed

LOCATION: See Plan of Borings, Plate 2

DEPTH, FT.	SYMBOLS	SAMPLE TYPE	STRATA DESCRIPTION	BLOWS/FOOT OR % CORE RECOV.	% PASSING NO. 200 SIEVE	LIQUID LIMIT %	PLASTICITY INDEX	MOISTURE CONTENT, %	POCKET PEN. TSF	COMPRESSIVE STRENGTH-TSF X-CONFINED I-UNCONFINED	UNIT DRY WT. LBS./CU. FT.
		S	Dark Brown Silty Clayey Sand-moist & soft; to medium stiff; SC-CL					17.6	3.0		96
		S	Greyish Brown Sandy Clay-moist & medium stiff to stiff;					19.0	4.5+	+2.5	108
5		S	w/iron oxide stains; w/clayey sand @ 6.0'; CL					15.4	4.5+	+1.4	114
		S	Brown Clayey Sand-moist & medium dense;					12.0	2.5	+1.7	113
		S	SC-CL					12.3	4.0	+1.5	112
10			Grey & Brown Shaley Clay-moist & stiff; variably stratified; slickensided; w/sandy shaley clay @ 12.0';								
15		S	w/trace of sand seams;			50	29	17.5	4.5+	+4.7	117
20		S	w/grey shaley clay @ 19.5'; CH					20.1	4.5+	+2.2	112
25											
30											
35											

COMPLETION DEPTH: 20.0'
DATE: 4-14-04

DEPTH TO WATER: Dry (caved to 19'-9")
DATE: 4-14-04

(04-119)

PLATE 4

PARKLAND ENGINEERING & TESTING, INC.

Log of Boring No. B-3

PROPOSED MEDICAL BUILDING
900 E.SOUTHLAKE BOULEVARD
SOUTHLAKE,TEXAS

TYPE BORING: Undisturbed LOCATION: See Plan of Borings, Plate 2

DEPTH, FT.	SYMBOLS	SAMPLE TYPE	STRATA DESCRIPTION	BLOWS/FOOT OR % CORE RECOV.	% PASSING NO. 200 SIEVE	LIQUID LIMIT %	PLASTICITY INDEX	MOISTURE CONTENT, %	POCKET PEN. TSF	COMPRESSIVE STRENGTH-TSF X-CONFINED ·-UNCONFINED	UNIT DRY WT. LBS./CU. FT.
		S	Dark Brown Sandy Clay-moist & stiff;(FILL-like to 2' w/gravel debris & plastic sheet remnant); CL					11.2	4.5+		112
		S						15.9	2.0		106
5		S	Greyish Brown Sandy Clay-moist & medium stiff;w/clayey sand; SC-CL					15.8	1.5		115
10											
15											
20											
25											
30											
35											

COMPLETION DEPTH: 5.0' DEPTH TO WATER: Dry(caved 4'-11")
DATE: 4-14-04 DATE: 4-14-04

(04-119) PARKLAND ENGINEERING & TESTING, INC. PLATE 5

Symbols and Terms Used on Boring Logs

Soil or Rock Types and Symbols

Symbol	Type	Symbol	Type	Symbol	Type
	GRAVEL		ORGANIC		SANDSTONE
	SAND		SANDY		LIMESTONE
	SILT		SILTY		SHALE
	CLAY		CLAYEY		CONGLOMERATE

Sample Types

S	C	P	B	N
Shelby Tube	Rock Core	Split Spoon	Auger	No Recovery

Consistency of Cohesive Soils

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (TON/SQ. FOOT)
Very Soft	Less than 0.25
Soft	0.25 – 0.50
Firm	0.50 – 1.00
Stiff	1.00 – 2.00
Very Stiff	2.00 – 4.00
Hard	More than 4.00

Relative Density of Cohesionless Soils

STD. PENETRATION RESISTANCE BLOWS/FOOT	DESCRIPTIVE TERM	RELATIVE DENSITY
0 – 10	Loose	0 TO 40%
10 – 30	Medium Dense	40 TO 70%
30 – 50	Dense	70 TO 90%
OVER 50	Very Dense	90 TO 100%

Soil Structure

CALCAREOUS	Containing deposits of calcium carbonate: generally nodular.
SLICKENSIDED	Having inclined planes of weakness that are slick and glossy in appearance.
LAMINATED	Composed of thin layers of varying color and texture.
FISSURED	Containing shrinkage cracks frequently filled with fine sand or silt. Usually more or less vertical.
INTERBEDDED	Composed of alternate layers of different soil types.

Physical Properties of Rock	Hardness and Degree of Cementation
VERY SOFT OR PLASTIC	Can be remolded in hand: corresponds in consistency up to very stiff in soils.
SOFT	Can be scratched with fingernail.
MODERATELY HARD	Can be scratched easily with knife: Cannot be scratched with fingernail.
HARD	Difficult to scratch with knife.
VERY HARD	Cannot be scratched with knife.
POORLY CEMENTED OR FRIABLE	Easily crumbled.
CEMENTED	Bound together by chemically precipitated material occurring in the interstices between allogenic particles of rock – quartz, calcite, dolomite, siderite and iron oxide are common cementing materials.

Physical Properties of Rock	Degree of Weathering
UNWEATHERED	Rock in its natural state before being exposed to atmospheric agents.
SLIGHTLY WEATHERED	Noted predominantly by color change with no disintegrated zones.
WEATHERED	Complete color change with zones of slightly decomposed rock.
EXTREMELY WEATHERED	Complete color change with consistency, texture, and general appearance approaching soil.

SUMMARY OF ALTERNATE PAVEMENT SECTIONS

COMPONENT THICKNESS (INCH)

ALTERNATE PAVEMENT SECTIONS	LIME STABILIZED SUBBASE	PORTLAND CEMENT CONCRETE
Rigid pavement on lime Stabilized subbase	**6.0**	**5.0***
Rigid pavement on compacted clays (on-site soils free of organic matters or over-sized)	---	**5.5***

NOTES:

* The thickness should be increased by one **(1)** inch in areas of heavy channelized-traffic or areas receiving heavy truck traffic.

*All street approach and fire lane shall be designed and constructed in compliance with the Building Codes and guidelines of the **City of Southlake**, Texas.