



GEOTECHNICAL INVESTIGATION

COLLIN COUNTY HEALTH CARE SERVICES PARKING LOT REHABILITATION

AGG REPORT NO. E16-0416

JUNE 15, 2016

PREPARED FOR:

COLLIN COUNTY

PRESENTED BY:



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- GEOTECHNICAL ENGINEERING
- ENVIRONMENTAL CONSULTING
- CONSTRUCTION MATERIALS ENGINEERING

June 15, 2016

Mr. Bill Burke
Collin County Construction and Projects
4600 Community Avenue
McKinney, Texas 75071

Phone: (214) 468-1593
Email: bburke@co.collin.tx.us

Re: Geotechnical Investigation
Collin County Health Care Services Parking Lot Rehabilitation
McKinney, Texas
AGG Report No: E16-0416

Dear Mr. Burke:

Please find enclosed our report summarizing the results of the geotechnical investigation performed at the above referenced project. We trust the recommendations derived from this investigation will provide you with the information necessary to complete your proposed project successfully.

For your future construction materials testing and related quality control requirements, it is recommended that the work be performed by Alliance Geotechnical Group in order to maintain continuity of inspection and testing services for the project under the direction of the geotechnical project engineer.

We thank you for the opportunity to provide you with our professional services. If we can be of further assistance, please do not hesitate to contact us.

Sincerely,
ALLIANCE GEOTECHNICAL GROUP, INC.
Texas Registered Engineering Firm F-1970


Douglas S. Land, P.E.
Branch Manager



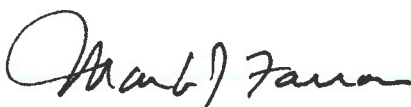

Mark J. Farrow, P.E.
Senior Vice President

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**GEOTECHNICAL INVESTIGATION
COLLIN COUNTY HEALTH CARE SERVICES PARKING LOT REHABILITATION
MCKINNEY, TEXAS**

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The project will consist of a parking lot reconstruction at the existing Collin County Health Care Services building located at the southwest corner of E. Midway Street and McDonald Street in McKinney, Texas. Approximately 73,000 square feet of asphalt parking lot will be removed and reconstructed. The area to be reconstructed is located east of the building (see Figure 1). The new parking lot will consist of rigid pavement.

1.2 PURPOSE AND SCOPE

The purposes of this geotechnical investigation were to: 1) explore the subsurface conditions at the site, 2) evaluate the pertinent engineering properties of the subsurface materials, 3) provide comments and recommendations for site grading and drainage, and 4) provide subgrade preparation and concrete pavement thickness recommendations. This report was prepared in general accordance with Alliance Geotechnical Group's Proposal No. P16-0414E dated April 19, 2016.

2.0 FIELD INVESTIGATION

The field investigation consisted of drilling six (6) test borings to depths of 10 feet within the pavement area. A truck-mounted auger drill rig was used to advance these borings and to obtain samples for laboratory evaluation. The borings were located at the approximate locations shown on the Plan of Borings (Figure 1).

Undisturbed samples of cohesive soils were obtained at intermittent intervals with standard, thin-walled, seamless tube samplers. These samples were extruded in the field, logged, sealed, and packaged to protect them from disturbance and maintain their in-situ moisture content during transportation to our laboratory.

The results of the boring program are presented on the Logs of Borings, Figures 2 thru 7. A key to the descriptive terms and symbols used on the logs is presented on Figure 8.

3.0 LABORATORY TESTING

Laboratory tests were performed on representative samples of the soil to aid in classification of the soil materials. These tests included Atterberg limits tests, moisture content tests and unit weight determinations. Hand penetrometer tests were performed on the clay soil samples to provide indications of the swell potential and the foundation bearing properties of the subsurface strata. The results of these tests are presented on the Logs of Borings (Figures 2 through 7).

To provide additional information about the swell characteristics of these soils at their in-situ moisture conditions, absorption swell tests were performed on selected samples of the clay soils (see Figure 9).

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 GENERAL SITE CONDITIONS

The project consists of removing and replacing the parking lot at the existing Collin County Health Care Services building located at the southwest corner of E. Midway Street and McDonald Street in McKinney, Texas.. The existing parking lot consists of asphalt paving that is severely damaged with longitudinal and alligator cracking. Several medium to tall trees are present within landscaping leave-outs within the parking lot. See Plan of Borings (Figure 1) for site configuration, location and aerial view.

4.2 SUBSURFACE CONDITIONS

Subsurface conditions encountered in the borings, including descriptions of the various strata, their depths, and thicknesses, are presented on the Logs of Borings. Refer to the Logs of Borings for existing asphalt and sub-base thicknesses. Note that depth on all borings refers to the depth from the existing grade or ground surface present at the time of the investigation. Boundaries between the various soil types are approximate.

4.3 SITE GEOLOGY

As shown on the Geologic Atlas of Texas, the site is located in the Austin Chalk Formation. This formation typically consists of limestone with interbedded layers of shale and clay. Soils derived from this formation are typically plastic clays exhibiting moderate to high shrink/swell potential with variations in moisture content

4.4 GROUNDWATER CONDITIONS

The borings were advanced using continuous flight auger methods. Advancement of the borings using these methods allows observation of the initial zones of seepage. Groundwater was not encountered in the test borings during drilling. The borings were backfilled and the pavement patched prior to moving to the next boring location. Therefore, delayed water level readings were not obtained.

It is not possible to accurately predict the magnitude of subsurface water fluctuations that might occur based upon short-term observations. The subsurface water conditions are subject to change with variations in climatic conditions and are functions of subsurface soil conditions and rainfall.

4.5 SOIL MOVEMENT

The subsurface exploration revealed the presence of highly expansive clay soils that extended the entire depth of the borings. The clay soils will have a moderate to high shrink/swell potential depending upon the soil moisture condition at the time of construction. Potential soil swell movement calculations were performed using swell test results, pocket penetrometer readings, and moisture content tests to estimate the swell potential of the soil.

Potential soil swell movements based upon the current soil moisture conditions and current grades have been estimated to range from 1 to 3 inches. In the area of existing trees, it is anticipated that dry soil conditions exist due to tree root desiccation whereby the soil swell PVR could exceed 6-inches. If after the existing pavement is removed and the upper clay soils were to become significantly dry prior to construction, the potential soil swell movements could increase to over 6 inches where deeper clay soils are present.

As indicated above, there are existing trees present within the existing landscaping leave-outs. The clay soils present within the tree drip lines are anticipated to be in a dry condition due to tree root absorption. It is anticipated that the soil swell movements within the tree influenced areas are currently over 6 inches (where deeper dry clays are present). These large upward soil swell movements could occur if existing trees die or are removed for any reason.

Note 1: If this magnitude of potential differential pavement movement is not acceptable, site preparation work would have to be performed in order to lower the potential differential movements to acceptable levels in areas sensitive to movements. If it is desired for the potential soil swell movements to be reduced, Alliance Geotechnical Group should be contacted to provide over-excavation and moisture conditioning recommendations in order to reduce the movements to acceptable levels.

Note 2: See Section 5.7 for tree effects for new pavement areas where existing trees remain.

It is imperative that all cracks and joints in the pavement be sealed and maintained by routine sealing in order to minimize differential pavement deflections caused by soil swelling. It is also imperative that positive drainage be provided along the pavement edges and that porous fill soils not be used as backfill behind the curbs to prevent ponding near the curb line.

5.0 ANALYSES AND PAVEMENT RECOMMENDATIONS

5.1 PROOFROLLING AND FILL PLACEMENT

After the existing asphalt pavement is removed and prior to filling (if any), the exposed subgrade should be proofrolled. Proofrolling can generally be accomplished using a heavy (25 ton or greater total weight) pneumatic tired roller making several passes over the areas. The proofrolling operations should be performed under the direction of a qualified geotechnical engineer. Where soft or compressible zones are encountered, these areas should be removed to a firm subgrade. Any resulting void areas should be backfilled to finished subgrade in 8 inch compacted lifts as specified below.

After completion of proofrolling, the ground surface should then be scarified to a depth of 8 inches and re-compacted to levels specified below. We recommend that fill soils be compacted to 97% of standard Proctor density (ASTM D698). Clay soils should be placed at moisture contents between optimum and +3% of the optimum moisture content.

5.2 SUBGRADE PREPARATION

Note: Existing stone and gravel base extends to depths of 10" to 13" below existing pavement grade. Therefore, some of the base would have to be removed and replaced with on-site clay prior to liming so that no more than 3 to 4 inches of base remains prior to liming to a depth of 8-inches. As an alternative to liming, new concrete could be placed over re-compacted soil (natural soil or existing base).

The surficial clay soils are active and have a high shrink/swell potential. Clay soils react with hydrated lime, which serves to improve their support value and provide a firm, uniform subgrade beneath the paving. Based the Atterberg Limits tests, and our experience with similar soils within the Austin Chalk geologic formation, eight (8) percent hydrated lime by dry weight (48 pounds per square yard per 8-inch depth) would be required to stabilize the existing clay subgrade. The actual lime requirement will depend upon the actual subgrade soils exposed at final grade and should be determined at the time of construction. It should also be verified that sulfate levels are less than 3,000 ppm prior to liming the subgrade

The lime should be thoroughly mixed and blended with the top 8 inches of the subgrade per TxDOT Item 260. The mixture should be compacted to a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D 698, within 2 percentage points of the soil's optimum moisture content. We recommend that this lime stabilization extend 1 to 2 feet beyond exposed pavement edges, if possible, in order to reduce the effects of shrinkage during extended dry periods.

Note: After final grading has been performed, depth checks and PI verification checks should be performed to verify that proper stabilization has been achieved as evidenced by a PI of 15 or less.

Sand should be specifically prohibited beneath pavement areas during final grading (after stabilization), since these more porous soils can allow water inflow, resulting in heave and strength loss of subgrade soils. It should be specified that only lime stabilized soil will be allowed for fine grading. After fine grading each area in preparation for paving, the subgrade surface should be lightly moistened, as needed, and recompact to obtain a tight non-yielding subgrade.

Project specifications should allow a curing period between initial and final mixing of the lime/soil mixture. After initial mixing, the lime treated subgrade should be lightly rolled and maintained at or to 5 percentage points above the soil's optimum moisture content until final mixing and compaction. We recommend a 3-day curing period for these soils. The following gradation requirements are recommended for the stabilized materials before final compaction:

	<u>Percent</u>
Minimum Passing 1 3/4" Sieve	100
Minimum Passing 3/4" Sieve	85
Minimum Passing No. 4 Sieve	60

All non-slaking aggregates retained on the No. 4 sieve should be removed before testing.

The stabilized subgrade should be protected and moist cured or sealed with a bituminous material for a minimum of 7 days or until the pavement materials are placed. Pavement areas should be graded to prevent ponding and infiltration of excessive moisture on or adjacent to the pavement areas.

5.3 RECOMPACTED PAVEMENT SUBGRADE

If subgrade stabilization is not performed, we recommend that the upper eight (8) inches of subgrade soil be compacted at -2% to +2% of optimum moisture to a minimum of 98% Standard Proctor density (ASTM D 698). The subgrade should be proof-rolled prior to subgrade compaction (see Section 5.1).

Only on-site soil (comparable to the underlying subgrade soil) should be used for fine grading the pavement areas. After fine grading, the subgrade should again be watered if needed and re-compacted in order to re-achieve the moisture and density levels discussed above and provide a tight non-yielding subgrade.

Sand should be specifically prohibited beneath pavement areas during final grading, since these more porous soils can allow water inflow, resulting in heave and strength loss of subgrade soils. It should be specified that only clay soils will be allowed for fine grading. After fine grading each area in preparation for paving, the subgrade surface should be lightly moistened, as needed, and recompacted to obtain a tight non-yielding subgrade.

The subgrade moisture content and density must be maintained until paving is completed. The subgrade should be watered just prior to paving to assure concrete placement over a moist subgrade.

Note: If a rain event occurs prior to paving, the subgrade should be aerated and re-tested prior to paving.

Due to the presence of expansive clay soils, post construction upward pavement movements should be anticipated. Inspection during construction is particularly important to insure proper construction procedures are followed.

5.4 DRIVE APPROACHES

Water should not be allowed to pond in drive approaches prior to paving. Density tests should be performed on the subgrade soils in each drive approach prior to fine grading in preparation for paving to verify compliance with project specifications.

5.5 PAVEMENT SECTIONS

We anticipate that automobile traffic and occasional heavy truck traffic will be used in the proposed reconstructed parking lot. The pavement recommendations provided below are based upon these traffic loading conditions. Tables 1 and 2 present the recommended pavement sections for this project based upon a design life of at least 20 years:

TABLE 1. LIGHT DUTY PAVEMENT SECTION

AUTOMOBILE TRAFFIC ONLY (Parking Lot)
<u>PCC SECTION</u> 5 inches Portland Cement Concrete 8 inches Scarified and Compacted Subgrade *

* Although not required for design, a lime stabilized subgrade could be used to improve performance and reduce maintenance.

TABLE 2. MEDIUM DUTY PAVEMENT SECTION

MEDIUM DUTY PAVEMENT (Auto Drive Approaches and High Density Travel Lanes with Occasional Truck Traffic) **
<u>PCC SECTION</u> 6 inches Portland Cement Concrete 8 inches Scarified and Compacted Subgrade **

** For 20 heavy truck repetitions per week. Although not required for design, a lime stabilized subgrade could be used to improve performance and reduce maintenance.

The concrete in automobile traffic only areas should have a minimum 28 day compressive strength of 3,600 psi. In truck drive and parking areas, the concrete strength should be increased to 4,000 psi for improved performance and increased serviceable life. Concrete quality will be important in order to produce the desired flexural strength and long term durability.

Proper joint placement and design is critical to pavement performance. Load transfer at all longitudinal joints and maintenance of watertight joints should be accomplished by use of tie bars. Control joints should be sawed as soon as possible after placing concrete and before shrinkage cracks occur. All joints including sawed joints should be properly cleaned and sealed as soon as possible to avoid infiltration of water.

Our previous experience indicates that joint spacing on 12 to 15 foot centers have generally performed satisfactorily. It is our recommendation that the concrete pavement be reinforced with No. 3 bars placed on chairs on approximately 18-inch centers in each direction. We recommend that the perimeter of the pavements have a stiffening curb section to prevent possible distress due to wheel loads near the edge of the pavements and to provide channelized drainage.

5.6 PAVEMENT CONSIDERATIONS

The soils at the site are active and differential heave within the pavement area could potentially occur. See Section 4.4 of this report. The service life of paving may be reduced due to water infiltration into subgrade soils through heave induced cracks in the paving section. This will result in softening and loss of strength of the subgrade soils. A regular maintenance program to seal paving cracks will help prolong the service life of the paving.

The life of the pavement can be increased with proper drainage. Areas should be graded to prevent ponding adjacent to curbs or pavement edges. Granular backfill materials, which could hold water behind the curb, should not be permitted. Flat pavement grades should be avoided.

5.7 TREE EFFECTS

Several medium to tall trees are present within landscaping leave-outs within the parking lot. The roots of mature trees absorb large amounts of moisture from the supporting soils to deep depths. The lateral limits of tree root influence extend at least 5 feet beyond the unpruned drip line and to much greater distances when the ground beneath the drip lines is paved and/or if multiple trees are present in the area (this condition exists at this site).

To reduce future settlement after reconstruction, root barriers and/or irrigated tree wells could be considered. An arborist or landscape architect should be contacted regarding the required depth of the irrigated tree wells and/or root barrier and whether or not this is a viable solution. Root barriers along curb lines would require large roots to be severed. This might kill the trees. If this occurred, large pavement heave could then occur (see Section 4.4 of this report). If the barriers are effective in reducing soil suction from the root systems, large differential heave would still occur as the soils regain lost moisture causing differential heave due to soil swelling. Due to these concerns, root barriers are probably not a viable

solution at this time for existing trees. Root barriers and/or irrigated tree wells should be considered for new trees to be planted along the pavement.

In our opinion, the most practical solution is to thicken the pavement near the tree covered areas especially in areas where deeper clay soils are present (see Boring B-3). An additional 1 to 2 inches of concrete (over the required design thickness) could be used near the tree areas to provide additional rigidity to reduce differential deflections caused by post construction shrink/swell movements. Additional steel reinforcement could be used to further stiffen the pavement. Larger bars on a closer spacing and two mats of steel should be considered. A structural engineer should be consulted regarding the most cost effective reinforcement design for the thickened sections.

If the pavement is thickened and stiffened as described above, differential deflections should be reduced. If differential settlements due to shrinkage caused by tree roots become objectionable, these areas could be mudjacked in the future as needed to level the pavement.

6.0 FIELD SUPERVISION

Many problems can be avoided or solved in the field if proper inspection and testing services are provided. It is recommended that all proofrolling, site and subgrade preparation, subgrade stabilization and pavement construction be monitored by a qualified engineering technician. Density tests should be performed to verify compaction and moisture content of any earthwork. Inspection should be performed prior to and during concrete placement operations. Alliance Geotechnical Group employs a group of experienced, well-trained technicians for inspection and construction materials testing who would be pleased to assist you on this project.

7.0 LIMITATIONS

The professional services, which have been performed, the findings obtained, and the recommendations prepared were accomplished in accordance with currently accepted geotechnical engineering principles and practices. The possibility always exists that the subsurface conditions at the site may vary somewhat from those encountered in the test borings. The number and spacing of test borings were chosen in such a manner as to decrease the possibility of undiscovered abnormalities, while considering the nature of loading, size, and cost of the project. If there are any unusual conditions differing

significantly from those described herein, Alliance Geotechnical Group should be notified to review the effects on the performance of the recommended foundation system.

The recommendations given in this report were prepared exclusively for the use of client, their client, and their consultants. The information supplied herein is applicable only for the design of the previously described development to be constructed at locations indicated at this site and should not be used for any other structures, locations, or for any other purpose.

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



Project No:
E16-0416

PLAN OF BORINGS

COLLIN COUNTY HCS PARKING
REHABILITATION
MCKINNEY, TEXAS

FIGURE NO:
1

LOG OF BORING B-1

Project: **Collin County HCS Parking Rehabilitation - McKinney, Texas**

Project No.: **E16-0416**

Date: 04/28/2016

Elev.:

Location: **See Figure 1**

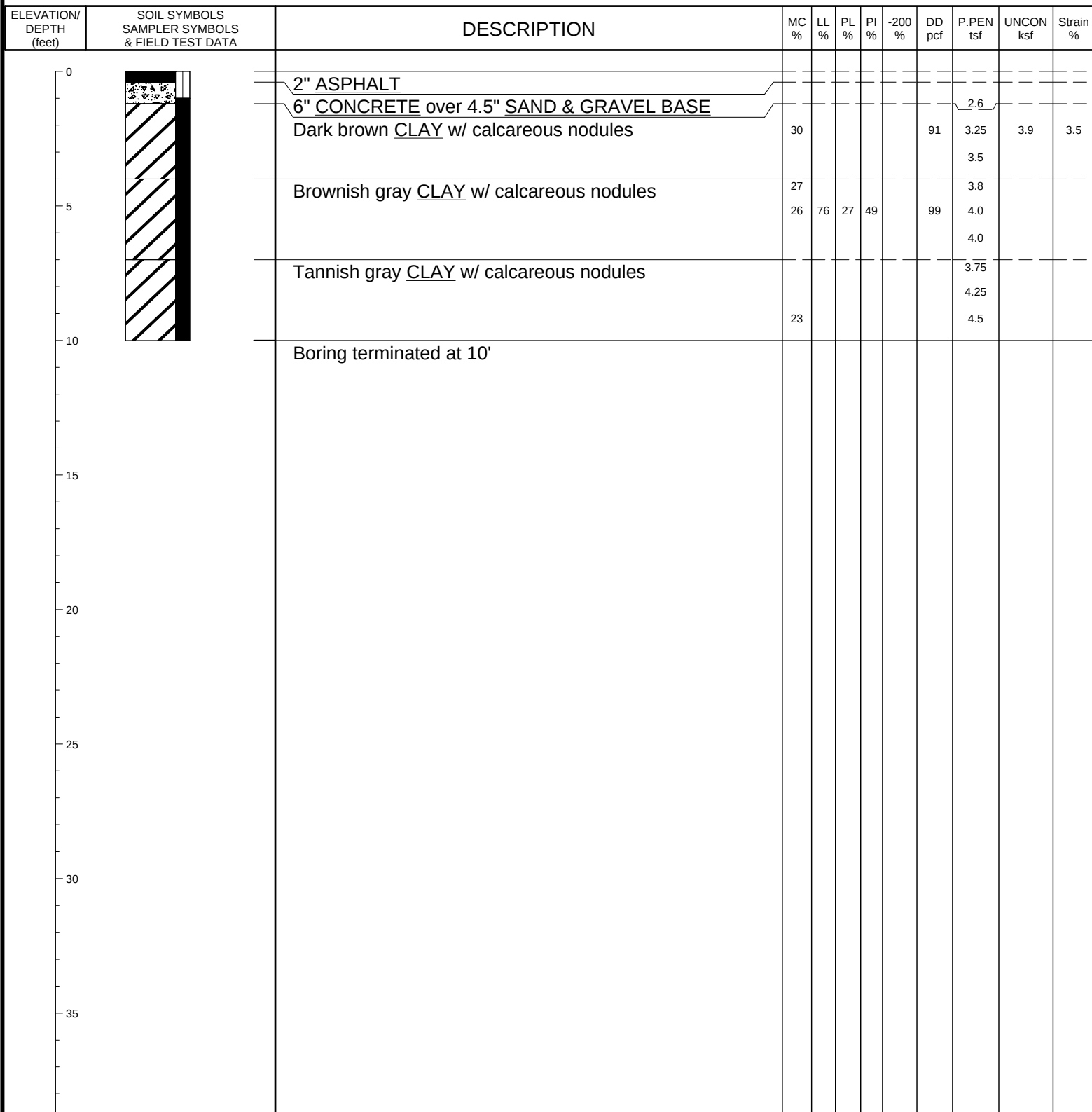
Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:



Notes:

FIGURE:2

LOG OF BORING B-2

Project: **Collin County HCS Parking Rehabilitation - McKinney, Texas**

Project No.: **E16-0416**

Date: **04/28/2016**

Elev.:

Location: **See Figure 1**

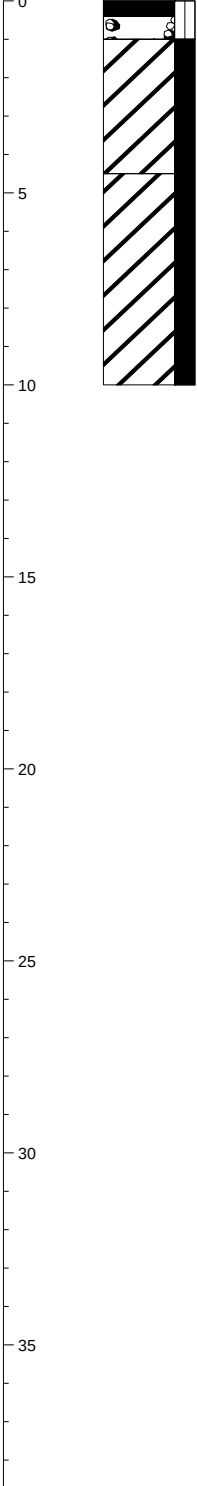
Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		2.5" ASPHALT									
		9.5" Crushed STONE BASE							2.5		
		Dark brown CLAY	39	83	32	51		78	2.35	2.2	2.9
									2.1		
									2.45		
5		Brownish gray CLAY w/ calcareous nodules							3.3		
									3.2		
									3.2		
			24						3.5		
									4.4		
10		Boring terminated at 10'									
15											
20											
25											
30											
35											

Notes:

FIGURE:3

LOG OF BORING B-3

Project: **Collin County HCS Parking Rehabilitation - McKinney, Texas**

Project No.: **E16-0416**

Date: **04/28/2016**

Elev.:

Location: **See Figure 1**

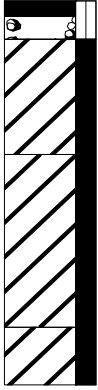
Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		3.75" ASPHALT									
		7.25" Crushed STONE BASE							2.5		
		Dark brown CLAY w/ calcareous nodules	32						2.75		
									3.0		
5		Brownish gray CLAY w/ calcareous nodules and iron deposits	27	67	25	42		95	2.75		
									3.0	2.8	3.4
									3.0		
									2.8		
			26						3.0		
		Tannish gray CLAY w/ calcareous nodules							3.5		
10		Boring terminated at 10'									
15											
20											
25											
30											
35											

Notes:

FIGURE:4

LOG OF BORING B-4

Project: **Collin County HCS Parking Rehabilitation - McKinney, Texas**

Project No.: **E16-0416**

Date: **04/28/2016**

Elev.:

Location: **See Figure 1**

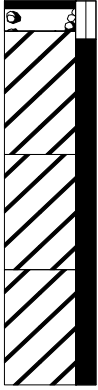
Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		1.5" ASPHALT									
		8" Crushed STONE BASE							3.5		
		Dark brown CLAY w/ calcareous nodules	37	77	27	50		82	3.75	3.1	6.5
									3.25		
		Brownish gray CLAY w/ calcareous nodules							3.5		
5									3.25		
									3.0		
		Tannish gray CLAY w/ calcareous nodules	25						4.0		
									3.75		
10			21	55	19	36		105	4.25		
		Boring terminated at 10'									
15											
20											
25											
30											
35											

Notes:

FIGURE:5

LOG OF BORING B-5

Project: **Collin County HCS Parking Rehabilitation - McKinney, Texas**

Project No.: **E16-0416**

Date: 04/28/2016

Elev.:

Location: **See Figure 1**

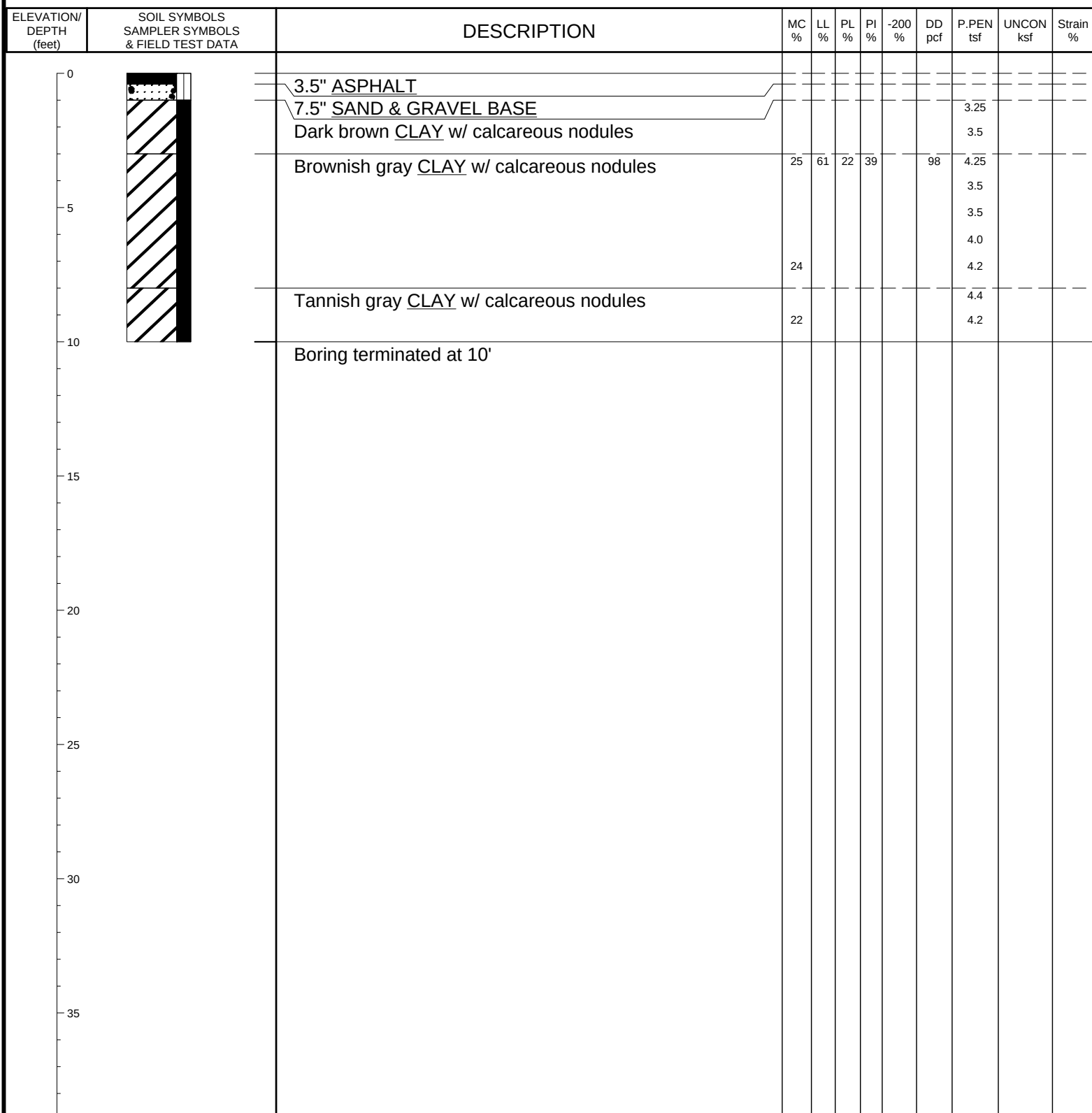
Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:



Notes:

FIGURE:6

LOG OF BORING B-6

Project: **Collin County HCS Parking Rehabilitation - McKinney, Texas**

Project No.: **E16-0416**

Date: **04/28/2016**

Elev.:

Location: **See Figure 1**

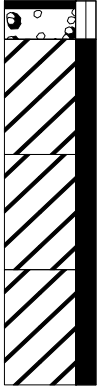
Depth to water at completion of boring: **Dry**

Depth to water when checked:

was:

Depth to caving when checked:

was:

ELEVATION/ DEPTH (feet)	SOIL SYMBOLS SAMPLER SYMBOLS & FIELD TEST DATA	DESCRIPTION	MC %	LL %	PL %	PI %	-200 %	DD pcf	P.PEN tsf	UNCON ksf	Strain %
0		2" ASPHALT									
		9.5" Crushed STONE BASE							2.8		
		Dark brown CLAY w/ calcareous nodules	30					89	3.6	2.4	7.0
									3.5		
5		Brownish gray CLAY w/ calcareous nodules	26	64	24	40		99	4.0		
									4.0		
									3.4		
		Tannish gray CLAY w/ calcareous nodules							4.2		
			23						4.25		
									4.5		
10		Boring terminated at 10'									
15											
20											
25											
30											
35											

Notes:

FIGURE:7

KEY TO LOG TERMS & SYMBOLS

Symbol Description

Strata symbols



Asphaltic
Paving



CONCRETE



CLAY



Crushed STONE



GRAVEL,
sandy

Soil Samplers



Rock
Core



Thin Wall
Shelby Tube

Notes:

1. Exploratory borings were drilled on dates indicated using truck mounted drilling equipment.
2. Water level observations are noted on boring logs.
3. Results of tests conducted on samples recovered are reported on the boring logs. Abbreviations used are:

DD = natural dry density (pcf)	LL = liquid limit (%)
MC = natural moisture content (%)	PL = plastic limit (%)
Uncon. = unconfined compression (tsf)	PI = plasticity index
P.Pen. = hand penetrometer (tsf)	-200 = percent passing #200
4. Rock Cores

REC = (Recovery) sum of core sample recovered divided by length of run, expressed as percentage.
RQD = (Rock Quality Designation) sum of core sample recovery 4" or greater in length divided by the run, expressed as percentage.

SWELL TEST RESULTS

BORING NO.	DEPTH (FEET)	UNIT WEIGHT	ATTERBERG LIMITS			IN-SITU MOISTURE CONTENT	FINAL MOISTURE CONTENT	LOAD (PSF)	% VERTICAL SWELL
			LL	PL	PI				
B-1	5-6	98.6	76	27	49	25.8	27.0	313	1.2
B-4	9-10	105.1	77	27	50	21.4	22.1	1188	0.7
B-5	3-4	98.4	61	22	39	24.8	26.0	438	1.7
B-6	4-5	98.5	64	24	40	26.0	27.0	563	1.1

PROCEDURE:

1. Sample placed in confining ring, design load (including overburden) applied, free water with surfactant made available, and sample allowed to swell completely.
2. Load removed and final moisture content determined.



SWELL TEST RESULTS		
COLLIN COUNTY HCS PARKING ADDITION		
McKINNEY, TEXAS		
ALLIANCE GEOTECHNICAL GROUP		
E16-0416	Date: 06/15/2016	FIGURE 9