Subsurface Exploration and Geotechnical Data Report
Proposed New Mayfair Parkway Detention Basin
New Braunfels, Texas

InTEC Project No. S251748
June 19, 2025

Southstar Communities
2055 Central Plaza, Suite 110, Box 195
New Braunfels, Texas 78130

Integrated Testing and Engineering Company of San Antonio, L.P.
12028 Radium, San Antonio, Texas 78216—Phone: (210) 525 9033—Fax: (210) 525 9032

June 19, 2025

Southstar Communities
2055 Central Plaza, Suite 110, Box 195
New Braunfels, Texas 78130

Attention: **Mr. Jim Vater**
Email: jim@southstartx.com

Re: Subsurface Exploration and Geotechnical Data Report
Proposed New Mayfair Parkway Detention Basin
New Braunfels, Texas

InTEC Project No. S251748

Dear Ladies & Gentlemen,

Integrated Testing and Engineering Company of San Antonio (InTEC) has completed a subsurface investigation and laboratory testing of soil at the above referenced project site. The results of the exploration are presented and InTEC is pleased to submit the Geotechnical Data Report for the proposed new detention basin. Our services were performed in general accordance with the scope of work outlined in the Professional Services Geotechnical Services Contract between Southstar Communities and InTEC dated May 08, 2025.

We appreciate and wish to thank you for the opportunity to be of service to you on this project. If we can be of additional assistance during the materials testing-quality control phase of construction, please call us.

Sincerely,
InTEC of San Antonio

Vinh Le, M.S., P.E.

STATE OF TEXAS
MURALI SUBRAMANIAM
102417
LICENSED
PROFESSIONAL ENGINEER
InTEC of SAN ANTONIO
F-7623

06/26/2025

Murali Subramaniam, Ph. D., P.E.
Vice President

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INTRODUCTION

General

This report presents the data results of our subsurface exploration and geotechnical testing of soil for the **Proposed New Mayfair Parkway Detention Basin in New Braunfels, Texas.** This project was authorized by **Mr. Jim Vater**, **Southstar Communities.**

Purpose and Scope of Services

The purpose of our geotechnical investigation is to compile and present the subsurface conditions of the project area and provide geotechnical laboratory testing results without interpretive conclusions with respect to ground behavior in this geotechnical data report. Our scope of services consists of:

1) drilling and sampling of sub-surface materials – Two (2) boreholes were drilled on the existing areas of the basin to a depth of 15-ft each. Approximate boring locations and depths are presented in **Plate 1F**;

2) approximate X-Y coordinates were obtained using a hand held GPS device;

3) Five (5) samples were taken from each boring;

4) evaluation of the in-place conditions of the subsurface soils through field standard penetration tests;

5) Observe the groundwater conditions at the time of drilling;

6) boreholes were backfilled using the remaining cuts;

7) performed laboratory tests including Atterberg limits, moisture content tests, one (1) permeability tests, and one (1) hydrometer tests.

All applicable ASTM procedures and standard practices were followed for the laboratory tests. A Geotechnical Design Memorandum (GDM) will be prepared for the proposed detention basins and will be submitted under separate cover.

Project Description

A new detention basin with maximum berm height of 11-ft is proposed at the subdivision. InTEC performed the planned Geotech bores and completed the logs. InTEC was on site for the general observation and operation. Drilling operations took one (1) business day to complete. The drilling of the borings was completed on June 02, 2025. All the boreholes were backfilled after completion of each hole. Collected samples were transported in plastic Ziploc bags. Laboratory tests were performed at InTEC.

SUBSURFACE EXPLORATION

Scope

The field exploration to determine the engineering characteristics of the subsurface materials included a reconnaissance of the project site, drilling the borings with a truck mounted drill rig, performing Standard Penetration Tests, and obtaining Split Barrel and/or Shelby Tube samples.

Boring locations were selected by the InTEC geotechnical engineer and established in the field by the drilling crew using GPS device.

Drilling and Sampling

The soil borings were performed with a drilling rig equipped with a rotary head. Rotary drilling method was used to advance the holes. Samples of the subsurface materials were obtained using either a Split Barrel sampler or a Shelby Tube sampler.

Five samples were collected from each boring. After completion, the boreholes were backfilled using the remaining cuts.

The samples were identified according to site number, boring number, XY coordinates (WGS84) and depth, encased in polyethylene plastic wrapping to protect against moisture loss, and transported to our laboratory.

In summary, the following samples as presented in Table No. 1 were collected as a part of our field exploration procedure:

Table No. 1 – Boring Locations and Depths

Boring No.	Plane Surface Coordinates		Approximate Boring Depth (ft)	# Split Barrel Samples	# Auger Samples
	Latitude	Longitude			
B-1	29.762764	-98.042889	15	3	2
B-2	29.763447	-98.043275	15	3	2

Field Tests

Penetration Tests – During the sampling procedures, standard penetration tests were performed in the borings in conjunction with the split-barrel sampling. The standard penetration value (N) is defined as the number of blows of a 140-pound automatic hammer, falling thirty inches, required to advance the split-spoon sampler one foot into the soil. The sampler is lowered to the bottom of the drill hole and the number of blows recorded for each of the three successive increments of six inches penetration. The "N" value is obtained by adding the second and third incremental numbers. The results of the standard penetration tests indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components.

Field Logs

All the Geotech bores were logged with information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as silt, clay, gravel or sand, observations of water depth, soil descriptions and blow counts at each depth. It also contained an interpretation of subsurface conditions between samples. Soils recovered from the Shelby Tube were tested for relative consistency by pocket penetrometer tests. Therefore, these logs included both factual and interpretive information.

Presentation of the Data

The final logs represent our interpretation of the contents of the field logs for the purpose delineated by our client. The final logs are included on **Plates 2 and 3** included in the Illustration section. A key to classification terms and symbols used on the logs is presented on **Plate 4**.

Sample Photographs

Samples were photographed in InTEC's laboratory. Photographs are presented immediately following the respective Boring Logs in Appendix A.

Storage of Samples

The remaining soil and rock samples recovered from the borings will be stored in InTEC's laboratory office for 30 days after the submission of GDR then the samples can be properly disposed by InTEC.

LABORATORY TESTING PROGRAM

Purpose

In addition to the field exploration, a supplemental laboratory testing program was conducted to determine additional pertinent engineering characteristics of the subsurface materials necessary in evaluating the soil parameters.

Laboratory Tests

All phases of the laboratory-testing program were performed in general accordance with the indicated applicable ASTM Specifications as indicated in Table No. 2.

Table No. 2 – Applicable ASTM Specifications

Laboratory Test	Applicable Test Standard
Liquid Limit, Plastic Limit, & Plasticity Index of the Soils	ASTM D 4318
Moisture Content	ASTM D 2216
Grain Size Distribution including hydrometer	ASTM D 422, D 1140, D 7928
Hydraulic Conductivity/Permeability	ASTM D 5084

In the laboratory, each sample was observed and classified by InTEC geotechnical engineer. As a part of this classification procedure, the natural water contents and grainsize distributions of selected specimens were determined. Liquid and plastic limit tests were performed on representative specimens to determine the plasticity characteristics of the different soil strata encountered. In addition, shear strengths of undisturbed samples at selected depths were evaluated by unconfined compression tests.

Presentation of the Data

In summary, the tests presented in Table No. 3 in the following page were conducted in the laboratory to evaluate the engineering characteristics of the subsurface materials:

Table No. 3 – Type and Amount of Conducted Tests

Type of Test	Number Conducted
Liquid Limit, Plastic Limit and Plasticity Index of the Soils	4
Moisture Content	10
Grain Size Distribution including hydrometer	1
Hydraulic Conductivity	1

The results of Atterberg Limits and moisture content tests are presented on appropriate boring logs. The grain size distribution curves including hydrometer results are presented in Appendix B. Hydraulic conductivity of saturated porous materials is presented in Appendix C. Summary of the laboratory tests are presented in Table No. 4.

Table No. 4 – Summary of Laboratory Tests

Boring No.	Sample Depth (ft)	Moisture Content (%)	Atterberg's Limit		Grain-size Dist. (Percent Finer)				USCS
			Liquid Limit	Plasticity Index	Minus #200 (%)	#40 (%)	#10 (%)	#4 (%)	
B-1	0-2	22	67	48	-	-	-	-	-
	4-6	19	66	49	-	-	-	-	-
	13-15	19	63	46	-	-	-	-	-
B-2	2-4	16	65	47	99.2	-	-	-	CH

Atterberg Limits, Amount of Material Finer than No. 200 sieve, Coefficients of Grainsize Distribution, Water Content of Soil

Liquid Limit, Plastic Limit, and Plasticity Index of Soil - These tests are conducted on clayey and silty soils and are commonly referred to as the Atterberg Limits determined in accordance with ASTM D 4318. The results of these tests are used to (1) identify, in part, the soil's classification in accordance with the Unified Soil Classification System (USCS, ASTM D2487) and (2) provide data for empirical correlations for engineering properties such as compressibility, permeability, strength, and shrink-swell potential. These test results are shown on the boring logs in the columns labeled "Liquid Limit" and "Plasticity Index" and are presented as a %.

Amount of Material Finer than No. 200 Sieve - Soils that pass a No. 200 (75-µm) sieve are considered fine-grained soils and include silt and clay. Soils that are retained on that sieve are considered coarse-grained soils and include sand and gravel up to a 3-inch maximum particle size. The No. 200 sieve was chosen as the delineation size between fine and coarse-grained soils because 75 µm (0.075 millimeter) is considered the minimum particle size that can be seen with the naked eye. The results of this test are used for soil classification purposes and correlations with other engineering properties. The tests were performed in accordance with ASTM D1140 and the results are shown on the boring logs in the column "Fines Content (%)".

Particle-Size Analysis of Soil - Test method ASTM D422 is used to determine the distribution of particle sizes in soils. The particle size distribution of fine-grained soils (i.e. passing the No. 200 sieve) is determined by a sedimentation process using a hydrometer. The particle size distribution of coarse-grained soils (i.e. retained on a No. 200 sieve) is determined by sieving over a set of standard sieve sizes up to 3 inches. Partial results of this test are shown on the boring logs in the columns labeled "Sand Content (%)" and "Fines Content (%)".

Water (Moisture) Content of Soil - This test is typically used to determine the water (moisture) content of a soil or rock sample at the time of sampling, assuming the sample is collected and stored in such a manner as to minimize drying. The results of this test by ASTM D2216 are shown on the boring logs in the column labeled "Moisture Content (%)".

GENERAL SUBSURFACE CONDITIONS

Site Geology

The proposed boreholes at the project area are mapped on the Geologic Map presented on Plate 1D in Illustration section. According to geologic map of New Braunfels, Texas, the location is within Pecan Gap Chalk (Kpg), which is described below:

Pecan Gap Chalk (Kpg) consists of very light yellow to yellowish brown calcareous clays, chalks, and marls.

Soil Stratigraphy

The soils underlying the project area based on the information from the boreholes may be grouped into **two generalized strata** with similar physical and engineering properties. The soil stratigraphy information at the boring locations is presented in **Boring Logs, Plates 2 and 3** in the Illustration section**.**

The engineering characteristics of the underlying soils based on the results of the laboratory tests performed on selected samples are summarized in the following paragraphs and visualized in Figure 1 in the following page.

- Stiff to very stiff brown clays and dark gray clays were encountered to depths of 1.5 to 2 feet. These clays are highly plastic with a tested Liquid Limit value of 67 and a Plasticity Index value of 48. The results of Standard Penetration Tests performed within these clays were from 07 to 08 blows per foot.

- Very stiff to hard tan and gray clays was highly plastic with tested Liquid Limit values varying from 63 to 67 and Plasticity Index values ranging from 46 to 49. The results of Standard Penetration Tests performed within these clays were from 16 to 36 blows per foot.

The description presented is of a generalized nature to highlight the major soil stratification features and soil characteristics. The lines designating the interface between soil strata on the logs represent approximate boundaries. Transition between materials may be gradual. The test boring logs should be consulted for specific information at each boring location. Soil stratigraphy may vary between boring locations. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the attention of InTEC.

Ground water Observations

Ground water was not encountered in the borings at the time of drilling. Short term field observations generally do not provide accurate ground water levels. The contractor should check the subsurface water conditions prior to any excavation activities. The low permeability of the soils would require several days or longer for ground water to enter and stabilize in the bore holes. Ground water levels will fluctuate with seasonal climatic variations and changes in the land use. It is not unusual to encounter shallow ground water during or after periods of rainfall. The surface water tends to percolate down through the surface soils until it encounters a relatively impervious layer.

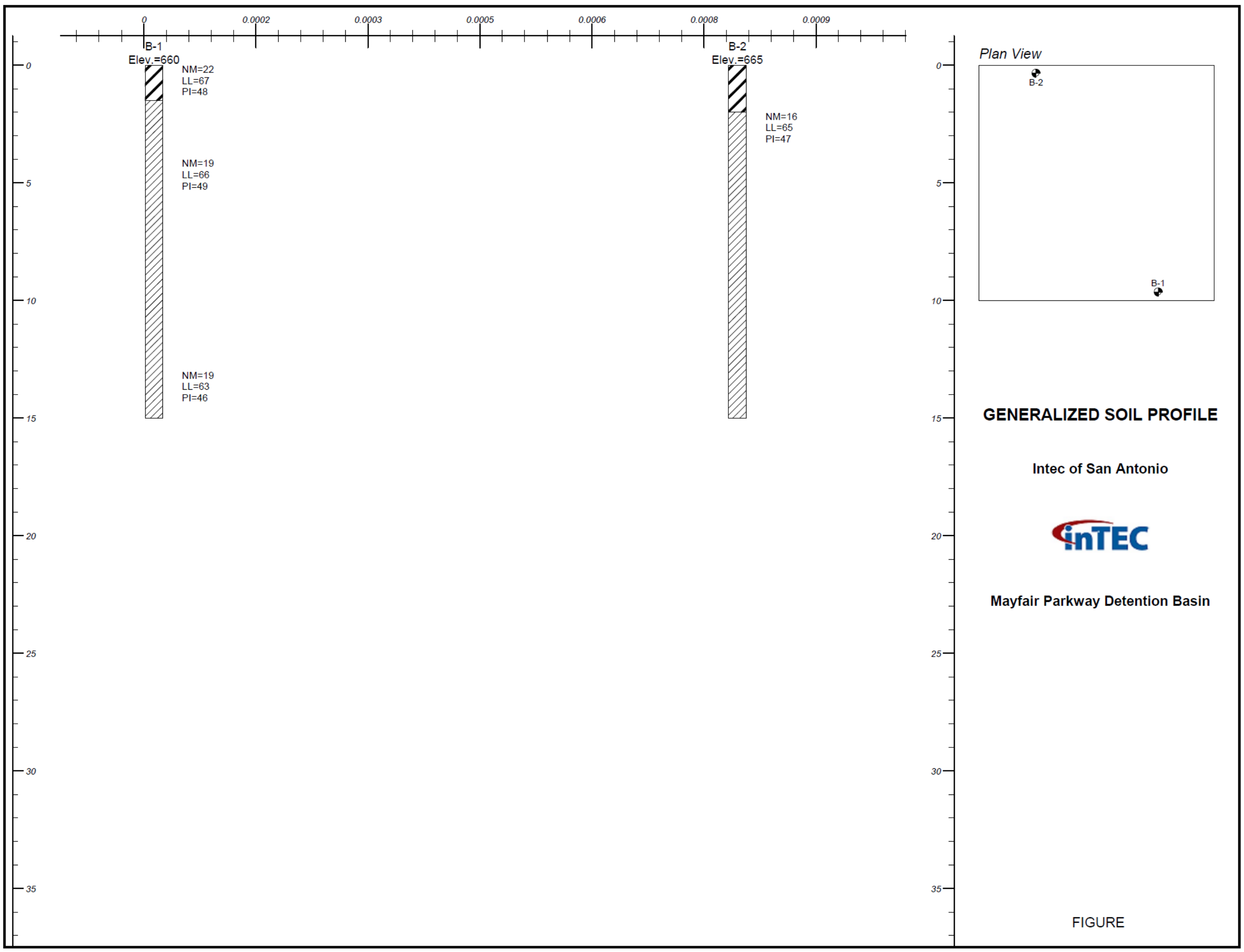


Figure 1 – Generalized Soil Profile of Geotech Bores at the project site

LIMITATIONS

The exploration and analysis of the subsurface conditions reported herein are per stated requirements and considered sufficient to form a reasonable basis for the design. **The results submitted are based upon the available soil information and material testing details furnished by InTEC.**

Two borings were drilled at the project site. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the attention of the geotechnical engineer. The information contained in this report and on the Boring Logs are not intended to provide the contractor with all the information needed for proper selection of equipment, means and methods, or for cost and schedule estimation purposes. The use of information contained in the report for bidding purposes should be done at the contractor's option and risk.

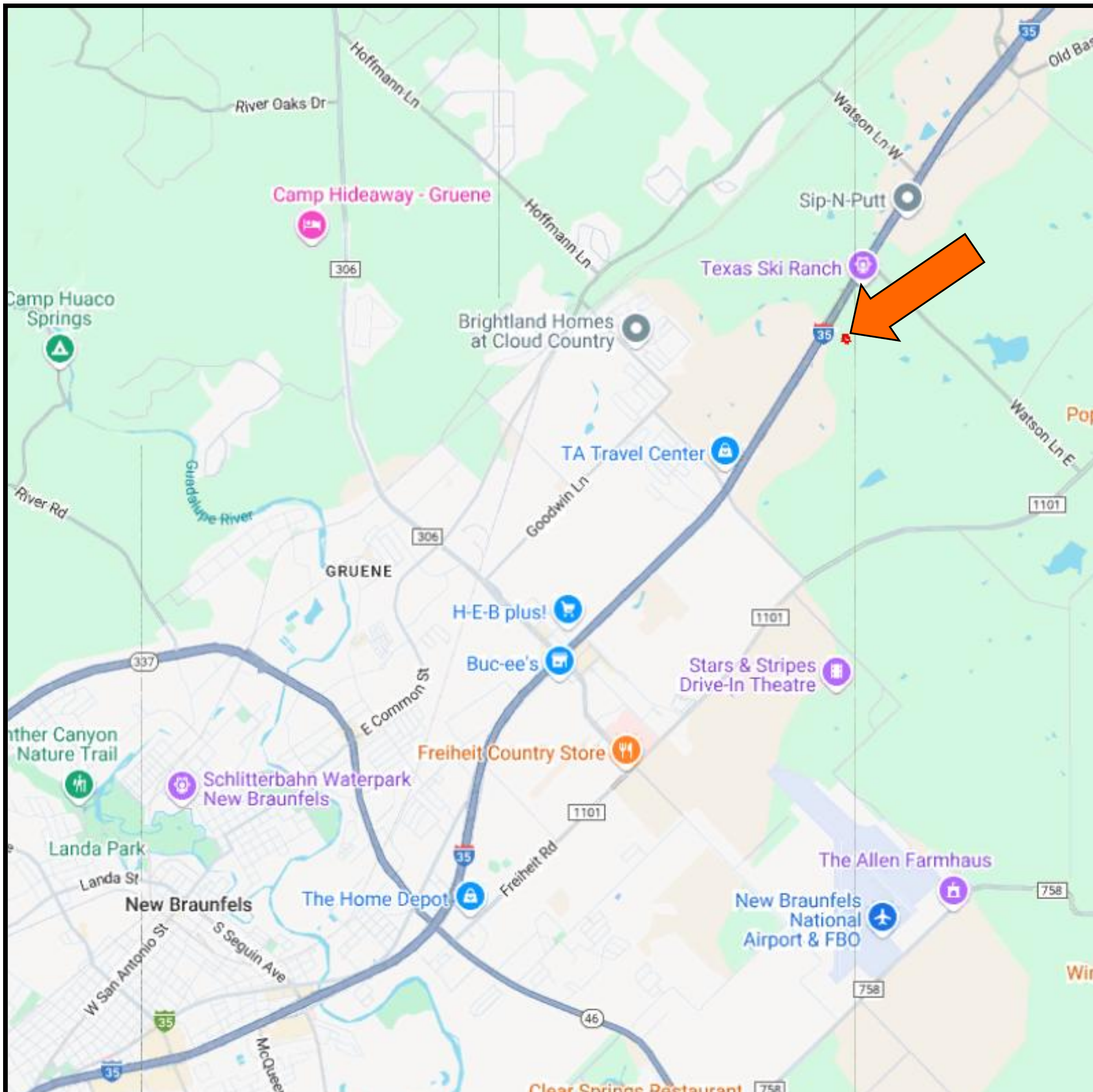
The geotechnical engineer declares that the findings, specifications, or professional services contained herein, have been made after being prepared in accordance with generally accepted professional engineering practice in the fields of geotechnical engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

This geotechnical data report has been prepared for the exclusive use of **Southstar Communities** for the specific application to the **Proposed New Mayfair Parkway Detention Basin in New Braunfels, Texas.**

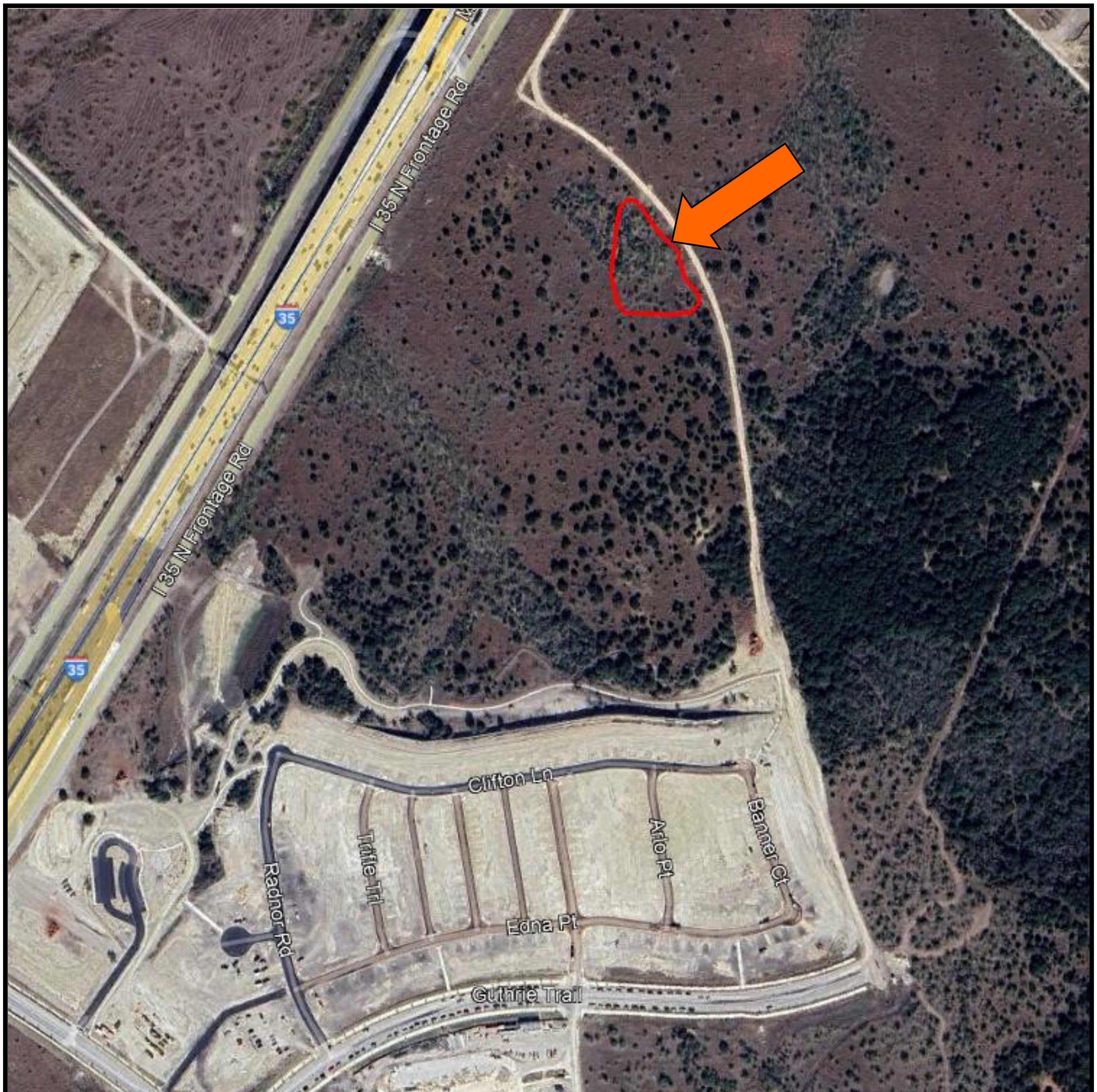
Illustration Section

Description	Plate No.
Vicinity Map	Plate 1A
Aerial Map	Plate 1B
Topographic Map	Plate 1C
Geologic Map	Plate 1D
Soil Map	Plate 1E
Approximate Boring Locations	Plate 1F
Boring Logs	Plates 2 & 3
Keys to Classifications and Symbols	Plate 4
Information on Geotechnical Report	Appendix

Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	InTEC Project Number: **S251748**	Date: 05/20/2025

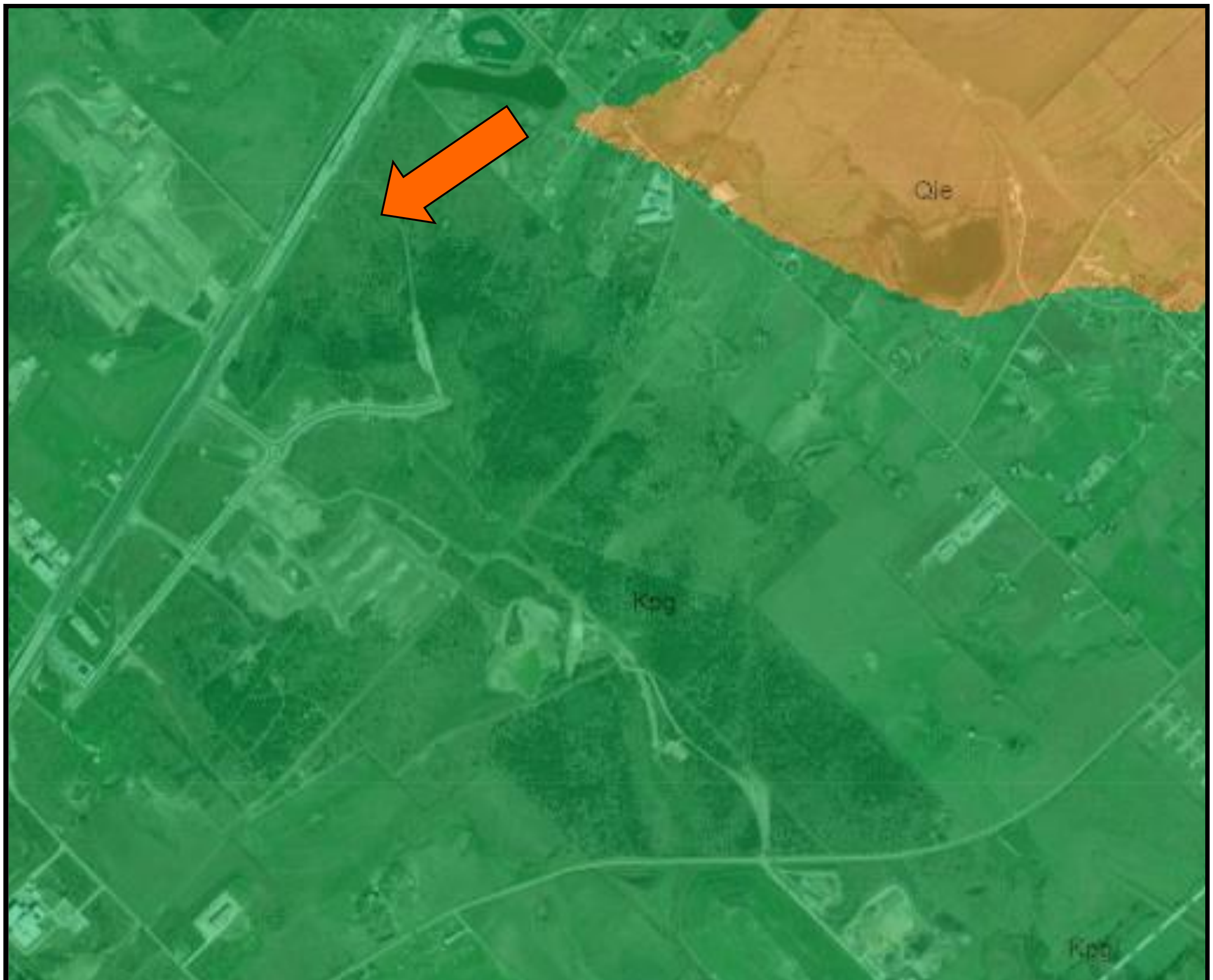


Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	**Vicinity Map**	
	InTEC Project Number: **S251748**	Date: 05/20/2025



Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	**Aerial Map—Approximate Location**	
	InTEC Project Number: **S251748**	Date: 05/20/2025

Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	**Topographic Map—Approximate Location**	
	InTEC Project Number: **S251748**	Date: 05/20/2025



Kpg—Pecan Gap Chalk

chalk and chalky marl, more calcareous westward, very light yellow to yellowish brown, weathers to form moderately deep soil, seldom exposed; Exogyra ponderosa common; thickness 100-400 feet, thins westward to eastern Medina County where it is overlain by Anacacho Limestone, beyond this point included with Austin Chalk

Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	**Geologic Map—Approximate Location**	
	InTEC Project Number: **S251748**	Date: 05/20/2025

Comal and Hays Counties, Texas

Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
FeF4—Ferris clay, 5 to 20 percent slopes, severely eroded														
Ferris, severely eroded	85	D	0-12	Clay	CH	A-7-6	0- 0- 0	0- 0- 0	92-96-100	92-96-100	75-88-100	75-88-100	51-64 -76	35-45-55
			12-35	Clay, silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	92-96-100	92-96-100	75-88-100	72-86-100	51-65 -78	35-46-56
			35-60	Clay, silty clay	CH	A-7-6	0- 0- 0	0- 0- 0	92-96-100	92-96-100	85-93-100	75-88-100	61-81 -100	42-59-75

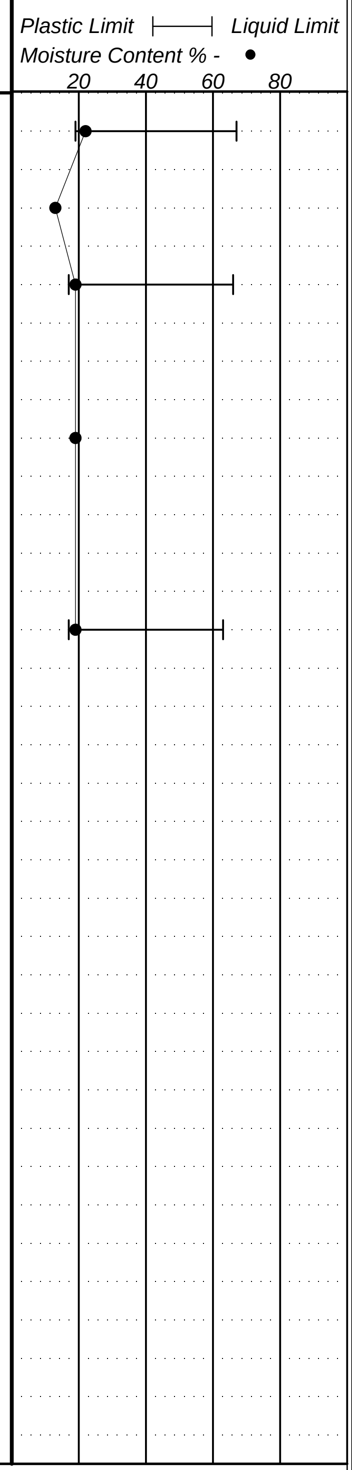
Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	**Soil Map—Approximate Location**	
	InTEC Project Number: **S251748**	Date: 05/20/2025

Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	**Approximate Boring Locations**	
	InTEC Project Number: **S251748**	Date: 05/20/2025

PROJECT: Mayfair Parkway Detention Basin **PROJECT NO: S251748**
LOCATION: New Braunfels, Texas **DATE:** 06/02/2025
CLIENT: Southstar Communities

BORING NO. B-1

DEPTH (feet)	SYMBOL	SAMPLES	SOIL DESCRIPTION	% MINUS 200 SIEVE	UNIT DRY WT IN PCF	S.S. BY P.P	BLOWS PER FOOT	SHEAR STRENGTH TSF	LIQUID LIMIT	PLASTICITY INDEX
0			Brown Clay							
		SS					08		67	48
			Tan and Gray Clay							
		SS					21			
5		SS					36		66	49
		AU								
10										
		AU							63	46
15										
20										
25										
30										
35										



Notes:

Ground Water Observed: No

Completion Depth (ft): 15

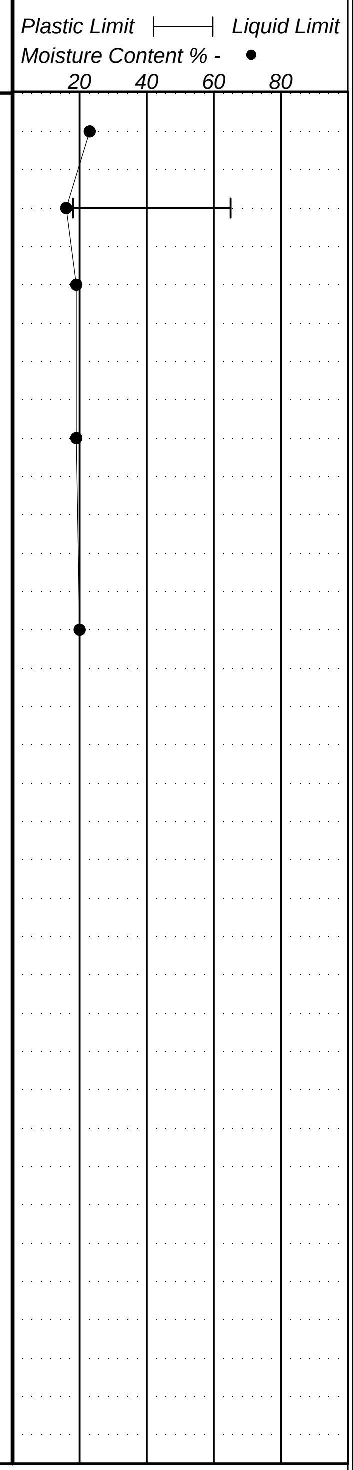
S.S by P.P - Shear Strength in TSF by Hand Penetrometer
S.S. - Split Spoon Sample
S.T. - Shelby Tube Sample
HA - Hand Auger
AU - Auger Sample

PROJECT: Mayfair Parkway Detention Basin
LOCATION: New Braunfels, Texas
CLIENT: Southstar Communities

PROJECT NO: S251748
DATE: 06/02/2025

BORING NO. B-2

DEPTH (feet)	SYMBOL	SAMPLES	SOIL DESCRIPTION	% MINUS 200 SIEVE	UNIT DRY WT IN PCF	S.S. BY P.P	BLOWS PER FOOT	SHEAR STRENGTH TSF	LIQUID LIMIT	PLASTICITY INDEX
0		SS	Dark Gray Clay				07			
		SS	Tan and Gray Clay				16		65	47
5		SS					24			
10		AU								
15		AU								
20										
25										
30										
35										



Notes:

Ground Water Observed: No

Completion Depth (ft): 15

S.S by P.P - Shear Strength in TSF by Hand Penetrometer
S.S. - Split Spoon Sample
S.T. - Shelby Tube Sample
HA - Hand Auger
AU - Auger Sample

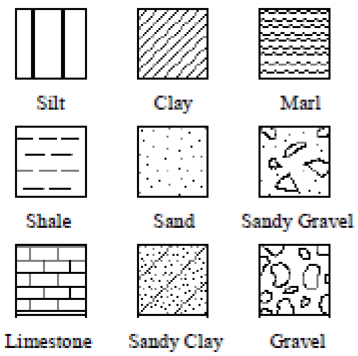
KEY TO CLASSIFICATIONS AND SYMBOLS

Soil Fractions

Component	Size Range
Boulders	Greater than 12"
Cobbles	3" - 12"
Gravel	3" - #4 (4.76mm)
Coarse	3" - ¾"
Fine	¾" - #4
Sand	#4 - #200 (0.074mm)
Coarse	#4 - #10 (2.00mm)
Medium	#10 - #40 (0.42mm)
Fine	#40 - #200 (0.074mm)
Silt and Clay	Less than #200

Soil or Rock Types

(Shown in symbols column)
(Predominate Soil Types Shown Heavy)



TERMS DESCRIBING SOIL CONSISTENCY

Description (Cohesive Soils)	Unconfined Compression TSF	Blows/Ft. Std. Penetration Test	Description (Cohesionless Soils	Blows/Ft. Std. Penetration Tests
Very Soft	0.25	<2	Very Loose	0 – 4
Soft	0.25 – 0.50	2 – 4	Loose	4 – 10
Firm	0.50 – 1.00	4 – 8	Medium Dense	10 – 30
Stiff	1.00 – 2.00	8 – 15	Dense	30 – 50
Very Stiff	2.00 – 4.00	15 – 30	Very Dense	50
Hard	>4.00	>30		

SOIL STRUCTURE

Calcareous	Containing deposits of calcium carbonate; generally nodular.
Slickenside	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.
Jointed	Consisting of hair cracks that fall apart as soon as the confining pressure is removed.
Varved	Consisting of alternate thin layers of sand, silt or clay formed by variations in sedimentations during the various seasons of the year, of often exhibiting contrasting colors when partially dried. Each layer is generally less than ½" in thickness.
Stratified	Composed of, or arranged in layers (usually 1 inch or more)
Well-graded	Having a wide range of grain sizes and substantial amount of all intermediate particle sizes.
Poorly or Gap-graded	Having a range of sizes with some intermediate sizes missing.
Uniformly-graded	Predominantly of one grain size.

Appendix

Subsurface Exploration & Berm Recommendations Mayfair Parkway Detention Basin New Braunfels, Texas	InTEC Project Number: **S251748**	Date: 05/20/2025

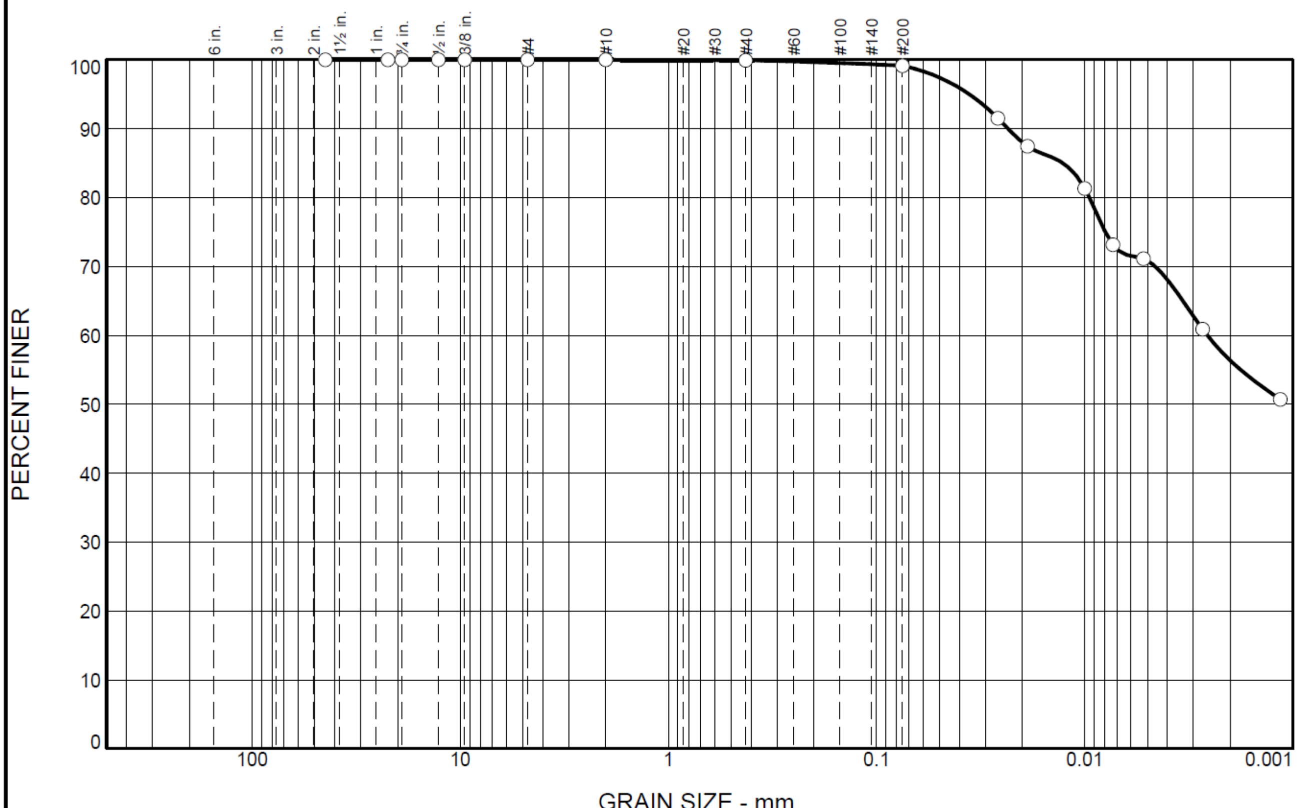
Appendix A: Soil Samples Photographs

Geotechnical Bore B-1

Geotechnical Bore B-2

Appendix B: Grain Size Distribution Curves of Selected Soil Samples

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	0.7	28.3	70.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1-3/4	100.0		
7/8	100.0		
3/4	100.0		
1/2	100.0		
3/8	100.0		
#4	100.0		
#10	100.0		
#40	99.9		
#200	99.2		

* (no specification provided)

Material Description

Atterberg Limits

PL= 18 LL= 65 PI= 47

Coefficients

D_{90}= 0.0233 D_{85}= 0.0127 D_{60}= 0.0026
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(52)

Remarks

Source of Sample: B-2 **Depth:** 2
Sample Number: 2 **Date:**

Client: Southstar Communities
Project: Mayfair Parkway Detention Basin
Project No: S251748 **Figure**

Appendix C: Permeability of Clay Soils

Client:	Southstar Communities	
Project Name:	Mayfair Pkwy Detention Basin	
Project #:	S251748	
Project Location:	New Braunfels, Texas	
Start Date:	06/04/2025	Tested By: Jinhu S.
End date:	06/09/2025	Checked By: Vinh L
Boring	B-2	Test #: K-1
Sample ID #:		
Depth:	@ 2'-4'	
Visual Description:		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Sample type: Split-spoon (SS). Permeant Fluid: de-aired tap water.
Orientation: Vertical Cell #: C1
Sample Preparation: trimmed from the SS sample, moisture content 12.9%.

Parameter	Initial	Final
Hight, in	1.51	1.59
Diameter, in	1.39	1.46
Area, in^2	1.51	1.68
Volume, in^3	2.3	2.7
Mass, g	78.91	85.13
Bulk Density, pcf	132	122
Moisture Content, %	12.9	23.3
Dry Density, pcf	117	99
Degree of Saturation, %	---	0.91

PERMEABILITY AT 20 °C: 5.6 $\times 10^{-9}$ cm/sec (@ 5 psi effective stress)

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:
- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:
- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

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