



**Integrated Testing and Engineering Company of San Antonio, L.P.**  
Geotechnical & Environmental Engineering • Construction Services • Geologic Assessment

June 16, 2025

**HDC HWY 211, LLC**

100 NE Loop 410, Suite 1080

San Antonio, Texas 78216

Attention: **Mr. L. Michael Cox**

Re: Subsurface Exploration and Pavement Analysis

Proposed New Streets

**Briggs Ranch East, Phase 1, Unit 2 Collector**

San Antonio, Texas

**InTEC Project No. S251074-A2**

Ladies & Gentlemen:

Integrated Testing and Engineering Company of San Antonio (InTEC) has completed a subsurface exploration and pavement thickness evaluation report (InTEC Project No. S251074 dated March 28, 2025) at the above referenced project site. As requested, commercial driveway (entry / exit) pavement sections are presented in this addendum. All other recommendations remain the same as in the original report.

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 or answer any questions, please call us.

Sincerely,

**InTEC of San Antonio**

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

Vice President



06/26/2025

**Table No. 1 – Commercial Driveway (Entry / Exit) – Asphalt Section**

Street Classification	Asphaltic Concrete			Aggregate Base, Inches	Geogrid	Stabilized Subgrade, Inches	Structural Number
	Type D, inches	Type C, inches	Type B, inches				
Collector	-	3.00	10.00	-	No	8"	5.36

**Table No. 2 – Commercial Driveway (Entry / Exit) – Concrete Section**

	Thickness, Inches
Reinforced Concrete (inches)	10
Stabilized Subgrade (inches)	8

Design Notes:

- The results of our laboratory testing and engineering evaluation indicate that the underlying shallow clays are **moderately plastic to highly plastic in character**. Potential vertical movement on the order of **2 ½ to 5 inches** is estimated at existing grade elevation.
- Cut and fill information is not available at this time. Anticipated potential vertical movements and recommended pavement sections should be re-evaluated after cut and fill information is made available. Final Subgrade Plasticity Index values greater than 20 are anticipated.
- Pavement section recommendations are based on the design CBR value of 2.0 and the input parameters. The pavement can experience cracking and deformation due to shrinkage and swelling characteristics of the soils as described in the *Vertical Movements* section of this report.
- As requested, Collector type street recommendations are presented.
- Input parameters are shown in Table No. 3 (Summary Table A). Please call us to provide pavement recommendations, if needed, for different input values.
- If repetitive truck or heavy truck traffic is anticipated, please contact us for revised pavement recommendations.

Subgrade Notes:

- Based on the thickness of the clays encountered in the borings, we anticipate the final pavement subgrade Plasticity Index value to be greater than 20 or less than or equal to 20.
- Cut and fill information is not available at this time. Fill used to raise the grade:
  - approved fill material free should have a minimum CBR value of 2.0 and a maximum Plasticity Index value of 50. Lime application rates should be re-evaluated and tested for sulfate content prior to use of the fill material.
  - The fill material should be approved by the geotechnical engineer, free of deleterious material, and the gravel size should not exceed 3 inches in size. The material should be placed and compacted as per applicable city / county guidelines.

- The subgrade, prior to placement of fill, should be proof rolled to identify weak areas. Any identified weak areas should be recompacted.
- If the final pavement subgrade is within Stratum II, calcareous clay or marl (plasticity index values less than equal to 20), then subgrade stabilization is not needed. The final pavement subgrade plasticity index value should be tested at the time of construction.
- Recommend stabilizing 8 inches of subgrade soils.
  - The subgrade soils should be tested for soil sulfate content prior to stabilization. If the soil sulfate content is higher than 3000 ppm an alternate / modified procedure will be needed.
  - Lime or cement may be used to stabilize the subgrade.
    - An application rate of 7 percent lime is recommended. Application rate of cement, if needed, should be determined at the time of construction.
    - Lime application rate of **42.0 lbs per sq yard for 8-inch depth** of stabilization is recommended.
    - Stabilization should meet Bexar County stabilization guidelines (such as Unconfined compressive strength value of 160 psi for lime application).
    - Cement application rate, if needed, should be determined at the time of construction.
- **If final pavement subgrade consists of marl and the subgrade Plasticity Index values are less than or equal to 20, subgrade stabilization is not needed.**

#### General Notes:

- Significant pavement distress has been observed during construction phase with the combination of construction traffic and irrigation water / rain water getting underneath the asphalt.
- If water is allowed to get underneath the asphalt or if moisture content of the base or subgrade soil changes significantly, then pavement distress will occur.
  - Minimizing moisture penetration underneath the asphalt will lower the chances of pavement distress.
  - Significant pavement distress, more often caused by water getting underneath the asphalt, is noted during home construction.
  - Aggregate base extending beyond the back of the curb increases the likelihood of water getting underneath the asphalt. Moisture penetration may be reduced by using a deeper curb, such as curb extending a minimum of 6 inches into subgrade or compacted clays backfilled against the curbs.
  - In addition, water should not be allowed to get underneath the pavement section at the time of home construction.

#### Geogrid:

- One layer of geogrid, Tensar Triax 130 or better (Bexar County), installed on top of compacted (stabilized) subgrade as per manufacturer's guidelines.

#### Aggregate Base:

- TxDOT Item 247 A1-2 aggregate base is recommended. The lift thickness and the compaction should follow all applicable city / county guidelines.

#### Asphalt:

- The asphalt material and installation should follow all applicable city / county guidelines.

#### Subgrade Verification:

- At the time of construction, the final pavement subgrade should be observed / verified by a representative of InTEC.

### **Reinforced Concrete**

Concrete material and installation should follow City of San Antonio Standard Construction Guidelines. At a minimum, 28-day compressive strength value of 4,000 psi recommended.

### **Concrete Pavement**

Concrete pavement slabs should be provided with adequate steel reinforcement. Proper finishing of concrete pavements requires the use of sawed and sealed joints which should be designed in accordance with current Portland Cement Association guidelines. Dowel bars should be used to transfer loads at transverse joints. Related civil design factors such as drainage, cross-sectional configurations, surface elevations and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required, especially for open jointed areas which may allow surface water infiltration into the subgrade.

**Table No. 3 – Concrete Pavement Reinforcement**

<b>Reinforcement:</b>	#3 reinforcing steel bars (grade 60) at 12 inches on center each way for 8 inch thick concrete
<b>Contraction joint spacing:</b>	15 feet each way for 8 inch thick concrete The saw cuts should be planned based on features such as inlets, manholes, valves, etc. The saw cuts are recommended to be made the same day.
<b>Contraction joint depth:</b>	At least one-fourth ( $\frac{1}{4}$ ) of pavement thickness
<b>Contraction joint width:</b>	One-fourth ( $\frac{1}{4}$ ) inch or as required by joint sealant manufacturer
<b>Expansion joint:</b>	Expansion joints are not recommended
<b>Isolation joint:</b>	Features such as concrete inlet structures, man-holes, and valve covers should be isolated using isolation joints.

### **Perimeter Drainage**

**It is important that proper perimeter drainage be provided so that infiltration of surface water from compacted areas surrounding the pavement is minimized, or if this is not possible, curbs should extend through the base and into the subgrade.** A crack sealant compatible to both asphalt and concrete should be installed at the concrete-asphalt interfaces.

The surface water may infiltrate from the compacted areas surrounding the pavement. These areas should be sloped away from the pavement areas and should be grass or concrete covered or riprapped. If a berm is provided before the sloped area, the berm should be sloped at least 1V to 8H. The sloped areas may be as steep as 1V to 3H. The sloped area will provide for drainage of the surface water away from the pavement areas.

## Calculations

**CBR = 2.0**

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## Design Parameters for AASHTO (1993) Equation

Reliability (%)	- 90	Initial Serviceability	- 4.2
Standard Normal Deviate	- -1.282	Terminal Serviceability	- 2.5
Standard Deviation	- 0.45	Change In Serviceability	- 1.7

Aggregate fill shall conform to following requirement:

D50 ≤ 27mm (Base course)

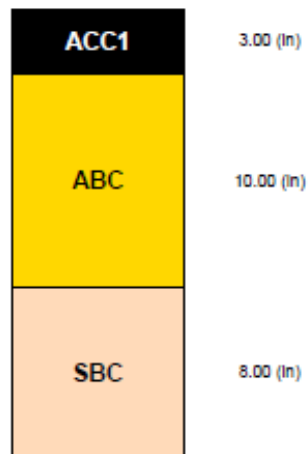
## Unstabilized Section Material Properties

Layer	Description	Cost (\$/ton)	Layer coefficient	Drainage factor
ACC1	Asphalt Wearing Course	70	0.440	N/A
ABC	Aggregate Base Course	20	0.340	1.0
SBC	Subbase Course	16	0.080	1.0

## Stabilized Section Material Properties

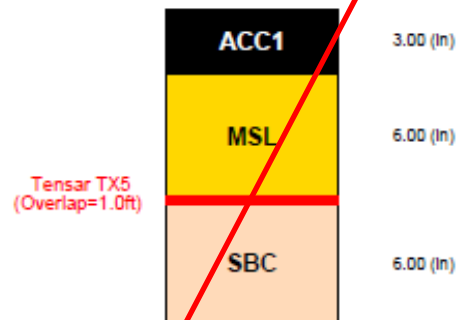
Layer	Description	Cost (\$/ton)	Layer coefficient	Drainage factor
ACC1	Asphalt Wearing Course	70	0.420	N/A
MSL	Mechanically Stabilized Base Course	20	0.265	1.0
SBC	Subbase Course	16	0.080	1.0

### Unstabilized Pavement



Subgrade Modulus = 3,000 (psi)  
Structural Number = 5.360  
Calculated Traffic (ESALs) = 2,073,000

### Stabilized Pavement



Subgrade Modulus = 3,000 (psi)  
Structural Number = 3.330  
Calculated Traffic (ESALs) = 92,000

## LIMITATIONS OF THE REPORT

The designs, illustrations, information and other content included in this report are necessarily general and conceptual in nature, and do not constitute engineering advice or any design intended for actual construction. Specific design recommendations can be provided as the project develops.

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# WinPAS

Pavement Thickness Design According to  
**1993 AASHTO Guide for Design of Pavements Structures**  
American Concrete Pavement Association

## Rigid Pavement Design/Evaluation

Concrete Thickness	9.77 inches	Load Transfer Coefficient	4.20
Total Rigid ESALs	3,000,000	Modulus of Subgrade Reaction	250 psi/in.
Reliability	90.00 percent	Drainage Coefficient	1.00
Overall Standard Deviation	0.35	Initial Serviceability	4.50
Flexural Strength	600 psi	Terminal Serviceability	2.50
Modulus of Elasticity	4,000,000 psi		

### Modulus of Subgrade Reaction (k-value) Determination

Resilient Modulus of the Subgrade	0.0
Unadjusted Modulus of Subgrade Reaction	0
Depth to Rigid Foundation	0.00
Loss of Support Value (0,1,2,3)	0.0

Modulus of Subgrade Reaction	250 psi/in.
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### Concrete Section

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## Appendix

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# 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 site-wide 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 not 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 Not 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 not 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 not building-envelope or mold specialists.*



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