

**GEOTECHNICAL
ENGINEERING STUDY**

**CLEARWATER CREEK SUBDIVISION
BEXAR COUNTY, TEXAS
LOCAL "B" & COLLECTOR
PAVEMENT DESIGN**

FROST GEOSCIENCES, INC. PROJECT NO.: FGS-G 20020-S2

REVISED

FEBRUARY 7, 2022

Prepared Exclusively for:

**Mr. Allen Hoover
Mosaic Land Development
6812 West Avenue, Suite 100
San Antonio, Texas 78213**

The logo for Frost GeoSciences features a large, dark blue, stylized 'C' or swoosh shape that frames the text. The text 'Frost GeoSciences' is in a bold, italicized, sans-serif font. Below it, a horizontal line separates the company name from the list of services: 'Construction Materials • Forensics', 'Environmental • Geotechnical'.

Frost GeoSciences
Construction Materials • Forensics
Environmental • Geotechnical



Frost GeoSciences

Frost Geosciences, Inc.
13406 Western Oak
Helotes, Texas 78023
Office (210)-372-1315
Fax (210)-372-1318

www.frostgeosciences.com

TBPE Firm Registration # F-9227
TBPG Firm Registration # 50040

February 7, 2022

Mr. Allen Hoover
Mosiatic Land Development
6812 West Avenue, Suite # 100
San Antonio, Texas 78213

SUBJECT:

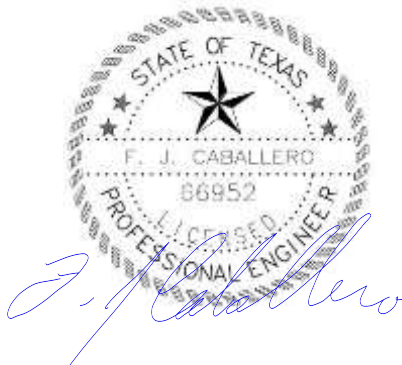
Clearwater Creek Subdivision
San Antonio, Texas
FGS Project No: FGS-G20020-S2

Dear Mr. Hoover;

Attached are the revised flexible pavement designs for a Local "B" and Collector type street having a CBR value of 2.0 for the Clearwater Creek Subdivision. These designs meet ALL of the Bexar County Paving Design Criteria.

We appreciate the opportunity to be of service to you in this phase of your project and future projects. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
Frost GeoSciences, Inc.



F. J. Caballero, P.E.
Project Engineer

JOT – FGS-G20020-S2

Copies Submitted:

- i. One (1) Electronic: Mr. Allen Hoover, Mosiatic Land Development, San Antonio, Texas
- ii. One (1) Electronic: Mr. Michael Richards, P. E., KFW Engineers

FGS Project No.: FGS-G20020-S2

In accordance with Bexar County design parameters we have developed the following flexible pavement recommendations for **LOCAL "B" Streets** on a Clay subgrade with a CBR value of 2.0.

COMPONENT	FLEXIBLE DESIGN SECTION (inches)			
	Local "B" Streets			
	Option # 1	Option # 2	Option # 3	Option # 4
Type D HMAC Surface	3.0 inches	3.0 inches	4.5 inches	3.0 inches
Type B HMAC Base	6.0 inches	6.0 inches	NO	NO
Flexible Base, (Type B, Grade 2), Pit Run	8.0 inches	8.0 inches	18 inches	16.75 inches
Lime Treated Subgrade (6 inch Min.)	YES	YES	YES	YES
TENSAR GEOGRID (TX-5)	NO	YES	NO	YES
Design ESAL Value	2,000,000	2,000,000	2,000,000	2,000,000
Actual ESAL Value	2,840,600	8,344,400	2,055,500	2,012,100

In accordance with Bexar County design parameters we have developed the following flexible pavement recommendations for **Collector Streets** on a Clay subgrade with a CBR value of 2.0.

COMPONENT	FLEXIBLE DESIGN SECTION (inches)			
	COLLECTOR STREETS			
	Option # 1	Option # 2	Option # 3	Option # 4
Type D HMAC Surface	3.0 inches	3.0 inches	5.5 inches	3.5 inches
Type B HMAC Base	6.0 inches	6.0 inches	NO	NO
Flexible Base, (Type B, Grade 2), Pit Run	9.00 inches	8.0 inches	18 inches	18 inches
Lime Treated Subgrade (6 inch Min.)	YES	YES	YES	YES
TENSAR GEOGRID (TX-5)	NO	YES	NO	YES
Design ESAL Value	2,000,000	2,000,000	2,000,000	2,000,000
Actual ESAL Value	2,018,200	4,678,000	2,247,400	2,095,800

Parameters

Project Information

Subgrade resilient modulus	Target ESALs	Reliability	Standard deviation	Serviceability	
				Initial	Terminal
3,000 psi	2,000,000	90%	0.45	4.2	2

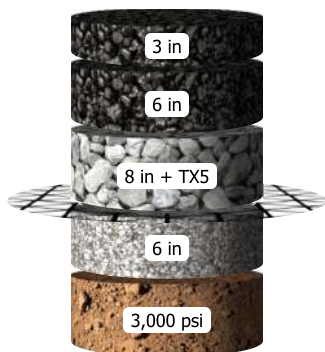
Results

TriAx Stabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	3 in	0.440	1.320
HMA layer 2	6 in	0.380	2.280
Mechanically stabilized layer	8 in	0.238	1.904
Subbase	6 in	0.080	0.480
Structural number (SN)	5.984		
Calculated traffic (ESALs)	8,344,400		

Unstabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	3 in	0.440	1.320
HMA layer 2	6 in	0.380	2.280
Aggregate base	8 in	0.140	1.120
Subbase	6 in	0.080	0.480
Structural number (SN)	5.200		
Calculated traffic (ESALs)	2,840,600		



Limitations of this Report

The designs, illustration, 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.

Design	O2-04-2022, Revised, local "B", BLACK BASE	Project	CLEARWATER CREEK
Company	FROST GEOSCIENCES, Inc.	Location	Bexar County, TX, USA
Designer	FLORENTINO CABALLERO, P. E.	Date	2/4/2022



Pavement Optimization Design Analysis

Parameters

Project Information

Subgrade resilient modulus	Target ESALs	Reliability	Standard deviation	Serviceability	
				Initial	Terminal
3,000 psi	2,000,000	90%	0.45	4.2	2.5

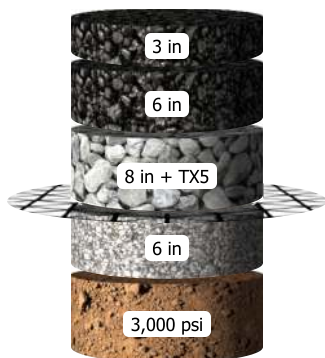
Results

TriAx Stabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	3 in	0.440	1.320
HMA layer 2	6 in	0.380	2.280
Mechanically stabilized layer	8 in	0.238	1.904
Subbase	6 in	0.080	0.480
Structural number (SN)	5.984		
Calculated traffic (ESALs)	4,678,000		

Unstabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	3 in	0.440	1.320
HMA layer 2	6 in	0.380	2.280
Aggregate base	9 in	0.140	1.260
Subbase	6 in	0.080	0.480
Structural number (SN)	5.340		
Calculated traffic (ESALs)	2,018,200		



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Design	01-04-2022, Revised, Collector, BLACK BASE	Project	CLEARWATER CREEK
Company	FROST GEOSCIENCES, Inc.	Location	Bexar County, TX, USA
Designer	FLORENTINO CABALLERO, P. E.	Date	2/4/2022

Parameters

Project Information

Subgrade resilient modulus	Target ESALs	Reliability	Standard deviation	Serviceability	
				Initial	Terminal
3,000 psi	2,000,000	90%	0.45	4.2	2

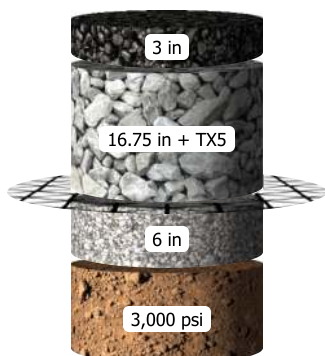
Results

TriAx Stabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	3 in	0.440	1.320
Mechanically stabilized layer	16.75 in	0.189	3.166
Subbase	6 in	0.080	0.480
Structural number (SN)			4.966
Calculated traffic (ESALs)			2,012,100

Unstabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	4.5 in	0.440	1.980
Aggregate base	18 in	0.140	2.520
Subbase	6 in	0.080	0.480
Structural number (SN)			4.980
Calculated traffic (ESALs)			2,055,500



Limitations of this Report

The designs, illustration, 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.

Design	O2-07-2022, Revised, local "B", ALL ASPHALT	Project	CLEARWATER CREEK
Company	FROST GEOSCIENCES, Inc.	Location	Bexar County, TX, USA
Designer	FLORENTINO CABALLERO, P. E.	Date	2/7/2022

Parameters

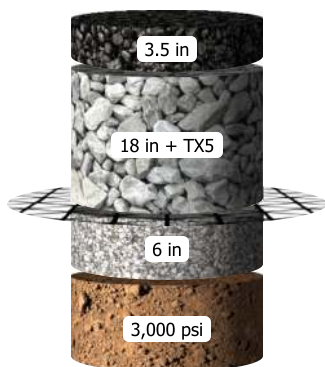
Project Information

Subgrade resilient modulus	Target ESALs	Reliability	Standard deviation	Serviceability	
				Initial	Terminal
3,000 psi	2,000,000	90%	0.45	4.2	2.5

Results

TriAx Stabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	3.5 in	0.440	1.540
Mechanically stabilized layer	18 in	0.186	3.348
Subbase	6 in	0.080	0.480
Structural number (SN)	5.368		
Calculated traffic (ESALs)	2,095,800		



Unstabilized Pavement Section

	Thickness	Coeff.	SN
HMA layer 1	5.5 in	0.440	2.420
Aggregate base	18 in	0.140	2.520
Subbase	6 in	0.080	0.480
Structural number (SN)	5.420		
Calculated traffic (ESALs)	2,247,400		



Limitations of this Report

The designs, illustration, 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.

Design	O1-07-2022, Revised, Collector, ALL ASPHALT	Project	CLEARWATER CREEK
Company	FROST GEOSCIENCES, Inc.	Location	Bexar County, TX, USA
Designer	FLORENTINO CABALLERO, P. E.	Date	2/7/2022