REPORT OF

PAVEMENT DESIGN

HERON VALLEY II SUBDIVISION
8880 HEATH CIRCLE DRIVE
SAN ANTONIO, TEXAS
BEA PROJECT NO. 12-22-0015

FOR

HYG HOMES, LLC
84 NE LOOP 410, SUITE 242
SAN ANTONIO, TEXAS 78216

JANUARY 27, 2023

BURGE ENGINEERING & ASSOCIATES
Geotechnical Engineering • Environmental • Testing

January 27, 2023

Mr. Carlos Eduardo Garza Herrera
HYG Homes, LLC
84 NE Loop 410, Suite 242
San Antonio, Texas 78216

RE: Pavement Design
Heron Valley II Subdivision
8880 Heath Circle Drive
San Antonio, Texas
BEA Project No. 12-22-0015

Dear Mr. Herrera:

Burge Engineering & Associates (BEA) has completed the subsurface exploration and geotechnical engineering analysis for the above-referenced project, in accordance with BEA Proposal No. P12-21-306R, revised December 6, 2022. Our report, which includes the results of our subsurface exploration program, laboratory testing program, and geotechnical engineering analysis, is enclosed with this letter.

Based on the results of the field exploration and laboratory testing programs, the site is considered suitable for the proposed construction, provided that the recommendations enclosed in this report are followed.

We appreciate the opportunity to be of service to you during the design phase of this project. We look forward to continuing our involvement with this project during the construction phase by providing construction materials testing services. If you have any questions regarding the information contained in this report or if we can be of further assistance to you, please feel free to contact us.

Respectfully submitted,
BURGE ENGINEERING & ASSOCIATES
Texas Registered Engineering Firm F-7740
Geotechnical Engineering Services

1/27/23

STATE OF TEXAS
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Mr. Alejandro Gómez, P.E. (Email)

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PROJECT OVERVIEW

Project Location

This report presents the results of our subsurface exploration and engineering analysis for Heron Valley II Subdivision located at 8880 Heath Circle Drive in San Antonio, Texas. The approximate site location is shown on the *Site Vicinity Map* provided in the Appendix.

Scope of Work

The conclusions and recommendations contained in this report are based on our site visits to the project site and on the soil samples gathered from five (5) borings (B-01 through B-05) performed by BEA on January 10, 2023. The borings were drilled within the proposed street alignments and extended to an approximate termination depth of 10 feet below the existing ground elevations. In addition to the boreholes, a bulk composite sample of the predominant subgrade material was collected from the top 24 inches near Borings B-01 and B-02, as identified in *Figure 2 – Boring Location Plan*. This bulk composite sample was used to perform the California Bearing Ratio analysis and our lime series laboratory testing.

Proposed Construction

Based on information provided to us, the project consists of the design and construction of city streets and installation of primary utilities for the development. This phase of the project does not include providing recommendations for future residential structures. The total length of the proposed roadways are approximately 1,500 lineal feet. We anticipate that the new streets will be classified as *Local Type "A" Residential Street without Bus Traffic* and *Local Type "A" Residential Street with Bus Traffic*.

The *Boring Location Plan* was developed from the *Plat No. 22-11800386* prepared by Gomez-Garcia and Associates, Inc., dated April 21, 2022. Detailed elevations were not provided to us, so ground elevations are not noted on the boring logs. The borings were located in the field using pacing/taping procedures from existing landmarks identified on the available drawing.

Purposes of Exploration

The purposes of this study were to explore the subsurface soil/bedrock and groundwater conditions at the site and to develop engineering recommendations to guide design and construction of the proposed streets. We accomplished these purposes by:

1. reviewing available geologic and soil survey maps of the project area,
2. drilling five (5) boreholes to explore the subsurface soil/bedrock and groundwater conditions,
3. performing laboratory tests on selected representative soil/bedrock samples from the borings and bulk sample to evaluate pertinent engineering properties, and

4. analyzing the field and laboratory data to develop appropriate engineering recommendations.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil/bedrock borings conducted as part of BEA's field exploration program were performed with a standard, truck-mounted drill rig, which utilized continuous, solid-stem flight augers to advance the boreholes. No drilling fluid was utilized during drilling operations. Upon completion of the borings, the boreholes were backfilled with spoils generated during the drilling process.

Representative samples of the subsurface soil were obtained employing split-spoon sampling procedures in general accordance with ASTM D-1586. The split-spoon sampler collects relatively disturbed samples at selected depths in the borings with the split-spoon sampler by driving a standard two (2) inch outer diameter split-spoon sampler 18 inches into the subsurface material using a 140 pound hammer falling 30 inches. The number of blows required to drive the split-spoon sampler the final 12 inches of penetration (N-value) is recorded in the "SPT N-value" column of the boring logs. Where limited sample was recovered or rock was encountered, grab samples were collected directly of the cuttings.

The drilling crew maintained field logs of the soil/bedrock and groundwater conditions encountered in the borings. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample were then placed into plastic bags that were sealed and delivered to our laboratory for further visual examination and testing.

Laboratory Testing Program

Representative soil/bedrock samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications, moisture contents, Atterberg Limits, sieve analyses, California Bearing Ratio (CBR), lime series analysis, and a soluble sulfate test. Visual classifications conducted in the laboratory were performed by a licensed professional engineer. All data obtained from the laboratory tests are included on the respective boring logs or as separate attachments in the Appendix.

Each soil sample was classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). A brief explanation of the USCS is included with this report. The various soil types were grouped into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual.

The soil samples will be retained in our laboratory for a period of 30 days, after which, they will be discarded unless other instructions are received by the client.

EXPLORATION RESULTS

Site Conditions

At the time of our field program, the subject property was improved with a single-family residence. The proposed street alignments had recently been cleared of vegetation and there were cobbles/boulders on the surface in some areas. The remaining property was vegetated with native grasses and trees. The property has good drainage that slopes down to the south and southeast. The surrounding properties include residential development, an elementary school, and undeveloped properties.

Regional Geology and Soil Survey

According to the Bureau of Economic Geology at The University of Texas at Austin, San Antonio Sheet, the proposed site is located in the Austin Chalk, Kau. This Upper Cretaceous Age formation consists of alternating layers of chalk and marl. The chalk is grayish white to white and averages about 85 percent calcium carbonate. The marl is medium gray with bentonitic seams locally. Thickness is about 350 to 580 feet.

The Soil Survey of Bexar County, Texas published by the United States Department of Agriculture, National Cooperative Soil Survey, indicates that the shallow soils in the general vicinity of the site are classified as a combination of Patrick Series, 1 to 3 percent slopes (PaB) and the Tarrant Association, gently undulating, 1 to 5 percent slopes (TaB). The following paragraphs describe each of these soils series:

- **Patrick Series** - These soils consist of shallow, dark-colored nearly level and gently sloping soils. These soils occur as terraces along streams that drain the limestone prairies of the county. The surface layer is very dark grayish-brown to dark-brown, calcareous clay loam about 12 inches thick. It has strong, granular structure. The subsurface is brown, calcareous, granular clay loam. It is about 5 inches thick. The substratum consists of waterworn, lime-coated limestone gravel. Patrick Soils have slow to rapid surface drainage and medium internal drainage. Because of shallowness, they have limited capacity to hold water. Permeability is moderate.

- **Tarrant Association -** The Tarrant Series consists of stony soils that are very shallow, dark colored, and gently undulating to steep. The surface layer is very dark grayish-brown, calcareous clay loam and is about 10 inches thick. It has moderate, fine, sub-granular blocky structure. This layer is crumbly and friable when moist. Tarrant Soils have rapid surface drainage and good internal drainage. The capacity to hold water is low. Water erosion is a hazard.

Soil/Bedrock Conditions

The near surface deposits, which were studied by our field exploration program, are consistent with the local soil survey and regional geology. Based on our observations at the time of our field study, the stratigraphy of the subsurface materials at this site can generally be described as presented in the following table:

Stratum	Range in Depth (ft)	Soil Description and Classification
I	0 – 3.5	Firm to very stiff, dark grayish brown or dark brown FAT CLAY (CH)
II	0 – 10	Very stiff, reddish brown FAT CLAY (CH) or hard, orangish tan SANDY LEAN CLAY (CL) and medium dense to dense, tan CLAYEY GRAVEL WITH SAND (GC) or CLAYEY SAND WITH GRAVEL (SC) with calcareous deposits
III	0.5 – 10	Very dense, gray, light tan, or white LIMESTONE

Stratum I – This stratum was comprised of firm to very stiff, dark grayish brown or dark brown FAT CLAY (CH). An Atterberg Limits test conducted on a representative sample of this stratum indicated this soil has a Liquid Limit (LL) of 85 with a corresponding Plasticity Index (PI) of 57. Based on these measured indices, this stratum has a very high potential for large changes in volume if fluctuations in the clay's moisture content occur.

Stratum II – This stratum was comprised of very stiff, reddish brown FAT CLAY (CH) or hard, orangish tan SANDY LEAN CLAY (CL) and medium dense to dense, tan CLAYEY GRAVEL WITH SAND (GC) or CLAYEY SAND WITH GRAVEL (SC) with calcareous deposits. Atterberg Limits tests conducted on representative samples of this stratum indicated this material has LL's ranging from 37 to 63 with corresponding PI's ranging from 16 to 45. Representative samples from this stratum indicated that 28 to 45 percent, by dry weight, was retained on the No. 4 Sieve and 23 to 37 percent, by dry weight, passed the No. 200 Sieve. Based on this stratum's classification, this stratum has a moderate to very high potential for changes in volume if fluctuations in the material's moisture content occur.

Stratum III – This stratum was comprised of very dense, gray, light tan, or white LIMESTONE. **This stratum is very dense bedrock material, and will require rock excavating equipment to cut into this stratum.** Typically, blow counts of 50 blows for 2 inches or less (as noted by sampler refusal on the boring logs) is not deemed ripable and usually requires removal through milling/sawing or other removal methods. The contractor and site and utility contractors should review the boring logs, as well as the entire geotechnical report, during preparation of their bids.

Groundwater Observations

Groundwater was not encountered during drilling operations. Observations for groundwater were made during sampling and upon completion of the drilling operations. During the drilling operations, water is not introduced into the boreholes, and the groundwater position can often be determined by observing water flowing into or out of the borings. Furthermore, visual

observation of the soil samples retrieved during the drilling operations can often be used in evaluating the groundwater conditions. It should be noted that groundwater conditions can fluctuate due to seasonal and climatic variations, and should be measured (checked) prior to construction activities.

Due to the bedrock geology, it is expected that groundwater conditions will be significantly influenced by surface water runoff, especially during high precipitation seasons. In addition, perched groundwater is typically encountered at the interface of soil and bedrock during wet seasons or seepage occurs within factures of the exposed bedrock slopes.

ANALYSIS AND RECOMMENDATIONS

The following recommendations are based on the five (5) borings performed at the site, laboratory test results, and the limited design information provided to us. We recommend that if there are any changes to the project characteristics as discussed in this report, BEA should be retained to review them so it can be determined if changes to the recommendations are necessary.

It should be noted that it has been our experience that pavements constructed on expansive sites experience cracking due to the highly expansive clay soils encountered in this area. It is anticipated that longitudinal cracking should be expected with these pavements regardless of the pavement section thicknesses installed.

Pavement Design

It is our understanding that the new streets will be designed as *Local Type "A" Street without Bus Traffic* or *Local Type "A" Street with Bus Traffic*. As such, we are designing the streets using the design criteria parameters in accordance with City of San Antonio Unified Development Code. Our pavement analysis was generally based on the design procedure developed by AASHTO's *Guide for Design of Pavement Structures*, 1993. Based on the site location and proposed use, we utilized an effective pavement life of 20 years. The CBR analysis indicated that the Stratum I Fat Clay had a CBR value of 5.7 percent when compacted to 95 percent of the maximum dry density in accordance with ASTM D698. For purposes of this pavement design, we are using a CBR value of three and one-half (3-½) percent for the Stratum I Fat Clay.

It should be noted that the Stratum I Fat Clay was only encountered at the surface at Borings B-01 and B-02. Stratum II Clayey Gravel and/or Stratum III Limestone was encountered at the surface of Borings B-03 through B-05 and are estimated to have a CBR value of over 10 percent. It is anticipated that the majority of the street alignments will encounter Stratum II Clayey Gravel or Stratum III Limestone following rough grading operations. Lime-stabilization will not be required for the portion(s) of the street's subgrade that encounter Stratum II Clayey Gravel or Stratum III Limestone at the surface following rough grading operations. The Geotechnical Engineer of Record, or his representative, shall observe the subgrade conditions following rough grading operations and determine which portion(s) of the street's subgrade will not require lime-stabilization.

BEA designed the proposed streets based on a combination of our laboratory results, the CBR design value, our experience with pavement designs in similar geology, the design guidelines set forth by AASHTO, and the design parameters outlined by City of San Antonio.

The following design parameters and criteria were considered in our analyses for the Local Type "A" Street without bus traffic and for the Local Type "A" Street with bus traffic.

- Resilient Modulus: 5,250 psi for Stratum I or 15,000 psi for Stratum II/III
- Reliability: 70 percent
- Overall Standard Deviation: 0.45 for flexible pavement
- Initial Serviceability: 4.2 for flexible pavement
- Terminal Serviceability: 2.0

Local Type "A" Residential Street without Bus Traffic

The pavement section detailed in this report assumes the streets are maintained on a regular basis. A design structural number of 2.35 was calculated for the Stratum I Clay using the stated design criteria for a *Local Type "A" Street without Bus Traffic* in order to meet a minimum of 100,000 ESAL's. The following table presents two pavement sections for a *Local Type "A" Street without Bus Traffic:*

Local Type "A" Residential Street without Bus Traffic

Pavement Material	**Thickness, (in)**	**Thickness, (in)**
Type D, Hot Mix Asphaltic Concrete	1.5	2
Crushed Limestone Base Material	9	7.5
Lime-Stabilized Subgrade, Note 1	6	6
Structural Number (SN)	2.40	2.41

Note 1.) Lime-stabilization is not required if Stratum II or Stratum III is encountered at the surface following rough grading operations.

Local Type "A" Residential Street with Bus Traffic

The pavement section detailed in this report assumes the streets are maintained on a regular basis. A design structural number of 3.35 was calculated for the Stratum I Clay using the stated design criteria for a *Local Type "A" Street with Bus Traffic* in order to meet a minimum of 1,000,000 ESAL's. The following table presents three pavement sections for a *Local Type "A" Street with Bus Traffic:*

Local Type "A" Residential Street with Bus Traffic

Pavement Material	**Thickness, (in)**	**Thickness, (in)**	**Thickness, (in.)**
Type D, Hot Mix Asphaltic Concrete	2	2	2.5
Type B, Hot Mix Asphaltic Concrete	3	5.5	---
Crushed Limestone Base Material	6.5	---	13
Lime-Stabilized Subgrade, Note 1	6	6	6
Structural Number (SN)	3.41	3.45	3.40

Note 1.) Lime-stabilization is not required if Stratum II or Stratum III is encountered at the surface following rough grading operations.

The following paragraphs specify the pavement materials to be used to construct the proposed streets:

Hot Mix Asphaltic Concrete Surface Course - The asphaltic concrete surface course should be plant mixed, hot laid Type D (Fine Graded Surface Course) meeting the 2014 Texas Department of Transportation (TxDOT) specification, Item 340 and specific criteria for the job mix formula. The mix should be designed for a stability of at least 40. The asphalt cement content by percent of total mixture weight should fall within a tolerance of ± 0.3 percent asphalt cement from the specific mix design and should be compacted to between 92 and 97 percent of the maximum theoretical density as determined in accordance with ASTM D 2041. In addition, the mix should be designed so that 75 to 85 percent of the voids in the mineral aggregate (VMA) are filled with asphalt cement.

Hot Mix Asphaltic Concrete Base Course - The asphaltic concrete base course should be plant mixed, hot laid Type B (Dense Graded Base Course) meeting the 2014 Texas Department of Transportation (TxDOT) specification, Item 340 and specific criteria for the job mix formula. The mix should be designed for a stability of at least 40 and should be compacted to between 91 and 95 percent of the maximum theoretical density as determined in accordance with Tex-207-F. The asphalt cement content by percent of total mixture weight should fall within a tolerance of ± 0.3 percent asphalt cement from the specific mix design. In addition, the mix should be designed so that 75 to 85 percent of the voids in the mineral aggregate (VMA) are filled with asphalt cement.

Crushed Limestone Base - Base material should be composed of crushed limestone meeting the requirements of TxDOT Item 247, Grade 1-2, Type A. The base should be compacted to a minimum of 95 percent of the maximum dry density as determined by the moisture-density relationship in accordance with TEX-113-E at -2 to +2 percentage points of optimum moisture content.

Lime-Stabilized Subgrade – If Stratum I Fat Clay is encountered at the surface following rough grading operations, then the clay subgrade shall be stabilized with hydrated lime in accordance with TxDOT Items 260 and 264. The lime should be blended with a mixing device such as a Pulvermixer, sufficient water added, and be allowed to cure for at least 48 hours. Based on the results of our lime series tests, four (4) percent lime, by dry weight, will be required to adequately stabilize the subgrade soils at this site. This is approximately 18 pounds per square yard for a six (6) inch deep treatment for the subgrade soils. After curing, the lime-soil blend should be remixed and compacted to at least 95 percent of the maximum dry density as determined in accordance with either ASTM D698 or TEX-114-E at moisture contents ranging from 0 to +4 percentage points of optimum moisture content. The elapse of time after mixing of the lime and soil has an effect on the maximum dry density, which decreases with time. For any mixture older than three (3) days, a new moisture-density relationship is required.

Compacted Subgrade – If Stratum II Clayey Gravel or Stratum III Limestone is encountered following rough grading operations, then the subgrade shall be proof-rolled with equipment weighing at least 20 tons and observed by the Geotechnical Engineer or his representative.

If our assumptions or the traffic loading conditions do not meet the intended use or if further information comes available, we would be happy to provide further design recommendations.

Soluble sulfate testing was conducted on a composite soil sample collected at Borings B-1 and B-2 from a depth of 6 to 24 inches. The sample had a soluble sulfate concentration of 95.8 mg/Kg. Based on the National Lime Association's *Lime-Treated Soil Construction Manual* (January 2004), sulfate concentrations less than 3,000 ppm are unlikely to cause problems when soils are stabilized with lime. Therefore, lime-stabilization is a viable alternative for the existing Stratum I clay subgrade soils.

Proper perimeter drainage in and around pavement sections is very important, and should be provided so that infiltration of surface water from unpaved areas surrounding the pavement areas is minimized. We do not recommend installation of landscape beds or islands in the pavement. Such features provide an avenue for water to enter into the pavement section and the underlying subgrade soil. In addition, any existing trees or landscaping along the pavement shoulder will affect the moisture levels of the clay subgrade soils. Water moisture fluctuations usually results in degradation of the pavement section with time, especially where vehicular traffic traverses areas of moisture infiltration. In addition, any concrete curb and gutter installed will be affected by these moisture fluctuations.

To help reduce migration of groundwater into the pavement base course from adjacent areas, the design team or owner may consider extending the curbs through the base material and at least six (6) inches into the clay subgrade, where present. A crack sealant compatible to both asphalt and concrete should be provided at all concrete-asphalt interfaces, and at all interfaces of existing/new pavement areas.

Utility Trench Recommendations

The contractor should take the necessary precautions with regard to sloping, benching, and shoring these soils on this site to maintain stability of the excavation sides and bottom. Furthermore, the contractor should evaluate the soil exposed in the excavations as part of their safety precautions. It should be noted that any trench and excavation safety recommendations presented in this report does not relieve the contractor from performing additional safety measures that are required to maintain health and safety. Furthermore, it is the contractor's sole responsibility to maintain safety at all times.

It is vital that all backfill being placed into utility trenches be moisture conditioned and compacted to a degree that meets or exceeds the compaction of the adjacent areas, so that differential settlement is minimized. Additionally, it is important that proper backfill material be used. Generally, the material that is excavated from the trenches is stockpiled on site and subsequently used as backfill material in the trenches.

Additionally, it is our recommendation that all backfill material used in the utility trenches be moisture conditioned to within three (3) percentage points of the optimum moisture content and compacted to at least **98 percent** of the maximum dry density as determined in accordance with ASTM D-698. Furthermore, it is our recommendation that the backfill material be placed in six

(6) inch lifts. The backfill material should be tested for moisture content and compaction for each six (6) inch lift at a minimum frequency of one (1) test per 100 linear feet. For narrow trenches that would be too confined to sufficiently compact the backfill materials, it is our recommendation that a flowable fill material be used to backfill the trench.

Construction Considerations

Cracking, particularly longitudinal cracking within one (1) to six (6) feet of the pavement edges, should be expected of any pavements constructed on this site where expansive clays are the subgrade. Although not common, this longitudinal cracking may even occur further than this distance from the curb line. The cracking occurs as the highly expansive soils adjacent to and below the pavements shrink and swell with seasonal moisture fluctuations. However, this type of longitudinal cracking can also occur at distances further from the curb lines as well. Therefore, proper maintenance, including sealing all cracks on a timely manner, should be conducted throughout the life of these pavements.

The surface soils in this vicinity are extremely moisture sensitive, and so any uncontrolled surface flow across the site could result in undesired infiltration and future difficulties with swell. For this reason, it is strongly urged that fill operations be performed in such a manner as to enhance natural water flow and control erosion.

In a dry and undisturbed state, the surficial soil at the site will provide sufficient subgrade support for fill placement and construction operations. However, when wet, these soils will degrade quickly with disturbance from contractor operations. Therefore, good site drainage should be maintained during earthwork operations which will help maintain the integrity of the soil.

Limitations

This report has been prepared to aid in the evaluation of subsurface conditions at this site and to assist design professionals in the geotechnical related design of this project. It is intended for use with regard to the specific project as described in this report. Any substantial changes should be brought to our attention so that we may determine any effect on the recommendations provided in this report.

The scope of our study did not include an environmental assessment of the soil, rock, or water conditions either on or adjacent to the site. As such, no environmental opinions are presented in this report.

The opinions and conclusions expressed in this report are those of BEA and represent interpretation of the subsurface conditions based on tests and the results of our analyses. BEA is not responsible for the interpretation or implementation by others of recommendations provided in this report. This report has been prepared in accordance with generally accepted principles of geotechnical engineering practice and no warranties are included, expressed, or implied, as to the professional services provided under the terms of our agreement.

The analysis and recommendations submitted in this report are based upon the data obtained from the borings performed at the locations indicated in the *Boring Location Plan*, and from other information described in this report. This report does not reflect any variations that may occur between the borings. In the performance of the subsurface exploration, specific information is obtained at specific locations and times. However, it should be noted that variations in soil/bedrock conditions exist on most sites between the boring locations, and conditions such as groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction.

If variations appear evident, BEA should be allowed to perform on-site observations during the construction period and note characteristics and variations to determine if a re-evaluation of the recommendations in this report will be necessary.

Closing

We recommend that the construction activities be monitored on a call-out basis by a qualified Geotechnical Engineer, or representative. We also recommend that once the plans are prepared, BEA be retained to review them so it can be determined if changes to the recommendations are necessary or if additional recommendations are required.

APPENDIX

Site Vicinity Map (Figure 1)

Boring Location Plan (Figure 2)

Boring Logs (B-01 through B-05)

Soil Classification Chart (1 page)

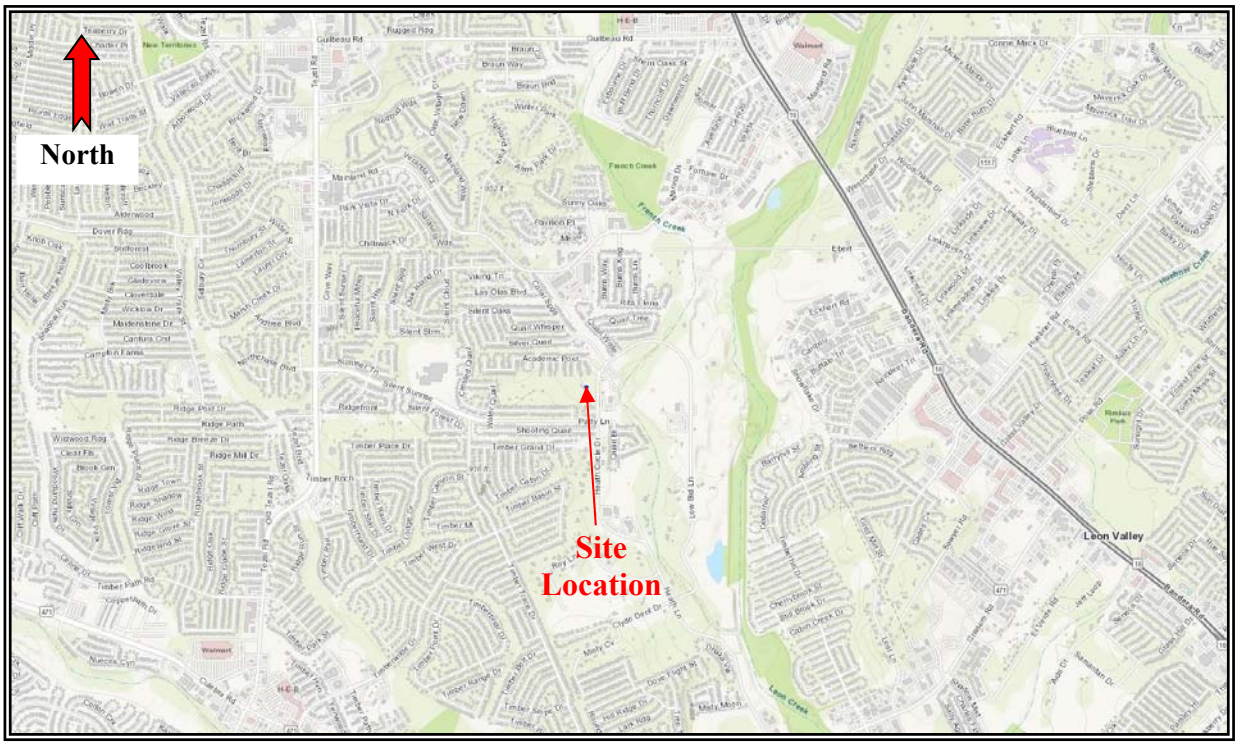
Physical Properties of Soils and Aggregates (1 page)

CBR Curve (1 page)

Lime Series Graphs (3 pages)

Soluble Sulfate Analytical Report (5 pages)

Laboratory and Field Test Procedures (1 page)



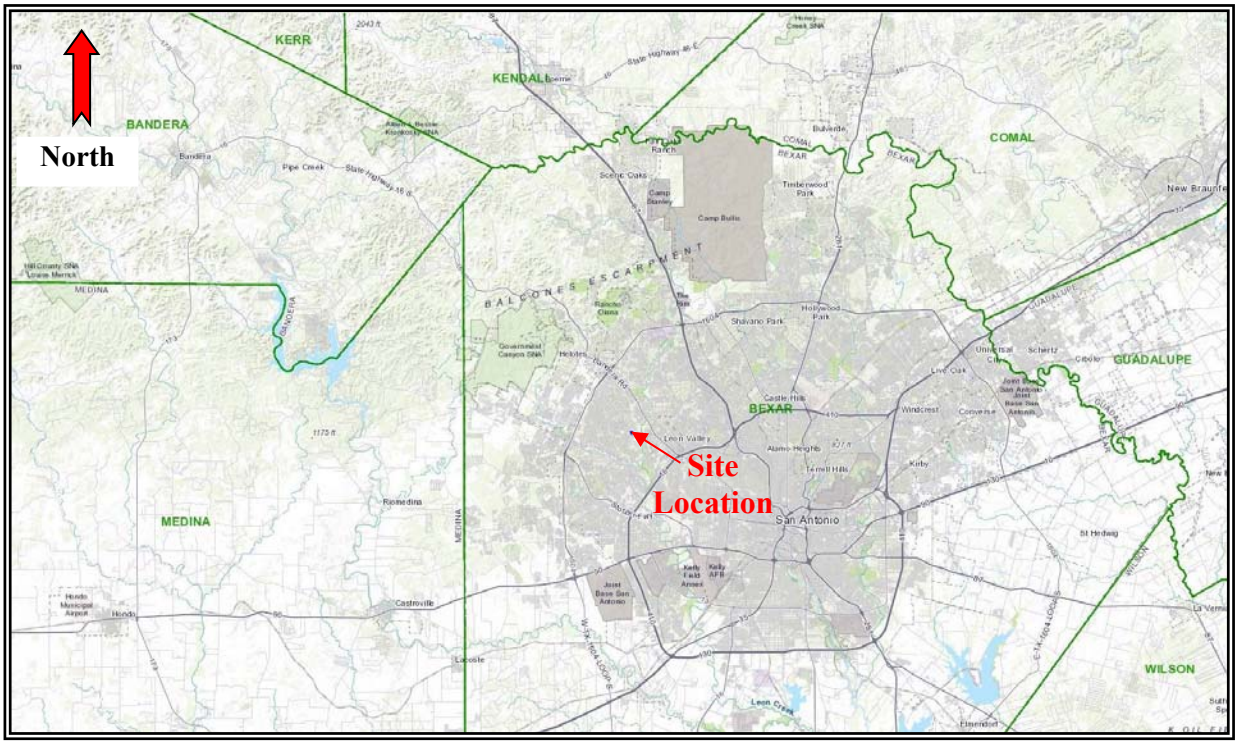


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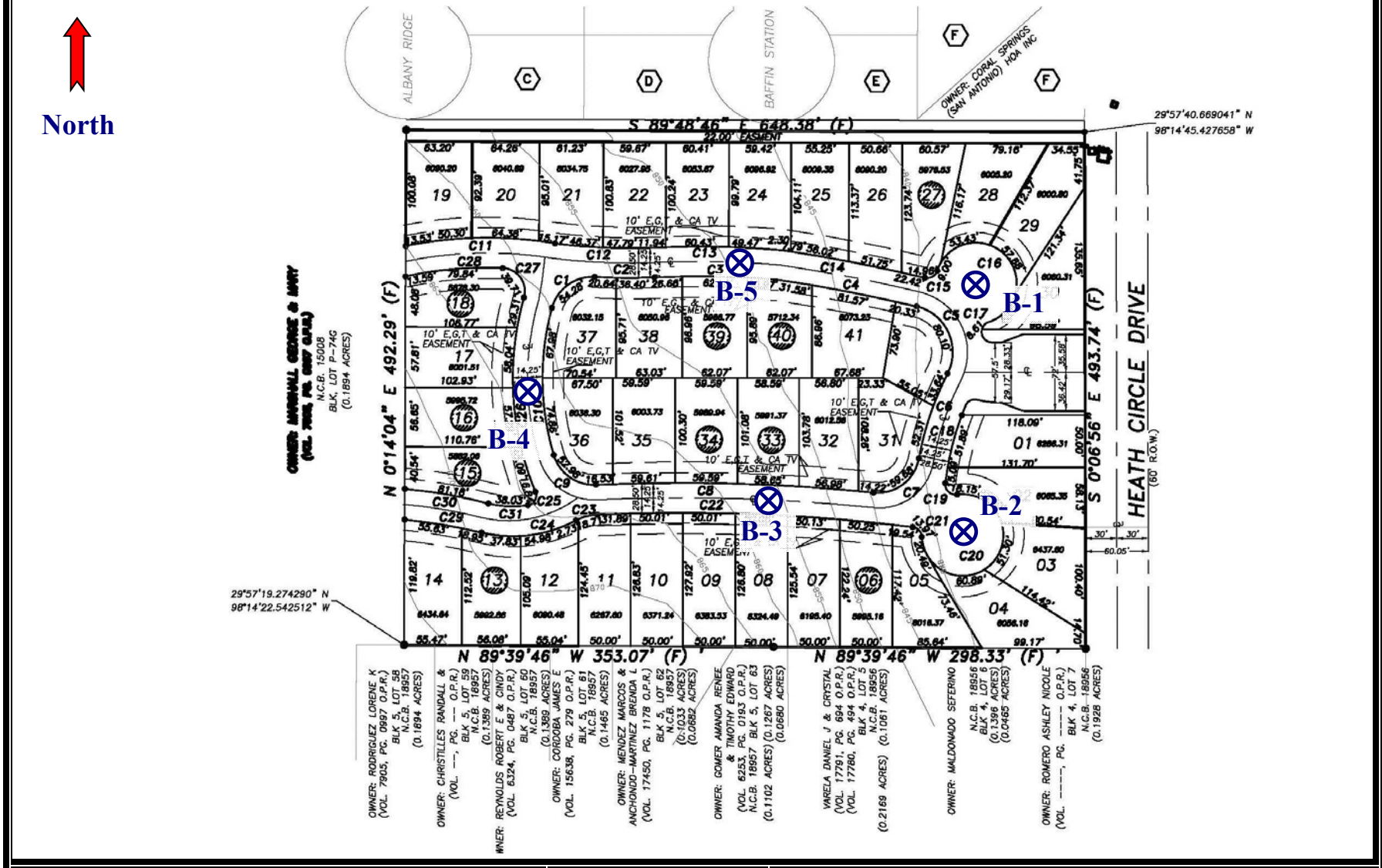
FIGURE 1

SITE VICINITY MAP



Pavement Design
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FIGURE 2

BORING LOCATION PLAN

Burge Engineering & Associates
3453 North Pan Am Expressway, Suite 201
San Antonio, Texas 78219
Telephone: 210-646-8566
Fax: 210-590-7476

BORING NUMBER B-01

CLIENT HYG Homes, LLC
PROJECT NAME Heron Valley II Subdivision
PROJECT NUMBER 12-22-0015
PROJECT LOCATION 8880 Heath Circle Drive, San Antonio, Texas
DATE STARTED 1/10/23 **COMPLETED** 1/10/23
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jason **CHECKED BY** R. Burge
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling operations.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Stratum I - Stiff to very stiff, dark grayish brown FAT CLAY (CH)	SS 1		6-5-6 (11)			17	85	28	57	
2.5			SS 2		7-8-13 (21)			18				
		Stratum II - Very stiff, reddish brown FAT CLAY (CH) with calcareous deposits from 3.5 to 8 feet										
5.0			SS 3		10-13-18 (31)			13	63	18	45	
7.5			SS 4		10-7-12 (19)			11				
		- grades to dense, orangish tan CLAYEY GRAVEL WITH SAND (GC) with calcareous deposits below 8 feet	SS 5		35-19-25 (44)			10				
10.0		Bottom of hole at 10.0 feet.										

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BORING NUMBER B-02

CLIENT HYG Homes, LLC
PROJECT NAME Heron Valley II Subdivision
PROJECT NUMBER 12-22-0015
PROJECT LOCATION 8880 Heath Circle Drive, San Antonio, Texas
DATE STARTED 1/10/23 **COMPLETED** 1/10/23
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jason **CHECKED BY** R. Burge
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling operations.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Stratum I - Firm, dark brown FAT CLAY (CH)	SS 1		2-3-2 (5)			7				
2.5		Stratum II - Medium dense, tan CLAYEY SAND WITH GRAVEL (SC) with calcareous deposits	SS 2		10-9-8 (17)			10	47	15	32	37
		- 28% gravel, 35% sand, & 37% fines from 2.5 to 4 feet										
5.0			SS 3		10-13-14 (27)			11				
		- grades to hard, orangish tan SANDY LEAN CLAY (CL) with trace calcareous deposits	SS 4		18-27-25 (52)			9				
7.5			SS 5		32-50/1"			8				
10.0		Bottom of hole at 10.0 feet.										

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3453 North Pan Am Expressway, Suite 201
San Antonio, Texas 78219
Telephone: 210-646-8566
Fax: 210-590-7476

BORING NUMBER B-03

CLIENT HYG Homes, LLC
PROJECT NAME Heron Valley II Subdivision
PROJECT NUMBER 12-22-0015
PROJECT LOCATION 8880 Heath Circle Drive, San Antonio, Texas
DATE STARTED 1/10/23 **COMPLETED** 1/10/23
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jason **CHECKED BY** R. Burge
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling operations.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Topsoil - 0 to 6 inches	SS 1		6-50/1"			8				
		Stratum III - Very dense, gray LIMESTONE - grab samples collected of auger cuttings due to split-spoon sampler from 0.5 to 10 feet - grades to light tan to white in color below 2 feet										
2.5			SS 2		50/1"			5				
5.0			SS 3		50/1"			4				
7.5			SS 4		50/1"			5				
			SS 5		50/1"			5				
10.0		Bottom of hole at 10.0 feet.										

Burge Engineering & Associates
3453 North Pan Am Expressway, Suite 201
San Antonio, Texas 78219
Telephone: 210-646-8566
Fax: 210-590-7476

BORING NUMBER B-04

CLIENT HYG Homes, LLC
PROJECT NAME Heron Valley II Subdivision
PROJECT NUMBER 12-22-0015
PROJECT LOCATION 8880 Heath Circle Drive, San Antonio, Texas
DATE STARTED 1/10/23 **COMPLETED** 1/10/23
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jason **CHECKED BY** R. Burge
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling operations.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Stratum II - Medium dense, tan CLAYEY GRAVEL WITH SAND (GC)	SS 1		7-12-16 (28)			11	37	21	16	
2.5		Stratum III - Very dense, light tan to white LIMESTONE - grab samples collected of auger cuttings due to split-spoon sampler below 2.5 feet	SS 2		50/1"			6				
5.0			SS 3		50/1"			10				
7.5			SS 4		50/1"			9				
			SS 5		50/1"			8				
10.0		Bottom of hole at 10.0 feet.										

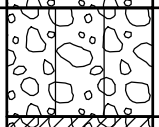
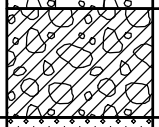
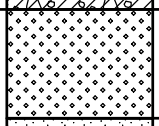
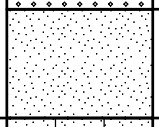
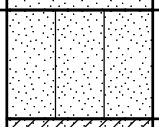
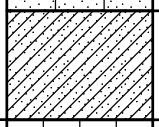
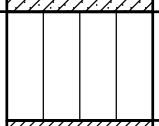
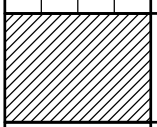
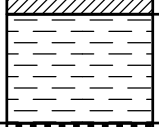
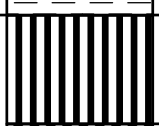
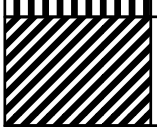
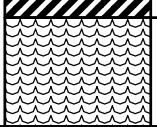
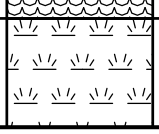
Burge Engineering & Associates
3453 North Pan Am Expressway, Suite 201
San Antonio, Texas 78219
Telephone: 210-646-8566
Fax: 210-590-7476

BORING NUMBER B-05

CLIENT HYG Homes, LLC
PROJECT NAME Heron Valley II Subdivision
PROJECT NUMBER 12-22-0015
PROJECT LOCATION 8880 Heath Circle Drive, San Antonio, Texas
DATE STARTED 1/10/23 **COMPLETED** 1/10/23
GROUND ELEVATION _____ **HOLE SIZE** 5"
DRILLING CONTRACTOR BEA
GROUND WATER LEVELS:
DRILLING METHOD Dry Auger
AT TIME OF DRILLING ---
LOGGED BY Jason **CHECKED BY** R. Burge
AT END OF DRILLING ---
NOTES Groundwater not encountered during drilling operations.
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Stratum II - Medium dense, tan CLAYEY GRAVEL WITH SAND (GC) - 45% gravel, 32% sand, & 23% fines from 0 to 2.5 feet	SS 1		8-12-17 (29)			4				23
2.5		Stratum III - Very dense, light tan to white LIMESTONE - grab samples collected of auger cuttings due to split-spoon sampler below 2.5 feet	SS 2		50/1"			5				
5.0			SS 3		50/1"			5				
7.5			SS 4		50/1"			5				
			SS 5		50/1"			6				
10.0		Bottom of hole at 10.0 feet.										

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BURGE ENGINEERING & ASSOCIATES
Geotechnical Engineering • Environmental • Testing

PHYSICAL PROPERTIES OF SOILS AND AGGREGATES

Client: **HYG HOMES, LLC**
84 NE LOOP 410, SUITE 242
SAN ANTONIO, TEXAS 78216

Date of Report: **1-18-23**
Job No.: **12-22-0015**
Lab No.: **L23-010**
Authorized by: Date:
Sampled by: **E. FLORES** Date: **1-11-23**
Submitted by: **E. FLORES** Date: **1-11-23**

Project: **HERON VALLEY II SUBDIVISION**
Contractor:
Type/Use of Material:
Sample Source/Location: **SAMPLE B-1 & B-2 (0 to 24 INCHES)**

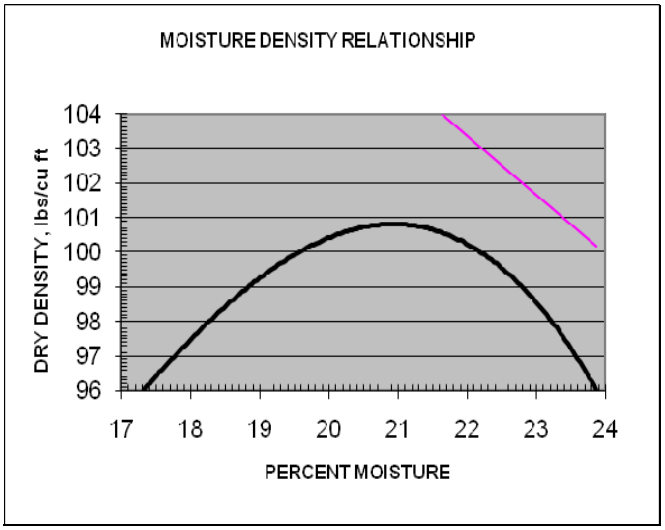
Location: **SAN ANTONIO, TX**
Lab No. : **1**
Supplier/Source: **NATIVE**
Location Design By: **E. FLORES**

TEST RESULTS

SIEVE ANALYSIS: ASTM D422
FINER THAN 200: ASTM D1140

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
4		
3		
2-½"		
1-¾"		
1"		
⅞"		
¾"		
½"		
⅜"		
¼"		
No. 4		
8		
10		
16		
30		
40		
50		
80		
100		
200		

LABORATORY COMPACTION CHARACTERISTICS: ASTM D698, METHOD A



SAMPLE PREPARATION:

X WET ☐ DRY

RAMMER USED:
X 2 IN. CIRCULAR FACE
☐ MECHANICAL
X MANUAL
☐ OTHER

Corrected:
MAXIMUM DENSITY → **100.8**
OPTIMUM MOISTURE → **21.0**

OVERSIZE AGGREGATE:
ASSUMED SP. GR.:
ASSUMED ABS.:
OVERSIZE:
IN LAB SAMPLE:

TEST PROCEDURE		RESULT	SPECS
LIQUID & PLASTIC PROPERTIES: ASTM D4318			
METHOD	LIQUID LIMIT →	**74**	
SAMPLE AIR DRY	PLASTIC LIMIT →	**23**	
EST. % RET.ON NO. 40	PLASTICITY INDEX →	**51**	

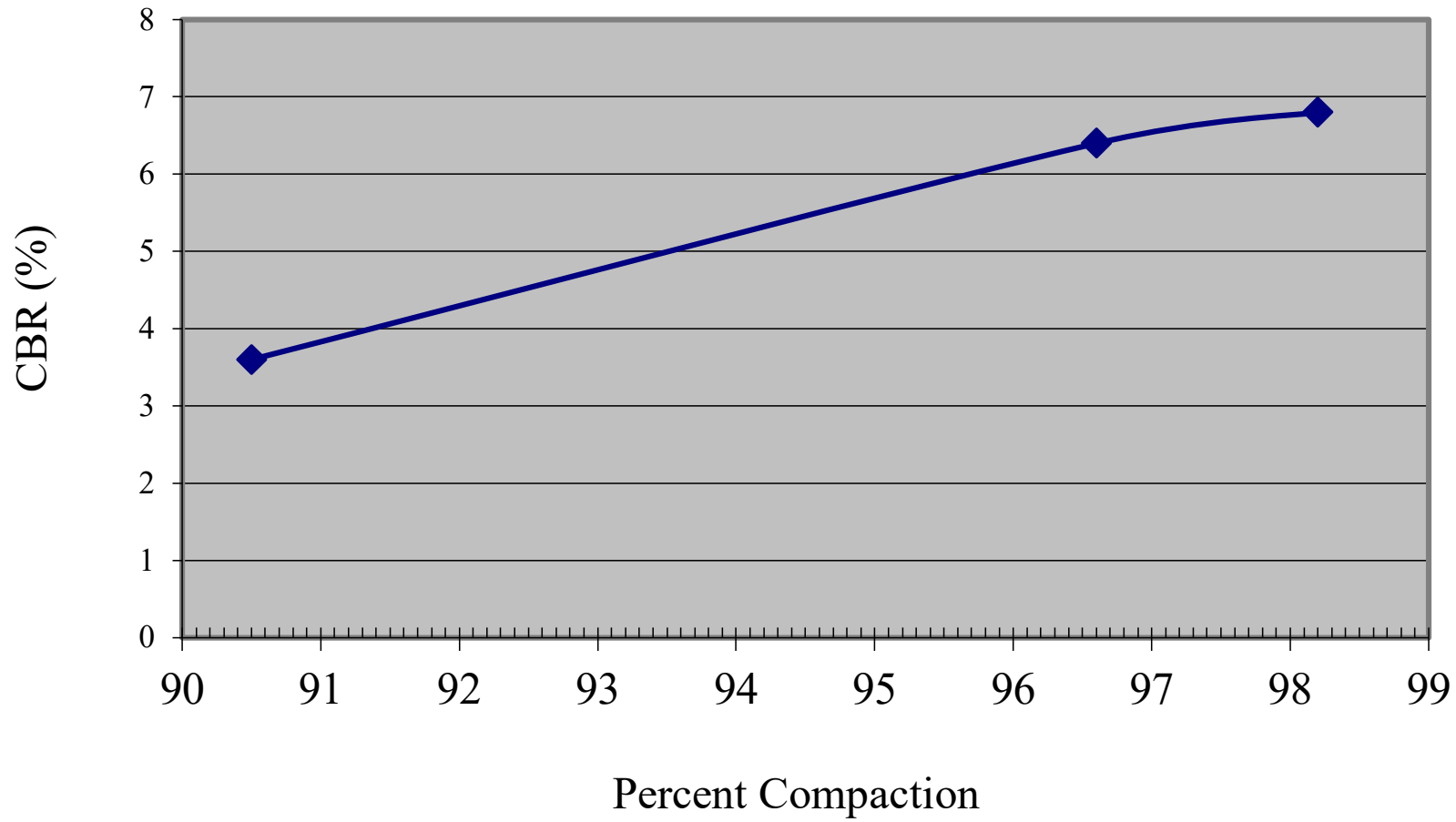
TEST PROCEDURE		RESULT	SPECS
MOISTURE CONTENT: ASTM D2216			
PORTION TESTED **ALL**	% DRY WEIGHT →		N/A

SOIL CLASSIFICATION: ASTM 2487
GROUP SYMBOL: **(CH)**
NAME: **DARK BROWN CLAY WITH ORGANICS**

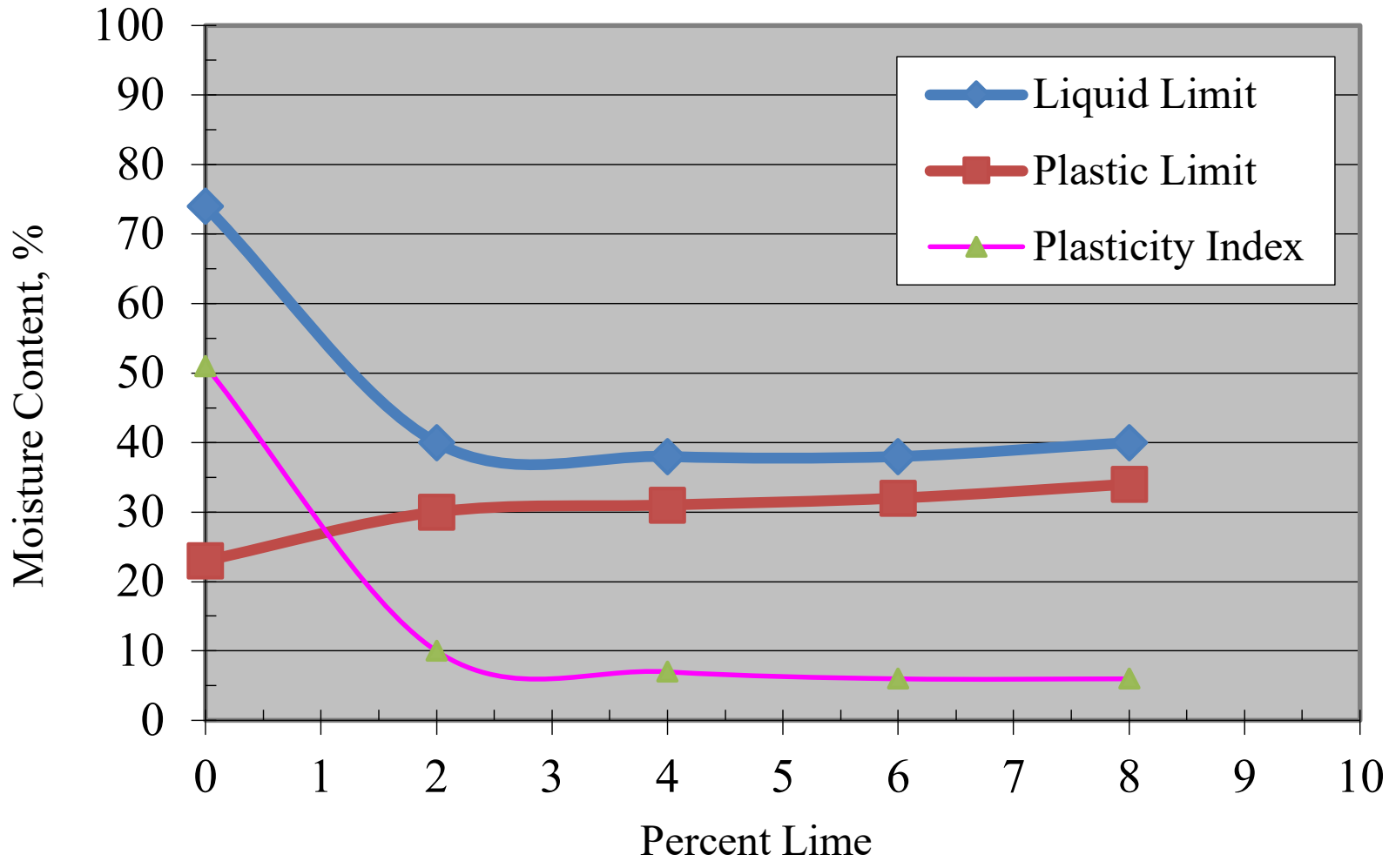
Comments:

3453 North Pan Am Expressway, Suite 201, San Antonio, Texas 78219
Phone: 210-646-8566 ◈ Fax: 210-590-7476

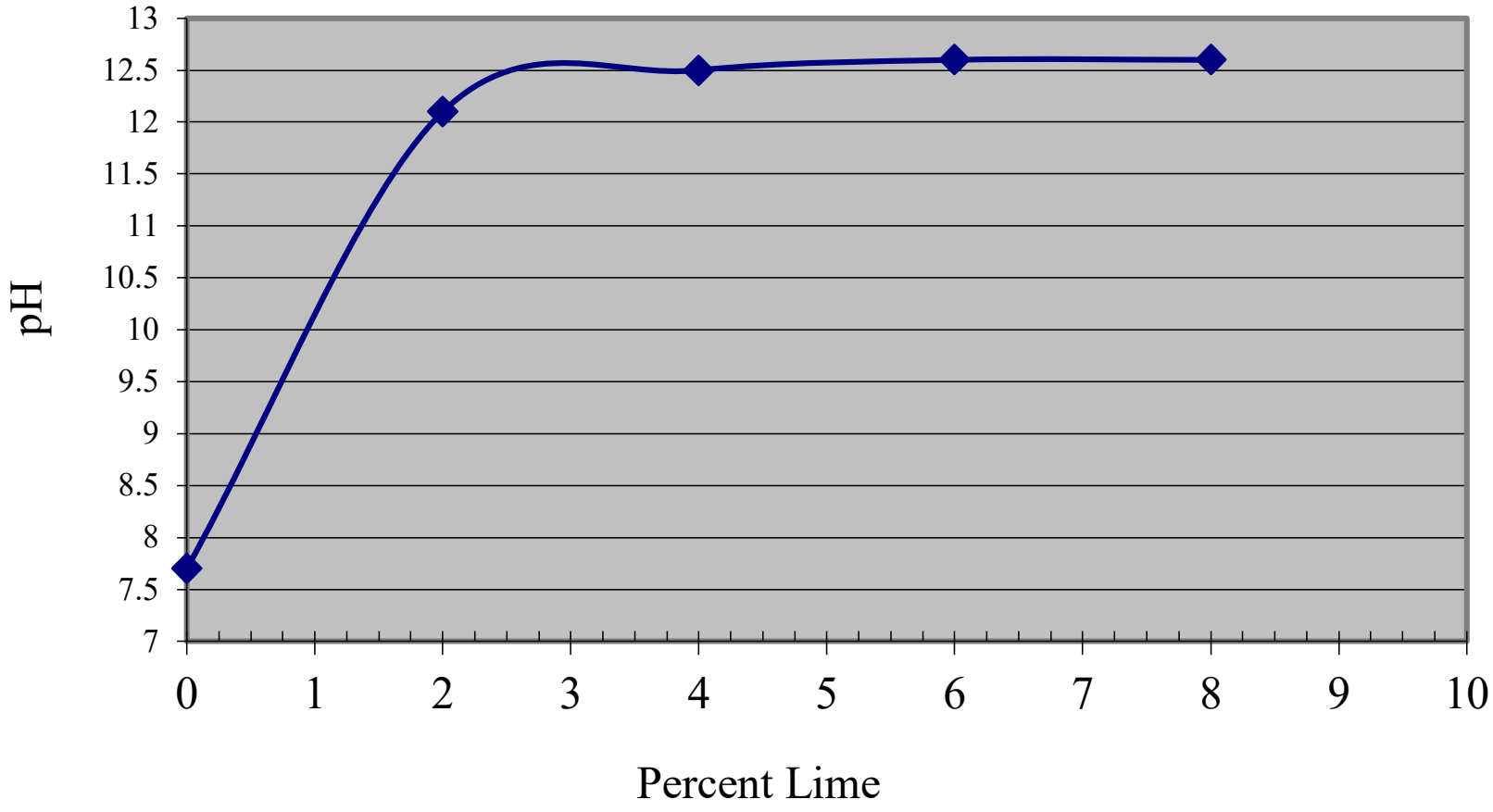
CBR Curve
Heron Valley II Sub. - B-1 & B-2 (0-2')



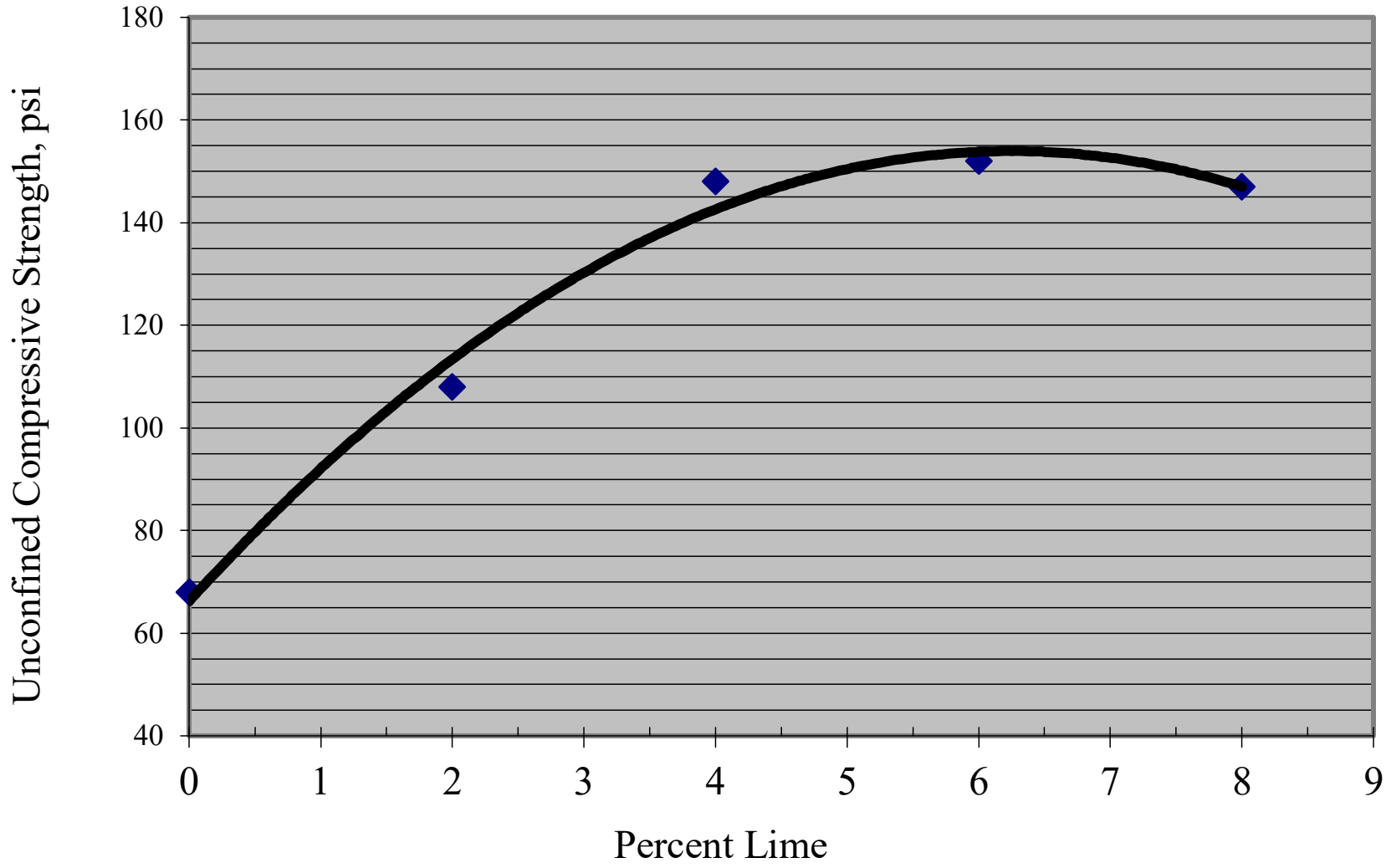
LIME SERIES CURVE
Heron Valley II Sub. - B-1 & B-2 (0-2')



LIME SERIES CURVE
Heron Valley II Sub. - B-1 & B-2 (0-2')



LIME SERIES CURVE
Heron Valley II Sub. - B-1 & B-2 (0 to 2')



ALAMO ANALYTICAL LABORATORIES, LTD.
Main: 10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121 . Fax. (210) 340-8123

REPORT NARRATIVE 1/27/2023

Robert Burge
Burge Engineering & Associates, Inc.
3453 N PanAm Expressway
Ste 201
San Antonio , TX - 78219
TEL: (210) 646-8566 Email: Bobby@burge-eng.com
FAX: (210) 590-7476

RE: 12-22-0015 Heron Valley II 8880 Heath Circle

Dear Robert Burge: Order No.: 2301072

Enclosed please find the analytical report for the sample/s received on 1/20/2023.

SAMPLE RECEIPT: Samples were received intact and with chain of custody documentation.
HOLDING TIMES: All samples were analyzed within prescribed holding times and/or in accordance with the Sample Acceptance Policy unless otherwise noted in the report.

If you have any questions regarding these test results call (210) 340-8121.

Thank you,

Reddy Gosala, Ph.D
Laboratory Director

NELAP Certificate# San Antonio : T104704367-22-17

ALAMO ANALYTICAL LABORATORIES, LTD.

Date: *27-Jan-23*

Analytical Results Report

Client: Burge Engineering & Associates, Inc.
Collection Date: 1/11/2023
Lab Order: 2301072
Matrix: SOIL
Project ID:
Lab ID: 2301072-01A
Project Name: 12-22-0015 Heron Valley II 8880 Heath Circle
Client Sample ID: CBR B1 / B2 Subgrade

Analyses	Result	Report Limit	Units	Dilution	Date Analyzed
TEX-620-J			**TX620J**	Analyst: **YK**	
Sulfate	95.8	25	mg/Kg	1	25-Jan-23

Approved by: Reddy Gosala, Laboratory Direct

Report of Laboratory Analysis

ALAMO ANALYTICAL LABORATORIES, LTD.

Date: *27-Jan-23*

CLIENT: Burge Engineering & Associates, Inc.

Work Order: 2301072 **Project:** 12-22-0015 Heron Valley II 8880 Heath Circl

QC SUMMARY REPORT

Analyte	BLK	SPK value	%REC LCS	%REC MS	%REC MSD	RPD %	RPD Limit	Low - High Limit
Batch ID: TX620J-SO4-1/25/2023	**TestName:** TEX-620-J							
Run ID: UV1_230125A	**Test Code:** TX620J		**Units:** mg/Kg		**Analysis Date:** 1/25/2023 12:45:00 PM		**Prep Date:** 1/24/2023 4:40:00 P	
Sulfate	<25	250	93.0%	89.0%	91.1%	1.000	30.0	80 - 120

Approved by:

Laboratory QC Report

ALAMO ANALYTICAL
LABORATORIES LTD.

CHAIN OF CUSTODY RECORD

COC#: 032306

MUST BE COMPLETED BY CLIENT

Main Office: 10526 Gulfdale
San Antonio, Texas 78216
(210) 340-8121 • Fax (210) 340-8123

Branch: 2500 Montana Avenue
El Paso, Texas 79903
(915) 599-2182

www.alamoanalytical.com
reports@alamoanalytical.com

AAL Rev. 001

Alamo's Client: BEA	Client's P.O. #:
Project Manager: Benny Krieger	Phone #: 210-646-8566
Address: 3453 N. Panam Exp., Ste 201	Email: benny@burge-eng.com
Project Number: 12-22-0015	Project Name: Heron Valley II
Project Location: 8880 Heath Circle	Sampler Signature:

Turnaround time: Standard (7) ☐
(in working days)
RUSH: 1 ☐ 2 ☐ 3-5 ☒ Days (additional charges)
TRRP 13 Report: Yes ☐ No ☐ (additional charges)
Analysis for Permit Compliance: Yes ☐ No ☐
DMR Form Required: Yes ☐ No ☐

LAB ID# (Do not use)	Sampling Date	Sampling Time	Composite	Grab	Matrix	FIELD ID#	FIELD DESCRIPTION	No. of Containers	ANALYSIS: Texba27 Sulfa27	REMARKS (Preservation, Size/Amount, Etc.)
230107Z-01	1/11/23		X		Soil	CBR	B1/B2 Subgrade	1	X	

Relinquished by: (Signature / Print Name)	Date	Time	Received by (Signature)
Benny Krieger / Benny Krieger	1/20/23	1036	
Relinquished by: (Signature / Print Name)	Date	Time	Received by (Signature)
Relinquished by: (Signature / Print Name)	Date	Time	Received by (Signature)
Relinquished by: (Signature / Print Name)	Date	Time	Received by (Signature)

Headspace			If Yes, Amt. N/A
Properly Sealed	✓		If No, Explain
Chilled ≤ 4° C		✓	If No, Temp.

Comments:

ALAMO ANALYTICAL LABORATORIES, LTD.

10526 Gulfdale
San Antonio, TX – 78216;
Ph. (210) 340-8121; Fax: (210) 340-8123

Document Control No.:
SOP-SAMP-REC Ver.13.1

Sample Log-In Checklist

DATE: 1/20/2023 **TIME:** 9:00 **INITIALS:** b

CLIENT: Burke Mutmo **PROJECT: W.O#** 230107893

1. Is a Chain of Custody present? (Yes) No
2. Is a Chain of Custody properly completed? (Yes) No
3. Are custody seals present? Yes (No)
   If yes, are they intact? Yes No
   Are they on: Sample _____ or on Shipping Container _____
4. Are all samples tagged or labeled? Yes No
   If yes, do the labels match the Chain of Custody? Yes No
5. Do all shipping documents agree (i.e., number of coolers arrived vs. on tickets)
   If not, describe below. Yes No (N/A)
6. Are samples preserved properly? *If not*, describe below. Yes No
7. Are all samples within holding times on arrival? Yes No
   If not, describe below.
8. Condition of shipping container: Intact ✓ or _____
9. Condition of samples: Intact ✓ or _____
10. Temperature of samples: Temp. (^{0}C): 14 Corrected Temp. (^{0}C): 14 Thermometer ID : ~~DT1~~ or L2
11. pH strip lot#: — Samples out of pH range: _____
12. Delivery agent: Client ✓ UPS ____ Fed-Ex____ Lone Star ____Alamo P/U ___ Other_____
13. Sample disposal: Return to client_____ Alamo Analytical Disposal ✓
14. Location: **WI** (Walk-In Cooler)/ **F2** (Freezer 2 for TPH 1005 Soils))/ **R1**(Refrigerator 1 for TPH & VOC water)

Comments: (Reference checklist item number from above, or for comments on resolution below):
Solid

Record of contacting client for resolution of sample discrepancies (first and retry contact)
Contacted How?

Name: _____ Phone ___Fax___ Date: ____/____/____Time: _____
Name: _____ Phone ___Fax___ Date: ____/____/____Time: _____

Laboratory and Field Test Procedures

Soil Classification per ASTM D2487
This soil testing standard was used for classifying soils according to the Unified Soil Classification System. The soil classifications of the earth materials encountered are as noted in the attached boring logs.

Soil Water Content per ASTM D2216
This test determines the water content of soil or rock expressed as a percentage of the solid mass of the soil. The test results are listed under Moisture Content in the attached boring logs.

Soil Liquid Limit per ASTM D4318
The soil Liquid Limit identifies the upper limit soil water content at which the soil changes from a moldable (plastic) physical state to a liquid state. The Liquid Limit water content is expressed as a percentage of the solid mass of the soil.

Soil Plastic Limit per ASTM D4318
The soil Plastic Limit identifies a lower limit soil water content at which the soil changes from a moldable (plastic) physical state to a non-moldable (semi-solid) physical state. The Plastic Limit water content is expressed as a percentage of the solid mass of the soil.

Plasticity Index per ASTM D4318
This is the numeric difference between the Liquid Limit and Plastic Limit. This index also defines the range of water content over which the soil-water system acts as a moldable (plastic) material. Higher Plasticity Index (PI) values indicate that the soil has a greater ability to change in soil volume or shrink and swell with lower or higher water contents, respectively.

Standard Penetration Test (SPT) and Split Spoon Sampler (SS) per ASTM D1586
This is the standard test method for both the penetration test and split-barrel (spoon) sampling of soils. This sampling method is used for soils or rock too hard for sampling using Shelby Tubes. The method involves penetration of a split spoon sampler into the soil or rock through successive blows of a 140 pound hammer in a prescribed manner.

Blow Counts (N) per ASTM D1586
This is the number of blows required to drive a Split Spoon Sampler by means of a 140 pound hammer for a distance of 12 inches in accordance with the variables stated in the test procedures.

Pocket Penetrometer (PP): This test method is an accepted modification of ASTM D1558 test method for establishing the moisture-penetration resistance relationships of fine-grained soils. The test results are measured in tons per square foot, tsf. The strength values provided by this method should be considered qualitatively.

Boring Logs: This is a summary of the above described information at each boring location.