ROCK ENGINEERING & TESTING LABORATORY INCORPORATED

- GEOTECHNICAL ENGINEERING
- CONSTRUCTION MATERIALS ENGINEERING & TESTING
- SOILS • ASPHALT • CONCRETE

May 5, 2022

JSR, Inc.
P.O. Box 870
Schertz, Texas 78151

Attention: Justin Curry

SUBJECT: **GEOTECHNICAL PAVEMENT INVESTIGATION REPORT**
REPAIR CARSWELL AVE
LACKLAND AIRFORCE BASE
SAN ANTONIO, TEXAS
RETL Project No.: G221603 Rev. 2

Dear Mr. Curry,

Introduction

In accordance with our agreement, we have conducted a pavement investigation, completed a laboratory testing program, and have prepared an evaluation of the proposed pavement improvements for the above referenced project. The results of these engineering services are to be found in this letter report, an electronic copy being transmitted herewith.

Proposal Authorization

The work for this project was performed in accordance with RETL Proposal No. SGP072621A, dated July 26, 2021. The proposal contained a scope of work, lump sum fee, and limitations. The proposal was approved, and a JSR, Inc. Work Order No. 12.0095303 under Master Subcontract/Master Consulting Agreement No. 2018-504 was executed on August 16, 2021.

Purpose and Scope

The purpose of this investigation was to identify the existing pavement sections, determine the underlying subgrade conditions, and to provide recommendations in support of the improvement of the subject roadway.

The scope of the services included measuring the thickness of the existing asphalt and base, performing soil borings, field sampling of the base and subgrade materials, performing Dynamic Cone Penetrometer (DCP) tests on the subgrade, performing laboratory testing, performing pavement thickness calculations, and preparation of this letter report.

General

The investigation and evaluation of the existing pavement and subgrade conditions reported herein is considered sufficient in detail and scope to form a reasonable basis for the evaluation of the proposed pavement sections.

The Geotechnical Engineer states that the findings contained herein, have been presented after being prepared in a manner consistent with the level of care and skill ordinarily exercised by reputable members of the Geotechnical Engineer's profession practicing contemporaneously under similar conditions in the locality of the project. RETL operates in accordance with "*Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction*", (ASTM D3740). No other representations are expressed or implied, and no warranty or guarantee is included or intended.

This report has been prepared for the exclusive use of JSR, Inc., for the specific application to the Repair Carswell Avenue Project at Lackland Airforce Base in San Antonio, Texas.

Field Investigation

The field exploration, completed in order to evaluate the engineering characteristics of the existing pavements and subsurface soil conditions, included a reconnaissance of the project site, drilling test borings, performing DCP tests, and recovering disturbed and relatively undisturbed samples of the subsurface materials encountered at the test boring locations. RETL performed a total of eighteen (18) borings at the site. RETL personnel determined the number, depth, and location of the borings. The borings were located in the field by the client and RETL completed the drilling operations. A Boring Location Plan is provided in the Appendix of this report.

Drilling and Sampling Procedures

The test borings were performed using a drilling rig equipped with a rotary head and solid flight augers were used to advance the boreholes to the termination depths. Disturbed samples were obtained employing split-barrel sampling procedures in general accordance with the procedures for "*Penetration Test and Split-Barrel Sampling of Soils*" (ASTM D1586). Relatively undisturbed soil samples were obtained using thin-wall tube sampling procedures in accordance with the procedures for "*Thin Walled Tube Sampling of Soils*" (ASTM D1587). The samples obtained by this procedure were extruded by a hydraulic ram in the field.

The samples obtained from the test borings were classified in the field, placed in plastic bags, marked according to boring number, depth and any other pertinent field data, and stored in special containers. The samples were delivered to the laboratory for testing at the completion of the drilling operations.

Field Tests and Measurements

Penetration Tests - During the sampling procedures, standard penetration tests (SPT) were performed to obtain the standard penetration value of the soil. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling 30-inches, required to advance the split-barrel sampler 1-foot into the soil. The sampler is lowered to the bottom of the previously cleaned drill hole and advanced by blows from the hammer. The number of blows is recorded for each of three successive 6-inch penetrations.

The “N” value is obtained by adding the second and third 6-inch increment number of blows from the hammer. The results of standard penetration tests indicate the relative density of cohesionless soils and comparative consistency of cohesive soils, thereby providing a basis for estimating the relative strength and compressibility of the soil profile components.

Dynamic Cone Penetrometer (DCP) Tests - Dynamic Cone Penetrometer (DCP) tests were performed at the boring locations. The Kessler Dynamic Cone Penetrometer is a device used to estimate the strength characteristics of fine-grained clay soils, granular construction material, and weak stabilized or modified material. The device is driven into the soil by dropping a sliding 17.6-pound hammer from a height of 22.6-inches.

The depth of cone penetration is measured at selected penetration or hammer drop intervals and the soil shear strength is reported in terms of DCP index. The DCP index is based on the average penetration depth resulting from one blow of the 17.6-pound hammer.

The California Bearing Ratio (CBR) can be estimated using the DCP index. The penetration per blow, or penetration rate (PR), is then used to estimate the in-situ CBR, or shear strength, using the appropriate correlation depending on the soil type. The following correlations were provided by the DCP manufacturer, Kessler Soils Engineering Products, Inc., and have been recommended by the US Army Corps of Engineers:

1. $CBR = 292 / PR^{1.12}$ (All soils except those listed in #2 and #3)
2. $CBR = 1 / (0.017019*PR)^{2}$ (CL soils w/ CBR less than 10)
3. $CBR = 1 / (0.002871*PR)$ (CH Soils)

PR= DCP Penetration Rate, mm per blow

It should be noted that a field DCP measurement results in a field, or in-situ, CBR and will not normally correlate with the laboratory, or soaked, CBR of the same material. The test is thus intended to evaluate the in-situ strength of a material under existing field conditions compared to controlled conditions in a lab.

Groundwater Observations - Groundwater observations were made during the test boring operations and are noted on the Logs of Boring provided in the Appendix. The amount of water in an open borehole largely depends on the permeability of the soils encountered at the boring location. In relatively pervious soils, such as sandy soils, the indicated depth is usually a reliable groundwater level. In relatively impervious soils, a suitable estimate of the groundwater depth may not be possible, even after several days of observation. Seasonal variations, temperature, land-use, and recent rainfall conditions may influence the depth to groundwater.

Surface Elevations - The surface elevations at the boring locations were not provided. The depths referred to in this report are referenced from the actual surface elevations at the boring locations during the time of our field investigation.

Laboratory Testing Program

A laboratory-testing program was conducted to supplement the information obtained during the field investigation. The results of the laboratory-testing program provide additional pertinent engineering characteristics of the base and subgrade soil materials necessary in analyzing the behavior of the prepared pavement repairs sections for the project.

The laboratory-testing program included performing supplementary visual classification (ASTM D2487) and moisture content tests (ASTM D2216). In addition, selected samples were subjected to Atterberg limits tests (ASTM D4318), percent material finer than the #200 sieve tests (ASTM D1140), moisture density relationship tests (ASTM D698), California Bearing Ratio (CBR) tests (ASTM D1883), pH tests (ASTM D5464), lime series (TEX Method 121E), and sulfate content determinations (TEX Method 145E). Estimated soil strengths were obtained in the field using a hand penetrometer.

The laboratory-testing program was conducted in general accordance with applicable ASTM Specifications. The results of these tests are presented on the accompanying Logs of Boring attached.

Sulfate Test Results

The sulfate test results on representative composite subgrade samples are provided in the following table:

UPPER SUBGRADE SULFATE TEST RESULTS	
Boring No.	**Sulfate (ppm)**
B-3 (Bulk)	600
B-6 (Bulk)	620
B-8 (Bulk)	400
B-15 (Bulk)	920

Section 2-1.3.2 of UFC 3-250-11 Soil Stabilization for Pavements states that treatment of soils with lime is acceptable when the soils are tested to have a sulfate content of 0.1 percent (1,000 ppm) or less.

The tested sulfate concentrations indicate the subgrade soils at the site are suitable for using lime as a treatment method.

Lime Series and pH Test Results

The lime series and pH test results on the bulk subgrade samples are provided in the following tables:

BORING B-3 COMPOSITE BULK SUBGRADE LIME SERIES AND pH TEST RESULTS		
% Lime	**LL / PI**	**pH**
0	35 / 20	8.3
4	38 / 10	12.4
6	37 / 11	12.5
8	41 / 11	12.5

BORING B-6 COMPOSITE BULK SUBGRADE LIME SERIES AND pH TEST RESULTS		
% Lime	**LL / PI**	**pH**
0	66 / 48	8.1
2	54 / 20	12.2
4	54 / 17	12.3
6	54 / 17	12.4
8	53 / 15	12.4
10	53 / 15	12.5

BORING B-8 COMPOSITE BULK SUBGRADE LIME SERIES AND pH TEST RESULTS		
% Lime	**LL / PI**	**pH**
0	26 / 9	8.0
2	31 / 9	12.4
4	31 / 8	12.5
6	32 / 9	12.5
8	33 / 10	12.5
10	33 / 10	12.5

BORING B-15 COMPOSITE BULK SUBGRADE LIME SERIES AND pH TEST RESULTS		
% Lime	**LL / PI**	**pH**
0	56 / 36	9.0
2	54 / 21	12.3
4	51 / 15	12.3
6	51 / 15	12.4
8	53 / 17	12.4
10	53 / 17	12.5

Where: LL = Liquid Limit (%)
PI = Plasticity Index

The results indicate the subgrade soils at Borings B-3 and B-8, and Borings B-6 and B-15 would require stabilization with 4 and 6-percent lime, respectively, to consistently reduce the plasticity index (PI) and pH to industry standard acceptable levels.

Pavement Investigation Findings

The types of pavement and subgrade materials encountered at the boring locations have been visually classified and are described in detail on the Logs of Boring. Representative samples of the asphalt, base, and subgrade materials were placed in polyethylene bags and are now stored in the laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed of three months after issuance of this report. The summary of the materials, as shown on the Logs of Boring represent the conditions at the actual boring locations. Variations may occur between or beyond the boring locations. It should be noted that, whereas the field exploration was performed by experienced personnel, it is sometimes difficult to record changes in materials within narrow limits.

The measured thicknesses of the existing pavement materials are provided in the following table:

PAVEMENT THICKNESS RESULTS				
Boring No.	**Phase**	**HMAC**	**Base**	**Subgrade Classification (DCP CBR Value)**
B-1	Phase 1	3"	7"	Silty Clayey Sand (CBR= 20+)
B-7	Phase 1	3"	9"	Clayey Gravel (CBR= 5)
B-8	Phase 1	3.5"	12"	Clayey Gravel (CBR= 8)
B-9	Phase 1	4"	6"	Gravelly Lean Clay (CBR= 10)
B-2	Phase 1	3"	12"	Clayey Gravel (CBR= 10+)
B-10	Phase 1	2.5"	9"	Clayey Gravel (CBR= 10+)
B-3	Phase 2	3.5"	15"	Clayey Gravel (CBR= 20+)
B-11	Phase 2	2.5"	9"	Clayey Gravel (CBR= 3)
B-12	Phase 2	4"	8"	Fat Clay with Gravel (CBR= 8)
B-13	Phase 2	3.5"	8"	Clayey Gravel (CBR= 10+)
B-4	Phase 2	3.5"	8"	Fat Clay w/ Gravel (CBR= 10+)
B-14	Phase 3	2"	10"	Gravelly Fat Clay (CBR= 10+)
B-15	Phase 3	2"	10"	Fat Clay with Sand (CBR= 10+)
B-5	Phase 3	3"	13.5"	Gravelly Fat Clay (CBR= 7)
B-16	Phase 3	3.5"	12"	Fat Clay (CBR= 10+)
B-17	Phase 3	2"	10"	Fat Clay (CBR= 10+)
B-18	Phase 3	2"	10"	Clayey Gravel (CBR= 6)
B-6	Phase 3	2"	15"	Fat Clay w/ Gravel (CBR= 7)

Proposed Pavement Section Evaluation

The work area consists of 3 phases. The roadway traffic generally consists of automobiles, 18-wheel trucks, and bus traffic. In evaluating the proposed pavement program, the existing subgrade and base material conditions were considered together with the anticipated traffic conditions and guidelines contained in UFC 3-250-01 and UFC 3-270-01. The project design vehicle is a 5-axle, 80,000 pound truck.

Based on the information provided to RETL, the proposed roadway repair program originally consisted of a 3-inch mill and overlay of Carswell Avenue at JBSA Lackland AFB. In areas which exhibit deflection or pumping at the subbase elevation upon completion of the milling operations, the milling would continue an additional 4 to 6-inches to remove the objectionable materials. However, this program was developed without information regarding the average daily passes for the provided design vehicle. An evaluation of the recently provided traffic data, the thickness of the existing pavement constituents, and the results of the CBR testing indicate that there is insufficient thickness of existing pavement materials to utilize the originally proposed 3-inch mill and overlay. Therefore, pavement constituent thickness recommendations for full depth reconstruction for Phases I, II & III and rehabilitation of the existing pavements for Phase I are provided as requested.

The following pavement design parameters were used as input into the Department of Defense software for the evaluation of transportation systems: Pavement-Transportation Computer Assisted Structural Engineering (PCASE), Version 7.0.1 released July 2021.

FLEXIBLE PAVEMENT DESIGN PARAMETER	DESIGN VALUE
Analysis Type	PCASE 7.0.1
Subgrade Design CBR Phases I, II & III	2.5
New Base Design CBR	80
Design Life	25 years
Phase I Traffic: Truck, 5-axle (80,000 lbs) Government Provided ADP	40
Phases II & III Traffic: Truck, 5-axle (80,000 lbs) Government Provided ADP	80

ADP = Average Daily Passes

The proposed reconstruction options are provided in the following tables:

"PHASES I, II & III ROADWAY RECONSTRUCTION SECTION"	
Pavement Constituent	**Layer Thickness**
New Type D HMAC	3"
New Flexible Base	8"
Lime Stabilized Subgrade*	8"

*The existing base materials may be substituted for the lime stabilized subgrade materials. This option will require the removal and disposal of the existing asphalt and then to remove and stockpile the existing base (using care not to contaminate the base material with subgrade) to the depth necessary to construct the pavement section presented in the above table. This will require excavating natural subgrade to allow for the required pavement section thickness and maintain the existing street profile. Additionally, the exposed clay subgrade will need to be moisture conditioned and compacted to a depth of 8-inches.

Proofroll Subgrade/Subbase

Upon completion of the stripping and excavation operations, the exposed surface should be proof-rolled with a minimum 15-ton rubber tire dump truck or water truck under the supervision of RETL to detect any soft areas prior lime stabilization. If any soft pockets or pumping areas are identified, the objectionable materials should be removed to expose firm materials and the excavation replaced with properly compacted lime stabilized subgrade or reclaimed existing base materials. In areas where the natural subgrade soils are exposed as part of the reconstruction program, the subgrade soils should be compacted as determined by a standard Proctor test (ASTM D698) and at, or above, the optimum moisture content. The RETL Geotechnical Engineer must approve the condition of the exposed surface prior to commencement of lime stabilization operations for full depth construction options.

Lime Stabilized Subgrade

Lime placement and mixing operations should be performed in accordance with UFC 3-250-11 Soil Stabilization for Pavements. Lime stabilization of the clay subgrade soils is recommended to reduce the effect of soil heave on the pavements. Lime shall be properly mixed at a minimum rate of 4 to 6-percent of the maximum dry unit weight of the raw subgrade soils as determined by the standard Proctor (ASTM D698). This percentage equates to approximately 20 to 30 pounds per square yard per 6-inch treatment depth and 24 to 36 pounds per square yard per 8-inch treatment depth.

After proper curing time, usually 48 to 72 hours, the lime stabilized soils should be remixed and compacted to a minimum density of 95-percent of the maximum dry unit weight of the lime stabilized subgrade soils as determined by a standard Proctor test (ASTM D698) and at, or above, the optimum moisture content.

Base Course Material

New flexible base course materials if required should meet the requirements set forth in UFC 3-250-01 Pavement Design For Roads and Parking Areas locally manufactured as TxDOT Item 247, Type A, Grade 1-2. The new/existing base material should be placed in maximum 8-inch thick loose lifts and compacted to a minimum density of **100**-percent of the maximum dry density as determined by the modified Proctor test (ASTM D1557). The moisture content of the base materials should be maintained at or near the optimum moisture content.

Asphaltic Concrete

Hot mix asphaltic concrete should meet the requirements set forth in UFC 3-250-03 OM Manual Standard Practice for Flexible Pavements; Type B base course and Type D surface course locally manufactured as TxDOT Item 340 Type B base course and Type D surface course. The asphaltic concrete should be compacted to between 94 and 98-percent of the maximum theoretical density as determined by the Rice specific gravity. Maximum and minimum thicknesses of HMAC placement are provided in the following table.

Recommended HMAC Compacted Lift Thickness		
HMAC Mixture Type	**Minimum Lift Thickness (in)**	**Maximum Lift Thickness (in)**
Type D HMAC	1.5	3

Surface Drainage

Proper drainage is very important for the adequate performance of pavements. Ruts and birdbaths in pavements allow for quick deterioration of the pavement primarily due to saturation of the underlying base materials and subgrade soils.

The pavement repair evaluation results in this report are based on the assumption that the pavement will have good drainage off the surface and collecting in curbs at the edge of the pavement.

Surface Cracking

It is typical for cracks to reappear in the new HMAC surface soon after a street reconstruction program is completed where the original pavements show prior longitudinal cracking along the pavement edges and random alligator cracking. The cracks are generally related to variations in moisture content of the subgrade soils and typically can extend deep into the soils below the reconstruction sections and propagate back to the surface over time.

Closing

We appreciate the opportunity to provide geotechnical and pavement consulting services for this project. If there are any questions, please contact our office.

Sincerely,

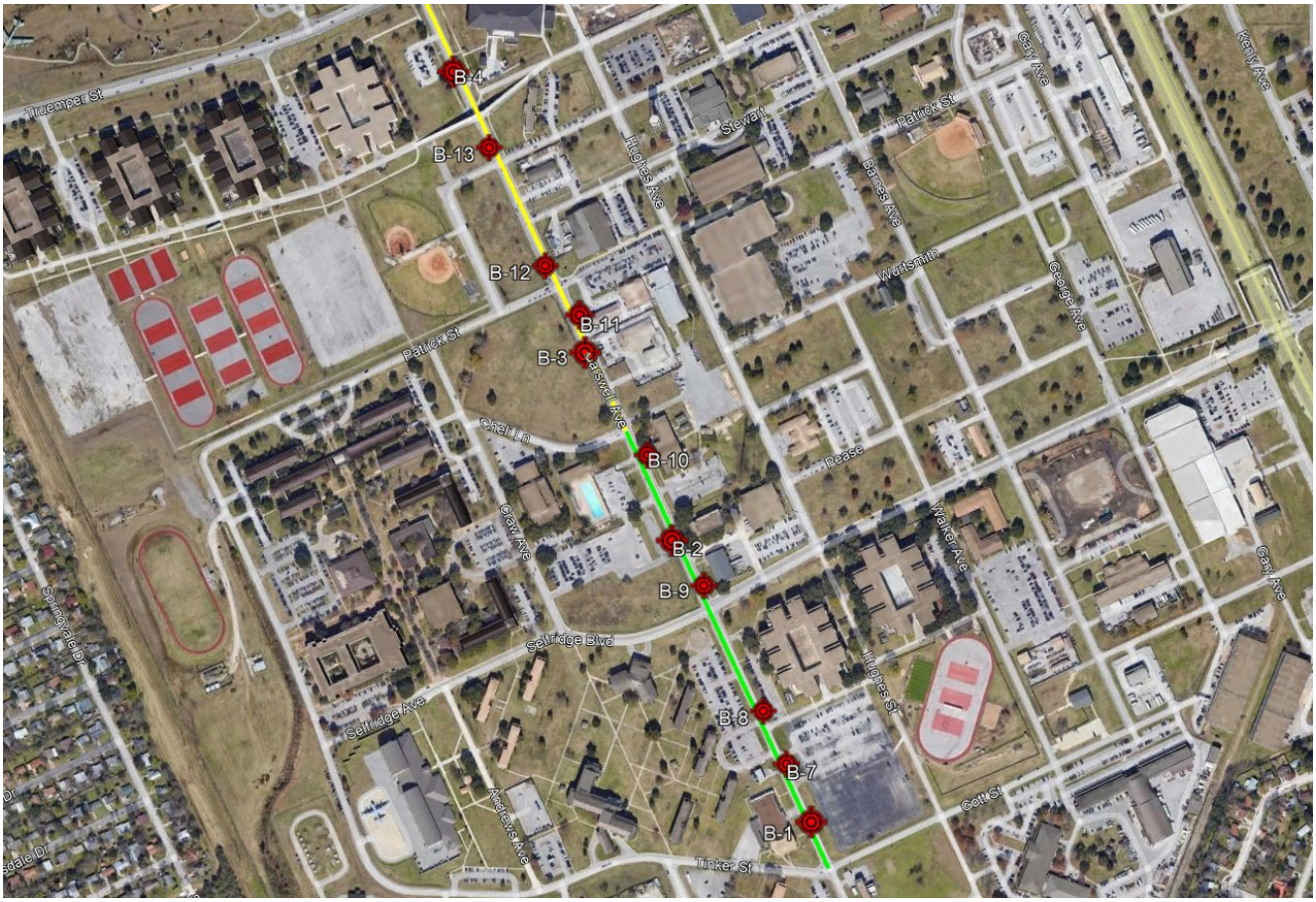
Kyle D. Hammock, P.E.
Vice President - San Antonio

KDH/jr

Attachments:
Boring Location Plan
Boring Logs B-1 through B-18
Dynamic Cone Penetrometer Test Results
Density vs Moisture Curves
CBR Curves
Key to Soil Classifications

BORING LOCATION PLAN

NO SCALE
BORING LOCATIONS ARE APPROXIMATE



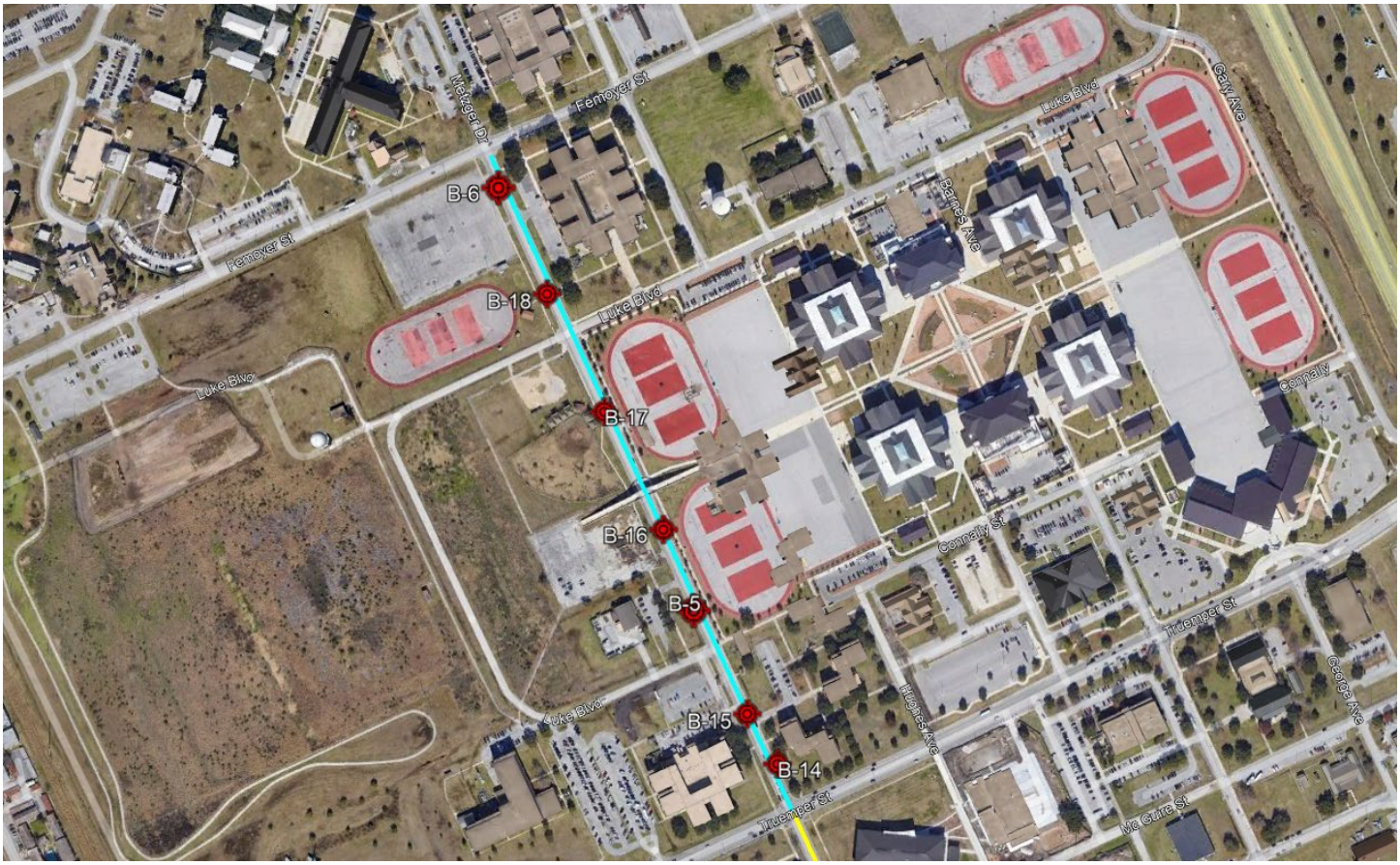
May 5, 2022
JSR, Inc.
RETL Project No.: G221603 Rev. 2

PAVEMENT INVESTIGATION
Carswell Ave LAFB
San Antonio, Texas

ROCK ENGINEERING AND TESTING LABORATORY, INC.
10856 VANDALE STREET
SAN ANTONIO, TEXAS 78216
(210) 495-8000

BORING LOCATION PLAN

NO SCALE
BORING LOCATIONS ARE APPROXIMATE



May 5, 2022
JSR, Inc.
RETL Project No.: G221603 Rev. 2

PAVEMENT INVESTIGATION
Carswell Ave LAFB
San Antonio, Texas

ROCK ENGINEERING AND TESTING LABORATORY, INC.
10856 VANDALE STREET
SAN ANTONIO, TEXAS 78216
(210) 495-8000

LOG OF BORING B-1 PHASE 1

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-80000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 09/01/2021

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			4							**ASPHALT= 3-INCHES** **CRUSHED LIMESTONE BASE= 7-INCHES**
	1											**DARK BROWN CLAY**
	2	SPT S-2		N= 27	16	24	19	5			45	**SILTY CLAYEY SAND**, with calcareous and gravel, light brown, moist, very stiff. (SC-SM)
	3	SPT S-3		N= 17	16							Same as above.
	4											
	5	SPT S-4		N= 33	4	NP	NP	NP			13	**SILTY SAND**, with gravel, light brown, dry, dense. (SM)
	6											
	7	SPT S-5		N= 26	11							**SILTY CLAYEY SAND**, with calcareous and gravel, light brown, moist, very stiff.
	8											
	9	SPT S-6		N= 46	5	14	10	4			28	Same as above, hard. (SC-SM)
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.37459°, W -98.62277°

LOG OF BORING B-2 PHASE 1

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-80000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 09/01/2021

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	1	AUGER S-1			9							**ASPHALT= 3-INCHES** **CLAYEY GRAVEL BASE= 12-INCHES**
	2	SPT S-2		N= 10	16	34	14	20			46	**CLAYEY GRAVEL** dark brown, moist, stiff. (GC)
	3	SPT S-3		N= 23	19							Same as above, very stiff.
	5	SPT S-4		N= 13	15						46	Same as above, stiff.
	7	SPT S-5		N= 15	17							**CLAYEY GRAVEL** brown, moist, stiff.
	9	SPT S-6		N= 26	11	20	15	5			50	**SILTY CLAYEY SAND**, with calcareous and gravel, light brown, moist, very stiff. (SC-SM)
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.37787°, W -98.62466°

LOG OF BORING B-3 PHASE 2

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-80000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 09/01/2021

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	1	AUGER S-1			9							**ASPHALT= 3.5-INCHES** **CLAYEY GRAVEL BASE= 15-INCHES**
	2	SPT S-2		N= 24	6						21	**CLAYEY GRAVEL** dark brown, dry, very stiff. (51% gravel)
	3	SPT S-3		N= 14	15	26	15	11			50	**GRAVELLY LEAN CLAY**, with calcareous, light brown, moist, stiff. (CL)
	4											
	5	SPT S-4		N= 23	11							Same as above, very stiff.
	6											
	7	SPT S-5		N= 37	16	24	14	10			53	Same as above, hard. (CL)
	8											
	9	SPT S-6		N= 54	9							**SILTY CLAYEY SAND**, with calcareous and gravel, light brown, dry, hard.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38007°, W -98.62582°

LOG OF BORING B-4 PHASE 2

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-80000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 09/01/2021

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			7						7	**ASPHALT=3.5-INCHES** **CRUSHED LIMESTONE BASE= 8-INCHES** (60% gravel)
	1											
	2	SPT S-2		N= 8	26	51	19	32			84	**FAT CLAY WITH GRAVEL**, dark brown, moist, stiff. (CH)
	3	SPT S-3		N= 9	22							Same as above.
	4											
	5	SPT S-4		N= 10	21	54	20	34			82	Same as above.
	6											
	7	SH S-5		P= 2.5	20							**FAT CLAY WITH SAND**, with calcareous, brown and light brown, moist, very stiff.
	8											
	9	SPT S-6		N= 11	18						85	Same as above, stiff.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38336°, W -98.62759°

LOG OF BORING B-5 PHASE 3

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-80000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 09/01/2021

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during the drilling operations and the boring was dry upon the completion of the drilling operations.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT= 3-INCHES
	1	AUGER S-1			8						15	**CRUSHED LIMESTONE BASE= 13.5-INCHES** (43% gravel)
	2	SPT S-2		N= 7	23	72	23	49			67	**GRAVELLY FAT CLAY**, dark brown, moist, firm. (CH)
	3											
	4	SPT S-3		N= 7	27	76	22	54			86	**FAT CLAY**, dark brown, moist, firm. (CH)
	5	SH S-4		P= 2.0	28							Same as above, brown, stiff.
	6											
	7	SH S-5		P= 1.0	28	64	23	41			88	Same as above, light brown. (CH)
	8											
	9	SPT S-6		N= 36	6							**SILTY CLAYEY SAND**, with calcareous and gravel, light brown, dry, hard.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38636°, W -98.62920°

LOG OF BORING B-6 PHASE 3

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-80000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 09/01/2021

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
												ASPHALT= 2-INCHES
	1	AUGER S-1			6						13	**CRUSHED LIMESTONE BASE= 15-INCHES** (42% gravel)
	2	SPT S-2		N= 8	25	71	26	45			74	**FAT CLAY WITH GRAVEL**, dark brown, moist, stiff. (CH)
	3	SPT S-3		N= 9	26							Same as above.
	4											
	5	SH S-4		P= 3.0	23	62	23	39			88	**FAT CLAY**, brown, moist, very stiff. (CH)
	6											
	7	SPT S-5		N= 27	12							**GRAVELLY LEAN CLAY**, with calcareous , light brown, moist, very stiff.
	8											
	9	SPT S-6		N= 56	12						60	Same as above, hard.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.39046°, W -98.63140°

LOG OF BORING B-7 PHASE 1

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/15/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			6							**ASPHALT= 3-INCHES, BASE= 9-INCHES**, brown, dry.
	1											
	2	SPT S-2		N= 9	20	44	18	26			48	**CLAYEY GRAVEL**, dark brown, moist, stiff. (GC)
	3	SPT S-3		N= 10	23	41	21	20			51	**SANDY LEAN CLAY**, light brown, moist, with gravel, stiff. (CL)
	4											
	5	SPT S-4		N= 2	24							Same as above, soft.
	6											
	7	SPT S-5		N= 4	30							Same as above, with calcareous, firm.
	8											
	9	SPT S-6		N= 9	23							**SANDY LEAN CLAY**, light brown, moist, highly calcareous, stiff.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.37525°, W -98.62311°

LOG OF BORING B-8 PHASE 1

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/15/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			6							**ASPHALT= 3.5-INCHES, BASE= 12-INCHES**, brown, dry.
	1											
	2	SPT S-2		N= 18	19	37	17	20			43	**CLAYEY GRAVEL**, dark brown, moist, very stiff. (GC)
	3											
		SPT S-3		N= 15	18							**SANDY SILTY CLAY**, light brown, moist, with calcareous and gravel, stiff.
	4											
	5	SPT S-4		N= 16	20	24	17	7			53	Same as above, very stiff. (CL-ML)
	6											
	7	SPT S-5		N= 45	17							Same as above, hard.
	8											
	9	SPT S-6		N= 59	4							**GRAVELLY LEAN CLAY**, light brown, dry, hard.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.37587°, W -98.62342°

LOG OF BORING B-9 PHASE 1

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/15/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			8							**ASPHALT= 4-INCHES, BASE= 6-INCHES**, brown, dry.
	1	SPT S-2		N= 34	16	44	17	27			57	**GRAVELLY LEAN CLAY**, dark brown, moist, hard. (CL)
	2											
	3	SPT S-3		N= 6-50/4"	12							Same as above, very hard.
	4											
	5	SPT S-4		N= 32	15							**CLAYEY GRAVEL**, brown, moist, dense.
	6											
	7	SPT S-5		N= 17	19							**GRAVELLY SILTY CLAY**, light brown, moist, very stiff.
	8											
	9	SPT S-6		N= 24	15	21	17	4			62	Same as above, highly calcareous. (CL-ML)
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.37734°, W -98.62422°

LOG OF BORING B-10 PHASE 1

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/15/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			6							**ASPHALT= 2.5-INCHES, BASE= 9-INCHES**, brown, dry.
	1											
	2	SPT S-2		N= 21-50/1"	5						16	**CLAYEY GRAVEL**, dark brown, dry, very dense.
	3	SPT S-3		N= 50/5"	11						22	Same as above, moist.
	4											
	5	SPT S-4		N= 31	16	88	26	62			56	**GRAVELLY FAT CLAY**, light brown, moist, hard. (CH)
	6											
	7	SPT S-5		N= 18	17							Same as above, with calcareous, very stiff.
	8											
	9	SPT S-6		N= 51	8							**GRAVELLY LEAN CLAY**, light brown, dry, hard.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.37887°, W -98.62498°

LOG OF BORING B-11 PHASE 2

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/15/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			9							**ASPHALT= 2.5-INCHES, BASE= 9-INCHES**, brown, dry.
	1											
	2	SPT S-2		N= 52	5						15	**CLAYEY GRAVEL**, dark brown, dry, very dense.
	3	SPT S-3		N= 28	13						21	Same as above, brown, moist, medium dense.
	4											
	5	SPT S-4		N= 40	14							Same as above, light brown, dense.
	6											
	7	SPT S-5		N= 32	12	103	33	70			33	**CLAYEY GRAVEL**, light brown, moist, with calcareous, dense. (GC)
	8											
	9	SPT S-6		N= 46	9							Same as above, highly calcareous, dry.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38051°, W -98.62589°

LOG OF BORING B-12 PHASE 2

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/15/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			9							**ASPHALT= 4-INCHES, BASE= 8-INCHES**, light brown, dry.
	1											
	2	SPT S-2		N= 11	26	65	22	43			71	**FAT CLAY WITH GRAVEL**, dark brown, moist, stiff. (CH)
	3	SPT S-3		N= 27	11							**CLAYEY GRAVEL**, dark brown to brown, moist, medium dense.
	4											
	5	SPT S-4		N= 18	17	50	19	31			24	Same as above (GC)
	6											
	7	SPT S-5		N= 26-50/3"	10							Same as above, light brown, with calcareous, very dense.
	8											
	9	SPT S-6		N= 27-50/2"	6							**CLAYEY GRAVEL**, light brown, dry, very dense.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38113°, W -98.62624°

LOG OF BORING B-13 PHASE 2

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/15/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			7							**ASPHALT= 3.5-INCHES, BASE= 8-INCHES**, light brown, dry.
	1											
	2	SPT S-2		N= 26	12						32	**CLAYEY GRAVEL**, dark brown, moist, medium dense.
	3	SPT S-3		N= 21	22	27	19	8			82	**LEAN CLAY WITH SAND**, light brown, moist, with some gravel, very stiff. (CL)
	4											
	5	SPT S-4		N= 11	19							**SILTY CLAY**, light brown, moist, stiff.
	6											
	7	SPT S-5		N= 18	21	22	17	5			91	Same as above, highly calcareous, very stiff. (CL-ML)
	8											
	9	SPT S-6		N= 15	14							Same as above, with gravel, stiff.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38244°, W -98.62712°

LOG OF BORING B-14 PHASE 2

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/16/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			7							**ASPHALT= 2-INCHES, BASE= 10-INCHES**, brown, dry.
	1											
	2	SPT S-2		N= 7	32	57	18	39			62	**GRAVELLY FAT CLAY**, dark brown, moist, firm. (CH)
	3	SPT S-3		N= 7	23	61	17	44			85	**FAT CLAY WITH SAND**, dark brown, moist, firm. (CH)
	4											
	5	SH S-4		P= 3.0	20							Same as above, light brown, with calcareous, very stiff.
	6											
	7	SPT S-5		N= 18	19							**GRAVELLY LEAN CLAY**, light brown, moist.
	8											
	9	SPT S-6		N= 35	7							Same as above, dry, hard.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38488°, W -98.62826°

LOG OF BORING B-15 PHASE 3

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/16/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			5							**ASPHALT= 2-INCHES, BASE= 10-INCHES**, light brown, dry.
	1	SH S-2		P= 2.5	27	63	19	44			78	**FAT CLAY WITH SAND**, dark brown, moist, very stiff. (CH)
	2											
	3	SH S-3		P= 2.5	26							Same as above, brown, with gravel.
	4											
	5	SPT S-4		N= 20	18							**GRAVELLY LEAN CLAY**, brown, moist, very stiff.
	6											
	7	SPT S-5		N= 33	10	44	15	29			53	Same as above, dry, hard. (CL)
	8											
	9	SPT S-6		N= 16	15							**FAT CLAY**, light brown and light gray, moist, with calcareous, very stiff.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38545°, W -98.62818°

LOG OF BORING B-16 PHASE 3

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/16/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
	1	AUGER S-1			10							**ASPHALT= 3.5-INCHES, BASE= 12-INCHES**, light brown, moist.
	2											
	3	SH S-2		P= 1.5	29	76	21	55				**FAT CLAY**, dark brown, moist, stiff.
	4											
	5	SH S-3		P= 2.0	34	77	22	55			90	Same as above.
	6											
	7	SPT S-4		N= 39	11							**GRAVELLY SILTY CLAY**, light brown and brown, dry, hard.
	8											
	9	SPT S-5		N= 42	8							Same as above, dry.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38653°, W -98.62915°

LOG OF BORING B-17 PHASE 3

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/16/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			5							**ASPHALT= 2-INCHES, BASE= 10-INCHES**, light brown, dry.
	1											
	2	SH S-2		P= 3.0	34	67	21	46			91	**FAT CLAY**, dark brown, moist, very stiff. (CH)
	3	SH S-3		P= 2.0	29							Same as above, stiff.
	4											
	5	SH S-4		P= 2.5	24	63	14	49			87	Same as above, dark brown to brown, very stiff. (CH)
	6											
	7	SH S-5		P= 4.5	23							**FAT CLAY**, brown, moist, with calcareous, very stiff
	8											
	9	SPT S-6		N= 13	27							**LEAN CLAY WITH SAND**, light brown, moist, with calcareous, stiff.
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38781°, W -98.65003°

LOG OF BORING B-18 PHASE 3

Rock Engineering & Testing Laboratory, Inc.
10856 Vandale Street
San Antonio, Texas 78216
Telephone: 210-495-8000
Fax: 210-495-8015

CLIENT: JSR, Inc.
PROJECT: Repair Carswell LAFB
LOCATION: Lackland AFB; San Antonio, Texas
NUMBER: G221603
DATE(S) DRILLED: 02/16/2022

DRILLING METHOD(S):
Solid Flight Auger

GROUNDWATER INFORMATION:
Groundwater was not encountered during drilling and the boring was dry upon completion of the drilling.

SURFACE ELEVATION: N/A

SOIL SYMBOL	DEPTH (FT)	SAMPLE NUMBER	SAMPLES	N: BLOWS/FT P: TONS/SQ FT T: TONS/SQ FT Qc: TONS/SQ FT	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT LL	ATTERBERG LIMITS PLASTIC LIMIT PL	ATTERBERG LIMITS PLASTICITY INDEX PI	DRY DENSITY POUNDS/CU.FT	COMPRESSIVE STRENGTH (TONS/SQ FT)	MINUS NO. 200 SIEVE (%)	DESCRIPTION OF STRATUM
		AUGER S-1			10							**ASPHALT= 2-INCHES, BASE= 10-INCHES**, light brown, moist.
	1											
	2	SPT S-2		N= 8	17	68	19	49			44	**CLAYEY GRAVEL**, dark brown, moist, firm. (GC)
	3	SPT S-3		N= 3	25							**FAT CLAY WITH SAND**, dark brown, moist, soft.
	4											
	5	SPT S-4		N= 7	18							Same as above, firm.
	6											
	7	SPT S-5		N= 8	15							Same as above.
	8											
	9	SPT S-6		N= 65	7	16	12	4			25	**SILTY CLAYEY GRAVEL**, light brown, dry, very dense. (GC-GM)
	10											Boring terminated at a depth of 10-feet.

N - STANDARD PENETRATION TEST RESISTANCE
Qc - STATIC CONE PENETROMETER TEST INDEX
P - POCKET PENETROMETER RESISTANCE

REMARKS:
Boring location determined by RETL. Drilling operations performed by RETL.
GPS Coordinates: N 29.38909°, W -98.63081°

DCP TEST DATA

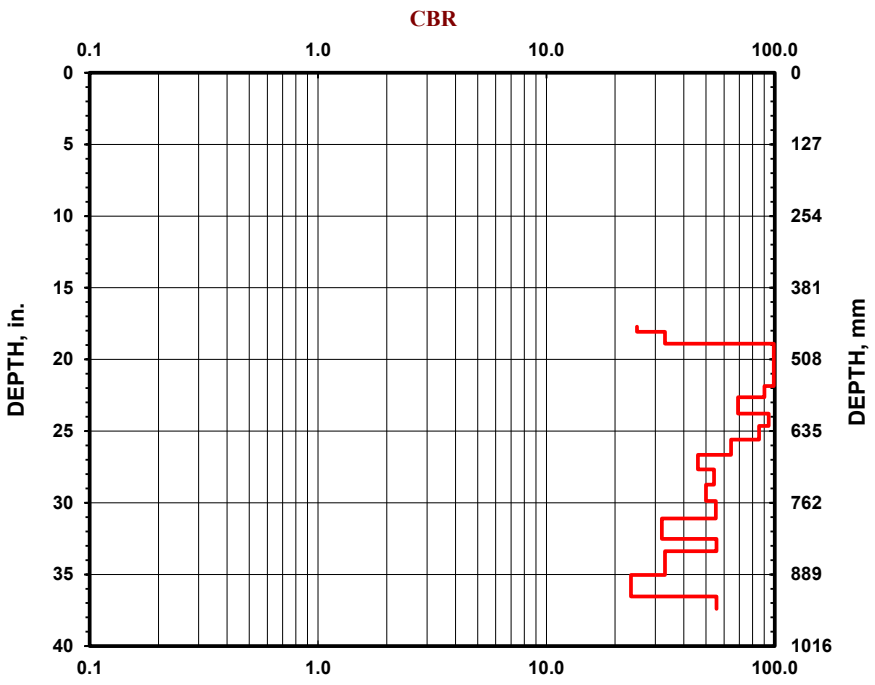
Project: *G221603* **Date:** 1-Sep-21

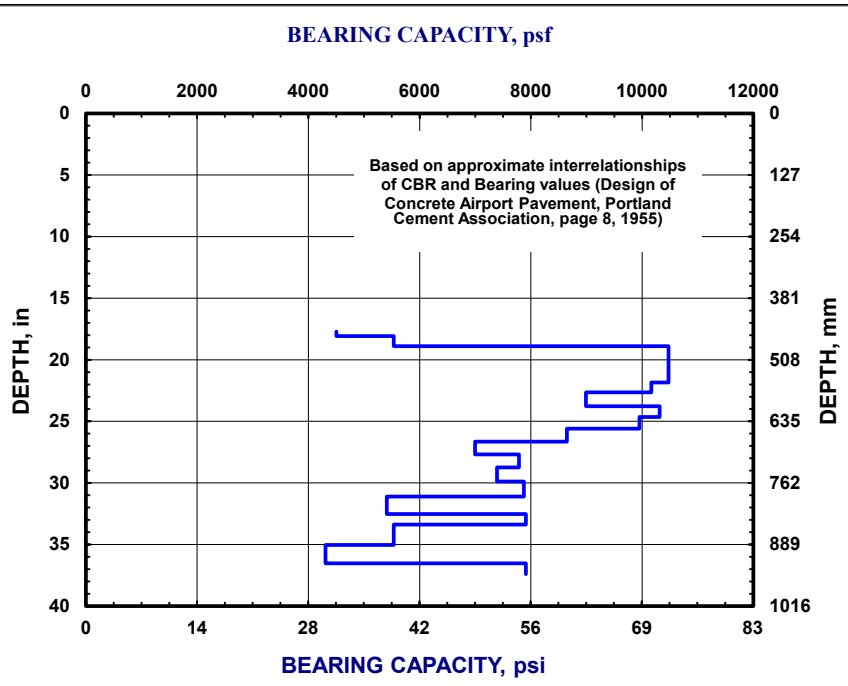
Location: B-1 **Soil Type(s):** Silty Clayey Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	450	1
1	459	1
3	480	1
11	505	1
12	530	1
11	555	1
7	575	1
8	604	1
8	626	1
8	650	1
7	677	1
5	703	1
6	730	1
6	759	1
7	790	1
5	826	1
5	848	1
6	890	1
4	928	1
5	950	1





DCP TEST DATA

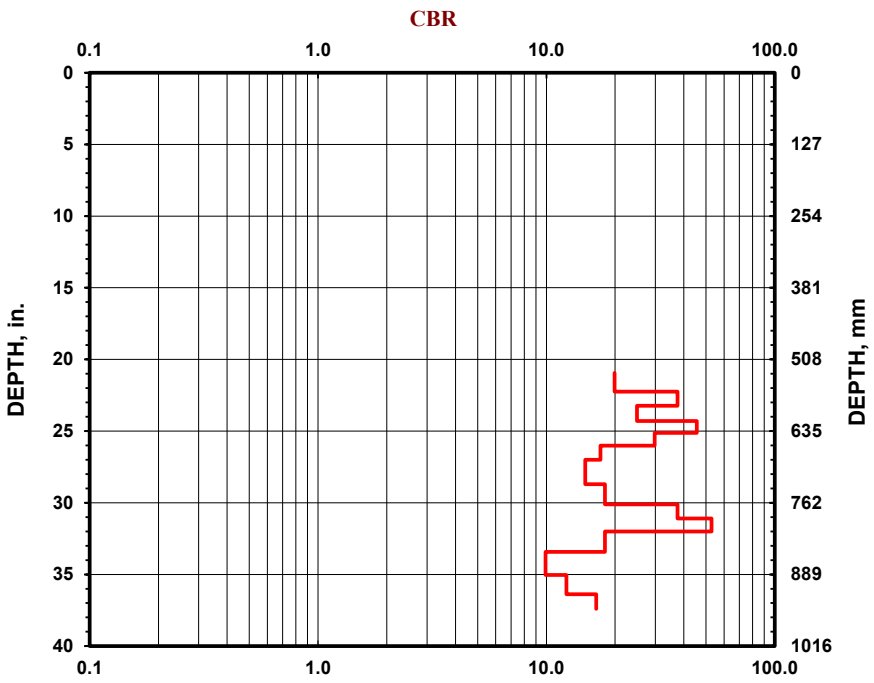
Project: *G221603* **Date:** 1-Sep-21

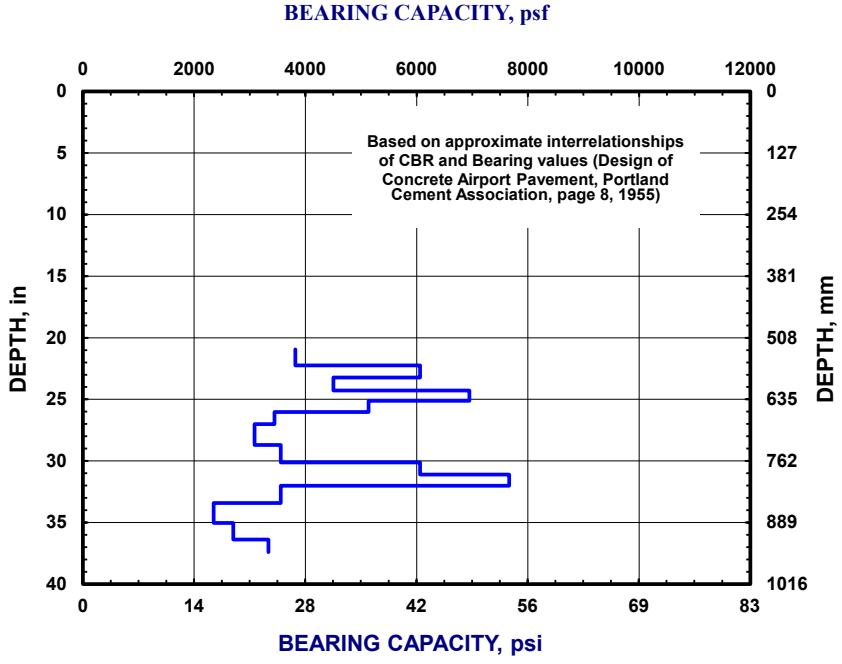
Location: B-2 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	532	1
3	565	1
4	590	1
3	617	1
4	638	1
3	661	1
2	686	1
3	729	1
3	765	1
4	790	1
5	813	1
3	849	1
2	890	1
2	924	1
2	950	1





DCP TEST DATA

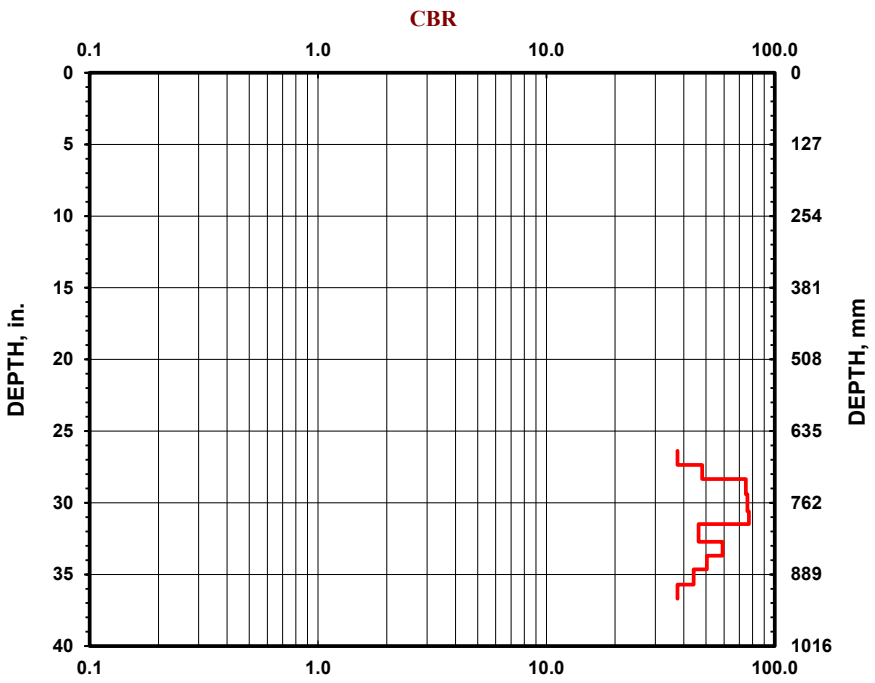
Project: *G221603* **Date:** 1-Sep-21

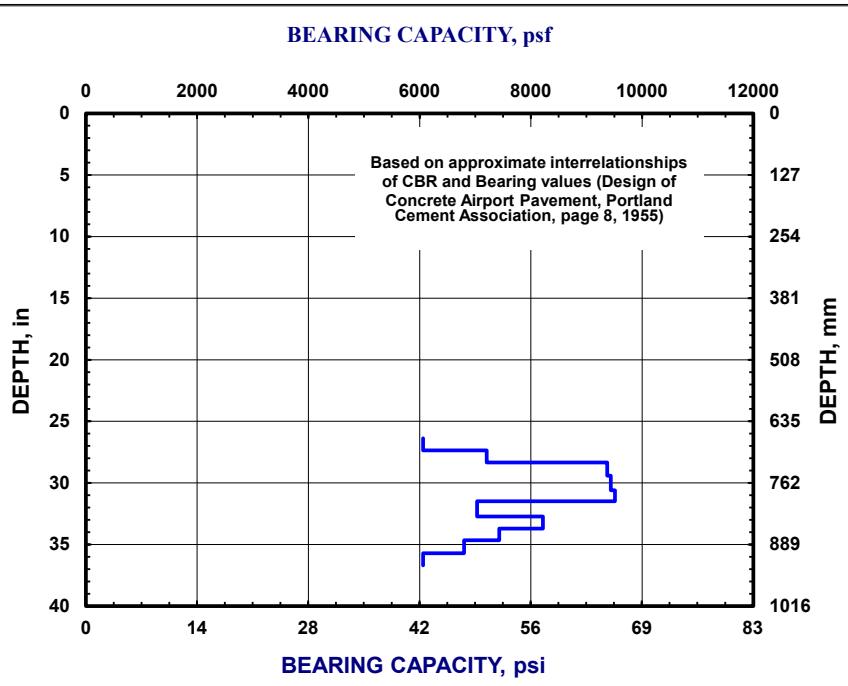
Location: B-3 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	670	1
4	695	1
5	720	1
8	747	1
9	777	1
7	800	1
6	831	1
6	856	1
5	880	1
5	907	1
4	932	1





DCP TEST DATA

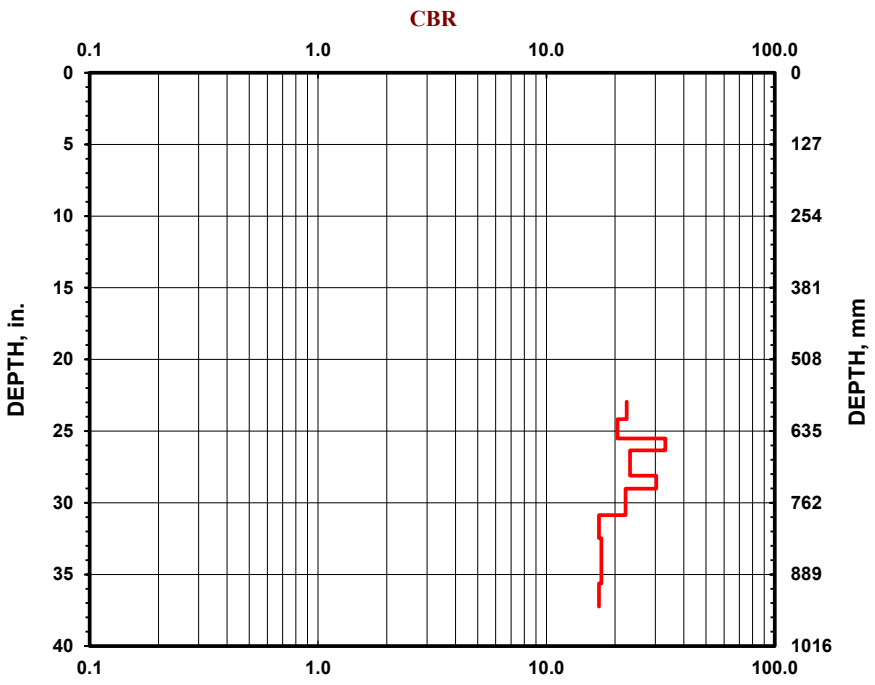
Project: *G221603* **Date:** 1-Sep-21

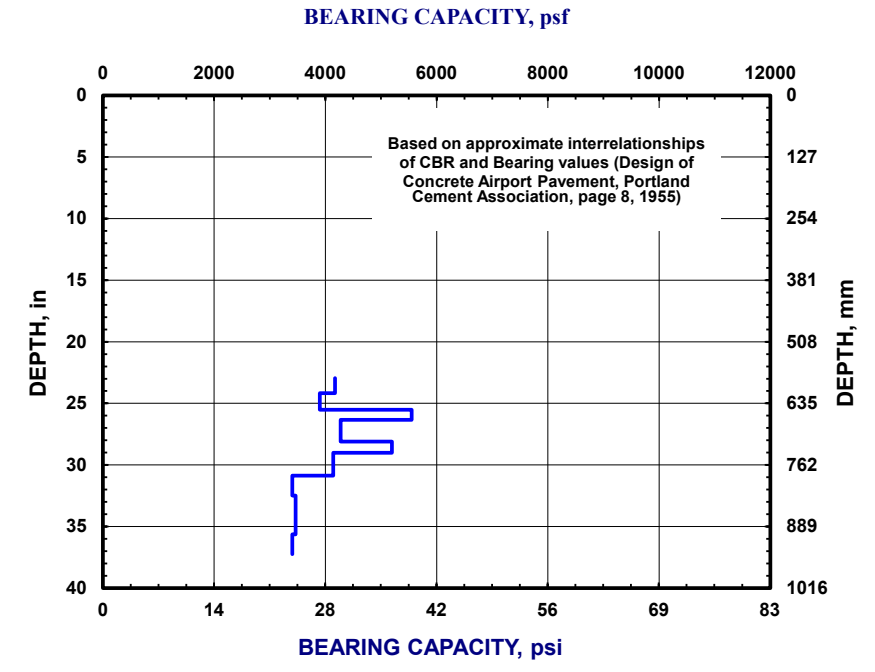
Location: B-4 **Soil Type(s):** Fat Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	583	1
2	614	1
2	648	1
2	669	1
3	714	1
2	737	1
3	784	1
2	825	1
2	865	1
2	905	1
2	946	1





DCP TEST DATA

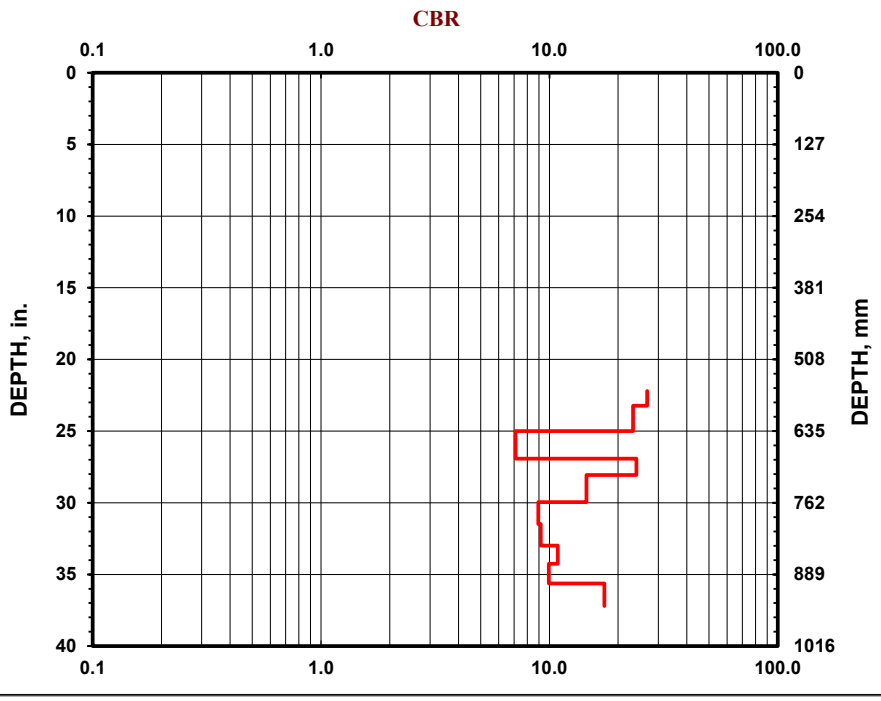
Project: *G221603* **Date:** 1-Sep-21

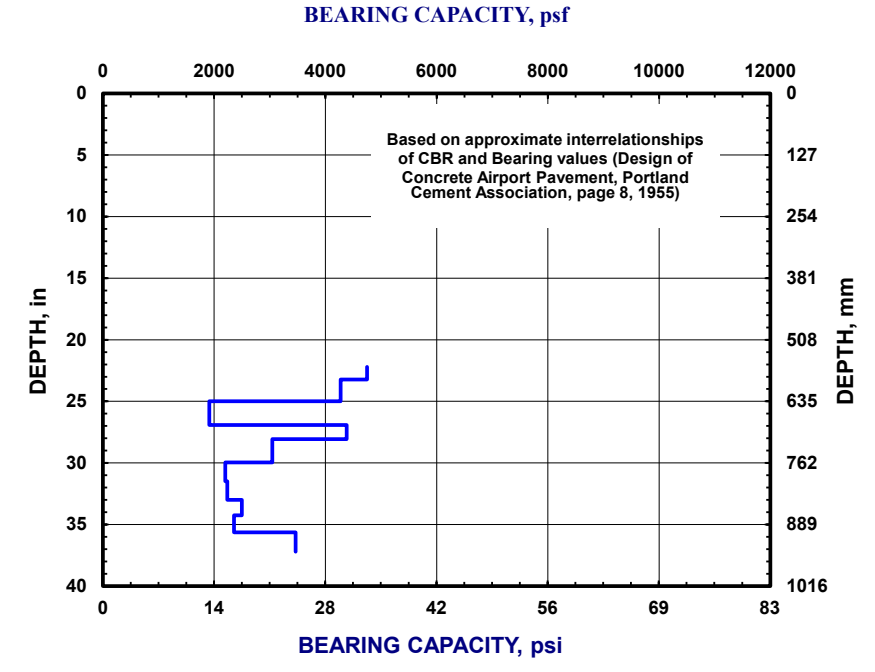
Location: B-5 **Soil Type(s):** Gravelly Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	564	1
2	590	1
3	635	1
1	684	1
2	713	1
2	761	1
1	800	1
1	838	1
1	870	1
1	905	1
2	945	1





DCP TEST DATA

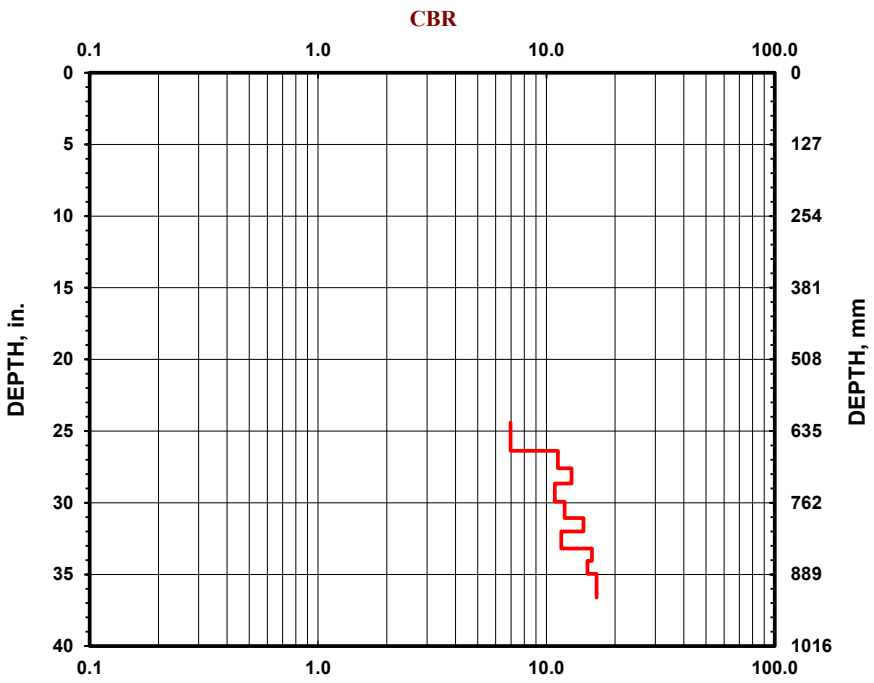
Project: *G221603* **Date:** 1-Sep-21

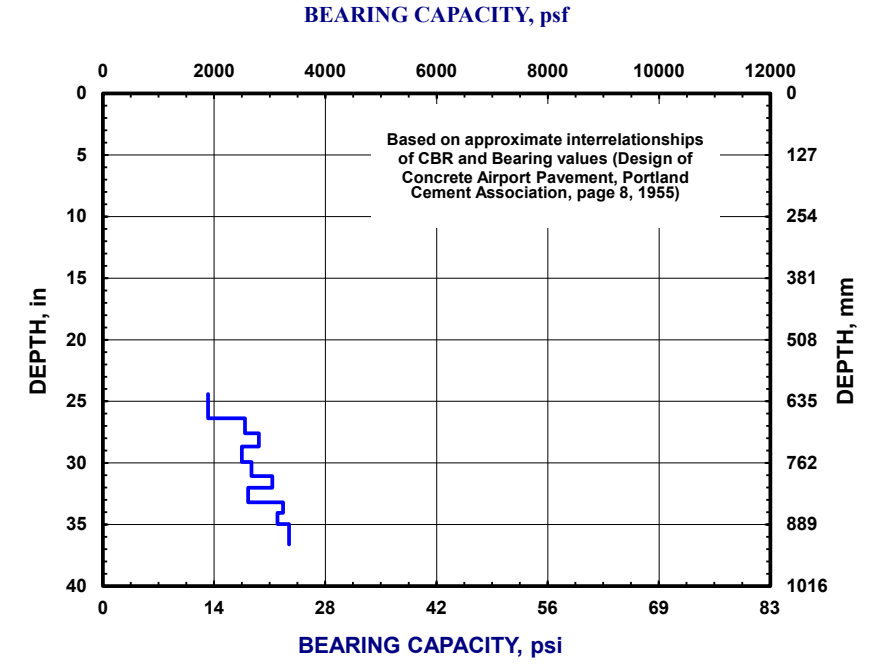
Location: B-6 **Soil Type(s):** Fat Clay with Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	620	1
1	670	1
1	701	1
1	728	1
1	760	1
1	789	1
1	813	1
1	843	1
1	865	1
1	888	1
2	930	1





DCP TEST DATA

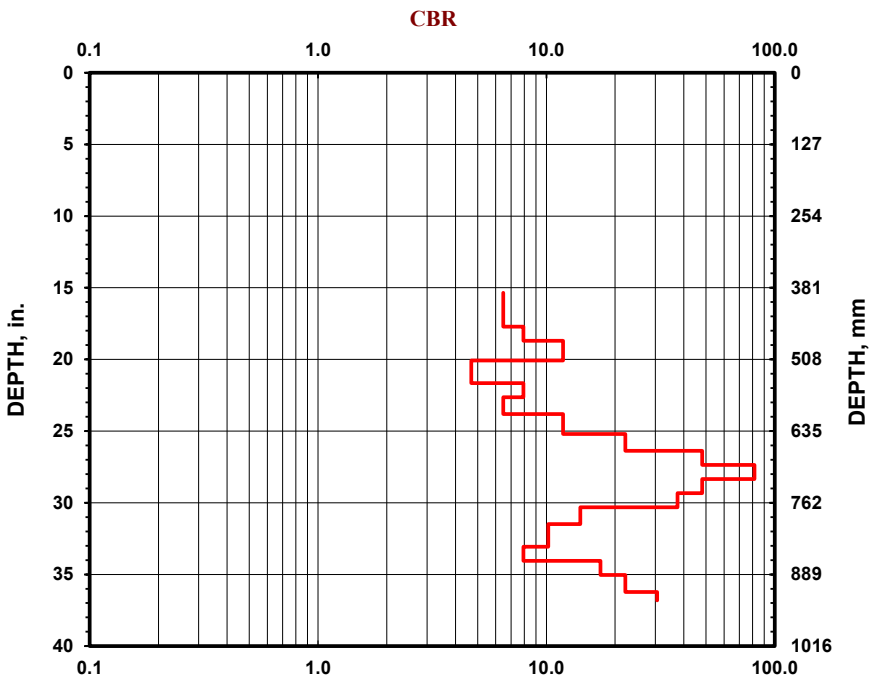
Project: *G221603* **Date:** 15-Feb-22

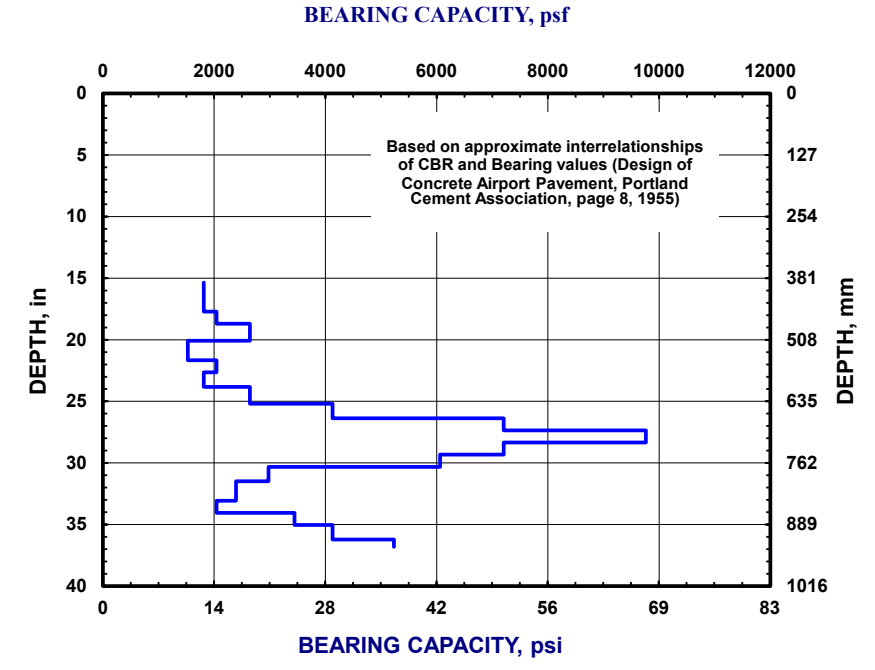
Location: B-7 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	390	1
1	420	1
1	450	1
1	475	1
2	510	1
1	550	1
1	575	1
1	605	1
2	640	1
3	670	1
5	695	1
8	720	1
5	745	1
4	770	1
2	800	1
2	840	1
1	865	1
2	890	1
3	920	1
2	935	1





DCP TEST DATA

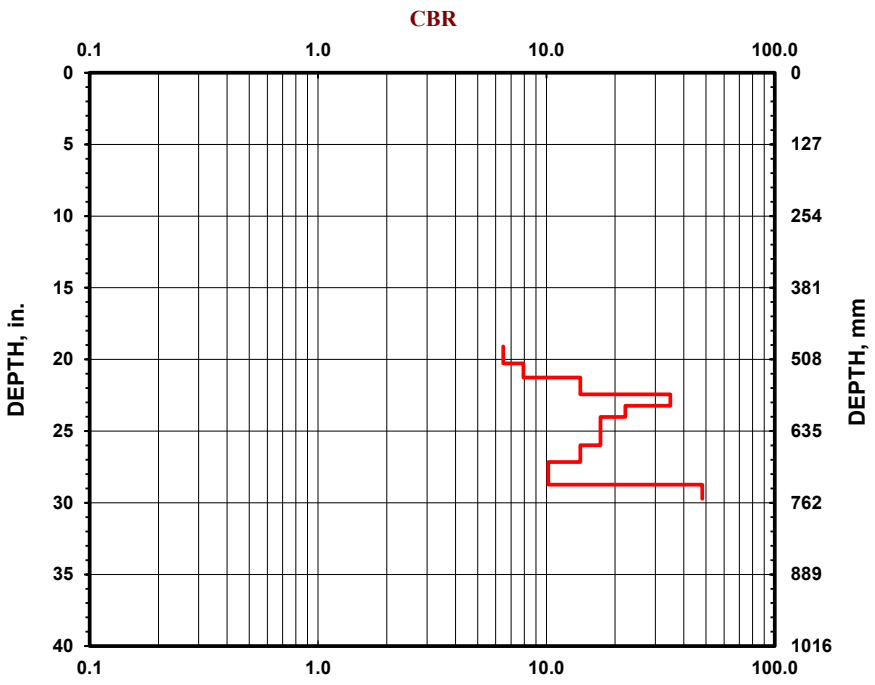
Project: *G221603* **Date:** 15-Feb-22

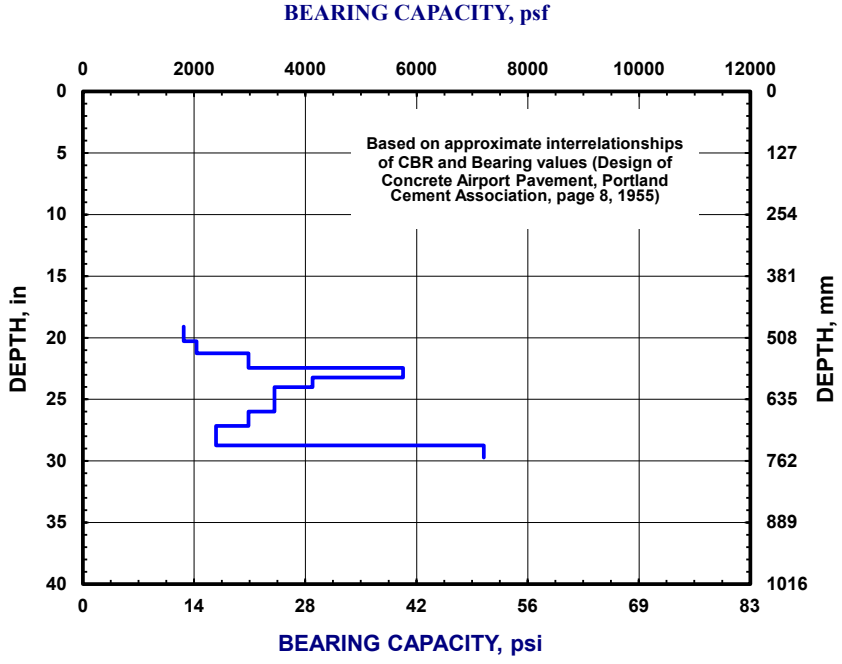
Location: B-8 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	485	1
1	515	1
1	540	1
2	570	1
3	590	1
2	610	1
2	635	1
2	660	1
2	690	1
2	730	1
5	755	1





DCP TEST DATA

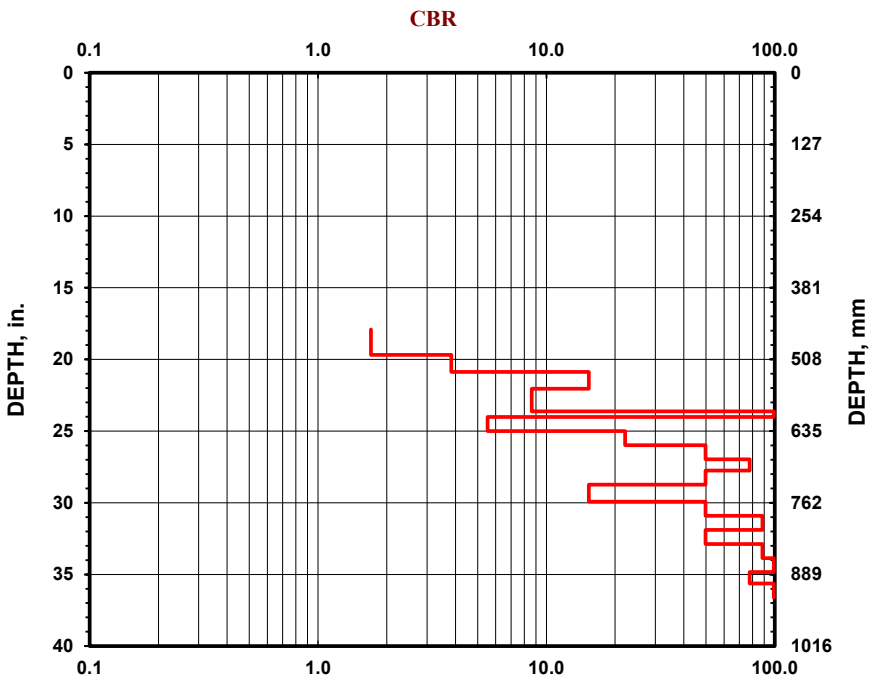
Project: *G221603* **Date:** 15-Feb-22

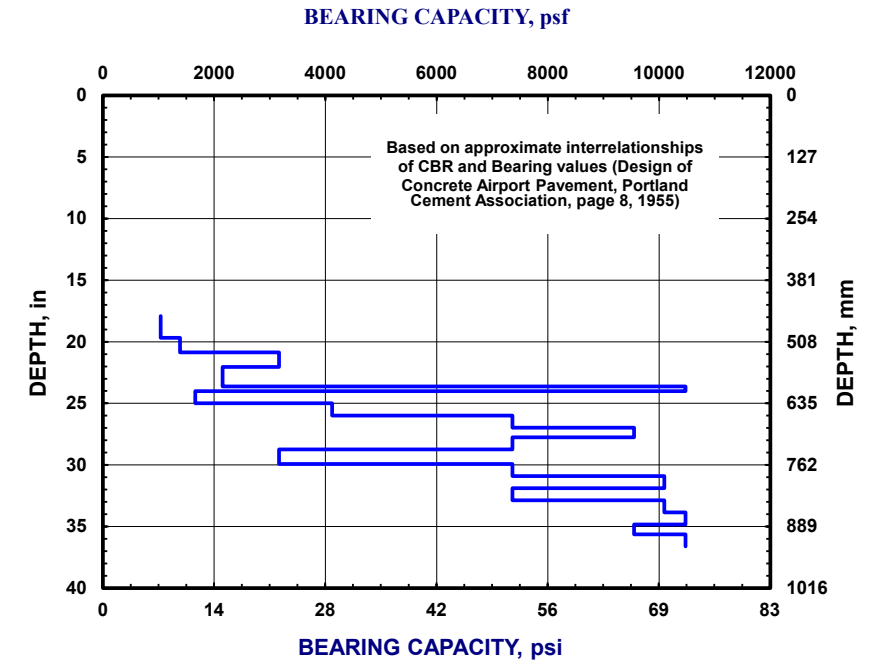
Location: B-9 **Soil Type(s):** Gravelly Lean Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ◉ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	455	1
1	500	1
1	530	1
2	560	1
2	600	1
2	610	1
1	635	1
2	660	1
3	685	1
3	705	1
3	730	1
2	760	1
3	785	1
4	810	1
3	835	1
4	860	1
6	885	1
3	905	1
6	930	1





DCP TEST DATA

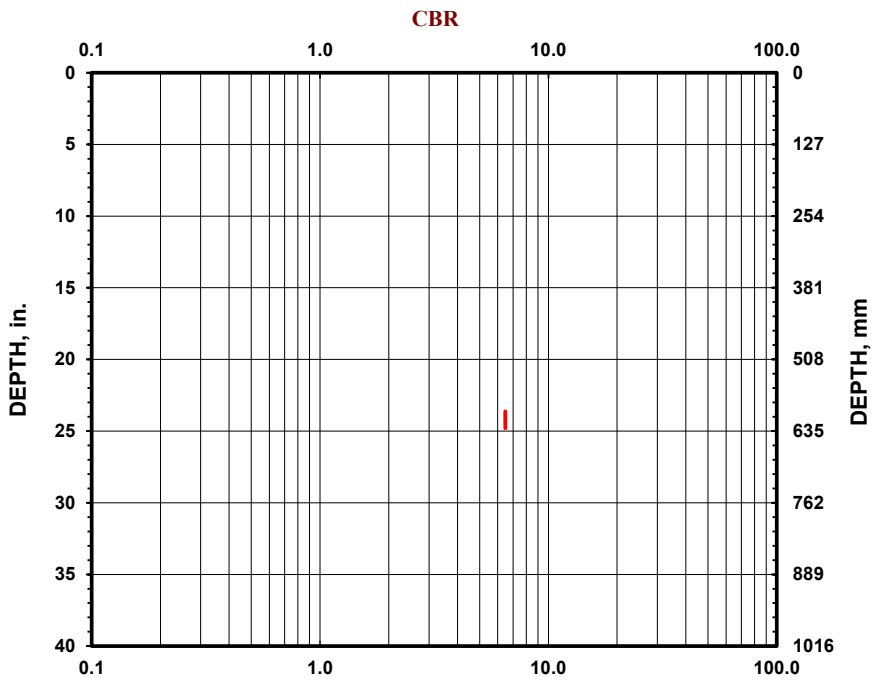
Project: *G221603* **Date:** 15-Feb-22

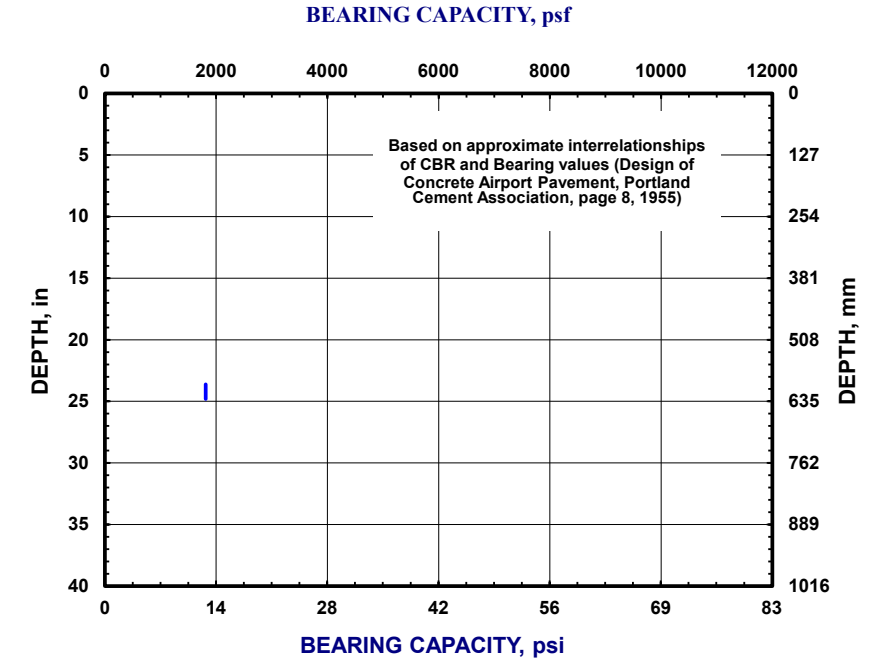
Location: B-10 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	600	1
1	630	1





DCP TEST DATA

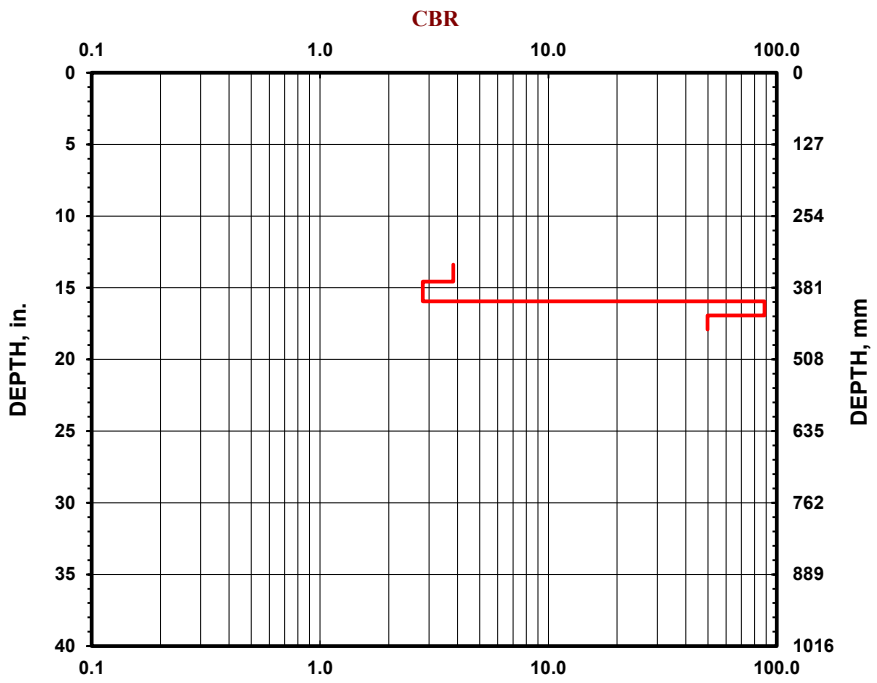
Project: *G221603* **Date:** 15-Feb-22

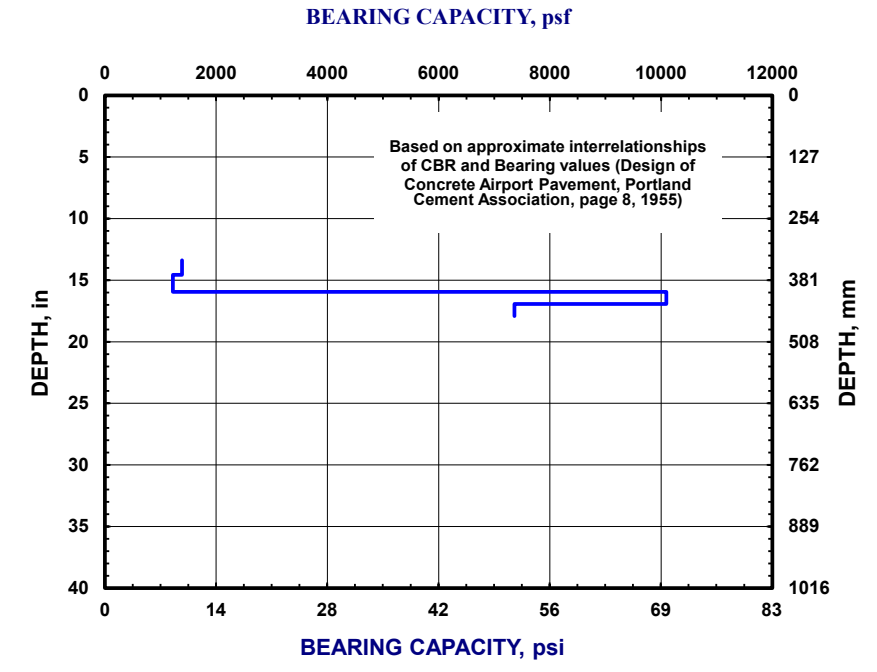
Location: B-11 **Soil Type(s):** Low plasticity Clay with CBR<10

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ◉ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	340	1
1	370	1
1	405	1
4	430	1
3	455	1





DCP TEST DATA

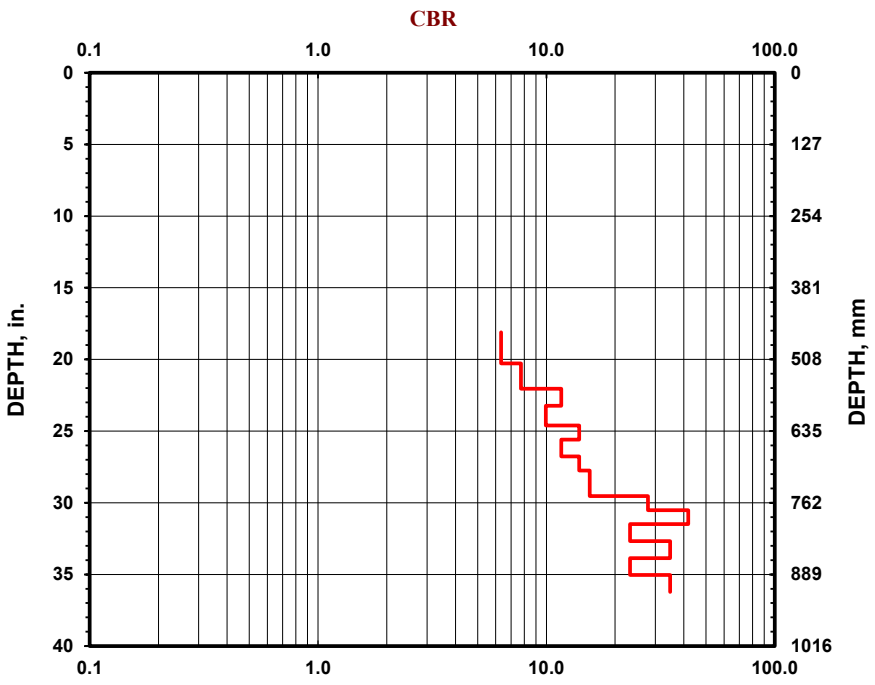
Project: *G221603* **Date:** 15-Feb-22

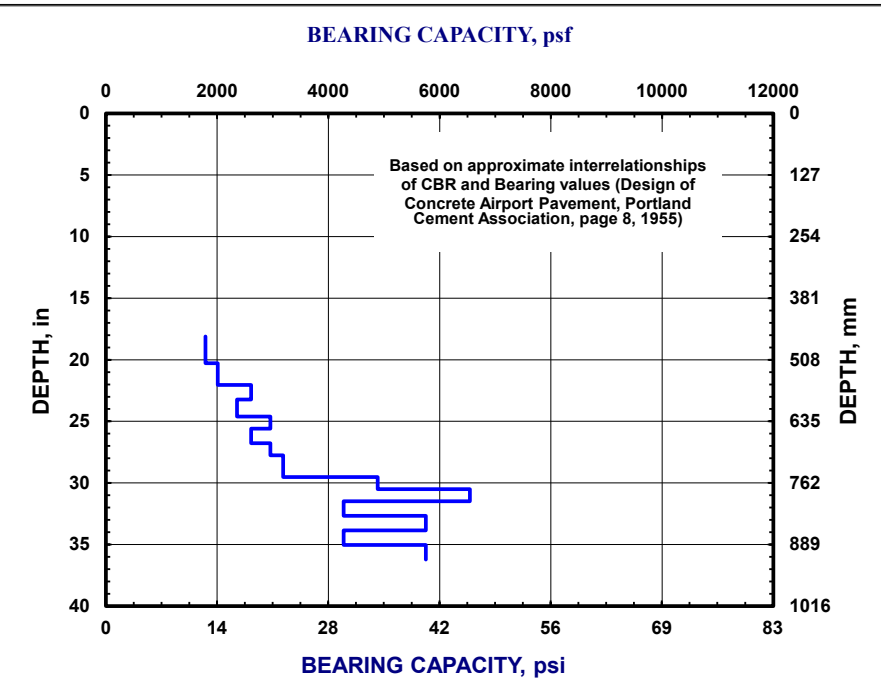
Location: B-12 **Soil Type(s):** High plasticity Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	460	1
1	515	1
1	560	1
1	590	1
1	625	1
1	650	1
1	680	1
1	705	1
2	750	1
2	775	1
3	800	1
2	830	1
3	860	1
2	890	1
3	920	1





DCP TEST DATA

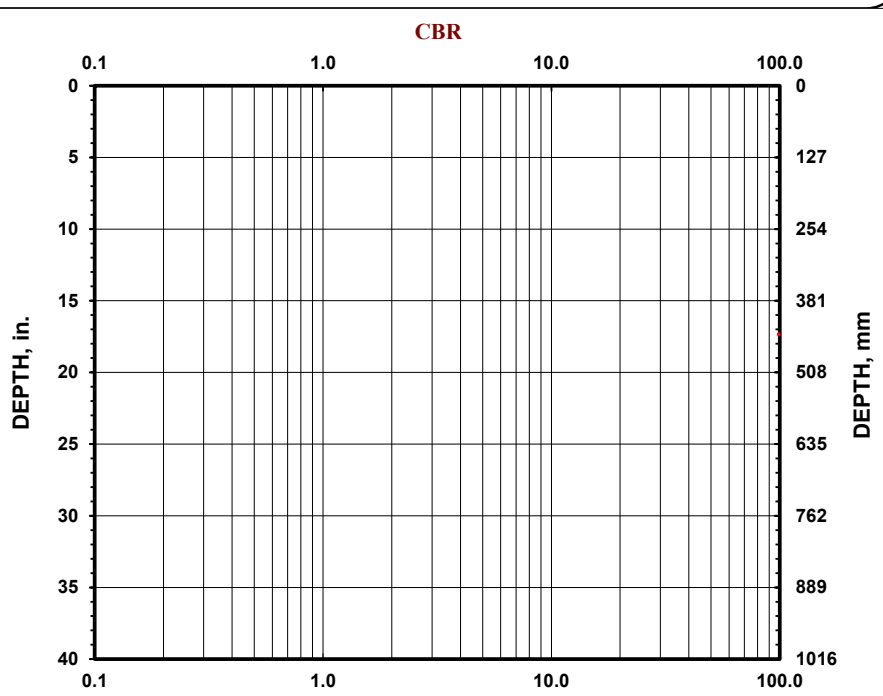
Project: *G221603* **Date:** 15-Feb-22

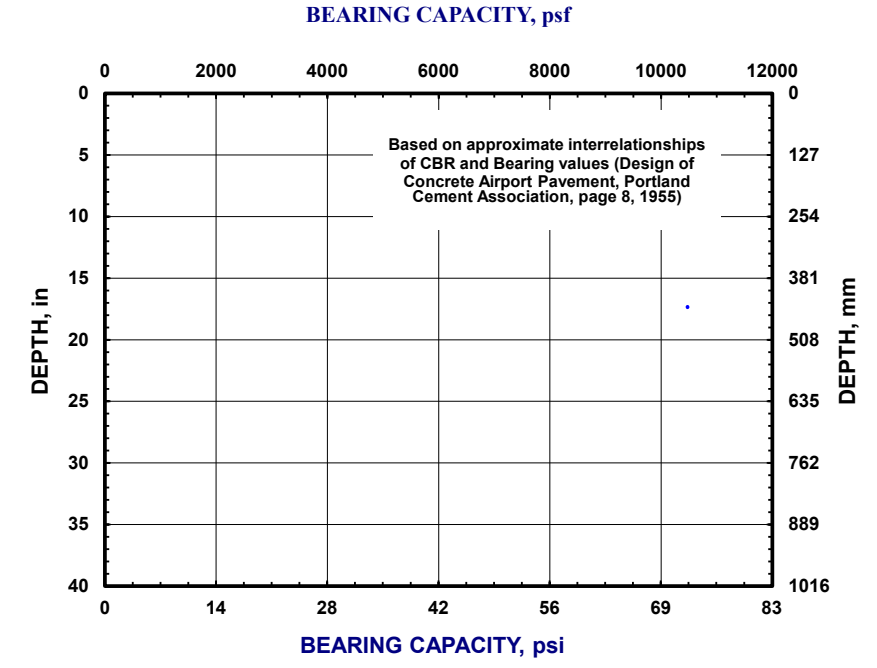
Location: B-13 **Soil Type(s):** Type in the soil type

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	440	1
10	441	1





DCP TEST DATA

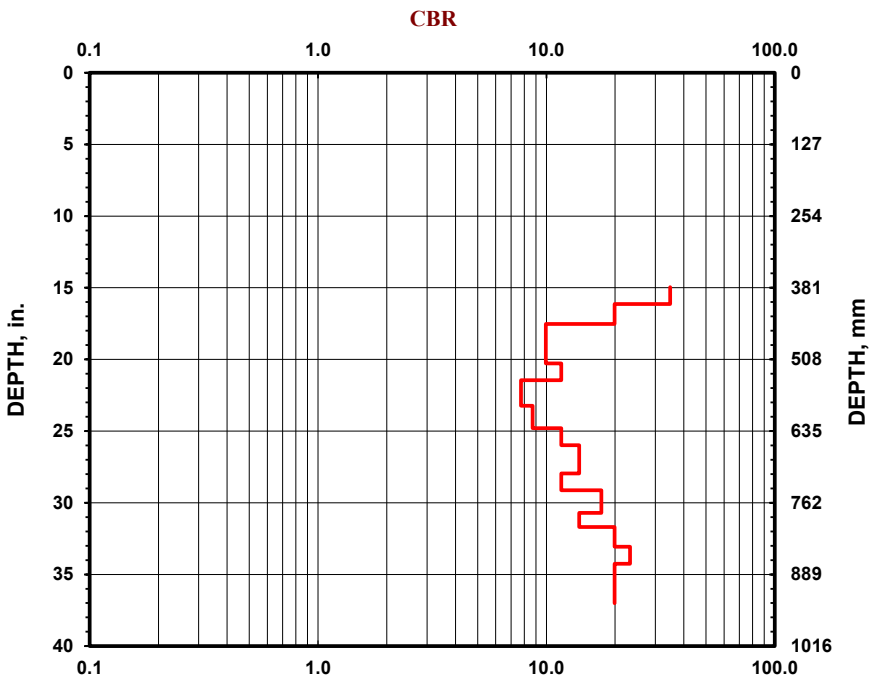
Project: *G221603* **Date:** 15-Feb-22

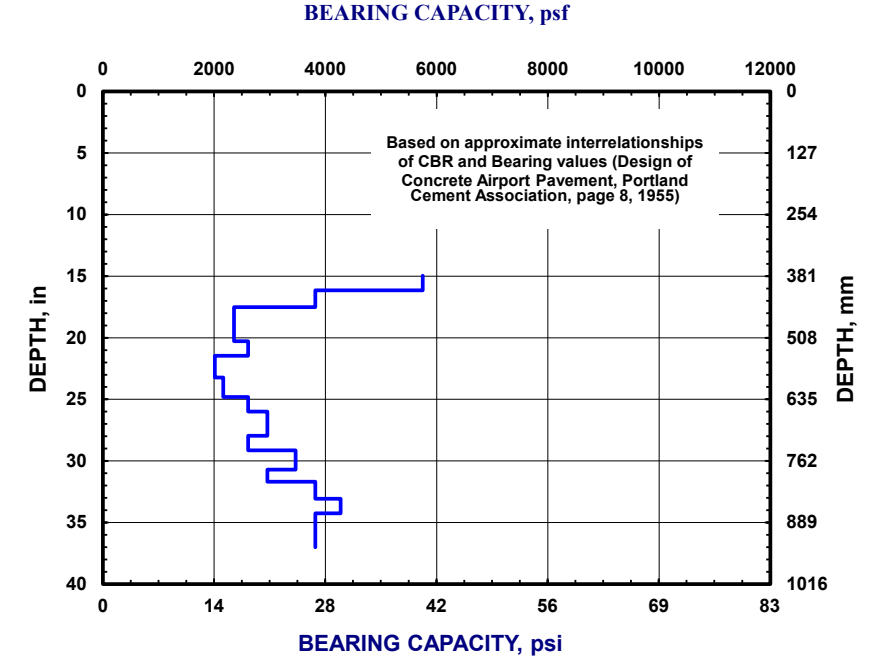
Location: B-14 **Soil Type(s):** Gravelly Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	380	1
3	410	1
2	445	1
1	480	1
1	515	1
1	545	1
1	590	1
1	630	1
1	660	1
2	710	1
1	740	1
2	780	1
1	805	1
2	840	1
2	870	1
2	905	1
2	940	1





DCP TEST DATA

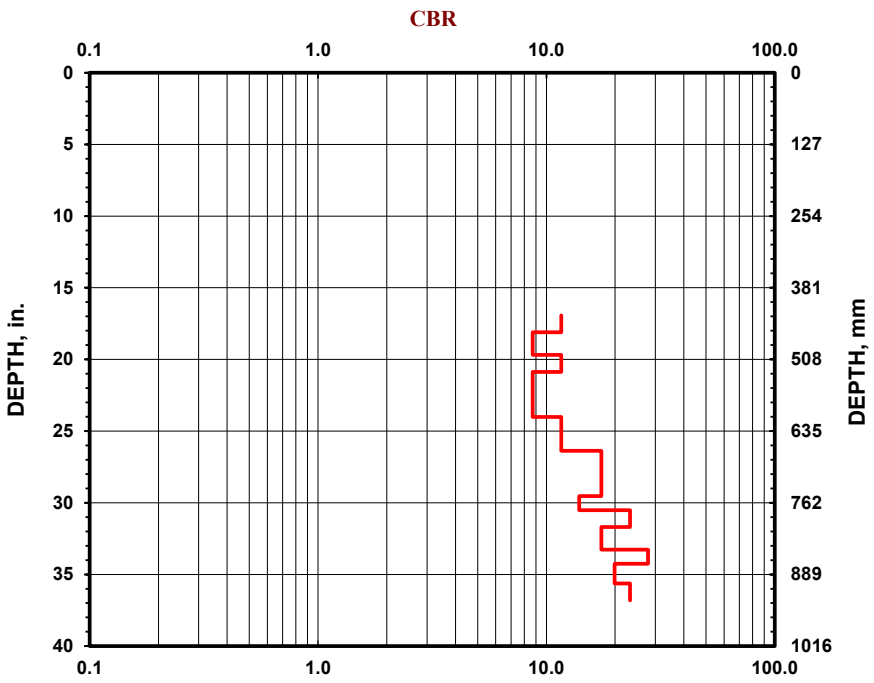
Project: *G221603* **Date:** 15-Feb-22

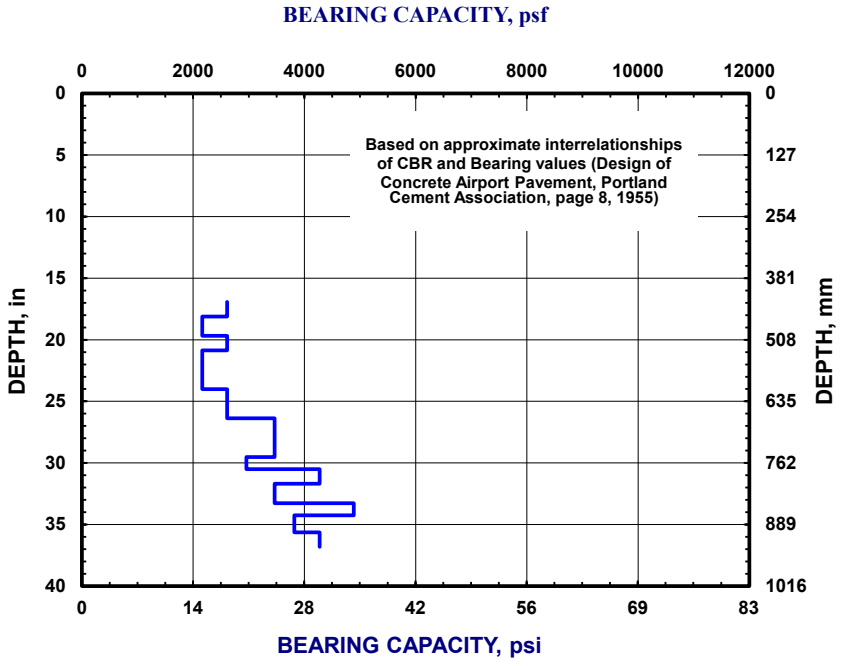
Location: B-15 **Soil Type(s):** Fat Clay with Sand

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	430	1
1	460	1
1	500	1
1	530	1
1	570	1
1	610	1
1	640	1
1	670	1
2	710	1
2	750	1
1	775	1
2	805	1
2	845	1
2	870	1
2	905	1
2	935	1





DCP TEST DATA

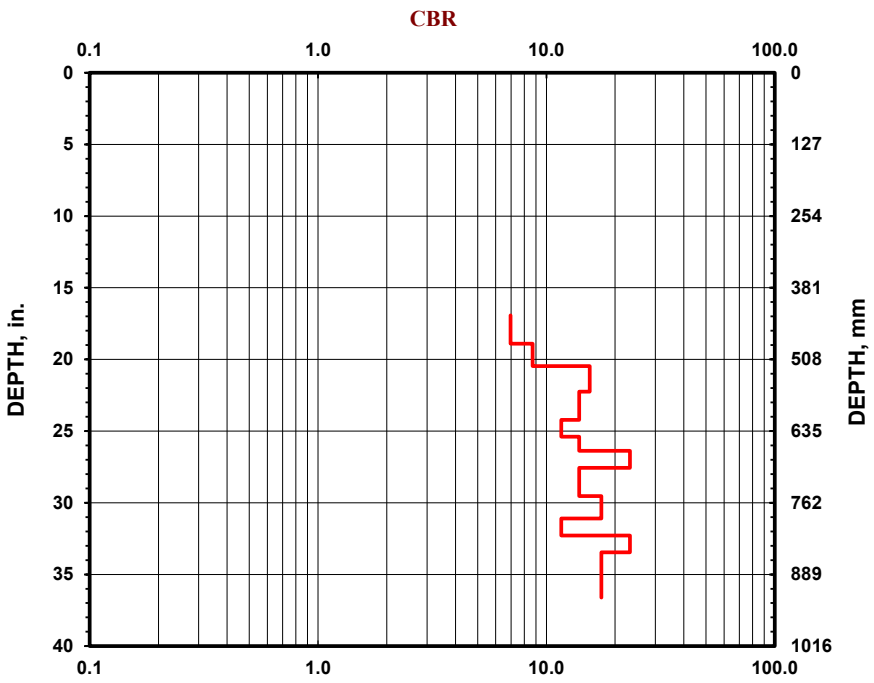
Project: *G221603* **Date:** 15-Feb-22

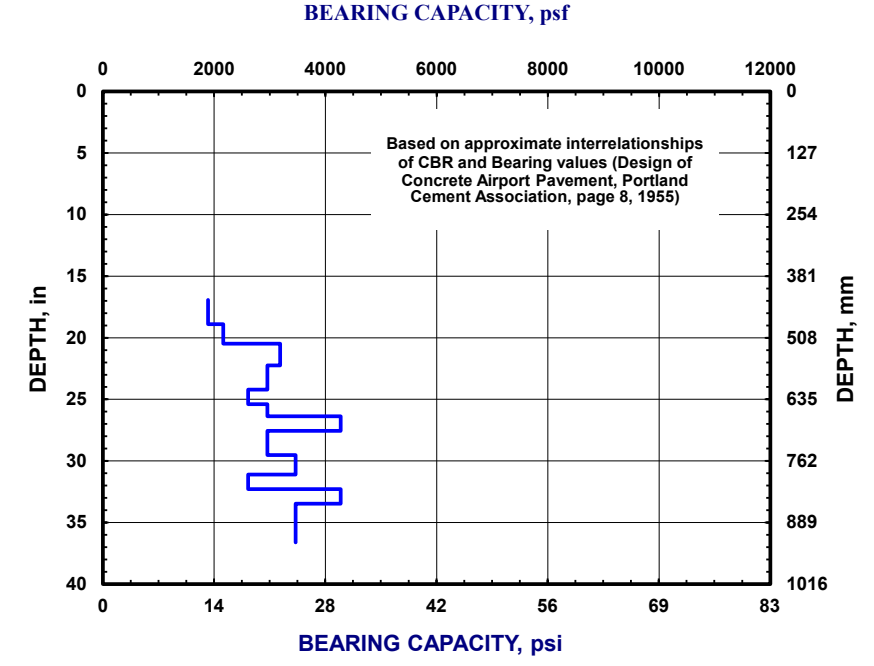
Location: B-16 **Soil Type(s):** Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	430	1
1	480	1
1	520	1
2	565	1
1	590	1
1	615	1
1	645	1
1	670	1
2	700	1
1	725	1
1	750	1
2	790	1
1	820	1
2	850	1
2	890	1
2	930	1





DCP TEST DATA

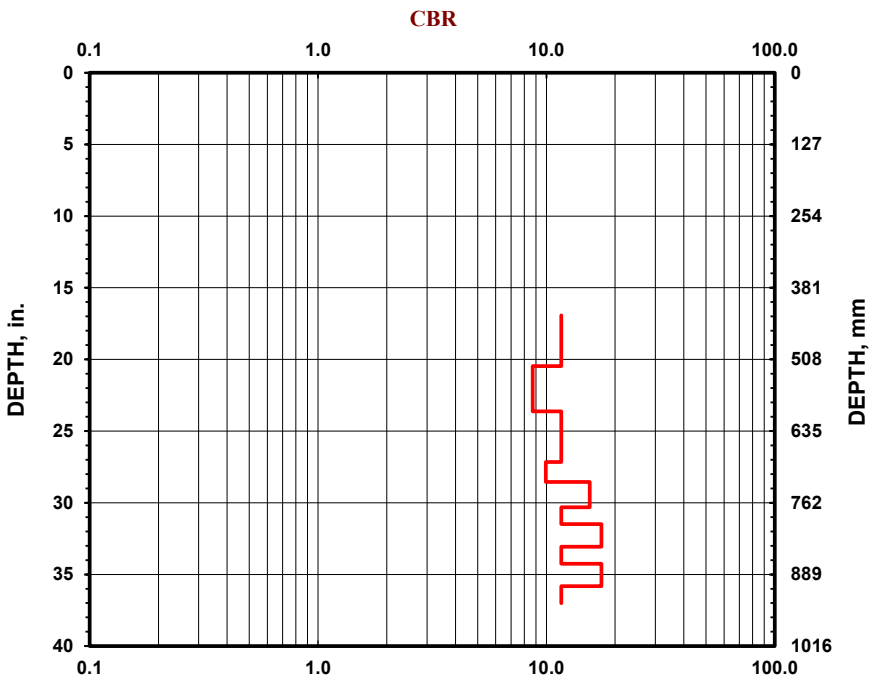
Project: *G221603* **Date:** 15-Feb-22

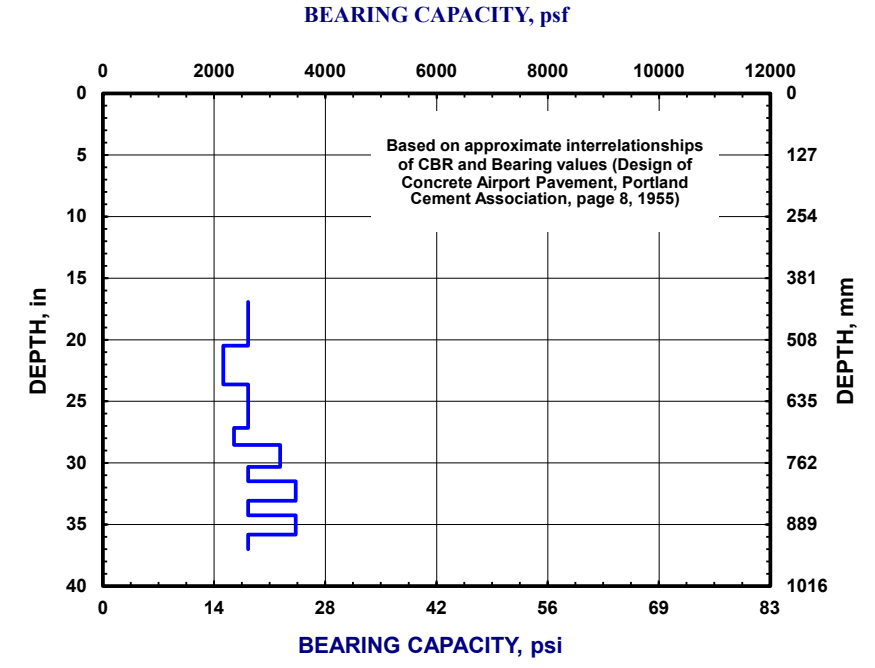
Location: B-17 **Soil Type(s):** Fat Clay

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

Soil Type
- ◉ CH
- ○ CL
- ○ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	430	1
1	460	1
1	490	1
1	520	1
1	560	1
1	600	1
1	630	1
1	660	1
1	690	1
1	725	1
2	770	1
1	800	1
2	840	1
1	870	1
2	910	1
1	940	1





DCP TEST DATA

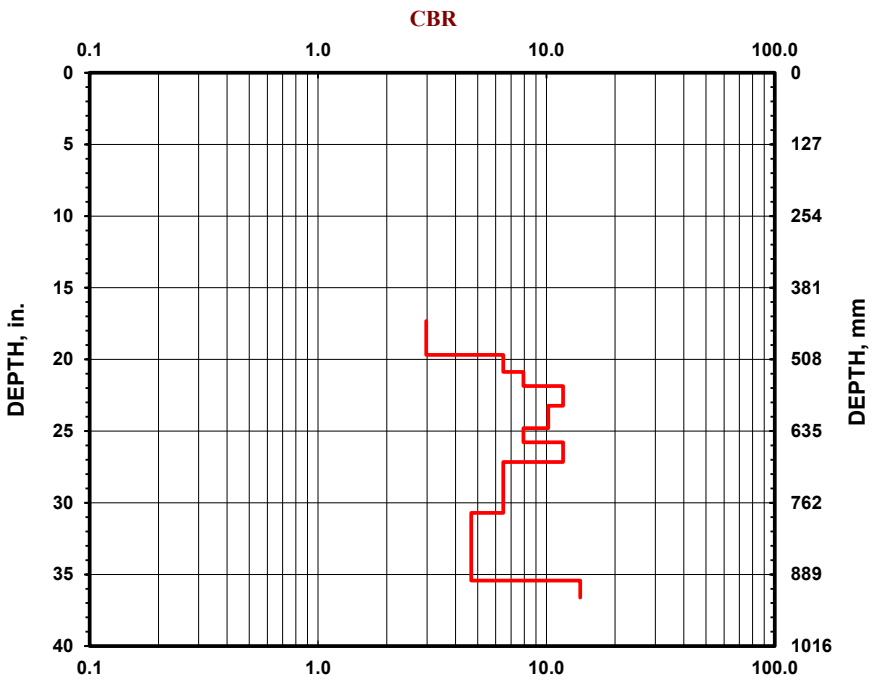
Project: *G221603* **Date:** 15-Feb-22

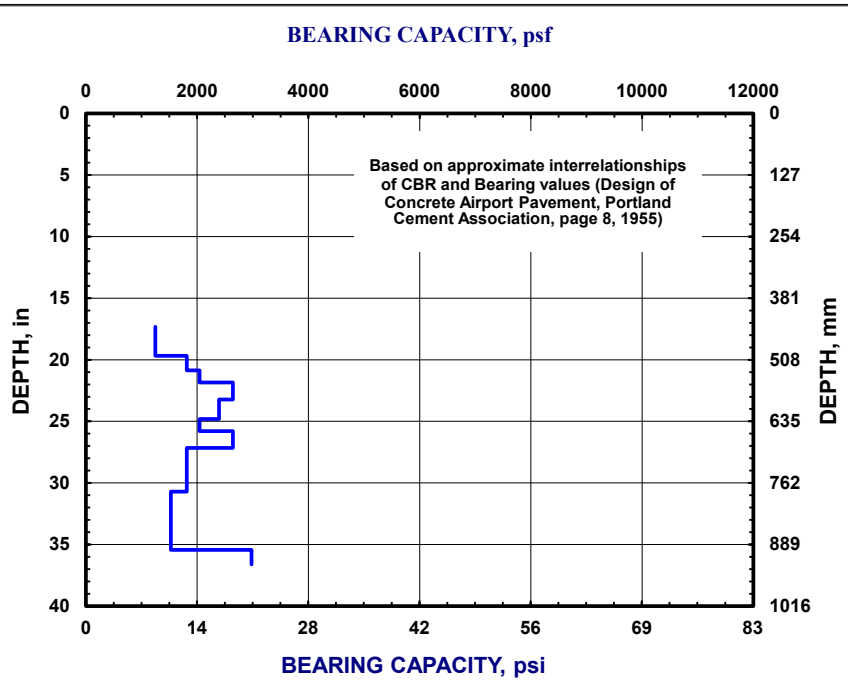
Location: B-18 **Soil Type(s):** Clayey Gravel

Hammer
- ○ 10.1 lbs.
- ◉ 17.6 lbs.
- ○ Both hammers used

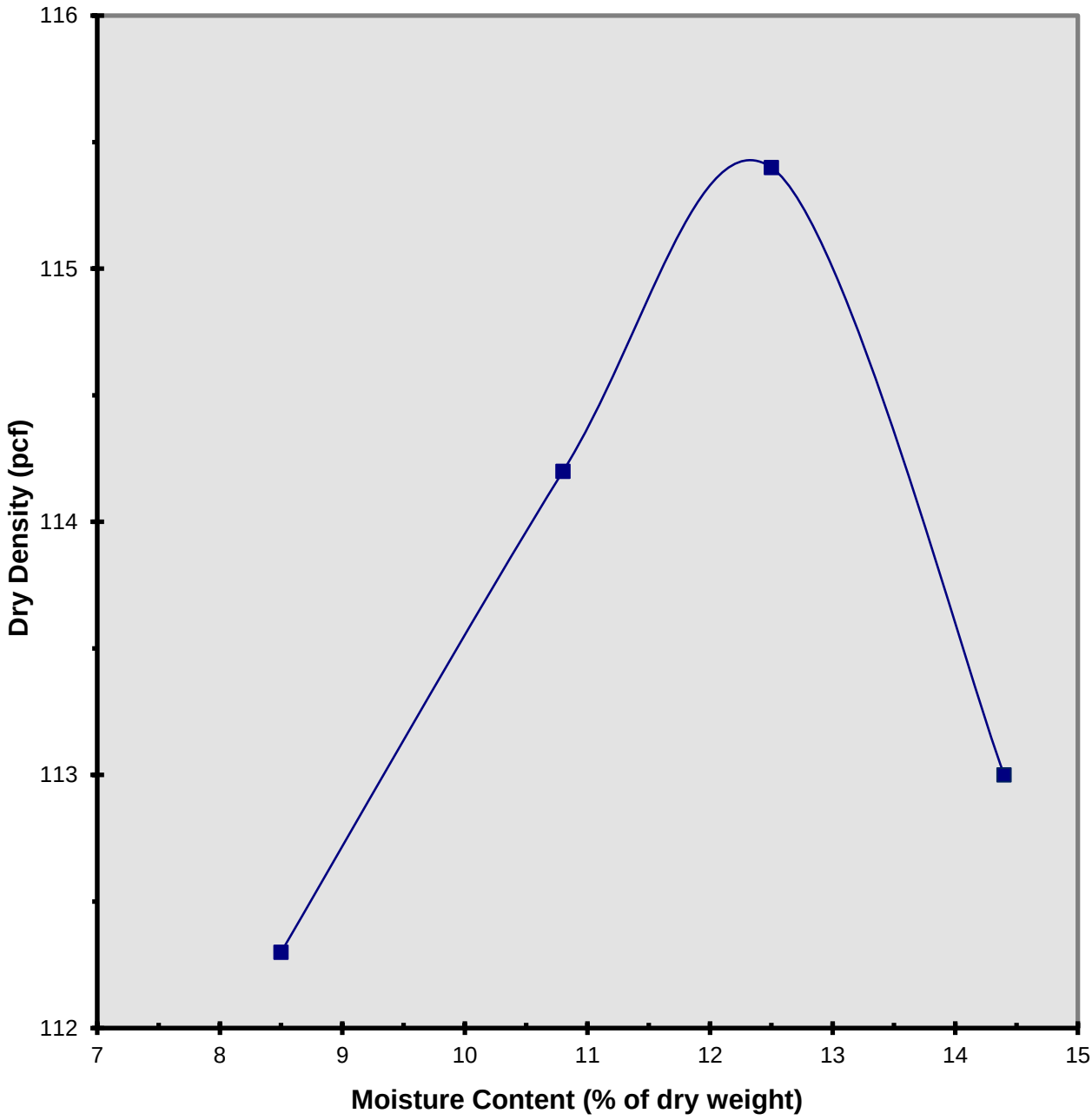
Soil Type
- ○ CH
- ○ CL
- ◉ All other soils

No. of Blows	Accumulative Penetration (mm)	Type of Hammer
0	440	1
1	500	1
1	530	1
1	555	1
2	590	1
2	630	1
1	655	1
2	690	1
1	720	1
1	750	1
1	780	1
1	820	1
1	860	1
1	900	1
2	930	1





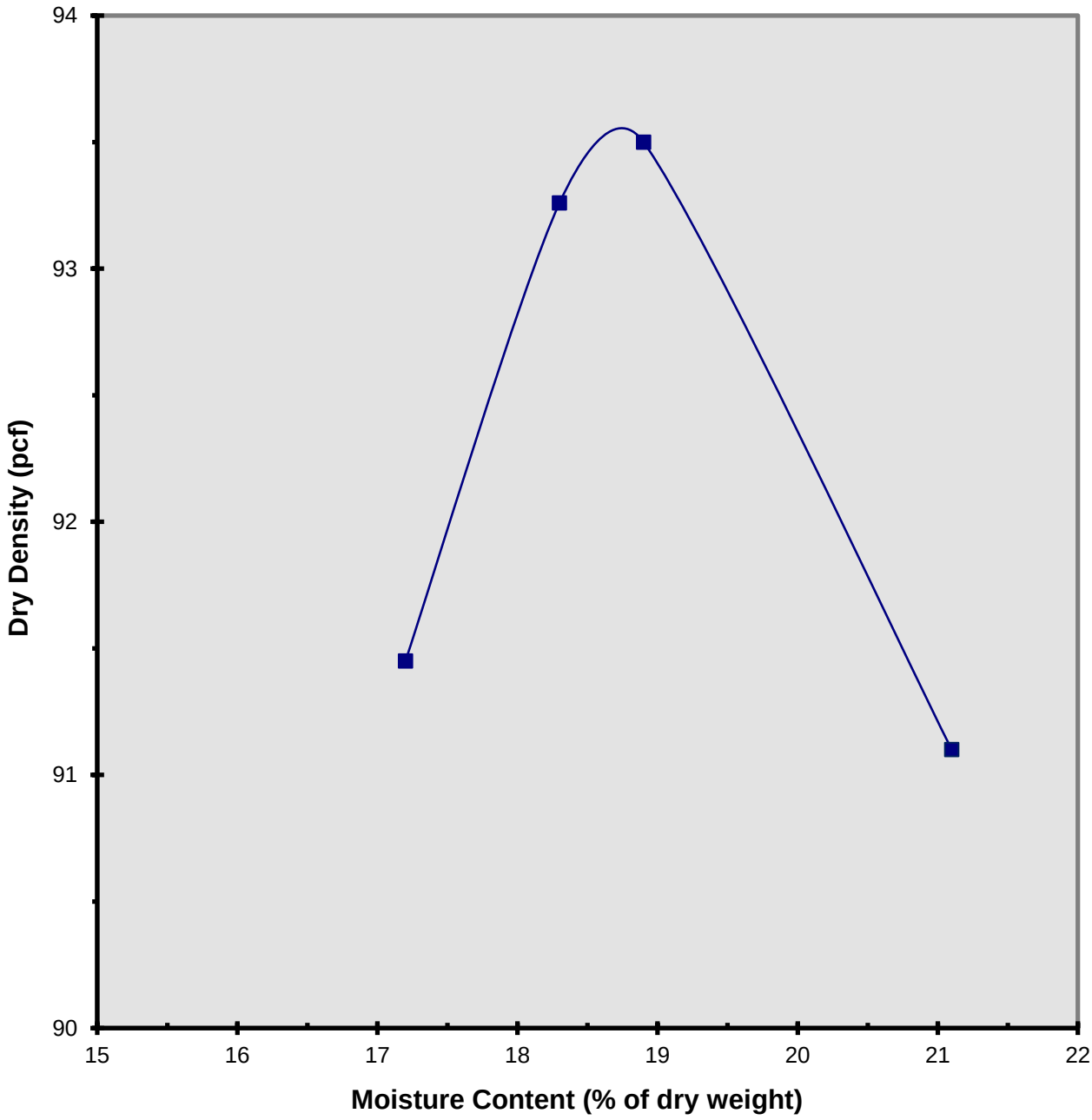
DENSITY VERSUS MOISTURE CURVE
(ASTM D698)



PROJECT	MAXIMUM LAB DENSITY	LAB DATA
Repair Carswell Avenue Lackland AFB; San Antonio, Texas	115.4pcf ASTM D698	LL = 35 PI = 20 Minus #200 = 23%
SAMPLE DESCRIPTION	**OPTIMUM MOISTURE**	**RETL PROJ. NO.**
Boring B-3 Bulk Sample Dark Brown Clayey GRAVEL (GC)	12.4%	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

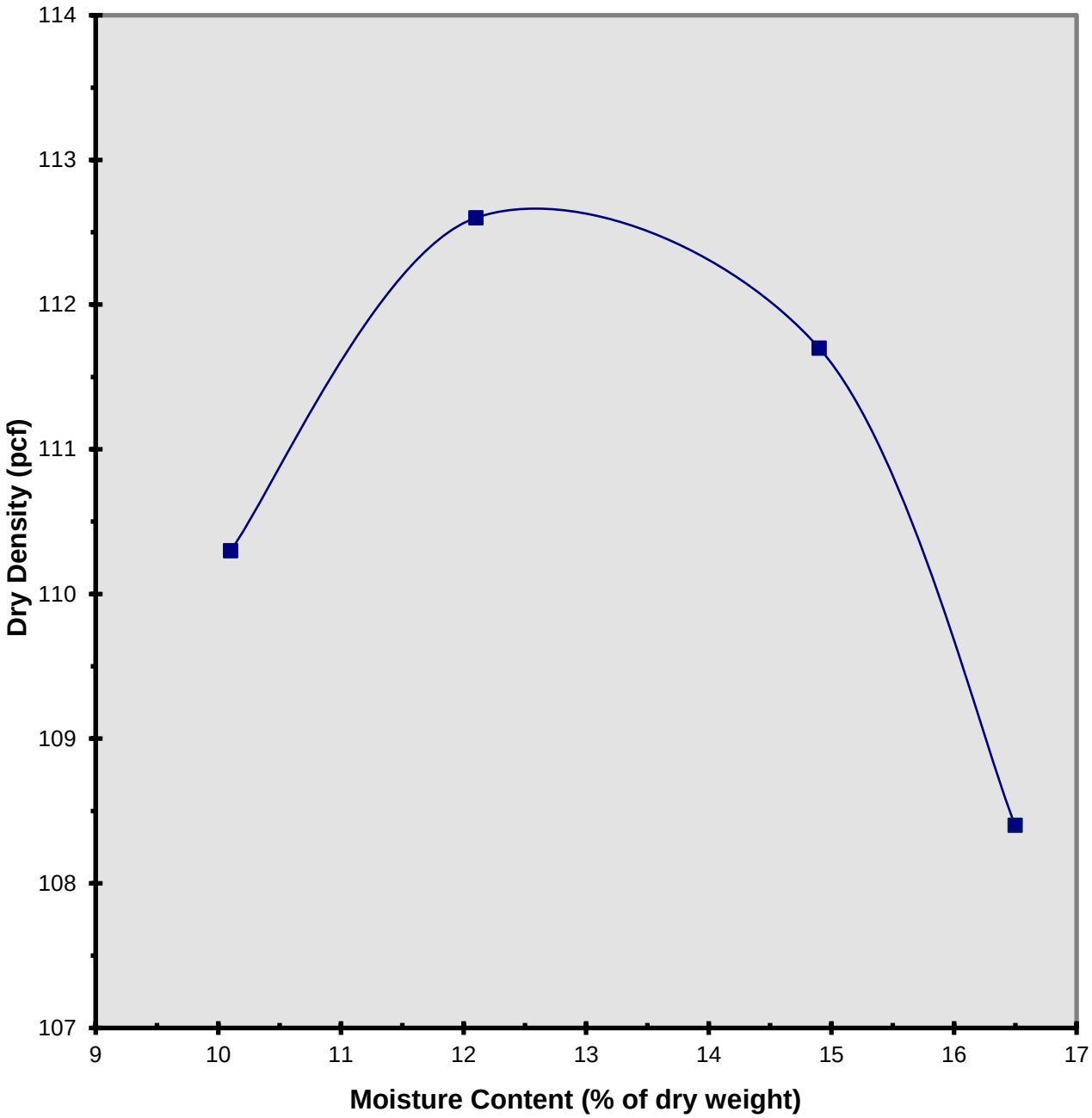
DENSITY VERSUS MOISTURE CURVE
(ASTM D698)



PROJECT	MAXIMUM LAB DENSITY	LAB DATA
Repair Carswell Avenue Lackland AFB; San Antonio, Texas	93.5 pcf ASTM D698	LL = 66 PI = 48 Minus #200 = 73%
SAMPLE DESCRIPTION	**OPTIMUM MOISTURE**	**RETL PROJ. NO.**
Boring B-6 Bulk Sample Dark Brown Fat CLAY with Gravel (CH)	18.9%	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

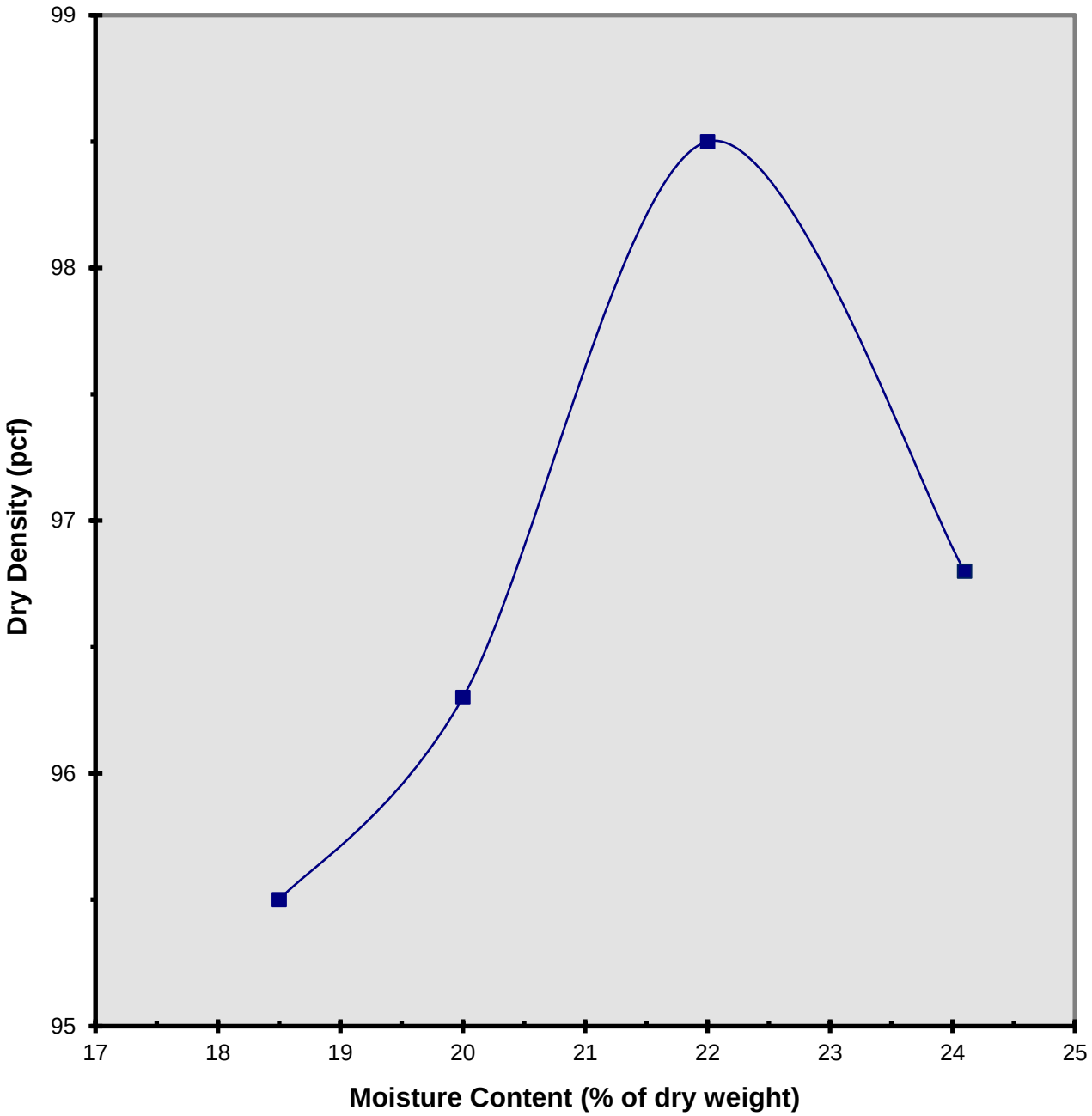
DENSITY VERSUS MOISTURE CURVE
(ASTM D698)



PROJECT	MAXIMUM LAB DENSITY	LAB DATA
Repair Carswell Avenue Lackland AFB; San Antonio, Texas	113.1 pcf ASTM D698	LL = 26 PI = 9 Minus #200 = 56%
SAMPLE DESCRIPTION	**OPTIMUM MOISTURE**	**RETL PROJ. NO.**
Boring B-8 Bulk Sample Light Brown Sandy Lean CLAY (CL)	13.2%	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

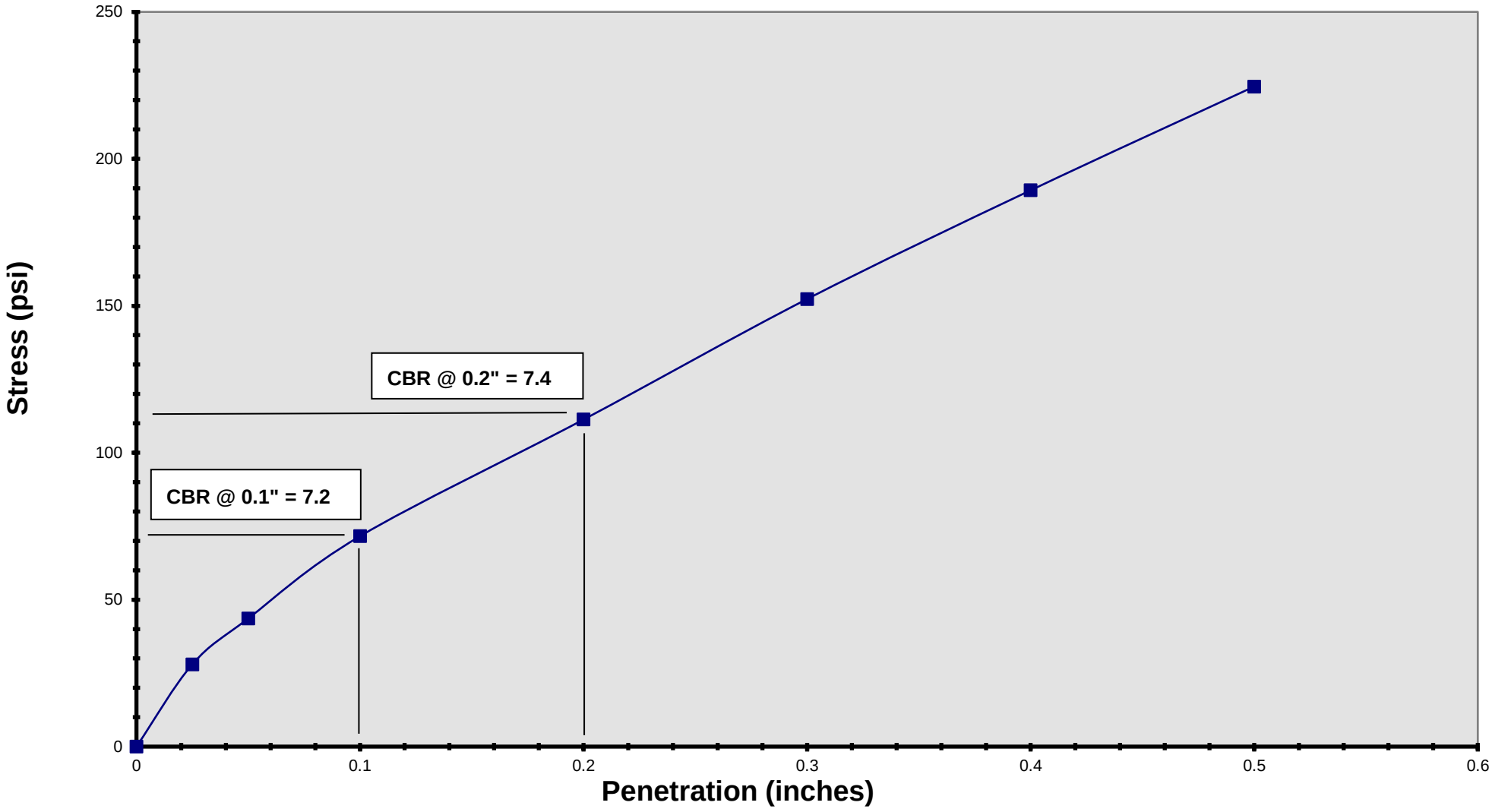
DENSITY VERSUS MOISTURE CURVE
(ASTM D698)



PROJECT	MAXIMUM LAB DENSITY	LAB DATA
Repair Carswell Avenue Lackland AFB; San Antonio, Texas	98.6 pcf ASTM D698	LL = 56 PI = 36 Minus #200 = 72%
SAMPLE DESCRIPTION	**OPTIMUM MOISTURE**	**RETL PROJ. NO.**
Boring B-15 Bulk Sample Dark Brown Fat CLAY w/ Sand (CH)	22.2%	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

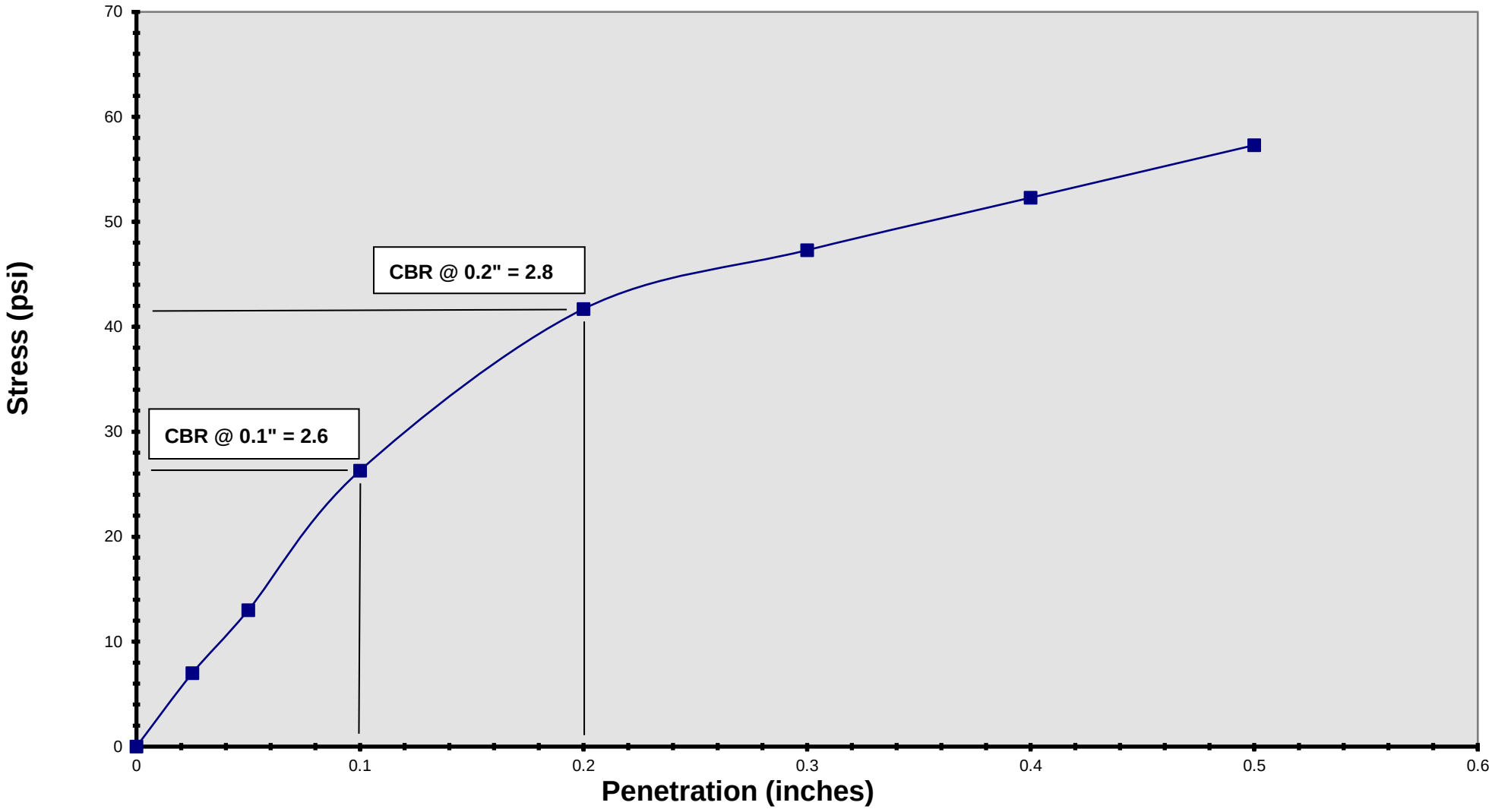
CBR - Stress versus Penetration Curve
(ASTM D1883)



PROJECT DESCRIPTION	MOLDED DRY DENSITY	CBR @ 0.1 INCH PENETRATION	TEST DATE
Repair Carswell Ave Lackland AFB; San Antonio, Texas	113.7 pcf (98.6% of max density)	7.2	September 2021
SAMPLE DESCRIPTION	**MOLDED MOISTURE CONT.**	**CBR @ 0.2 INCHES PENETRATION**	**RETL PROJ. NO.**
Boring B-3 Bulk Sample Dark Brown Clayey GRAVEL (GC)	12.8%	7.4	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

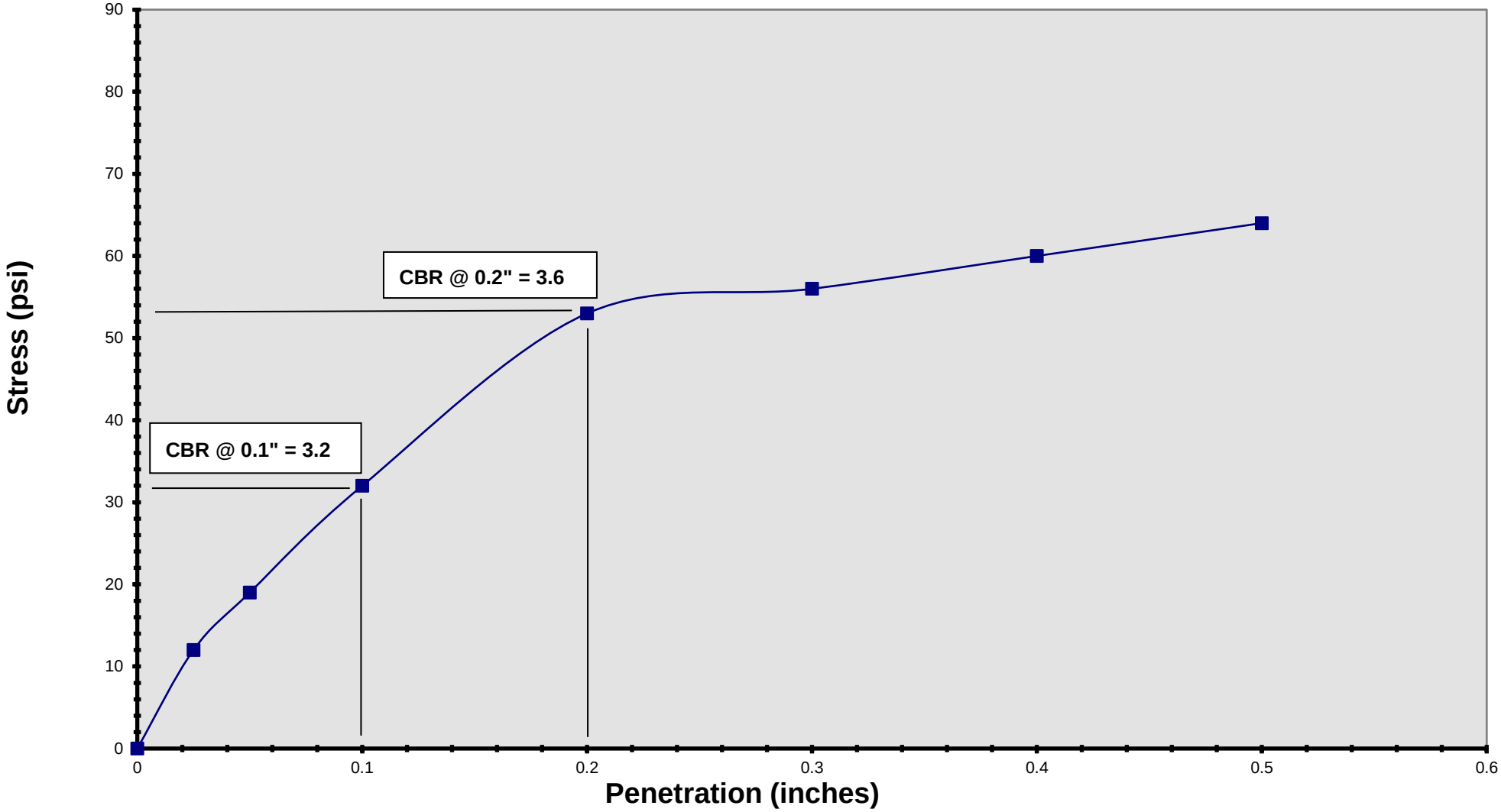
CBR - Stress versus Penetration Curve
(ASTM D1883)



PROJECT DESCRIPTION	MOLDED DRY DENSITY	CBR @ 0.1 INCH PENETRATION	TEST DATE
Repair Carswell Ave Lackland AFB; San Antonio, Texas	92.0 pcf (98.0% of max density)	2.6	September 2021
SAMPLE DESCRIPTION	**MOLDED MOISTURE CONT.**	**CBR @ 0.2 INCHES PENETRATION**	**RETL PROJ. NO.**
Boring B-6 Bulk Sample Dark Brown Fat CLAY with Gravel (CH)	18.8%	2.8	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

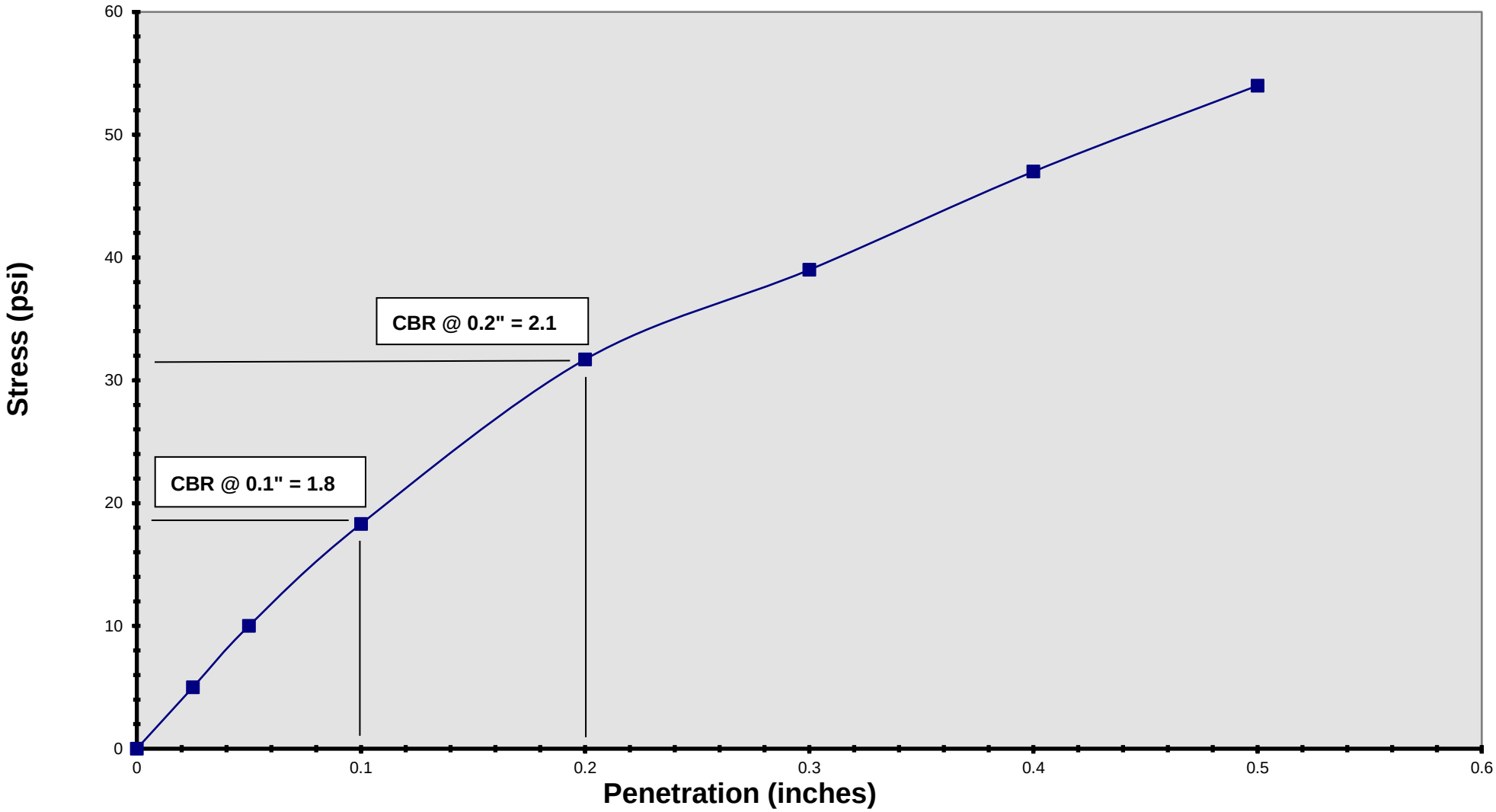
CBR - Stress versus Penetration Curve
(ASTM D1883)



PROJECT DESCRIPTION	MOLDED DRY DENSITY	CBR @ 0.1 INCH PENETRATION	TEST DATE
Repair Carswell Ave Lackland AFB; San Antonio, Texas	105.8 pcf (93.5% of max density)	3.2	March 2022
SAMPLE DESCRIPTION	**MOLDED MOISTURE CONT.**	**CBR @ 0.2 INCHES PENETRATION**	**RETL PROJ. NO.**
Boring B-8 Bulk Sample Light Brown Sandy Lean CLAY (CL)	13.4%	3.6	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

CBR - Stress versus Penetration Curve
(ASTM D1883)



PROJECT DESCRIPTION	MOLDED DRY DENSITY	CBR @ 0.1 INCH PENETRATION	TEST DATE
Repair Carswell Ave Lackland AFB; San Antonio, Texas	94.8 pcf (96.1% of max density)	1.8	March 2022
SAMPLE DESCRIPTION	**MOLDED MOISTURE CONT.**	**CBR @ 0.2 INCHES PENETRATION**	**RETL PROJ. NO.**
Boring B-15 Bulk Sample Dark Brown Fat CLAY w/ Sand (CH)	23.6%	2.1	G221603

ROCK ENGINEERING AND TESTING LABORATORY, INC.

Engineering & Testing
Laboratory, Inc.

Rock Engineering & Testing Laboratory
10856 Vandale
San Antonio, TX 78216
Telephone: 210-495-8000
Fax: 210-495-8015

KEY TO SOIL CLASSIFICATION AND SYMBOLS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	NAME
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well Graded Gravels or Gravel-Sand mixtures, little or no fines
		GP	Poorly Graded Gravels or Gravel-Sand mixtures, little or no fines
		GM	Silty Gravels, Gravel-Sand-Silt mixtures
		GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	SAND AND SANDY SOILS	SW	Well Graded Sands or Gravelly Sands, little or no fines
		SP	Poorly Graded Sands or Gravelly Sands, little or no fines
		SM	Silty Sands, Sand-Silt Mixtures
		SC	Clayey Sands, Sand-Clay mixtures
FINE GRAINED SOILS	SILTS AND CLAYS LL < 50	ML	Inorganic Silts and very fine Sands, Rock Flour, Silty or Clayey fine Sands or Clayey Silts
		CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
		OL	Organic Silts and Organic Silt-Clays of low plasticity
	SILTS AND CLAYS LL > 50	MH	Inorganic Silts, Micaceous or Diatomaceous fine Sandy or Silty soils, Elastic Silts
		CH	Inorganic Clays of high plasticity, Fat Clays
		OH	Organic Clays of medium to high plasticity, Organic Silts
HIGHLY ORGANIC SOILS		PT	Peat and other Highly Organic soils

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance

FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical

LAMINATED (VARVED) - composed of thin layers of varying color and texture, usually grading from sand or silt at the bottom to clay at the top

CRUMBLY - cohesive soils which break into small blocks or crumbs on drying

CALCAREOUS - containing appreciable quantities of calcium carbonate, generally nodular

WELL GRADED - having wide range in grain sizes and substantial amounts of all intermediate particle sizes

POORLY GRADED - predominantly of one grain size uniformly graded) or having a range of sizes with some intermediate size missing (gap or skip graded)

SYMBOLS FOR TEST DATA

- — Groundwater Level (Initial Reading)
- — Groundwater Level (Final Reading)
- — Shelby Tube Sample
- — SPT Samples
- — Auger Sample
- — Rock Core

TERMS DESCRIBING CONSISTENCY OF SOIL

COARSE GRAINED SOILS		FINE GRAINED SOILS		
DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	DESCRIPTIVE TERM	NO. BLOWS/FT. STANDARD PEN. TEST	UNCONFINED COMPRESSION TONS PER SQ. FT.
Very Loose	0 - 4	Very Soft	< 2	< 0.25
Loose	4 - 10	Soft	2 - 4	0.25 - 0.50
Medium	10 - 30	Firm	4 - 8	0.50 - 1.00
Dense	30 - 50	Stiff	8 - 15	1.00 - 2.00
Very Dense	over 50	Very Stiff	15 - 30	2.00 - 4.00
		Hard	over 30	over 4.00

Field Classification for "Consistency" is determined with a 0.25" diameter penetrometer