

April 20, 2023



ENTECH
ENGINEERING, INC.

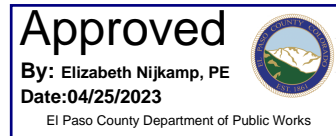
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

Proterra Properties
1864 Woodmoor Drive, Suite 100
Monument, Colorado 80132

Attn: Joe Desjardin

Re: Pavement Recommendations (Revised)
Cloverleaf, Filing 2
El Paso County, Colorado
Entech Job No. 212757

Full-depth asphalt paving is
not allowed in unincorporated
El Paso County.



Dear Mr. Desjardin:

As requested, Entech Engineering, Inc. has obtained samples of the pavement subgrade soils from the roadways in the Cloverleaf, Filing 2 subdivision. This letter presents the results of the laboratory testing and pavement recommendations for the roadway sections within the filing.

Project Description

The roadways for this project consist of Crimson Clover Drive, Alsike Clover Court, and White Clover Drive in Monument, Colorado. Subsurface Soil Investigation and laboratory testing were performed in order to determine the pavement support characteristics of the soils. The approximate locations of the test borings are presented on the Test Boring Location Map, Figure 1.

Subgrade Conditions

Seventeen test borings were drilled along the roadway to depths of approximately 5 and 10 feet below the existing subgrade surface. The soils at the roadway subgrade depth consisted of silty to slightly silty to clayey sand fill (Soil Type 1).

One general soil type was encountered in the test borings at subgrade level and was used in this design, Soil Type 1. The Test Boring Logs are presented in Appendix A. Sieve Analyses and Atterberg Limit testing were performed on the subgrade soil samples obtained from the test borings for the purpose of classification. The percent passing the No. 200 sieve for the Type 1 soils ranged from approximately 4 to 24 percent. (Soil Type 2) native silty to slightly silty sand, and (Soil Type 3) very clayey sand was encountered below the zone of pavement influence and was not used in this design. Based on the grain size analysis, the Type 1 subgrade soils classify as A-2-4 and A-1-b soils using the AASHTO classification system. These soils typically provide good pavement support characteristics. Groundwater was not encountered in the test borings. Water soluble sulfate tests results indicated that the soils exhibit a negligible potential for sulfate attack.

Atterberg Limits Testing on samples of the Type 1 soil taken from the test borings resulted in Liquid Limits of no value to 25 percent and Plastic Indexes of non-plastic to 7 percent. Based on the soils classification, mitigation of expansive soils is not required on this site. Laboratory test results are presented in Appendix B and are summarized in Table 1.

PCD File No. SF-2123

Proterra Properties
Pavement Recommendations
Cloverleaf, Filing No. 2
Monument, Colorado
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California Bearing Ratio (CBR) testing was performed on a representative sample of Soil Type 1 from Test Boring No. 9 to determine the support characteristics of the subgrade soils for the roadway sections. The results of the CBR testing, are presented in Appendix B and summarized as follows:

Soil Type 1 – Silty Sand Fill

R @ 90% = 35.0

R @ 95% = 71.0

Use R = 50.0 for design

Classification Testing

Liquid Limit	NV
Plasticity Index	NP
Percent Passing 200	24.1
AASHTO Classification	A-2-4
Group Index	0
Unified Soils Classification	SM

Pavement Design

CBR testing was used to determine pavement sections for the roadways. Pavement sections were determined utilizing the El Paso County Pavement Design Criteria Manual. The roadways in the filing classify as urban local roads, which used an 18K ESAL value of 292,000 for design purposes. Pavement sections were determined for asphalt supported on aggregate basecourse.

Design parameters used in the pavement analysis for the roadways are as follows:

Reliability (Local Roads)	80%
Standard Deviation	0.45
Design R-Value Subgrade	50
Resilient Modulus	13,168 psi
Loss in Serviceability (Δ psi)	2.0
Structural Coefficients	
Hot Bituminous Pavement	0.44
Aggregate Basecourse	0.11

The pavement design calculations are presented in Appendix C. Pavement sections for the roadway sections are presented below. Any additional grading may result in subgrade soils with different support characteristics. The following pavement sections should be re-evaluated if additional grading is performed.

Proterra Properties
 Pavement Recommendations
 Cloverleaf, Filing No. 2
 Monument, Colorado
 Entech Job No. 212757

Exhibit 1: Pavement Sections – Soil Type 1

Roadway Classification	Design ESAL	Alternatives
Urban Local	292,000	1. 3.0 inches asphalt over 8.0 inches aggregate basecourse
		2. 4.0 inches asphalt over 6.0 inches aggregate basecourse

Notes:

1. Alternative 1 meets the minimum asphalt and basecourse thicknesses required per El Paso County Pavement Design Criteria Manual for Urban Local Roadways.
2. Alternative 2 requires a deviation form submittal for acceptance by El Paso County.

Roadway Construction – Asphalt on Aggregate Basecourse

Prior to placement of the asphalt, subgrade should be compacted to a minimum of 95 percent of the soils maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture content and proof rolled. Any soft or loose subgrade areas should be removed and replaced with suitable materials. Basecourse materials should be compacted to a minimum of 95 percent of its maximum Modified Proctor Dry Density, ASTM D-1557 at ± 2 percent of optimum moisture content. Special attention should be given to areas adjacent to manholes, inlet structures and valves.

In addition to the above guidance, the asphalt, cement, subgrade conditions, compaction of materials and roadway construction methods shall meet the El Paso County Engineering Criteria Manual.

We trust that this report contains the information you require. If you have questions or need additional information, please contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.


 Stuart Wood

SW/rs

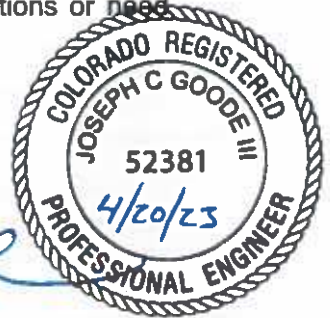
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F:\AA projects\2022\221977 Pavement Design\221977 pr.docx

Reviewed by:



Joseph C. Goode III, P.E.



TABLE

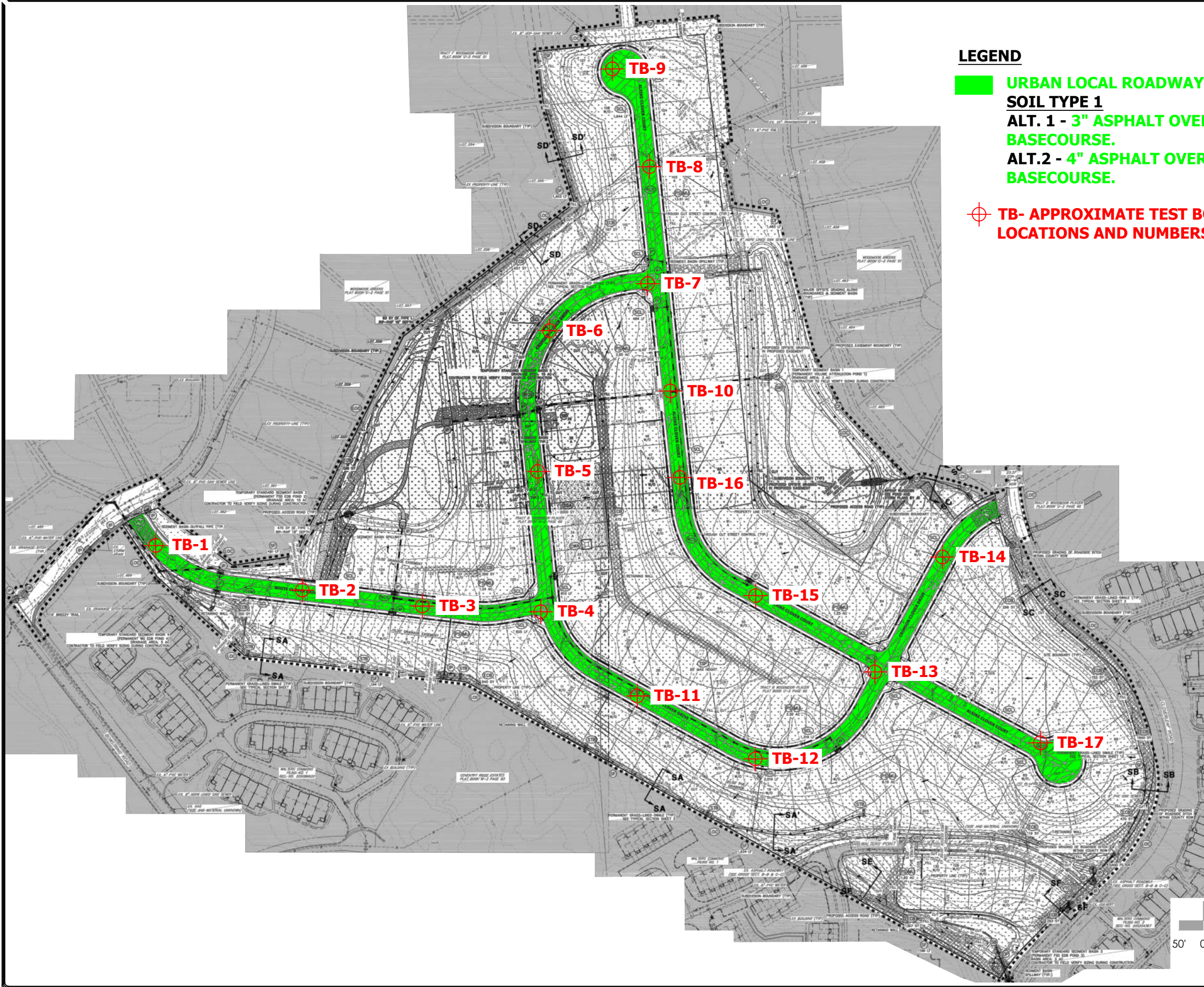
TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT PROTERRA PROPERTIES
 PROJECT CLOVERLEAF & HIGBY
 JOB NO. 212757

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	AASHTO CLASS.	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1, CBR	9	0-3			24.1	NV	NP		A-2-4		SM	FILL, SAND, SILTY
1	1	1-2			6.9	NV	NP		A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	2	1-2			18.6	NV	NP	0.01	A-2-4		SM	FILL, SAND, SILTY
1	3	1-3			12.9	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	4	1-2			13.5	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	5	1-2			17.2	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	6	1-2			13.1	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	7	1-2			17.8	NV	NP	0.01	A-2-4		SM	FILL, SAND, SILTY
1	8	1-2			22.2	25	7		A-2-4		SC-SM	FILL, SAND, SILTY, CLAYEY
1	9	1-2			18.6	NV	NP		A-2-4		SM	FILL, SAND, SILTY
1	10	1-2			9.6	NV	NP		A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	11	1-2			11.0	NV	NP	<0.01	A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	12	1-2			7.3	NV	NP		A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	13	1-2			4.4	NV	NP		A-1-b		SW	FILL, SAND
1	14	1-2			13.3	NV	NP		A-2-4		SM	FILL, SAND, SILTY
1	15	1-2			17.0	NV	NP		A-2-4		SM	FILL, SAND, SILTY
1	16	1-2			9.0	NV	NP	<0.01	A-1-b		SM-SW	FILL, SAND, SLIGHTLY SILTY
1	17	1-2			4.9	NV	NP		A-2-4		SW	FILL, SAND
1	17	0-3			8.7						SM-SW	FILL, SAND, SLIGHTLY SILTY
1	4	0-3			18.2						SM	FILL, SAND, SILTY
2	4	10			13.8	NV	NP	<0.01	A-2-4		SM	SAND, SILTY
2	7	10			7.3	NV	NP	<0.01	A-2-4		SM-SW	SAND, SLIGHTLY SILTY
3	1	10			98.2	35	16		A-6		SC	SAND, VERY CLAYEY

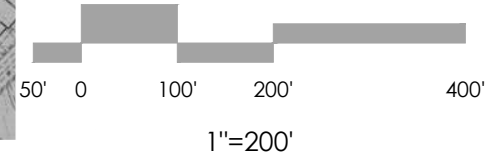
FIGURE



LEGEND

- URBAN LOCAL ROADWAY (292,000 ESAL)
- SOIL TYPE 1**
- ALT. 1 - 3" ASPHALT OVER 8" AGGREGATE BASECOURSE.**
- ALT. 2 - 4" ASPHALT OVER 6" AGGREGATE BASECOURSE.**

TB- APPROXIMATE TEST BORING LOCATIONS AND NUMBERS



REVISION	BY

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505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

TEST BORING LOCATION MAP
CLOVERLEAF & HIGBY
EL PASO COUNTY, CO
For: PROTERRA PROPERTIES

DRAWN	JAC
CHECKED	DS
DATE	03/24/23
SCALE	1"=200'
JOB NO.	212757
FIGURE No.	1

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 2
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

DRY TO 10', 3/13/23

FILL 0-3', SAND, SLIGHTLY SILTY,
 FINE TO COARSE GRAINED, TAN,
 MEDIUM DENSE, MOIST
 SAND, VERY CLAYEY, FINE
 GRAINED, GRAY BROWN, MEDIUM
 DENSE TO DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-3	[Symbol]		11	4.5	1
3-5	[Symbol]		15	10.8	3
5-10	[Symbol]		43	12.1	3

REMARKS

DRY TO 5', 3/13/23

FILL 0-5', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		21	5.9	1
5-10	[Symbol]		19	5.0	1



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TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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JOB NO.:
 212757

FIG NO.:
 A- 1

TEST BORING NO. 3
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 4
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 3/13/23						
FILL 0-5', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	5			13	5.2	1
	5			24	5.8	1
	10					
	15					
	20					

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 3/13/23						
FILL 0-8', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO LOOSE, MOIST	5			24	5.7	1
	5			8	5.2	1
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	10			18	4.4	2
	15					
	20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: SW

DATE: 3-28-23

JOB NO.: 212757

FIG NO.: A-2

TEST BORING NO. 5
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 6
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

DRY TO 5', 3/13/23
 FILL 0-5', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, LOOSE
 TO MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		6	7.1	1
5	[Symbol]		23	5.2	1
10					
15					
20					

REMARKS

DRY TO 5', 3/13/23
 FILL 0-5', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, LOOSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5	[Symbol]		7	7.6	1
5	[Symbol]		6	7.9	1
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE: *3-28-23*

JOB NO:
 212757

FIG NO:
 A-3

TEST BORING NO. 7
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 8
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 3/13/23						
FILL 0-8', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO LOOSE, MOIST	5			12	6.1	1
	5			21	2.5	1
SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	10			23	3.4	2
	15					
	20					

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 3/13/23						
FILL 0-5', SAND, SILTY, CLAYEY, FINE GRAINED, BROWN, MEDIUM DENSE, MOIST	5			11	8.1	1
	5			18	7.4	1
	10					
	15					
	20					



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TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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JOB NO.: 212757
 FIG NO.: A-4

TEST BORING NO. 9
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 10
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

DRY TO 10', 3/13/23
 FILL 0-10', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			20	7.8	1
5			22	11.8	1
10			13	4.8	1
15					
20					

REMARKS

DRY TO 5', 3/13/23
 FILL 0-5', SAND, SLIGHTLY SILTY,
 FINE TO COARSE GRAINED, TAN,
 LOOSE, MOIST TO DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			4	7.3	1
5			9	1.9	1
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE:

3-28-23

JOB NO.:
 212757

FIG NO.:
 A- 5

TEST BORING NO. 11
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 12
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

DRY TO 5', 3/13/23

FILL 0-5', SAND, SLIGHTLY SILTY,
 FINE TO COARSE GRAINED, TAN,
 MEDIUM DENSE TO LOOSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		11	4.4	1
5	[Symbol]		6	5.0	1
10					
15					
20					

REMARKS

DRY TO 5', 3/13/23

FILL 0-5', SAND, SLIGHTLY SILTY,
 FINE TO COARSE GRAINED, TAN,
 MEDIUM DENSE TO LOOSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5	[Symbol]		6	3.5	1
5	[Symbol]		24	5.2	1
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: SW

DATE: 3-28-23

JOB NO.: 212757

FIG NO.: A-6

TEST BORING NO. 13
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 14
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 3/13/23						
FILL 0-10', SAND, CLEAN TO SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST	5			20	3.6	1
	5			26	3.8	1
	10			32	7.7	1
	15					
	20					

REMARKS

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 3/13/23						
FILL 0-5', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	5			29	5.2	1
	5			16	5.4	1
	10					
	15					
	20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: *SW*

DATE: *3-28-23*

JOB NO.
 212757

FIG NO.
 A-7

TEST BORING NO. 15
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO. 16
 DATE DRILLED 3/13/2023
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 3/13/23							DRY TO 5', 3/13/23						
FILL 0-5', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST	5	[Symbol]		25	7.2	1	FILL 0-5', SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, LOOSE, DRY TO MOIST	5	[Symbol]		4	2.9	1
	5	[Symbol]		22	5.2	1		5	[Symbol]		5	5.9	1
	10							10					
	15							15					
	20							20					



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TEST BORING LOG

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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JOB NO.: 212757
 FIG NO.: A-8

TEST BORING NO. 17
 DATE DRILLED 3/13/2023
 Job # 212757

TEST BORING NO.
 DATE DRILLED
 CLIENT PROTERRA PROPERTIES
 LOCATION CLOVERLEAF & HIGBY

REMARKS

REMARKS

DRY TO 10', 3/13/23

FILL 0-10', SAND, CLEAN TO SILTY,
 FINE TO COARSE GRAINED, TAN,
 MEDIUM DENSE TO LOOSE,
 MOIST TO DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			4	3.6	1	5					
10			21	2.5	1	10					
15						15					
20						20					



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TEST BORING LOG

DRAWN:

DATE:

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DATE:

3-28-23

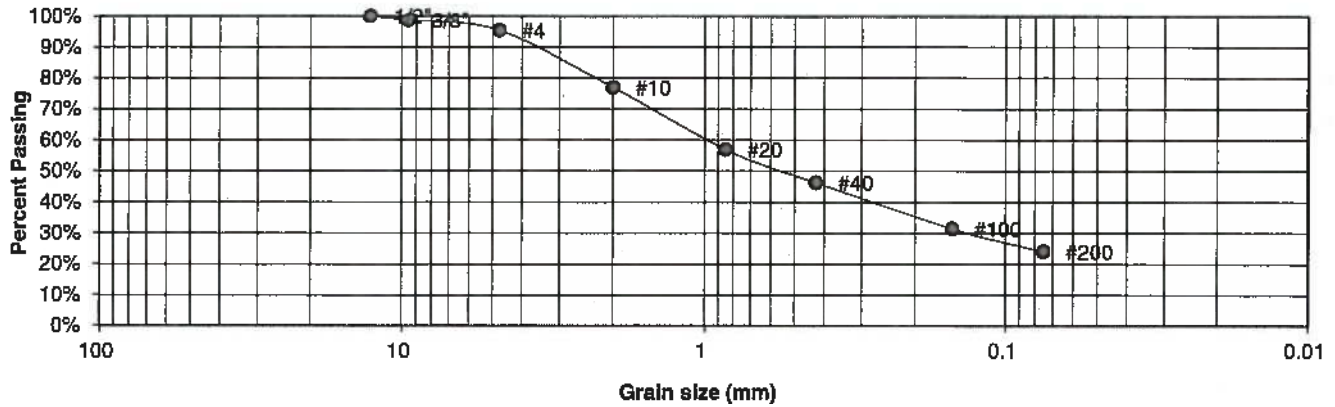
JOB NO.:
 212757

FIG NO.:
 A- 9

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1, CBR	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	9	JOB NO.	212757
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.7%
4	95.4%
10	77.0%
20	57.0%
40	46.3%
100	31.4%
200	24.1%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

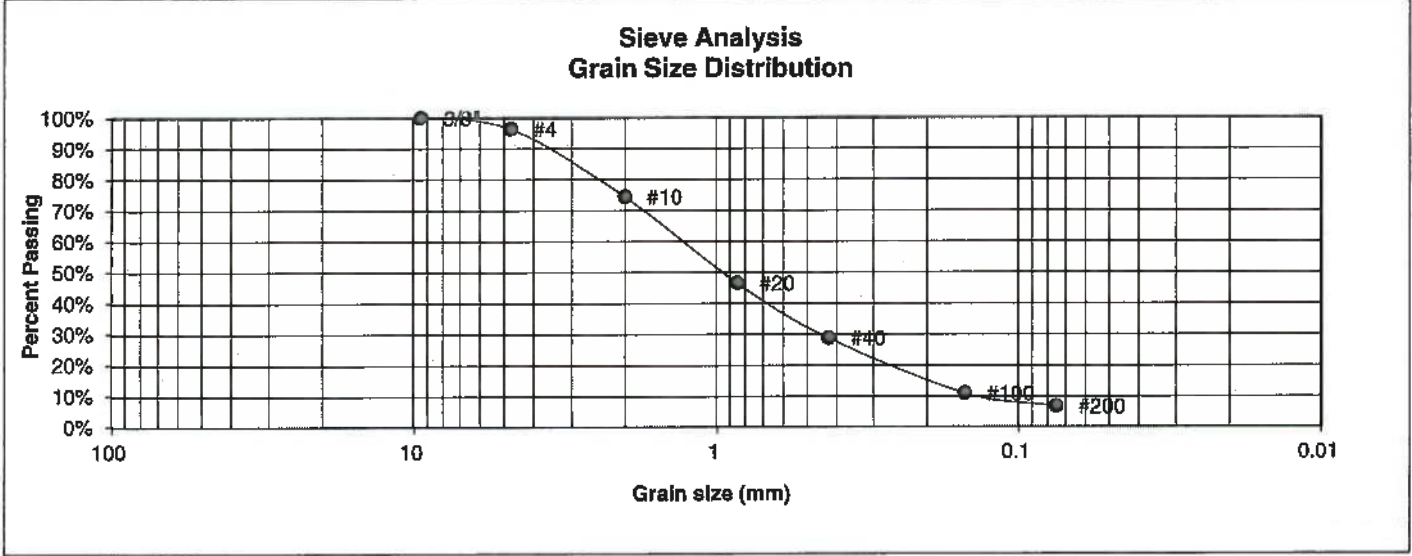
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JOB NO.:

212757
FIG NO.:

B-1

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	1	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.4%
10	74.5%
20	46.5%
40	28.8%
100	11.0%
200	6.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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JOB NO.:

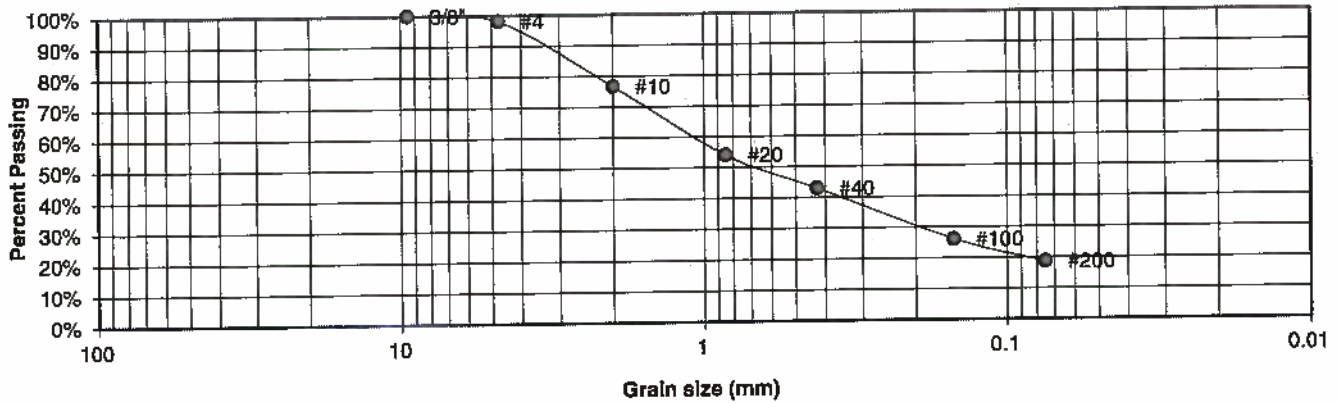
212757
FIG NO.:

B-2

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 2
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-4

CLIENT PROTERRA PROPERTIES
PROJECT CLOVERLEAF & HIGBY
JOB NO. 212757
TEST BY BL
GROUP INDEX 0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.1%
10	76.7%
20	54.0%
40	42.9%
100	26.0%
200	18.6%

Atterberg Limits
 Plastic Limit NP
 Liquid Limit NV
 Plastic Index NP

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



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**LABORATORY TEST
RESULTS**

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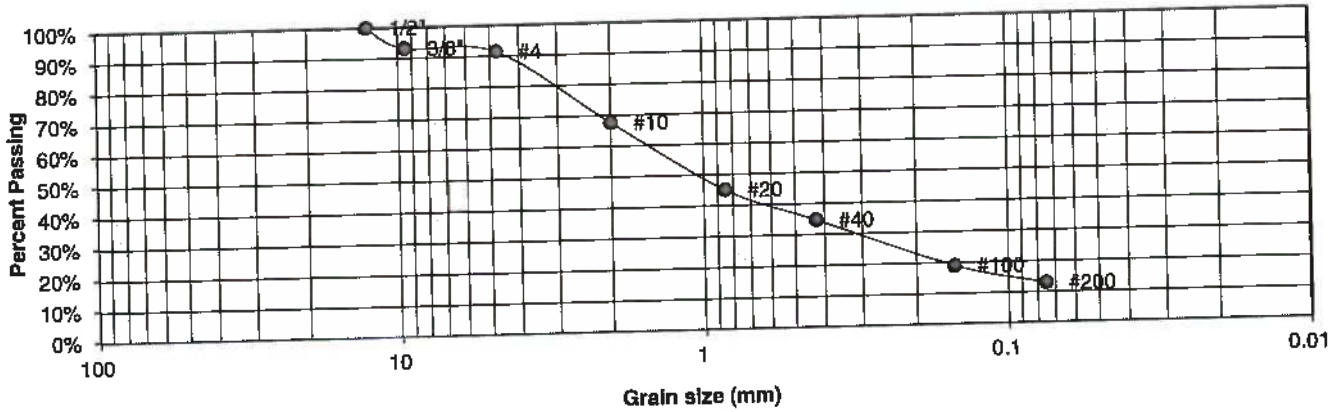
JOB NO.:

212757
FIG NO.:

B-3

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	3	JOB NO.	212757
DEPTH (FT)	1-3	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	93.1%
4	91.5%
10	67.6%
20	45.1%
40	34.7%
100	18.9%
200	12.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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**LABORATORY TEST
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DRAWN:

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DATE:

3-28-23

JOB NO.:

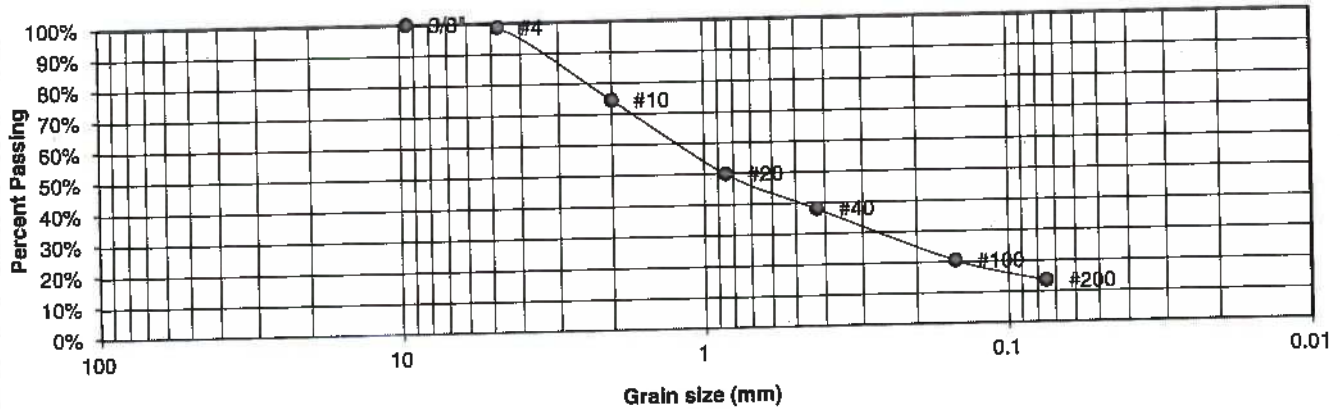
212757

FIG NO.:

B4

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	4	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.7%
10	74.5%
20	49.9%
40	38.0%
100	20.4%
200	13.5%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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JOB NO.:

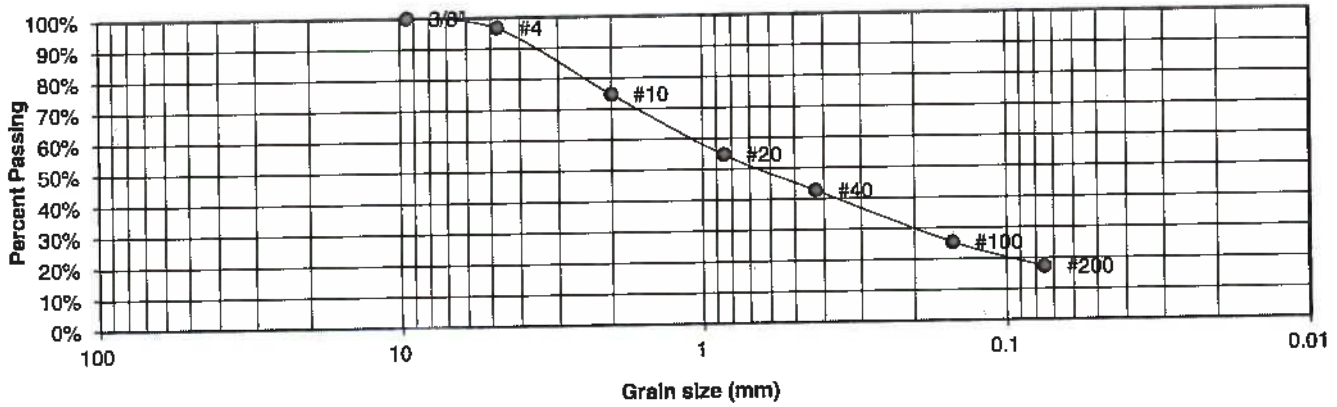
212757
FIG NO.:

8-5

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 5
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-1-b

CLIENT PROTERRA PROPERTIES
PROJECT CLOVERLEAF & HIGBY
JOB NO. 212757
TEST BY BL
GROUP INDEX 0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.7%
10	74.7%
20	54.6%
40	42.7%
100	25.3%
200	17.2%

Atterberg Limits
 Plastic Limit NP
 Liquid Limit NV
 Plastic Index NP

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED: SW	DATE: 3-28-23
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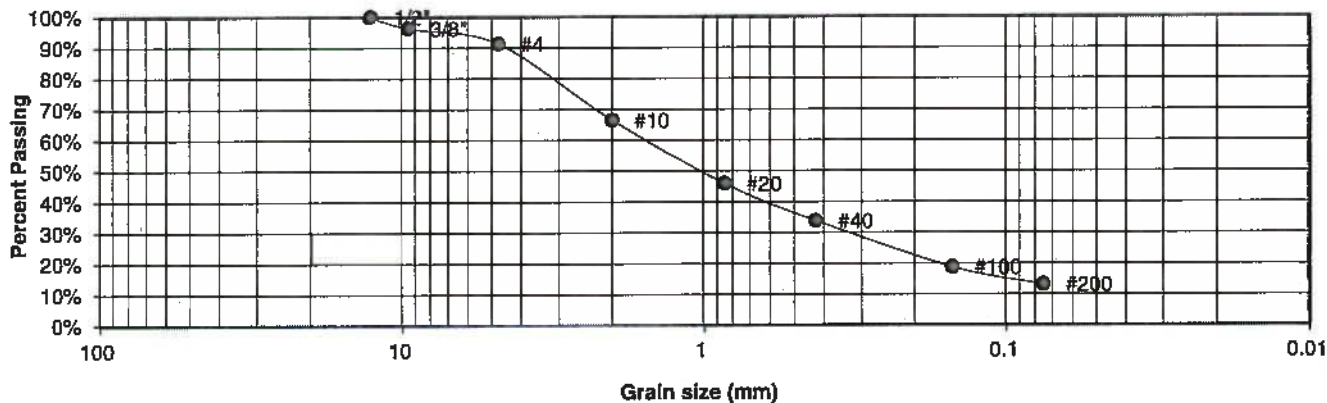
JOB NO.:

212757
FIG NO.:

B-6

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	6	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	96.3%
4	91.3%
10	66.5%
20	45.9%
40	33.8%
100	18.7%
200	13.1%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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**LABORATORY TEST
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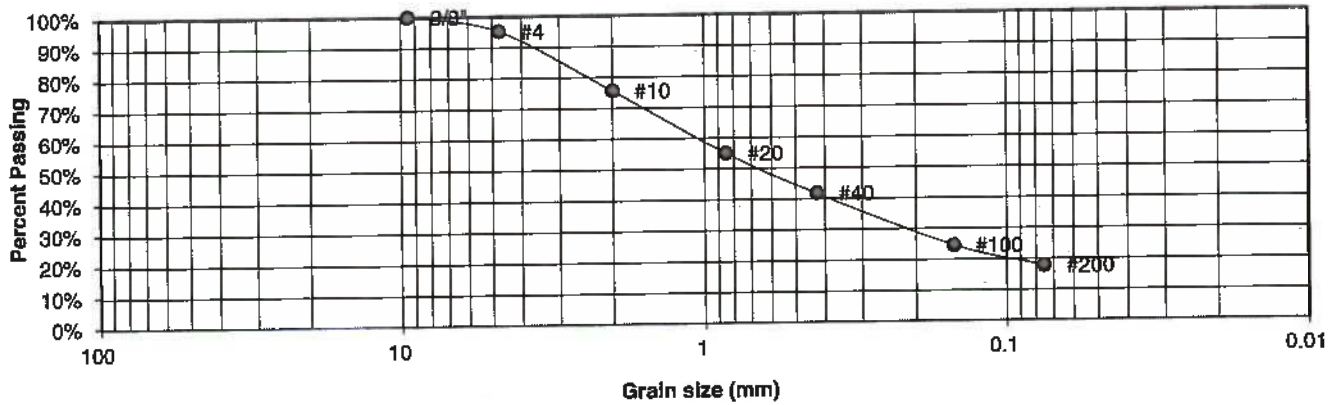
JOB NO.:

212757
FIG NO.:

B-7

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	7	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.2%
10	75.6%
20	55.0%
40	41.8%
100	24.5%
200	17.8%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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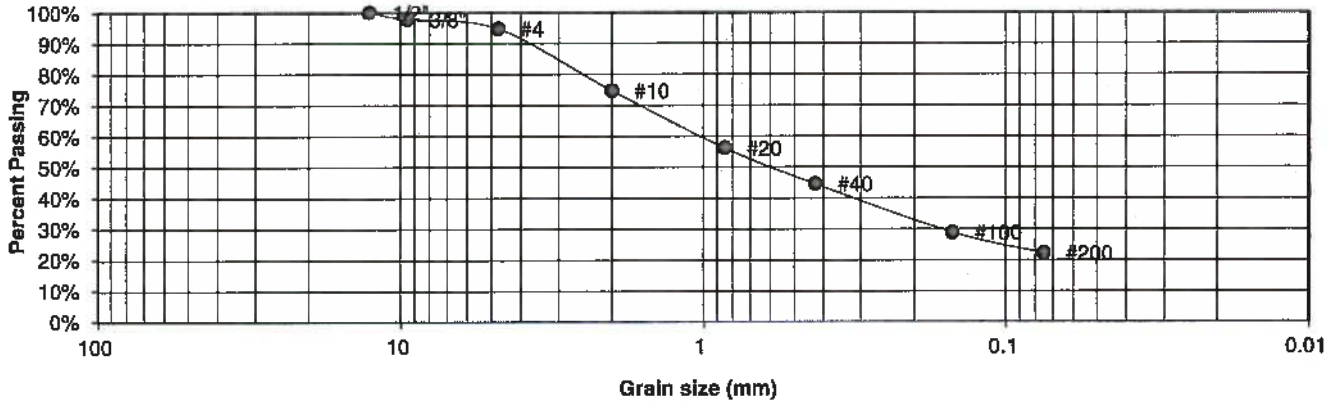
JOB NO.:

212757
FIG NO.:

B-8

UNIFIED CLASSIFICATION	SC-SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	8	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.7%
4	94.7%
10	74.7%
20	56.2%
40	44.6%
100	28.9%
200	22.2%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	25
Plastic Index	7

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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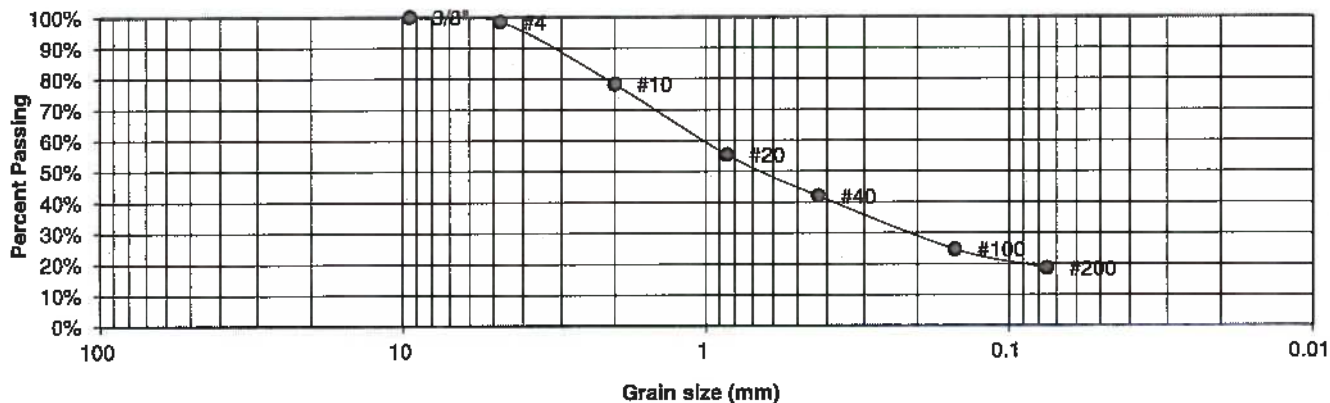
JOB NO.:

212757
FIG NO.:

B-9

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	9	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.5%
10	78.2%
20	55.4%
40	42.0%
100	24.7%
200	18.6%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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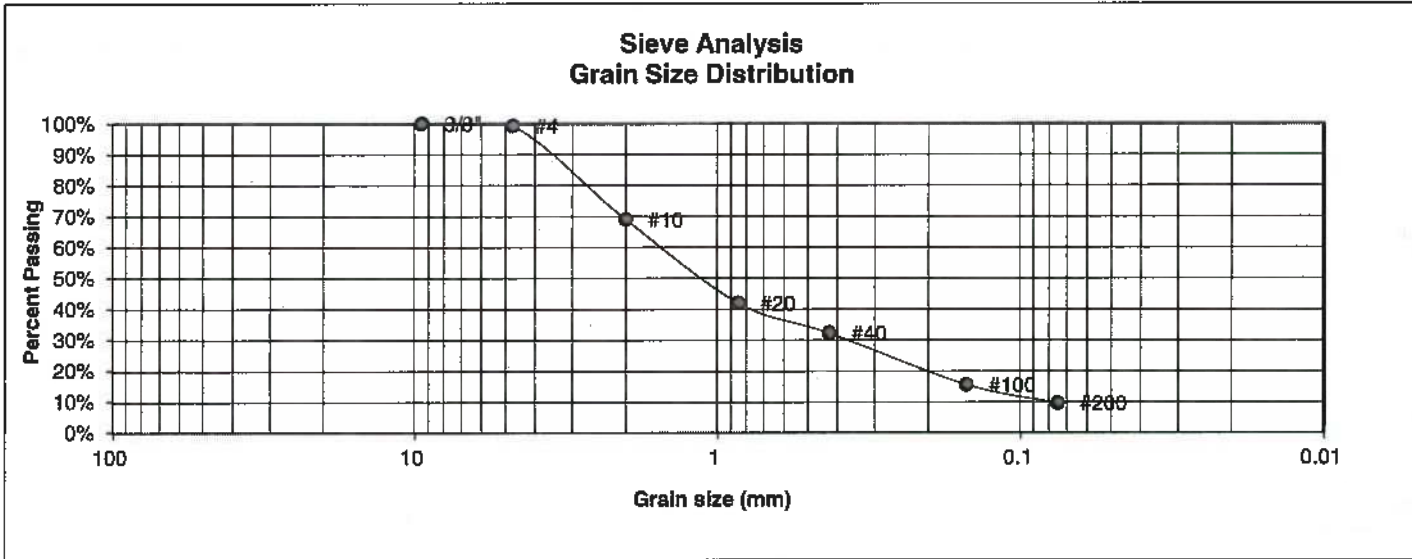
JOB NO.:

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FIG NO.:

B-10

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	10	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.3%
10	69.0%
20	42.0%
40	32.3%
100	15.6%
200	9.6%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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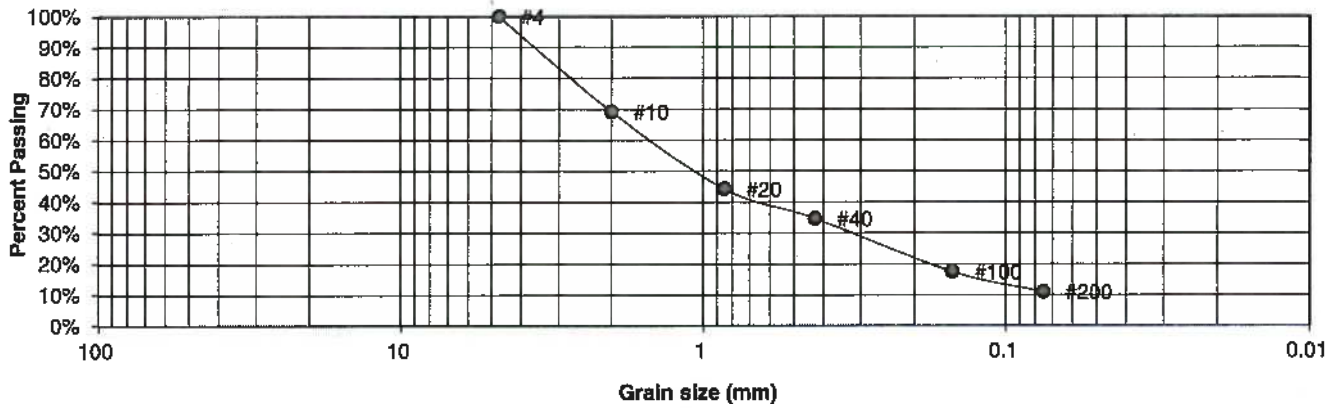
JOB NO.:

212757
FIG NO.:

B-11

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	11	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	69.2%
20	44.2%
40	34.6%
100	17.5%
200	11.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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JOB NO.:

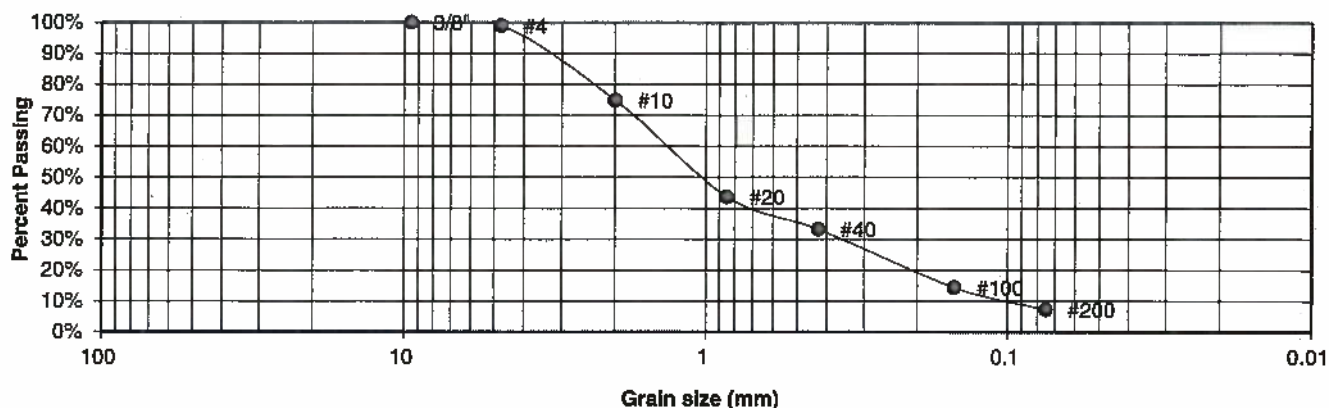
212757

FIG NO.:

B-12

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	12	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.0%
10	74.9%
20	43.7%
40	33.2%
100	14.4%
200	7.3%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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JOB NO.:

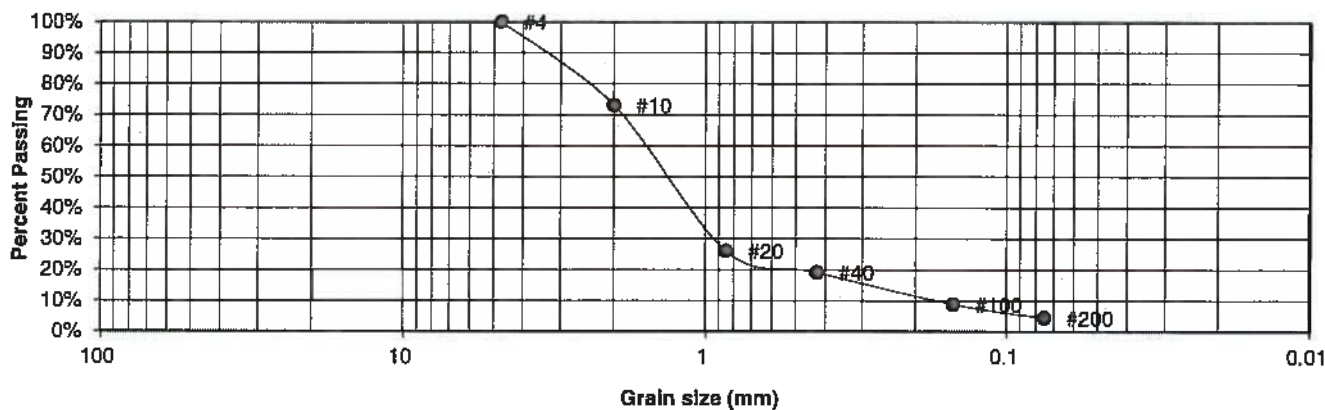
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FIG NO.:

B-13

UNIFIED CLASSIFICATION	SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	13	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	73.0%
20	26.0%
40	19.1%
100	8.8%
200	4.4%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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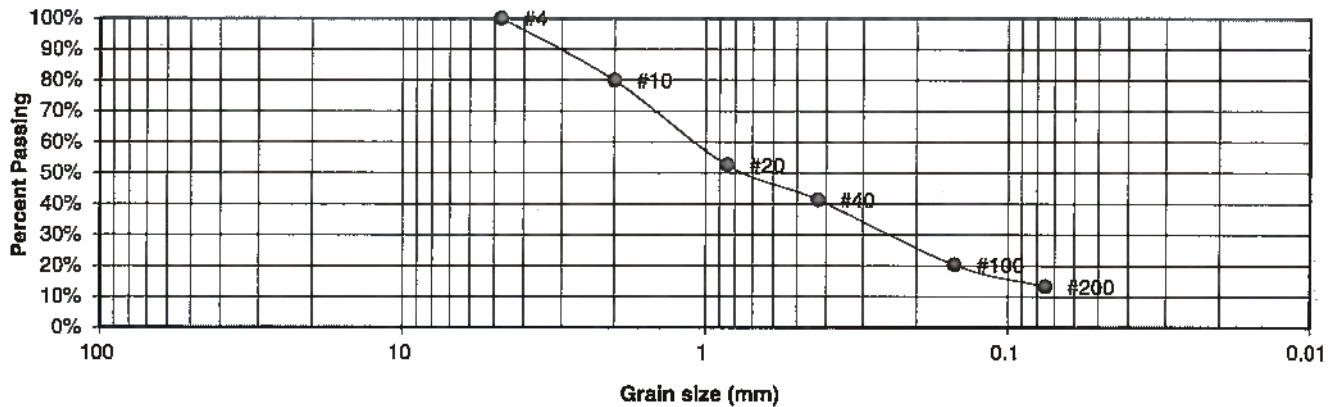
JOB NO.:

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FIG NO.:

B-14

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	14	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	80.0%
20	52.6%
40	41.3%
100	20.3%
200	13.3%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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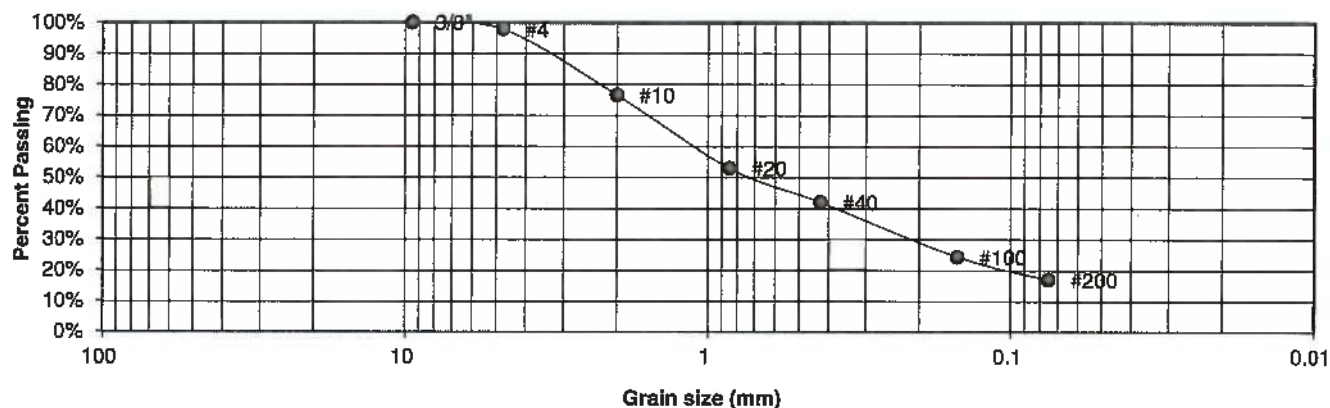
**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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JOB NO.:
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FIG NO.:
B-15

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	15	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.8%
10	76.6%
20	53.1%
40	42.0%
100	24.4%
200	17.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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		SW	3-29-23

JOB NO.:

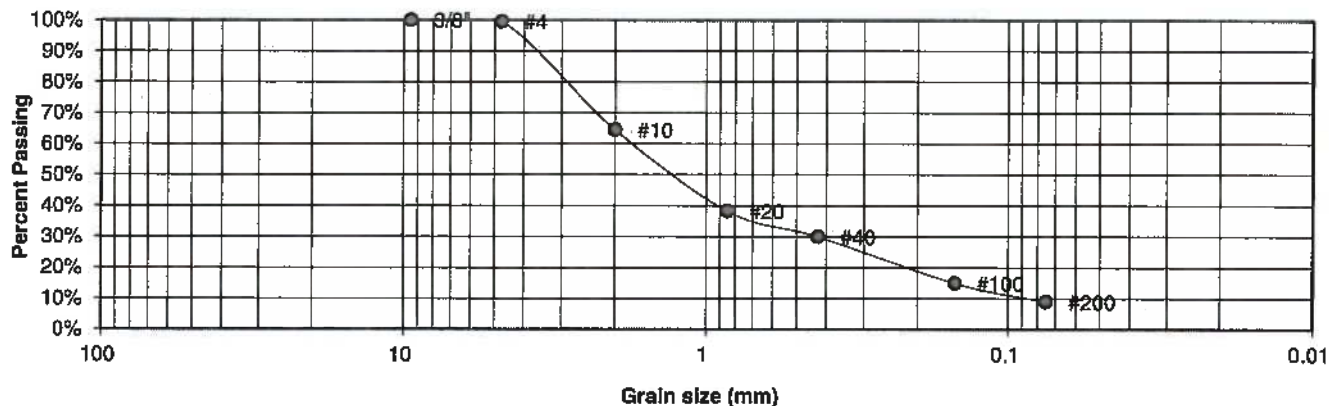
212757

FIG NO.:

B-16

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	16	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-1-b	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
#4	99.5%
#10	64.5%
#20	38.2%
#40	29.9%
#100	14.9%
#200	9.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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JOB NO.:

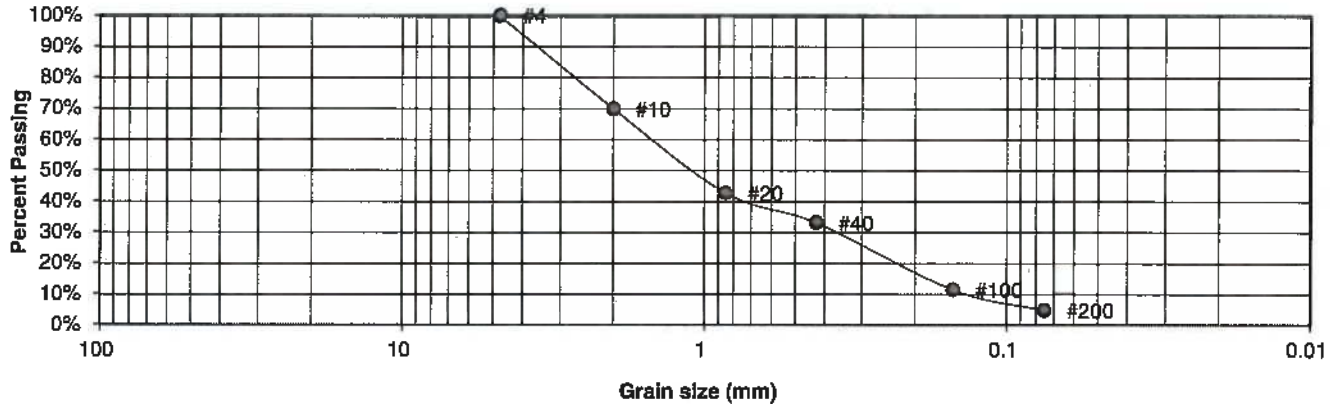
212757

FIG NO.:

B-17

UNIFIED CLASSIFICATION	SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	17	JOB NO.	212757
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	69.9%
20	42.8%
40	33.1%
100	11.5%
200	4.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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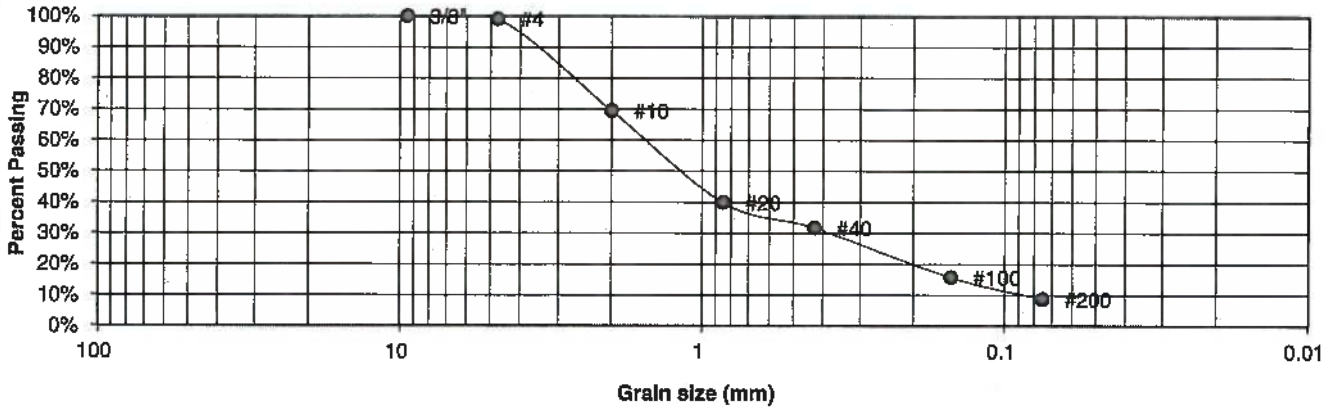
JOB NO.:

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FIG NO.:

B-18

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	17	JOB NO.	212757
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION		GROUP INDEX	

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.1%
10	69.5%
20	39.9%
40	31.6%
100	15.7%
200	8.7%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



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DRAWN:

DATE:

CHECKED: *SW*

DATE:

3-28-23

JOB NO.:

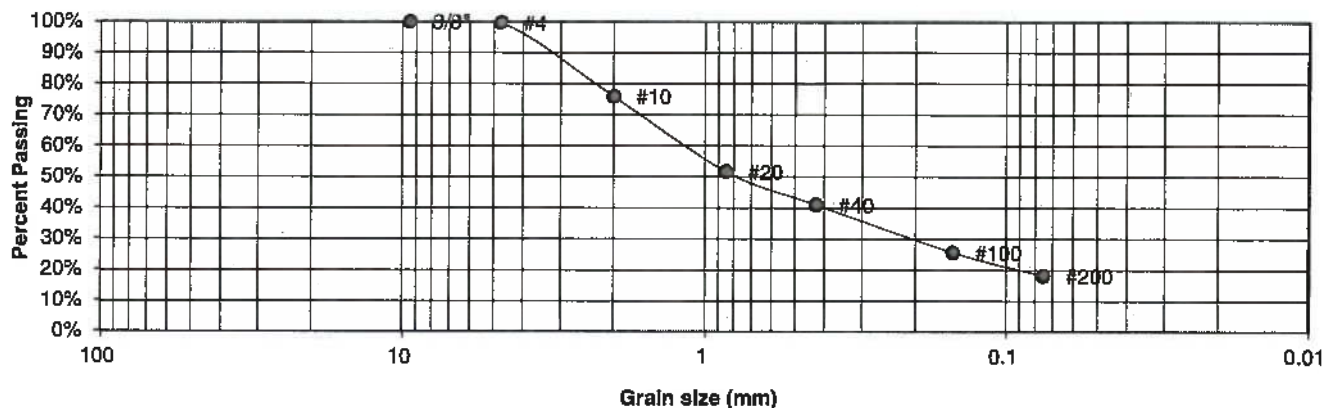
212757

FIG NO.:

B-19

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	1	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	4	JOB NO.	212757
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION		GROUP INDEX	

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.7%
10	75.8%
20	51.7%
40	41.0%
100	25.6%
200	18.2%

Atterberg Limits
 Plastic Limit
 Liquid Limit
 Plastic Index

Swell
 Moisture at start
 Moisture at finish
 Moisture increase
 Initial dry density (pcf)
 Swell (psf)



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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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JOB NO.:

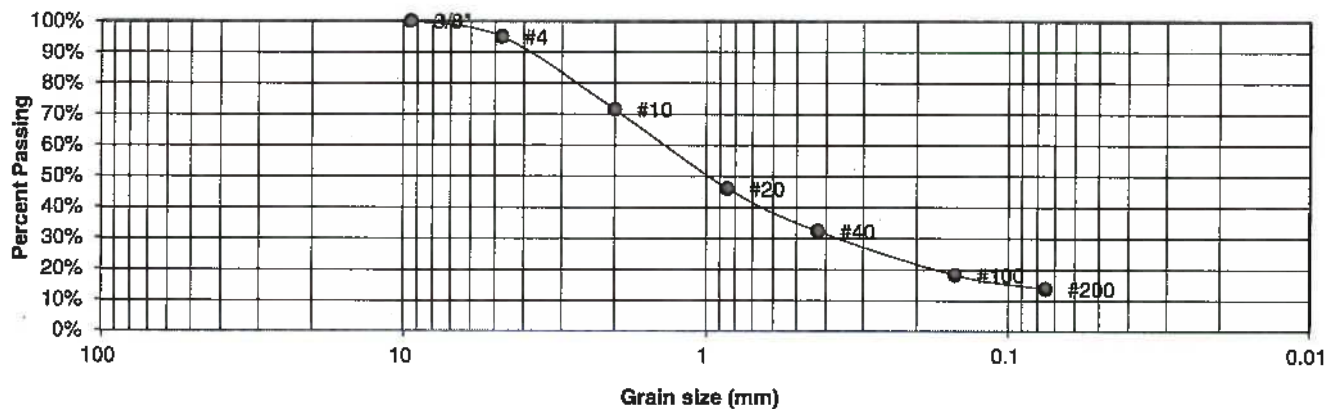
212757

FIG NO.:

B-20

UNIFIED CLASSIFICATION	SM	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	2	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	4	JOB NO.	212757
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.0%
10	71.5%
20	46.1%
40	32.4%
100	18.3%
200	13.8%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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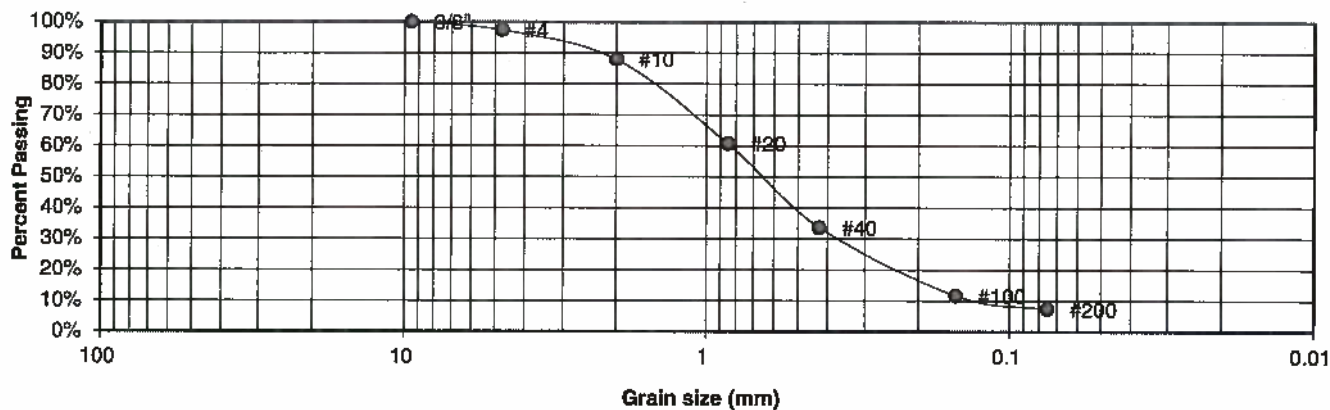
JOB NO.:

212757
FIG NO.:

B-21

UNIFIED CLASSIFICATION	SM-SW	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	2	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	7	JOB NO.	212757
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.4%
10	87.9%
20	60.8%
40	33.6%
100	11.7%
200	7.3%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-28-23</i>
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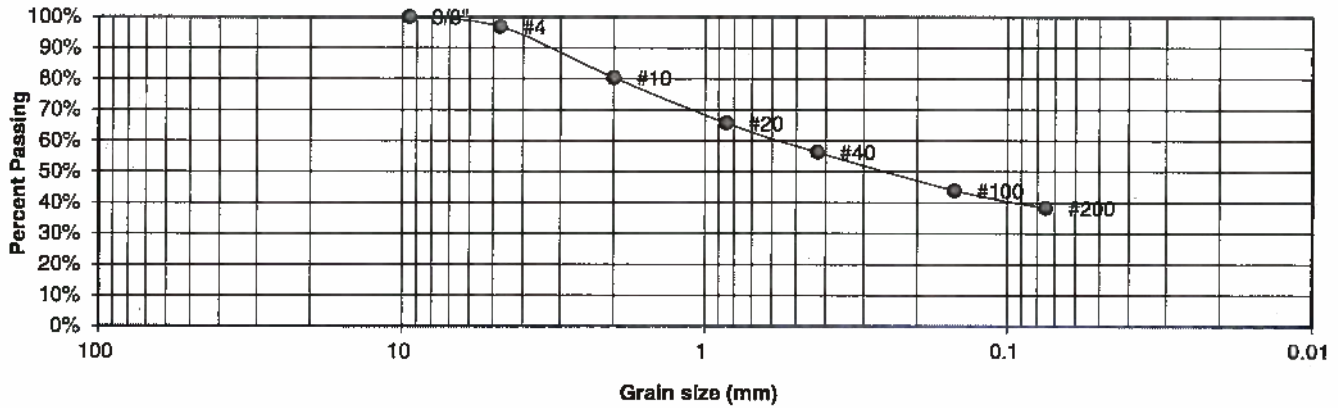
JOB NO.:

212757
FIG NO.:

B-22

UNIFIED CLASSIFICATION	SC	CLIENT	PROTERRA PROPERTIES
SOIL TYPE #	3	PROJECT	CLOVERLEAF & HIGBY
TEST BORING #	1	JOB NO.	212757
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	2

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.8%
10	80.3%
20	65.7%
40	56.3%
100	43.9%
200	38.2%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	35
Plastic Index	16

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	



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**LABORATORY TEST
RESULTS**

DRAWN:	DATE:	CHECKED: <i>SW</i>	DATE: <i>3-29-23</i>
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JOB NO.:

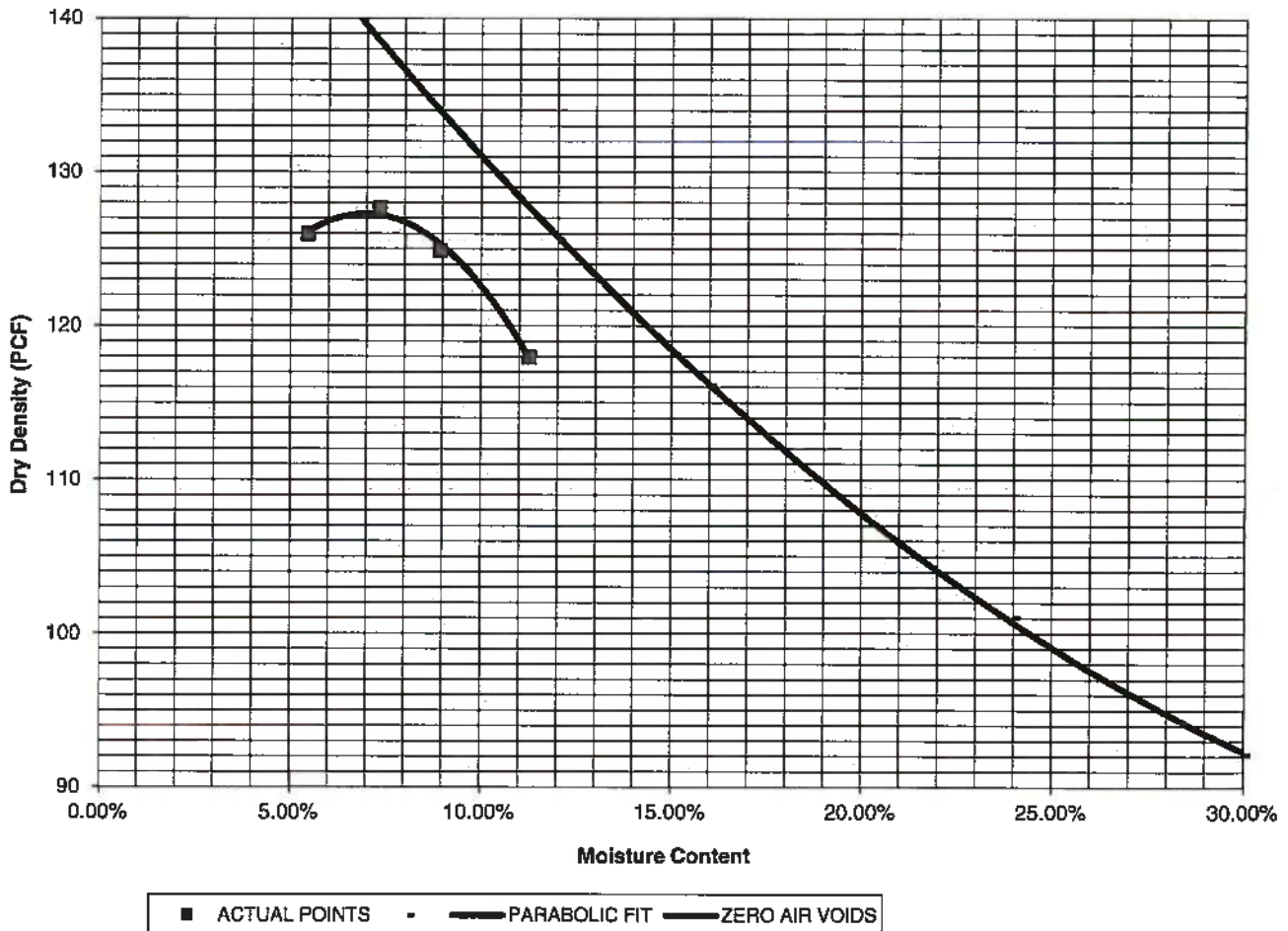
212757
FIG NO.:

B-23

PROJECT	CLOVERLEAF & HIGBY	CLIENT	PROTERRA PROPERTIES
SAMPLE LOCATION	TB-9 @ 0-3'	JOB NO.	212757
SOIL DESCRIPTION	FILL, SAND, SILTY, TAN	DATE	03/20/23

IDENTIFICATION	SM	COMPACTION TEST #	1, CBR #1
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	127.8	OPTIMUM MOISTURE	7.2%

Compaction Curve



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MOISTURE DENSITY RELATION

DRAWN:

DATE:

CHECKED:

DATE:

SW

3-28-23

JOB NO.:

212757

FIG NO.:

B-25

CBR TEST LOAD DATA

JOB NO: 212757
 CLIENT: PROTERRA PROPERTIES
 PROJECT: CLOVERLEAF & HIGBY
 SOIL TYPE: 1, SOIL TYPE #1

PISTON		PISTON		10 BLOWS		25 BLOWS		56 BLOWS	
DIAMETER (cm)		AREA (in ²)		MOLD # 1		MOLD # 2		MOLD # 3	
4.958		2.993		LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)
PENETRATION DEPTH (INCHES)		(LBS)	(PSI)	(LBS)	(PSI)	(LBS)	(PSI)	(LBS)	(PSI)
0.000		0	0.00	0	0.00	0	0.00	0	0.00
0.025		128	42.77	256	85.55	497	166.08		
0.050		248	82.87	495	165.41	834	278.70		
0.075		343	114.62	685	228.90	1229	410.69		
0.100		448	149.71	896	299.41	1404	469.17		
0.125		662	221.22	1324	442.44	1794	599.50		
0.150		821	274.35	1641	548.37	2263	756.22		
0.175		991	331.16	1981	661.99	2397	801.00		
0.200		1168	390.31	2335	780.28	2707	904.59		
0.300		1998	667.67	3396	1134.83	3809	1272.84		
0.400		2155	720.13	4305	1438.59	4807	1606.34		
0.500		2985	997.49	5061	1691.22	5781	1931.82		

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	303	357	352
WT. CAN	8.26	7.97	8.03
WT. CAN+WET	147.47	197.94	216.03
WT. CAN+DRY	132.22	181.2	198.56
WT. H2O	15.25	16.74	17.47
WT. DRY SOIL	123.96	173.23	190.53
MOISTURE CONTENT	12.30%	9.66%	9.17%

WET DENSITY (PCF)	125.2	134.3	143.9
DRY DENSITY (PCF)	116.8	125.3	134.2

BEARING RATIO 14.97 29.94 46.92

90% OF DRY DENSITY 115.0
 95% OF DRY DENSITY 121.4

BEARING RATIO AT 90% OF MAX	11.81 ~ R VALUE	35
BEARING RATIO AT 95% OF MAX	23.10 ~ R VALUE	71

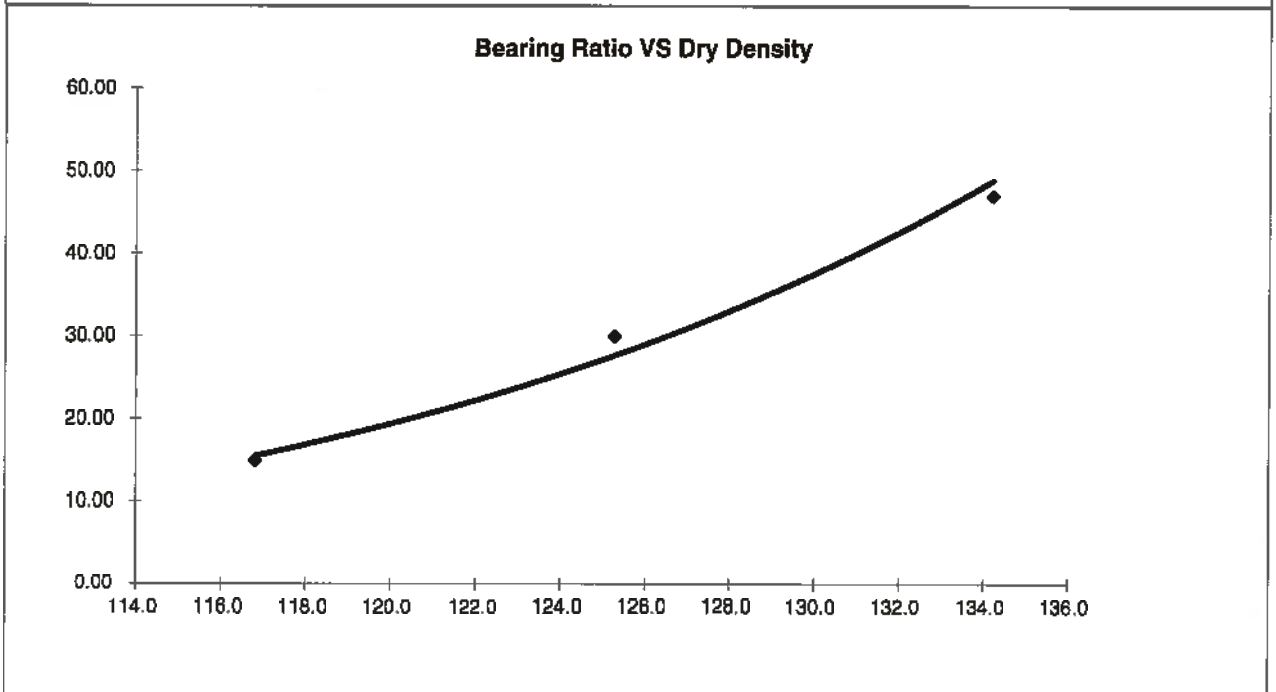
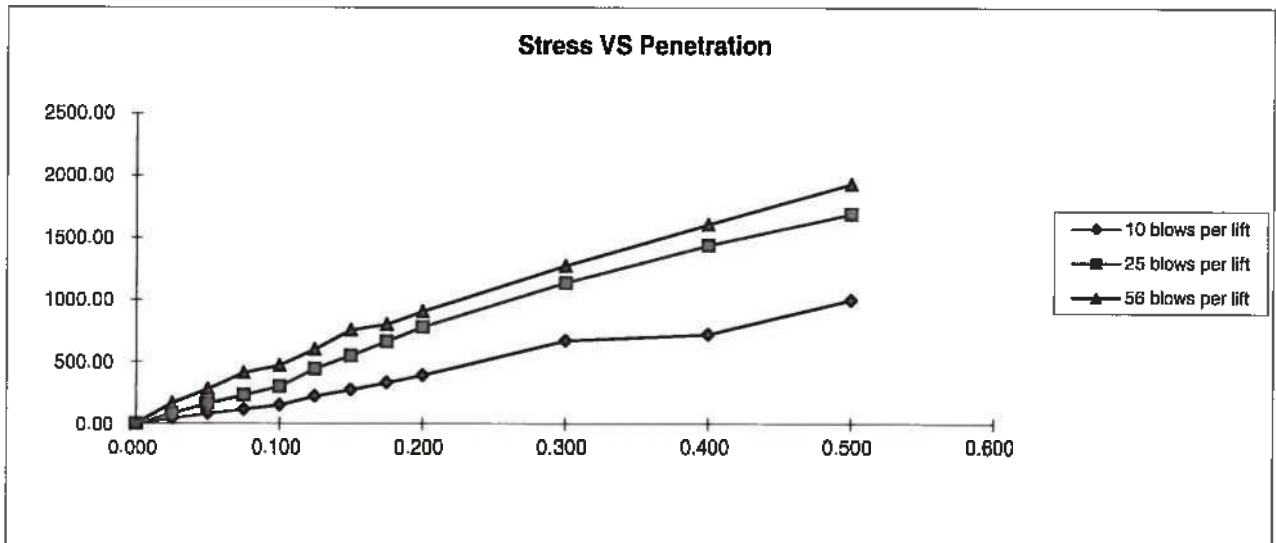


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CBR TEST DATA

DRAWN: DATE: CHECKED: SW DATE: 3-28-23

JOB NO.: 212757
 FIG NO.: B-26



BEARING RATIO AT 90% OF MAX	11.81 ~ R VALUE	35.00
BEARING RATIO AT 95% OF MAX	23.10 ~ R VALUE	71.00

JOB NO: 212757
 SOIL TYPE: 1, SOIL TYPE #1



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CALIFORNIA BEARING RATIO

DRAWN:

DATE:

CHECKED: *SW*

DATE: *3-28-23*

JOB NO.:

212757

FIG NO.:

B-27

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

PROTERRA PROPERTIES
CLOVERLEAF, FILING NO. 2
URBAN LOCAL ROADWAY SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Hveem Stabilometer (R Value) Results:	R =	50
Standard Deviation	S_o =	0.45
Loss in Serviceability	$\Delta\psi$ =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	13168

Weighted Structural Number (WSN): ➔ WSN = 2.10

DESIGN TABLES AND EQUATIONS

$$S_1 = [(R - 5) / 11.29] + 3$$

$$M_R = 10^{[(S_1 + 18.72) / 6.24]}$$

$$k = M_R / 19.4$$

Where:

M_R = resilient modulus (psi)

S_1 = the soil support value

R = R-value obtained from the Hveem stabilometer

CBR = California Bearing Ratio

Reliability (%) Z_R (z-statistic)

80	-0.84
85	-1.04
90	-1.28
93	-1.48
94	-1.56
95	-1.65
96	-1.75
97	-1.88
98	-2.05
99	-2.33
99.9	-3.09
99.99	-3.75

$$\log_{10} W_{18} = Z_R * S_o + 9.36 * \log_{10} (SN+1) - 0.20 + \frac{\log_{10} \left[\frac{\Delta \text{PSI}}{4.2 - 1.5} \right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 * \log_{10} M_R - 8.07$$

Left	Right	Difference
5.47	5.47	0.0

Job No. 212757

Fig. No. C-1

DESIGN CALCULATIONS

DESIGN DATA PROTERRA PROPERTIES
 CLOVERLEAF, FILING NO. 2
 URBAN LOCAL ROADWAYS SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 292,000
Hveem Stabilometer (R Value) Results:	R = 50
Weighted Structural Number (WSN):	WSN = 2.10

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt

$C_2 = 0.11$ Strength Coefficient - Aggregate Basecourse

$D_1 =$ Depth of Asphalt (inches)

$D_2 =$ Depth of Basecourse (inches)

FOR ASPHALT + AGGREGATE BASECOURSE SECTION

Asphalt Thickness (t) = inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 7.1$ inches of Aggregate
Basecourse, use 8.0 inches

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 8.0 inches of Aggregate Basecourse

Job No. 212757

Fig. No. C-2

DESIGN CALCULATIONS

DESIGN DATA PROTERRA PROPERTIES
 CLOVERLEAF, FILING NO. 2
 URBAN LOCAL ROADWAYS SOIL TYPE 1

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 292,000
Hveem Stabilometer (R Value) Results:	R = 50
Weighted Structural Number (WSN):	WSN = 2.10

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt

$C_2 = 0.11$ Strength Coefficient - Aggregate Basecourse

$D_1 =$ Depth of Asphalt (inches)

$D_2 =$ Depth of Basecourse (inches)

FOR ASPHALT + AGGREGATE BASECOURSE SECTION

Asphalt Thickness (t) = 4 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 3.1$ inches of Aggregate
Basecourse, use 6.0 inches

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 6.0 inches of Aggregate Basecourse

Job No. 212757
Fig. No. C-3