

April 14, 2023



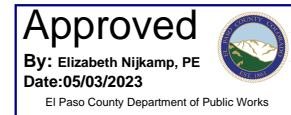
ENTECH
ENGINEERING, INC.

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

SR Land, LLC
20 Boulder Crescent, 1st Floor, Suite 100
Colorado Springs, Colorado 80903

Attn: Chaz Collins

Re: Pavement Recommendations
Homestead North at Sterling Ranch – Filing No. 1
El Paso County, Colorado
Entech Job No. 222146



Dear Mr. Collins:

As requested, Entech Engineering, Inc. has obtained samples of the pavement subgrade soils from the roads in the Homestead North at Sterling Ranch Filing No. 1 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 sections of Wheatland Drive, Nat Love Drive, Texas Jack Drive, along with Tom Ketchum Drive including the cul-de-sac, Jack Helm Drive, Harvey Logan Drive, and Jane Kirkham Drive located northeast of Colorado Springs, in the northern portion of El Paso County, 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 Plan, Figure No 1.

Subgrade Conditions

Eighteen test borings were drilled along the roadways to depths of approximately 5 and 10 feet below the existing subgrade surface at the required intervals. The soils in the test borings consisted of clayey sand fill and slightly silty to silty sand fill (Soil Type 1), native silty to clayey sand (Soil Type 2), native sandy clay (Soil Type 3) silty to slightly silty to clayey sandstone (Soil Type 4), and very sandy to sandy claystone to very clayey sandstone (Soil Type 5).

The pavement designs will be based on 2 soil types, Soil Type A and Soil Type B. The type 1, 2, and 4 soils will be grouped together as Soil Type A and the type 3 and 5 soils will be grouped together as Soil Type B due to similar characteristics. 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 A soils is approximately 9 to 36 percent. The Type A subgrade soils generally classify as A-1-b, A-2-4, A-2-6 and A-4 soils. The Type B soils generally classify as A-4 to A-6 soils which typically provide poorer pavement support characteristics using the AASHTO classification system. Mitigation of the Type B soils will be required. Groundwater was not encountered in the test borings. Water soluble sulfate tests results indicated that the soils exhibit a negligible potential for sulfate attack.

EPC PROJECT No. SF-2213

Atterberg Limits Testing on samples of all types of the soils taken from the test borings resulted in Liquid Limits of No-Value to 37 percent and Plastic Indexes of Non-Plastic to 19 percent. Swell/Consolidation Testing on random samples from all soil types resulted in volume changes from 0.2 to 1.6 percent and consolidations of 0.2 to 0.5 percent. These results indicate a low consolidation potential and a low to moderate expansion potential. Test results indicate that mitigation due to expansive soils is not required on this site. Laboratory test results are presented in Appendix B and are summarized in Table 1.

California Bearing Ratio (CBR) testing was performed on representative samples of Soil Type 1 and Soil Type 2 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 A – Clayey Sand Fill

R @ 90% = 60.0
R @ 95% = 74.0
Use R = 50.0 for design

Soil Type B – Very Clayey

Sandstone

R @ 90% = 1
R @ 95% = 14
Use R = 14.0 for design

Classification Testing

Soil Type A

Soil Type B

Liquid Limit	28	Liquid Limit	29
Plasticity Index	13	Plasticity Index	11
Percent Passing 200	25.8	Percent Passing 200	39.2
AASHTO Classification	A-2-6	AASHTO Classification	A-6
Group Index	0	Group Index	1
Unified Soils Classification	SC	Unified Soils Classification	SC

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 cul-de-sac section on Tom Ketchum Drive classifies as an urban local (low volume) roadway, which will use an 18k ESAL value of 36,500 for design. The remaining roadways classify as urban local roads, which will use an 18k ESAL value of 292,000 for design purposes. Alternative pavement sections were determined for asphalt supported by aggregate basecourse, and asphalt supported by recycled concrete. County approval is required if recycled concrete is to be utilized. Additional laboratory testing for the recycled concrete is in process.

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

Reliability (Collector)	80%
Serviceability Index 2.0	2.0%
Standard Deviation	0.44
"R" Value Subgrade	
Soil Type A	50.0
Soil Type B*	14.0*
Resilient Modulus	
Soil Type A	13,168 psi
Soil Type B*	4,060 psi
Δpsi	2.0
Structural Coefficients	
Hot Bituminous Pavement	0.44
Aggregate Basecourse	0.11
Recycled Concrete	0.11

*The Type B soils, where encountered will require removal up to 18 inches of the Type B Soils and replacement with on-site Type A Soils.

The pavement design calculations are presented in Appendix C. Pavement section alternatives 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.

Soil Type A Pavement Sections
ESAL = 36,500 – Urban Local (Low Volume)

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Recycled Concrete (in)</u>
1. Asphalt Over Basecourse	3.0*	6.0*	–
2. Asphalt Over Recycled Concrete	3.0*	–	6.0*

Soil Type A Pavement Sections
ESAL = 292,000 – Urban Local

<u>Alternative</u>	<u>Asphalt (in)</u>	<u>Basecourse (in)</u>	<u>Recycled Concrete (in)</u>
1. Asphalt Over Basecourse	3.0*	8.0*	–
2. Asphalt Over Recycled Concrete	3.0*	–	8.0*

*Minimum sections required per El Paso County Pavement Design Criteria Manual.
-Full Depth Asphalt is not allowed in unincorporated El Paso County.

Mitigation

El Paso County requires mitigation of expansive soils that have a swell of 2 percent or greater with a 150 pound per square foot surcharge. Based on the swell testing, the soils at subgrade depth do not require mitigation for expansion potential.

The Type B soils consisted of expansive clays, which would require thicker asphalt sections. In the areas with Type B soils, it is recommended that 18 inches of the Type B soils be removed and replaced with Type A soils. The thinner Soil Type A sections can then be used. The approximate extents of the Type B soils are shown in Figure No. 1. The approximate locations for mitigation will be field determined.

Roadway Construction – Asphalt on Aggregate Basecourse or Recycled Concrete Alternatives

Prior to placement of the asphalt, the subgrade should be mitigated as required and 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 or to 95% of the soils maximum Standard Proctor Dry Density ASTM D-698 at 0 to 4 percent over optimum moisture content, and proofrolled. Any loose 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, at ± 2 percent of optimum moisture content. Special attention should be given to areas adjacent to manholes, inlet structures and valves.

Based on the soils encountered, subgrade soil problem areas, if any, will be identified at proof roll. We do not anticipate issues with the subgrade in regards to shallow water, frost susceptible soils, groundwater or drainage conditions, soluble sulfates, or cold weather construction.

In addition to the above guidance, the asphalt, basecourse, recycled concrete, subgrade conditions, compaction of materials and roadway construction methods shall meet El Paso County pavement design specifications.

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.


Daniel P. Stegman

DPS/lu

Encl.

Entech Job No. 222146
A\Projects\2022\222146 pr

Reviewed by:



Austin M. Nossokoff, P.E.

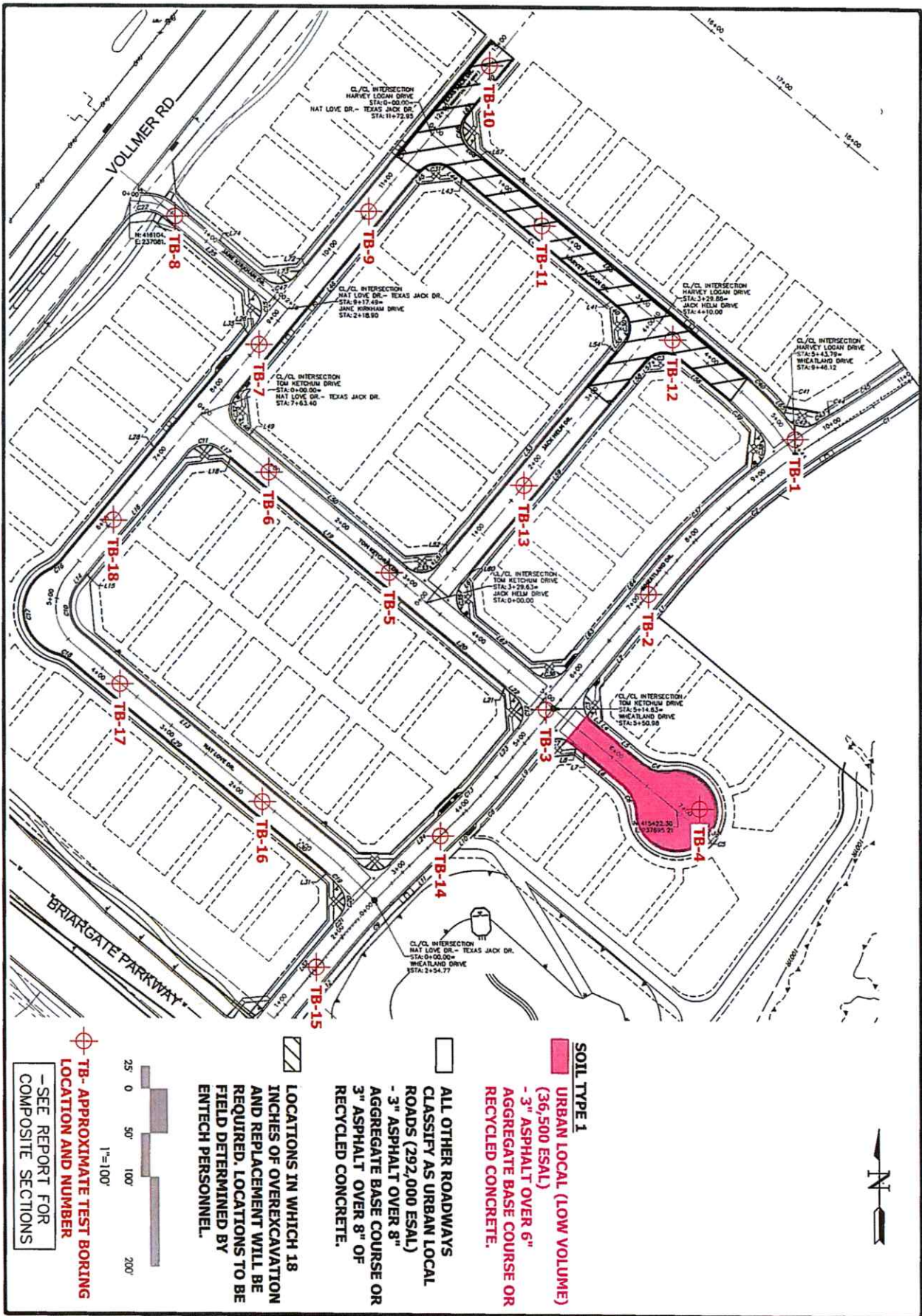


TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT SR LAND, LLC
 PROJECT STERLING RANCH, F-1
 JOB NO. 222146

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	3	0-3	13.1	112.7	25.8	28	13		A-2-6	0.5	SC	FILL, SAND, CLAYEY
1	1	1-2	11.1	113.1	25.4	35	15	<0.01	A-2-6	0.2	SC	FILL, SAND, CLAYEY
1	2	1-2	12.5	113.3	34.8	32	12		A-2-6	0.3	SC	FILL, SAND, CLAYEY
1	3	1-2		33.7	33.7	32	10		A-4		SC	FILL, SAND, CLAYEY
1	4	1-2		30.0	30.0	29	10	0.00	A-4		SC	FILL, SAND, CLAYEY
1	7	1-2		18.6	18.6	NV	NP	<0.01	A-2-4		SM	FILL, SAND, SILTY
1	8	1-2		19.4	19.4	NV	NP		A-2-4		SM	FILL, SAND, SILTY
1	14	1-2		18.8	18.8	NV	NP		A-1-b		SM	FILL, SAND, SILTY
1	15	1-2		9.1	9.1	NV	NP		A-1-b		SM-S-W	FILL, SAND, SLIGHTLY SILTY
1	16	1-2	9.9	119.1	15.0	27	11		A-2-6	-0.2	SC	FILL, SAND, CLAYEY
1	17	1-2	10.3	117.0	34.2	34	18		A-2-6	0.2	SC	FILL, SAND, CLAYEY
1	15	0-3		21.2	21.2						SM	FILL, SAND, SILTY
2	5	1-2		16.0	16.0	NV	NP		A-2-4		SM	SAND, SILTY
2	6	1-2		15.3	15.3	NV	NP		A-2-4		SM	SAND, SILTY
2	9	1-2		16.8	16.8	NV	NP		A-1-b		SM	SAND, SILTY
2	8	5	7.0	103.4	29.2	29	9	<0.01	A-2-4	-0.5	SC	SAND, CLAYEY
2	6	0-3		21.7	21.7						SM	SAND, SILTY
2	9	0-3		28.8	28.8						SM	SAND, SILTY
3	10	1-2	13.3	111.2	64.4	37	19		A-6	1.6	CL	CLAY, SANDY
4	11	1-2	9.8	116.7	28.2	29	11		A-2-6	0.3	SC	SANDSTONE, CLAYEY
4	13	1-2		21.4	21.4	29	10		A-2-4		SC	SANDSTONE, CLAYEY
4	18	1-2		13.3	13.3	NV	NP		A-1-b		SM	SANDSTONE, SILTY
4	5	5		12.4	12.4	NV	NP	0.00	A-1-b		SM	SANDSTONE, SILTY
4	9	10		11.3	11.3	NV	NP		A-1-b		SM-SW	SANDSTONE, SLIGHTLY SILTY
4	15	10	10.1	117.6	35.5	32	12		A-6	0.7	SC	SANDSTONE, CLAYEY
4	16	5		12.3	12.3	NV	NP		A-1-b		SM	SANDSTONE, SILTY
4	18	1-3		18.5	18.5						SM	SANDSTONE, SILTY
5, CBR #2	12	1-3		39.2	39.2	29	11		A-6		SC	SANDSTONE, VERY CLAYEY
5	12	1-2		51.2	51.2	26	9		A-4		CL	CLAYSTONE, VERY SANDY
5	3	10	9.5	119.5	46.9	33	13		A-6	0.3	SC	SANDSTONE, VERY CLAYEY
5	6	10	15.4	109.3	73.0	31	13		A-6	1.1	CL	CLAYSTONE, SANDY
5	10	5	14.0	111.5	43.3	31	13		A-6	0.9	SC	SANDSTONE, VERY CLAYEY



APPENDIX A: Test Boring Logs

TEST BORING NO. 1
 DATE DRILLED 11/16/2022
 Job # 222146

TEST BORING NO. 2
 DATE DRILLED 11/16/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS

DRY TO 5', 11/16/22
 FILL 0-5', SAND, CLAYEY, FINE
 TO MEDIUM GRAINED, BROWN,
 MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			21	11.8	1
5			17	11.8	1
10					
15					
20					

REMARKS

DRY TO 5', 11/16/22
 FILL 0-5', SAND, CLAYEY, FINE
 TO MEDIUM GRAINED, BROWN,
 DENSE TO MEDIUM DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			31	12.2	1
5			15	12.1	1
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

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DATE:

12-23-22

JOB NO.:
 222146

FIG NO.:
 A- 1

TEST BORING NO. 3
 DATE DRILLED 11/16/2022
 Job # 222146

TEST BORING NO. 4
 DATE DRILLED 11/16/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS

DRY TO 10', 11/16/22

FILL 0-4', SAND, CLAYEY, FINE
 TO MEDIUM GRAINED, BROWN,
 MEDIUM DENSE, MOIST

SANDSTONE, VERY CLAYEY,
 FINE TO MEDIUM GRAINED,
 GRAY BROWN, VERY DENSE,
 MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			35	11.2	1
5			50	10.1	5
			10"		
10			50	9.2	5
			4"		
15					
20					

REMARKS

DRY TO 5', 11/16/22

FILL 0-5', SAND, CLAYEY, FINE
 TO MEDIUM GRAINED, BROWN,
 DENSE TO MEDIUM DENSE, DRY

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			29	2.2	1
5			34	1.5	1
10					
15					
20					



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TEST BORING LOG

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DATE:

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DATE: 12-23-22

JOB NO.:
 222146

FIG NO.:
 A- 2

TEST BORING NO. 5
 DATE DRILLED 11/16/2022
 Job # 222146

TEST BORING NO. 6
 DATE DRILLED 11/16/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS

DRY TO 5', 11/16/22
 SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, DENSE, MOIST
 SANDSTONE, SILTY, FINE TO
 COARSE GRAINED, TAN, VERY
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			45	4.1	2
			50 7"	10.7	3
10					
15					
20					

REMARKS

DRY TO 10', 11/16/22
 SAND, SILTY, FINE TO COARSE
 GRAINED, TAN, MEDIUM DENSE,
 DRY TO MOIST
 CLAYSTONE, SANDY, GRAY
 BROWN, HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			24	2.5	2
			24	14.4	2
10			50 7"	14.8	5
15					
20					



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TEST BORING LOG

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DATE: *12-23-22*

JOB NO.:
 222146

FIG NO.:
 A-3

TEST BORING NO. 7
 DATE DRILLED 11/16/2022
 Job # 222146

TEST BORING NO. 8
 DATE DRILLED 11/16/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS

DRY TO 5', 11/16/22
 FILL 0-5', SAND, SILTY FINE
 TO MEDIUM COARSE, TAN,
 MEDIUM DENSE TO DENSE,
 DRY TO MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			24	2.2	1
5			30	10.1	1
10					
15					
20					

REMARKS

DRY TO 5', 11/16/22
 FILL 0-3', SAND, SILTY, FINE TO
 COARSE GRAINED, TAN, MEDIUM
 DENSE, DRY
 SAND, CLAYEY, FINE TO
 MEDIUM GRAINED, GRAY BROW
 DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5			29	1.9	1
5			37	18.2	2
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED:

DATE:

SW

12-23-22

JOB NO.:
 222146

FIG NO.:
 A- 4

TEST BORING NO. 9
 DATE DRILLED 11/17/2022
 Job # 222146

TEST BORING NO. 10
 DATE DRILLED 11/17/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 11/17/22						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, DRY				39	1.6	2
	5			50 10"	9.8	4
SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST	10			50 6"	10.9	4
	15					
	20					

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 11/17/22						
CLAY, SANDY, TAN, VERY STIFF, MOIST				42	15.2	3
SANDSTONE, VERY CLAYEY, FINE GRAINED, BROWN, VERY DENSE, MOIST	5			50 9"	10.5	5
	10					
	15					
	20					



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 COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

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DATE:

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DATE:

12-23-22

JOB NO.:
 222146

FIG NO.:
 A-5

TEST BORING NO. 11
 DATE DRILLED 11/17/2022
 Job # 222146

TEST BORING NO. 12
 DATE DRILLED 11/17/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS

DRY TO 5', 11/17/22
 SAND, SILTY, TAN
 SANDSTONE, CLAYEY, FINE TO
 MEDIUM GRAINED, BROWN,
 VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
1			50	9.2	2
10"			10"		4
5			50	10.6	4
7"			7"		
10					
15					
20					

REMARKS

DRY TO 5', 11/17/22
 SAND, SILTY, TAN
 CLAYSTONE, VERY SANDY,
 BROWN, HARD, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
1			50	6.3	2
6"			6"		5
5			50	8.6	5
6"			6"		
10					
15					
20					



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TEST BORING LOG

DRAWN:

DATE:

CHECKED: SW

DATE: 12-23-25

JOB NO.: 222146

FIG NO.: A-6

TEST BORING NO. 13
DATE DRILLED 11/17/2022
Job # 222146

TEST BORING NO. 14
DATE DRILLED 11/17/2022
CLIENT SR LAND, LLC
LOCATION STERLING RANCH, F-1

REMARKS

DRY TO 5', 11/17/22
SAND, SILTY, TAN
SANDSTONE, CLAYEY, FINE TO
MEDIUM GRAINED, BROWN,
VERY DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5			50 6"	7.7	2 4
5-10			50 5"	6.3	4
10-15					
15-20					

REMARKS

DRY TO 5', 11/17/22
FILL 0-5', SAND, SILTY FINE
TO MEDIUM COARSE, TAN,
MEDIUM DENSE, MOIST

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
0-5			26	3.6	1
5-10			17	15.1	1
10-15					
15-20					



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TEST BORING LOG

DRAWN:

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DATE:
12-23-22

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222146

FIG NO.:
A-7

TEST BORING NO. 15
 DATE DRILLED 11/17/2022
 Job # 222146

TEST BORING NO. 16
 DATE DRILLED 11/17/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 10', 11/17/22						
FILL 0-9', SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST TO DRY	5			25	2.4	1
	5			29	7.4	1
SANDSTONE, CLAYEY, FINE TO MEDIUM GRAINED, TAN, VERY DENSE, MOIST	10			50	13.7	4
	10			11"		
	15					
	20					

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 11/17/22						
FILL 0-3', SAND, CLAYEY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST	5			10	5.9	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST	5			50	8.6	4
	5			6"		
	10					
	15					
	20					



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TEST BORING LOG

DRAWN:

DATE:

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DATE:

12-23-22

JOB NO.:
 222146

FIG NO.:
 A-8

TEST BORING NO. 17
 DATE DRILLED 11/17/2022
 Job # 222146

TEST BORING NO. 18
 DATE DRILLED 11/17/2022
 CLIENT SR LAND, LLC
 LOCATION STERLING RANCH, F-1

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 11/17/22						
FILL 0-5', SAND, CLAYEY, FINE TO MEDIUM GRAINED, BROWN, MEDIUM DENSE, MOIST	5			21	8.1	1
	5			20	7.1	1
	10					
	15					
	20					

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 5', 11/17/22						
SAND, SILTY, TAN	1			50	7.2	2
SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST	11"			50		4
	5			50	12.0	4
	6"					
	10					
	15					
	20					



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JOB NO.:
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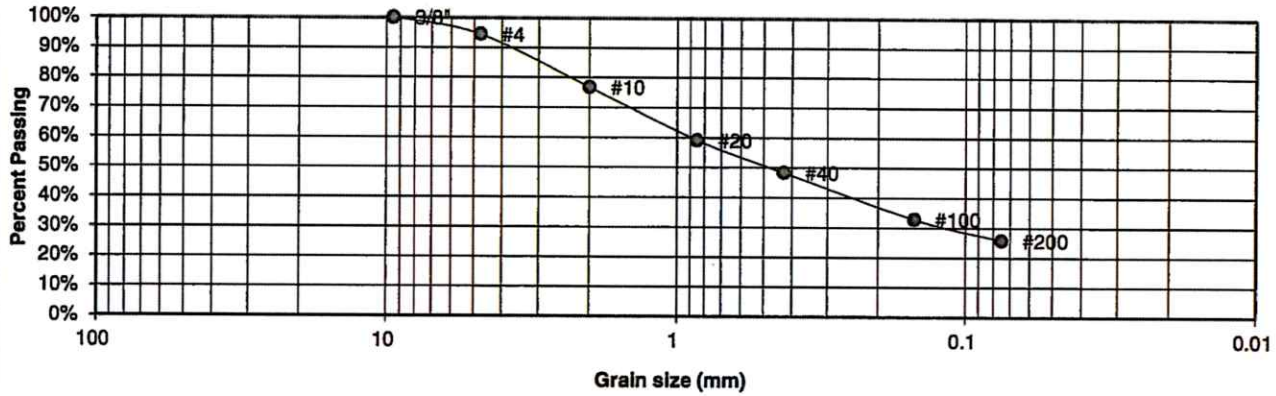
FIG NO.:

A-9

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SC	CLIENT	SR LAND, LLC
SOIL TYPE #	1, CBR	PROJECT	STERLING RANCH, F-1
TEST BORING #	3	JOB NO.	222146
DEPTH (FT)	0-3	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	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	94.5%
10	76.7%
20	59.1%
40	48.3%
100	32.8%
200	25.8%

**Atterberg
Limits**

Plastic Limit	15
Liquid Limit	28
Plastic Index	13

Swell

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



**ENTECH
ENGINEERING, INC.**

505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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DATE:

12-23-22

JOB NO.:

222146

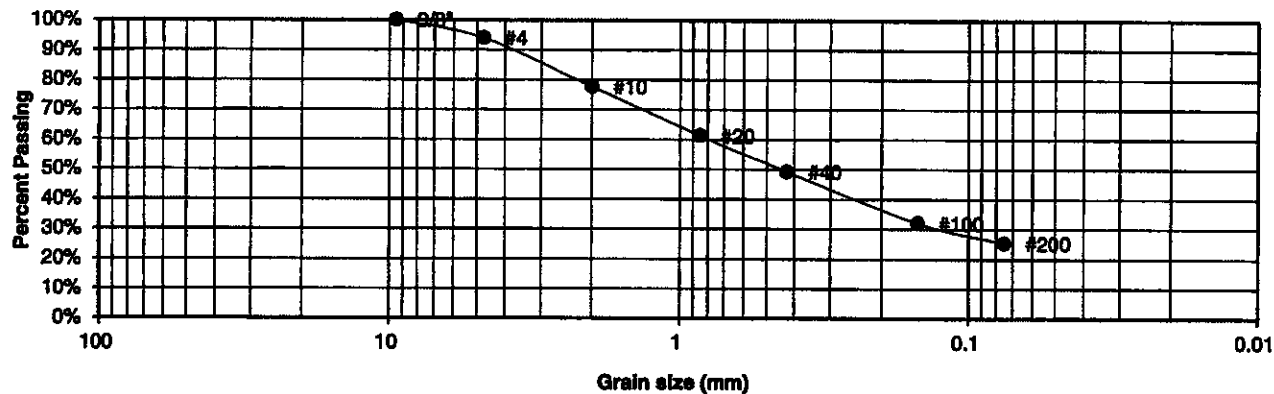
FIG NO.:

B-1

UNIFIED CLASSIFICATION SC
SOIL TYPE # 1
TEST BORING # 1
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX 1

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.0%
10	77.7%
20	61.3%
40	49.3%
100	32.0%
200	25.4%

**Atterberg
Limits**
 Plastic Limit 20
 Liquid Limit 35
 Plastic Index 15

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



**ENTECH
ENGINEERING, INC.**

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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DATE:

12-23-22

JOB NO.:

222146

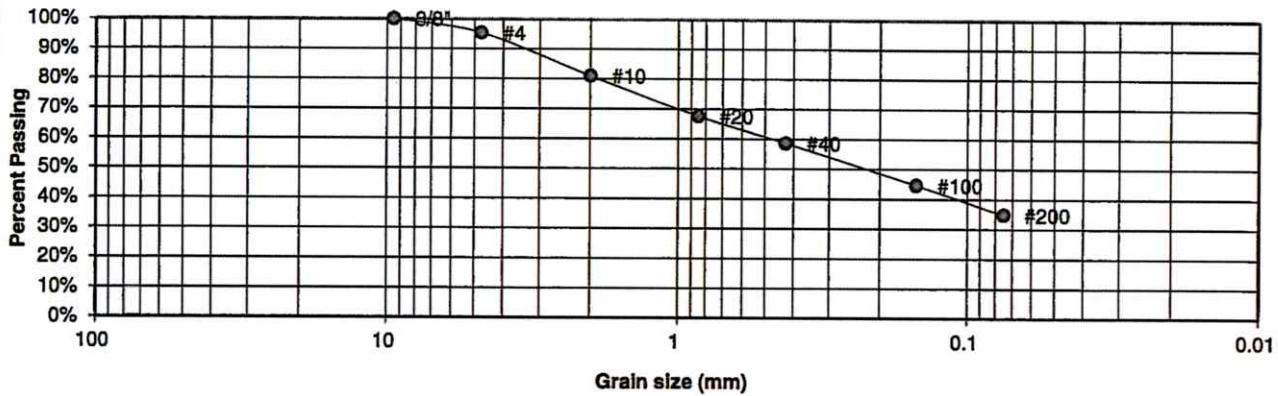
FIG NO.:

B-2

UNIFIED CLASSIFICATION SC
SOIL TYPE # 1
TEST BORING # 2
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	95.4%
#10	81.0%
#20	67.5%
#40	58.7%
#100	44.6%
#200	34.8%

**Atterberg
Limits**
 Plastic Limit 20
 Liquid Limit 32
 Plastic Index 12

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



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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

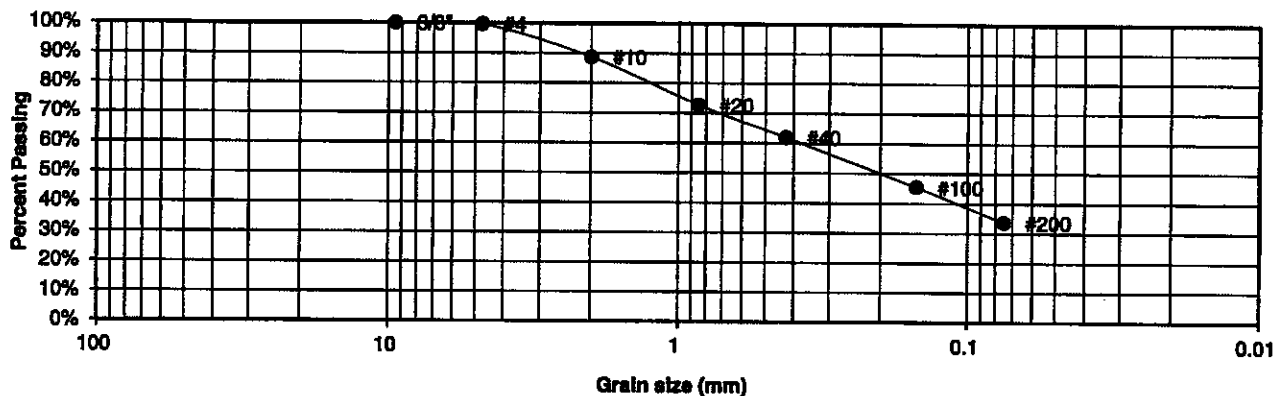
DRAWN:	DATE:	CHECKED: SW	DATE: 12-23-22
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JOB NO.:
 222146
 FIG NO.:
 5-3

UNIFIED CLASSIFICATION SC
SOIL TYPE # 1
TEST BORING # 3
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	99.6%
10	88.7%
20	72.6%
40	62.0%
100	45.4%
200	33.7%

**Atterberg
Limits**
 Plastic Limit 22
 Liquid Limit 32
 Plastic Index 10

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



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SW

DATE:

12-23-22

JOB NO.:

222146

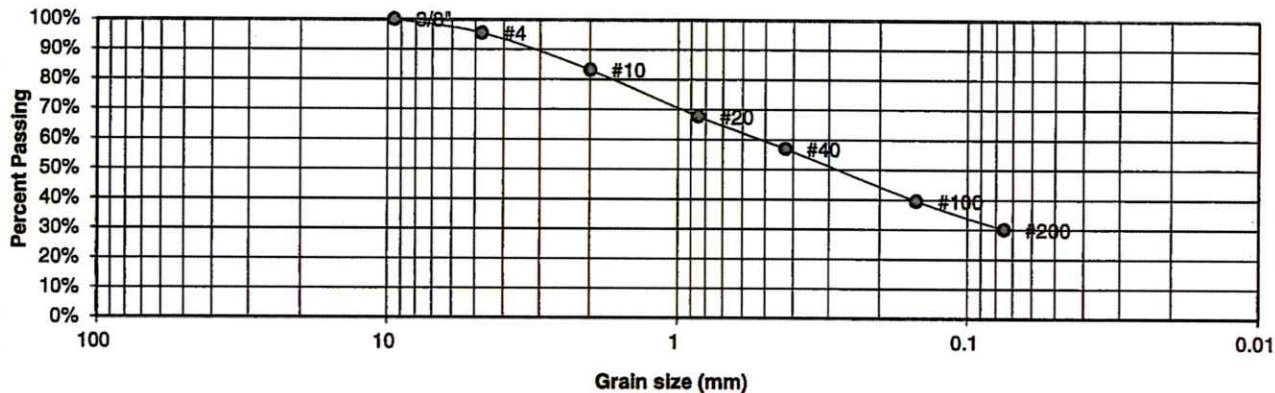
FIG NO.:

B-4

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

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	95.5%
10	83.2%
20	67.6%
40	57.0%
100	39.5%
200	30.0%

Atterberg Limits
 Plastic Limit 19
 Liquid Limit 29
 Plastic Index 10

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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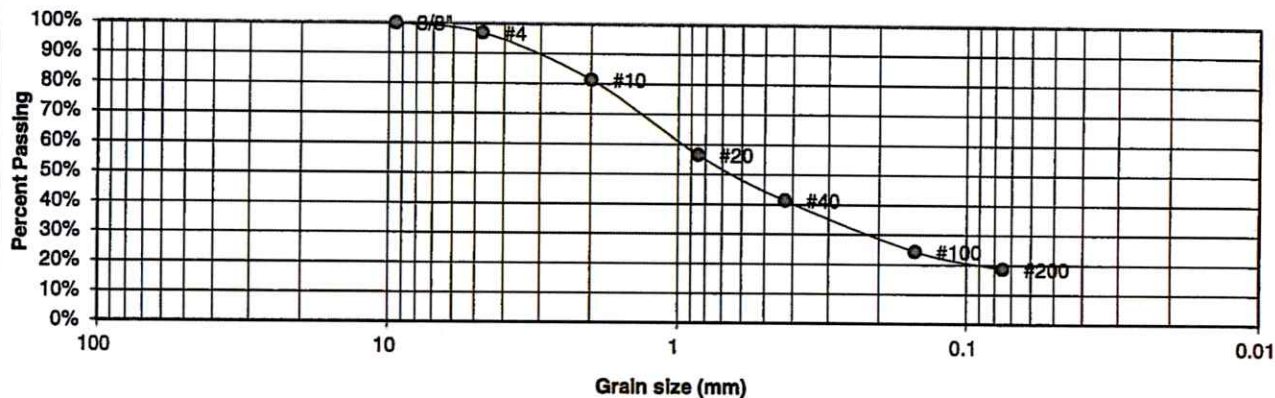
FIG NO.:

B-5

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 7
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	96.9%
10	81.4%
20	56.5%
40	41.4%
100	24.4%
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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JOB NO.:

222146

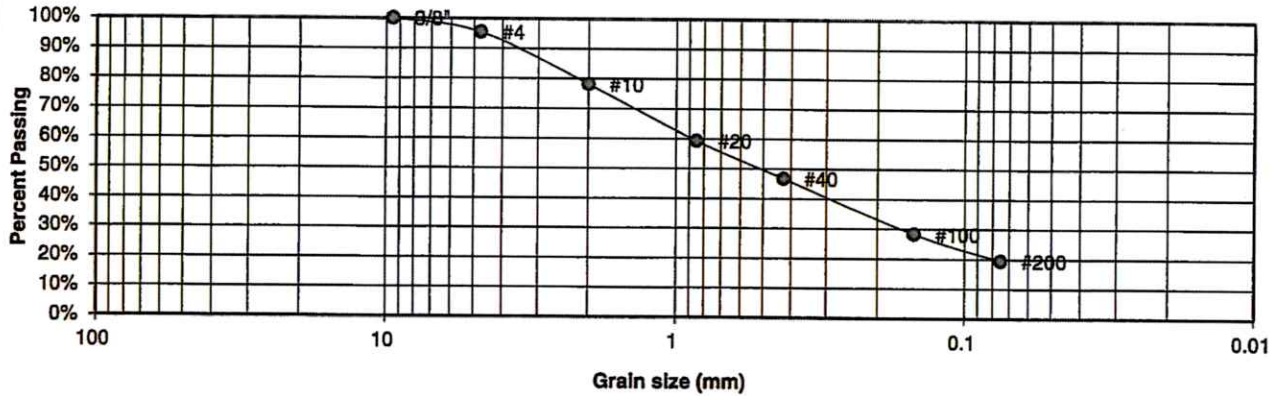
FIG NO.:

B-6

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 8
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	95.4%
10	78.1%
20	59.3%
40	46.8%
100	28.3%
200	19.4%

**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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**LABORATORY TEST
RESULTS**

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DATE:

12-23-22

JOB NO.:

222146

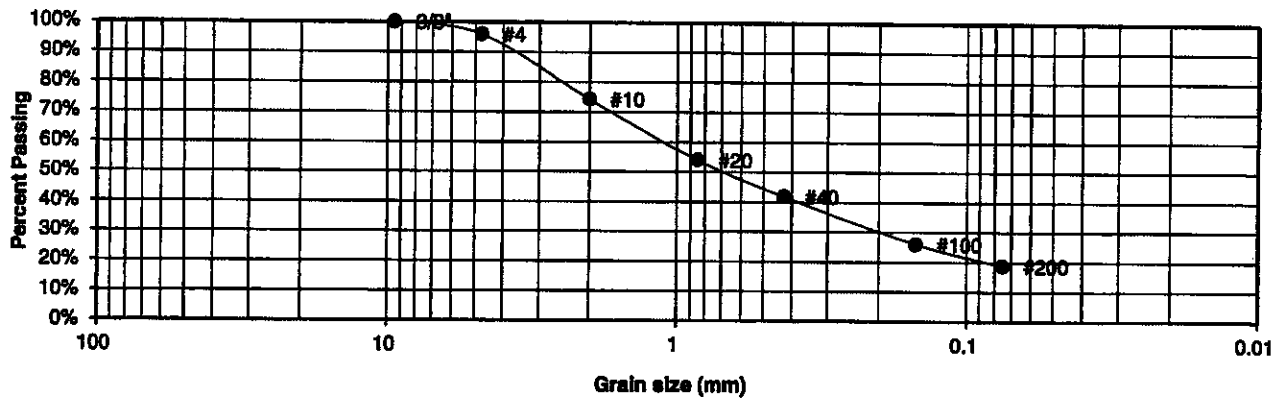
FIG NO.:

B-7

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 14
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-1-b

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	95.9%
10	74.2%
20	54.0%
40	41.9%
100	25.9%
200	18.8%

**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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505 ELKTON DRIVE
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**LABORATORY TEST
RESULTS**

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DATE:

12-23-22

JOB NO.:

222146

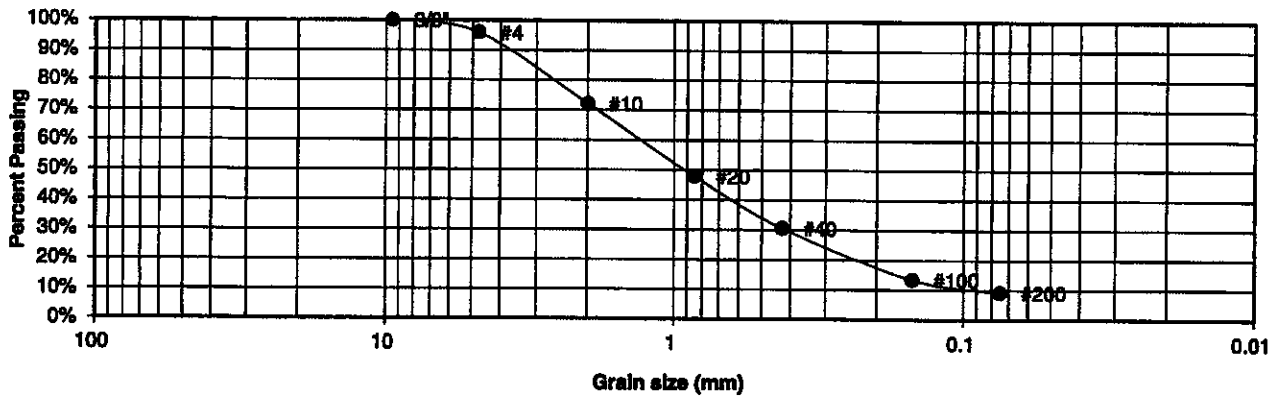
FIG NO.:

B-8

UNIFIED CLASSIFICATION SM-S-W
SOIL TYPE # 1
TEST BORING # 15
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-1-b

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	95.9%
10	72.1%
20	47.9%
40	30.6%
100	13.4%
200	9.1%

**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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RESULTS**

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DATE:

12-23-22

JOB NO.:

222146

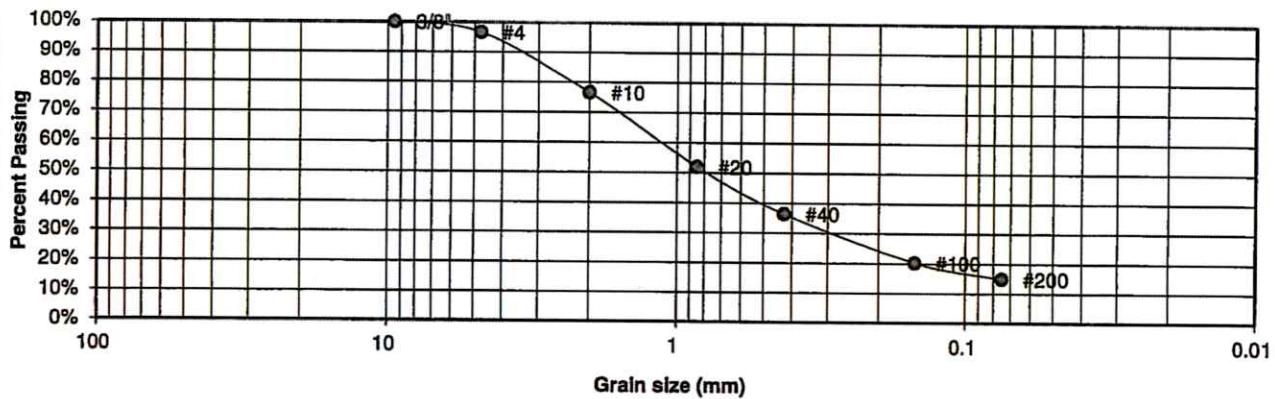
FIG NO.:

B-9

UNIFIED CLASSIFICATION SC
SOIL TYPE # 1
TEST BORING # 16
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	96.6%
10	76.6%
20	52.0%
40	36.4%
100	20.2%
200	15.0%

**Atterberg
Limits**
 Plastic Limit 16
 Liquid Limit 27
 Plastic Index 11

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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DATE:

CHECKED: SW

DATE:

12-23-22

JOB NO.:

222146

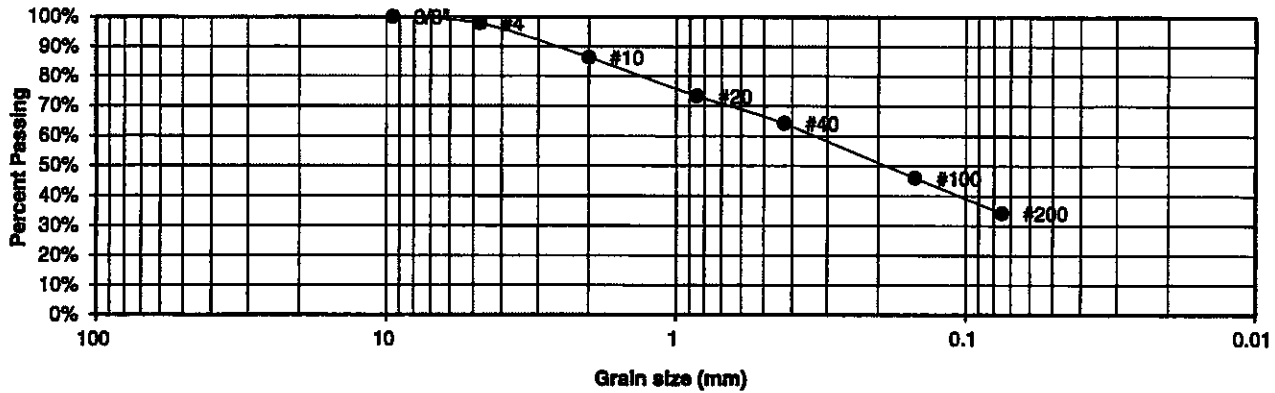
FIG NO.:

8-10

UNIFIED CLASSIFICATION SC
SOIL TYPE # 1
TEST BORING # 17
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
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	97.8%
10	86.3%
20	73.3%
40	64.2%
100	46.0%
200	34.2%

**Atterberg
Limits**
 Plastic Limit 16
 Liquid Limit 34
 Plastic Index 18

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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DATE:

12-23-22

JOB NO.:

222146

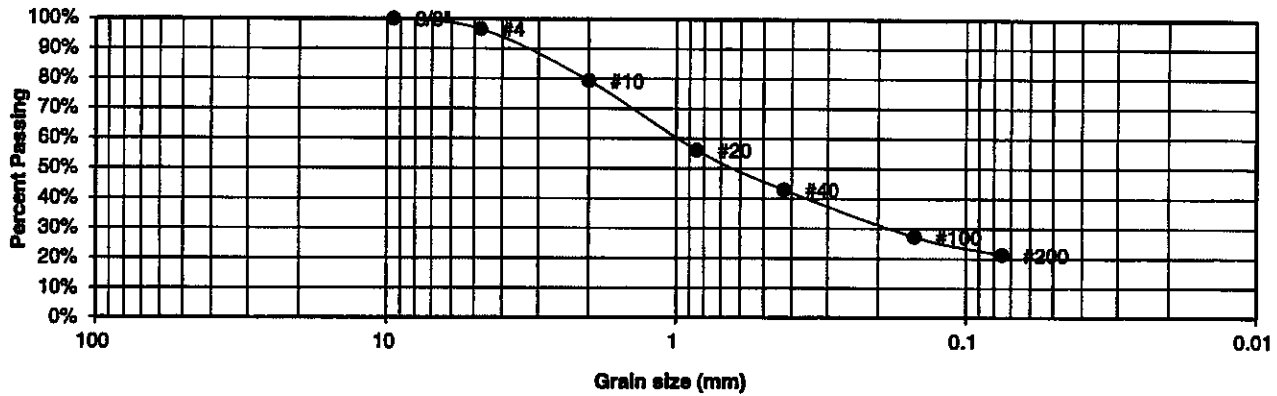
FIG NO.:

B-11

UNIFIED CLASSIFICATION SM
SOIL TYPE # 1
TEST BORING # 15
DEPTH (FT) 0-3
AASHTO CLASSIFICATION

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX #VALUE!

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
#4	96.6%
#10	79.3%
#20	56.1%
#40	43.0%
#100	27.3%
#200	21.2%

**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**

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JOB NO.:

222146

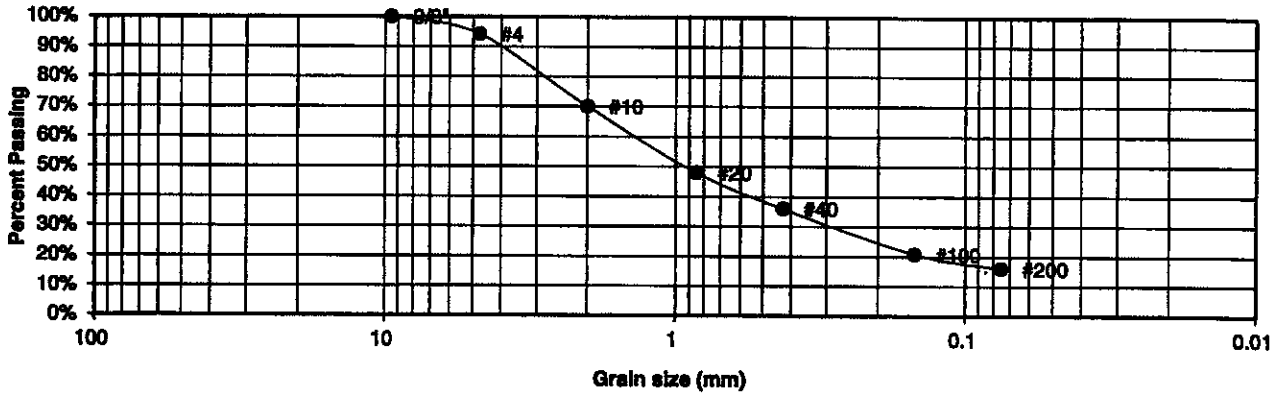
FIG NO.:

B-12

UNIFIED CLASSIFICATION SM
SOIL TYPE # 2
TEST BORING # 5
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	94.2%
10	70.0%
20	47.9%
40	36.0%
100	20.7%
200	16.0%

**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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**LABORATORY TEST
RESULTS**

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JOB NO.:

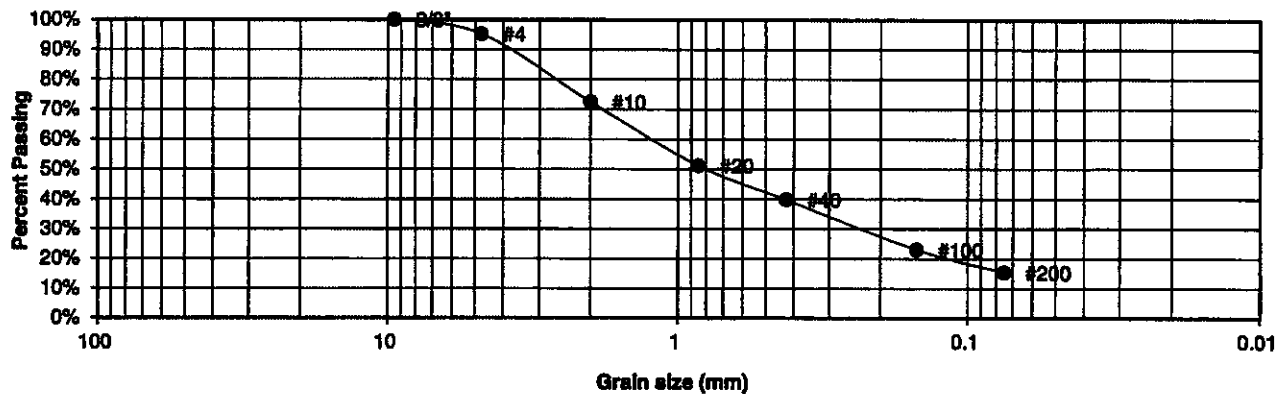
222146
 FIG NO.:

B-13

UNIFIED CLASSIFICATION SM
SOIL TYPE # 2
TEST BORING # 6
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	95.2%
10	72.5%
20	51.2%
40	39.9%
100	23.0%
200	15.3%

**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: SW	DATE: 12-23-22
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JOB NO.:

222146

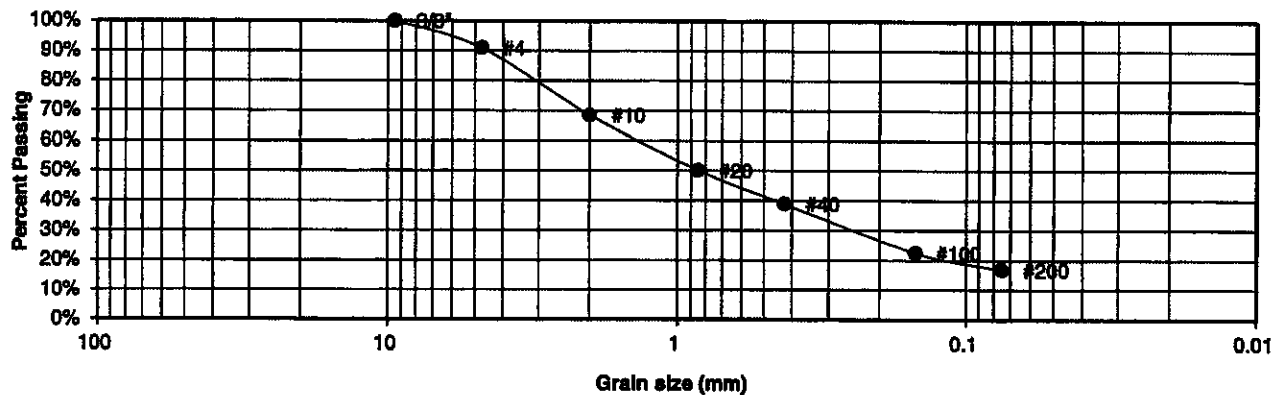
FIG NO.:

B-14

UNIFIED CLASSIFICATION SM
SOIL TYPE # 2
TEST BORING # 9
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-1-b

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	91.0%
#10	68.5%
#20	50.1%
#40	38.9%
#100	22.5%
#200	16.8%

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

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12-23-22

JOB NO.:

222146

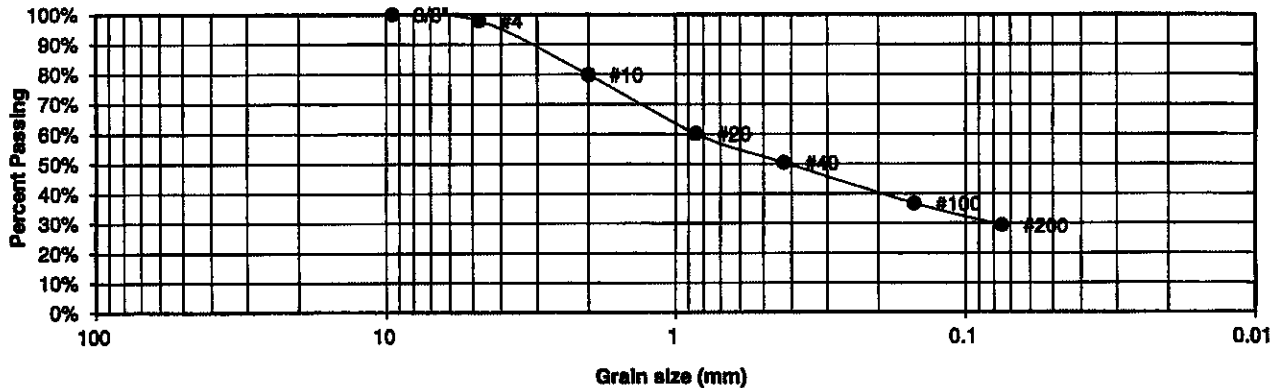
FIG NO.:

B-15

UNIFIED CLASSIFICATION SC
SOIL TYPE # 2
TEST BORING # 8
DEPTH (FT) 5
AASHTO CLASSIFICATION A-2-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
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	98.0%
10	79.9%
20	60.1%
40	50.4%
100	36.6%
200	29.2%

Atterberg

Limits

Plastic Limit	20
Liquid Limit	29
Plastic Index	9

Swell

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



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505 ELKTON DRIVE
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LABORATORY TEST
RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

SW

12-23-22

JOB NO.:

222146

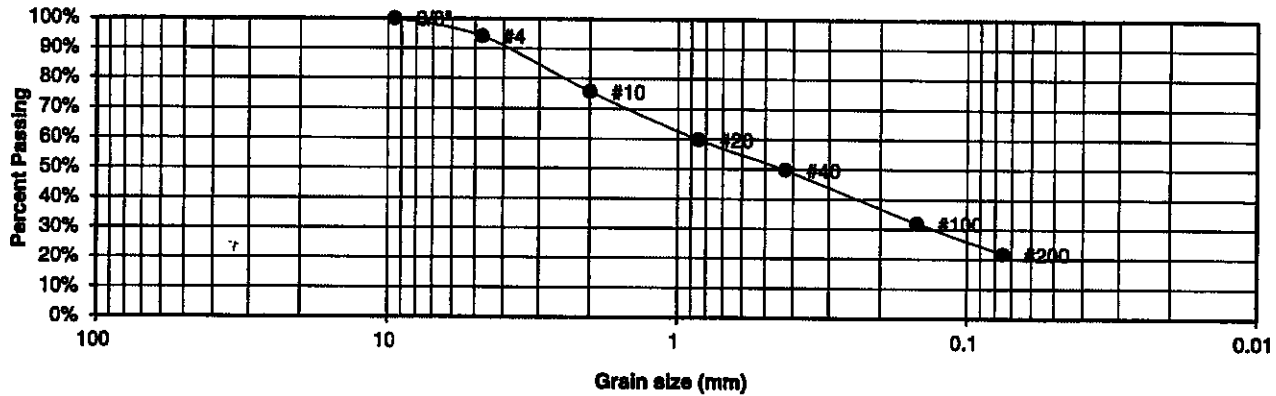
FIG NO.:

B-16

UNIFIED CLASSIFICATION SM
SOIL TYPE # 2
TEST BORING # 6
DEPTH (FT) 0-3
AASHTO CLASSIFICATION

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
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	94.2%
10	75.7%
20	59.7%
40	49.7%
100	31.9%
200	21.7%

**Atterberg
Limits**
 Plastic Limit
 Liquid Limit
 Plastic Index

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



**ENTECH
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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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JOB NO.:

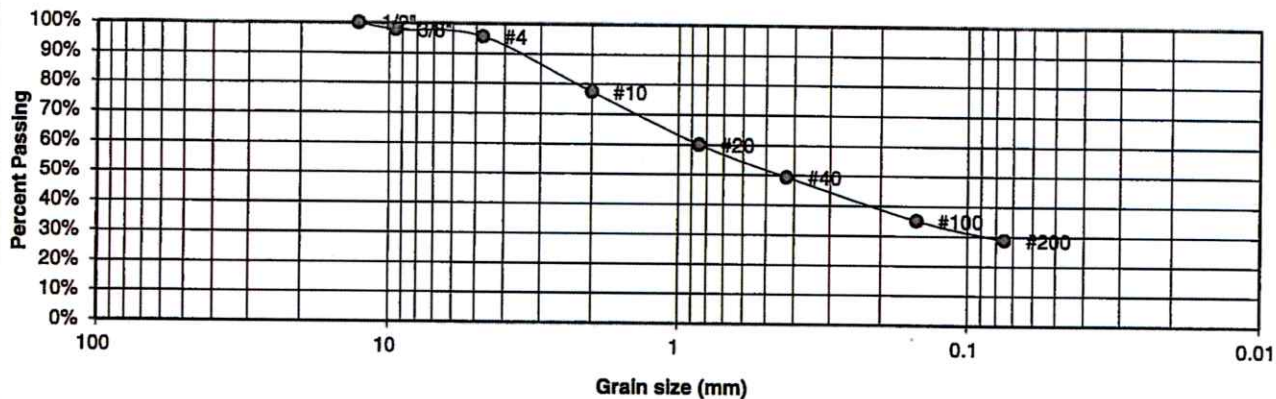
222146
 FIG NO.:

B-17

UNIFIED CLASSIFICATION SM
SOIL TYPE # 2
TEST BORING # 9
DEPTH (FT) 0-3
AASHTO CLASSIFICATION

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX #VALUE!

Sieve Analysis Grain Size Distribution



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.8%
#4	95.7%
#10	77.3%
#20	60.1%
#40	49.4%
#100	35.1%
#200	28.8%

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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505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

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DATE:

CHECKED:

SW

DATE:

12-23-22

JOB NO.:

222146

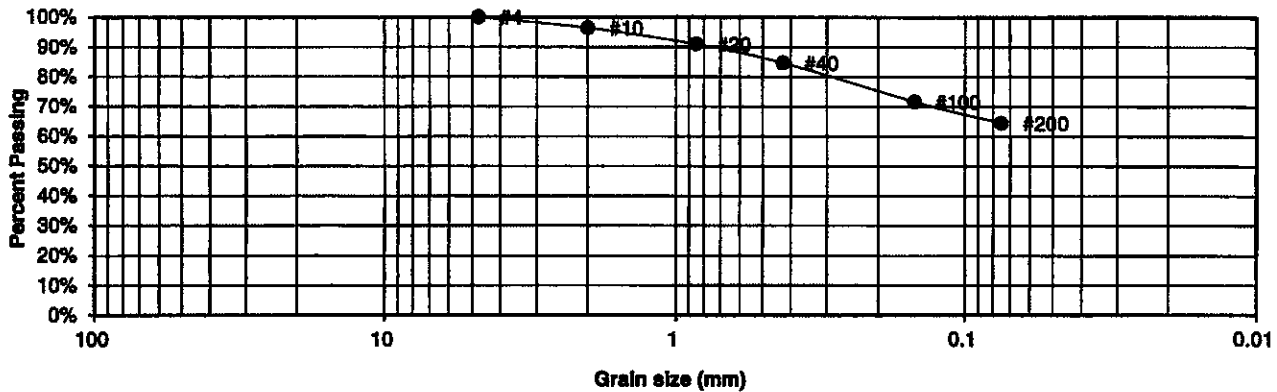
FIG NO.:

B-18

UNIFIED CLASSIFICATION CL
SOIL TYPE # 3
TEST BORING # 10
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX 10

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	96.4%
20	91.0%
40	84.7%
100	71.6%
200	64.4%

**Atterberg
Limits**
 Plastic Limit 18
 Liquid Limit 37
 Plastic Index 19

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



**ENTECH
ENGINEERING, INC.**

605 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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DATE:

12-23-22

JOB NO.:

222146

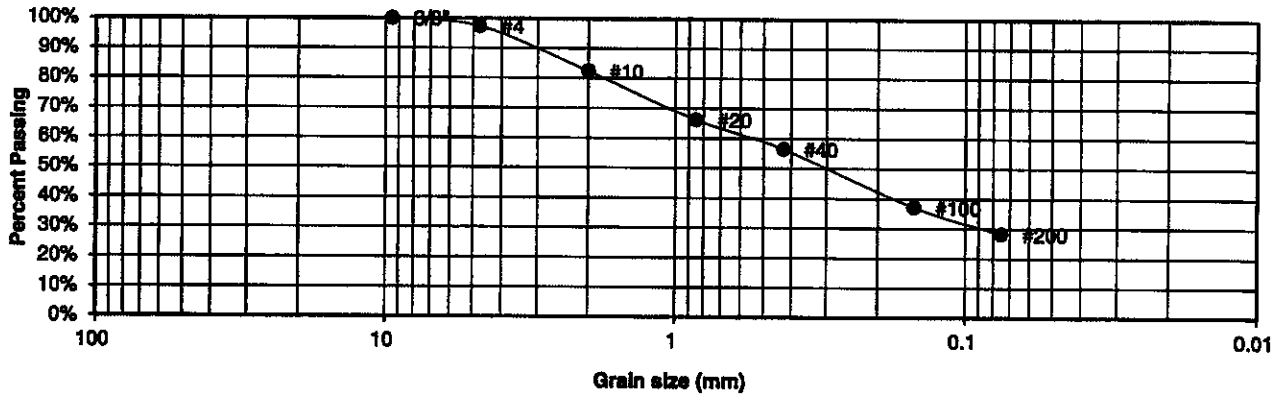
FIG NO.:

B-19

UNIFIED CLASSIFICATION SC
SOIL TYPE # 4
TEST BORING # 11
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	97.3%
#10	82.3%
#20	66.1%
#40	56.5%
#100	37.1%
#200	28.2%

**Atterberg
Limits**
 Plastic Limit 18
 Liquid Limit 29
 Plastic Index 11

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



**ENTECH
ENGINEERING, INC.**

505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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DATE:

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DATE:

12-23-22

JOB NO.:

222146

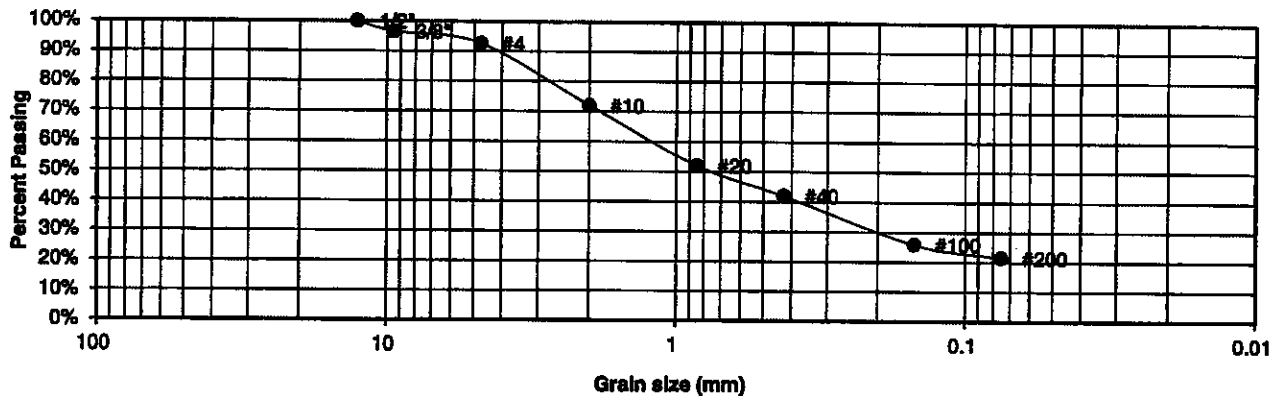
FIG NO.:

B-20

UNIFIED CLASSIFICATION SC
SOIL TYPE # 4
TEST BORING # 13
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-2-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
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"	96.6%
#4	92.6%
#10	71.9%
#20	52.1%
#40	42.0%
#100	25.9%
#200	21.4%

**Atterberg
Limits**
 Plastic Limit 19
 Liquid Limit 29
 Plastic Index 10

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



**ENTECH
ENGINEERING, INC.**

805 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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		SW	12-23-22

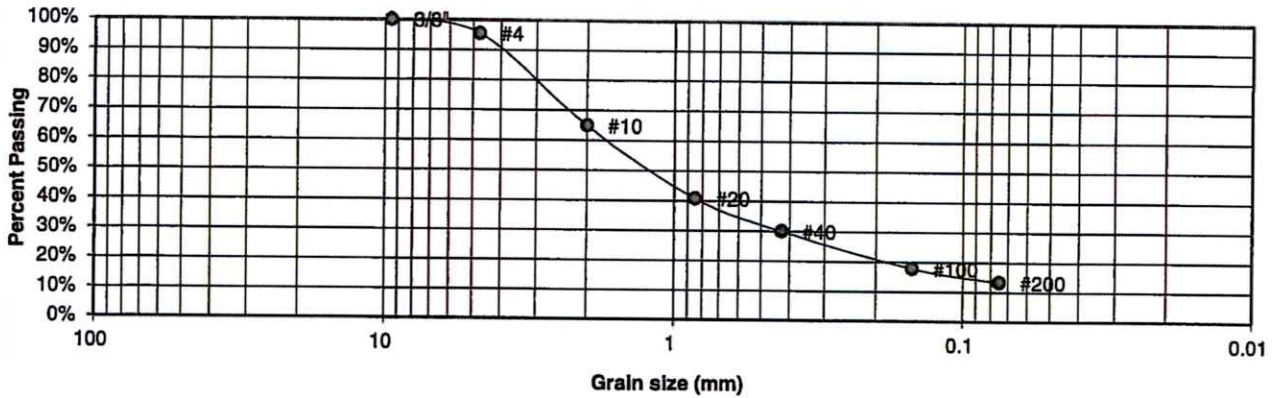
JOB NO.:
 222146
 FIG NO.:

B-21

UNIFIED CLASSIFICATION SM
SOIL TYPE # 4
TEST BORING # 18
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-1-b

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	95.6%
10	64.8%
20	40.8%
40	30.0%
100	17.8%
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)



ENTECH
ENGINEERING, INC.
 505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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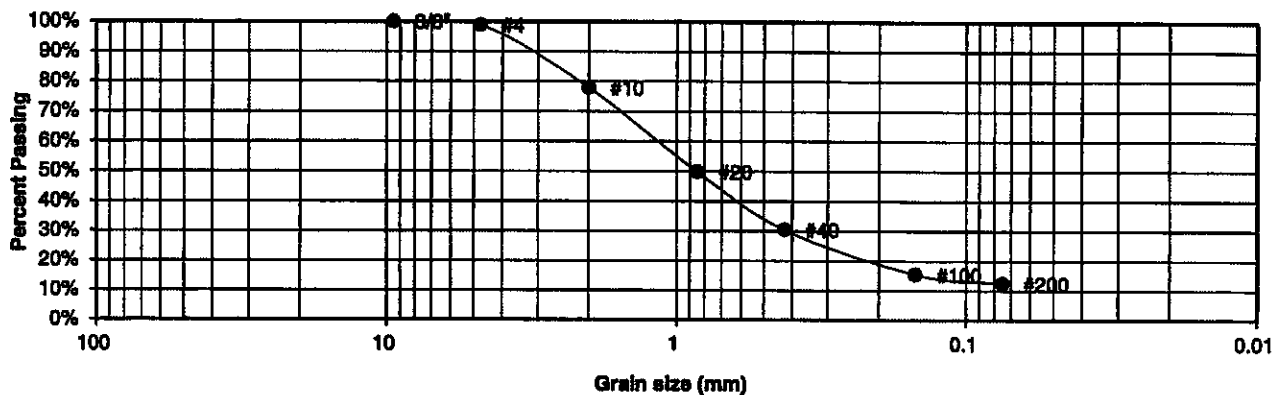
JOB NO.:
 222146
 FIG NO.:

6-22

UNIFIED CLASSIFICATION SM
SOIL TYPE # 4
TEST BORING # 5
DEPTH (FT) 5
AASHTO CLASSIFICATION A-1-b

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	98.8%
10	77.9%
20	49.9%
40	30.5%
100	15.4%
200	12.4%

**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)



**ENTECH
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 505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

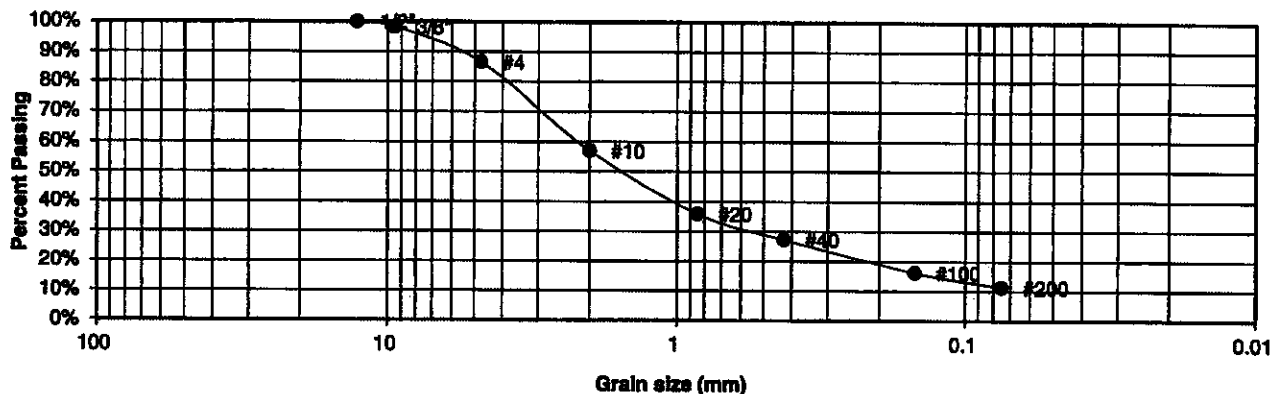
DRAWN:	DATE:	CHECKED: SW	DATE: 12-23-22
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JOB NO.:
 222146
 FIG NO.:
 B-23

UNIFIED CLASSIFICATION SM-SW
SOIL TYPE # 4
TEST BORING # 9
DEPTH (FT) 10
AASHTO CLASSIFICATION A-1-b

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
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"	98.3%
4	86.6%
10	57.0%
20	35.9%
40	27.2%
100	16.2%
200	11.3%

**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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505 ELKTON DRIVE
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**LABORATORY TEST
RESULTS**

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SW

DATE:

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JOB NO.:

222146

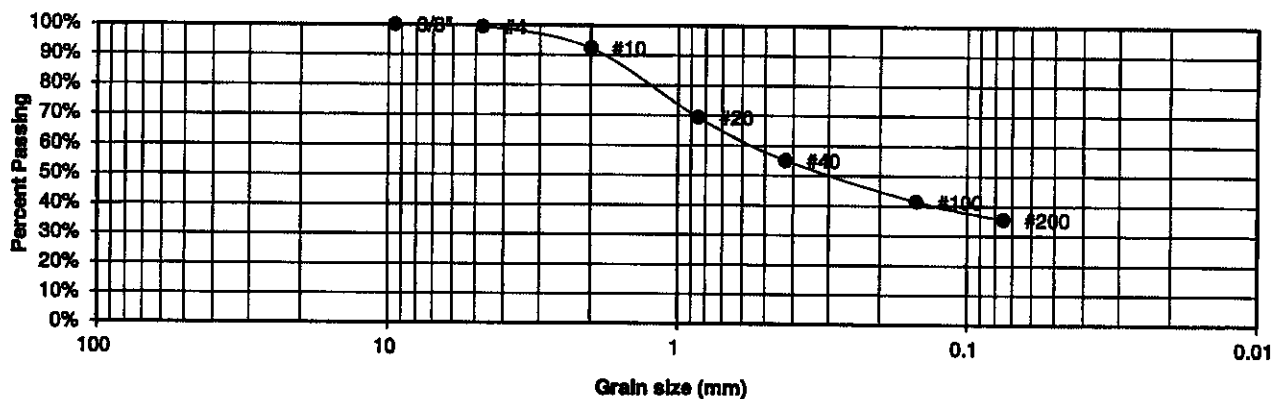
FIG NO.:

B-24

UNIFIED CLASSIFICATION SC
SOIL TYPE # 4
TEST BORING # 15
DEPTH (FT) 10
AASHTO CLASSIFICATION A-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
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	99.4%
#10	92.3%
#20	69.3%
#40	55.1%
#100	41.4%
#200	35.5%

**Atterberg
Limits**
 Plastic Limit 20
 Liquid Limit 32
 Plastic Index 12

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



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ENGINEERING, INC.**

505 ELKTON DRIVE
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**LABORATORY TEST
RESULTS**

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DATE:

12-23-22

JOB NO.:

222146

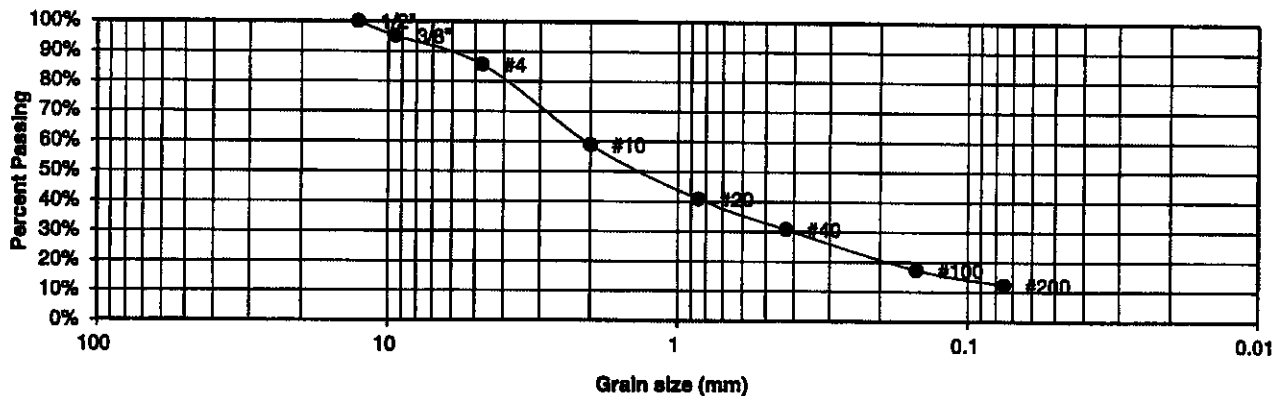
FIG NO.:

B-25

UNIFIED CLASSIFICATION SM
SOIL TYPE # 4
TEST BORING # 16
DEPTH (FT) 5
AASHTO CLASSIFICATION A-1-b

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
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"	95.1%
4	85.7%
10	58.9%
20	40.9%
40	30.8%
100	17.3%
200	12.3%

**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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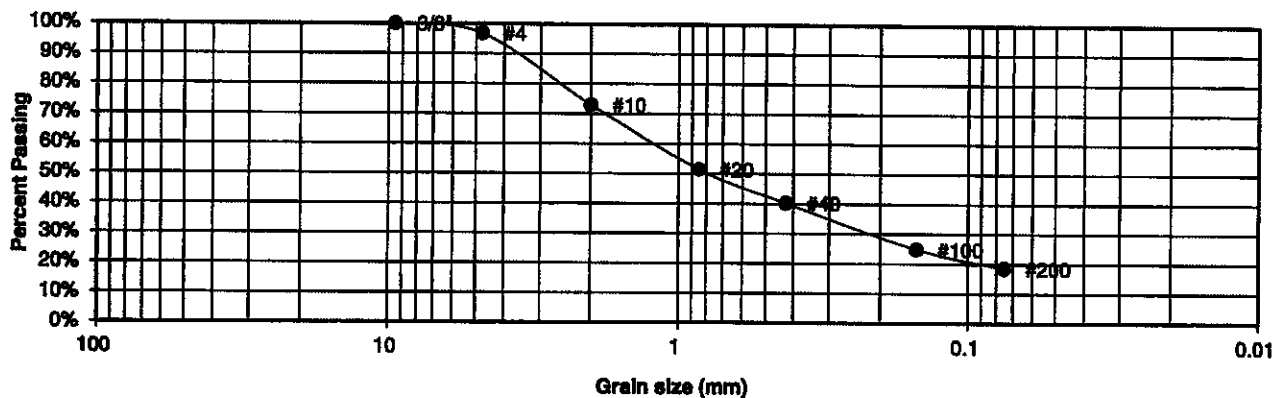
FIG NO.:

B-26

UNIFIED CLASSIFICATION SM
SOIL TYPE # 4
TEST BORING # 18
DEPTH (FT) 1-3
AASHTO CLASSIFICATION

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX #VALUE!

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 72.9%
 20 51.5%
 40 40.3%
 100 24.8%
 200 18.5%

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

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DATE:

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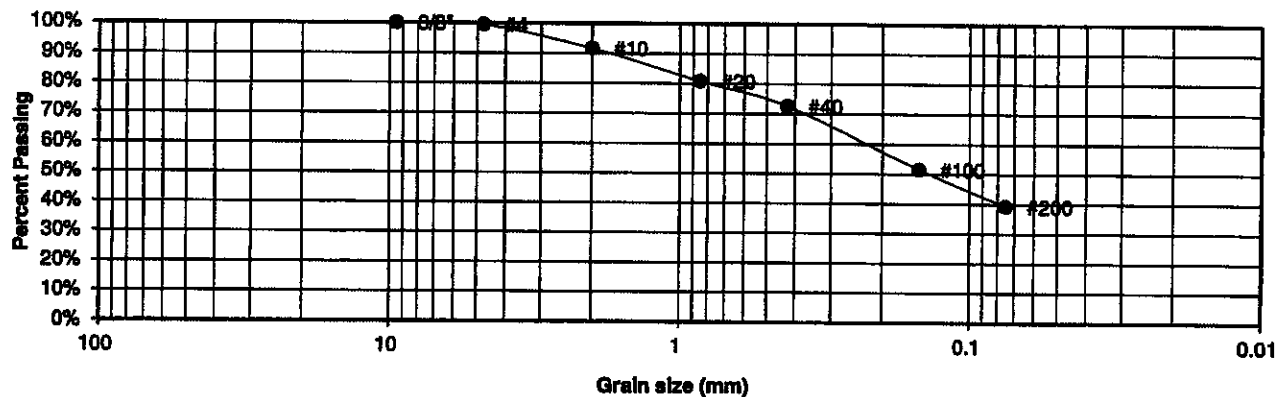
FIG NO.:

6-27

UNIFIED CLASSIFICATION SC
SOIL TYPE # 5, CBR #2
TEST BORING # 12
DEPTH (FT) 1-3
AASHTO CLASSIFICATION A-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX 1

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.4%
10	91.7%
20	80.8%
40	72.6%
100	51.6%
200	39.2%

**Atterberg
Limits**
 Plastic Limit 18
 Liquid Limit 29
 Plastic Index 11

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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DATE:

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DATE:

12-23-22

JOB NO.:

222146

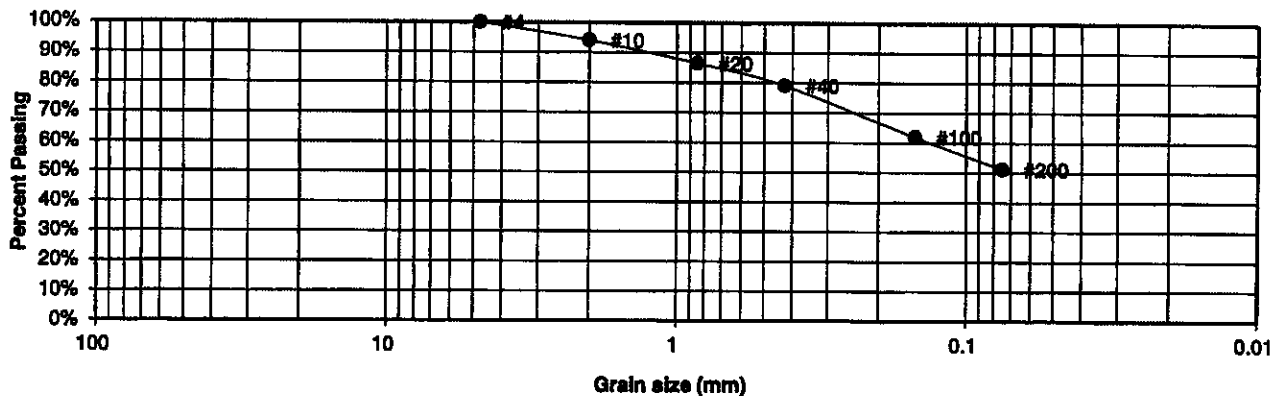
FIG NO.:

B-28

UNIFIED CLASSIFICATION CL
SOIL TYPE # 5
TEST BORING # 12
DEPTH (FT) 1-2
AASHTO CLASSIFICATION A-4

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX 2

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	94.0%
20	86.5%
40	79.1%
100	61.9%
200	51.2%

**Atterberg
Limits**
 Plastic Limit 17
 Liquid Limit 26
 Plastic Index 9

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



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 505 ELKTON DRIVE
 COLORADO SPRINGS, COLORADO 80907

**LABORATORY TEST
RESULTS**

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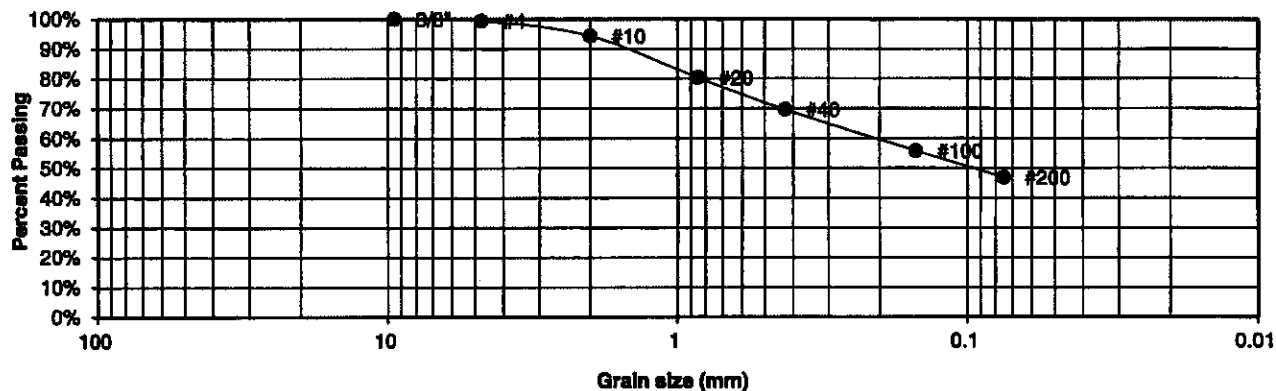
JOB NO.:

222146
 FIG NO.
 B-29

UNIFIED CLASSIFICATION SC
SOIL TYPE # 5
TEST BORING # 3
DEPTH (FT) 10
AASHTO CLASSIFICATION A-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX 3

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.4%
10	94.3%
20	80.3%
40	69.6%
100	55.8%
200	46.9%

**Atterberg
Limits**
 Plastic Limit 20
 Liquid Limit 33
 Plastic Index 13

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



**ENTECH
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505 ELKTON DRIVE
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**LABORATORY TEST
RESULTS**

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222146

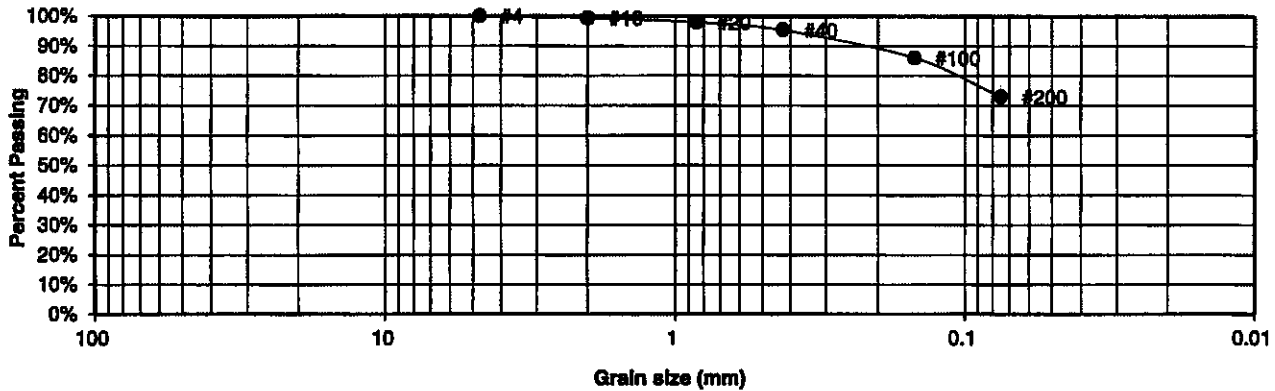
FIG NO.:

8-30

UNIFIED CLASSIFICATION CL
SOIL TYPE # 5
TEST BORING # 6
DEPTH (FT) 10
AASHTO CLASSIFICATION A-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
GROUP INDEX 8

**Sieve Analysis
Grain Size Distribution**



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.4%
20	98.0%
40	95.4%
100	86.0%
200	73.0%

**Atterberg
Limits**
 Plastic Limit 18
 Liquid Limit 31
 Plastic Index 13

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



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505 ELKTON DRIVE
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**LABORATORY TEST
RESULTS**

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DATE:

CHECKED:

DATE:

JOB NO.:

222146

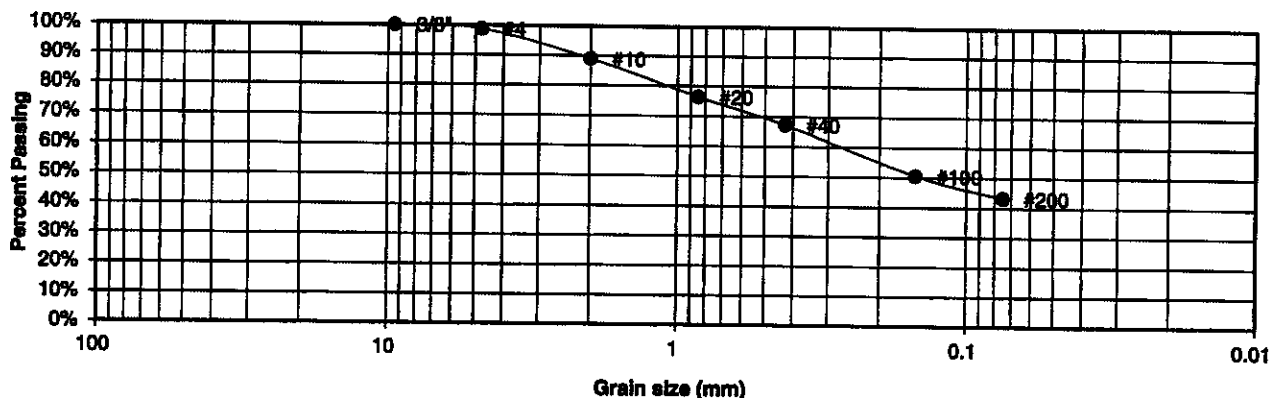
FIG NO.:

B-31

UNIFIED CLASSIFICATION SC
SOIL TYPE # 5
TEST BORING # 10
DEPTH (FT) 5
AASHTO CLASSIFICATION A-6

CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1
JOB NO. 222146
TEST BY BL
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	98.8%
10	88.9%
20	76.4%
40	67.2%
100	50.5%
200	43.3%

**Atterberg
Limits**
 Plastic Limit 18
 Liquid Limit 31
 Plastic Index 13

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



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505 ELKTON DRIVE
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**LABORATORY TEST
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JOB NO.:

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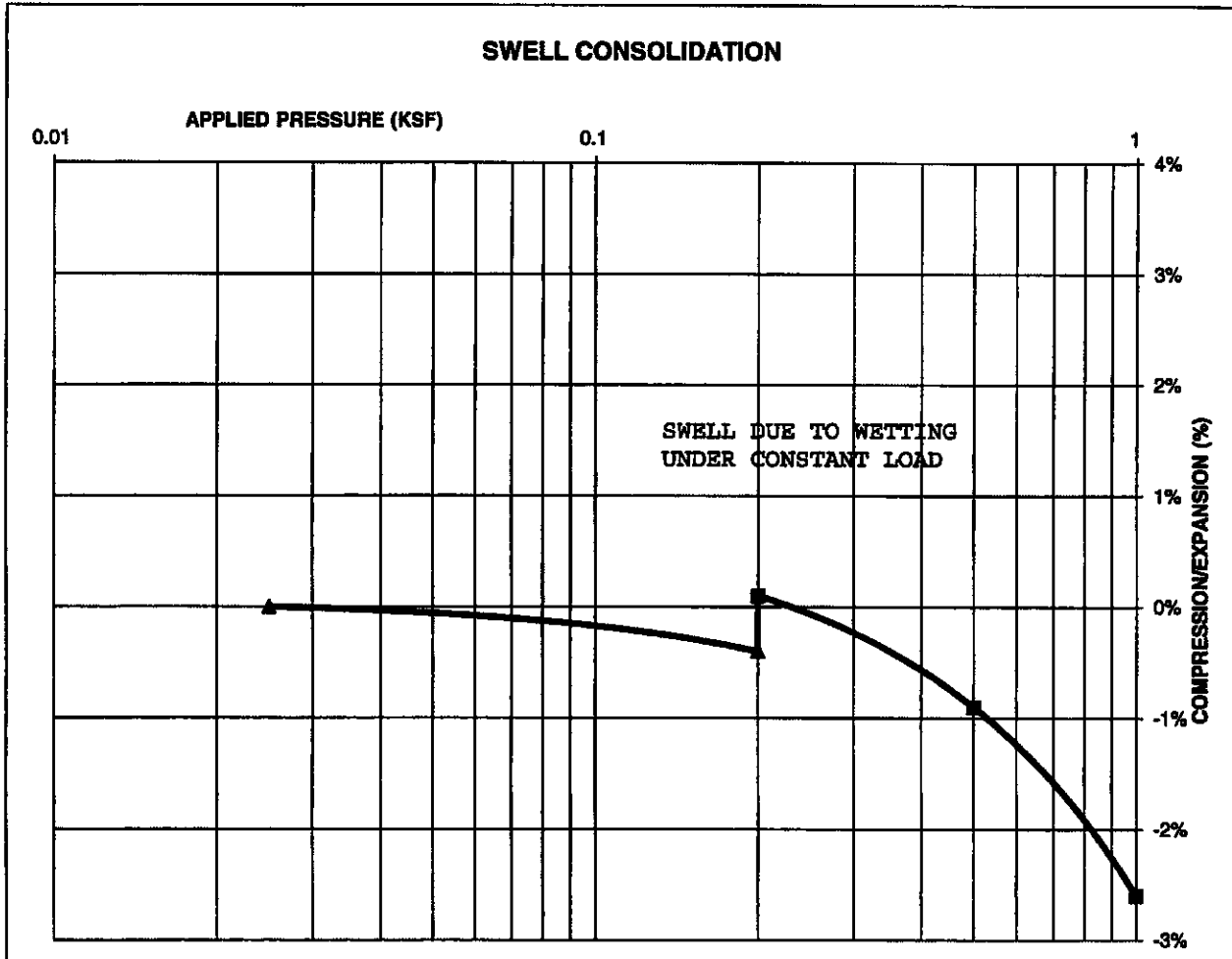
FIG NO.:

B-32

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	0-3
DESCRIPTION	SC	SOIL TYPE	1, CBR
NATURAL UNIT DRY WEIGHT (PCF)	113		
NATURAL MOISTURE CONTENT	13.1%		
SWELL/CONSOLIDATION (%)	0.5%		

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CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



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SWELL CONSOLIDATION TEST RESULTS

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DATE:

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222146

FIG NO.:

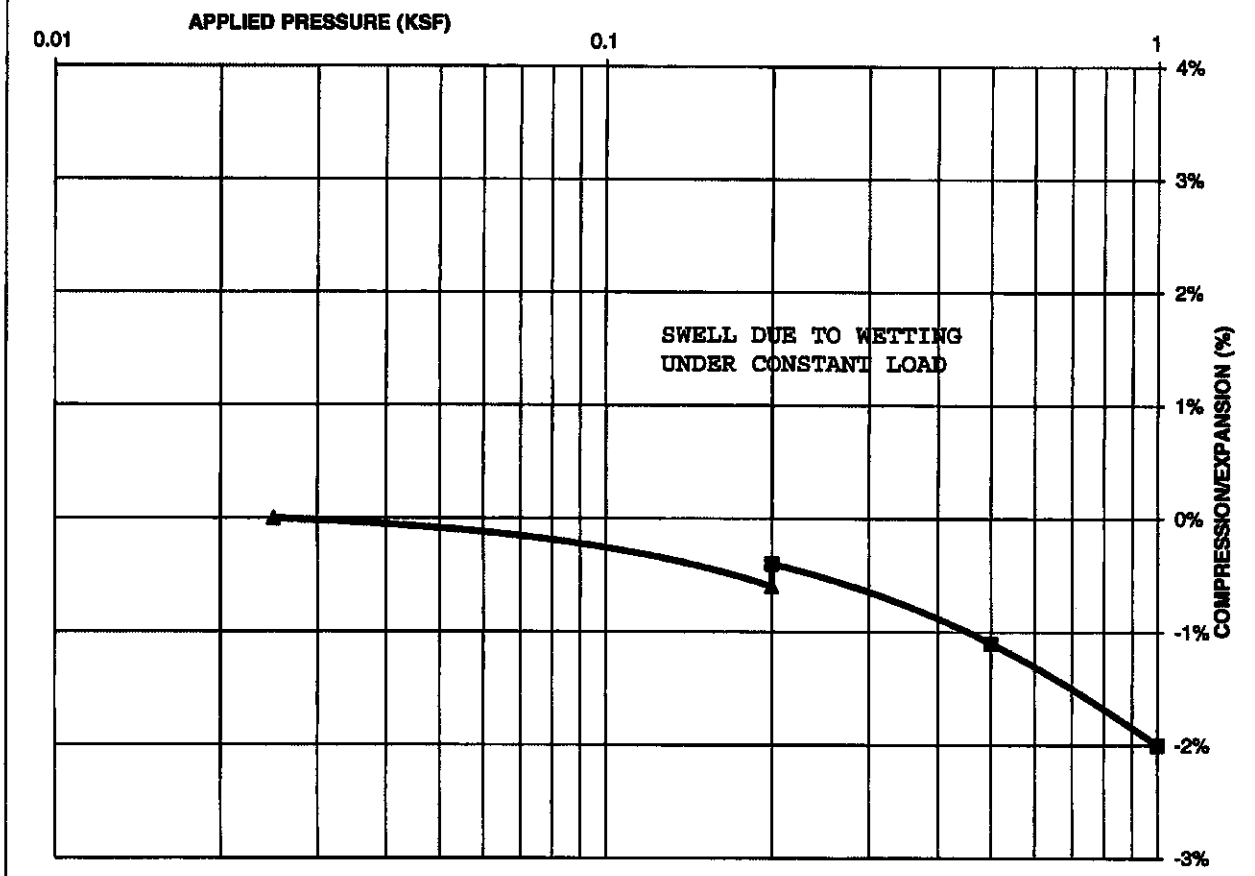
6-33

CONSOLIDATION TEST RESULTS

TEST BORING #	1	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)	113		
NATURAL MOISTURE CONTENT	11.1%		
SWELL/CONSOLIDATION (%)	0.2%		

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CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1

SWELL CONSOLIDATION



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SWELL CONSOLIDATION TEST RESULTS

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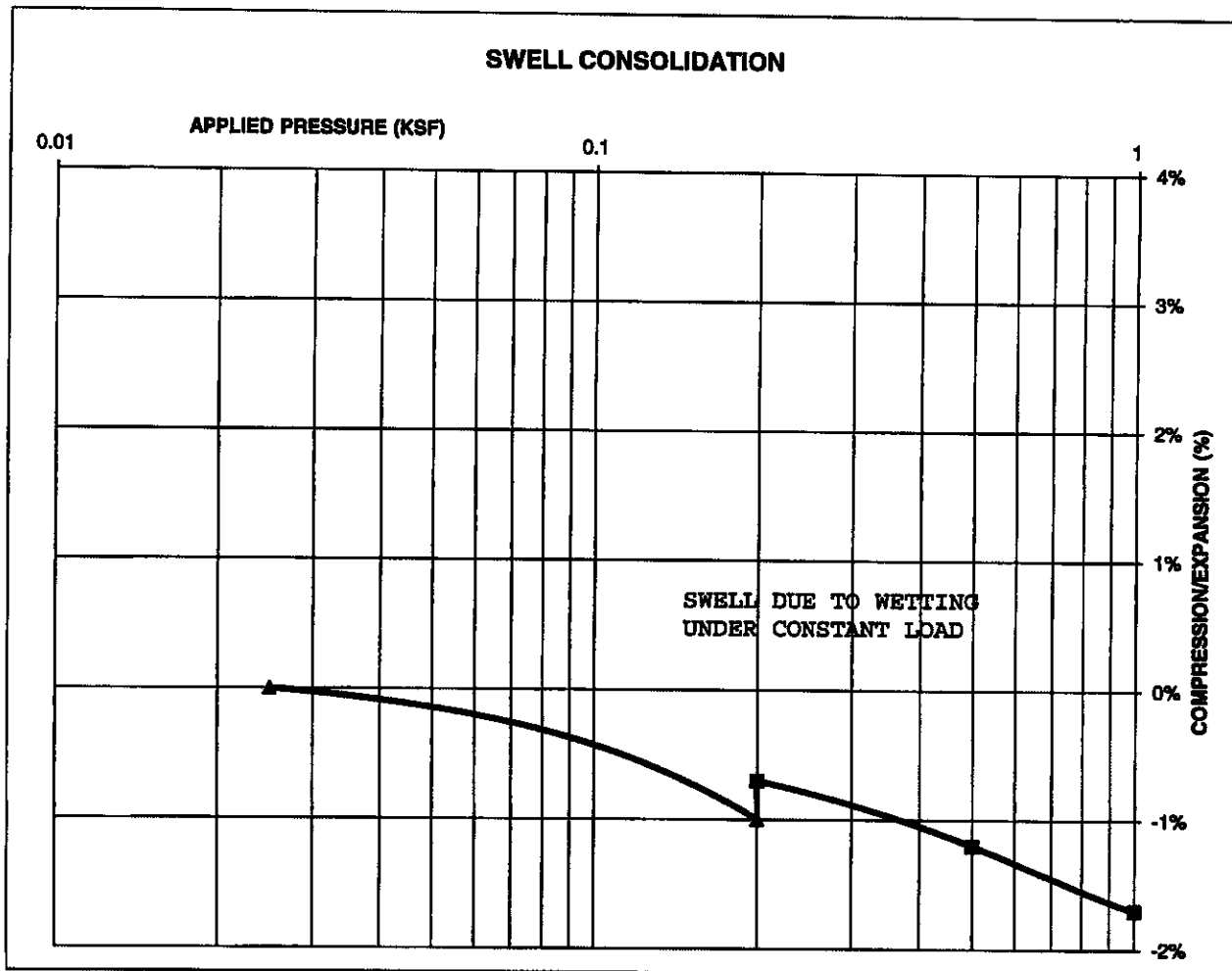
FIG NO.:

8-34

CONSOLIDATION TEST RESULTS

TEST BORING #	2	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)	113		
NATURAL MOISTURE CONTENT	12.5%		
SWELL/CONSOLIDATION (%)	0.3%		

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CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION TEST RESULTS

DRAWN:

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CHECKED:

DATE:

SW

12-23-22

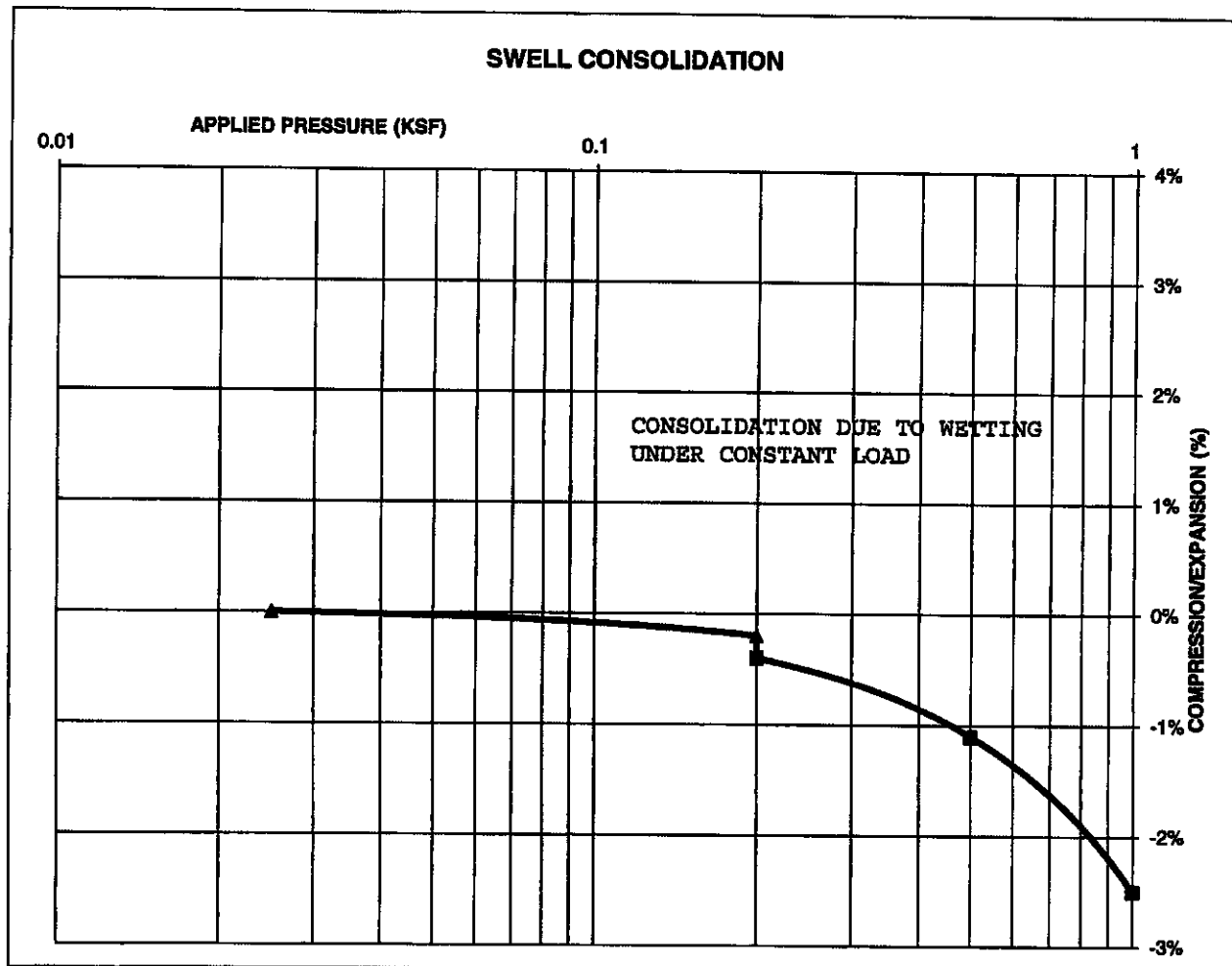
JOB NO.:
222146

FIG NO.:
B-35

CONSOLIDATION TEST RESULTS

TEST BORING #	16	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)	119		
NATURAL MOISTURE CONTENT	9.9%		
SWELL/CONSOLIDATION (%)	-0.2%		

JOB NO. 222146
CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION TEST RESULTS

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DATE:

CHECKED:

SW

DATE: 12-23-22

JOB NO.:

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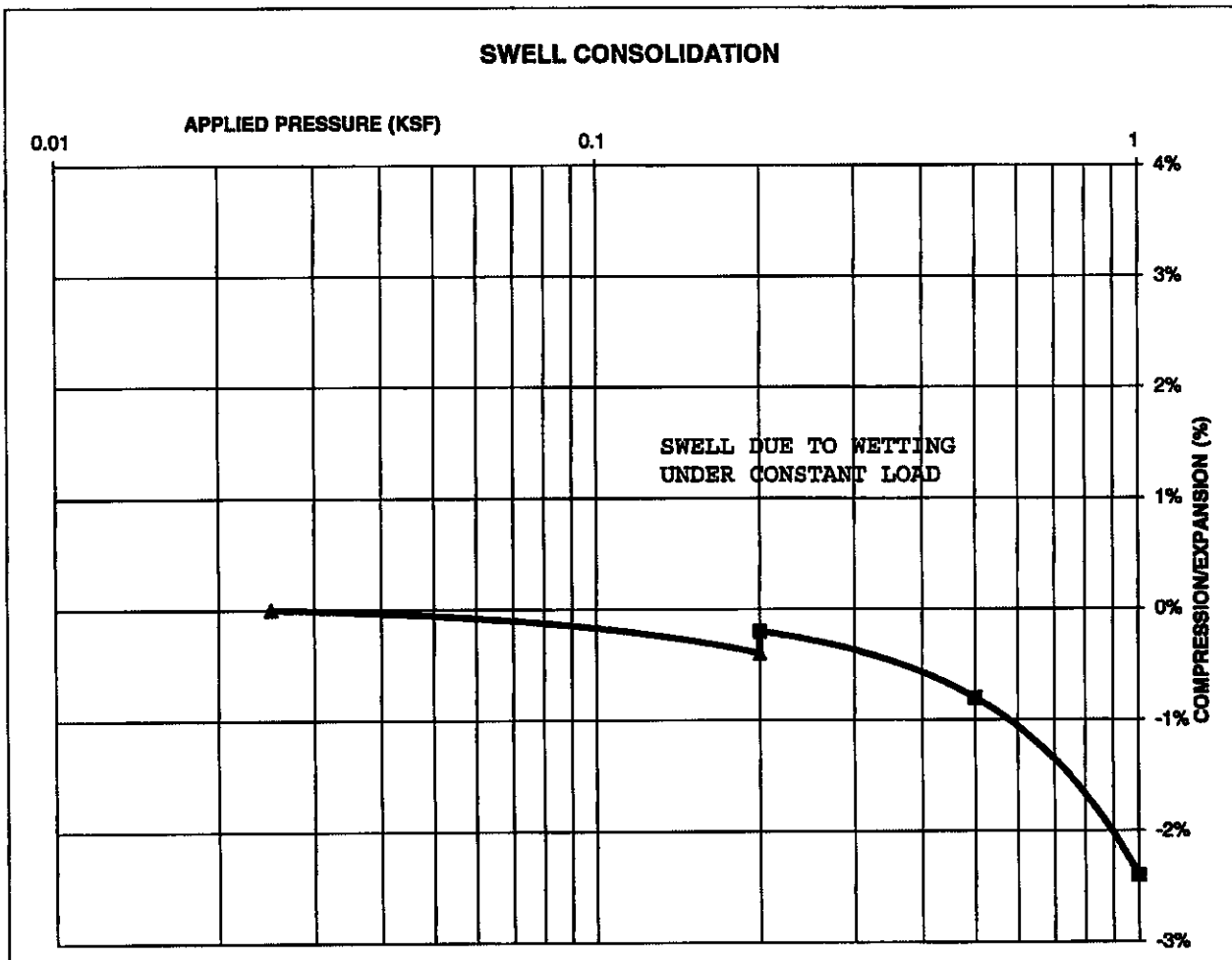
FIG NO.:

B-36

CONSOLIDATION TEST RESULTS

TEST BORING #	17	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)	117		
NATURAL MOISTURE CONTENT	10.3%		
SWELL/CONSOLIDATION (%)	0.2%		

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CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



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SWELL CONSOLIDATION TEST RESULTS

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DATE:

12-23-22

JOB NO.:
222146

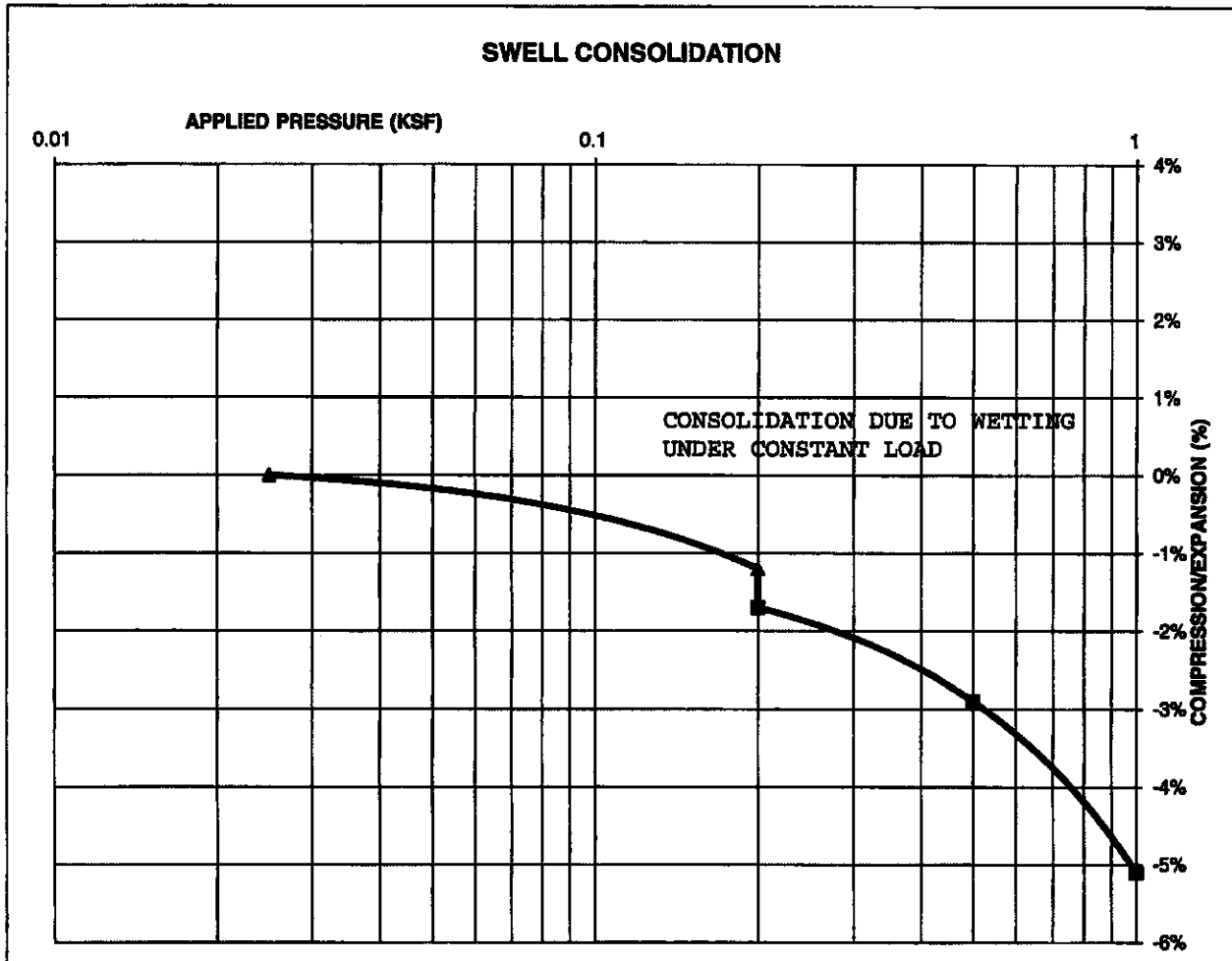
FIG NO.:

B-37

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	5
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)	103		
NATURAL MOISTURE CONTENT	7.0%		
SWELL/CONSOLIDATION (%)	-0.5%		

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CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



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COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

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DATE: 12-23-22

JOB NO.:
222146

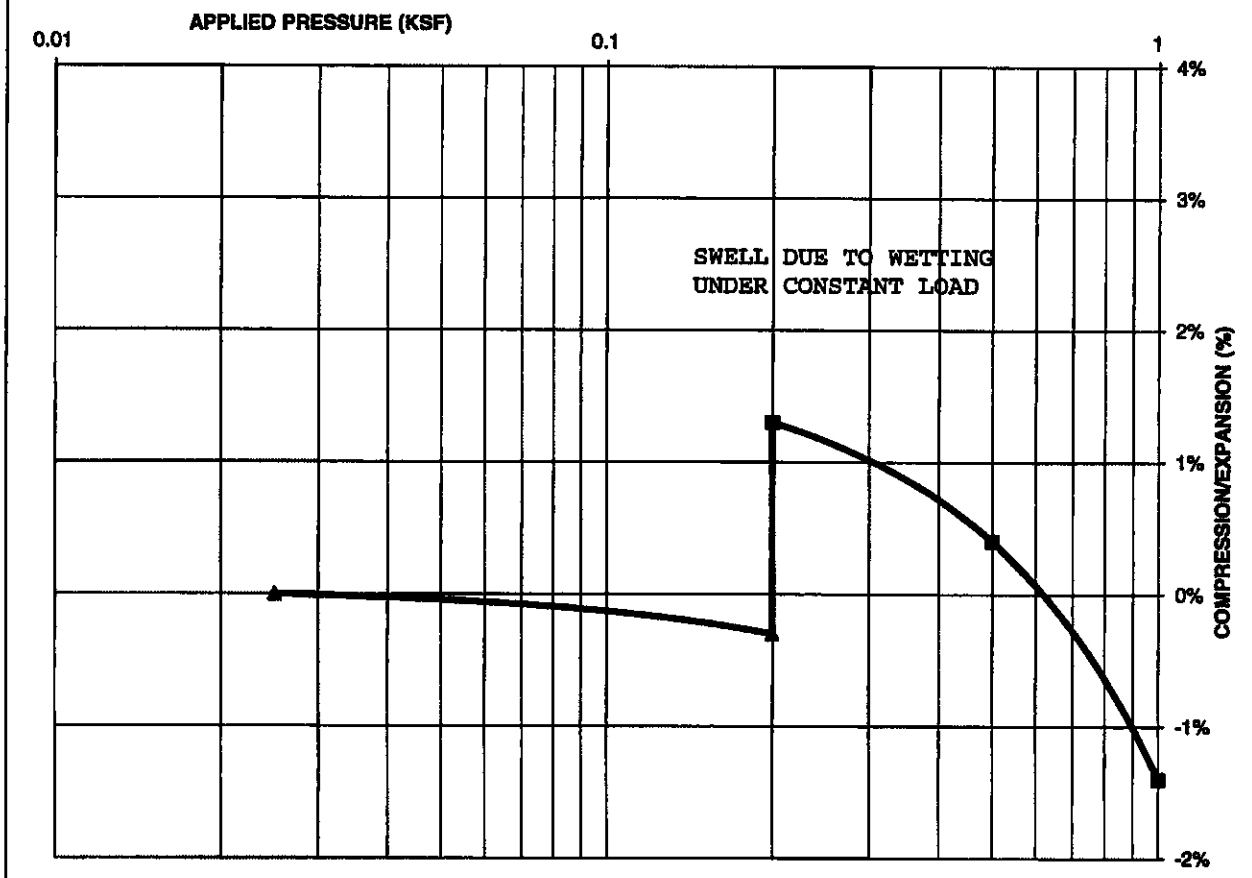
FIG NO.:
B-38

CONSOLIDATION TEST RESULTS

TEST BORING #	10	DEPTH(ft)	1-2
DESCRIPTION	CL	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)	111		
NATURAL MOISTURE CONTENT	13.3%		
SWELL/CONSOLIDATION (%)	1.6%		

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SWELL CONSOLIDATION



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505 ELKTON DRIVE
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SWELL CONSOLIDATION TEST RESULTS

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DATE:

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FIG NO.:

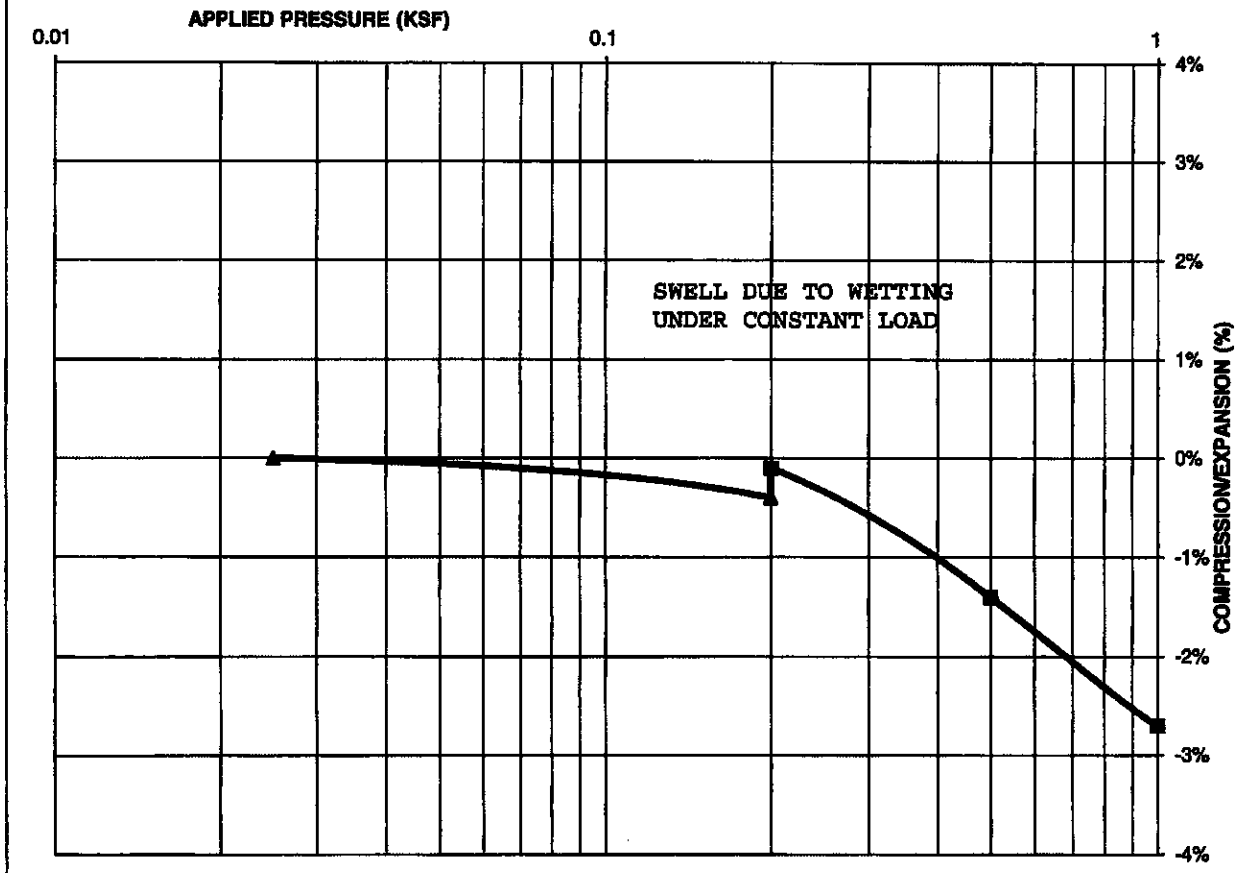
B-39

CONSOLIDATION TEST RESULTS

TEST BORING #	11	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)	117		
NATURAL MOISTURE CONTENT	9.8%		
SWELL/CONSOLIDATION (%)	0.3%		

JOB NO. 222146
CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1

SWELL CONSOLIDATION



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605 ELKTON DRIVE
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SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

SW 12-23-22

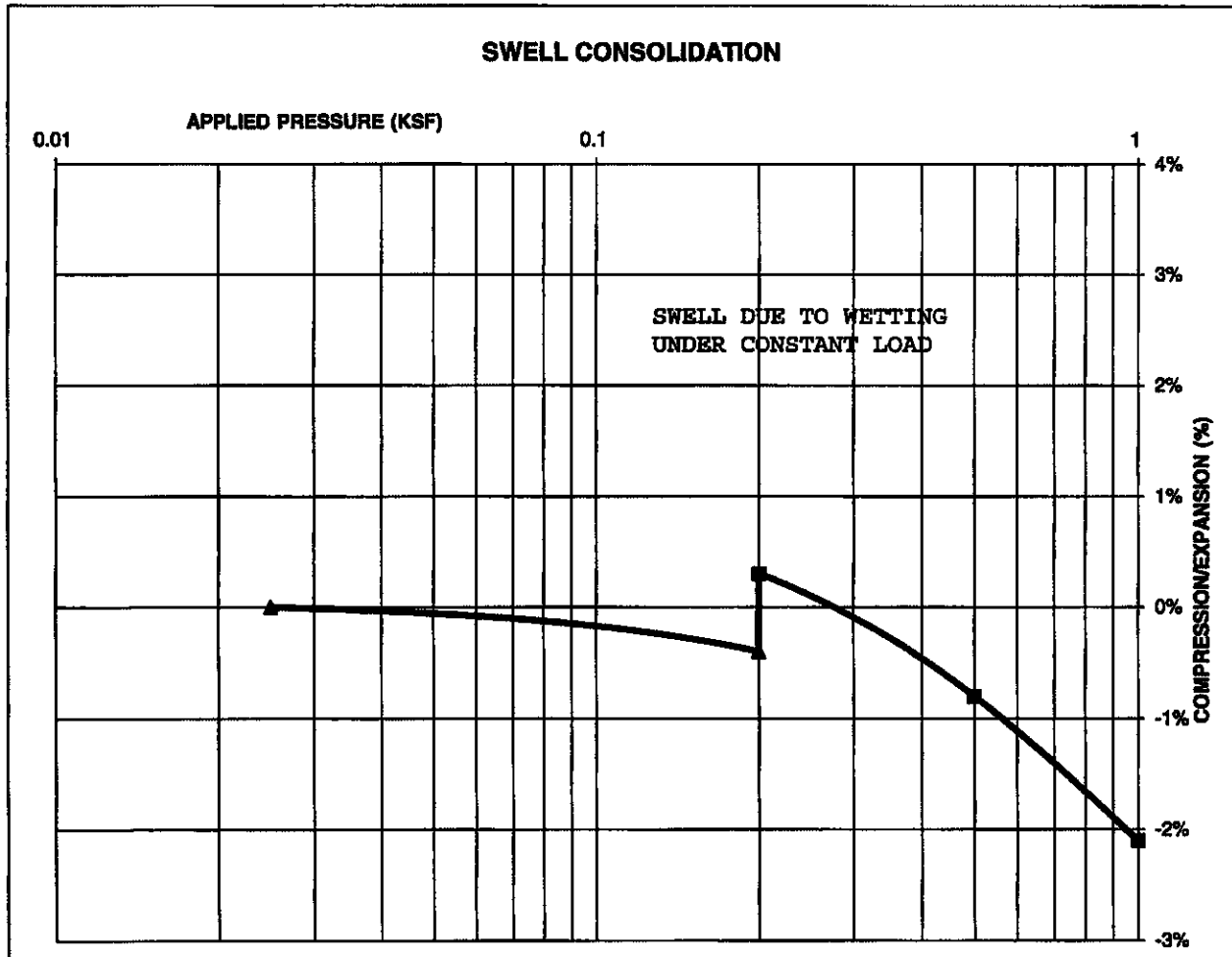
JOB NO.:
222146

FIG NO.:
B-40

CONSOLIDATION TEST RESULTS

TEST BORING #	15	DEPTH(ft)	10
DESCRIPTION	SC	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			118
NATURAL MOISTURE CONTENT			10.1%
SWELL/CONSOLIDATION (%)			0.7%

JOB NO.	222146
CLIENT	SR LAND, LLC
PROJECT	STERLING RANCH, F-1



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SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED:

DATE:

30

12-23-22

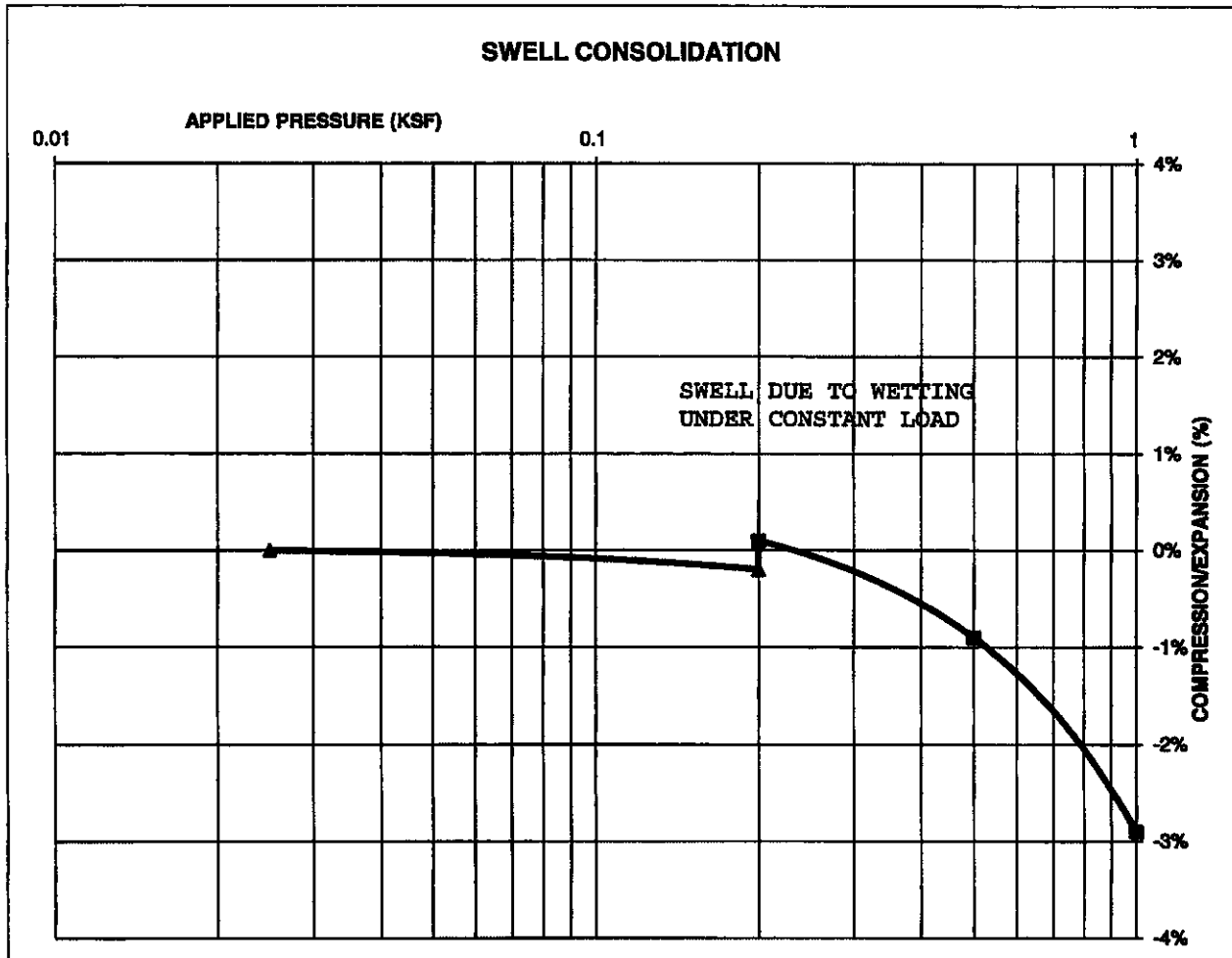
JOB NO.:
222146

FIG NO.:
B-41

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	10
DESCRIPTION	SC	SOIL TYPE	5
NATURAL UNIT DRY WEIGHT (PCF)	120		
NATURAL MOISTURE CONTENT	9.5%		
SWELL/CONSOLIDATION (%)	0.3%		

JOB NO. 222146
CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

**SWELL CONSOLIDATION
TEST RESULTS**

DRAWN:

DATE:

CHECKED:

DATE:

SW

12-23-22

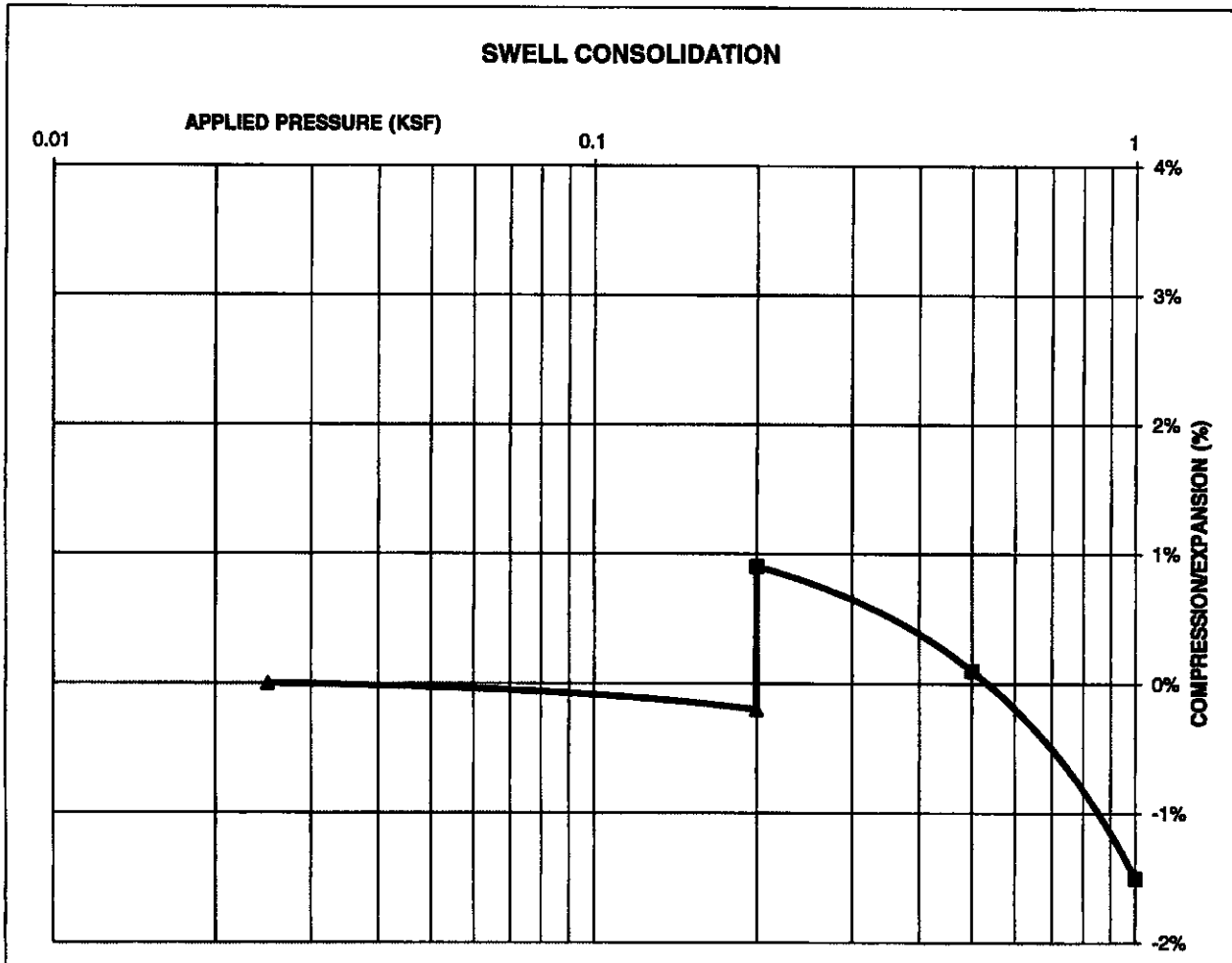
JOB NO.:
222146

FIG NO.:
B-42

CONSOLIDATION TEST RESULTS

TEST BORING #	6	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	5
NATURAL UNIT DRY WEIGHT (PCF)	109		
NATURAL MOISTURE CONTENT	15.4%		
SWELL/CONSOLIDATION (%)	1.1%		

JOB NO. 222146
CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



**ENTECH
ENGINEERING, INC.**

505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED:

SW

DATE:

12-23-22

JOB NO.:

222146

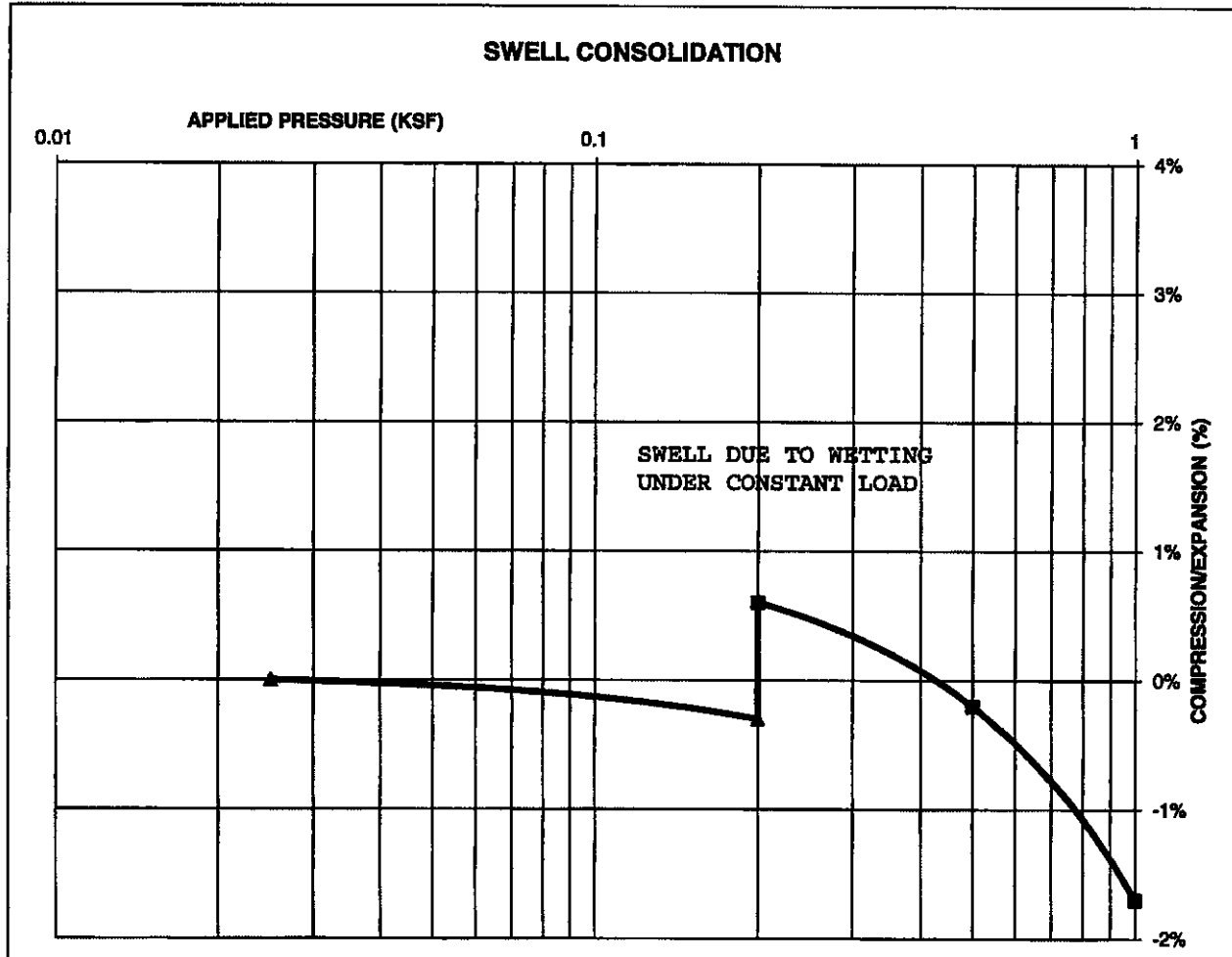
FIG NO.:

B-43

CONSOLIDATION TEST RESULTS

TEST BORING #	10	DEPTH(ft)	5
DESCRIPTION	SC	SOIL TYPE	5
NATURAL UNIT DRY WEIGHT (PCF)	111		
NATURAL MOISTURE CONTENT	14.0%		
SWELL/CONSOLIDATION (%)	0.9%		

JOB NO. 222146
CLIENT SR LAND, LLC
PROJECT STERLING RANCH, F-1



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SWELL CONSOLIDATION TEST RESULTS

DRAWN:

DATE:

CHECKED: *SW*

DATE: 12-23-22

JOB NO.:
222146

FIG NO.:
B-44

CLIENT	<u>SR LAND, LLC</u>	JOB NO.	<u>222146</u>
PROJECT	<u>STERLING RANCH, F-1</u>	DATE	<u>12/20/2022</u>
LOCATION	<u>STERLING RANCH, F-1</u>	TEST BY	<u>BL</u>

[illegible]

QC BLANK PASS



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LABORATORY TEST SULFATE RESULTS

DRAWN:

DATE:

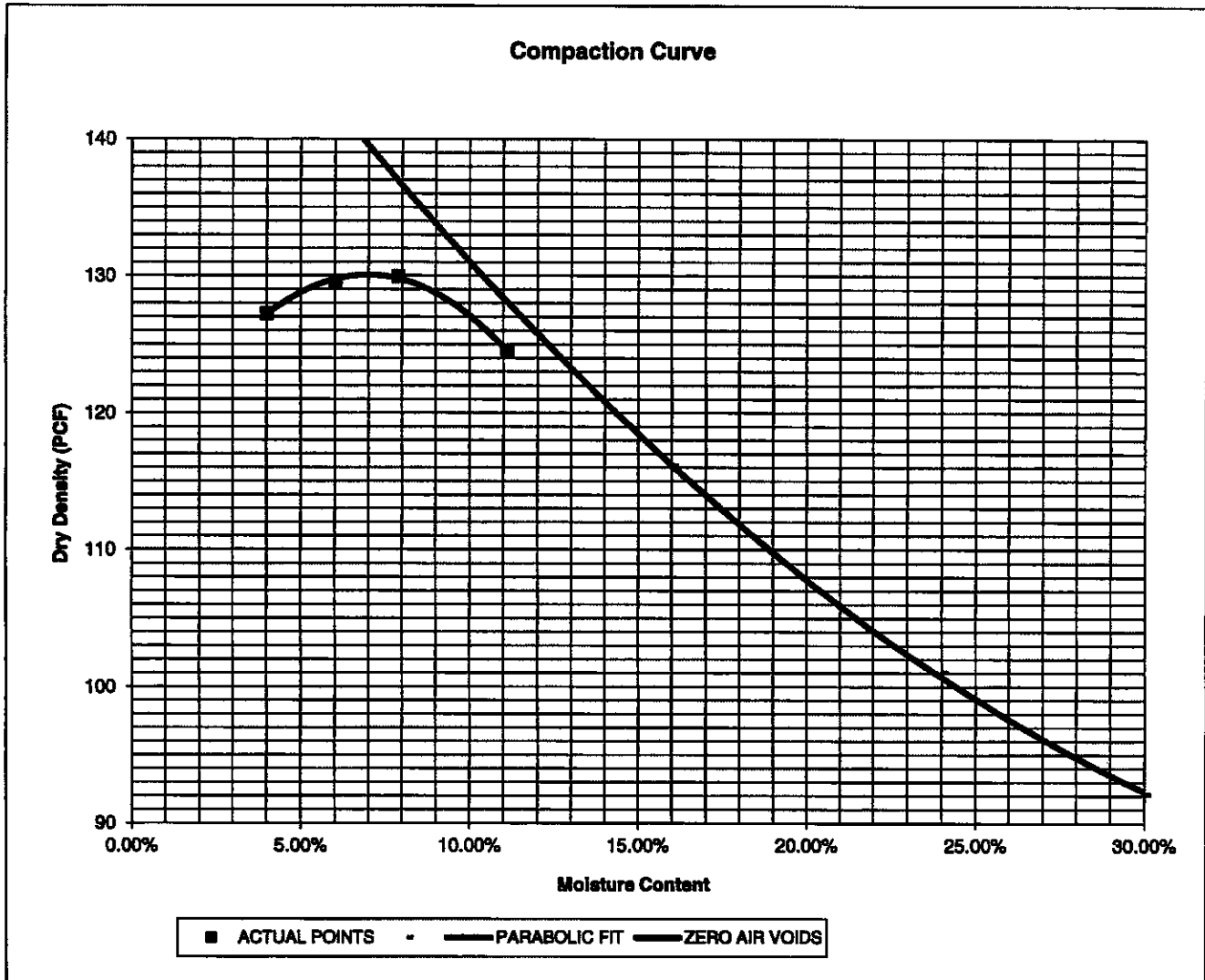
CHECKED:
SW

DATE: 12-23-22

JOB NO.:
222146
FIG NO.:
B-45

PROJECT	STERLING RANCH, F-1	CLIENT	SR LAND, LLC
SAMPLE LOCATION	TB-3 @ 0-3'	JOB NO.	222146
SOIL DESCRIPTION	FILL, SAND, CLAYEY, BROWN	DATE	11/17/22

IDENTIFICATION	SC	COMPACTION TEST #	1, SOIL TYPE #1
TEST DESIGNATION / METHOD	ASTM D-1557-A	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	130.1	OPTIMUM MOISTURE	7.2%



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MOISTURE DENSITY RELATION

DRAWN:

DATE:

CHECKED:

SW

DATE:

12-23-22

JOB NO.:

222146

FIG NO.:

B-4/6

CBR TEST LOAD DATA

JOB NO: 222146
 CLIENT: SR LAND, LLC
 PROJECT: STERLING RANCH, F-1
 SOIL TYPE: 1, CBR #1

PISTON DIAMETER (cm) 4.958	PISTON AREA (in ²) 2.993						
PENETRATION DEPTH (INCHES)	10 BLOWS		25 BLOWS		56 BLOWS		
	MOLD # 1		MOLD # 2		MOLD # 3		
	LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)	LOAD(LBS)	STRESS (PSI)	
0.000	0	0.00	0	0.00	0	0.00	
0.025	200	66.83	214	71.51	585	195.49	
0.050	258	86.22	489	163.41	800	267.33	
0.075	294	98.25	675	225.56	969	323.81	
0.100	336	112.28	954	318.80	1276	426.40	
0.125	369	123.31	1110	370.93	1989	664.66	
0.150	457	152.71	1295	432.75	2415	807.02	
0.175	480	160.40	1461	488.22	2923	976.77	
0.200	519	173.43	1605	536.34	3229	1079.03	
0.300	593	198.16	2120	708.44	4454	1488.38	
0.400	716	239.26	2546	850.79	5463	1825.56	
0.500	808	270.01	2609	871.84	6000	2005.01	

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	346	351	354
WT. CAN	6.92	7.04	6.92
WT. CAN+WET	139.28	120.99	109.19
WT. CAN+DRY	120.53	107.18	98.65
WT. H2O	18.75	13.81	10.54
WT. DRY SOIL	113.61	100.14	91.73
MOISTURE CONTENT	16.50%	13.79%	11.49%

WET DENSITY (PCF)	122.9	131.7	137.9
DRY DENSITY (PCF)	114.7	122.8	128.7

BEARING RATIO 11.23 31.88 42.64

90% OF DRY DENSITY 117.1
 95% OF DRY DENSITY 123.6

BEARING RATIO AT 90% OF MAX	17.36 ~ R VALUE	60
BEARING RATIO AT 95% OF MAX	33.32 ~ R VALUE	74



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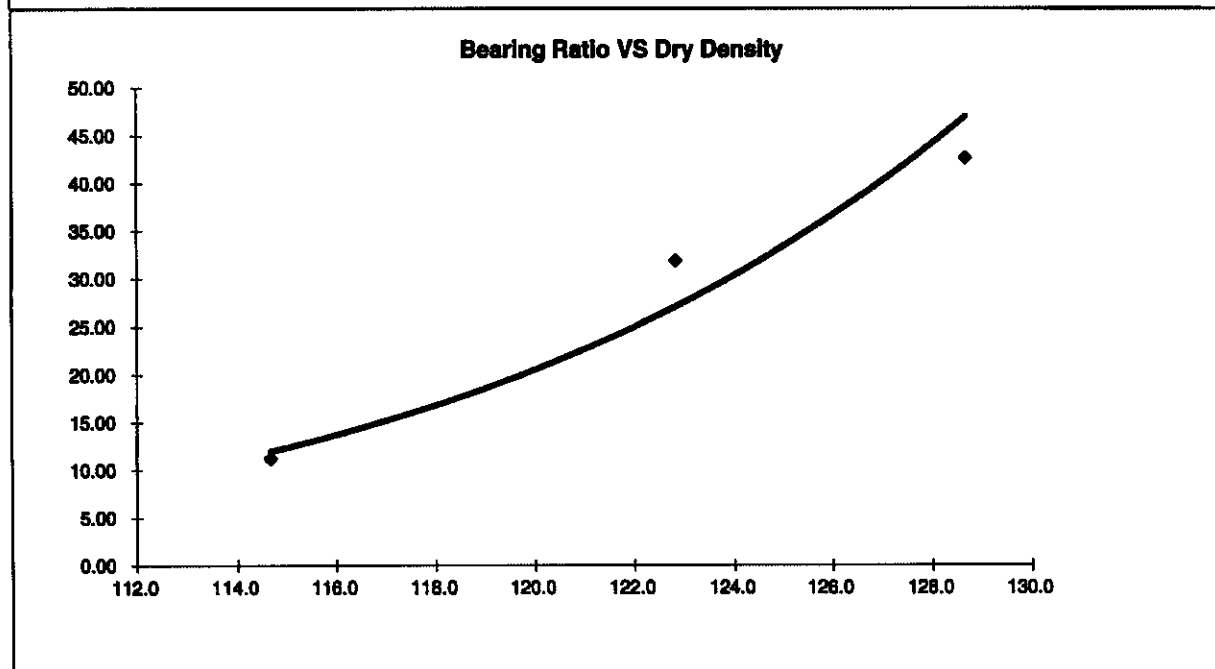
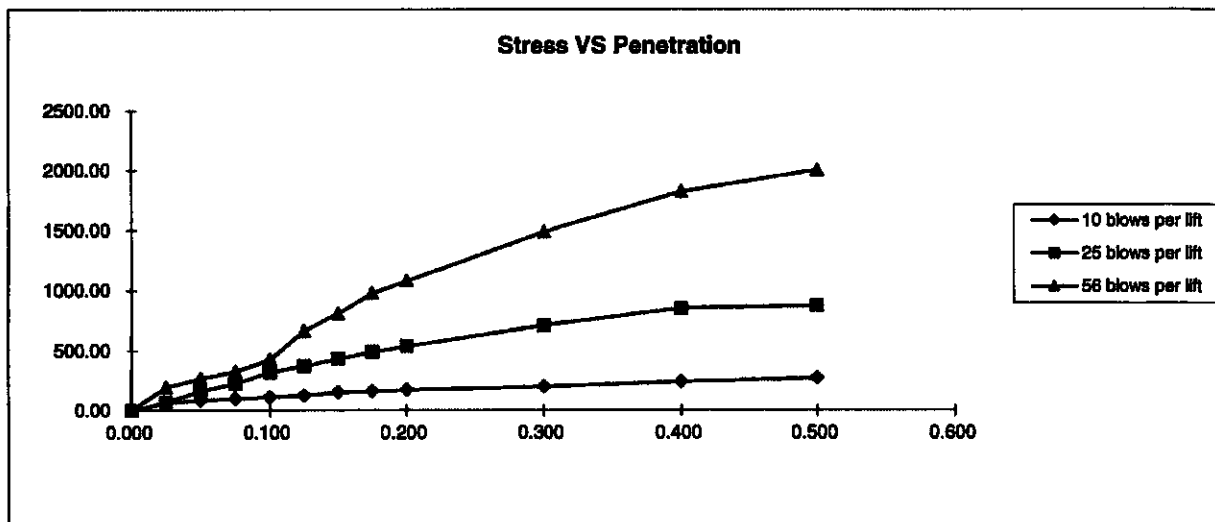
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CBR TEST DATA

DRAWN: DATE: CHECKED: SW DATE: 12-23-22

JOB NO.:
 222146

FIG NO.:
 B-47



BEARING RATIO AT 90% OF MAX	17.36 ~ R VALUE	60.00
BEARING RATIO AT 95% OF MAX	33.32 ~ R VALUE	74.00

JOB NO: 222146
SOIL TYPE: 1, CBR #1



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CALIFORNIA BEARING RATIO

DRAWN:

DATE:

CHECKED: *SW*

DATE: *12-23-22*

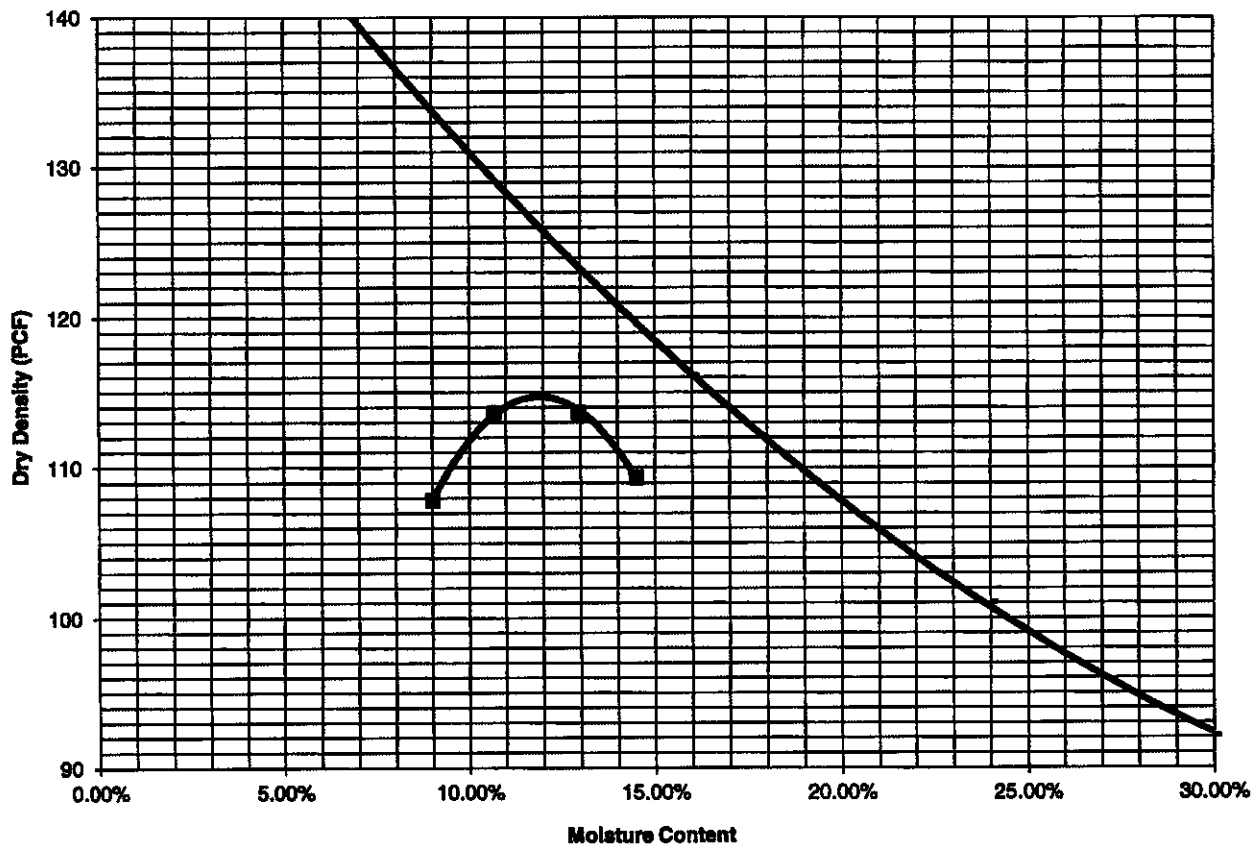
JOB NO:
222146

FIG NO:
B-48

PROJECT	STERLING RANCH, F-1	CLIENT	SR LAND, LLC
SAMPLE LOCATION	TB-12 @ 0-3'	JOB NO.	222146
SOIL DESCRIPTION	SANDSTONE, V. CLAYEY, BROWN	DATE	11/17/22

IDENTIFICATION	SC	COMPACTION TEST #	2, SOIL TYPE #5
TEST DESIGNATION / METHOD	ASTM D-698-A	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	114.8	OPTIMUM MOISTURE	12.0%

Compaction Curve



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MOISTURE DENSITY RELATION

DRAWN:

DATE:

CHECKED:

SW

DATE:

12-23-22

JOB NO.:

222146

FIG NO.:

B-49

CBR TEST LOAD DATA

JOB NO: 222146
 CLIENT: SR LAND, LLC
 PROJECT: STERLING RANCH, F-1
 SOIL TYPE: 5, CBR #1

PISTON DIAMETER (cm) 4.958	PISTON AREA (in ²) 2.993	10 BLOWS		25 BLOWS		56 BLOWS	
PENETRATION DEPTH (INCHES)	MOLD # 1 LOAD(LBS) (LBS)	STRESS (PSI)	MOLD # 2 LOAD(LBS) (LBS)	STRESS (PSI)	MOLD # 3 LOAD(LBS) (LBS)	STRESS (PSI)	
0.000	0	0.00	0	0.00	0	0.00	
0.025	75	25.06	96	32.08	151	50.46	
0.050	93	31.08	134	44.78	213	71.18	
0.075	103	34.42	160	53.47	241	80.53	
0.100	115	38.43	191	63.83	274	91.56	
0.125	125	41.77	233	77.86	326	108.94	
0.150	131	43.78	268	89.56	382	127.65	
0.175	139	46.45	294	98.25	419	140.02	
0.200	148	49.46	341	113.95	467	156.06	
0.300	161	53.80	420	140.35	613	204.84	
0.400	175	58.48	481	160.73	713	238.26	
0.500	189	63.16	525	175.44	814	272.01	

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	350	352	348
WT. CAN	6.57	6.71	6.85
WT. CAN+WET	154.45	168.07	105.13
WT. CAN+DRY	132.49	142.71	92.85
WT. H2O	21.96	25.36	12.28
WT. DRY SOIL	125.92	136	86
MOISTURE CONTENT	17.44%	18.65%	14.28%

WET DENSITY (PCF)	119.0	122.0	131.1
DRY DENSITY (PCF)	106.2	108.9	117.1

BEARING RATIO 3.84 6.38 9.16

90% OF DRY DENSITY 103.3
 95% OF DRY DENSITY 109.1

BEARING RATIO AT 90% OF MAX	1.04 - R VALUE	1
BEARING RATIO AT 95% OF MAX	6.44 - R VALUE	14



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CBR TEST DATA

DRAWN:

DATE:

CHECKED:

SW

DATE:

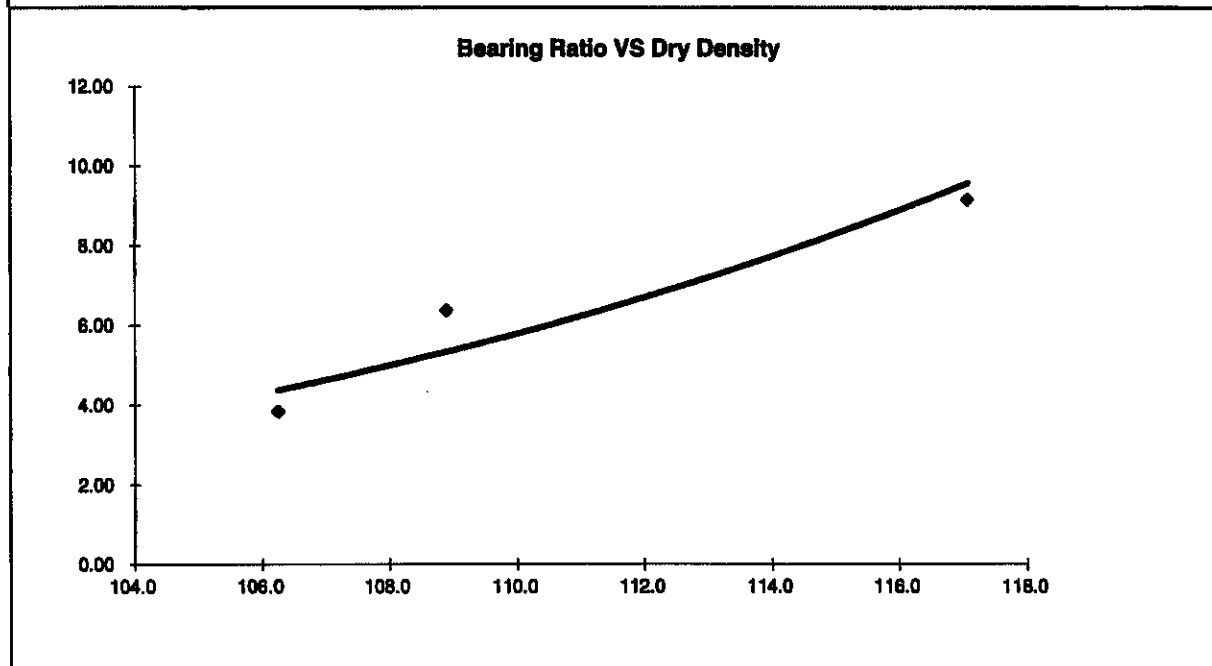
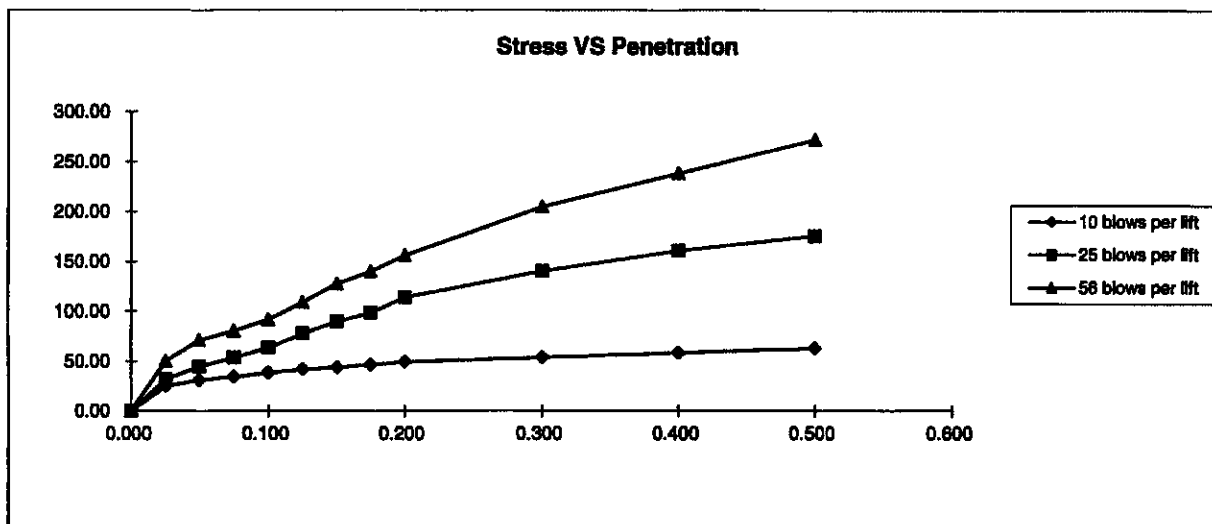
12-23-22

JOB NO:

222146

FIG NO:

B-50



BEARING RATIO AT 90% OF MAX	1.04 ~ R VALUE	1.00
BEARING RATIO AT 95% OF MAX	6.44 ~ R VALUE	14.00

JOB NO: 222146
SOIL TYPE: 5, CBR #1



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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

CALIFORNIA BEARING RATIO

DRAWN:

DATE:

CHECKED:

DATE:

SW

12-23-22

JOB NO:

222146

FIG NO:

B-51

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

SR LAND, LLC

HOMESTEAD NORTH AT STERLING RANCH FILING NO. 1

URBAN LOCAL LOW VOLUME - SOIL TYPE A

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
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 = 1.46

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

$$\log_{10} W_{18} = Z_R * S_o + 9.36 * \log_{10} (SN+1) - 0.20 + \frac{\log_{10} \left[\frac{\Delta \text{PSI}}{4.2 - 1.5} \right]}{0.40 + \frac{1094}{(SN+1)^{5.18}}} + 2.32 * \log_{10} M_R - 8.07$$

Left	Right	Difference
4.56	4.56	0.0

Job No. 222146

Fig. No. C-1

DESIGN CALCULATIONS

DESIGN DATA SR LAND, LLC

HOMESTEAD NORTH AT STERLING RANCH FILING NO. 1
URBAN LOCAL LOW VOLUME - SOIL TYPE A

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 36,500
Hveem Stabilometer (R Value) Results:	R = 50
Weighted Structural Number (WSN):	WSN = 1.46

DESIGN EQUATION

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ 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 FULL DEPTH ASPHALT SECTION (currently not allowed)

$D_1 = (WSN)/C_1 = 3.3$ inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASECOURSE SECTION

Asphalt Thickness (t) = 3 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 1.3$ inches of Aggregate

Basecourse, use 6.0 inches USE 6 INCHES MINIMUM.

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 6.0 inches of Aggregate Basecourse, or
2. 5.0 inches of Asphalt

Job No. 222146

Fig. No. C-2

DESIGN CALCULATIONS

RECYCLED CONCRETE SECTIONS

DESIGN DATA SR LAND, LLC
 HOMESTEAD NORTH AT STERLING RANCH
 URBAN LOCAL LOW VOLUME - SOI TYPE A

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL = 36,500
Hveem Stabilometer (R Value) Results:	R = 50
Weighted Structural Number (WSN):	WSN = 1.46

DESIGN EQUATION

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt

$C_2 = 0.11$ Strength Coefficient - Recycled Concrete

D_1 = Depth of Asphalt (inches)

D_2 = Depth of Recycled Concrete (inches)

FOR ASPHALT + CEMENT STABILIZED SUBGRADE SECTION

Asphalt Thickness (t) = 3 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 1.3$ inches of Recycled Concrete

Recycled Concrete, Use 6.0 inches minimum

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 6.0 inches of Recycled Concrete

Job No. 222146

Fig. No. C-3

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

SR LAND, LLC

HOMESTEAD NORTH AT STERLING RANCH FILING NO. 1

URBAN LOCAL - SOIL TYPE A

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

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

Left	Right	Difference
5.47	5.47	0.0

Job No. 222146

Fig. No. C-4

DESIGN CALCULATIONS

DESIGN DATA SR LAND, LLC
 HOMESTEAD NORTH AT STERLING RANCH FILING NO. 1
 URBAN LOCAL - SOIL TYPE A

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

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ 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 FULL DEPTH ASPHALT SECTION (currently not allowed)

$D_1 = (WSN)/C_1 = 4.8$ inches of Full Depth Asphalt
Use 5.0 inches Full Depth

FOR ASPHALT + AGGREGATE BASECOURSE SECTION

Asphalt Thickness (t) = 3 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 7.1$ inches of Aggregate
Basecourse, use 8.0 inches USE 8 INCHES MINIMUM.

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 8.0 inches of Aggregate Basecourse, or
2. 5.0 inches of Asphalt

Job No. 222146
Fig. No. C-5

DESIGN CALCULATIONS

RECYCLED CONCRETE SECTIONS

DESIGN DATA SR LAND, LLC
 HOMESTEAD NORTH AT STERLING RANCH
 URBAN LOCAL - SOI TYPE A

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

$$WSN = C_1 D_1 + C_2 D_2$$

$C_1 = 0.44$ Strength Coefficient - Hot Bituminous Asphalt

$C_2 = 0.11$ Strength Coefficient - Recycled Concrete

D_1 = Depth of Asphalt (inches)

D_2 = Depth of Recycled Concrete (inches)

FOR ASPHALT + CEMENT STABILIZED SUBGRADE SECTION

Asphalt Thickness (t) = 3 inches

$D_2 = ((WSN) - (t)(C_1))/C_2 = 3.8$ inches of Recycled Concrete

Recycled Concrete, Use 8 inches minimum

RECOMMENDED ALTERNATIVES

1. 3.0 inches of Asphalt + 8.0 inches of Recycled Concrete

Job No. 222146

Fig. No. C-6