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

September 7, 2021

Tech Contractors
3575 Kenyon Street, Suite 200
San Diego, California 92110

Attn: Raul Guzman

Re: Pavement Recommendations
Rolling Hills at Meridian Ranch Filing No. 2, Phase 1
El Paso County, Colorado

Dear Mr. Guzman:

As requested, Entech Engineering, Inc. has obtained samples of the subgrade soils from sections of the roadways in the Rolling Hills at Meridian Ranch, Filing No. 2, Phase 1, in El Paso County, Colorado. Laboratory testing to determine the pavement support characteristics of the soils was performed. This letter presents the results of the laboratory testing and provides pavement recommendations for the roadways.

Project Description

The roadways in this project consist of sections of Savannah Falls Court, Valley Peak Drive, Woods Grove Drive, Rolling Ranch Drive, Rolling Peaks Drive, New Ranch Drive, and Morning Heights Drive. The site layout and the locations of the test borings, drilled at approximate 500-foot intervals, are shown on the Test Boring Location Map, Figure 1.

Subgrade Conditions

Eight exploratory test borings were drilled in the roadways to depths of approximately 5 to 10 feet. The Boring Logs are presented in Appendix A. Sieve Analysis and Atterberg Limit testing were performed on the subgrade soil samples obtained from the test borings for the purpose of classification. Three soil types were encountered in the test borings. The soils encountered at subgrade depth consisted of two general soil types; Soil Type 1 and Soil Type 2. The Type 1 soils consist of silty to clayey sand and the Type 2 soil consists of native silty very clayey sand and very clayey sand. Soil Type 3 was encountered at depths below the subgrade influence zone. This report evaluates and presents recommendations for the Type 2 soils, which design values were used for all of the roadway sections.

Sieve analyses performed on Type 2 subgrade soils indicated the percent passing the No. 200 sieve ranged from approximately 36 to 45 percent. Atterberg Limit Tests performed on the samples resulted in Liquid Limits ranging from 26 to 33 and Plastic Indexes of 6 to 16. Soil Type 2 classified as A-4 and A-6 soils based on the AASHTO classification system. These soils have poor to fair pavement support characteristics. Sulfate testing of the subgrade indicated that the soils exhibit a negligible potential for sulfate attack. Groundwater was not encountered in the test borings.

Swell testing was performed on several samples of the site soils based on their Plastic Indexes. Volume changes of 0.0 to 1.6 percent were measured on the soils at subgrade depth. Based on the low volume changes, mitigation is not required. Laboratory test results are presented in Appendix B and are summarized on Table 1.

California Bearing Ratio (CBR) testing was performed on a sample of Soil Type 2 to determine the support characteristic of the subgrade soils for the roadway sections. The results of the CBR testing, are presented in Appendix B and summarized as follows:

Soil Type2 – Very Clayey Sand

R @ 90% = 7.5
R @ 95% = 17.0
Use R = 17.0 for design

Classification Testing

Liquid Limit	30
Plasticity Index	16
Percent Passing 200	38.7
AASHTO Classification	A-6
Group Index	2
Unified Soils Classification	SC

Pavement Design

The CBR testing was used to determine pavement sections for this site. The pavement sections were determined utilizing the El Paso County "Pavement Design Criteria and Report". The following classifications and ESAL values were used for this portion of the filing. The cul-de-sac portion of Savannah Falls Court classifies as an urban local (low-volume) roadway, which used an 18k ESAL value of 36,500 for design. All of the remaining roadways in this phase classify as urban local roads, which used an 18K ESAL value of 292,000 for design. Pavement alternatives for asphalt over aggregate basecourse and cement stabilized subgrade sections are provided. Full depth asphalt sections are not allowed, per El Paso County. Design parameters used in the pavement analysis are as follows:

Reliability, Local Low Volume + Urban Local	80%
Serviceability Index, Local Low Volume + Urban Local	2.0
Resilient Modulus	4,478 psi
"R" Value Subgrade	17.0
Structural Coefficients:	
Hot Bituminous Pavement	0.44
Aggregate Base Course	0.11
Cement Stabilized Subgrade	0.12

Pavement calculations are attached in Appendix C. Pavement sections recommended for this phase of the filing are summarized as follows:

Pavement Sections – Soil Type 2

Urban Local (low volume) – ESAL = 36,500
Savannah Falls Court

Alternative	Asphalt (in)	Base Course (in)	Cement Stabilized Subgrade (in.)
1. Asphalt + Base Course	3.5	6.5	--
2. Asphalt + Cement Subgrade	4.0	--	8.0

Urban Local – ESAL = 292,000
Valley Peak Drive, Rolling Ranch Drive, Woods Grove Drive, Rolling Peaks Drive, New Ranch Drive, and Morning Heights Drive

Alternative	Asphalt (in)	Base Course (in)	Cement Stabilized Subgrade (in.)
1. Asphalt + Base Course	5.0	8.5	--
2. Asphalt + Cement Subgrade	4.5	--	10.0

Full depth sections are not allowed.
* Minimum sections required by the El Paso County Pavement Design Criteria and Report.

Mitigation

El Paso County criteria requires mitigation of expansive soils for roadway subgrade that have a swell of 2 percent or greater with a 150 pound per square foot surcharge. All of the site subgrade soils tested exhibited low swell potentials which did not exceed the threshold. Mitigation is not required.

Roadway Construction - Asphalt on Aggregate Base Course Alternatives

Prior to placement of the asphalt, the subgrade should be proofrolled and compacted to a minimum of 95 percent of its maximum Standard Proctor Dry Density, ASTM D-698 at 0 to 3 percent over optimum moisture content. Any loose or soft areas should be removed and replaced with suitable materials. Base course 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.

Roadway Construction – Cement Stabilized Subgrade Alternative

Prior to placement of the asphalt, the subgrade shall be stabilized by addition of cement to a depth of 8 and 10 inches, as determined by Roadway Classification. The depth of the required cement stabilized subgrade is shown in the previous table. The amount of cement applied shall be 2.0 percent (by weight) of the subgrade's maximum dry density as determined by the Standard Proctor Test (ASTM D-698) based on laboratory cement stabilization testing. The cement should be spread evenly on the subgrade surface and be thoroughly mixed into the subgrade over the

appropriate 8 to 10 inches depth such that a uniform blend of soil and cement is achieved. Prior to application or mixing of the cement, the upper 8 to 10 inches of subgrade, as recommended should be thoroughly moisture conditioned to the soil's optimum water content or as much as 2 percent more than the optimum water content as necessary to provide a compactable soil condition. Densification of the cement-stabilized subgrade should be completed to obtain a compaction of at least 95 percent of the subgrade maximum dry density as determined by the Standard Proctor Test (ASTM D-698). Satisfactory compaction of the subgrade shall occur within 90 minutes from the time of mixing the cement into the subgrade.

The following conditions shall be observed as part of the subgrade stabilization:

- Type I/II cement as supplied. A local supplier shall be used. All cement used for stabilization should come from the same source. If cement sources are changed a new laboratory mix design should be completed.

- Moisture conditioning of the subgrade and/or mixing of the cement into the subgrade shall not occur when soil temperatures are below 40°F. Cement treated subgrades should be maintained at a temperature of 40°F or greater until the subgrade has been compacted as required.

- Cement placement, cement mixing and compaction of the cement treated subgrade should be observed by a Soils Engineer. The Soils Engineer should complete in situ compaction tests and construct representative compacted specimens of the treated subgrade material for subsequent laboratory quality assurance testing.

- Pending the results of the field density testing, microfracturing of the stabilized subgrade will likely be required. Soil strengths in excess of 200 psi require microfracturing.

If significant grading is performed, the soils at subgrade may change. Modification to the pavement section recommendations should be evaluated after site grading is completed.

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

We trust that this has provided you with the information you required. If you have any questions or need additional information, please do not hesitate to contact us.

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Daniel P. Stegman

DPS/bs

Entech Job No. 212273
AAprojects/2021/212273 pr2

COLORADO LICENSED
MARK HOWARD HAUSCHILD
35140
9/8/2021
PROFESSIONAL ENGINEER

Reviewed by:

Mark H. Hauschild, P.E.
Senior Engineer

TABLE

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2
JOB NO. 212273

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	2	1-2	8.9	122.1	33.2	29	12		A-2-6	1.6	SC	SAND, CLAYEY
1	4	1-2	8.0	106.1	23.8	NV	NP	<0.01	A-1-b	0.0	SM	SAND, SILTY
1	5	1-2	10.5	99.8	33.7	NV	NP		A-2-4	0.0	SM	SAND, SILTY
1	8	1-2	8.7	120.4	26.0	27	9		A-2-4	0.2	SC	SAND, CLAYEY
1	9	1-2			24.9	31	12		A-2-6		SC	SAND, CLAYEY
1	10	1-2			27.6	36	17		A-2-6		SC	SAND, CLAYEY
2, CBR	2	0-3			38.7	30	16		A-6		SC	SAND, VERY CLAYEY
2	3	1-2	11.3	122.4	40.2	26	6		A-4	1.1	SC-SM	SAND, VERY CLAYEY, SILTY
2	6	1-2	10.4	121.9	44.9	31	14		A-6	0.0	SC	SAND, VERY CLAYEY
2	7	1-2	8.9	119.1	37.0	33	15	0.00	A-6	0.9	SC	SAND, VERY CLAYEY
2	8	0-3			36.2						SC	SAND, VERY CLAYEY
3	1	1-3			38.8	19	5		A-4		SC-SM	SANDSTONE, VERY CLAYEY, SILTY
3	1	1-2			32.5	NV	NP	<0.01	A-2-4		SM	SANDSTONE, SILTY
3	8	10	11.1	126.8	38.6	36	19	<0.01	A-6	2.0	SC	SANDSTONE, VERY CLAYEY

FIGURE

CT F

LIMITS OF INVESTIGATION

TB-6

LIMITS OF INVESTIGATION

TB-8

LIMITS OF INVESTIGATION

TB-5

TB-4

TB-2

TB-7

TB-3

TB-9

TB-1

LIMITS OF INVESTIGATION

TB-10

WOODS GROVE DR.

MORNING HILLS DR.

SAVANNAH FALLS CT.

NEW RANCH DR.

ROLLING PEAKS DR.

TRACT G

TRACT H

N

25 0 50 100 200

1:100

LEGEND:

= LOCAL (LOW-VOLUME) (ESAL = 36,500)
(4" ASPHALT OVER 8" CTS)

= URBAN LOCAL (ESAL = 292,000)
(4 1/2" ASPHALT OVER 10" CTS)

TB- APPROXIMATE TEST BORING LOCATIONS AND NUMBERS

REVISION	BY

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TEST BORING LOCATION MAP
ROLLING HILLS RANCH, F2, PH1
EL PASO COUNTY, COLORADO
FOR: TECH CONTRACTORS

DRAWN	JAC
CHECKED	DPS
DATE	09/01/21
SCALE	1:100
JOB NO.	212273
FIGURE No.	1

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 8/18/2021
Job # 212273

REMARKS

DRY TO 10', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					1
			50/8"	3.3	3
5			50/3"	4.8	3
10			50/1"	7.5	3
15					
20					

SAND, SILTY, BROWN SANDSTONE, SILTY TO CLAYEY, FINE TO MEDIUM GRAINED, TAN, VERY DENSE, MOIST

TEST BORING NO. 2
DATE DRILLED 8/18/2021
CLIENT TECH CONTRACTORS
LOCATION ROLLING HILLS, FILING 2

REMARKS

DRY TO 5', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			29	8.6	1
5			41	5.3	1
10					
15					
20					

SAND, CLAYEY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE TO DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:

JOB NO.: 212273
FIG NO.: A- 1

TEST BORING NO. 3
DATE DRILLED 8/18/2021
Job # 212273

REMARKS

DRY TO 5', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			25	7.8	2	SAND, VERY CLAYEY, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO LOOSE, MOIST
5			9	7.5	2	
10						
15						
20						

TEST BORING NO. 4
DATE DRILLED 8/18/2021
CLIENT TECH CONTRACTORS
LOCATION ROLLING HILLS, FILING 2

REMARKS

DRY TO 10', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			9	7.8	1	SAND, SILTY, FINE TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST
5			27	5.7	1	
10			10	7.5	1	
15						
20						

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: A- 2

TEST BORING NO. 5
DATE DRILLED 8/18/2021
Job # 212273

REMARKS

DRY TO 5', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			18	9.9	1
5			9	8.6	1

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE TO LOOSE, MOIST

TEST BORING NO. 6
DATE DRILLED 8/18/2021
CLIENT TECH CONTRACTORS
LOCATION ROLLING HILLS, FILING 2

REMARKS

DRY TO 5', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			18	8.6	2
5			20	8.2	2

SAND, VERY CLAYEY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: A- 3

TEST BORING NO. 7
DATE DRILLED 8/18/2021
Job # 212273

REMARKS

DRY TO 5', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			19	8.4	2	SAND, VERY CLAYEY, FINE TO MEDIUM GRAINED, DARK BROWN, MEDIUM DENSE, MOIST
5			18	7.5	2	
10						
15						
20						

TEST BORING NO. 8
DATE DRILLED 8/18/2021
CLIENT TECH CONTRACTORS
LOCATION ROLLING HILLS, FILING 2

REMARKS

DRY TO 10', 8/18/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			11	8.4	1	SAND, CLAYEY, FINE TO MEDIUM GRAINED, DARK BROWN, MEDIUM DENSE, MOIST
5			23	10.4	2	SAND, VERY CLAYEY, FINE GRAINED, BROWN, MEDIUM DENSE, MOIST
10			50/9"	9.6	3	SANDSTONE, VERY CLAYEY, FINE TO MEDIUM GRAINED, DARK BROWN, VERY DENSE, MOIST
15						
20						

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: A- 4

TEST BORING NO. 9
DATE DRILLED 9/9/2021
Job # 212273

REMARKS

DRY TO 5', 9/9/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			13	8.5	1	SAND, CLAYEY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST
5			16	8.8	1	
10						
15						
20						

TEST BORING NO. 10
DATE DRILLED 9/9/2021
CLIENT TECH CONTRACTORS
LOCATION ROLLING HILLS, FILING 2

REMARKS

DRY TO 5', 9/9/21

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			12	5.5	1	SAND, CLAYEY, FINE TO MEDIUM GRAINED, TAN, MEDIUM DENSE TO LOOSE, MOIST
5			8	5.9	1	
10						
15						
20						

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TEST BORING LOG

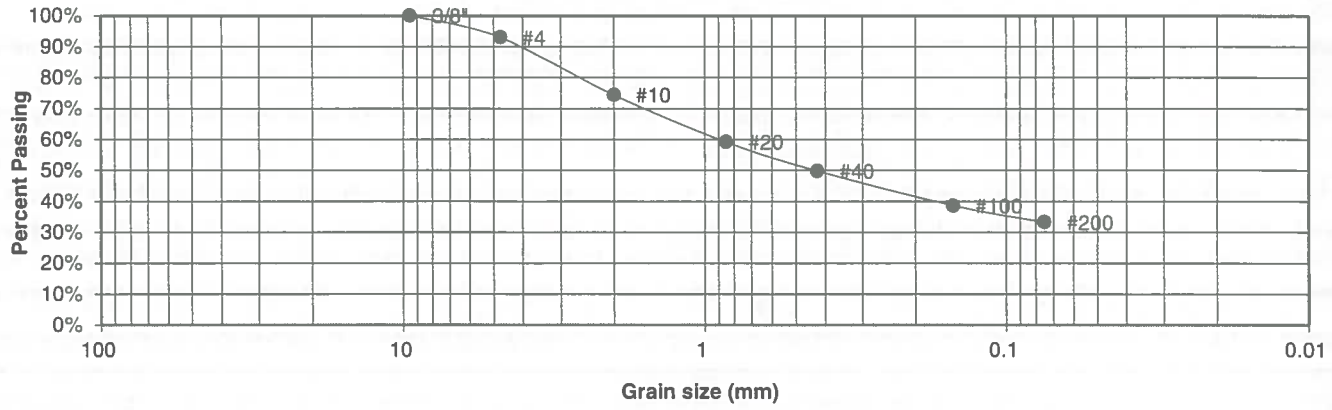
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/12/21

JOB NO.: 212273
FIG NO.: A- 5

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	2	JOB NO.	212273
DEPTH (FT)	1-2	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	93.0%
10	74.4%
20	59.2%
40	49.8%
100	38.6%
200	33.2%

Atterberg Limits

Plastic Limit	17
Liquid Limit	29
Plastic Index	12

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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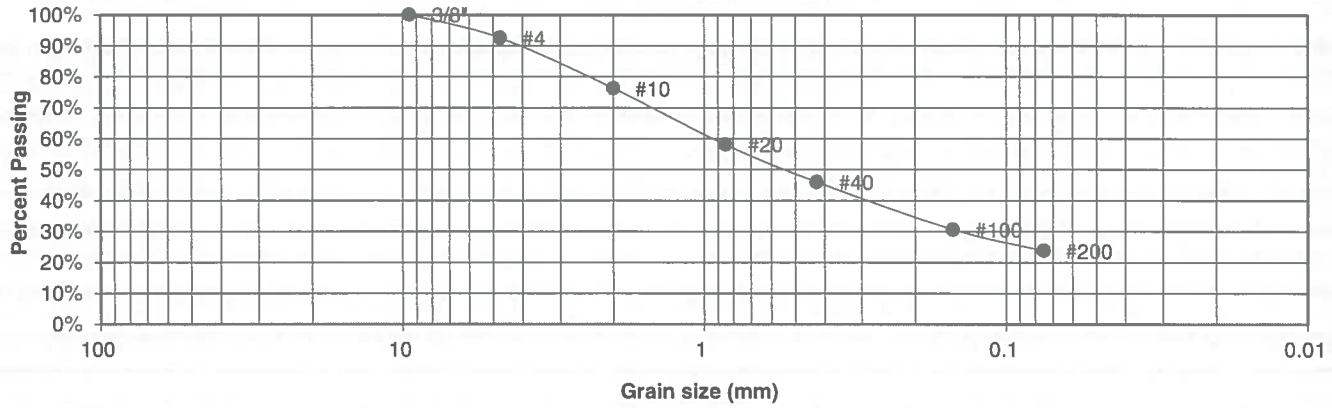
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DT	2/13/21

JOB NO.: 212273
FIG NO.: B-1

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	4	JOB NO.	212273
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	92.6%
10	76.3%
20	58.1%
40	46.0%
100	30.6%
200	23.8%

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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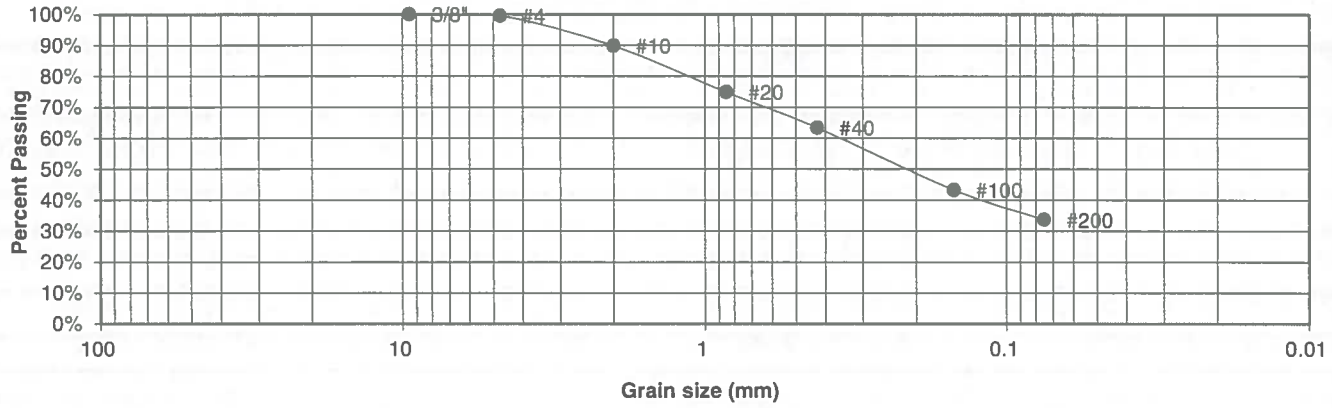
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	8/31/21

JOB NO.: 212273
FIG NO.: B-2

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	5	JOB NO.	212273
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	99.5%
10	89.9%
20	74.9%
40	63.4%
100	43.2%
200	33.7%

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

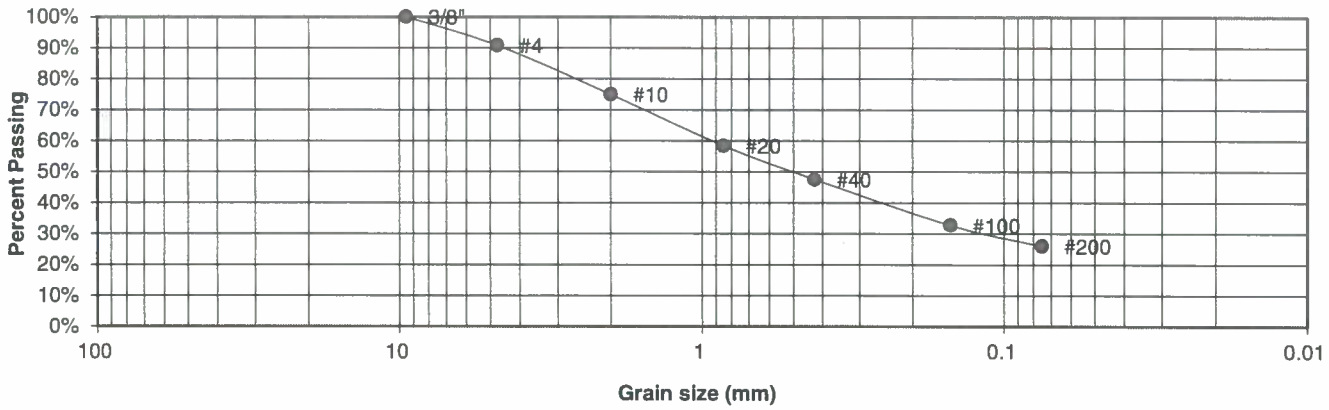
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-3

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	8	JOB NO.	212273
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	90.8%
10	75.0%
20	58.4%
40	47.5%
100	32.7%
200	26.0%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	27
Plastic Index	9

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

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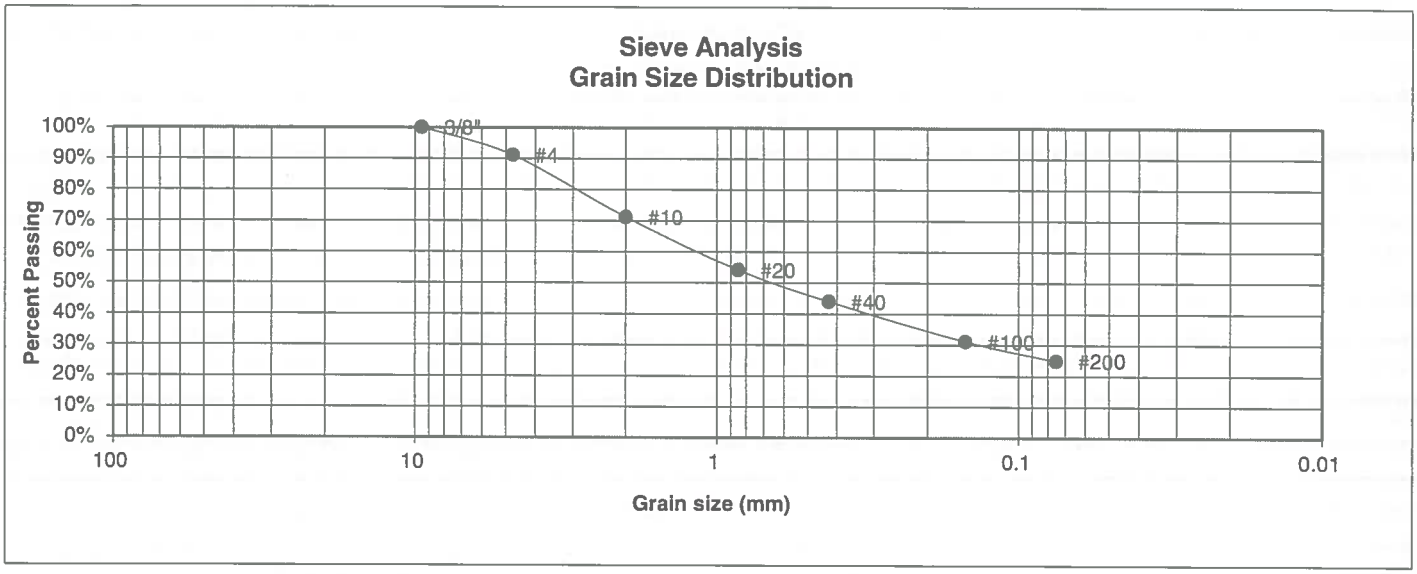
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-4

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	9	JOB NO.	212273
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.1%
10	71.2%
20	54.2%
40	44.0%
100	31.1%
200	24.9%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	31
Plastic Index	12

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

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COLORADO SPRINGS, COLORADO 80907

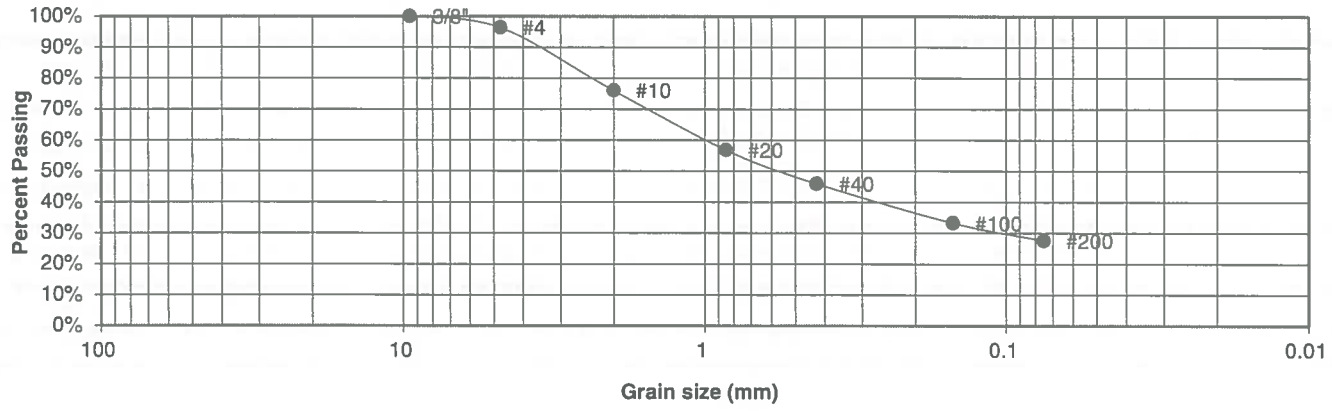
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/1/21

JOB NO.: 212273
FIG NO.: B-5

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	1	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	10	JOB NO.	212273
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-6	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	96.4%
10	76.0%
20	56.8%
40	45.9%
100	33.2%
200	27.6%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	36
Plastic Index	17

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

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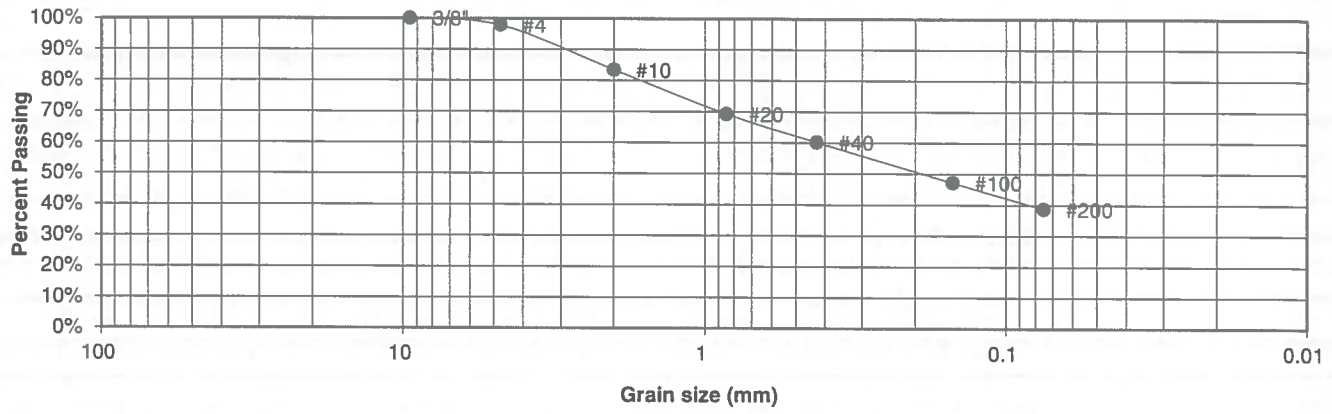
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	9/11/21

JOB NO.: 212273
FIG NO.: B-1

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2, CBR	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	2	JOB NO.	212273
DEPTH (FT)	0-3	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	97.8%
10	83.4%
20	69.2%
40	60.2%
100	47.2%
200	38.7%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	30
Plastic Index	16

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

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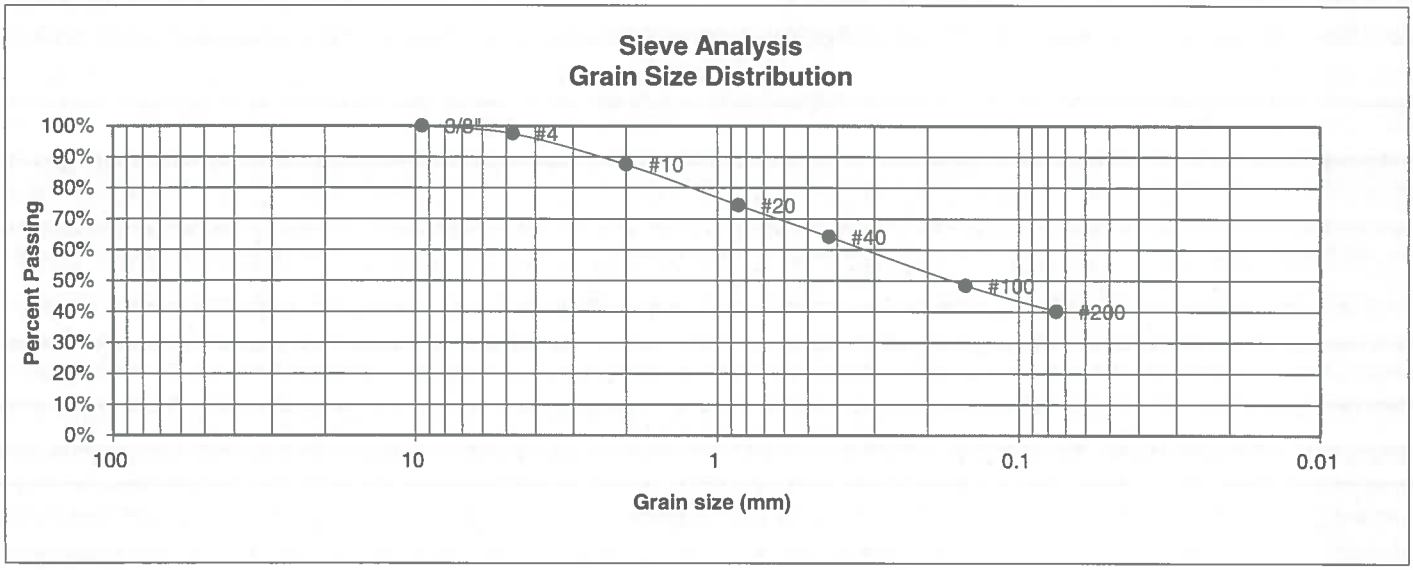
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-7

UNIFIED CLASSIFICATION	SC-SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	3	JOB NO.	212273
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.5%
10	87.5%
20	74.4%
40	64.3%
100	48.5%
200	40.2%

Atterberg Limits	
Plastic Limit	19
Liquid Limit	26
Plastic Index	6

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

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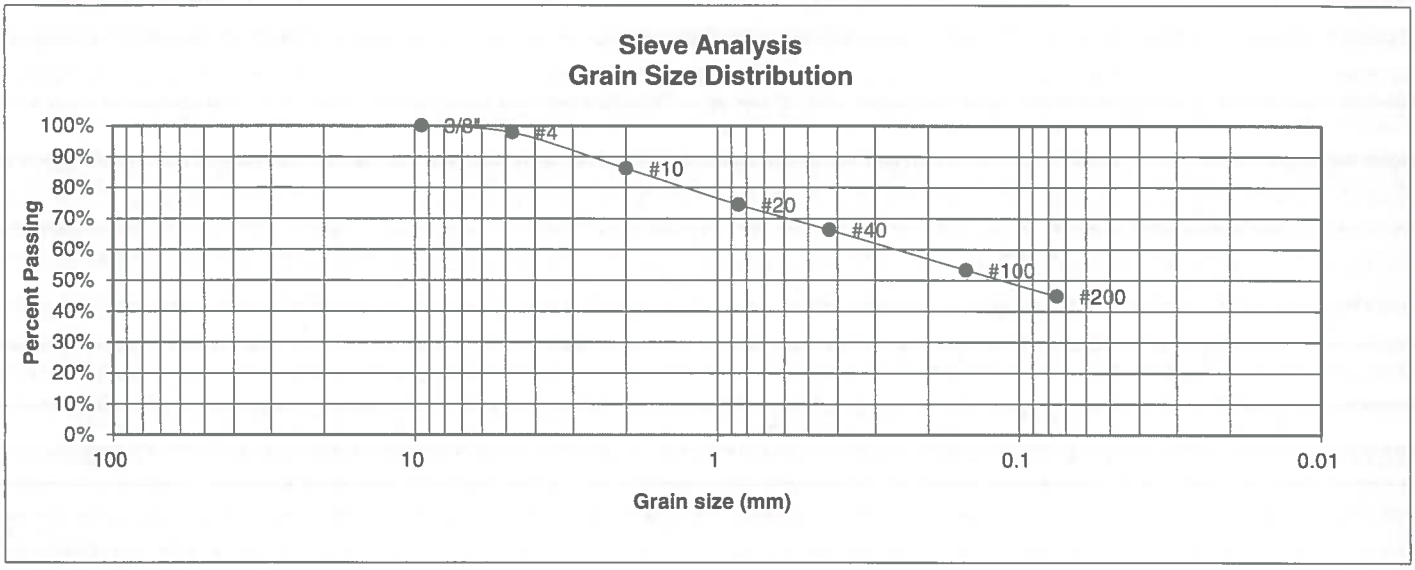
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DJ	8/31/21

JOB NO.: 212273
FIG NO.: B-8

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	6	JOB NO.	212273
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	3



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.8%
10	86.2%
20	74.5%
40	66.4%
100	53.3%
200	44.9%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	31
Plastic Index	14

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

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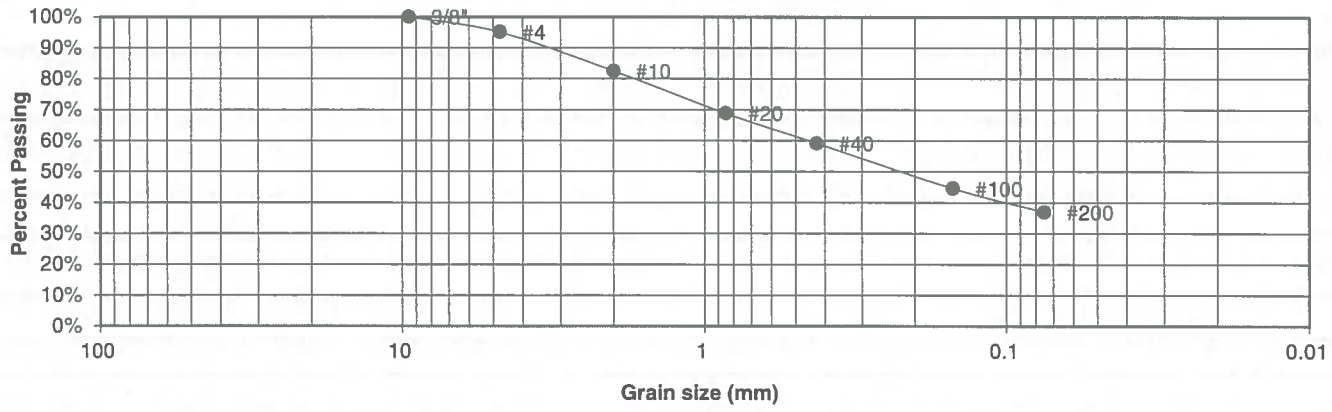
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/24

JOB NO.: 212273
FIG NO.: B-9

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	7	JOB NO.	212273
DEPTH (FT)	1-2	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	95.1%
10	82.5%
20	68.8%
40	59.2%
100	44.6%
200	37.0%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	33
Plastic Index	15

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

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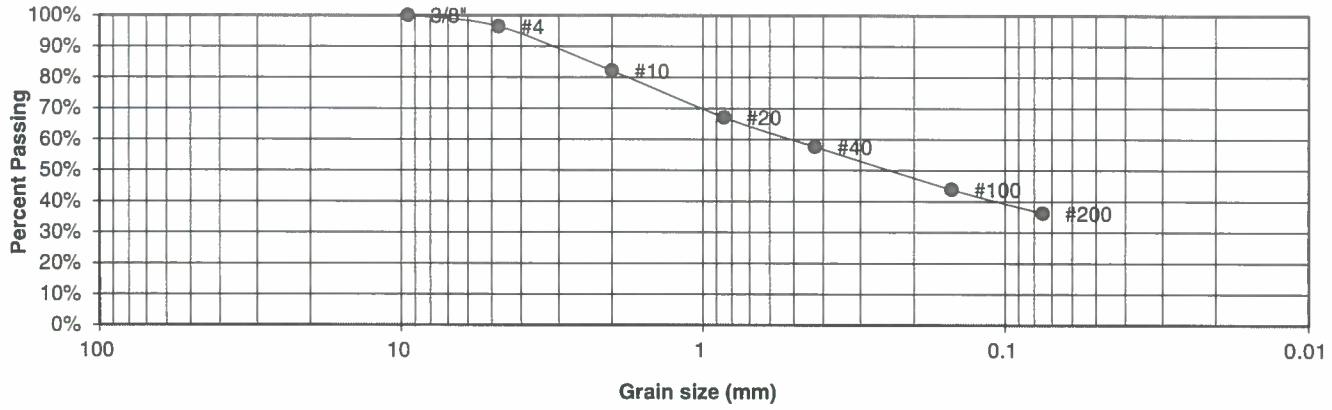
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	6/13/21

JOB NO.: 212273
FIG NO.: B-10

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	2	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	8	JOB NO.	212273
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	96.4%
10	82.1%
20	67.1%
40	57.6%
100	43.8%
200	36.2%

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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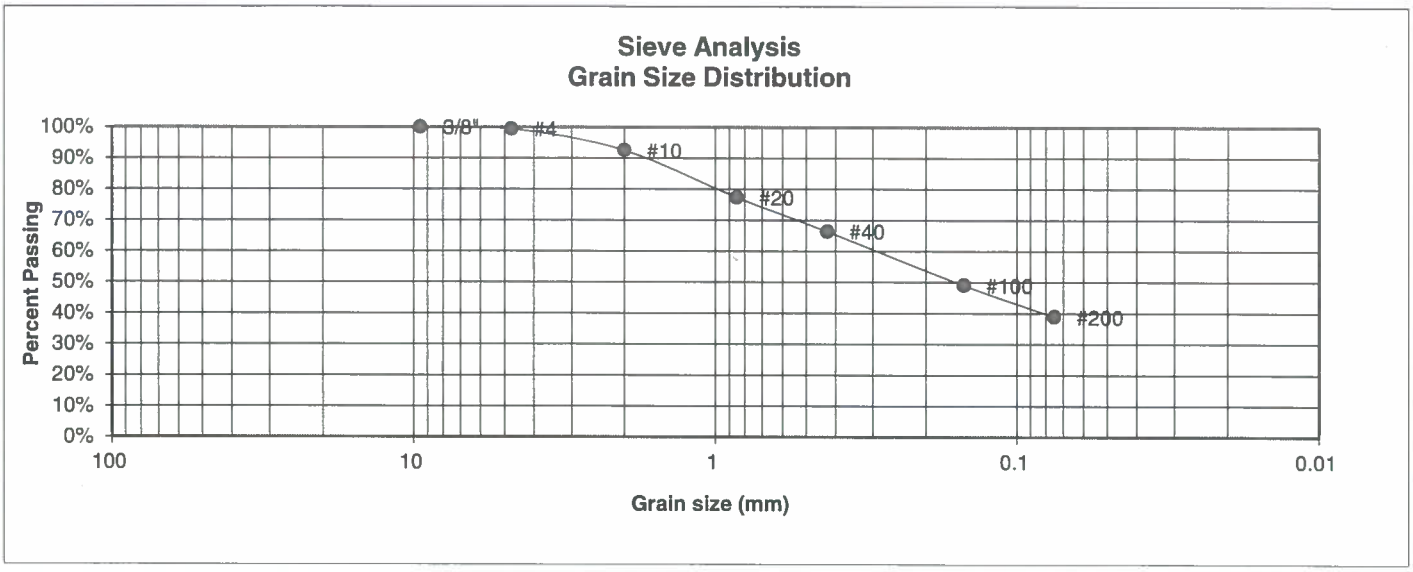
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-11

UNIFIED CLASSIFICATION	SC-SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	1	JOB NO.	212273
DEPTH (FT)	1-3	TEST BY	BL
AASHTO CLASSIFICATION	A-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.4%
10	92.5%
20	77.4%
40	66.4%
100	49.0%
200	38.8%

Atterberg Limits	
Plastic Limit	14
Liquid Limit	19
Plastic Index	5

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

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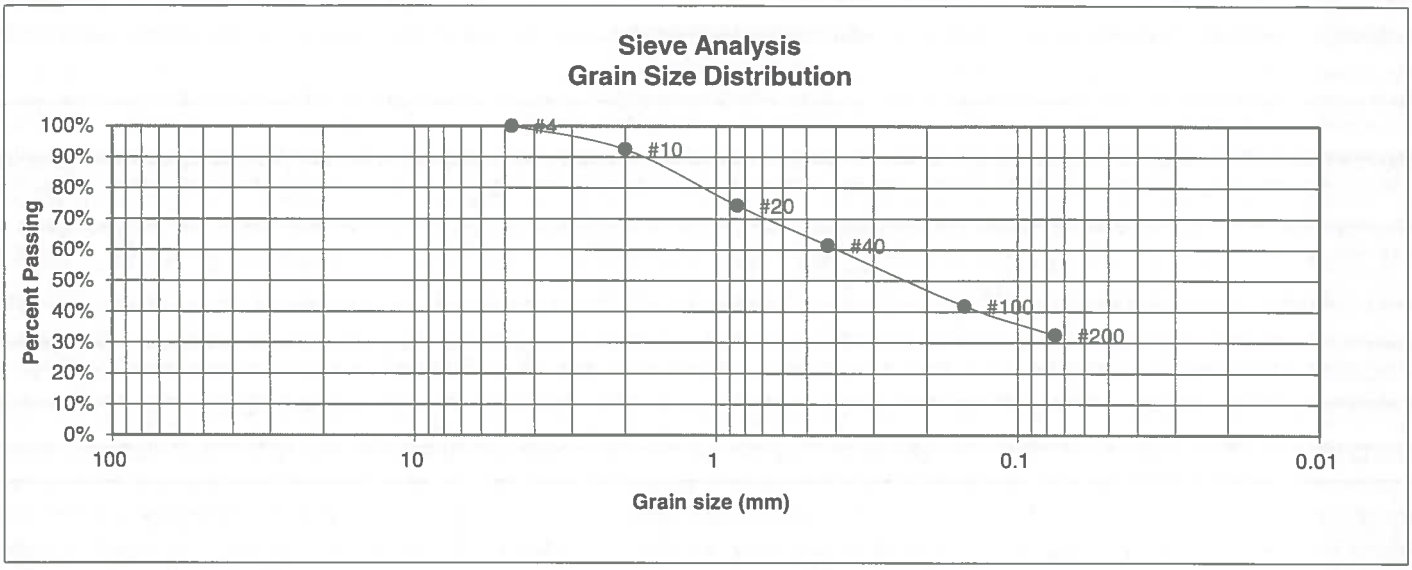
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	6/13/12

JOB NO.: 212273
FIG NO.: B-12

UNIFIED CLASSIFICATION	SM	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	1	JOB NO.	212273
DEPTH (FT)	1-2	TEST BY	BL
AASHTO CLASSIFICATION	A-2-4	GROUP INDEX	0



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	92.5%
20	74.3%
40	61.4%
100	41.8%
200	32.5%

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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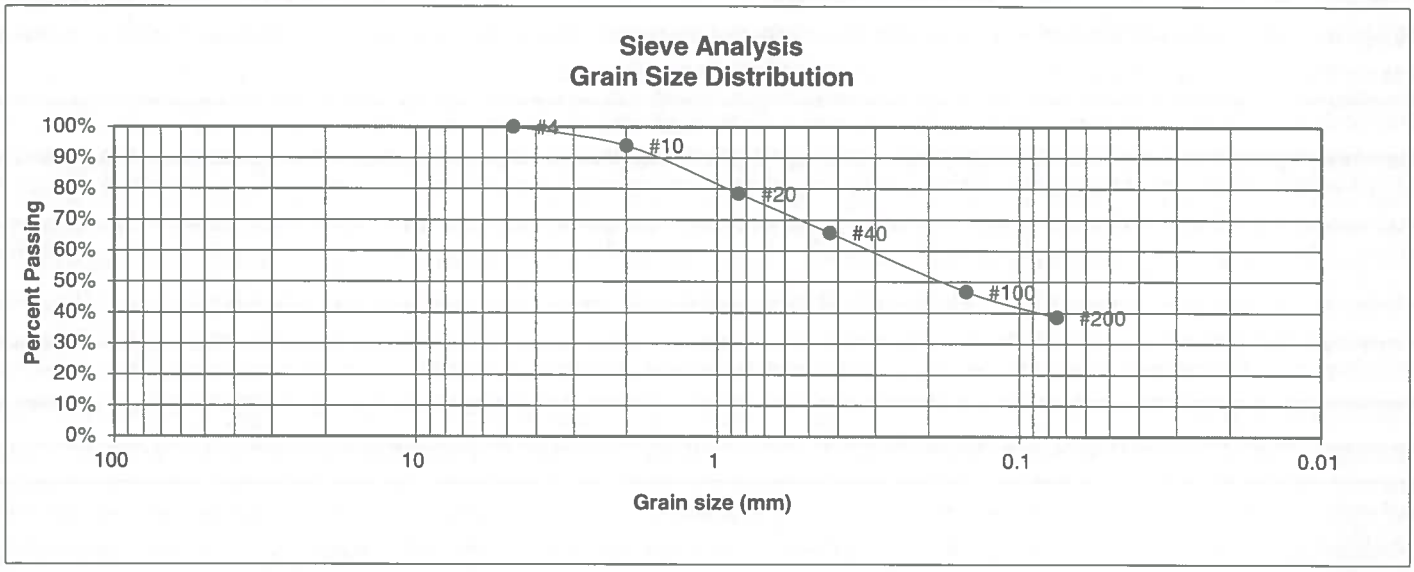
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-13

UNIFIED CLASSIFICATION	SC	CLIENT	TECH CONTRACTORS
SOIL TYPE #	3	PROJECT	ROLLING HILLS, FILING 2
TEST BORING #	8	JOB NO.	212273
DEPTH (FT)	10	TEST BY	BL
AASHTO CLASSIFICATION	A-6	GROUP INDEX	3



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	93.9%
20	78.5%
40	65.8%
100	46.8%
200	38.6%

Atterberg Limits	
Plastic Limit	17
Liquid Limit	36
Plastic Index	19

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

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LABORATORY TEST RESULTS

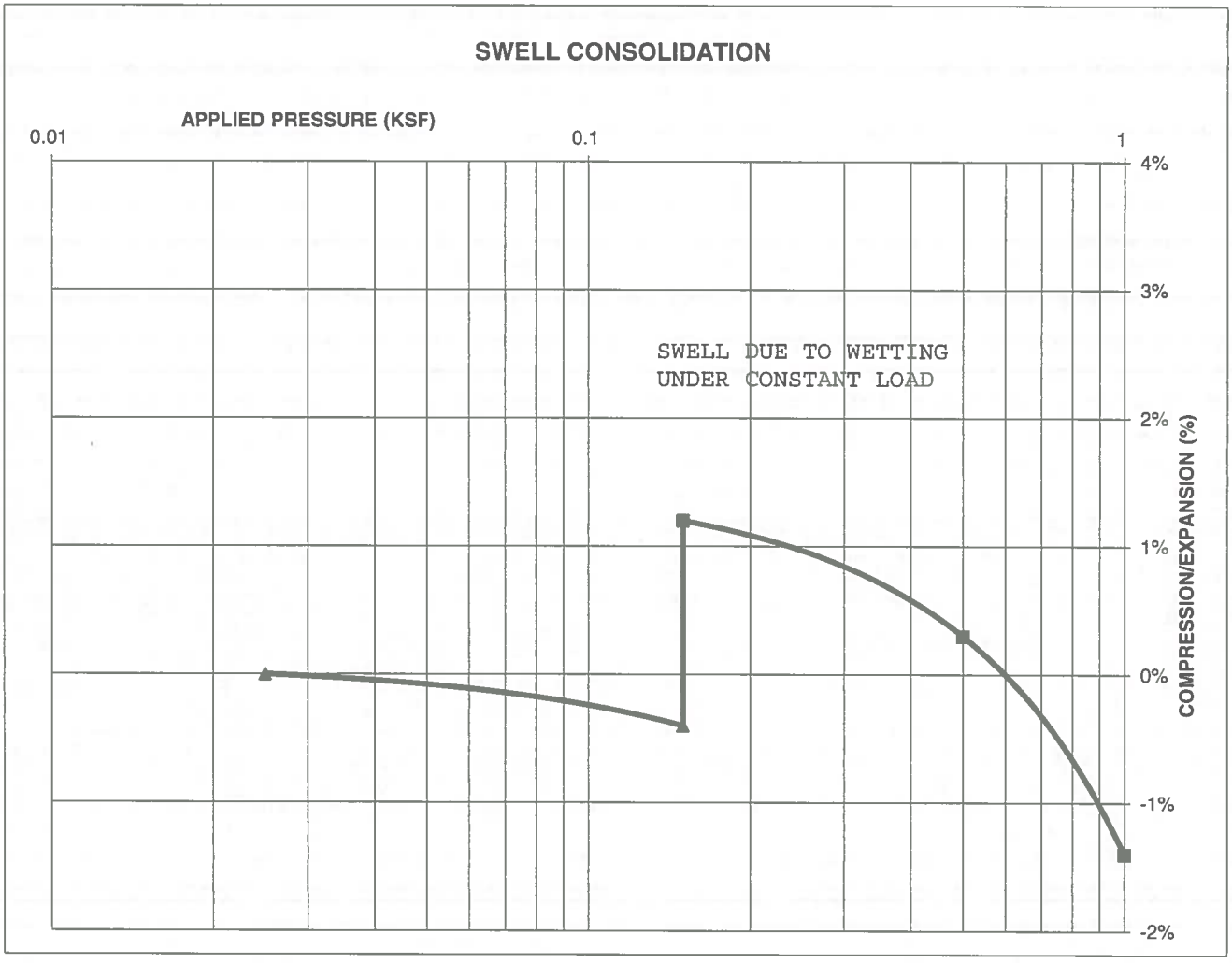
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-14

CONSOLIDATION TEST RESULTS

TEST BORING #	2	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			122
NATURAL MOISTURE CONTENT			8.9%
SWELL/CONSOLIDATION (%)			1.6%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

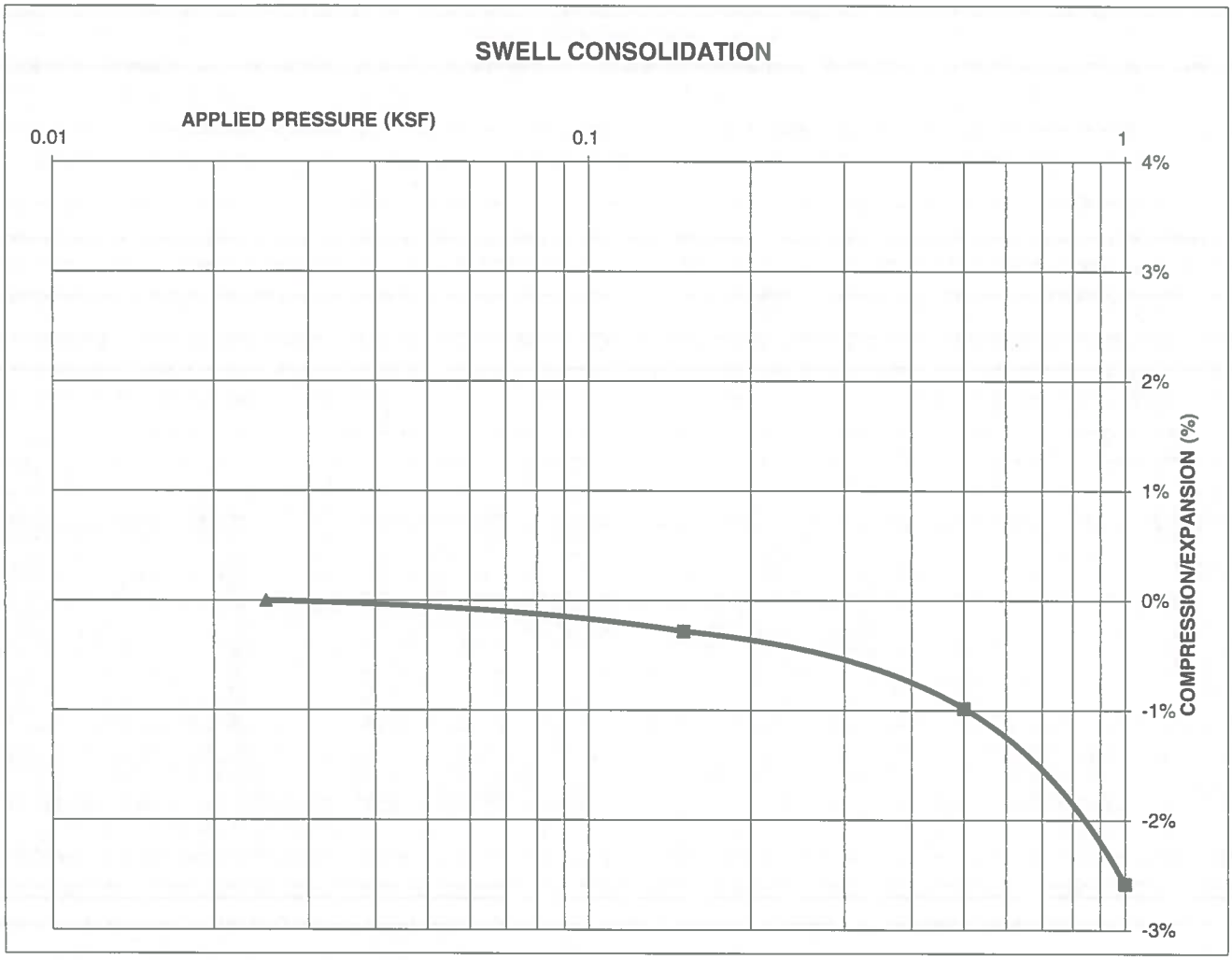
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-15

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	1-2
DESCRIPTION	SM	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			106
NATURAL MOISTURE CONTENT			8.0%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

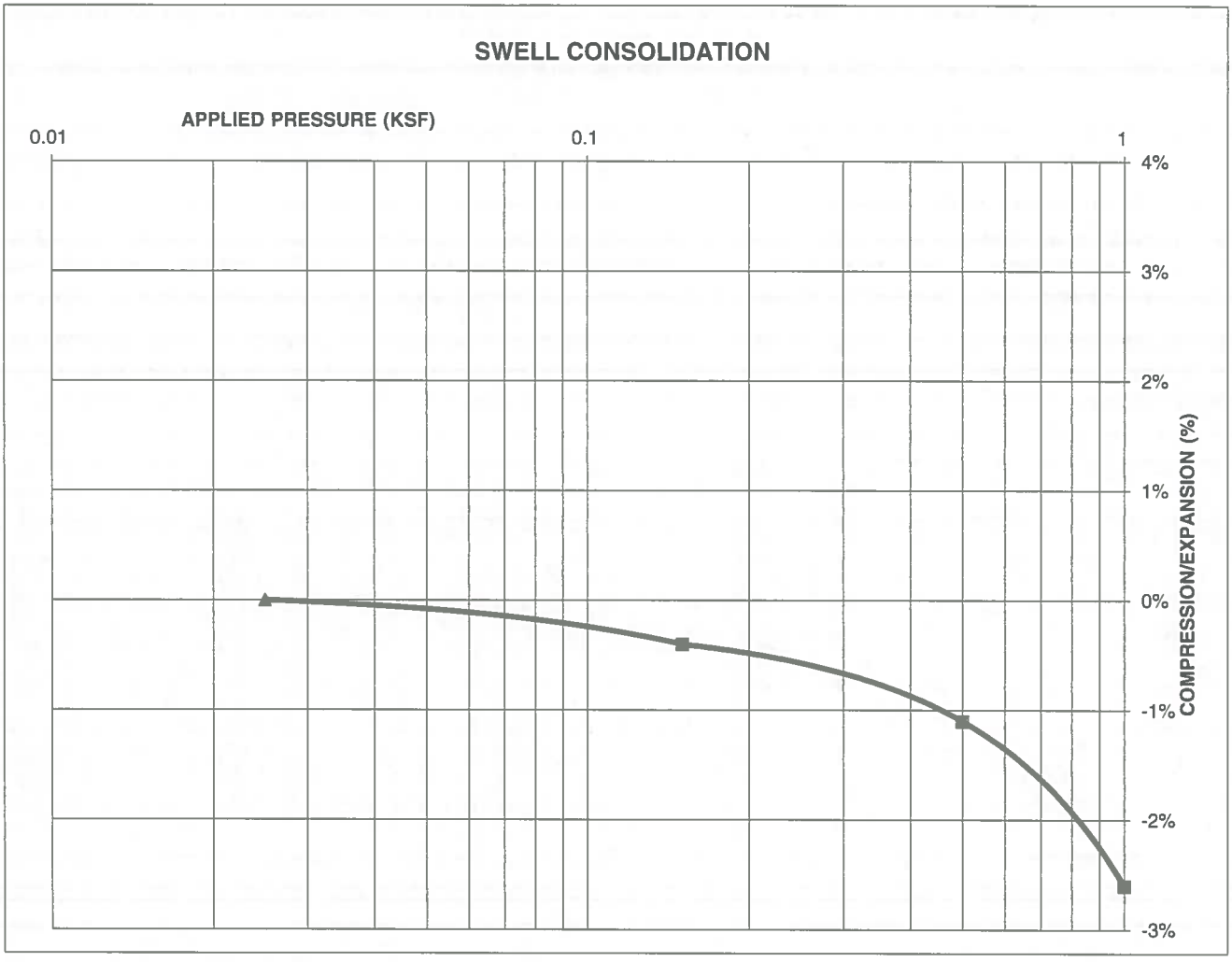
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-16

CONSOLIDATION TEST RESULTS

TEST BORING #	5	DEPTH(ft)	1-2
DESCRIPTION	SM	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			100
NATURAL MOISTURE CONTENT			10.5%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

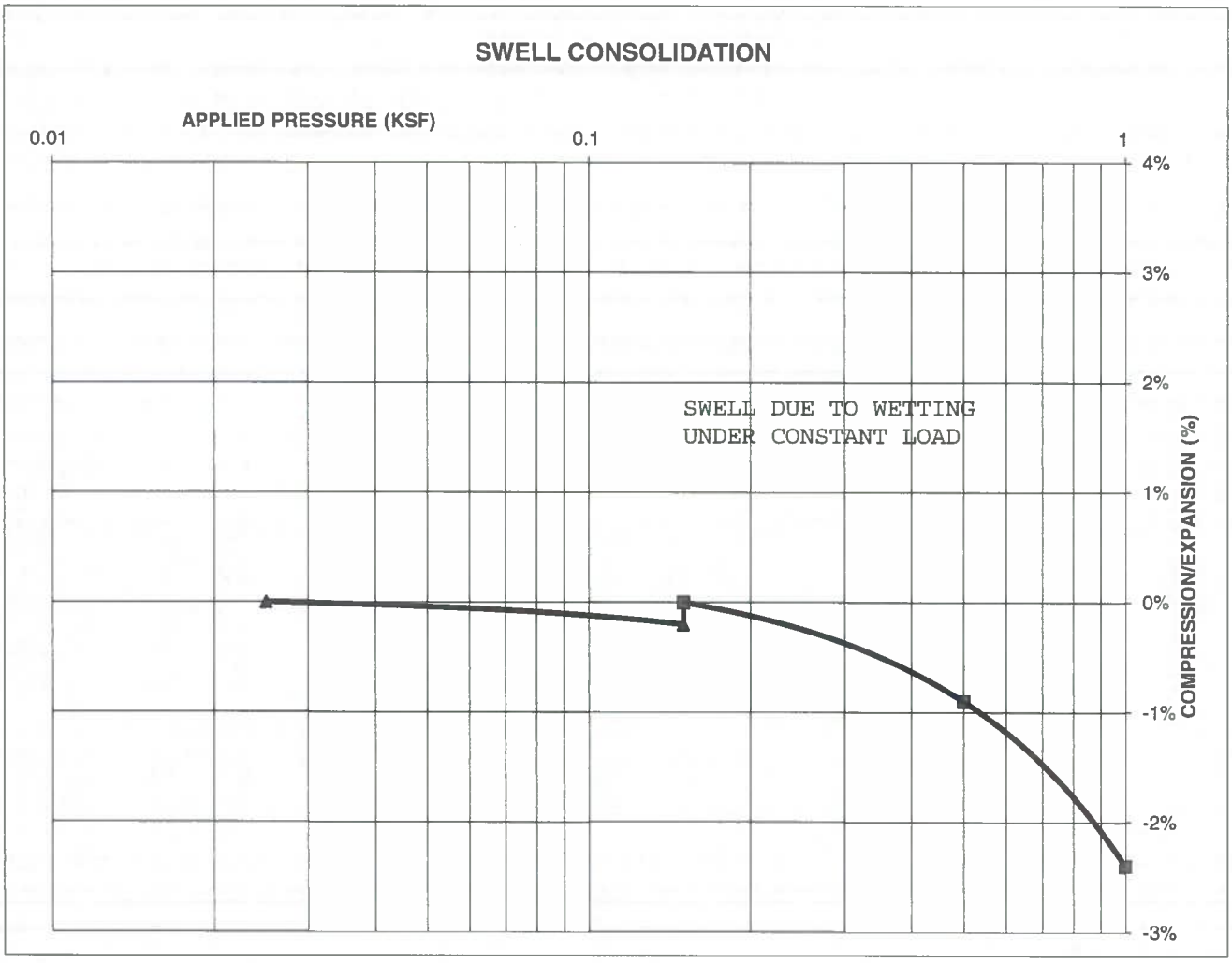
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-17

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	1
NATURAL UNIT DRY WEIGHT (PCF)			120
NATURAL MOISTURE CONTENT			8.7%
SWELL/CONSOLIDATION (%)			0.2%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

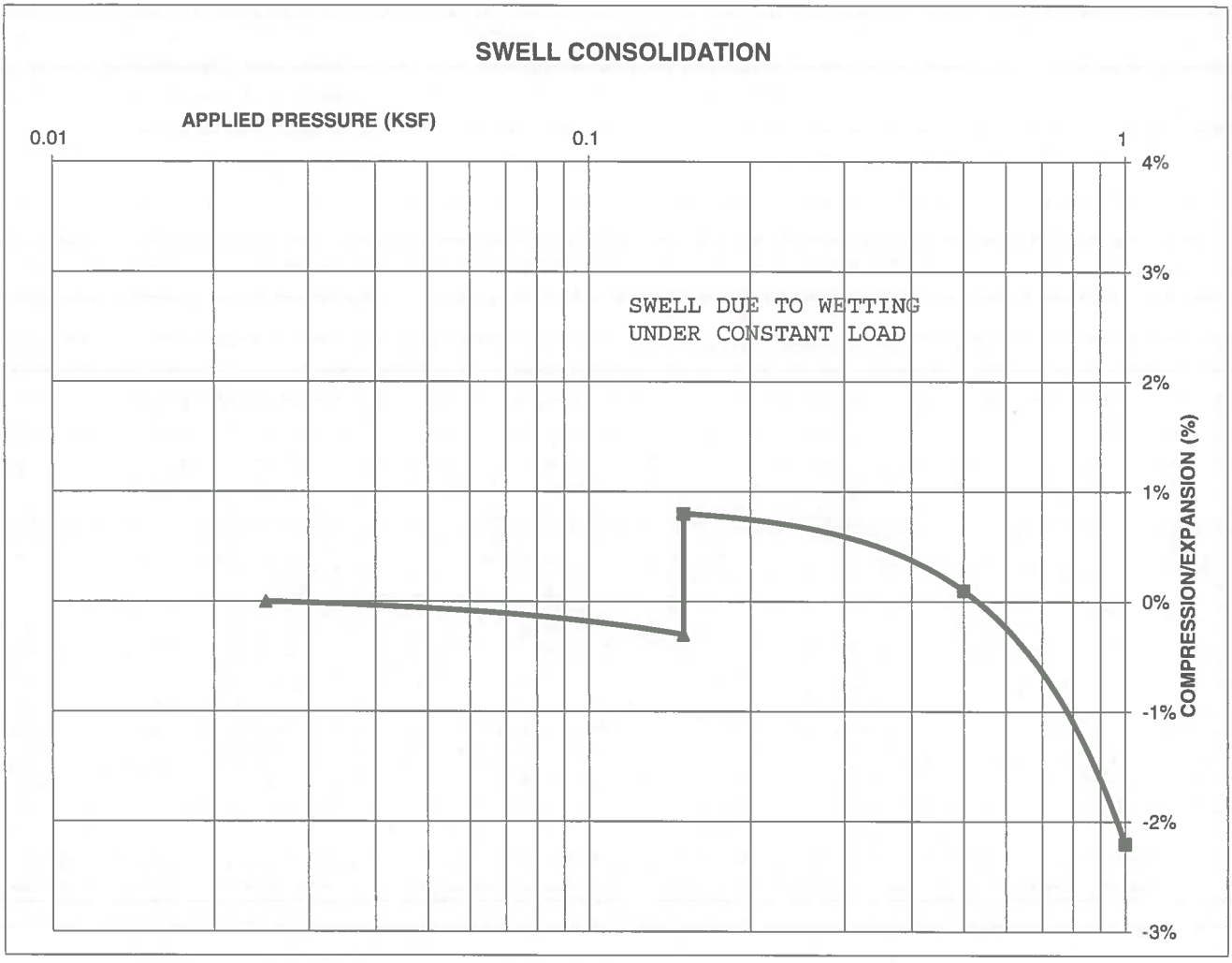
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-18

CONSOLIDATION TEST RESULTS

TEST BORING #	3	DEPTH(ft)	1-2
DESCRIPTION	SC-SM	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			122
NATURAL MOISTURE CONTENT			11.3%
SWELL/CONSOLIDATION (%)			1.1%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

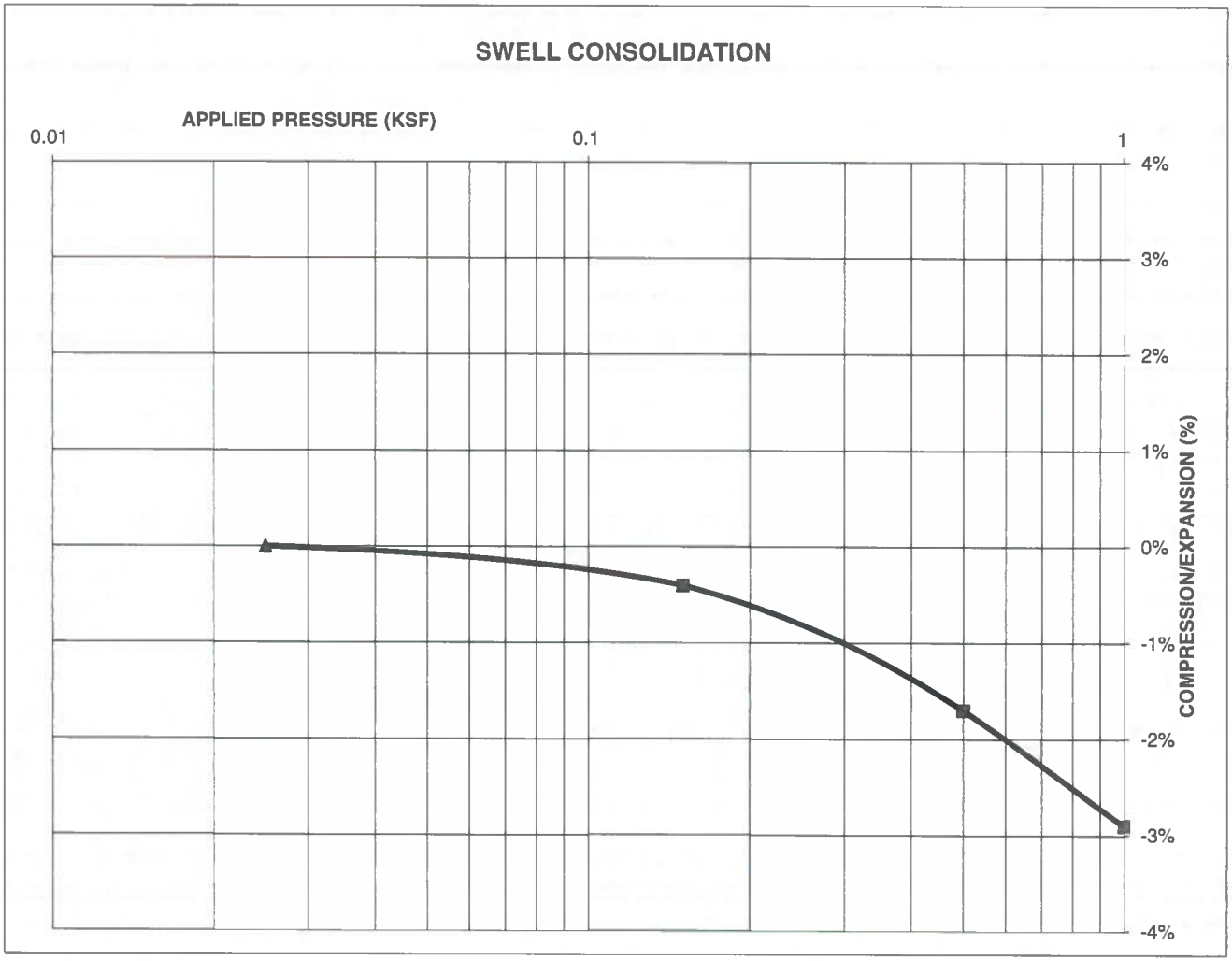
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-19

CONSOLIDATION TEST RESULTS

TEST BORING #	6	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			122
NATURAL MOISTURE CONTENT			10.4%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

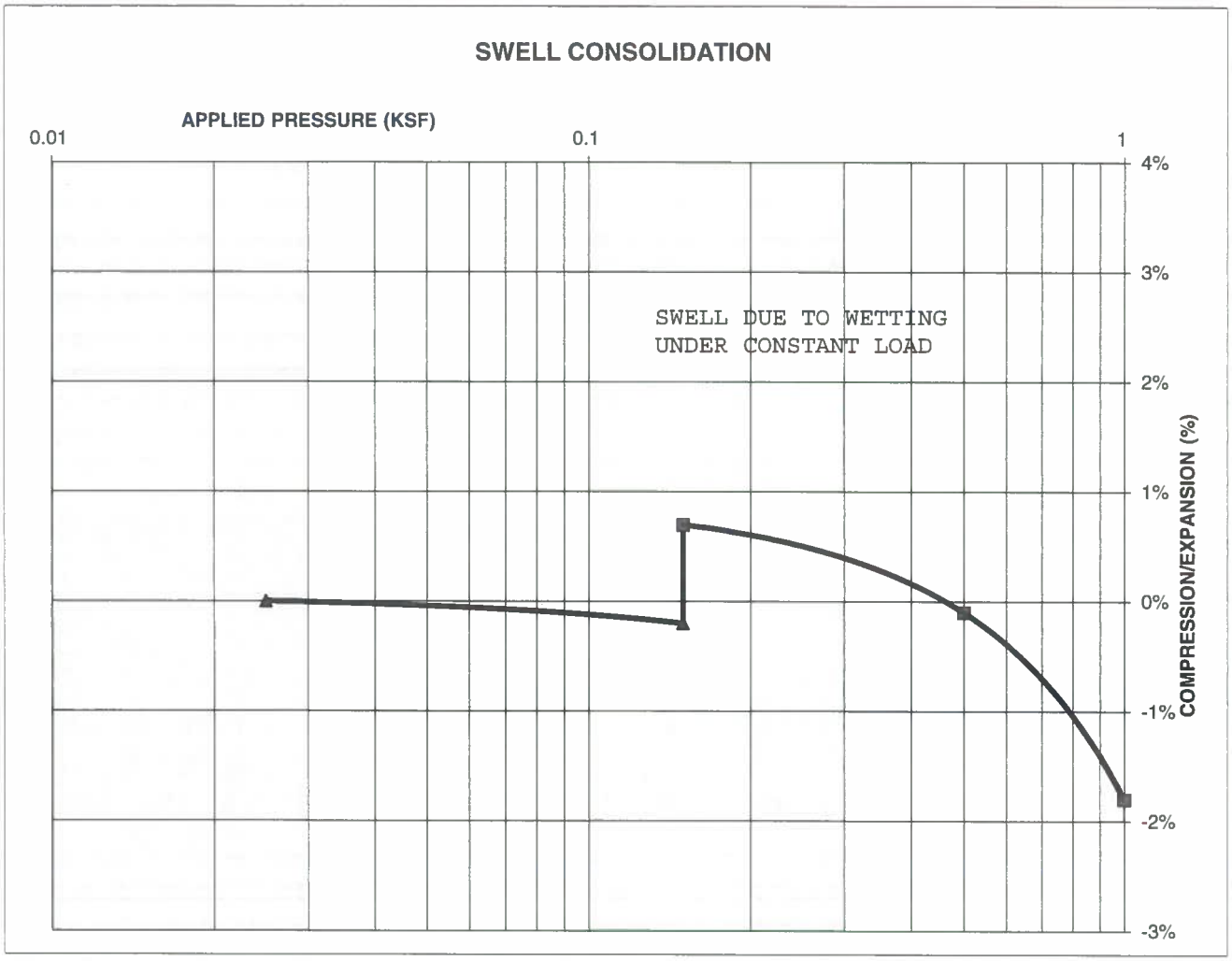
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-20

CONSOLIDATION TEST RESULTS

TEST BORING #	7	DEPTH(ft)	1-2
DESCRIPTION	SC	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			8.9%
SWELL/CONSOLIDATION (%)			0.9%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

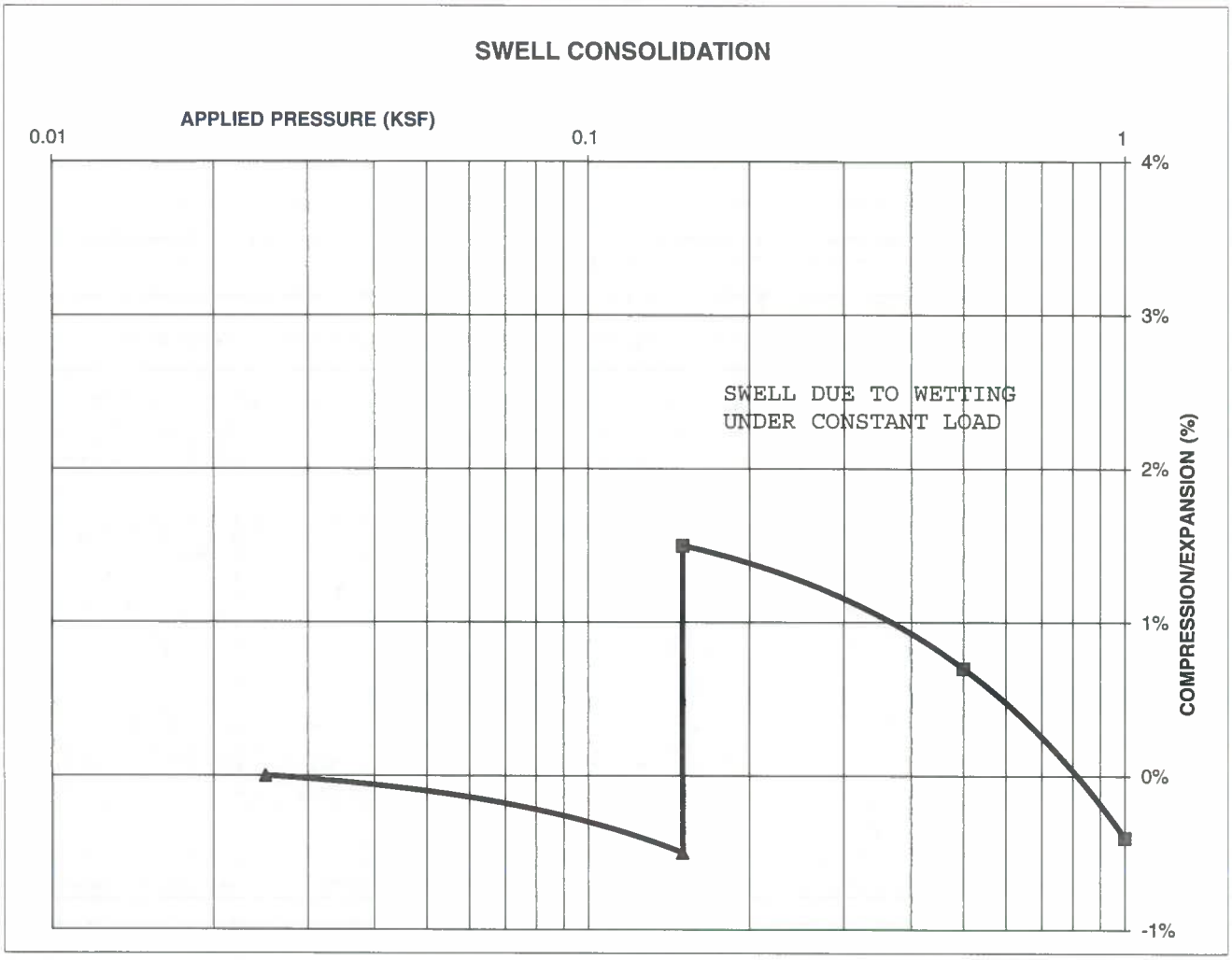
DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-2.1

CONSOLIDATION TEST RESULTS

TEST BORING #	8	DEPTH(ft)	10
DESCRIPTION	SC	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			127
NATURAL MOISTURE CONTENT			11.1%
SWELL/CONSOLIDATION (%)			2.0%

JOB NO. 212273
CLIENT TECH CONTRACTORS
PROJECT ROLLING HILLS, FILING 2



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-22

CLIENT	TECH CONTRACTORS	JOB NO.	212273
PROJECT	ROLLING HILLS, FILING 2	DATE	8/26/2021
LOCATION	ROLLING HILLS, FILING 2	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	1-2	3	SM	<0.01
TB-4	1-2	1	SM	<0.01
TB-7	1-2	2	SC	0.00
TB-8	10	3	SC	<0.01

QC BLANK PASS

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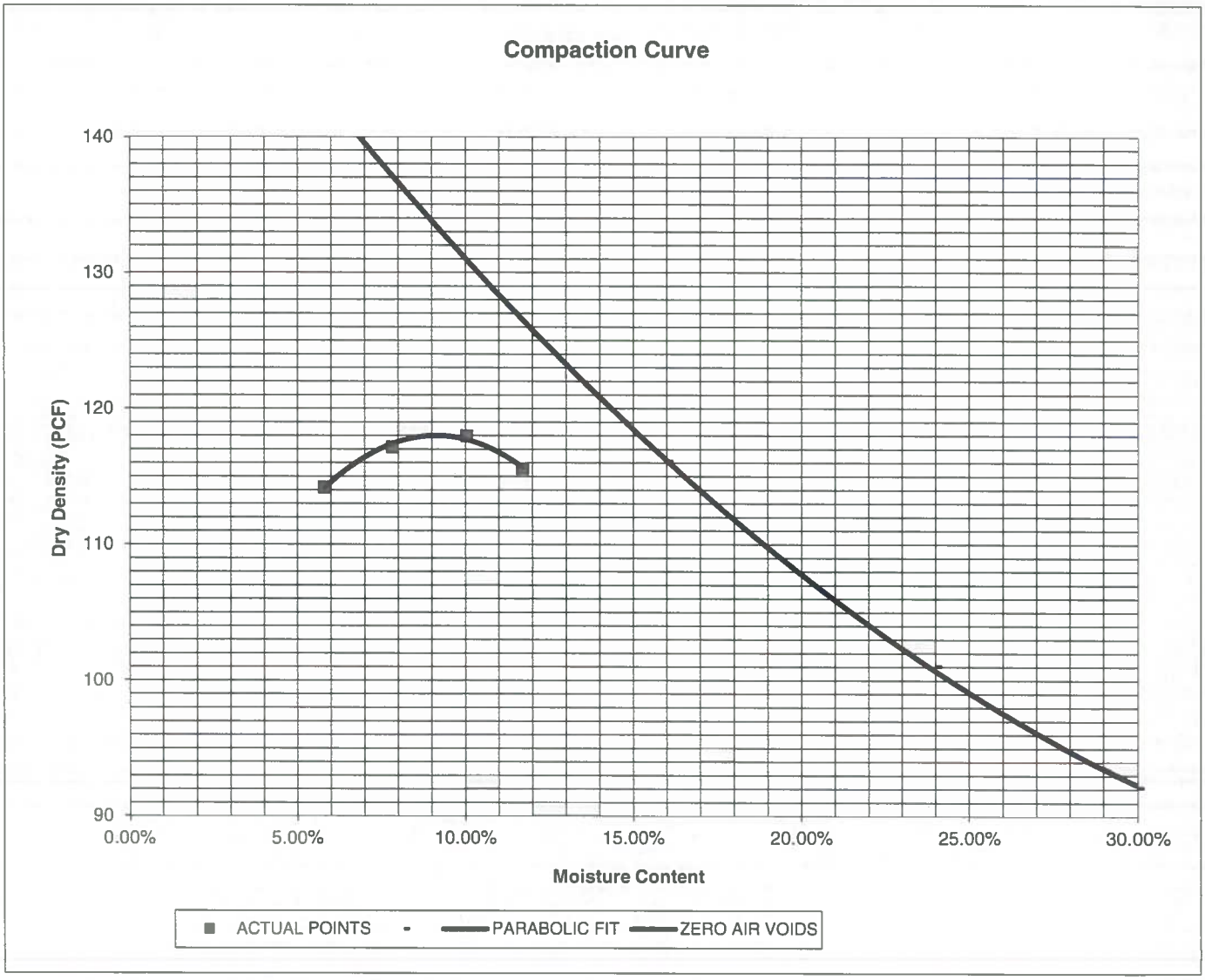
LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED: DS	DATE: 8/31/21

JOB NO.: 212273
FIG NO.: B-23

PROJECT	ROLLING HILLS, FILING 2	CLIENT	TECH CONTRACTORS
SAMPLE LOCATION	TB-2 @ 0-3'	JOB NO.	212273
SOIL DESCRIPTION	SAND, VERY CLAYEY, BROWN	DATE	08/26/21

IDENTIFICATION	SC	COMPACTION TEST #	1, SOIL TYPE #2
TEST DESIGNATION / METHOD	ASTM D-698-A	TEST BY	BL
MAXIMUM DRY DENSITY (PCF)	118	OPTIMUM MOISTURE	9.1%



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MOISTURE DENSITY RELATION

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273

FIG NO.: B-24

CBR TEST LOAD DATA

JOB NO: 212273
CLIENT: TECH CONTRACTORS
PROJECT: ROLLING HILLS, FILING 2
SOIL TYPE: 2

PISTON DIAMETER (cm)	PISTON AREA (in^2)
4.958	2.993

PENETRATION DEPTH (INCHES)	*10 BLOWS* MOLD # 1 LOAD(LBS) (LBS)	STRESS (PSI)	*25 BLOWS* MOLD # 2 LOAD(LBS) (LBS)	STRESS (PSI)	*56 BLOWS* MOLD # 3 LOAD(LBS) (LBS)	STRESS (PSI)
0.000	0	0.00	0	0.00	0	0.00
0.025	37	12.36	86	28.74	153	51.13
0.050	40	13.37	111	37.09	211	70.51
0.075	42	14.04	128	42.77	240	80.20
0.100	43	14.37	143	47.79	268	89.56
0.125	45	15.04	158	52.80	309	103.26
0.150	47	15.71	170	56.81	335	111.95
0.175	52	17.38	188	62.82	349	116.62
0.200	53	17.71	194	64.83	372	124.31
0.300	50	16.71	204	68.17	419	140.02
0.400	50	16.71	228	76.19	487	162.74
0.500	48	16.04	246	82.21	564	188.47

FINAL MOISTURE CONTENT

	MOLD # 1	MOLD # 2	MOLD # 3
CAN #	310	99	302
WT. CAN	6.85	6.8	6.82
WT. CAN+WET	163.82	213.4	170.74
WT. CAN+DRY	137.66	182.99	149.56
WT. H20	26.16	30.41	21.18
WT. DRY SOIL	130.81	176.19	142.74
MOISTURE CONTENT	20.00%	17.26%	14.84%

WET DENSITY (PCF)	109.1	118.3	125.1
DRY DENSITY (PCF)	100.0	108.5	114.7

BEARING RATIO		1.44	4.78	8.96
90% OF DRY DENSITY	106.2			
95% OF DRY DENSITY	112.1			

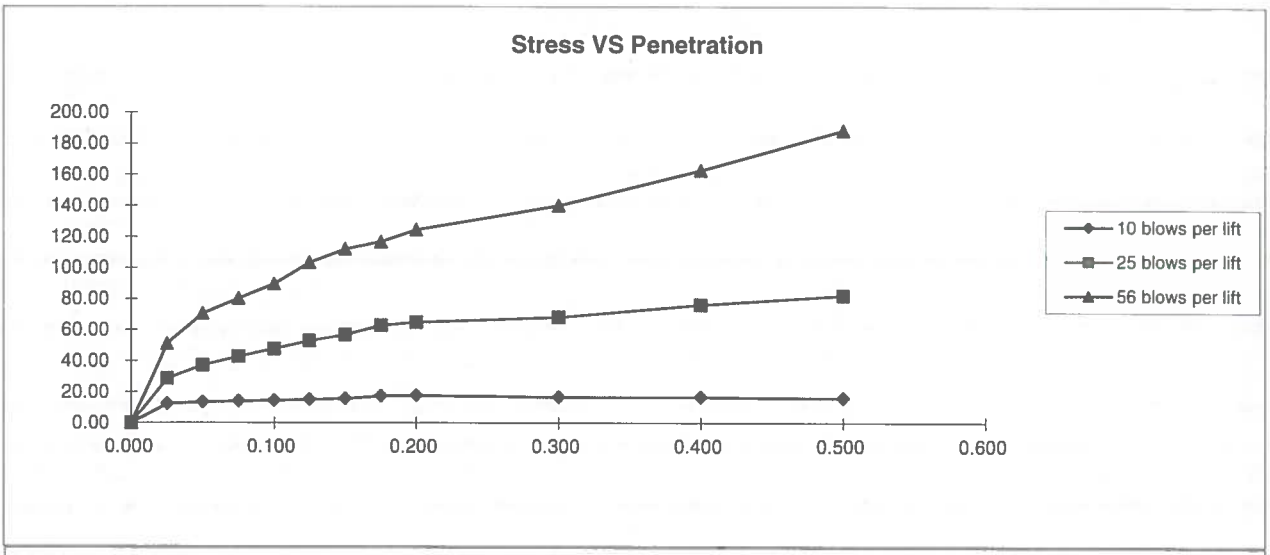
BEARING RATIO AT 90% OF MAX	3.89	~ R VALUE	7.5
BEARING RATIO AT 95% OF MAX	7.21	~ R VALUE	17

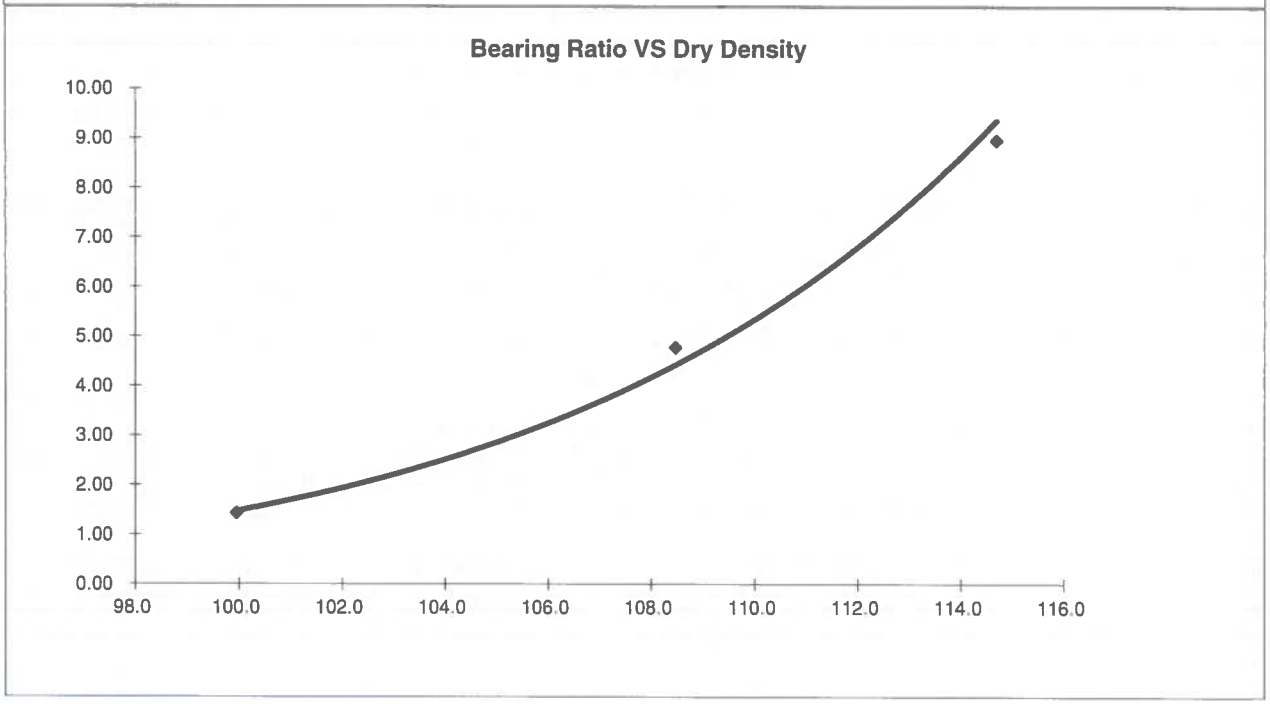
ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

CBR TEST DATA

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-25





BEARING RATIO AT 90% OF MAX	3.89	~ R VALUE	7.50
BEARING RATIO AT 95% OF MAX	7.21	~ R VALUE	17.00

JOB NO: 212273
SOIL TYPE: 2

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CALIFORNIA BEARING RATIO

DRAWN:	DATE:	CHECKED:	DATE:
		DS	8/31/21

JOB NO.: 212273
FIG NO.: B-26

APPENDIX C: Pavement Design Calculations

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 2, PHASE 1
SAVANNAH FALLS COURT CUL-DE-SAC -LOCAL LOW-VOLUME

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	36,500
Hveem Stabilometer (R Value) Results:	R =	17
Standard Deviation	S_o =	0.45
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	4478

Weighted Structural Number (WSN): → WSN = 2.25

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

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

Left	Right	Difference
4.56	4.56	0.0

Job No. 212273
Fig. No. C-1

DESIGN CALCULATIONS

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 2, PHASE 1
SAVANNAH FALLS COURT CUL-DE-SAC -LOCAL LOW-VOLUME

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	17
Weighted Structural Number (WSN):	WSN =	2.25

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 Base Course

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 5.1 inches of Full Depth Asphalt
Use 5.5 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = 3.5 inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 6.4 inches of Aggregate
Base Course, use 6.5 inches

RECOMMENDED ALTERNATIVES

1. 3.5 inches of Asphalt + 6.5 inches of Aggregate Base Course, or
2. 5.5 inches of Full Depth Asphalt

Job No. 212273
Fig. No. C-2

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA:

ROLLING HILLS AT MERIDIAN RANCH FILING 2, PHASE 1
SAVANNAH FALLS COURT CUL-DE-SAC -LOCAL LOW-VOLUME

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	36,500
Hveem Stabilometer (R Value) Results:	R =	50
Weighted Structural Number (WSN):	WSN =	2.25

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.12 Strength Coefficient - Cement Treated Subgrade.

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Cement Treated Subgrade (inches)

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 5.1 inches of Full Depth Asphalt
Use 5.5 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4 inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 4.1 inches
Use 8.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.0 inches of Asphalt + 8 inches of Cement Treated Subgrade.
2. 5.5 inches of Full Depth Asphalt

Job No. 212273
Fig. No. C-3

FLEXIBLE PAVEMENT DESIGN

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 2, PHASE 1
LOCAL RESIDENTIAL - SEE FIGURE 1 FOR SPECIFIC ROADS

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL (W_{18}) =	292,000
Hveem Stabilometer (R Value) Results:	R =	17
Standard Deviation	S_o =	0.45
Loss in Serviceability	Δpsi =	2.0
Reliability	Reliability =	80
Reliability (z-statistic)	Z_R =	-0.84
Soil Resilient Modulus	M_R =	4478

Weighted Structural Number (WSN): → WSN = 3.13

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

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

Left	Right	Difference
5.47	5.47	0.0

Job No. 212273
Fig. No. C-4

DESIGN CALCULATIONS

DESIGN DATA

ROLLING HILLS AT MERIDIAN RANCH FILING 2, PHASE 1
LOCAL RESIDENTIAL - SEE FIGURE 1 FOR SPECIFIC ROADS

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	292,000
Hveem Stabilometer (R Value) Results:	R =	17
Weighted Structural Number (WSN):	WSN =	3.13

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 Base Course

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Base Course (inches)

FOR FULL DEPTH ASPHALT SECTION (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 7.1 inches of Full Depth Asphalt
Use 7.5 inches Full Depth

FOR ASPHALT + AGGREGATE BASE COURSE SECTION

Asphalt Thickness (t) = [5] inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 8.4 inches of Aggregate Base Course, use 8.5 inches

RECOMMENDED ALTERNATIVES

1. 5.0 inches of Asphalt + 8.5 inches of Aggregate Base Course, or
2. 7.5 inches of Full Depth Asphalt

Job No. 212273
Fig. No. C-5

DESIGN CALCULATIONS

CEMENT TREATED SECTIONS

DESIGN DATA:

ROLLING HILLS AT MERIDIAN RANCH FILING 2, PHASE 1
LOCAL RESIDENTIAL - SEE FIGURE 1 FOR SPECIFIC ROADS

Equivalent (18 kip) Single Axle Load Applications (ESAL):	ESAL =	292,000
Hveem Stabilometer (R Value) Results:	R =	17
Weighted Structural Number (WSN):	WSN =	3.13

DESIGN EQUATION

$$WSN = C_1D_1 + C_2D_2$$

C_1 = 0.44 Strength Coefficient - Hot Bituminous Asphalt
C_2 = 0.12 Strength Coefficient - Cement Treated Subgrade.

D_1 = Depth of Asphalt (inches)
D_2 = Depth of Cement Treated Subgrade (inches)

FOR FULL DEPTH ASPHALT SECTION - (CURRENTLY NOT ALLOWED)

$D_1 = (WSN)/C_1$ = 7.1 inches of Full Depth Asphalt
Use 7.5 inches Full Depth

FOR ASPHALT + CEMENT TREATED SUBGRADE SECTION

Asphalt Thickness (t) = 4.5 inches
$D_2 = ((WSN) - (t)(C_1))/C_2$ = 9.6 inches
Use 10.0 inches of Cement Treated Subgrade.

RECOMMENDED ALTERNATIVES

1. 4.5 inches of Asphalt + 10.0 inches of Cement Treated Subgrade.
2. 7.5 inches of Full Depth Asphalt

Job No. 212273
Fig. No. C-6